A JOINT INITIATIVE OF

Government of India

Government of Andhra Pradesh

Power for **All**

Government of India

Piyush Goyal
Union Minister of Power

Foreword

Electricity consumption is one of the most important indices that decide the development level of a nation. The per capita consumption of electricity in FY 2012-13 was 917 units, which is around 20% of that in China or 5% of the level in USA. The Government of India is committed to improving the quality of life of its citizens through higher electricity consumption. Our aim is to provide each household access to electricity, round the clock. The 'Power for All' programme is a major step in this direction.

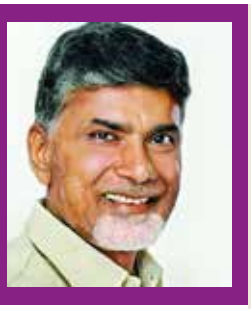
In the first phase of the programme, Andhra Pradesh has been chosen alongwith Rajasthan and Delhi. The success of implementation in these three states will go a long way in determining the roll out of 24x7 PFA in other states.

This joint initiative of Government of India and Government of Andhra Pradesh aims to enhance the satisfaction levels of the consumers and improve the quality of life of people through 24x7 power supply. This would lead to rapid economic development of the state in primary, secondary & tertiary sectors resulting in inclusive development of the State.

I compliment the Government of Andhra Pradesh and wish them all the best for implementation of this programme. The Government of India will complement the efforts of Government of Andhra Pradesh in bringing uninterrupted quality power to each household, farmer and establishment in the state.

Government of Andhra Pradesh

N. Chandrababu Naidu
Chief Minister of Andhra Pradesh



Foreword

Power sector is a critical infrastructure element required for the smooth functioning of the economy. An efficient, resilient and financially healthy power sector is essential for growth and poverty reduction. The availability of reliable, quality and affordable power helps in the rapid agriculture, industrial and overall economic development of the state.

I would like to thank Government of India, Hon'ble Prime Minister and Hon'ble Union Minister of State for Power, for selecting Andhra Pradesh for implementation of 'Power for All' programme.

Andhra Pradesh was one of the pioneer states in the country to initiate the power sector reforms as early as 1998. 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 the development in other sectors resulting in increased energy deficit (17.6% in 2013).

Today, the daily energy deficit of the state has been brought down due to joint efforts of the State and Central Governments. However conceptualizing, creating and implementing long lasting and sustainable measures is the need of the hour.

It is at this juncture that the 'Power for All' programme plays a pivotal role. Conceived with the objective of providing 24x7 quality, reliable and affordable power for all, this programme takes a holistic approach for addressing the concerns across the value chain in power sector.

Government of Andhra Pradesh is committed to supply 7 hours of free supply to agriculture which would be increased to 9 hours in a phased manner. Post bifurcation of the state, AP requires adequate energy to build a new economy, attract investments and accelerate growth. We need to facilitate the expansion of economy by providing a conducive policy environment, infrastructure and power. The State Government would ensure that all the necessary steps are taken up in terms of capacity addition, import of coal, power procurement, strengthening the required transmission and distribution network, encouraging renewables, energy efficiency measures, undertaking customer centric initiatives, reduction of Aggregate Technical & Commercial losses, bridging the gap between Average Cost of Supply (ACS) & Annual Revenue Requirement (ARR), providing the required subsidy for free power supply to agriculture and following good governance practices in implementation of all central and state government schemes.

'Power for All' programme is an excellent platform for addressing these and this programme provides AP another opportunity to regain its past glory and become the pioneer in Power Sector in the country.

Our Government is fully prepared to transform AP into a power-cut free state within a short period and provide every citizen access to reliable and affordable electricity, with cooperation from the Central Government.

Government of India

Government of Andhra Pradesh

Joint Statement

Andhra Pradesh is one of the three states in the country selected for 'Power for All' (PFA) programme. This programme will be implemented by Government of Andhra Pradesh (GoAP) with active support from Government of India. The objective of the above programme is to supply 24x7 quality, reliable and affordable power to all Domestic, Commercial and Industrial consumers within a fixed time frame. Further, all unconnected households will be provided access to electricity in a phased manner by March 2017.

GoAP is committed to provide 7 hours of free power supply to agriculture which would be increased to 9 hours in a phased manner.

The State Government is attaching highest priority to power sector and power supply position is been reviewed by the State Cabinet once in every ten days. The State Government would provide full support to all utilities for ensuring quality power supply.

The State Government would ensure that all the necessary steps outlined in the PFA document are taken up in terms of capacity addition, import of coal, power procurement, strengthening the required transmission and distribution network, encouraging renewables, energy efficiency measures, undertaking customer centric initiatives, reduction of AT & C losses, bridging the gap between ACS & ARR, providing the required subsidy for free power supply to agriculture and following good governance practices in implementation of all central and state government schemes.

Government of India (GoI) would supplement the efforts of State Government through additional allocation of power from CGS, adequate fuel supply to thermal stations, expediting the grid connectivity between the WR- SR and ER –SR regions by PGCIL, promotion of renewable energy through ultra-mega solar parks and solar pump-sets, evacuation of renewable energy through green energy corridor and financial assistance to AP Transco and AP Discoms under various schemes of GoI.

It is envisaged to cover the entire state under PFA programme in a phased manner and provide 24x7 power supply to all domestic, industrial and commercial consumers for all connected households by October 2016 and all un-connected households by March-2017. However GoAP would endeavor to implement the programme much earlier than the above targeted dates.

The central and state governments would meet regularly to review the progress of the programme over the next 5 years and would strive to achieve the objectives of the programme by taking the necessary steps as envisaged in the PFA document.

Jyoti Arora, IAS
Joint Secretary
Minister of Power (GoI)

Ajay Jain, IAS
Secretary, Energy Department
Government of Andhra Pradesh

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01 Introduction

Power sector is a critical infrastructure element required for the smooth functioning of the economy. An efficient, resilient and financially healthy power sector is essential for growth and poverty reduction. The availability of reliable, quality and affordable power helps in the rapid agriculture, industrial and overall economic development of the state.

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.

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 and AP is lagging behind the other states in terms of energy and power deficit.

The policy of GoAP is to provide 24 hours power supply to all industries. However, due to power deficit, industries have suffered load shedding up to 40% of their demand (3 days a week power holiday) in recent years. Similarly load relief has been imposed up to 4 hours in Municipal Corporations. 6 hours in Municipalities, 8 hours in Mandals & 12 hours in villages. The State Government is providing 7 hours of free power supply to the Agricultural consumers.

Government of India & Government of AP have taken joint initiative to provide un-interrupted 24x7 power in the state of AP (except agriculture consumers). This mainly includes the following:

1. Reliable 24X7 supply to the consumers (except agriculture) in a phased manner within a period of three years from the date of commencement of the programme.
2. Increase duration of supply of electricity to agriculture consumers from seven hours per day at present to nine hours per day in a phased manner
3. All unconnected households to be provided access to electricity in a time bound manner by FY 2016-17
4. To ensure adequate capacity addition planning & tie ups for power from various sources at affordable price to meet the projected increase in power demand for future.
5. Strengthen the Transmission and Distribution network to cater to the expected growth in demand of existing as well as forthcoming consumers.
6. Monitoring the timely commissioning of various generating plants, transmission and distribution infrastructure to meet the expected growth in demand.

7. To ensure reduction of AT & C losses as per the agreed loss reduction trajectory.

8. Overall Power Supply Improvement – To be achieved by undertaking measures such as energy mix optimization, reduction in power operational efficiency of state generation plant(s) and optimal fuel procurement costs including sources of supply.

9. Financial measures including optimizing investments and undertaking necessary balance sheet restructuring measures to ensure liquidity in the utility finances.

10. Introduce modern technologies to monitor reliable supply like sub-station automation, providing adequate communication infrastructure, GIS, Reliability, Centralised Network Analysis and Planning tools, SAP driven ERP systems, DMS (Distribution Management Systems), OMS (Outage Management System), etc.

An exercise has been carried out to assess the additional energy requirement for providing 24x7 power supply to all households in the state. An assessment of the adequacy of availability of power to the state from various sources i.e. from generating sources owned by the state both existing and under construction, from central sector stations both existing and under construction, Common projects, generating sources owned by private sector and PPAs have been made.

Inter State Transmission System (ISTS), Intra state Transmission System and distribution infrastructure have been reviewed to ensure their adequacy for providing 24x7 power in the states. Works required for strengthening and augmentation of distribution infrastructure have been identified for supplying uninterrupted power to the consumers. Central Government will supplement the efforts of the State Government through schemes which are being finalized by Ministry of Power for funding of works required for strengthening and augmentation of distribution infrastructure, feeder segregation and 100% metering.

This joint initiative of Government of India and Government of Andhra Pradesh aims to enhance the satisfaction levels of the consumers, improve the quality of life of people and increase the economic activities resulting into inclusive development of the State.

02 Power Supply Scenario

The requirement of electricity, i.e. both energy and peak demand are expected to increase significantly in Andhra Pradesh from the present level of 43,684 MU & 6,158 MW to 82,392 MU and 13,436 MW respectively by FY 2018-19.

- Natural Load Growth
- 24x7 power supply to all consumers (except agricultural consumers)
- Increase in electrification of households
- 9 hours supply to Agricultural consumers
- Additional Energy Requirement for upcoming Capital city & associated investments, new Industrial corridors, new Lift Irrigation schemes.

2.1 Present Power Supply Position

Power is being supplied to Domestic, Commercial & Industrial consumers along with Agricultural consumers in rural areas through mixed feeders. There are 706 Nos. of dedicated/express industrial feeders. 7 hours three phase power supply is being given to agricultural consumers mostly in single/ two spells and supply timings are rotated every 7 days.

Rural areas are given single phase domestic lighting from 6 pm to 6 am. Three phase supply to rural areas for Domestic, Commercial & Industrial consumers is along with Agricultural supply only. As a result, most of the consumers, other than Agricultural in rural areas on mixed feeders get between 12-16 hours of supply every day, depending on Agricultural supply spell timings.

Agricultural feeders have been separated from Domestic feeders in 14 mandals on a pilot basis during 2011. In these mandals, domestic consumers are being extended 3 phase supply depending upon availability of power. However, there is a system in Andhra Pradesh which enables single phase supply to be extended to all domestic consumers through suitable control mechanism at the substations.

Depending upon availability of Power, 24 hrs single phase power supply has been extended to Domestic, Commercial consumers & Industrial consumers in rural areas. The segregation of Agricultural feeders would enable extension of 24x7, reliable 3 phase supply to all domestic, commercial & industrial consumers.

Table 1: Energy & Peak Deficit Trend in united Andhra Pradesh

Particulars	Unit	FY 11-12	FY 12-13	FY 13-14
Energy Deficit	%	7.2	17.6	6.9
Peak Deficit	%	14.8	20.2	17.6

2.2 Estimation of Future Demand for providing 24x7 Power

During the previous years, consumers in Andhra Pradesh have been subjected to Load relief. The actual energy requirement would be higher than the actual energy supplied due to the latent demand which has not been included. To determine the energy demand for AP state, taking into account the latent demand, the following methodology has been followed.

- The supply for FY 2012-13 is taken (39,900 MU) and load restrictions (10,900 MU) is added on to it. This has been adopted as the unrestricted demand of FY 2013-14 (50,800 MU). FY 2013-14 year has not been considered as base as the actual demand during the year was considerably low due to above average monsoon.
- 8% growth rate is applied on the projected unrestricted demand of FY 2013-14 to get the unrestricted demand of FY 2014-15 (54,864 MU).
- Energy requirement to meet additional 2 hours supply to agriculture consumers of 3,481 MU is added to the unrestricted demand of FY 2014-15. For FY 2014-15, 1,740 MU (50%) has been added as scheme will be launched in October 2014.
- The Total Energy requirement of FY 2014-15 is escalated every year by 8% growth rate for 2 years (up to FY 2015-16) and by 10% for next 3 years (FY 2016-17 to FY 2018-19). The historical growth rate of Power Sector in AP has been 8% (6 year CAGR). A further 2% is added in view of demand expected to come up due to above mentioned reasons.

Table 2: Demand Projection

Particulars	Unit	FY 14-15	FY 15-16	FY 16-17	FY 17-18	FY 18-19
Gross Energy Requirement (A)	MU	54,864	59,253	65,178	71,696	78,866
Energy Requirement - 2 hours Agri. Supply (B)	MU	1,740	3,759	4,136	4,549	5,004
Total Energy Requirement (C= A+ B)	MU	56,604	63,012	69,314	76,245	83,870
Energy Savings - Efficiency & Conservation (D)	MU	69	399	751	1,044	1,478
Net Energy Requirement (E=C–D)	MU	56,535	62,613	68,563	75,201	82,392
Peak Demand @ 70% System Load Factor (F)	MW	9,220	10,211	11,181	12,264	13,436

03 Generation Plan

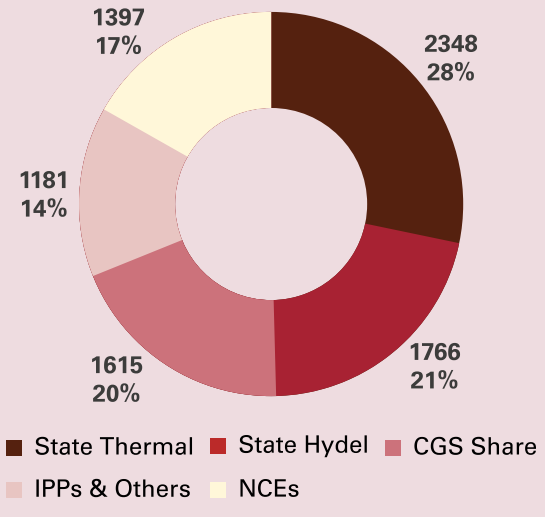
The requirement of electricity both energy and peak demand in Andhra Pradesh are expected to increase significantly from the present level of 43,684 MU & 6,158 MW to 82,392 MU and 13,436 MW respectively by FY 2018-19.

