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Attracting Investments for Development of the Power Sector in Andhra Pradesh

A Study by
INDEPENDENT POWER PRODUCERS ASSOCIATION OF INDIA
April 2015

Disclaimer: The above study has been done on the basis of information available in public domain.

Powering Andhra Pradesh

Power is an important element for the development of any economy. It is equally essential for both industrial and agricultural development. Availability of reliable and affordable power is the need of the hour. Andhra Pradesh has been one of the pioneer states to initiate power sector reforms, and due to which the energy deficit in the state was reduced to 1.5% compared to 7.1% during 2003-04. But post 2004, the state couldn't keep up the growth in supply at par with the demand in growth. The lack of capacity addition in both generation and transmission segments hampered the power supply situation in the erstwhile united Andhra Pradesh. In 2014 Andhra Pradesh was bifurcated into two states namely Telangana and Andhra Pradesh. Andhra Pradesh thus underwent a division of resources including power, infrastructure and fuel as well. Bifurcation has further aggravated the problems as the division was done on the basis of the consumption pattern in the state during 2006-07. The state has been crippled with gas power stations lying stranded in the absence of gas; coal plants bereft of coal supplies and expensive short term power for the state. The Government needs a roadmap of steps which would help to address these critical issues in the state. Both short term and long term plans are required to supply the state with reliable and affordable power.

The objective of this document is to highlight the dynamics of power in Andhra Pradesh, post bifurcation. We have tried to focus on the issues which are affecting the power supply scenario in the state. Some of the areas focused upon are:

- Challenges in the newly created state of Andhra Pradesh, Post bifurcation.
- New Gas Scheme: Details and Implications
- Research paper : Assessment of power transfer capability from the rest of India to southern region (by : Mr. Ravinder)
- Bottlenecks in the transmission of electricity to Andhra Pradesh.
- Future of Renewable Energy in Andhra Pradesh
- Key highlights of the new solar and wind policy 2015, Andhra Pradesh.

The conference aims to further deliberate on the above mentioned issues along with many others and discuss possible solutions. These suggestions would then be forwarded in the form of recommendations and suggestions to the Central Government, State government and concerned ministries.

Post bifurcation challenges: Generation, Transmission & Distribution

The Andhra Pradesh Reorganisation Bill, 2014 was introduced in Lok Sabha on 18 February 2014 by the Ministry of Home Affairs. The Bill highlights the creation of a separate state, to be called Telangana, comprising 10 districts of the existing State of Andhra Pradesh.

The bifurcation of the power sector between Andhra Pradesh & Telangana

The division of the units of Andhra Pradesh Power Generation Corporation (APGENCO) will be based on the geographical location of power plants. Existing Power Purchase Agreements (PPAs) with respective Distribution Companies (DISCOMS) will stand true for both ongoing projects and those under construction. The existing State Load Despatch Centre (SLDC) shall function on behalf of both the new States for a maximum period of two years. In this period, separate SLDCs will be set up. The transmission lines of Transmission Corporation of Andhra Pradesh (APTRANSCO) of 132 KV and higher voltage cutting across the new States shall be deemed as Inter-State Transmission System (ISTS) lines. The transmission lines falling within the territory of each new State will be transferred to the respective state transmission utilities. Furthermore, the maintenance of ISTS lines will be carried out by the new states in their respective jurisdictions. The power generated from the central generating stations will be allotted between the two new States based on the actual energy consumption in the last five years of the relevant DISCOMS in the respective new State. The hydro generation issues at present will be handled by the Andhra Pradesh Electricity Regulatory commission (a representative of Telangana shall be there in the committee). Furthermore, for a period of 10 years, the new State that has a deficit of electricity shall have the first right of refusal for the purchase of surplus power from the other state.

Impact on power sector in Andhra Pradesh

The bifurcation of the combined state into Andhra Pradesh and Telangana had an adverse impact on Andhra Pradesh. The allocation of power from APGENCO stations has been done based on G.O. 20 dated 08th May 2014 which has allocated 46.11% of the total capacity of APGENCO stations (Existing & Under construction) to Andhra Pradesh. This figure was arrived at, based on consumption in the last five years. Though the ownership of the power stations is with the respective GENCOs based on geographical locations, power was not allocated based on the principle of geographical location. The allocation of power based on G.O 20 instead of being based on geographical location has resulted in a capacity loss of 1,142 MW for Andhra Pradesh. This would result in an annual energy shortage of 8,700 MU for the state. The financial impact on the state over the PPA term for meeting this shortfall from the open market would be an NPV of around INR 10,000 Crore.

Telangana claims ownership of Krishnapatnam Thermal Project, Andhra dismisses it

Citing the share holding pattern of DISCOMs, the Telangana government has claimed ownership of the 800 MW thermal project at Krishnapatnam, a project was planned when the state was united. At that time, a separate corporation called AP Power Development Corporation Limited (APPDCL) was created to fund the project. The erstwhile APGENCO was the major shareholder in the APPDCL with 51% shares, followed by CPDCL with 29.37%, SPDCL with 9.84%, NPDCL 7.06%, EPDCL 6.99% and the AP government 4.78%. Post bifurcation, these figures were changed as per the formula created by the Ministry of Power, and the assets of APGENCO and APTRANSCO were distributed between the two states. The special purpose vehicle (SPV) that was formed to fund Krishnapatnam project was also split. Thus, the Telangana government got the majority share in APPDCL. While Telangana GENCO got 27.49%, the two DISCOMs -southern DISCOM and northern DISCOM in Telangana got 16.82% and 7.02 %, respectively. The AP government's share was trimmed to 46.69%, with APGENCO's share pegged at 23.51% and eastern and southern DISCOMs getting 6.99% and 13.39%, respectively. At present the AP government has rejected this, stating that the project is located within in its state. To resolve this dispute centre will formulate a committee under the stewardship of CEA.

