# White Paper on Power Sector in Andhra Pradesh

**Contents**

**Objective**

Power sector is a critical infrastructure element required for the smooth functioning of the state economy. An efficient, resilient and financially robust power sector is essential for growth and poverty reduction. The availability of reliable, quality and affordable power helps in the rapid Agriculture and Industrial development and the overall economy of the state. The objective of this white paper is to provide an understanding of the dynamics of the power sector in Andhra Pradesh, various challenges being faced by the power sector which has aggravated due to recent bifurcation of state, analyze the underlying causes and propose proactive measures to address the issues plaguing the Andhra Pradesh power sector.

## Introduction

The Government of Andhra Pradesh was one of the pioneer states to initiate the power sector reforms in 1998. The erstwhile Andhra Pradesh State Electricity Board (APSEB) was unbundled into six entities to focus on the core operation of Power Generation (APGENCO), Power Transmission (APTRANSCO) and Distribution (APDISCOMS). Significant amount of investments were made for building up Generation capacity, strengthening Transmission and Distribution network, industrial feeder segregation, loss reduction and improving quality of power supply. As a result of various initiatives that were taken up during the reform period (1998-2004), energy deficit was brought down to a mere 1.5 % as compared to all India energy deficit of 7.1 % during FY 2003-04. CRISIL had ranked AP state as No. 1 in 2003 among all the states based on the performance parameters for the power sector.

Since 2004, the performance of the power sector in Andhra Pradesh did not keep up pace with development in other sectors. The generation and transmission capacity addition in the state has not been commensurate with the increase in energy demand. The lack of capacity addition was a result of various reasons like long lead time in setting up power plants due to delay in getting the required clearances, delay in allocation of fuel (coal and gas) and lack of integrated planning involving all the three arms of power sector – Generation, Transmission and Distribution. This resulted in an increased energy deficit in Andhra Pradesh over the years (**17.6 % in FY 2012-13**)

The bifurcation of the state has only increased problems of the power sector in Andhra Pradesh due to allocation of power based on consumption of FY 2006-07 instead of

allocation as per geographical location or population criteria resulting in severe power deficit in the residuary Andhra Pradesh.

There is an urgent need to come out with a detailed roadmap of the steps to be taken to address the issues of the power sector in the state. A 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 the three arms of the power sector. This would help the state to provide uninterrupted 24 hours power supply to Domestic and Industrial consumers, provide quality 9 hours power supply to Agriculture consumers, harness Renewable energy potential, promote Energy conservation and make APDISCOMS customer centric organizations by ensuring quality, reliable and affordable supply to all consumers.

## Evolution of Power sector in Andhra Pradesh from 1996 to 2004

### Andhra Pradesh Electricity Reforms Act of 1998

The Government of Andhra Pradesh (AP) in 1996 had set up a high level committee to look into ways and means to improve the performance of power sector. Based on the recommendation of the committee the Government enacted the Andhra Pradesh Electricity Reforms act of 1998. Under the Act APSEB was unbundled into APGENCO and APTRANSCO in February 1999. In April 2000, the APTRANSCO was further unbundled into a transmission company and four distributions companies (DISCOMs), Eastern Power Distribution Corporation of AP Ltd (APEPDCL), Southern Power Distribution Corporation of AP Ltd (APSPDCL), Central Power Distribution Corporation of AP Ltd (APCPDCL) and Northern Power Distribution Corporation of AP Ltd (APNPDCL) managing distribution in four zones of the State.

Until 1998, State electricity boards had the power of fixing tariffs for power purchase. As part of the AP Reforms Act, Andhra Pradesh Electricity Regulatory Commission (APERC) was set up as an independent and autonomous body to regulate the business of electricity including tariff fixation and create an environment for dynamic and equitable growth of the electricity sector in the State.

The state was sanctioned a $1 billion loan by World Bank in 1999 as part of the Andhra Pradesh Power Sector restructuring Program (APPSRP) for undertaking various initiatives in the power sector.