3.1 Existing Generation

Capacity allocation for Andhra Pradesh from existing and under costruction projects (Thermal & Hydel) has been considered in the proportion of 46.11% for APGENCO & IPPs and 47.88% for CGS stations and 100% for NCE projects.

The total generation capacity of Andhra Pradesh as on 2nd Jun 2014 (on the day of formation of the new state) is 8,307 MW as per power allocation.

Fig. 1: Capacity installed / allocated to Andhra Pradesh as on 2nd June 2014



3.2 Future Generation Plans

For meeting the increase in demand, substantial capacity addition is under progress, as shown below:

State Sector

APGENCO has 3,850 MW upcoming capacity under different phases of construction & tendering, with a estimated capital outlay of Rs. 17,340 Crs

i. Krishnapatnam Stage- I Unit 1 – 800 MW, expected CoD by September 2014, Unit II – 800 MW, expected CoD by December 2014

ii. RTPP – Stage IV – 600 MW to be commissioned by August 2016

iii. Nagarjunasagar tail pond (hydroelectric project) – 50 MW to be commissioned by Oct' 14

iv. Krishnapatnam Stage- II* – 800 MW, estimated Zero Date is Apr'15 & CoD Apr'19

v. VTPS Stage V* – 800 MW, estimated Zero Date is Apr'15 2015 & CoD Apr'19

*Not considered for Energy Availability / Supply projections till FY 2018-19.

Coal based IPP's

i. Hinduja 1040 MW (2x520 MW): Unit I to be commissioned by December 2014 & Unit II to be commissioned by April 2015

ii. Case -1 : (Long term): 46.11% of 500 MW from Thermal Power Tech- CoD April 2015

iii. Case -1 : (Medium term): 46.11 % of 500 MW from KSK Mahanadi-up to June'16

Following Table shows capacity additions from various sources.

Table 3: New Capacity Additions

Particulars	FY 14-15	FY 15-16	FY 16-17	FY 17-18	FY 18-19	Total
State Thermal Total	1,600	600	600	0	0	2,800
State Hydel Total	170	150	90	0	0	410
Central Generating Stations Total	255	551	329	614	200	1,949
Others Total	520	1,020	1,050	0	0	2,590
Total Capacity Addition	2,545	2,321	2,069	614	200	7,749

Apart from the above stations, energy from NCE sources have also been considered:

Table 4: Capacity Addition from upcoming RE Projects (considered for supply Projections) (MW)

Particulars	FY 14-15	FY 15-16	FY 16-17	FY 17-18	FY 18-19	Total
NCE - Solar	30	800	1200	1500	1500	5,030
NCE-Wind Power	250	600	800	1000	1500	4,150
Total	280	1,400	2,000	2,500	3,000	9,180

Keeping in view the prevailing power deficit scenario, approval for procuring 2000 MW +/ -20% through Case – 1 competitive power procurement has already been granted by GoAP.

3.3 Generation Capacity required to meet Peak Demand

Adequacy of Generation Capacity both existing & upcoming has been analyzed for meeting the projected peak demand and the same are given in the table below.

Table 5: Capacity Available for meeting Peak Demand (MW)

Particulars	FY 14-15	FY 15-16	FY 16-17	FY 17-18	FY 18-19
Upcoming Conventional Capacity – Cumulative (A)	1,178	2,258	3,218	3,512	3,608
Load adjusted Capacity (B=A*70%)	825	1,581	2,253	2,458	2,526
Contribution of NCE towards Peak Demand – Cumulative (C)	134	246	406	606	846
Power Procurement through Competitive Bidding (D)	1,400	1,900	1,900	1,900	1,900
70% of existing capacity of 6910 MW (E)	4,837	4,837	4,837	4,837	4,837
Final Projected Capacity available for meeting Peak Demand (F)	7,196	8,564	9,396	9,801	10,109
Projected Peak Demand (G)	9,220	10,211	11,181	12,264	13,436
Additional capacity required to meet the projected Demand	2,024	1,647	1,785	2,463	3,327

The likely installed capacity from all sources (existing & upcoming) by FY 2018-19 is 13,264 MW thus leaving a shortfall of 3,300 MW during peak hours in FY 2018-19.

In addition to Long Term of 1,900 MW being undertaken currently, AP would go for another Long Term power procurement after commissioning of ER-SR link. NTPC has also proposed to set up a 4000 MW Ultra Mega Power plant at Pudimadaka in Vishakhapatnam district, which is scheduled to be completed by FY 2019-20. Efforts are also being made to utilize the stranded gas based capacity in the state.

3.4 Action points for GoAP / APGENCO

In the current situation, there are a host of measures that are being taken up immediately by GoAP/APGENCO, while others will be implemented in a phased manner for long term reduction of fuel deficit.

3.4.1 Coal Imports to meet shortfall of Coal from MCL

GoAP has given in-principle approval to APGENCO to import coal for its needs. APGENCO, in view of domestic coal shortfall from MCL, has drawn up the following import plans, for its stations.

Table 6: Coal Import Plan by APGENCO

Coal Imports by APGENCO	FY 14-15	FY 15-16	FY 16-17	FY 17-18	FY 18-19
Mandatory Imports for Krishnapatnam	0.5	1.1	1.2	1.2	1.2
Imports to meet deficit	3.0	3.0	4.0	4.2	4.2
Total Coal Imports*	3.5	4.1	5.2	5.4	5.4

*Permissible at current domestic coal availability

It has to be noted that, even after importing coal to the maximum technical limits, the PLF will remain in the range of 75% only.

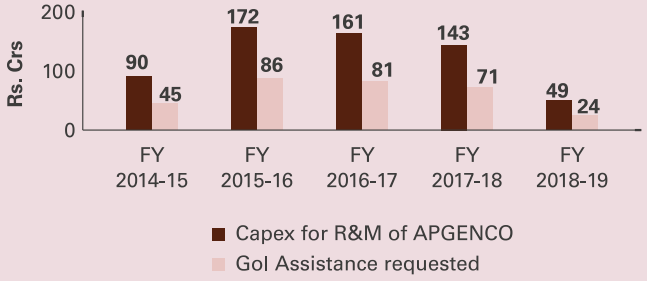
3.4.2 Renovation & Modernization Plan and Over-Haul Plan for APGENCO stations

APGENCO has lined up various activities under the Renovation & Modernization Plan for Dr. NTTPS, Vijayawada & RTPP, Muddunur units, which are more than 20 years old. The capital outlay required over the next 5 years to carry out these activities is mentioned in the figure below. Completion of the R&M activities will lead to PLF improvement in the range of 3% to 5%. The savings accrued in terms of generated units, will outweigh the costs incurred for R&M, in the long run.

3.5 Requirement of funds

APGENCO has planned capital expenditure of Rs. 17,340 Crs over the next 5 years towards Thermal capacity addition of 3,800 MW and Hydel capacity addition of 50 MW. Some of these projects are under construction and others are under planning / tendering stage. APGENCO has secured financial tie-up for 80% of the capital cost from REC/PFC and other financial institutions. Remaining 20% will be contributed as equity by GoAP/APGENCO. It requests central assistance of 50% for Renovation & Modernisation of its older units. No financial assistance is requested from GoI for new projects.

Fig. 2: APGENCO's Capital Outlay for R&M of old units & construction of new units (Rs. Crs)



The details about the source of funds have been mentioned in the Figure 12.

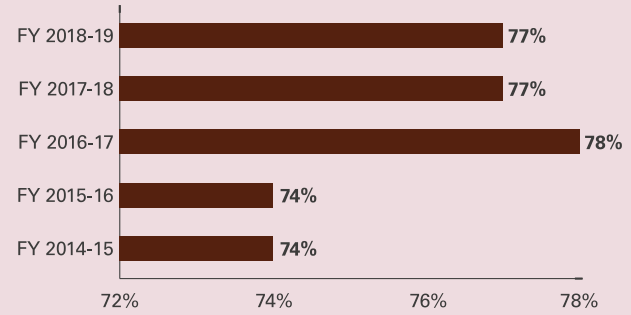
3.6 Support Requested from Govt. of India

GoAP requests assistance of GoI in the areas of fuel security and generation. These interventions are mostly strategic in nature, some in the form of policy guidelines, and some as directions to Public Sector companies.

3.6.1 Direction to MCL & WCL for providing Coal

Materialization of Linkage from MCL is currently around 60%. Coal deficit situation is projected to persist up to FY 2018-19 as APGENCO stations cannot use imported coal beyond a certain limit due to technical limitations, as shown in Annexure I. Therefore domestic raw coal has to be provided to enable APGENCO to run its plants up to 90% PLF. If deficit in raw coal is not met, APGENCO's PLF will be limited around 75 %, even after importing coal to the maximum extent possible. Following is the projected PLF that APGENCO can achieve with above deficit in domestic coal.

Fig. 3: Projected PLF in case shortfall is not met

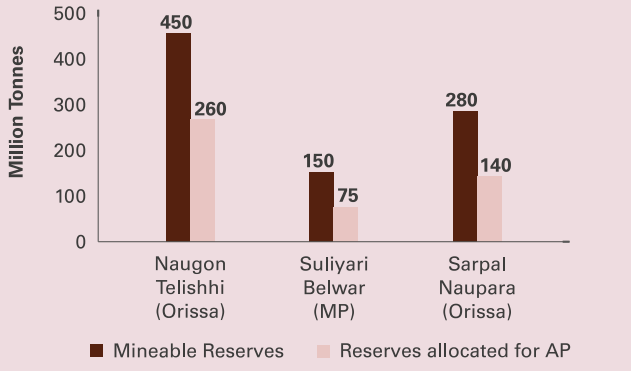


The energy deficit can be reduced to a considerable extent by improving the PLF of APGENCO stations to 85%. To achieve this level of generation, Govt. of India's interventions is requested for ensuring 100% materialization of coal linkages from MCL and ad-hoc 1.5 - 2 MTPA coal linkage from WCL.

3.6.2 Fast- Tracking of Coal Blocks allotted for new APGENCO units

Further, assistance of Govt. of India is requested for land acquisition and various clearances to fast-track the development of coal blocks which have been allocated to APGENCO/APMDC for proposed 4000 MW capacity APGENCO's upcoming stations. (3X800 MW at Srikakulam, 1X800 MW at Vijayawada, 1X800 MW at Srikakulam).

Fig. 4: Coal Blocks allotted to APGENCO / APMDC



3.6.3 Additional Gas Allocation for IPPs based in AP

Also, adequate RLNG supply to the Independent power producers should be ensured and they should be nominated as Spinning Reserves. The state should expedite the construction of FSRU at Kakinada and LNG terminal at Gangavaram port. A long term RLNG contract with GAIL/ Petronet shall be explored by the state.

2.5 mmscd of Gas is being supplied against requirement 13 mmscd which is just enough for 500 MW, leaving 2270 MW capacity stranded. Details have been presented in Annexure II. **Gas based IPPs require 1.5 mmscd** Gas immediately from upcoming ONGC fields of Eastern region at KG basin. Gas pooling mechanism should be explored by GoI through discussions with various stakeholders & GoAP would extend full support to such an initiative.

3.6.4 Additional Gas Allocation for IPPs based in AP

As majority of above mentioned capacity (apart from short term 2,000 MW) will take 2-4 years to materialize, additional CGS allocation is sought from Ministry of Power immediately.

GoAP requests MoP, GoI for additional CGS allocation from following plants, especially those in the SR, to avoid inter-regional transmission constraints.

- 150 MW from Kudankulam - NPCIL NPP Stage-1 (2x1000 MW)
- 150 MW from Vallur- NTPC-Tamil Nadu Energy JV (3x500 MW)
- 75 MW from Neyvelli- NLC expansion, Stage-2 (2x250 MW)
- 200 MW from Jhajjar – NTPC Indira Gandhi STPS.

3.6.5 Direction to PGCIL for fast-tracking projects

The transmission corridor connectivity from Eastern Region to Southern Region grid has to be completed timely by the CTU to enable power import from ER at much cheaper rates. This will also help APDISCOMs in narrowing the gap between ARR & ACS.

To enable the evacuation of the renewable projects, a Renewable Energy Evacuation is being proposed. Central assistance is sought in this regard as high capital outlay is required for these schemes.

Though, Govt of India would make all possible efforts within the framework/ policies to assist the Govt of Andhra Pradesh as requested above, but if, there is any problem in meeting the above requests of the State Govt , a back up plan would be worked out by State Govt to procure adequate power to meet the projected requirement.

04 Transmission Plan

The requirement of electricity both energy and peak demand in Andhra Pradesh are expected to increase significantly from the present level of 43,684 MU & 6,158 MW to 82,392 MU and 13,436 MW respectively by FY 2018-19.

To meet this growing demand, robust & reliable transmission network is required both at Inter-state & Intra state level. However, Inter State Transmission System (ISTS) network is required to facilitate import & drawl of allocated ISGS power.