The legal proceedings on the residual matters of the Regulatory Commission

Proceedings in the original petitions, review petitions and interlocutory applications pending before the erstwhile Andhra Pradesh Electricity Regulatory Commission (APERC) are questioned after the bifurcation of the State of Andhra Pradesh.

As in so far both the Commission's has geographical jurisdiction power as defined by the G.o.I. Proceedings in the original petitions, review petitions and interlocutory applications pending before the erstwhile Andhra Pradesh Electricity Regulatory Commission have to be continued before Telangana Electricity Regulatory Commission (TERC).

To achieve the said purpose the following procedure is defined as below;

- The petitioners have to report to the Commission whether their petitions / applications as framed and as pending are within the jurisdiction of the present Commission and need no amendment.
- If the respondents desire to question the existence of such jurisdiction, it is open to them to file an additional pleading to that effect, in response to which, the petitioners can file their rejoinder. The question of jurisdiction will be decided by the Commission on merits, if so raised.
- If the petitioners report that the petitions / applications require to be amended in respect of the parties or the subject matter or the relief or otherwise in respect of any part of the pending proceedings, they can come up with appropriate Interlocutory Applications which can be resisted by the respondents by filing counters and the Commission will decide the amendment applications on merits.

- If the amendment applications are allowed, necessary consequential procedural steps will be ordered and respondents will have a right to file additional pleadings in response to the amended petitions / applications.

Foresight needed on the part of the Government towards power purchase

There is not enough long term power procurement planned by the State Government. Government needs to arrange power procurement arrangement on medium and short term basis. In the absence of a comprehensive plan, Government did not take any initiative to book the limited transmission corridor available between the NEW and the Southern grid. The entire transmission corridor was booked in advance by neighbouring states of Karnataka and Tamil Nadu. As a result, APDISCOMS were forced to buy power at higher cost from Southern regional generators and lost the opportunity to avail power at a much cheaper rate from NEW grid. A comprehensive plan to approach the problem of power shortage is necessary to provide the state with affordable and reliable power supply.

Integrated planning in Generation, Transmission and Distribution

The Transmission capacity addition is not in line with the Generation capacity addition resulting in a lack of evacuation options for new generating plants. Some of the power plants which were commissioned were forced to remain idle for the lack of evacuation options. This has to be dealt with effective and efficient planning.

There is an urgent need to come up with a detailed roadmap with steps to be taken to address the issues of the power sector in the state. Short to long term planning is required for augmenting the power capacity commensurate with the increase in demand by having a common integrated planning framework involving all three arms of the power sector to achieve key objectives outlined below

Key objectives:

- Provide 24 hours availability to all industrial and domestic customers
- Provide 7 hours availability to agriculture sector with a view to gradually increase it to 9 hours over a period of time
- Ensure reliable and affordable power to all consumers
- Thrust for optimum harnessing of renewable sources of energy
- Monitor and improve customer satisfaction
- Reduce power loss levels to lowest in the country

New Gas Scheme for utilization of gas-based power projects: Details & Implications

An Overview of the Present Situation

The present gas based capacity, commissioned as well as ready for commissioning projects in the country is 27,123 MW. Of this, during the last financial year (April 2014 to January 2015), the gas grid connected plants with the capacity of 9,845 MW received some limited available domestic gas and operated at an average PLF of 32.2%. Further, 14,305 MW capacity had no supply of domestic gas during the year and have been classified as stranded projects. Of 14,305, about 6294 MW generation capacity is based in the state of Andhra Pradesh. Projects which have been facing serious fuel paucity issues for the past few years in Andhra Pradesh include those of Reliance Power, GVK, GMR Energy, Lanco Infratech, among others. With sub-optimal capacity utilisation and supply side bottlenecks, the present sunk investment in these gas based power plants of over INR 64,000 Crore is in danger of turning into non-performing assets (NPAs).

**Grid Connected Gas-based Power Plants:
Ownership, Consumption and Plant Load Factor**

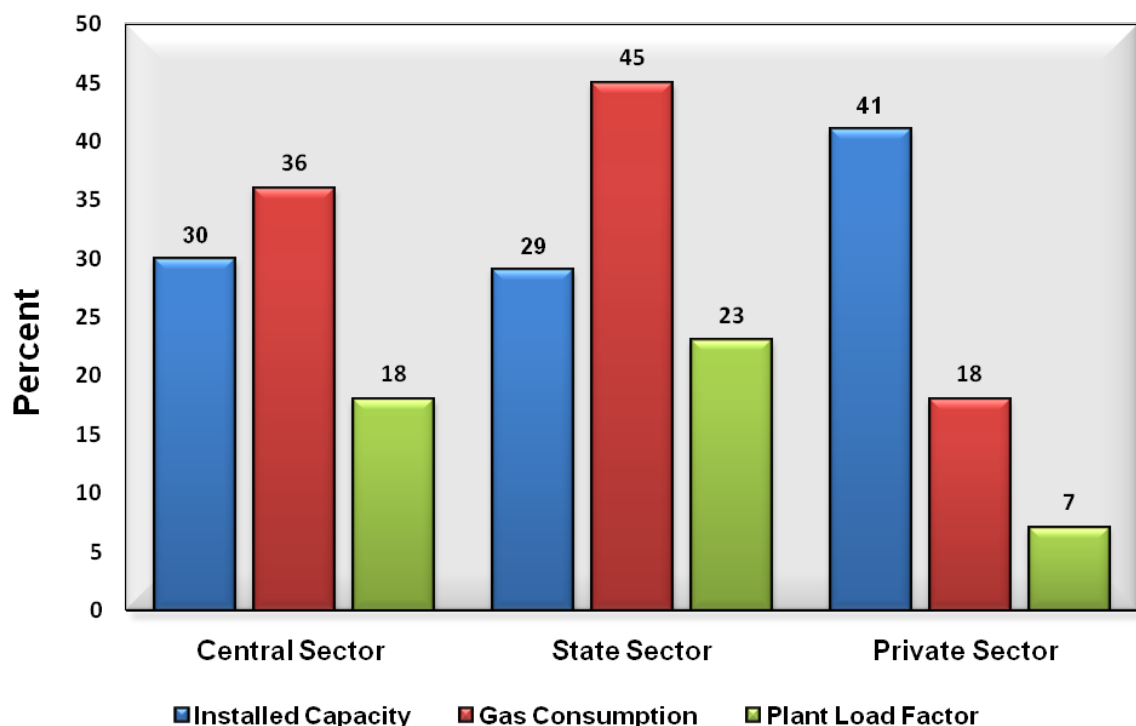


Figure 1: Grid Connected Gas-based Power Plants: Ownership, Consumption and Plant Load Factor, Source: Central Electricity Authority (CEA) & National Council of Applied Economic Research (NCAER)