The following were the various initiatives taken up by the State Government from 1994-2004

- **Increase in Installed capacity and Power Generation**

The installed capacity in the state increased from 5,634 MW to 10,695 MW over the period FY 1993-94 to FY 2003-04 (90% increase).

- **100% capacity allocation of NTPC Simhadri Stage-I (2X500 MW)**

Due to efforts of the State Government, 100% capacity of NTPC Simhadri Stage-I (2X500 MW) was dedicated to the state of Andhra Pradesh in 2002.

- **Increase in PLF of Thermal stations**

The Plant load factor (PLF) of Andhra Pradesh thermal plants had increased from 68.7 % in FY 1994-95 to 86% in FY 2003-04 which was the best in the country.

- **Reduction in Power Deficit**

The average power deficit reduced from 11.6% in FY 1995-96 to 1.5% in FY 2003-04 in spite of the fact that the Agricultural consumers were supplied power for 9 hours daily till Rabi 2003. The major reasons for the steep reduction in energy deficit were improved planning, capacity additions and improved availability.

- **Reduction in Transmission & Distribution (T&D) Losses**

The average T&D losses reduced drastically from 36.90% to 23.15% over the period FY 1999-00 to FY 2003-04 due to improved metering, efficient operations, and regular energy audits undertaken by the government.

- **Efficiency Improvement Initiatives**[1]
  - **Industrial feeder Separation**
    - All industrial feeders (> 11 kV voltage level) were separated into either dedicated or express feeders to ensure uninterrupted quality supply
    - Responsibilities were assigned to ADE/DE to monitor feeder wise losses, collection, quality etc.
  - **Energy audit & Metering**
    - Better metering of feeders, especially the 11 KV feeders and agricultural feeders to accurately segregate agriculture usage and T&D losses.
    - 100% metering was achieved at interface points
    - High accuracy meters installed by distribution companies for High value customers
    - Spot billing machines were introduced
      - To read the consumption on monthly basis, to inspect the status of the meter for further analysis and reduce the time required for billing cycle
  - **Consumer Analysis Tool (CAT)**

    A robust integrated tool was rolled out to analyze the various inputs to improve overall operation of distribution companies
    - Analyse exception reports such as meter burnout, meters with no seal, meter stuck-up, meter not found
    - Check meter readings of consumers to check the accuracy of meter readers
    - Energy audit for all towns/ MHQs

[1] World Bank report on "Implementation Completion Report on a Loan in the amount of US $210 Million to the Government of India for AP Power Sector Restructuring. Report No: **27775**

- **Monitoring and Audit system (MATS)**

  An IT enabled system was developed and implemented to streamline the functioning of the power sector and reduce response time, resulting in improved customer service to

  - Effectively monitor and track various issues like theft, mal practice, etc.
  - Enable process automation to reduce high documentation requirement and loss of records

- **Book consolidation Module (BCM)**
  - Enabled budgeted verses actual comparisons; These reports compared monthly variance between budgeted and actual income or expenses from various account codes
  - Comparative statements; These reports compared income/expense for current month with the previous month or the previous year to calculate appropriate variances

- **Investments in infrastructure[2]**
  - A total of Rs. 2,426 crores was invested in transmission system from FY 1995-96 to FY 2003-04. This has helped in achieving 99% availability of transmission system in the state and reduction in losses which was the best in the country
  - A total of Rs. 4,986 crores was invested in distribution systems from FY 1995-96 to FY 2003-04.