4.1 Inter State Transmission System (ISTS)

4.1.1 Existing ISTS Infrastructure

Presently about 5250 ckt km of transmission lines comprises of 765kV (110 ckt km) and 400kV (5140 ckt km) lines & 8 no. of substations (1 nos. of 765 kV, 6 nos. of 400kV & 1 nos. of HVDC station) with total transformation capacity of about 8,131 MVA are existing in Andhra Pradesh under the Inter State transmission system. In Andhra Pradesh, one (1) no. of Central Sector generating station viz. Simhadri – I & II with a cumulative installed capacity of 2000MW is existing. Out of which Simhadri –I of 1000 MW is dedicated to erstwhile combined Andhra Pradesh. Details of transmission system to transfer power from existing ISGS are as under:

Simhadri Phase – II (1000 MW):

LILO of Gazuwaka – Vemagiri/Vijayawada 400 kV D/c line at Simhadri – II

The details of the existing ISTS network in Andhra Pradesh is enclosed at Annexure III.

4.1.2 Planned ISTS Infrastructure

To cater the growing demand of Andhra Pradesh by FY 2018-19, a number of inter-state transmission schemes are under various stages of implementation. Further, new transmission schemes have been identified / planned under ISTS to cater future load growth in Andhra Pradesh and Southern region as a whole. The planned augmentations include 765kV high capacity Inter-Regional links as well as 765kV high capacity corridors within Southern Region passing through the state of Andhra Pradesh and shall facilitate in drawl of power through ISTS network.

Some of the major on-going transmission lines are as under

- Angul - Srikakulam-Vemagiri 765 kV D/c line (Inter regional link between SR & ER)
- Gooty - Madhugiri. 400 kV D/c line
- Vijayawada – Nellore 400 kV D/c line
- Nellore – Kurnool 765 kV D/c line.
- Kurnool – Tiruvallam 765kV D/c line.

AP can import power from other regions through the above SR-ER corridor.

The details of the future ISTS network is enclosed at Annexure IV.

4.1.3 Transmission system for Integration of Large Scale Renewables

In Andhra Pradesh, existing renewable capacity is about 1,397 MW (Wind-777MW, Solar- 77MW, Others- 543MW) as on June 2014. It is envisaged to add about 9,150 MW renewable capacities by FY 2018-19 mainly through solar and wind generation. Out of this, 7,150 MW (Wind: 4150MW & Solar: 3000MW) would be developed as grid connected for which transmission system strengthening is required. Balance 2,000 MW capacity (majority solar) would be developed as distributed generation projects including roof-top solar, and therefore would be connected to the DISCOMs' network (33/11 kV substations). As part of the above mentioned 2000 MW Distributed Generation, AP will be shortly inviting tenders for 1000 MW (+/- 20%) of solar projects. Details of wind and solar capacity addition programme is given at Table below.

Table 7: Details of Solar & Wind capacity requiring Transmission Evacuation

Particulars	Unit	Wind	Solar	Total *
Existing capacity (As in June 2014)	MW	777	77	854
Envisaged Addition by (2018-19)	MW	4150	3000	7150
Total	MW	4927	3077	8004

* excluding Biomass/SHP/WTE/Bagasse

Renewable capacity is mainly confined in Ananthapur, Kurnool & Kadapa districts. Details of pocket wise envisaged wind and solar capacity in Andhra Pradesh are mentioned given at Annexure V

Based on the capacity addition, it is expected that Andhra Pradesh may have more RE capacity than required for meeting their Renewable Purchase Obligations (RPO). Further, Andhra Pradesh may not be able to absorb the entire RE energy locally - particularly during off-peak period - when renewable generation is at its peak. In addition, the IEGC stipulates the renewable energy plants as "MUST RUN" and not to be subjected to "merit order dispatch" principles.

To address above aspects and the intermittency nature of renewable energy generation, development of strong and reliable grid interconnections is important. This shall also facilitate enlarging balance area and interconnection with flexible generation. There is a need to strengthen Inter-state transmission which shall facilitate transfer of power outside the RE resource rich states.

In order to facilitate integration of large scale renewable generation capacity by FY 2018-19, a comprehensive transmission plan comprising of intra state and inter state transmission system strengthening has been evolved as a part of "Green Energy Corridors". As part of this corridor, under ISTS one nos. of 400/220kV substation in Anantapur would be established in Andhra Pradesh. This substation proposed to be interconnected with Kurnool and Chiknayakhalli (near Bangalore). Details are as under:

Inter-state transmission scheme for Andhra Pradesh for integration of renewable generation as part of Green Energy Corridor – The Scheme is yet to be approved

- Anantapur – Chiknayakhalli (near Bangalore) 400kV D/c
- Anantapur - Kurnool (new) 400kV D/c (Quad)
- Establishment of 3x500 MVA, 400/220kV S/s at Anantapur

Estimated Cost : Rs 1000 cr

In addition to this, 400kV Hindupur substation of APTRANSCO is proposed to be interconnected with 765/400kV Madhugiri substation (ISTS) as a part of intra state strengthening for renewable to facilitate evacuation of renewable power outside to Andhra Pradesh.

Further to facilitate pooling of power from various RE generations to points of common coupling (PCC) and transfer to various load centers, the intra state strengthening scheme has been evolved which will be interconnected with the ISTS points.

As part of Green Energy Corridor schemes, 870 Ckm of lines and 1500 MVA substation capacity will be added.

In order to integrate large scale variable generation and address its inherent characteristics of intermittency & variability, there is a need of addressing it through suitable mitigating measures like balancing & control infrastructure. Balancing infrastructure includes enlargement of balancing area through strong grid interconnection, flexible generation resources like Pumped storage plants (PSP), large scale battery storage etc. In addition control infrastructure like Renewable forecasting system, Renewable Energy Management Centre (REMC), Dynamic reactive compensation, Real time monitoring etc. are also required to be provided.

4.1.4 Renewable Energy Management Centres (REMC)

Renewable generation especially wind is characterized by its intermittent & variable characteristics. Therefore other control infrastructure such as forecasting of renewable generation, balancing infrastructure, dynamic compensation, establishment of Renewable Energy Management centres (REMC), at SLDC/RLDC/NLDC level, real time measurement/ monitoring, large scale Energy storage etc. have also been identified as part of the green energy corridors.

Establishment of Renewable Energy Management Centres (REMC) has also been proposed for the State of Andhra Pradesh considering the high level of renewable penetration. REMC shall perform real time monitoring of renewable generation as well as renewable generation forecasting exclusively on different time scales. Integration of REMC with existing control centres would facilitate scheduling & dispatch of RE power. Further, in order to facilitate real time dynamic state measurement at RE pooling stations or point of common coupling, installation of PMU/PDC and associated Fibre optic communication links are considered.

4.1.5 Investment:

Total estimated cost in Andhra Pradesh for inter-state transmission network strengthening including integration of RE generation is about Rs 23,284cr.

Inter-state transmission network: Rs 23,284cr

- Rs 22,284 Cr for inter state transmission scheme (Rs 9403 cr scheme is under implementation and Rs 12881cr scheme is planned)
- Rs 1000 cr for Green Energy Corridor (The Scheme is yet to be approved)

Funding of inter state transmission scheme(Rs 1000 Cr) for renewable would be through own resources and external borrowing. However to rationalize the transmission tariff soft loan from multilateral funding agencies is required. In such cases sovereign guarantee is required from GoI.

4.1.6 Adequacy

The planned ISTS system along with existing network is sufficient to meet the power transfer requirement of Andhra Pradesh by FY 2018-19 to meet the projected demand.

Interstate transmission system along with proposed intra state scheme for integration of renewable generation is adequate for 7,150MW capacity addition, however in case of for increased quantum, additional transmission system would be required.

Note: The proposed transmission system is evolved considering a particular load generation scenario and network configuration, which may change time to time depending upon actual load growth, generation capacity addition, network development etc. In case of any change in the above consideration, the proposed transmission system needs to be reviewed.

4.1.7 Action Points

- POWERGRID/Implementing agency to ensure development of Inter State transmission system as indicated above progressively by FY 2018-19
- State nodal agency shall ensure that Renewable generation developer apply for connectivity/Long term access for its integration in the ISTS.
- GoI may identify implementing agency(ies) for development of ISTS (Rs 1000 Cr) for integration of renewables.

4.2 Intra State Schemes

4.2.1 Existing Network Infrastructure

The present transmission infrastructure consists of 6 Nos. of 400 kV substations, 72 Nos. of 220 kV substations, 167 Nos. of 132 kV substations and 18,907 Ckm of EHT lines.

4.2.2 Planned Network Infrastructure

APTRANSCO has drawn up investment plans of Rs. 11,087 Crs. in the period FY 2014-15 to FY 2018-19 for Intra-state Transmission schemes including Renewable Evacuation (Rs. 1,289 Crs of Wind Corridor Phase-2 Scheme & Rs. 1,816 Crs Renewable Energy Evacuation Scheme).

Table 8: Capital Investment required for System Strengthening and Renewable Evacuation

	Particulars	Capex
A	Total funding required for system improvement, capacity augmentation & network strengthening (400, 220, 132 kV)	Rs. 7,982 Crs
B	Total funding required for renewable energy evacuation (400, 220 kV)	Rs. 3,105 Crs^
C	Total Funding required	Rs. 11,087 Crs

^ Does not include Rs. 2,084 Crs of Phase-1 Wind Corridor as financial closure is complete for the scheme.

4.2.2.1 Non-Renewable Schemes

The above investment includes Rs 2,306 Crs (including IDC) investment on substations. These include 8 numbers of 400 kV substations, 26 substations of 220 kV and 75 substations of 132 kV along with associated lines.

APTRANSCO also plans to strengthen the network by augmentation of lines (220 kV, 132 kV) and power transformers (in the network of 400 kV, 220 kV & 132 kV) by spending an amount of Rs. 4,504 Crs. This investment includes 160 km of 220 kV lines and 1,775 km of 132 kV lines towards transmission strengthening and 690 MVA/MVAR additions in 400 kV substations, 2512 MVA addition in 220 kV substations and 2,910 MVA addition in 132 kV substations. Transmission ring of 220 kV with GIS substations and associated cables is also covered in the above capital outlay. The network improvement also includes Ring-Main circuit around Guntur city along with two GIS substations, connected lines and 220 kV under-ground cables wherever required.

The 400 kV network enhancements also cover a 400 kV transmission ring network around the cities of Vijayawada & Guntur with three 400 kV substations and 440 km of Quad-moose transmission lines with an investment of Rs. 975 Crs. The details of the above investments by APTRANSCO towards network augmentation has been mentioned in Annexure VI

4.2.2.2 Renewable Evacuation Schemes

To harness this green power, APTRANSCO had formulated a transmission network to evacuate 3150 MW with outlay of Rs. 3,373 Crs. Under the Phase-1 of this 'Wind Corridor', works amounting to Rs. 2,084 Crs have already been taken up by APTRANSCO and are under different stages of construction. Construction of the second Phase of wind evacuation scheme, amounting to Rs 1,289 crs will be taken up shortly. The above 'corridor' will not be enough to evacuate the upcoming Wind & Solar projects. Therefore a separate intra state transmission scheme has been proposed which will be able to evacuate 3000 MW of Solar and 1000 MW Wind power. This is proposed to be named as ***"Renewable Energy Evacuation"***.

To evacuate the power under this scheme, a 400 kV network and a 220 kV network has been planned. The 400 kV network will consist of 4 substations with 436 km of Quad-moose lines and 220 kV network will consist of 8 substations with 541 km twin-moose DC line with total outlay of Rs. 1,816 Crs. (This capital outlay does not include the investment for Phase-2 wind evacuation scheme, amounting to Rs 1,289 Crs.)

Thus APTRANSCO requires a capital outlay of Rs 3,105 Crs. (Rs. 1,289 Crs of Wind Corridor Phase-2 Scheme & Rs. 1,816 Crs Renewable Energy Evacuation Scheme). The details have been provided in Annexure VII. It includes evacuation network for two solar parks, with a total capacity of 2,500 MW also.

As part of Intra state transmission system strengthening schemes, proposed capital expenditure of Rs 1289 Crs, constitutes 1060 Ckm of lines & 3498 MVA substation capacity and associated structures.

Details of additional Intra state transmission Renewable Energy Evacuation scheme of Rs 1816 Cr for renewable is as shown below:

Table 9: Details of proposed new Renewable Evacuation Scheme

Description of work	No./CKM	Rs. Crs.
400kV Substations	3	483
400kV Transmission Lines	532	739
220kV Substations	4	108
220kV Transmission Lines	445	319
Total		**1649**
Interest during Construction		167
Total Including IDC		**1816**

^ Does not include Rs. 2,084 Crs of Phase-1 Wind Corridor as financial closure is complete for the scheme.

Creation of New State Load Dispatch Centre (SLDC):

A state-of-the-art SLDC at Vijayawada & a backup SLDC at TIRUPATI is planned with a capital out lay of 45 Crs. The main SLDC at Vijayawada is programmed to be operational by May 2015 and back up SLDC is planned to be completed by August 2015.

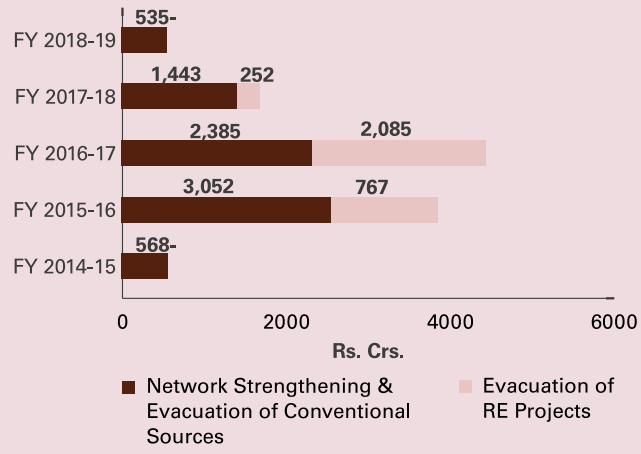
At present 132 kV SS Data acquisition to main SLDC is not available to monitor 24X7 power supply up to 33 kV level. Hence it is proposed to establish the communication link to all 132 kV substations by extending fiber optic cable duly providing terminal equipment and RTUs etc. The estimated cost for these works amounts to Rs. 195 Crs for providing fiber optic & terminal equipment. The RTUs required are included in cost estimate table in Annexure VI.