State-wise distribution of gas based power plants

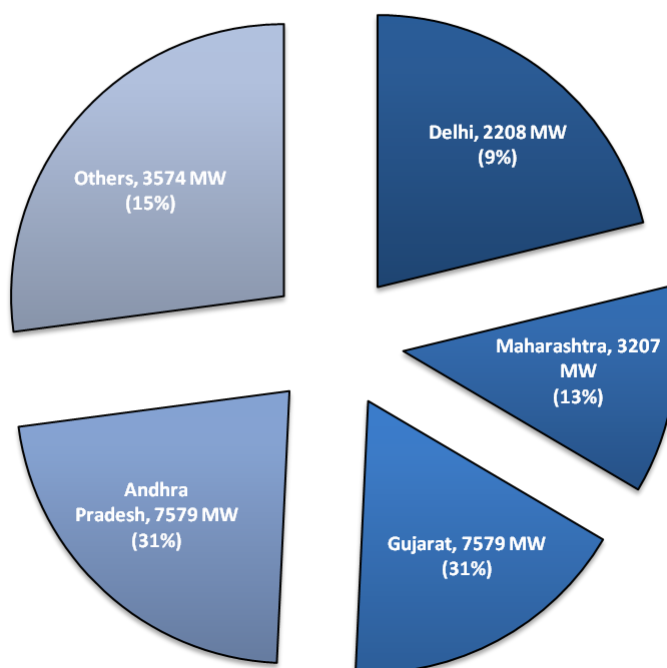


Figure 1.1: State-wise distribution of gas-based power plants in India, Source: Central Electricity Authority (CEA)

Capacity utilization in Andhra Pradesh

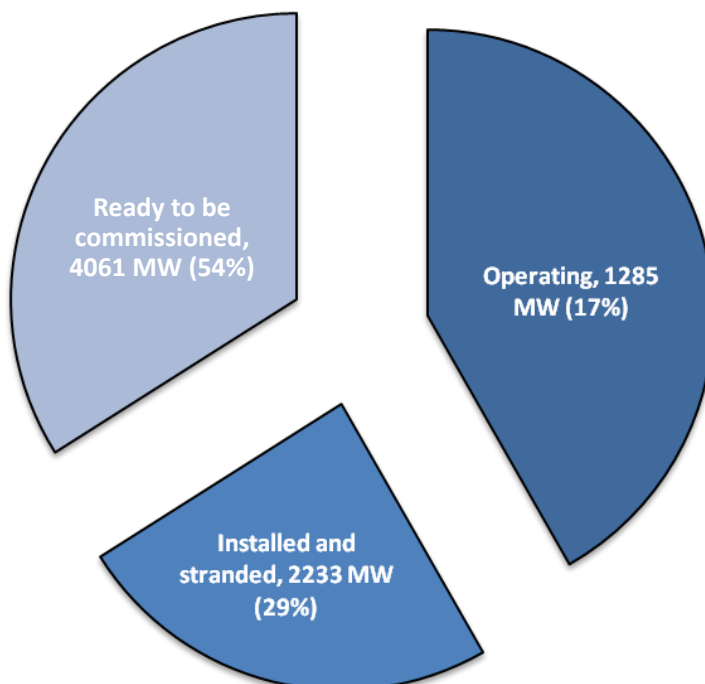


Figure 1.2: Capacity utilization in Andhra Pradesh, Source: Central Electricity Authority (CEA)

Brief on the scheme

A new innovative gas plan was mooted last month to kick start stranded gas-based power projects, particularly in the state of Andhra Pradesh. The new scheme aims to utilize gas based power generation capacity for the years 2015-16 and 2016-17. A subsidy of up to 7,500 Crore will be provided to private power companies in the next two years as part of the scheme approved by the Cabinet to revive 31 electricity generating units stranded for want of gas. 31 power stations with a capacity of 14,305 MW, would be allowed to run their power plants at 30 per cent capacity by using expensive imported gas. The additional cost of generation (and subsequent need to increase power tariff) would be absorbed through subsidy grants by government from its power system development fund (PSDF), created to finance projects that help in keeping the grid stable, robust and strong.

The PSDF kitty has accumulated INR 9,500 Crore as of now. Though the purpose of this fund is to maintain grid stability and security, the government justified its use for reviving gas-based power plants on the grounds that such plants are best suited to meet the peak load demand.

The Cabinet Committee on Economic Affairs (CCEA) on March 26, approved a financial assistance scheme for private power companies for two years, with INR 3,500 Crore of support capped for 2015-16 and INR 4,000 Crore for 2016-17.

The outlay for the support from PSDF has been fixed at INR 3500 Crore and INR 4000 Crore for FY 2015-16 & 2016-17 respectively. Further, PSDF support is apportioned between the two groups as Stranded plants: INR 3000 Crore, Plants receiving domestic gas: INR 500 Crore for FY 2015-16 and Stranded plants: INR 3500 Crore, Plants receiving domestic gas: INR 500 Crore for FY 2016-17.