- **Transformer information management system**

  A Transformer information management system was developed which resulted in

  - Improved asset tracking, utilization and maintenance
  - Improved customer service through deployment of transformers and exception handling
  - Enabled greater visibility leading to improved decision making

➢ **Recognition of work done by Government in the Power sector till FY 2003-04: CRISIL report on State Power sector rankings**

As per the CRISIL report on ranking of states on performance parameters, Andhra Pradesh was ranked No. 1 overall for the years 2003 and second in 2004. The state

[2] Power Sector Reforms in Andhra Pradesh : Their Impact and Policy Gaps, Governance and Policy Spaces (GAPS) Project Centre for Economic and Social Studies, 2007

ranked 1st in the individual sub- categories of SERC parameters, financial risk and third in generation parameters. The report noted significant strengths of the sector in AP like[3]

- Strong regulatory processes in place with timely filing of revenue requirement and issue of orders; multi-year framework for tariff setting is being attempted
- Significant addition to generating capacity in state
- Sound operating performance of thermal plants (PLF 86% in FY 2003-04, high availability factors)
- Inter-face metering has been completed
- Debt servicing of loans has been timely
- Pension liabilities have been quantified and master trust has been created

**Key issues of Power sector during the period FY 2004-05 to FY 2013-14**

There was a drastic decline in performance of Power sector during the decade from 2004 to 2014 in various key performance indicators as shown below

1. **Increase in installed capacity**: There was only an increase of 56% in installed capacity from 10,695 MW to 16,917 MW against an increase of 90% (5,634 MW to 10,695 MW) during 1994 to 2004. Even the increase in installed capacity did not materialize fully as around 1,500 MW out of this additional capacity from 2004 to 2014 is lying idle for lack of gas. Further the increase in generation capacity was not commensurate with the increase in demand.
2. **Plant Load Factor of Thermal Power Plants**: Due to proper maintenance, timely overhaul, reduction in time of planned outages and maintenance of adequate quantity and quality of coal, PLF of thermal stations was increased from 68.7% to 86% during the decade from 1994 to 2004. During this period APGENCOs Thermal Power Stations of VTPS, RTPP-I & KTPS- Stage V had the highest PLF in the country. However, PLF decreased to 78% by FY 2013-14 due to lack of adequate quantity of coal and supply of poor quality of coal leading to frequent outages particularly during monsoon season.
3. **Coal stock in Thermal Power Plants**: Up to 2004, around 1 month coal stock was maintained in all the thermal power plants due to proper coordination with SCCL, MCL and Railways. Monitoring at the highest level of Government ensured that adequate stock of coal was maintained in all the thermal power stations and

[3] CRISIL's Power sector rating – consolidated report to the Ministry of Power - 2005

there was no loss of generation due to inadequate supply of coal. However, during 2004 -2014, the coal stock position in thermal power stations became very precarious. As on today, less than a day's stock of coal is available in most of thermal power plants. The quantity and quality of coal supplied has come down drastically during the last 5 years resulting in loss of generation.

4. **Energy and Peak Deficit**: The energy deficit in the state decreased to 1.5% in 2003-04 as against the all India average of 7.1% while it increased to 17.6% during 2012-13 as against the all India average of 8.7%. Similarly, there was no peak demand deficit during 2003-04 as against all India peak demand deficit of 11.2% while the peak deficit increased to 6.5% during 2013-14 as against all India peak demand deficit of 4.5%
5. **Power sector and APDISCOM ratings**: AP Power sector was ranked 1st in the country by CRISIL during 2003 and APDISCOMS were given "A" rating. AP was a role model and pioneer in taking up power sector reforms. Other states used to follow the AP model of power sector development. However, by 2014, the performance of power sector has declined drastically and APDISCOMS have been given B+/B rating due to financial mismanagement and lack of support by Government.
6. **Financial mismanagement of GoAP**: The Distribution Utility finances – critical to realizing sector goals deteriorated sharply over 2004-2014. There was no debt burden on APDISCOMS towards purchase of outside power up to 2004. During the last decade, APDISCOMS ended up having a net cumulative loss of Rs. 17,200 Crs. as on March 2014. In order to overcome this financial burden, AP which used to be a pioneer state had to accept the financial bailout package of Government of India and financial restructuring had to be resorted to by GoAP to bail out the sick APDISCOMS.