In order to integrate large scale renewable capacity which is intermittent & variable in nature, suitable balancing infrastructure/ mechanism is required in the form of flexible and quick ramp up & ramp down generating resources like Pumped storage plants (PSP), large scale battery energy storage etc. To emphasize this balancing infrastructure, consistent & stable policies and regulatory mechanism are to be formulated.

Investment required for intra state transmission network

- Intra state transmission network: Rs 11,087 Crs- (Year-wise capital outlay requirement shown in figure below)
- Rs 7982 Crs for Total funding required for system improvement, augmentation of PTR and procurement of power through case-I bidding (400kV, 220kV, 132 kV)-Annexure VI
- Rs 3105 Crs for all RE Evacuation Schemes (Excluding transmission scheme of Rs 2085 Cr, which is already awarded)-Annexure VII

Fig. 5: Year-wise details of proposed investments



4.3 Action points for GoAP / APTRANSCO

APTRANSCO shall make equity participation in the upcoming projects, wherever required. APTRANSCO will also focus on timely completion of projects. One example is the Gadividi substation and associated lines at Srikakulam. AP can import power from Orissa by connecting the APTRANSCO network to PGCIL's upcoming ER-SR corridor, by getting linkage through a 400 kV substations at Srikakulam (Gadividi - Palasa).

4.4 Support Required from Govt. of India

The capital outlay required in the next five years is very high and cannot be met through market funding or equity contribution by APTRANSCO alone. Therefore GoAP requests financial assistance from GoI.

In addition to financial support, GoAP wants that Renewable generation developer apply for connectivity/Long term access to CTU for its integration in the ISTS for balancing of nearly 9,000 MW of Renewable Power, which is highly variable, requires quick ramping up/ramping down stations, which may not be adequate in Andhra Pradesh.

GoAP may submit their proposal to MNRE for funding of Green Energy Corridor under NCEF as per norms of prevailing schemes.

05 Distribution Plan

The requirement of electricity, i.e. both energy and peak demand are expected to increase significantly in Andhra Pradesh from the present level of 43,684 MU & 6,158 MW to 82,392 MU and 13,436 MW respectively by FY 2018-19.

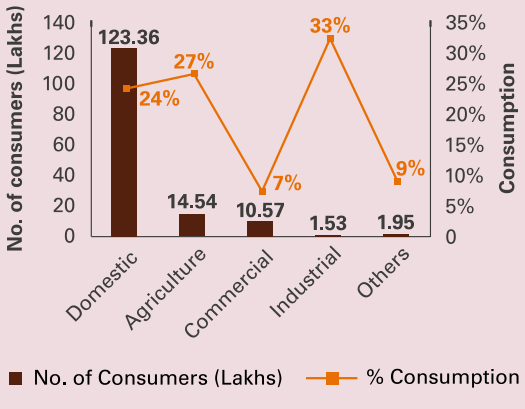
APDISCOMs have planned a robust and reliable distribution system to provide uninterrupted 24x7 power to the consumers. The existing distribution infrastructure would be strengthened and augmented to cater to the load growth, increase in electrification and higher quantum of supply.

5.1 Existing Network

There are 2,524 Nos. of 33/11 kV SS, 9,264 Nos. of Feeders (Urban - 2,114, Rural/Mixed – 5,375, Dedicated / Express Industrial – 706, Others-1069) & 5.62 lakhs of DTRs in the two DISCOMs.

The category-wise breakup of consumers & consumption has been shown in the figure below.

Fig. 6: Category wise Electricity consumption (Total 151.95 lakh consumers)



Rajiv Gandhi Grameen Vidyutikaran Yojana (RGGVY)

Andhra Pradesh has total 127.53 lakhs households (Rural - 88.59 lakhs, Urban - 38.94 lakhs), out of which around 5.84 lakhs are un-electrified. At present, the un-electrified households are being electrified under RGGVY scheme of Govt of India. Under this scheme electricity connections are being provided for the rural households in the habitations with population of more than 100 only. As part of the 10th & 11th five year plans, 19.42 lakhs of households were electrified under RGGVY.

Under the 12th plan, DPRs covering 4.29 lakhs households amounting to Rs. 332 Crores have already been submitted to REC for approval. Out of the remaining 1.54 lakhs households, 1.41 lakhs will be connected by APDISCOMs under normal operations, 8,038 households will be covered under DDG scheme, 3,928 households will be covered under Tribal sub-plan & 1,723 households will be covered under SC sub-plan.

Restructured Accelerated Power Development and Reform Programme (R-APDRP)

Under Part-A of R-APDRP programme, 72 towns of Andhra Pradesh have been covered at a cost of Rs. 364 Crs. The projects are at advanced stages of completion, with some towns such as Vishakhapatnam nearing Go-Live. Part-A covers projects for establishing base line data and IT applications for energy accounting/auditing and IT based consumer services like, consumer indexing, GIS mapping, metering of DTRs & Feeders, SCADA/DMS systems, etc. Part-A SCADA is planned for another town at a cost of Rs. 13 Crs.

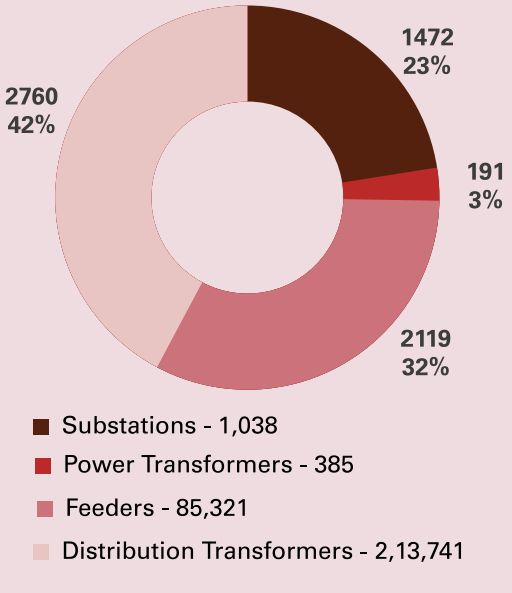
Part-B of RAPDRP programme was taken up in 42 towns of AP at a cost of Rs. 297 Crs. These projects cover loss reduction and network strengthening works like installation of new DTRs re-conductoring of LT lines, replacement of LT bare conductors with LT AB cables, conversion of 1 phase to 3 Phase lines, etc.

5.2 Proposed Network Additions

To support the growing power requirement of the state, AP power distribution companies (APEPDCL and APSPDCL) have constantly endeavored to increase their sub-transmissions and distribution capacity in-line with load requirements. In addition to planned capital expenditure to meet the present power scenarios, new capacity enhancements are planned to provide reliable and uninterrupted supply in line with the states promise of providing 24x7 power supply to all domestic consumers.

Base Capex - Capacity addition: As part of the sub transmission network strengthening and capacity augmentation, additional infrastructure is planned to be commissioned in the next five years at a cost of Rs 6,542 Crs:

Fig. 7: Base Capex planned by APDISCOMs (Total Base Capex = Rs. 6542 Crs)



Other Capex:

- Reduction of AT&C losses: With the overall objective of reducing technical losses in the distribution system to below 7% in all towns and Mandal HQs, various initiatives are planned at a cost of Rs. 343 Crs. This includes providing Capacitor banks at substations & lines to increase the power factor, thereby reducing the Reactive kVA, thus reducing technical losses and by providing AB (Air Bunched) cables in theft prone areas to reduce commercial losses.
- Loss measurement and verification methodology implemented through external agencies to be implemented much like the assignment carried out by TPIA for R-APDRP towns.
- Reliability and contingency schemes: To improve the reliability & contingency of the distribution systems, initiatives like alternative supply to 33 kV, 11 kV and LT consumers, laying of covered conductors for 33 KV & 11 KV voltage levels, wedge connectors, maintenance free earthing pits, installation of substation monitoring software, re-conductoring of existing lines are planned to be taken up. In addition, for coastal areas prone to cyclones and religious towns, breakdown mitigation activities to prevent outages such as replacement of over-head lines with Under-Ground cables are planned. The total capital expenditure for such initiatives is Rs. 3,019 Crs.
- Renovation & Modernization schemes: Renovation and modernization of sub-stations in order to increase their life span and replacement of old and obsolete equipment such as Breakers, DTRs, lines etc. is planned at a total expenditure of Rs. 530 Crs.
- Technology Up-gradation: Technology improvements such as IT interconnection / networking of various sub-stations and offices located at remote areas using WAN/ LAN and leased lines, technical projects such as SCADA, GIS/GPS, AMRs for all DTR's in rural areas & towns, ATP machines in each circle etc. are proposed to be taken up at a cost of RS. 646 Crs.

IT enabled services to the towns with less than 30 thousand population and in rural areas under RAPDRP-Part- A

The towns of Andhra Pradesh covered under RAPDRP Part –A are with the population of more than 30,000 for IT enabled services. In order to implement RAPDRP scheme in the entire state irrespective of the coverage of Sub Division / Town of more than 30,000 populations in RAPDRP, it was considered that all modules under Part-A of RAPDRP would also be implemented in the towns of population of less than 30 thousand and in rural areas.

- Further R-APDRP has already initiated a number of measures in this regard to AT&C Loss reduction including energy audit and accounting with IT intervention. These initiatives now need to be strengthened and expanded in other areas. To meet this objective, the backbone infrastructure for improving measurement and visualization will be created across the state and would include:

- Implementation of Geographic Information Systems (GIS) to map the network assets and consumers comprehensively and always updated for operational purposes. Activities that would be supported by the GIS capabilities would include fault detection and restoration, new service connection issuance, connection – disconnection, network expansion, etc. To achieve its real potential accuracy and regular updations of asset & consumer mapping needs to be carried out both for the existing and new set of asset and consumer. It is also important for the utility to identify and regularly update the incremental changes that is happening in the network. Currently, in AP DISCOM, GIS has not been implemented successfully due to various reasons.

- As per RAPDRP plan, Government has thought of installation of meter for in all the distribution transformer & feeder in the urban areas in the state. As the scheme has not progressed successfully, a comprehensive feeder and distribution transformer metering programme needs to be rolled out that would cover all feeders and transformers in the State. Measures in this regard have been continuing in the state over the past several years. This will be made more comprehensive, and will be backed by an expeditious restoration plan in case the meters turn defective or damaged;

- Network analysis of the system to base on power flows and network status to ensure that the losses and line outages can be predicted or identified in a timely manner; As per RAPDRP program Network analysis application would have been supplied to DISCOM. However one can assume that without a credible GIS database the same has not been utilized fully in the DISCOM. Through change in process management, DISCOMS have to ensure that the entire new capital investment program are routed through network analysis module rather than existing stopgap approach.

- Consumer metering: Consumer metering would be put in place to ensure 100% metering of all supplies including agriculture in the next 3 years. This will be implemented by the support of the State Government and Government of India.

- New Consumer Capex: Rs 519 Crs is planned towards new consumer capex, which include meters for new services & subsidy for releasing agricultural services)

- Miscellaneous Capex: Other activities like civil infrastructure developments, miscellaneous expenses are planned at a cost of Rs. 8 Crs.

- Connecting the Unelectrified housholds

  Under RGGVY scheme of Govt. of India, the electricity connections are being provided for the rural households in the habitations with population of more than 100 only. An assessment of the un-electrified /partially electrified Villages /scattered households in the state have to be made which are not eligible to be covered under RGGVY. GoAP has to make a plan to electrify, all the households located in these Villages by extending supply from the grid. Wherever possible or the scattered /remote households where grid supply is either not feasible or not possible, may be electrified through renewable energy sources under various schemes of MNRE.

DDG schemes: RVEP-DDG schemes are planned at a cost of 33 Crs, to augment the power availability in areas which presently receive less than 6 hours of electricity and villages where provision of grid electricity is not possible due to inaccessibility or high costs.

Real-time Metering of DTRs: GoAP plans to meter all the DTRs for Energy Audit purpose. Meter readings of DTRs will be connected to online data-base where information can be stored and retrieved on a real-time basis.

Replacement of Burnt Distribution Transformer: Andhra Pradesh faces a challenge of more than 5% of the Distribution Transformer burnt annually. Timely Replacement of Distribution Transformer and incorporations of improvement measures to reduce DT failure needs to be focused.

Replacement of Consumer Meters: Replacement of old electro mechanical meters with new IrDA (Infra-red Data Acquisition) meters for all households to improve accuracy & enhance revenues is planned at a total cost of Rs. 647 Crs. GoAP may explore installing prepaid meters in Government institutions.

Replacement of all defective meters: Replacement of defective Meters including meter burnt, meter stop, etc. should be taken on priority and to be completed by March 15. Apart from one time meter replacement of defective meters there should be periodic drive for testing of meters and the replacement of defective meters as per SOP guidelines issued by APSERC and according expenses are to be planned.