Power Companies seeking the lowest support from PSDF, after considering an electricity tariff of INR 5.50/unit, will get the first right over LNG, whose delivered price too will be slightly reduced by asking importer and transporter to take a hair-cut in marketing and operational cost.

For stranded plants, where bids are invited for subsidy support, the tariff will be capped at INR 5.50/unit initially, while it will be capped at INR 4.19/unit for those running partially on domestic gas.

Power plant developers would quote a tariff, with INR 5.5/unit as the feed-in rate or the assured tariff. The lowest bidder would be able to sell power to distribution companies, and would be supplied natural gas, while the distribution companies would be subsidized by the government.

These developers will have to quote a per unit price as subsidy support in reverse bidding. For 2015-16, the ceiling price for stranded plants will be INR 0.94 per unit and INR 1.26 per unit for plants receiving domestic gas. The bidders will have to quote lower support from the ceiling price.

The subsidy would be paid to discoms by an empowered pool management committee (EPMC). The discoms will pay for the gross value of purchased power (including the amount received from PSDF). The amount will be deposited in a trust and retention account, where lenders would have the first right on revenue for servicing debt.

To make the imported fuel affordable, the union government has also decided to waive service tax while the importer will take a 50% cut in the cost of converting the liquid gas (LNG) into its gaseous state. State gas utility GAIL will cut its marketing margin by 75% and while the pipeline transportation tariff too would be cut by 50%. All the measures together will help bring down the delivered cost by at least USD 1 per million British thermal unit.

Broad contours of the scheme

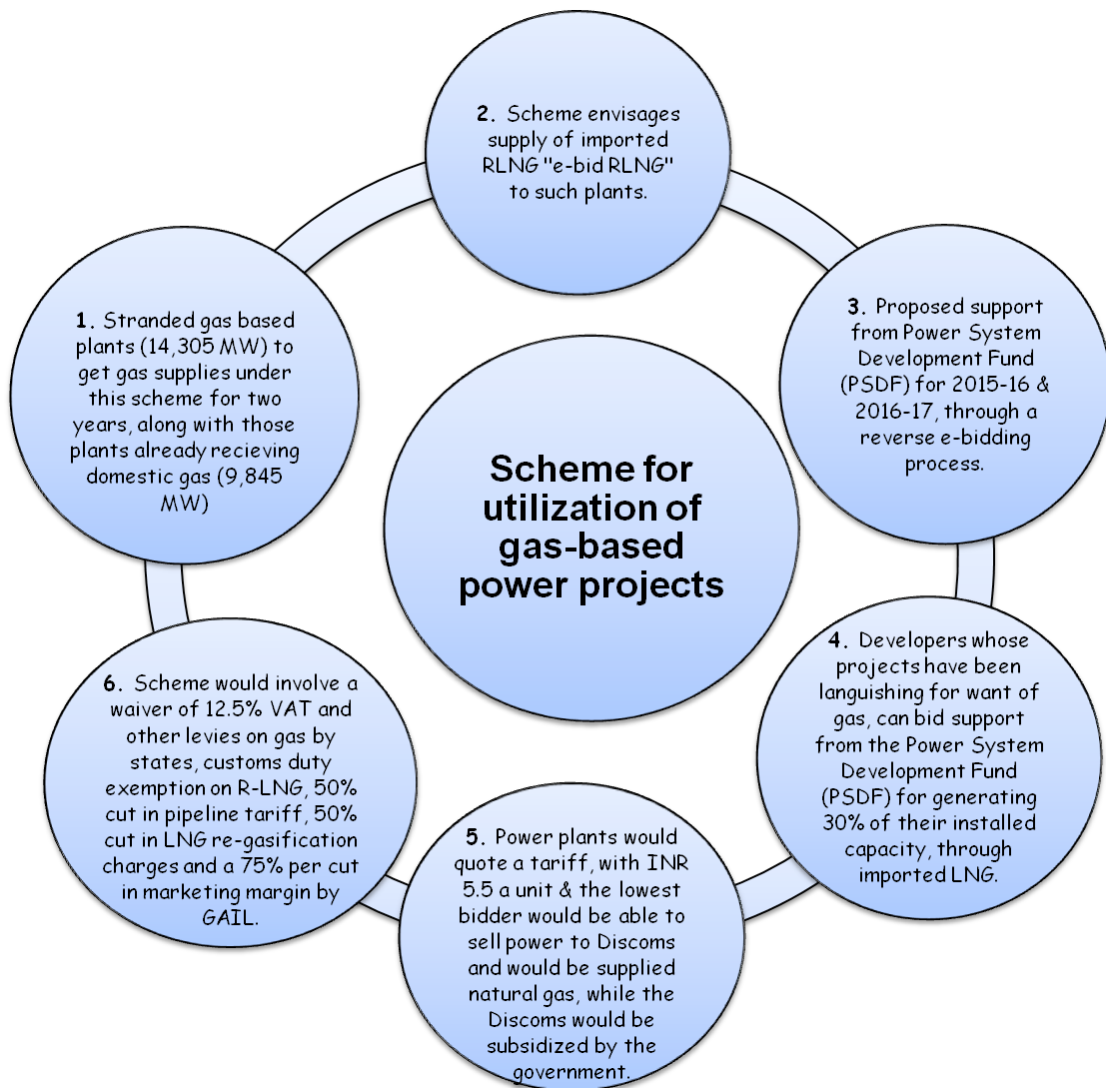


Figure 1.3: New Gas Scheme, Source: Ministry of Power (MoP)

Some thought provoking facts

Though details of the scheme are still being worked out, it comes with a number of riders. For instance, power plants availing of it will have to function at 30 per cent plant load factor. This will translate to roughly 1.2 million standard cubic metres a day (mscmd) of gas for a 1000 Mw power plant. It is expected that initially 10 mmscmd would be imported during the monsoon months, followed by another 18 mmscmd.