   GoAP had directed APDISCOMS to supply 7 hours power to agriculture consumers and maintain continuous supply to other consumer categories. To comply with the directions of GoAP, APDISCOMS had to purchase 57,112 MU from open market during the last decade. However, GoAP did not release adequate funds for purchase of above power and the balance was met by APDISCOMS by taking short term loans from the banks making the financial position of the APDISCOMS very precarious. GoAP also exacerbated

APDISCOMS financial difficulties by compelling them to borrow to cover operational expenses.

The Ministry of Power report on State Distribution Utilities First Annual Integrated Rating published in March 2013 had noted several concerns regarding APDISCOMS.

- Non receipt of subsidy for expensive power from government leading to high receivables and receivable days
- Weak coverage of Costs through revenue
- Weakening of capital structure over the last three years with increasing reliance on short term debt (constituting 88% of debt profile as on March 31, 2012)

The report after carefully considering the issues, awarded B+/B rating to APDISCOMS.

7. **Support by GoAP to Power sector:** During the period 1994-2004, 7.8% of Government budget (Non-plan) was allocated to power sector while it came down to a meagre 5% during the period 2004-2014.
8. **Increase in tariff**: The Cost of Service increased to Rs. 5.25/Unit in 2014 against Rs. 2.55/Unit in 2004. Due to this increase in Cost of Service. Rs. 28,835 Crs. additional burden was imposed on the consumers during last decade. This included Fuel Surcharge Adjustment (FSA) to the tune of Rs. 12,714 Crs. There was a significant increase in tariff for various consumer categories during the period 2004 to 2014 including FSA (Domestic – 93%, Industrial – 94%, Commercial – 86%), while post reforms from 1999-2000 to 2003-04, the tariff hike was around 30% with additional financial implication of Rs. 1500 Crs. on the consumers
9. **Improper maintenance of Distribution Infrastructure:** There was no proper maintenance of Substations. Feeders, Distribution Transformers, Poles and Wires. Leaning poles, loose hanging wires and improper earthing of electrical equipment have led to around 9, 140 accidents (Fatal-7,388, Non-fatal-1,752) during the period
10. **Increase in power purchase from private sources**: During the decade from 1999 to 2004, only 12% of power was procured from private sources (other than APGENCO, CGS and NCE projects). However, it increased to 21% during 2004-2014.

11. **Percentage reduction in T&D losses**: Due to monitoring at the highest level of the Government during 1999-2004, the T&D losses were brought down by 14% from 37% to 23%. However, only 8% loss reduction has taken place since 2004.
12. **Power Supply Position**: During the period 1994-2004, 9 hours supply till Rabi 2003 and 7 hours supply thereafter till May 2004 was maintained to agricultural consumers. However, as on today farmers are facing the brunt of erratic, untimely and poor quality of power supply

    During FY 2003-04, no power cuts were imposed on domestic consumers while during FY 2013-14 power cuts have been imposed up to 4 hours in Municipal Corporations, 6 hours in Municipalities, 8 hours in Mandal Headquarters and 12 hours in Villages

    During the period 1994-2004, Industries were supplied 24 hours uninterrupted power through segregation of dedicated Industrial feeders. From 2012 onwards Industrial consumers were given 12 days power holiday in a month there by hampering economic growth and rendering lakhs of workers unemployed. APERC had to step in in FY 2012-13 to regulate the supply - demand on a day to day basis by imposing Restriction and Control measures on industrial consumers forcing these consumers to cut down their consumption by 40%. Huge penalties up to an extent of 6 times of energy charges (Rs 30/unit) were imposed on industries for any violations. DISCOMs were not allowed to release new or additional industrial loads causing stranded capacities of production and also severe loss to APDISCOMs since industrial consumers provide significant amount of cross-subsidy to DISCOMS. Some of the existing industries shifted their operations from the state and only a few industries are willing to come forward to set up their units in the state due to power supply problem. The lack of reliable power is a leading concern for Industry and a potential constraint to growth.
13. **Lack of foresight on part of Government towards power purchase:** There was no long term power procurement planned by Government. In the absence of a comprehensive plan, Government did not take any initiative to book the limited transmission corridor available between the NEW and 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. Power was procured up to Rs. 13/unit during 2008-09 resulting in higher electricity costs for consumers.