Agriculture feeder segregation: To ensure 24 hrs. supply to the domestic, commercial, Industrial and other loads (other than Agriculture loads) in the villages on par with urban consumer, it is required to segregate agricultural loads or village loads from mixed load DTRs and install exclusive DTRs to feed the agriculture loads or village loads (whichever is economical and convenient) and form separate 11 KV Agriculture feeder and 11 KV village feeder from 33/11 KV substation. Total planned capital expenditure is Rs. 3,182 Crs.

HVDS In order to reduce line losses to agriculture feeders and improve the life of DTR, improvement in customer satisfaction due to lower burnout of motors, improvement of tail end voltage, elimination of low voltage packets and reduction in theft of energy, HVDS project to replace LT lines with HT lines is being planned at a total cost of Rs. 2,388 Crs.

Revamping Maintenance Philosophy: In order to increase reliability of the system DISCOM should look for implementing system driven preventive maintenance system. Power Transformers, Distribution Transformers, Circuit Breakers can be checked periodically for identification of any faults and correction thereof. Further, Discom should have defined roadmap to adapt Predictive Maintenance as well.

Safety Improvement Plan: Hon'ble AP Commission in Latest Tariff Order mandated on preparation of the Safety Improvement Plan and its implementation and has accordingly approved a budget of Rs 25 Crs. (erstwhile united Andhra Pradesh and would be required to be divided after bifurcation) for next five years.

Performance Monitoring Mechanism: In order to implement appropriate reform measures and meet the objective, baseline parameters needs to be verified and established, and hence it is proposed that a Third Party Audit should be carried out for establishing the baseline parameters for the KPI indicated below and thereafter following performance parameters needs to be monitored at the DISCOM Corporate level.

Corporate Strategic Objectives	KPI	UOM
Maximize Rate of Return	PAT	Rs Crs
	No of households to be electrified	Nos in Lakhs
	CAPEX	Rs. Crs
Sustain AT&C loss level & achieve further reduction	AT&C Losses	%
	Collection Efficiency	%
	Billing Efficiency	%
Monitoring Distribution Cost	Establishment Cost	Rs. Crs
	R&M Cost	Rs. Crs
	A&G Cost	Rs. Crs
	Power Purchase Cost	Rs./unit
Enhancing Customer Satisfaction	CSI Overall	Index
	Total Consumer Complaints / '000 consumers	Nos.
	New initiatives to enhance customer convenience	Nos.
	Addition in regards to Payment Avenues	Nos.
	PA Compliance Index	Index
Operational Efficiency	No. of customers served /employee	Ratio
System Reliability	SAIDI	Hrs
	SAIFI	nos.
	DTR Failure Rate	%
	PADCI (Project Average Duration Closure Index)	Months
	No of Accidents (Fatal/ Non Fatal)	Nos

For motivating the employees, an incentive scheme is to be designed on the similar lines of R-APDRP.

Training and capacity building of compliance officials and design professional through Institutional framework

With the increase of IT in the Generation, Transmission & Distribution system and to meet the expectations of 24 X 7 power supply for the consumers in the state, it is important to focus on capacity building of the employees for enhancement of technical know-how for latest technological developments and to increase the consumer satisfaction. The capacity building may also include consumer grievance system, awareness regarding importance of working with safety, outage management system, demand side management etc. It is also imperative to state that for serving the consumers in a different way change of mindset of the employees would be required. It is critical that Change Management initiatives are roll out and institutionalize throughout the DISCOM for achieving better results.

A state level officers training institute may be required to be opened in the state to fulfil the ongoing training requirement for employees of Discoms. A provision of approximately Rs. 25 Crores would be required for the same. Also at each district headquarters, training schools needs to be opened for training of subordinate technical staff for which expenses needs to planned for each district headquarter. Following training programmes are proposed to be implemented for Discoms:

1. Two Weeks trainings for technical staff including officers & engineers once in every two years.
2. One week training for non-technical officers every two years.
3. One week training for subordinate technical staff at each district headquarters every year.

5.3 Also, the training for the class C & D employees are also to be provided under RAPDRP Part C scheme.Requirement of Funds

APDISCOMs have planned total capex of Rs. 18,978 Crs. over next five years for augmentation of the distribution network in the state.

5.4 Action points of GoAP / APDISCOMs

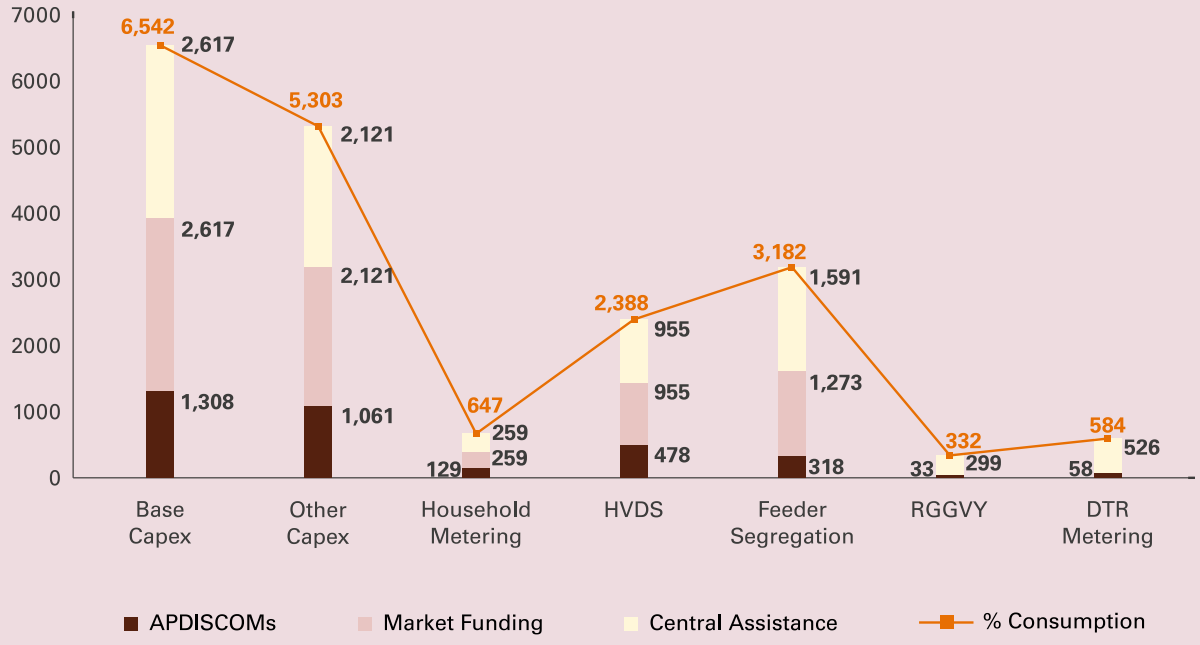
APDISCOMs aim to be the best utilities' among the country & achieve global benchmarks in the next 5 years. They are undertaking a host of measures, such as network strengthening & modernization to ensure reliable & quality supply. At the same time APDISCOMs are working towards increasing internal efficiency to ensure affordability of power supply. These include measures for reduction of AT&C losses as per the targets set by GoI / GoAP. GoAP wants to ensure that the 24x7 power supplied to consumers remains affordable and at the same time the utilities remain financially viable & healthy. Therefore, GoAP has, in recent years, released committed subsidy to APDISCOMs and would provide further subsidy support for free agricultural supply as per GoAP policy.

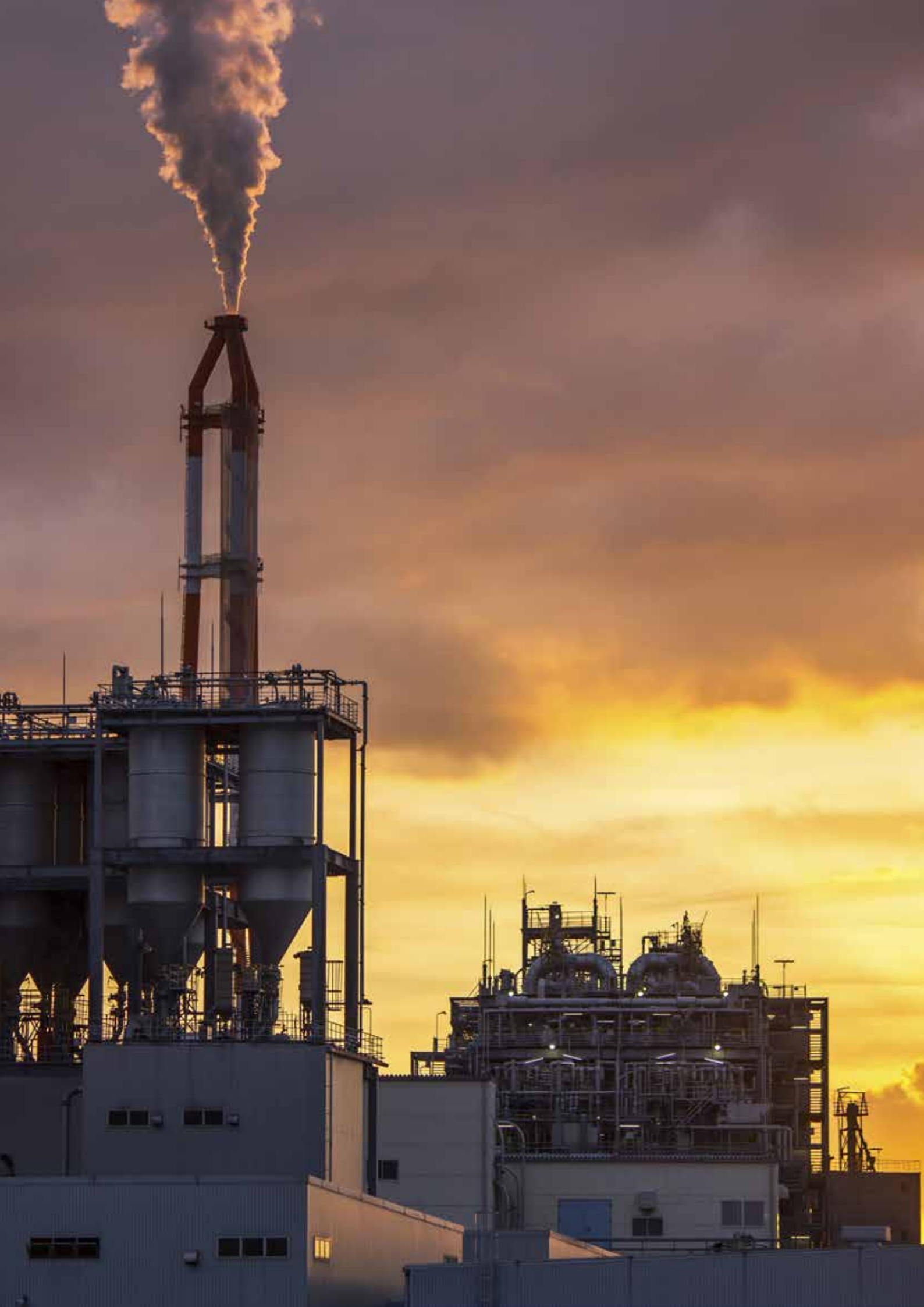
5.5 Support Requested from Govt. of India

As the investments required for Distribution Network enhancement is huge, (Rs. 18,978 Crs) GoAP requests assistance from GoI in the form of special grants & soft loans. This has been detailed in Figure 13, in the Chapter on GoI Interventions.

Two Schemes for funding for strengthening & augmentation of sub transmission and distribution works, 100 % metering, capacity building, ERP and feeder segregation etc are being finalized by MoP. GoAP may seek funding under the proposed schemes as per norms of the scheme.

Fig. 8: Source of Funds for Distribution schemes (Total Capex Rs. 18,978 Crs)





06 Financial Position of Power Utilities in Andhra Pradesh

Andhra Pradesh has been a pioneer in Power Sector reforms. Due to the proactive measures of its power utilities, they are financially healthy as compared to their peers in other states of the nation. APGENCO & APTRANSCO (STU) are among few profitable utilities in India.

The accumulated surplus as per provisional accounts at the end of FY 2013-14 of APTRANSCO (Residuary AP) was Rs. 401 Crs. and APGENCO (Residuary AP) was Rs. 958 Crs.

Fig. 9: AT&C Loss Trajectory for APDISCOMs

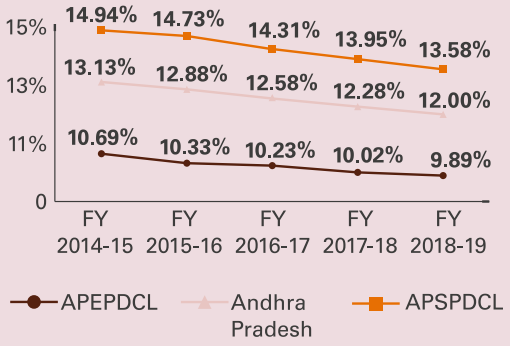
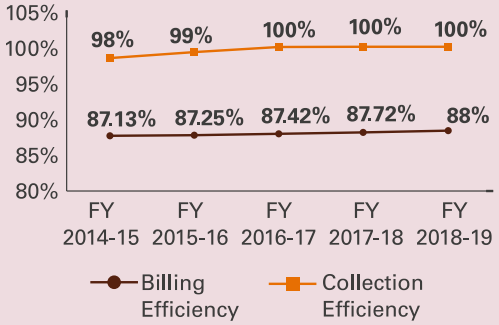


Fig. 10: Commercial Efficiency of APDISCOMs



APDISCOMS have one of the lowest loss levels in the country and the AT&C losses have been following a steady downward trend. MoP, GoI has set an ambitious loss reduction trajectory.