Besides the condition of lower PLF, power plants will also have to forego their return on equity while calculating the tariff. This means that the power plant's revenue will essentially meet the operating cost and service debt. According to a Moody's report, IDBI Bank has an especially high exposure to gas-based power plants and would be the key beneficiary of these measures. State Bank of India and ICICI Bank have exposure to Ratnagiri Gas & Power, which is the largest gas-based power plant in India, and would benefit as well, it said. The total exposure of the banking system to the power sector at the end of January 2015 was around \$88 billion, or 9 per cent of the outstanding bank credit. Banks had a major exposure to gas-based power plants that had a high risk of turning into non-performing loans. What it holds for the owners of these gas-based plants like Lanco Infratech, Essar Power, Reliance Power, GVK Group and GMR Energy is not very clear. Repayment of debt would enable them to get some of the liabilities out of their balance sheets.

The current spot rate of imported gas is \$10 with the cost of generation working out to be INR 5/unit, while domestic gas-based power is INR 4/unit (in comparison to INR 4 for imported coal and INR 3.25 for domestic coal).

The bottomline

The success of the new mechanism is yet to be gauged. But a lot would depend on the concurrence of distribution companies and their ability to buy such power at INR 5.5/unit. As things stand today, sometimes they are reluctant to buy power even at INR 4/unit. Between balancing the interest of consumers and producers, the government seems to be walking a tight-rope on such issue.

Key challenges

(a) Fiscal implications:

As per unit selling price electricity has been administratively capped at INR 5.50/unit, the difference between the selling price and the price of production leads to a revenue shortfall. Currently, domestic gas is priced at \$4.66 per mmbtu on Gross Calorific Value basis while the imported LNG price varies between \$10 and \$14 per mmbtu. The increase in the cost of power generation using imported gas would make it unaffordable to the end-uses. The difference between the selling price of gas and the cost price of gas is the revenue shortfall. This revenue shortfall is proposed to be covered by various agencies including the central and state governments, gas transporters, power developers and the banks.

The total revenue shortfall can be divided into three main groups: subsidies, potential tax revenue forgone by government, and the potential revenue losses to be borne by other sectors taking cuts in their marketing, transportation and re-gasification costs.

(b) Logistics challenges:

Logistics and operational efficiency of the power plants would have a key role to play as efficient power plants would have a lower marginal cost of production compared to inefficient ones. However, one of the key drawbacks of the mechanism is the 30 per cent target PLF, which is a low utilisation threshold to derive any meaningful benefit (even for paying out lenders). The competitive process of selection further mandates a higher benchmark PLF (may be up to 70 per cent) to reduce the burden on all stakeholders, including the government.

As the economy grows, it is inevitable that our requirements for natural gas will also grow at a much faster rate than our domestic production. However, our capability to enhance imports is seriously crippled by the capacities of LNG terminals (India currently imports 40 mmscmd of gas annually, while the existing capacity to handle imports is only 60 mmscmd). Hence, it is pertinent for the government to support expansion plans and new greenfield investments on new LNG terminals.

The natural gas price, especially RLNG is highly volatile, and the three most important sectors - fertilisers, transport/domestic and electricity are not structurally tuned to absorb such price shocks.

(c) Unwillingness of Discoms to procure power:

Though the government has capped the price of power from gas-based generation units at INR 5.50 per unit, it is also at a higher band and Discoms may be unwilling to procure power at this price. Given the past experience of state-run utilities and the huge burdens of loss they have had to bear, persuading them to absorb any incremental cost of power would be an uphill task.

Looking at the constraints, this new scheme might be a good beginning. However to ensure its success, a suitable Power Purchase Agreement (PPA) must be in place incorporating scheme specific features such as 30 per cent PLF, pre-determining fixed charge and feed in tariff, to ensure that developers are not worse off than now.

Gas swapping and co-mingling: What it holds for plants in Andhra Pradesh and other states

It is argued by the government that in order to supply e-bid RLNG adequate provision of swapping of gas would be essential. Under the gas swap, KG-D6 gas will be diverted to IPPs in Andhra Pradesh and in lieu of the same, the existing off-takers of KG-D6 gas will be supplied e-bid RLNG. In order to ensure the transaction to be revenue neutral to the existing fertilizers customers of KG-D6 and also for the pipeline transporters concerned, the

beneficiary IPP's in Andhra Pradesh need to bear **additional costs** incurred in this transaction towards AP State VAT and reverse flow transportation tariff under the PNGRB regulations.

This will also lead to a payment of ship-or-pay charges up to 90% of the contractual transportation volumes by the fertilizers units to the transporter (RGTEL). Similarly, for gas swapping for the states with Maharashtra/Goa/Karnataka will be required as e-bid RLNG cannot be transported from Dabhol terminal to Gujarat along GAIL's pipeline network.

The Fertiliser Ministry recently allowed swapping of natural gas from the KG-D6 reserve being supplied to Rashtriya Chemicals and Fertilizers (RCF) units located in Maharashtra with R-LNG, thereby facilitating an additional supply of 2.2 mmscmd to Andhra Pradesh and Telangana.

With the approval, around 450 MW of power can be generated by independent power producers (IPPs) with Andhra Pradesh getting a share of 208 MW and Telangana 242 MW.

The IPPs located in the two States have pipeline connectivity with RGTEL's (Reliance gas transportation) East-West pipelines, while currently operational R-LNG terminals are located on the western coast. Even though East-West pipeline of RGTEL provides physical connectivity to eastern part but as communicated by RGTEL, it is not possible for R-LNG to flow from western parts of India to Andhra Pradesh. Therefore, direct R-LNG supply to customers in Andhra Pradesh and Telangana is not possible and can only be achieved through swapping of gas. **(Source: Hindu Business Line / March 13, 2015)**

Domestic gas price cut in line with falling international prices:

Domestically produced natural gas will be priced at \$5.17 per million British thermal units (mBtu) on the basis of net calorific value (NCV) between April 1 and September 30 2015, a 7.7 per cent cut from the existing price of \$5.61 per mBtu. The new price reflects the significant decline in global crude oil and LNG prices since June last year. On gross calorific value (GCV) basis, the price is seen coming down from the existing \$5.05 per unit to \$4.66 per unit. The new gas price of \$4.66 per unit had been worked out based on the New Domestic Natural Gas Pricing Guidelines of 2014.