14. **Non adherence to Standards of Performance prescribed by APERC for APDISCOMS:** APERC has laid down Standards of Performance for the smooth and efficient performance of APDISCOMS. It was observed that APDISCOMS have not adhered to the SOP. APDISCOMS have been unable to replace the faulty DTRs within the specified timeline of 24 hours for towns and cities and 48 hours for villages leading to severe inconvenience to the consumers particularly farming community. Farmers have been forced to transport transformers at their own cost. APDISCOMS have not been able to adhere to the timelines for release of new Industrial connections thereby losing out on potential revenue and adversely impacting the industrial growth. Currently, there are 1421 Industrial connection applications pending with APDISCOMS for a cumulative capacity of 1580 MVA
15. **Lack of Integrated Planning between Generation, Transmission and Distribution**: There was a lack of integrated planning between Generation, Transmission and Distribution. The Transmission capacity addition was not in line with the Generation capacity addition resulting in 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.
16. **Idle capacity owing to shortage of Gas and Coal:** The gas based power plants in Andhra Pradesh have seen a consistent decline in generation. The total installed capacity of gas based IPPs having approved PPAs with APDISCOMS in Andhra Pradesh is 2,770 MW. Besides this, additional capacity of around 4,200 MW is available. However, owing to shortage of gas, only about 500 MW of this capacity is operational and generating power. This has led to generation losses to the state totaling about 14,000 MU annually.
17. **Failure of Krishnapatnam UMPP (5X800 MW):** Implementation of the Rs. 175 billion Krishnapatnam Ultra Mega Power Project (UMPP) was stalled in July 2011, due to rise in prices of imported coal.
18. **Neglect of Renewable energy sector:** There was total neglect of Renewable energy sector during last decade despite having huge potential. The addition of Solar and Wind capacity in the state has not been encouraging. The installed wind capacity was only 731 MW as on March 2014 as against the estimated potential

of 14,500 MW. Similarly, the installed solar capacity was only 113 MW as on March 2014 despite having huge potential. Capacity addition of renewable energy grew at a CAGR of 66% from 1995 -2004 but only grew at a CAGR of 11% from 2004-2014.

During the same period, other states like Tamil Nadu, Maharashtra, Gujarat, Rajasthan and Karnataka have added 7251 MW, 3472 MW, 3384 MW, 2734 MW and 2312 MW respectively in wind capacity. Similarly, states like Gujarat, Rajasthan, Madhya Pradesh and Maharashtra have added 916 MW, 730 MW, 347 MW and 250 MW respectively in solar capacity. This displays the gross underutilization of potential on part of Andhra Pradesh which is today at the bottom in Renewable energy as compared to similarly placed states.

19. **Non obligation of Renewable Power Purchase Obligation (RPPO) by APDISCOMS:** As per APERC Regulations, APDISCOMS are mandated to purchase 5% of their energy consumption (Min 0.25% from solar) from renewable sources. However, less than 2% of energy consumption was met from renewable sources.
20. **Failure of Government to get 100% capacity allocation from NTPC Simhadri Stage – II (2X500 MW).**

    The state government failed to get 100% capacity allocation from NTPC Simhadri stage II (2X500 MW) to AP as was done earlier in 2002**.** Only 46 % (460 MW) capacity has been allocated to AP.