These loss levels are achievable for APDISCOMs, in light of their historic performance. In FY 2013-14, the AT&C loss of APEPDCL was 10.35% (6.33% Distribution Loss + 4.02% Transmission Loss) and that of APSPDCL was 14.95% (10.93% Distribution Loss + 4.02% Transmission Loss). Further, the goal prescribed by GoAP for APDISCOMs, is tougher than the goal set by MoP, GoI (AT&C losses - 9%).

It is recommended that before embarking on the journey of loss reduction, baseline AT&C losses should be re-established for the each of the DISCOMs. This will help in removing the ambiguity in terms of loss level. Baseline AT&C losses can be fixed by following the method as prescribed for TPIA by PFC. Baseline AT&C losses will also help in resolving other important matter such as level of subsidy requirement, category wise billing details etc.

APDISCOMS have to pay around Rs. 2,808 Crs. in the form of long term loans (50% of Short term loans converted to Long term loans) over the period of 5 years. The financial health of the APDISCOMS depends significantly on the ways it can bridge the deficit/losses of past period as well as the gap between Average Cost of Supply (ACS) and Average Revenue Realized (ARR) over the next 5 years. The ACS-ARR gap will be reduced by efficiency improvement of AP utilities, AT&C loss reduction, subsidy support from government and central financial assistance towards capital expenditure by AP utilities and other measures.

6.1 Action Points for GoAP / AP Utilities

GoAP / AP Utilities are taking a number of steps to reduce the ACS-ARR gap. Some of them are listed below:

- Increase APGENCO's PLF to 90%, thus increasing energy availability at lower prices. This will in-turn reduce bilateral sales and thereby lower total power purchase cost
- GoAP has set stringent loss reduction targets for APDISCOMs & APTRANSCO. This will increase realization of energy, thus reducing the ARR-ACS gap.
- APDISCOMs & SECM are launching several awareness campaigns for energy conservation. GoAP is in the process of issuing energy conservation guidelines / mandates. EESL in collaboration of APDISCOMs is planning DSM measures for household lighting, municipal street lighting & agricultural pump-sets.

6.2 Support Requested from Govt. of India

In view of the achievements of AP utilities and the global standards set for them, GoI is requested to facilitate access to multilateral funding for various schemes of AP utilities. The major areas of multi-lateral assistance would be AT&C loss reduction, Solar pump-sets, Feeder & DTR metering & real-time network communication. Some of the schemes are already underway in phased manner and pilot projects & DPRs are being prepared for the rest.

GoI is also requested to help AP utilities in getting access to cheaper credit within the country for working capital, as the credit rating of AP utilities is among the highest.

07 Renewable Energy Plan

Renewable energy is increasingly becoming an important source of the energy mix - meeting the twin objectives of meeting energy security and clean energy considerations.

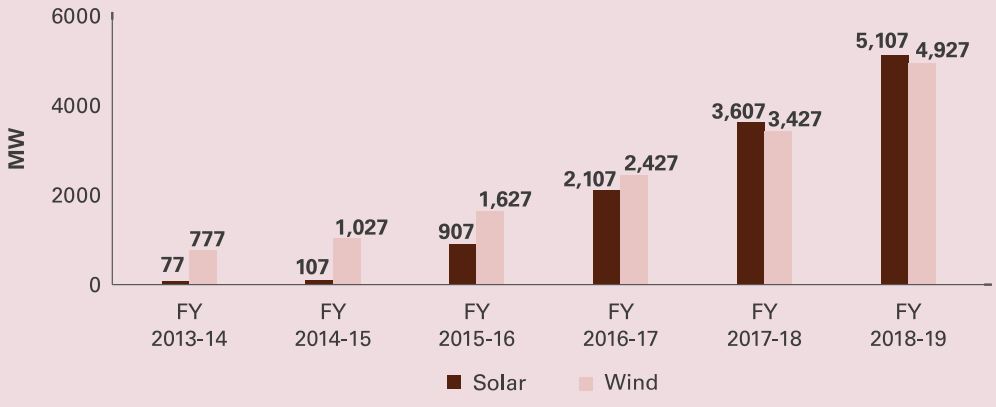
Andhra Pradesh has good potential for promotion of renewable energy projects, particularly Solar and Wind power projects. The total Renewable Energy (RE) installed capacity in the state as on 30.06.2014 was 1396.77 MW. Category-wise breakup is provided below.

The Govt. is keen to tap renewable power potential of the state – focus on solar and wind power potential – to meet the growing demand for power in an environmentally sustainable manner.

7.1 Solar Power

- Andhra Pradesh is blessed with good sunshine with average solar insolation of more than 5.0 kwh/sq. m/day. Especially, the scope of promoting solar power in the Rayalaseema belt is immense.
- The State Govt. is drafting a solar policy to promote usage of utility scale and rooftop solar power across the State.
- The State power utilities are planning to invite tender process for procuring 1000 MW of solar power in two phases of 500 MW each, through competitive bidding process within the next month. The bids will be invited for setting up solar power plants to connect at the nearest substation to enable connectivity to the existing system without any additional augmentation.
- GoAP is planning to develop Solar Parks of 2500 MW capacity at identified locations. It is proposed to develop these solar parks with the support of Solar Energy Corporation of India (SECI). SPV companies will be floated with the equity participation from SECI, APGENCO and NREDCAP to create infrastructure facilities in the Solar Parks.

Fig. 11: Renewable Energy addition over the next 5 years



- GoAP has already announced the net metering policy for Rooftop Solar Power Projects for households, institutions, commercial and industrial consumers. It is proposed to install Grid connected Solar Rooftop Systems on all major Govt. buildings in the State. 10 MW of Grid connected Solar Rooftop systems are proposed to be installed every year for next five years period with 30% Central Financial Assistance amounting to Rs. 30 Crs / year. If special status is provided to Andhra Pradesh, CFA of 70% is requested, which amounts to Rs.70 Crores per year.
- The Government buildings, hospitals, Public Health Centres (PHCs) in rural and semi-urban areas are proposed to be provided with Solar Off-Grid Systems with battery support. 5 MW of Solar Off-Grid systems are proposed to be installed every year. This would require 30% Central Financial Assistance, amounting to Rs. 25.5 Crs. If special status is provided to Andhra Pradesh, CFA of 90% may be provided to AP for solar pump sets, amounting to Rs. 76.5 Crs.
- It is proposed to promote solar pump sets for new agriculture connections in the State with a target to install 10,000 Solar pump-sets every year for next five year period. It is proposed to install 5000 solar pump-sets under MNRE scheme and 5000 solar pump-sets under NABARD scheme. As per the guidelines, for 5000 solar pump-sets annually, 30% Central Financial Assistance is available from MNRE . For another 5000 units, 40% Financial Assistance through NABARD can be provided alongside 40% NABARD loans. APDISCOMs will contribute 20% of the value for all solar pump-sets.
- All the un-electrified and remote hamlets are proposed to be electrified through Decentralized Distributed Generation (DDG), Micro Grids etc., under Remote Village Electrification Programme (RVEP) with support from MNRE. Under this scheme, the hamlets which are not covered under RGGVY programme will be considered for implementation under REVP scheme with 90% Central Financial Assistance. 95 Hamlets have already been identified in APEPDCL area which are proposed within the 12th Plan period.

7.2 Wind Power

- The Southern region of Andhra Pradesh comprising of Ananthapur, Kadapa, Kurnool and Chittoor districts have good wind power potential. The estimated wind power potential in the State is around 13,000 MW out of which1000 MW of wind projects will be developed in the 1st phase.
- In the second & third phases, the capacity planned is 1500 MW & 1650 MW respectively.
- The GoAP is bringing out comprehensive Wind Power Policy with provisions for sale of power to DISCOMs, Captive use, Sale of Power to Third Parties and REC route.

7.3 Requirement of Funds

The upcoming renewable projects in Andhra Pradesh will be mostly developed by private developers & public sector companies, who will make equity contribution and borrow the remaining capital from market sources. Therefore no Central Financial Assistance is sought in this regard.

However, in order to facilitate capacity addition and to keep the tariffs affordable, GoAP requires 500 Crs for development of Solar Parks. This includes roads, switchyards, water and other basic infrastructure. For developing DDG schemes, rooftop solar projects, etc, the GOI assistance required have been listed below.

7.4 Action points for GoAP / APTRANSCO / APDISCOMs

Renewable Energy is a clear focus area for GoAP. GoAP is taking a host of measures to support off-take of Renewable Energy in the state. Andhra Pradesh is targeting Renewable capacity addition in the order of 9000 MW in the next 5 years. Below are some of the recent measures / initiatives taken by GoAP / AP utilities

- GoAP is drafting new Solar & Wind policies that will attract renewable investments in the state, bridge the energy deficit & provide generation security.
- The 1st Phase of APTRANSCO's Wind Corridor has been awarded at an estimated cost of Rs. 2,084 Crs. As part of the second phase, projects worth Rs. 1,289 Crs will be taken up shortly.
- APTRANSCO has also planned 'Renewable Energy Evacuation' scheme, capable of evacuating 3000 MW of Solar and 1000 MW of Wind energy, with a capital outlay of Rs. 1,816 Crs is requested.
- GoAP plans to develop Ananthapur as a Renewable Energy Hub. (a drought prone district having very good potential for development of Solar and Wind Power Projects). GoAP is also keen to develop the area as a renewable manufacturing zone.
- GoAP is facilitating the development of two solar parks at Anathapur, Kurnool & Kadapa districts. GoAP / AP Utilities are working in collaboration with central PSUs for these projects.

7.5 Support requested from Govt. of India

To implement the above projects / schemes, the Govt. of India may provide financial assistance under Power for All (PFA) scheme.

- Sanction of grants from MNRE for development of Solar Parks to the tune of Rs 20 lakhs/ MW (Total Rs. 500 Crs for 2,500 MW) may be provided through SECI for Solar Park development
- Allocation of 500 MW of thermal power for bundling with 1,000 MW of Solar Power through NVVN, in the ratio of 1:2 (Thermal : Solar)
- Sanction of 10,000 Solar pumps per year for next five year period 5,000 nos. under MNRE scheme and 5,000 nos. through NABARD. The Central Financial Assistance under MNRE and NABARD schemes would be Rs. 375 Crs and Rs. 500 crs respectively in next 5 years.
- Sanction of Grid Connected Solar Rooftop systems of 10 MW capacity every year for next five years period.
- Sanction off-grid Solar Systems of 5 MW capacity annually for next five years for Govt. buildings, hospitals, Public Health Centres (PHCs) in rural and semi-urban areas
- Sanction of funds under Remote Village Electrification Programme (RVEP) with 90% Central Financial Assistance, amounting to Rs. 10 Crs per annum to implement DDG schemes in Un-electrified remote hamlets in the next 3 years.
- Govt of Andhra Pradesh would submit their proposals to MNRE for funding under as per the norms of the scheme.

08 Energy Efficiency

In order to supply power to all consumers 24x7, (82,392 MU by FY 2018-19), incremental energy procurement is required. The energy procurement has to be supplemented by energy conservation efforts as well.

Secondly, the peak demand (projected 13,436 MW by FY 2018-19) can be reduced by usage of energy efficient devices such as LED bulbs & street lights, etc.

With increasing importance being given to low carbon growth, the cheapest and more affordable option to overcome this energy deficit has been demand side management and implementation of energy efficiency measures in various sectors such as agriculture, municipalities, buildings, domestic, industries etc. In this chapter, the demand side energy savings potential that exist in Andhra Pradesh are projected. Various interventions alongwith timelines are mentioned.

8.1 Savings potential & Investment

The table below summarizes the sector specific demand side energy savings potential vis-à-vis the investments required in Andhra Pradesh in next 5 years

Table 10: Energy Savings potential in AP

Sector	% of energy consumption	Consumption (MU)	Savings Potential per annum (MU)	Investment to achieve potential savings (Rs. Crs)	Techniques to be incorporated
Agriculture	27 %	11700	3293	4550	Replacement with energy efficient pump-sets
Domestic	24%	10400	3390	2550.5	Replacement of ICLs with LED bulbs
Commercial Buildings	7%	3033.33	383*	574*	Retrofitting of energy efficient equipments
Public Water Works	4%	1733.33	379	237	Replacement with energy efficient pump-sets
Municipal Street lighting	1%	433.33	162	225	Replacement of existing street lights with LED.
Total		27300	7607**	8136.5**	

*For commercial buildings sector only 50% (i.e. 1613 MU) having connected load greater than 100 kW or with contract demand of 120 kVA or more are considered. **Around 2821 MU of energy savings annually can be achieved at an investment of Rs. 2715 crores.

8.2 Interventions

The agricultural sector accounted for about 27% of the state's energy consumption i.e. 11.70 BU during FY 2013-14 and the subsidy burden of the State for the year FY 2014-15 is estimated at Rs.1,942 crores for about 13 lakhs pump-sets. Two successful pilots in Agricultural Demand Side Management have proved that investment in agricultural pump-sets efficiency can payback in a short time, refer table below:

Table 11: Pumpset Agriculture Energy efficiency

Parameters	Solapur	Hubli
No. of pump-set replaced	2209	590
Energy savings (MU/year)	6.1	2.9
Energy Savings (%)	25	37
Investment (INR crores)	8	2.6
Subsidy Reduction(Rs crs/year)	1.2	1.01

As per the DRP prepared by BEE in APEPDCL for 2200 pump-sets, the energy saving potential is around 30%. Taking the average energy savings outcome of the two pilots, a 30% reduction in energy consumption and subsidy is possible by replacing all existing pumps with star rated energy efficient pump-sets. The average pump sizes in the two DISCOMS are around 6 HP. The estimated investment in replacement of inefficient pump-sets, taking an average cost of efficient pump-sets to Rs. 35,000 will be of Rs. 4500 crores with an estimated savings of around 3.3 BU per annum. Apart from the energy savings, this would result in annual subsidy savings of Rs. 1250 crores to the state. Based on the estimated subsidy reduction, the simple payback on investment is around 3.5 years. Farmers have little financial obligation to pay electricity bills, therefore apart from monetary savings on account of electricity bills, the reduced maintenance cost of farmers is the biggest incentive in such interventions.