Assessment of power transfer capability from rest of India to Southern Region

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Present scenario of Southern Region for importing power

Feb 15²

Corridor	Total Transfer Capability (TTC)	Reliability Margin	Available Transfer Capability (ATC)	Long Term Access (LTA)/ Medium Term Open Access (MTOA)	Margin Available for Short Term Open Access (STOA)
WR-SR	2100/2500	750	1350/ 1750	1350	0/ 400
ER-SR	2650	0	2650	2650	0
S1- S2	2875	315	2650	2535	25

March 15³

Corridor	Total Transfer Capability (TTC)	Reliability Margin	Available Transfer Capability (ATC)	Long Term Access (LTA)/ Medium Term Open Access (MTOA)	Margin Available for Short Term Open Access (STOA)
WR-SR	2100	750	1350	1350	0
ER-SR	2650	0	2650	2650	0
S1- S2	2875	315	2650	2535	25

1) Former Chairperson and Member Power Systems, CEA
2) http://posoco.in/attachments/article/271/ATC_NLDC_Feb'15_Rev12.pdf
3) http://posoco.in/attachments/article/272/ATC_NLDC_Mar'15_Rev4.pdf

April 2015 (Rev5)⁴

Corridor	Total Transfer Capability (TTC)	Reliability Margin	Available Transfer Capability (ATC)	Long Term Access (LTA)/ Medium Term Open Access (MTOA)	Margin Available for Short Term Open Access (STOA)
WR-SR	2300/2700	750	1550/1950	1350	200/600
ER-SR ⁵	2650	0	2650	2585/2650	65/0
S1- S2 ⁶	2970	31	2655	2535	120

The simultaneous import capability of SR in April 2015 is of the order of 4950/5350 MW depending on time of the day.

Limiting Constraints in April 2015 for WR-SR & ER-SR

1. (N-1) contingency of one circuit of 400kV Parli (PG)-Sholapur(PG)
2. N-1 of 400 kV Wardha – Parli will lead to 30 degrees angular separation between Wardha and Parli.
3. ER-SR TTC has been declared assuming more than 1100 MW generation at Talcher Stage-2. In case Talcher Stage-2 generation goes below 1100 MW, then the ER-SR TTC would be revised downward as constraints within ER would emerge

What will happen next?

765 kV Pune-Sholapur single circuit line has been recently commissioned as a result of one more path in addition to Parli-Sholapur has been created for pushing power to SR. The TTC for WR-SR has been increased marginally in April 2015. As a result of completion of 765 kV Narendra- Kohlapur double circuit inter regional line at 400kV between WR and SR in Dec 15 there could be a marginal addition of a few hundred MW. PGCIL is making best efforts to bring it by Aug 2015, however, there is apprehensions of loop flow i.e. power going to SR from Sholapur and coming back to WR via Narendra to Kohlapur.

Aurangabad - Solapur line D/C 765kV, 280 Km is progressing well and scheduled to be commissioned in MAR-16. This may not result in significant change because N-1 criterion limits the capability of Sholapur- Raichur corridor to about 3000MW.

4) http://posoco.in/attachments/article/273/ATC_NLDC_Apr'15_Rev5.pdf

5) ER-SR TTC declared at Talcher Interconnector and Gazuwaka HVDC B/B seam

6) S1 comprises AP and Karnataka: S2 comprises Tamil Nadu, Kerala and Pondicherry

So, in the next one year the transfer capability would increase only marginally and exact calculation would be done at the appropriate time.

The next WR-SR link to come up is 765kV Wardha- Hyderabad double circuit link (via Nizamabad) for which substation land has been acquired and orders have been placed. It should take 2 to 2½ years i.e. mid 2017. It may add 2500 MW to SR in terms of TTC. The line was awarded to POWERGRID on nomination basis in December 2010, however, the implementation has been delayed.

Warora-Warangal 765kV double circuit line has been taken up for implementation through competitive bidding in March 2015 and it should be ready by 3½ years, which means end of 2018. This may contribute about 2500MW.

6000MW, +800kV HVDC Bipole link between Western region (Raigarh, Chhattisgarh) and Southern region (Pugalur, Tamil Nadu) has been awarded to PGCIL on nomination basis and they have issued the NIT. It may take five years i.e. by 2020.

Strengthening of transmission system beyond Vemagiri (to Chilakaluripeta to Cuddapah, Narsaraopeta, Madhugiri and Hindupur. Srikakulam to Garividi) has been notified in March 2015 for implementation through competitive bidding. Angul (ORISSA) is already getting connected to Srikakulam and Vemagiri in the next two years i.e. by 2017. This will result in an ER-SR 765KV double circuit corridor by 2019.

According to CEA perspective plan prepared in Aug 14, the WR-SR transmission capacity by the end of 13th plan may be 22,320 MW. This is the sum of transmission capacity for the IR links and should not be confused with the transfer capability. By rule of thumb based on the international experience and experience of NLDC, the TTC is usually 30%-40% of aggregate transmission capacity of the inter-regional links.