## Bifurcation of 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 08$^{th}$ 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 of FY 2006-07. Though the ownership of power stations is with the respective GENCOs based on geographical location, power was not allocated based on geographical location. The allocation of power based on G.O 20 instead of allocation based on geographical location has resulted in a capacity loss of 1,142 MW to Andhra Pradesh as detailed in the table below. 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 open market would be an NPV of around Rs. 10,000 Crs.

| Capacity loss (MW) from APGENCO stations to Andhra Pradesh | | | |
|---|---|---|---|
| | **As per G.O Ms. No 20 of 2014** | **As per Geographical location** | **Impact** |
| **Existing** | | | |
| APGENCO –Thermal | 2,348 | 2,810 | - 462 |
| APGENCO – Hydel | 1,760 | 1,670 | 90 |
| **Total (A)** | **4,108** | **4,480** | **- 372** |
| **Under Construction** | | | |
| APGENCO –Thermal | 1,291 | 2,200 | - 909 |
| APGENCO – Hydel | 189 | 50 | 139 |
| **Total (B)** | **1,480** | **2,250** | **- 770** |
| **Total Capacity (A+B)** | **5,588** | **6,730** | **- 1,142** |

**Impact on capacity from Central Generating Stations**

As per AP Reorganisation Act, power of Central Generating Stations (CGS) should be allocated based on last 5 years consumption (AP – 47.88%). However, the allocation from CGS was done based on FY 2006-07 consumption only (AP – 46.11%). Due to this, AP has lost a capacity of 62 MW which implies an energy loss of around 422 MU per annum.

## The Way Forward

There is an urgent need to come out with a detailed roadmap of the steps to be taken to address the issues of the power sector in the state. A 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

**Steps to be taken for achieving objectives**

To meet the key objectives detailed in the previous section, the following steps would be taken by the government:

**Customer focus**

- Set up call center with toll free number for timely agricultural DTR replacement
- Set up online application tracking mechanisms through SMS and mobile apps to provide regular status updates to customers
- Implement a system to seek IVRS-driven customer feedback on performance of distribution companies.
- Strict adherence to Standards of performance prescribed by APERC

**Increasing generation capacity in the state**

- APGENCO will be encouraged and supported by GoAP to augment the generation capacity by timely completion of on-going projects and taking up new projects
- Procurement of power through procurement bidding process so as to make AP self-sufficient in power supply

**Promotion of Renewable energy**

A comprehensive new Solar and Wind policy would be formulated by GoAP to encourage renewable energy and exploit the untapped wind and solar potential of the state

**Promote Energy Conservation/ Efficiency**

- Mandate and Monitor BEE standards
- Energy savings campaign driven by social media outreach

**Other Initiatives**

- Rationalization of coal block linkages
- Implement agricultural feeder separation to provide uninterrupted power supply to domestic and industrial consumers in rural areas

- Implement industrial feeder segregation to provide uninterrupted power supply to industrial consumers
- Roll out scheme to introduce solar agricultural pump-sets in close coordination with banks and solar manufacturers
- Pilot ESCO programs for agricultural pump-set replacement
- Pilot Smart Grid

Government will ensure that high quality, updated data is publicly available and this data is used for monitoring and benchmarking performance for planning and decision making. The current dearth of consistent, reliable, updated data hampers sound management. A statutory requirement for utilities to regularly collect primary data will be enforced including data on customer satisfaction and state performance with respect to subsidy commitments. Third party monitoring will be encouraged.

## Conclusion

The Government has accorded the highest priority for development of power sector in Andhra Pradesh. The Government is committed to provide quality, reliable and affordable 24 hours power supply to all domestic, commercial and industrial consumers and 9 hours power supply to farming community. This white paper is prepared in line with the key objectives of the Government for developing power sector and also the short term to long term plans to achieve these objectives.

The Government requests all stakeholders and general public to study this white paper and provide their valuable suggestions / comments which would help the AP power sector to become the role model in the country.