Domestic sector accounted for an energy consumption of 8.9 BU which is nearly 24% of the total consumption in FY 2013-14. In order to stimulate investments in energy efficient lighting projects, high quality LED lamps are proposed to be given to households at the cost of incandescent lamps (ICLs) to encourage them to invest in energy efficiency under the DSM based Efficient Lighting Programme (DELP). The main features of DELP includes replacement of 60 W ICL with 8 W LED with 5-6 years free replacement warrantee on lamps against technical defects, distribution of 3 LEDs to each household on getting back the working ICLs and monitoring of projects as per international standard methodology approved by CDM Executive Board for BLY. There are an estimated 20 million households in the state as per 2011 Census data. Thus, the total energy savings from replacement of ICLs to DISCOMs will be 3390 MU annually at an investment of Rs. 2550.5 crores. Puducherry has become the first state to undertake implementation of DELP on a large scale. Projects in 4 locations of Andhra Pradesh, 2 in each DISCOMs, covering 50 lakh consumers have already been initiated by EESL.

In FY 2013-14, the commercial sector in the state of Andhra Pradesh accounted for nearly 7% of the total energy consumption, i.e., 2551 MU of which the targeted baseline for energy conservation is around 50% (i.e. 1275 MU) in the organized sector in buildings having connected load greater than 100 kW or with contract demand of 120 kVA or more. Techno-commercial analysis for energy efficiency project implementation indicates energy savings to the tune of 30% are achievable in the end

use functional areas of lighting, cooling & ventilation, refrigeration, etc., which can help the state alleviate 383 MU, with an estimated investment requirement of Rs. 574 Crores. In addition to these, the Andhra Pradesh Government has already adopted Energy Conservation Building Code (ECBC) for new commercial buildings, the effective implementation of which will also result is significant energy savings.

The municipal sector accounted for 5% of the energy consumption, with public water works comprising 4% (1458 MU) and street lighting constituting of around 1% (308 MU). Various energy audit studies have revealed a savings potential of 25% - 30% through replacement of inefficient drinking and sewage water pumping systems with energy efficient ones. Thus, it can be estimated with an investment of around Rs. 237 crores all the drinking and sewage water pumping systems can be made energy efficient and savings of around 379 MU annually can be achieved.

In Andhra Pradesh, almost the entire public lighting is based on conventional lights and it has been demonstrated that replacement of these existing lights with LEDs can lead to an energy savings between 55-60%. In addition to energy savings, LED street lights also reduce maintenance costs as they come with 5-7 years free replacement warranties enhance the light output and meet national lighting standards, allow automatic controls to enhance savings by remote switching, daylight savings and dimming. In addition, LED lamps improve the power factor of the system and enhance the savings to DISCOMs. Replacement of all street lights with LEDs in Andhra Pradesh with an investment of around Rs. 225 crores can lead to energy savings of 162 million units annually. Andhra Pradesh Government has in principle agreed to replace all conventional street lights with LEDs over the next 4-5 years and EESL is to begin implementation in 24 ULBs shortly on receiving formal authorization.

8.3 Approach / Strategy

All the above interventions involve replacement of inefficient equipment / appliances with energy efficient ones for the agriculture, domestic, commercial buildings and municipalities. These can be undertaken by the State Govt. at no upfront cost by using the Energy Service Company (ESCO) model. The model is based on the concept of promoting Performance Contract mode where the company invests in any project by entering into a contract agreement with the facility owner which is recovered through the savings accrued due to reduced electricity bills. The plan is detailed under timelines section below.

8.4 Action Points

The sector-wise Central Government and State Government actions envisaged to facilitate implementation of energy efficiency measures as mentioned above are detailed below:

8.4.1 Agriculture Sector

8.4.1.1 Central Government:

- M/o Agriculture may amend the guidelines of various schemes and promote star rated energy efficient pump-sets (EEPS) under these schemes like Rashtriya Kisan Vikas Yojana (RKVY).
- Considering the usage of higher size pump-sets (>15 KW) in agriculture sector of AP, accordingly BEE may expand its star labeling programs to cover higher size pump-sets.
- Energy Efficiency Services Limited (EESL) to take up project design and project development.

8.4.1.2 State Government:

- Distribution Companies / Utilities may file DSM petition with Andhra Pradesh Electricity Regulatory Commission for getting sanction of the proposed DSM plan.
- State may issue mandatory notification for use of energy efficient pump-set for new agriculture connections. Also encourage and continue the schemes for promoting EEPS like the present scheme of providing financial assistance of Rs. 500/- per HP for up gradation of existing pump-sets or procurement of new EEPS.
- Ensure formulation of a detailed time line in consultation with concerned departments like Distribution Companies for implementation of energy efficiency measures in agriculture.
- Ensure establishment of a payment security mechanism so that the company making investments under the ESCO mode recovers the same through the savings accrued due to reduced electricity bills. This could include setting up of a revolving fund that could reduce the investment risk.

8.4.2 Domestic Sector

8.4.2.1 Central Government:

- BEE may consider formulation of specification for LED bulbs.
- BEE may consider introducing star label scheme for LED bulbs.
- Energy Efficiency Services Limited (EESL) to take up project design and project development.

8.4.2.2 State Government

- Distribution Companies / Utilities may file DSM petition with Andhra Pradesh Electricity Regulatory Commission for getting sanction of the proposed DSM plan.
- Ensure formulation of a detailed time line in consultation with concerned departments like Distribution Companies for implementation of energy efficiency measures in municipalities.
- Ensure establishment of a payment security mechanism so that the company making investments under the ESCO mode recovers the same through the savings accrued due to reduced electricity bills.

8.4.3 Commercial buildings

8.4.3.1 Central Government:

- BEE may provide technical support for effective enforcement of ECBC and promotion of ESCO based retrofitting works in Government buildings. BEE can provide support for capacity building of state department through establishment of ECBC cells for compliance of ECBC and retrofitting in Government buildings.
- In addition to above, residential buildings are one of the largest users of electricity and as per the Planning Commission's projection; this sector becomes the largest consumers of electricity in the county by 2030. BEE is introducing design guidelines for energy efficient multi storey residential apartments that could be adopted by the state to reduce electricity consumption in this sector.
- Energy Efficiency Services Limited (EESL) to take up project design and project development for retrofitting in commercial buildings.

8.4.3.2 State Government:

- Government of Andhra Pradesh has adopted ECBC Directives for new commercial building design and mandated energy audit of existing commercial building once in a three-year period. Effective enforcement of ECBC compliance and mandating retrofitting in energy-audited buildings may result in reduction of electrical consumption from commercial sector. Government of Andhra Pradesh may consider mandatory retrofitting in Government buildings with an objective of reduction of electricity bills, which state government is paying against electricity bill of these buildings. This would also demonstrate impact of ESCO based retrofitting projects to private building owners to adopt the same.
- BEE has developed energy efficient design guidelines for multistory residential buildings in composite and hot & dry climatic zone. State Government may mandate compliance of these guidelines through institutional framework in the state.
- Ensure formulation of a detailed time line in consultation with concerned departments like Public Works Department, for implementation of energy efficiency measures in municipalities.
- Ensure establishment of a payment security mechanism so that the company making investments under the ESCO mode recovers the same through the savings accrued due to reduced electricity bills.
- For residential buildings, the state could adopt the star labeling scheme for multi-storey residential apartment buildings, being prepared by BEE.

8.4.4 Municipal Sector (Public Water Works & Street Lights)

Central Government:

- BEE may consider formulation of specification for LED street lights and provide some financial assistance for one pilot project under MuDSM programme.
- Energy Efficiency Services Limited (EESL) to take up project design and project development.

State Government

- Ensure formulation of a detailed time line in consultation with concerned departments like Public Health & Engineering Department and Urban Development Department for implementation of energy efficiency measures in municipalities.
- Ensure establishment of a payment security mechanism so that the company making investments under the ESCO mode recovers the same through the savings accrued due to reduced electricity bills
- In addition to the above, Andhra Pradesh Electricity Regulatory Commission (RERC) may be requested to issue directives for creation of DSM funds by DISCOMs / Utilities of the State so that DSM activities can get extra emphasis. Such funds can be utilized for meeting incremental cost of efficiency improvement. Timelines for Implementation.

8.4.4.1 Agriculture Sector:

Under Agricultural DSM, a plan to cover 6.14 lakh pump sets is indicated below. The year wise investment required savings to be achieved and reduction of subsidy burden is also indicated. The project will also evolve standard operating processes as well as robust payment security mechanisms so as to replicate the same in an accelerated manner.

Table 12: Agricultural DSM cost sheet

Particulars	Units	FY 14-15	FY 15-16	FY 16-17	FY 17-18	FY 18-19	Total
Agl pumps to be replaced	Lakhs	0.14	1.00	1.40	1.80	1.80	6.14
Energy Consumption (A)*	MU	82	270	675	945	1,674	3,646
Energy Savings (B=A*30%)	MU	24	81	202	283	502	1,093

* For avg. pump size of 5 KW and avg. running for 6 hrs. a day for 300 days in a year.

Assuming the state government is paying subsidy of Rs 2.50/ per unit of energy consumption in agriculture sector. The estimated simple payback period is around 6 years.

8.4.5 Domestic Sector

A plan to cover 5.1 million households has been prepared which is in table below. The year wise investment required and savings to be achieved is also indicated.

Table 13: Household DSM cost sheet

Description	Units	2014	2015	2016	2017	2018	Total
Households	Lakh	3	12	12	12	12	51
LEDs to be replaced	Lakh	9	36	36	36	36	153
Energy Savings	MU	12.5	250	450	650	850	2213

Assuming electricity price in the domestic sector to be Rs. 4/ kWh, the simple payback period is little over 2 years.

8.4.6 Commercial buildings

The plan to cover the commercial buildings in Andhra Pradesh is shown in table below:

Table 14: Implementation plan for Commercial Building

Parameter	FY 14-15	FY 15-16	FY 16-17	FY 17-18	FY 18-19	Total
Coverage of retrofitting	Govt.	Govt. & Pvt.	Govt. & Pvt.	Pvt.	Pvt.	Govt. & Pvt.
Annual Energy Saved (MU)	19.2	56.8	84	95	128	383
Investment (Rs. Crs.)	28.8	95	115	135	200	573.8

Assuming electricity price in the domestic sector to be Rs. 4 / kWh, the simple payback period is around 4 years. In addition to above, the following activities to promote the efficient use of energy and its conservation in commercial buildings may be undertaken:

Table 15: Energy Efficiency Activities – Timelines

S. No.	Activity	Time-lines
1	Amendment in Schedule of Rates and Plinth Area rates of PWD	2014-15
2	Amendment of standard design template of public buildings	On going
3	Training and capacity building of compliance officials and design professional through Institutional framework	On going

8.4.7 Municipal Sector (Public Water Works & Street Lights):

A plan to cover the entire municipal sector (public water works and street lights) of the state is shown.

Table 16: Public Water Works

Parameters	FY 14-15	FY 15-16	FY 16-17	FY 17-18	FY 18-19	Total
Water systems to be covered	0.8%	2.4%	6.3%	8.7%	15.8%	34.0%
Energy Saved (MU)	3	9	24	33	60	129
Investment (Rs. Crs.)	5	18	37	54	103	217

Assuming electricity price in the domestic sector to be Rs. 4/ kWh, the simple payback period is around 1.5 years.

Table 17: Street light DSM cost sheet for 111 ULBs

Description	FY 14-15	FY 15-16	FY 16-17	FY 17-18	Total
Total Street lights to be replaced (Thousands)	85	150	150	128	513
Energy consumption* (Mu/ per annum)	51	90	90	77	308
Reduction in energy consumption^ (Mu/per annum)	26	48	48	40	162

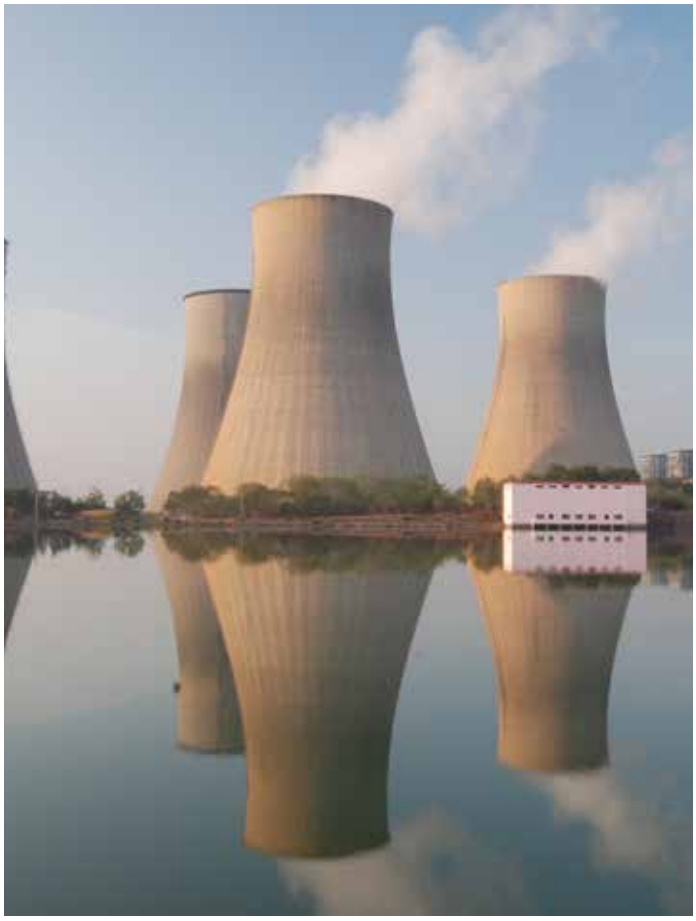
* @ 150W per each light on average with effective working hours @ 11
^ @ 55% savings on average

Assuming electricity price in street lighting to be Rs. 4/kWh, the simple payback period is around 5 years. Sector-wise savings potential through various energy efficiency measures are shown in table below:

Table 18: Household DSM cost sheet

Particulars	Unit	FY 14-15	FY 15-16	FY 16-17	FY 17-18	FY 18-19	Total
Street Lighting	MU	26	48	48	40	-	162
Household Lighting	MU	13	250	450	650	850	2213
Agl. Pump-sets	MU	24	81	202	283	502	1092
Public Water Works	MU	3	9	24	33	60	129
Commercial Buildings	MU	3	11	27	38	66	145
Total Savings*	MU	69	399	751	1,044	1,478	3,741

*The total energy savings accrued due to various conservation & efficiency improvement measures have been deducted from projected energy requirement in Demand Projections.