Inter- Regional Transmission Capacity addition during 13th Plan⁷

WEST- SOUTH

Wardha (WR-Maharashtra) – Nizamabad (SR- Telangana) 765kV D/c line	4200 MW
Raigarh (WR-Chhattisgarh) – Pugalur (SR-TN) +/- 800kV, 6000 Bi-pole	6000 MW
Warora Pool (WR-Maharashtra) – Warangal (SR-Telangana) 765kV D/c line	4200 MW
	14,400 MW

EAST- SOUTH

Angul (ER-Orissa) – Srikakulam (SR- Andhra Pr) 765kV D/c line (2 nd)	4200 MW
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7) http://posoco.in/attachments/article/273/ATC_NLDC_Apr'15_Rev5.pdf

Summary of Inter- Regional Transmission Capacity MW⁸

Transmission Corridor	Existing	12th Plan	End of 12th Plan	13th Plan	Total Transmission Capacity
WR-SR	5720	2200	7920	14400	22,320
ER-SR	3630	4200	7830	4200	12,030

Please note that from the existing WR-SR transmission capacity of 5,720MW in the CEA table, the TTC is now only 2100. The impact of addition of Narendra- Kohlapur is going to be marginal due to its position in the network. Similarly, for ER-SR, against the transmission capacity of 3630MW the TTC is 2650MW. The addition of Angul- Srikakulam 765kV D/C lines in 12th Plan (4200MW) means little in term of TTC for SR until the line goes deep up to Cuddapah/ Madhugiri/ Narsaraopeta etc.

ATC is a dynamic figure depending on load flow study on the actual state of the network in a given time frame. Limiting constraints keep on shifting in a large network. Any long-term ATC forecast can only be probabilistic and in a broad range.

In view of above, the following tentative scenario has been arrived at:

Corridor	Time Period	Total Transfer Capability (TTC) MW	Reliability Margin MW	Available Transfer Capability (ATC) MW	Aggregate IR link capacity MW	ATC as % of IR link capacity
WR-SR	March 15	2300 /2700	750	1550/1950	5,720	27%/ 34%
	Jan 16	3500	750	2750	7,920	27.7%
	2017 end	6000	1000	5000	12,120	35.4%
	2018 end	8500	1000	7500	16,320	40.9%
	2020	11500	1000	10500	22,320	47%
ER-SR	March 2015	2650	0	2650	3,630	73% ⁹
	2020	6650	0	6650	12,030	55.2%

8) CEA Perspective Transmission Plan for Twenty Years (2014-2034)

9) The figure is high because Talchar-Kolar 2500MW HVDC is historically operated without N-1 margin.

Chhattisgarh and Odhisa are interconnected by a number lines such as Jhasuguda-Dharamjaygarh and Raipur- Roorkela, and a new ISTS interconnection between Raipur and Angul is under implementation. Therefore, we may look at the combined transfer capacity from ER and WR to SR.

The lines directly connected to generating stations/ loads are easy to be designed for optimum loading because the local influence is dominant. Tie lines, such as inter regional link, are different. There is a danger of critical loading even if there is a small disturbance. If limiting constraints are occurring elsewhere, even while the tie lines are under loaded, it is a reflection on quality of planning or some links are missing/ under construction. How can all the links in a mesh as well its tie lines be simultaneously loaded to the optimum? That seems to be an impossibility. However, as the number of inter regional links increase, there should be gradual improvement in their utilization provided there is continuous effort to optimize the system.

The Transmission Foul play

The transmission network has still been a bottleneck in delivering the cheaper power from the rest of India to the energy starved southern grid. For the month of March 2015, transferring electricity from WR to SR was next to impossible due to congestion in the transmission corridor (WR-SR). Following this the price of power traded in S1 region increased by 15% to INR 5.29, compared to prevailing price of INR 2.82 (average clearing price) in the northern region. The Raichur – Sholapur 765KV line is yet to realize its full potential after the completion of the double circuitry of the line. On completion of the line, cheaper power from the north can be transferred to the southern power market. Other important lines that would facilitate the interconnection between southern grid and rest of India are:

- Kolhapur (new) – Narendra (Kudgi) GIS 765 kV double circuit line
- Angul – Srikakulam PP-Vemagiri Pooling Point
- Wardha - Nizamabad – Hyderabad 765 kV double circuit

Sothern Grid is further subdivided in S1 and S2 region, wherein Andhra Pradesh, Telangana and Karnataka fall in S1 and Tamil Nadu and Kerala fall in S2. The existing congestion in S1-S2 sections of the SR grid needs to be resolved for better intra transmission of electricity. In the month of March 2015, the S1-S2 corridor was congested for more than 36% of the time in the month. Southern grid has been facing similar congestion in transmission of electricity since a long time, especially during summers when the demand in Tamil Nadu and Kerala goes relatively higher. Also during windy monsoon season, the electricity from the wind mills is not transmitted to S1 owing to the congestion in the grid. This is big loss in terms of both monetary means and environment. Clearing of congestion would also help in utilizing the wind generation from Tamil Nadu during the monsoon season. This would also facilitate the cheaper power from the north to be transmitted to South where industries are buying costly diesel generated power. The inter-state transmission systems within the southern region include links between Vijayawada-Nellore, Chittor-Thiruvalam, Kurnool-Thiruvalam, Madhugiri-Salem, Somanahalli-Salem, Salem-Somanahalli and Mysore-Kozhikode.

Congestion in corridors connecting with Southern grid

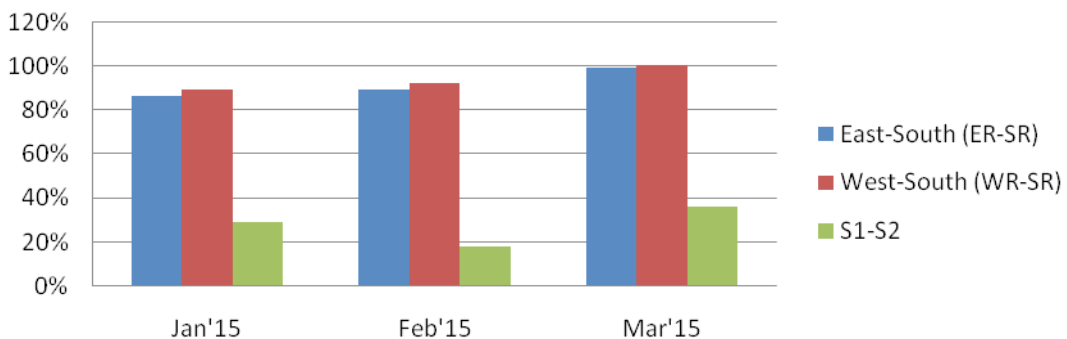


Figure 1.4: Transmission Congestion in Southern Grid, Source: IEX

The Future of Renewable Energy in Andhra Pradesh

Andhra Pradesh after bifurcation has suffered a considerable loss in both generation and high end consumers. This is going to affect both the power supply system and revenue realization of the discoms in the state. The bifurcation has given Andhra Pradesh 46.11% of the share from United Andhra Pradesh. This figure has been arrived at on the basis of consumption in 2006-07, rather than on a geographical basis. This has resulted in a capacity loss of 1142 MW and annual supply shortage as well. The shortage is also expected to increase as there is an acute shortage of coal in the state owned gencos, and there is no solution to the existing shortage of gas in the near term.

As per the ARR filed by both the state discoms, they will have to spend close to INR 3701 Crores (for 5250 M). Undoubtedly this power from short term purchase, including power from NTPC Jhajjar power plant, is expensive as compared to average purchase cost of non conventional energy (NCE). As per the ARR filed by the two discoms in the state, NCE power is approximately 30% cheaper than power from short term purchase. The state's electricity regulatory commission has however emphasized on reducing the procurement of power through short term purchase and has set a cap on power purchase cost through short term market at INR 5.70 from a proposed cost of INR 7.05, which still makes it expensive than average cost of purchase from NCE. The commission has also given recommendation on meeting the shortage in supply of power through alternative sources.

There has been a significant increase in the sales volume forecast by the state discoms in the ARR. This is contributed to 2 main reasons, namely:

- Implementation of '*Power for All*' Scheme in the state.
- Improved power distribution due to withering away of supply constraints.

Electricity consumption in Andhra Pradesh during bifurcation was lower than Telangana, but the figures projected by the discoms in both these states have put Andhra Pradesh ahead of Telangana in electricity consumption. AP is expected to see a further increase in consumption in subsequent years as Andhra Pradesh would be developing Amravati as its new capital and the state government is trying by all possible means to bring in foreign investments to develop manufacturing sector in the state. This would improve the revenue realization of the state discoms. The state discoms at present have a revenue realization of more than 70% through industries and other HT connected consumer base. With further development of industrial and commercial set ups in the state, situation would grow stronger.

Future for Renewable Energy Projects

The arguments made above are indications that generators in the state would see an increase in supply and consumption statistics. For the new renewable energy projects coming up in the state, the new solar and wind policy 2015 are a major boost. The policy aims at bringing parity between conventional and RE energy. The new policy has granted Must

Run status to the wind and solar plants, which means that injection from these sources would be considered as deemed scheduled. Incentives in open access, CSS, Wheeling charges, grant of clearances and status of PPP projects to new wind and solar projects along with concession in taxes would help in attracting fresh investments in RE projects. The new policy will help in cost reductions in project development and setting up of tighter timeframes for grant of clearances.

We can also expect a good return on the investment done on these projects, as AP would face demand outstripping supply, and RE sources will be a cheaper and cleaner source of electricity to bridge the demand and supply gap. The state is also doing well on removing the bottlenecks in supply of electricity, but it needs to expand the network and its capacity to meet the demands which would emerge with the new capital coming up at Amaravati.

	Approved by APERC
Approved Sales	54255 MU
Approved purchase volume through short term sources (including NTPC Jhajjar)	756.6 MU
Price Cap for purchase through short term sources	INR 5.70 per unit
Average of approves costs for purchase of electricity through various sources	INR 3.6
Average of approved cost of purchase of RE	INR 4.41
Approved subsidy for full cost recovery tariff	INR 3186 Crore
%age increase in tariff as demanded by discoms	6%
%age increase in tariff as approved by APERC	5%
Approved tariff for bundles solar power	INR 4.69
Approved tariff for wind power	INR 4.32

Key Highlights of the new Solar and Wind policy 2015, Andhra Pradesh*

Some of the key incentives and benefits under the new policies have been listed below:

- (a) Exemption from paying supervision charges to the distribution companies of Andhra Pradesh (AP Discoms) or the State Transmission Utility, APTRANSCO towards construction of internal power evacuation infrastructure
- (b) Exemption from paying transmission/distribution charges to wheel electricity to captive and third party HT-I category consumers located within the state
- (c) Exemption from paying electricity duty if power is sold to AP Discoms
- (d) Exemption from paying cross subsidy surcharge for a period for 5 years from the date of commissioning for solar projects
- (e) 100 % banking of electricity throughout the year
- (f) Disposal of applications for power evacuation and grid connectivity within 14 days. Any strengthening of upstream transmission lines/evacuation infrastructure to be done on a priority basis
- (g) Intra-state open access for the entire tenure of the PPA. Deemed open access will be granted if applications for open access are not disposed of within 21 days
- (h) Deemed PPP status for projects selling power to AP Discoms
- (i) Deemed Non-Agricultural status for land parcels acquired to set up the projects
- (j) Deemed industry status to take advantage of incentives available to industries
- (k) Deemed 'must run' status for the purposes of scheduling of power to the grid
- (l) Exemption from obtaining NOC (Consent to Operate/Consent to Establish) from AP Pollution Control Board
- (m) Solar projects set up in solar parks located within the state to be eligible for all incentives provided by the Central Government under the National Solar Mission or any other scheme
- (n) Single window assistance from the nodal agency (NREDCAP) to acquire land required to set up a project and
- (o) The Revised Policies also provide incentives for developers setting up roof-top solar projects or those considering repowering their existing wind power projects.

**Source : Trilegal*

This image shows a full page of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page. In the top-left corner, the word "Notes" is written in a bold, black, sans-serif font.

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.



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