09 Other Initiatives

9.1 Consumer Initiatives

The main objective of the "Power for all" scheme is to provide reliable and quality power - to increase the satisfaction levels of all the consumers. The following initiatives are proposed to be undertaken to improve the overall consumer experience:

- Interactive Voice Response System (IVRS) based call center: It is proposed to upgrade to an IVRS based call center – for all types of customer complaints. It will be available 24x7 to the consumers and help in improving the response time from Discom
- Toll-free number: It is proposed to have one (1) toll free number across the State for dealing with any issue arising out of power sector. This toll free number can help consumers reach out to the power utilities on issues relating to power supply, complaints regarding metering, billing and collection, feedback etc.
- Substation Level Committees: The substation level committees comprising the MLA, A.E's and with adequate representation from stakeholders – shall be activated to provide hands-on feedback on the progress of the works being undertaken under this scheme. This feedback shall be passed on to the PMU being setup to ensure appropriate action.
- Agl DTR Replacement: A separate toll free number will be provided to the farmers for exclusively dealing with complaints regarding DTR replacement. The response time will be logged/monitored and information/status update – will be communicated to the farmer. This will help improve the satisfaction levels of the farmers
- **Real time feeder monitoring system:** A real time feeder monitoring system is under development and it is expected to be rolled-out across the state soon. This can help consumers monitor on a real time basis the power flow position across the State. The details of all feeders (in towns) can be accessed online on the APEPDCL & APSPDCL website (and the characteristics can be seen. This level of real-time monitoring will further be taken to the DTR levels & then to the consumer level within a period of 5 years.

Table 19: Online monitoring a Feeders

No. of Feeders	Feeders being monitored real-time	Feeders to be monitored real-time by Sep' 14	Balance feeders monitoring by Nov'14
9,264	783	3,519	4,962

Currently real-time feeder status in towns/DHQs of APEPDCL can be viewed online by the public. Similar information for APSPDCL can be accessed online. Additionally, status of R-APDRP projects can be viewed on APSPDCL's website after login.

- **Mobile alerts through SMS:** It is proposed to link the mobile phones of the users with the electricity connection number so as to provide SMS based alerts to the consumers regarding information on planned outages and disruptions. The SMS alerts will also be sent to the consumers for follow-up on bill payment and collection of dues.

Table 20: Linkage of cell-phone numbers with consumer numbers

Total Consumers	Consumers with mobile linkage	Consumers whose mobile will be linked by Sep'14	Balance consumers' mobile linkage by Nov'14
151.96 lakhs	11.8 lakhs	41.05 lakhs	99.11 lakhs

- **Consumer Grievance Cell:** A customer grievance redressal cell shall be formed in all offices to monitor and address issues that arise out of customer complaints. The response time against the standards of performance will be monitored and feedback will be provided to the CMDs on a regular basis. Steps will be taken to ensure that most activities that today require the customers to visit the customer service center - with supported documentation such as new connection release, billing and meter related complaints etc. are made online.

  The above measures will help improve credibility of the Discoms and enhance consumer satisfaction levels.

- **Improving Consumer Convenience:** Improving consumer convenience should be the focus of any distribution utility. For improving consumer convenience in AP Standard of Performance guidelines has been issued by the Regulator.

  DISCOM should submit the compliance on SOP in the time period as prescribed by the regulator. For improving further and make the process more transparent state regulator can undertake Customer Satisfaction Survey through some independent agency. Customer segmentation in terms of differentiated service delivery can also be prescribed by state regulator in the next phase.

9.2 Private sector particiaption

To improve upon the Reliability and Service standards, involvement of private participation by way of PPP/franchising will be promoted., Urban areas (of population greater than 8 lacs) needing high reliability & better Service Standards should be an ideal choice for PPP model. Also, a provision would be useful to be built-in the bidding document to include concentric areas of the towns selected over period of time. For their other areas different models such as Input based urban franchise / Collection based / rural franchise with Self Help Group (SHG), can be explored.

Information Technology (IT) Initiatives

The need to adopt IT in every sphere of utility operation is pervasive. Power is a complex product that must be consumed on a real time basis. The overall value involved in the process is very high. Even more importantly it touches all citizens. Yet, the information systems that drive the operations of the sector are generally very basic and information transparency and consistency is poor. While sporadic efforts have been made in the past to improve this, quantum changes are required to increase IT adoption in all spheres of power sector operation.

In Andhra Pradesh, IT adoption on a massive scale will be pursued in the following areas:

- At the corporate level, the operations need to be integrated through implementation of Enterprise Resource Planning Systems (ERP). This would cover critical aspects like Finance and Accounts, Asset Management, Inventory Management, Human Resource Management, Project Management, Personal information System (PIS). ERP will help in timely capitalization of asset, deriving better business value of investment etc.
- At the commercial operations level there is a need to comprehensively implement Customer Management Systems (CMS) for undertaking customer related processes including billing and collections, customer complaint management, new connection provision etc.
- Centralized Information & Monitoring System for operational , enforcement & litigation, vigilance activities and analysis
- Power management would require the institution of technically capable controlling facilities equipped with tools like SCADA and Distribution Management Systems (DMS) that allow for adequate visualization of the networks and response capabilities. Technologies for sub-station automation, GIS, SCADA, DMS, OMS, etc., shall be adopted. For the urban areas SCADA is quite useful for improving reliability and reduction of network downtime.
- Regional Distribution Control Centres (RDCC) within the State are proposed to be established. These will initially cater to the principal load centres, but would thereafter be expanded to all load centres of the state. This will be a key initiative, not only for effectively managing 24X7 supply, but also thereafter for other functions like forecasting.
- Renewable Energy Management centres shall be established and equipped with adequate capabilities.
- Smart Cities will be implemented to inter-alia, reduce the intensity of electricity consumption in the cities while simultaneously improving supply quality, reliability and integration of renewable energy resources.

- Power procurement optimization tools will be implemented to reduce the power procurement costs and improve supply reliability. This shall be achieved through the institution of technically robust forecasting, scheduling and dispatch (Unit Commitment) and settlement tools. The tools shall be used to ensure that the control room operators have the ability to take real time decisions to ensure cost reduction.
- Project monitoring tools shall be incorporated in the PMU to ensure that progress on the investments in the state are monitored rigorously and bottlenecks identified.
- Standards of service specified under Section 57 of the EA 2003 shall be monitored. The utilities shall use IT tools to gather the information with regards to service standards with minimal manual intervention to ensure transparency and credibility.

The above need to be implemented urgently, and also need to be integrated with each other to ensure that the systems are inter-operable (i.e., they can talk to each other). For this the utilities shall evolve a detailed IT plan to implement the above in a well-coordinated manner.

9.4 Institutional Arrangements

A strong monitoring framework is essential to ensure the success of the "Power for all" scheme. The following structure is being proposed to undertake regular monitoring of the progress of all initiatives being under-taken in this scheme.

1. **Government of India (GOI) Level Committee:** It is proposed that this committee, headed by the union minister of power will review the overall progress of the scheme on a quarterly basis and provide necessary support to ensure a coordinated response from the Central Govt. - where necessary. The committee may be constituted with the following members – PFC, REC, CEA, SECI, EESL, Ministry of Coal, MNRE, MoPNG and Ministry of Power. Government of India will review the progress of the project on a regular basis by constituting an executive committee besides the above GoI level committee.
2. **State Government Level Apex Committee:** It is proposed that a State Level Apex Committee headed by the Hon'ble Chief Minister and comprising of the Hon'ble Ministers of Finance, Municipal & Urban Development, Agriculture, Industries and Rural Development be formed to review the progress of the scheme on a quarterly basis. This committee will monitor the progress of the works undertaken as part of the scheme and issue directions to enable faster execution.
3. **Executive Committee:** This committee will be headed by the Chief Secretary and constituted with the following members – Pr. Secy (Energy), Pr. Secy (Finance), Pr. Secy (Industries), Pr. Secy (Irrigation), Pr. Secy (Agriculture), Pr. Secy (MA& UD), CMD Transco, CMD SPDCL, CMD EPDCL, MD Genco, CEO SECM and MD NREDCAP.
4. **Department Level Committee:** It is proposed that the Department level committee headed by the Hon'ble Power Minister, with the Energy Secretary as vice-Chairman, will be formed and shall undertake steps required to ensure the projects are progressing as per the action plan. This committee will undertake progress reviews on a monthly basis. The committee will be constituted with the following members – Pr. Secy (Energy), CMD Transco, CMD SPDCL, CMD EPDCL, MD Genco, CEO SECM and MD NREDCAP.
5. **District Level Committee:** It is proposed to constitute a district level committee headed by the Minister in-charge of the district, with the District Collector as vice-Chairman, to take action that is necessary to ensure the projects are completed in a timely manner and address any issues pertaining to land or other relevant approvals. The committee will be constituted with the following members – District Collector, S.E Transco, S.E Discom and DM NREDCAP.
6. **Project Monitoring Unit (PMU)** – A project monitoring unit shall be set to up for monitoring the progress of the works being undertaken under this scheme.
7. **The PMU will be working under the Secretary, Energy and shall comprise the following** – technical officials (2 -S.E/D.E), IT officials (2 - GM/ DGM) and consultants (5 resources). The PMU shall be responsible for undertaking coordination, preparing the action plans and monitoring progress of all works under the "Power for all" scheme. The PMU would also help facilitate in tracking the action steps and providing feedback to the various committee that are proposed to be set up under the scheme

The committees that are being proposed above are required to be set up at the earliest to kick start the whole scheme. It is important that the committees keep meeting on a regular basis as per the frequency/ timelines mentioned above – to ensure that the objectives set out under the "Power for all" scheme are achieved.

9.5 Communication Strategy

Once an area is declared "Power for All" there shall be no load-shedding. In the event of power-cut due to exigencies or preventive cuts or calamities such as cyclones, the consumers will be informed through various channels such as Facebook Posts, Twitter tweets & mobile bulk SMS.

Apart from the above, customer outreach programme to ensure two-way communication with customers is important for the success of the "Power for all" initiative. It is important to keep updating the consumers on a regular basis about the action plan & developments / activities under the scheme.

A centralized corporate communication team can be formed at headquarters of the DISCOM for looking at activities of overall communication strategy.

It is proposed that the Energy, Secretary will be responsible for communicating the messages regarding the overall scheme and the roll-out plan. The roll out plan can have details pertaining to the places/areas - where 24x7 scheme would be implemented in a phased manner in the State. Table 19 below provides the responsibility and frequency of communication for various heads of departments that will be part of implementing the "Power for all" scheme.

Each department will be responsible for communicating and taking feedback of the actions being undertaken by the respective departments. It is proposed to leverage all options available at our disposal for reaching out to the consumers. The communication channels that will be actively used are shown below:

- Electronic & Print Media
- Social Media – (Facebook, Twitter and You tube) – Website Management – (Discom, Transco, NREDCAP, SECM and Genco)
- Posters at office/substations/DTR's – Focusing on energy savings and efficiency
- Electricity Bills - Focusing on energy savings and efficiency
- Mobile alerts – SMS alerts on planned load shedding, disruptions.

The feedback received from customers will be analyzed by the respective department(s) taking help of their IT teams. An action taken report on the feedback received shall be provided to the PMU on a fortnightly/monthly basis. The above measures will help increase awareness amongst the consumers providing them an opportunity to be a part of the exercise – making it a more participative.

Table 21: Proposed communication responsibilities

Communication Objective	Responsibility	Frequency
" Power for all" - Roll Out Plan	Energy Secretary	Quarterly
Power Supply Position	CMD APTransco	Daily
Energy Savings & Conservation	CEO, SECM	Monthly
Planned Outages & Disruption	CMD, Discom	Daily
Real time feeder-wise Information	CMD, Discom	Daily
Status update on Deliverables	Secretary, Energy	Quarterly
Renewable Power	MD, NREDCAP	Quarterly
Generation- Projects, PLF & Fuel	MD, APGenco	Monthly
Transmission Projects – Physical Progress and Achievements	CMD, APTransco	Monthly
Distribution – Progress ,Achievements, Losses, Consumer Initiatives etc.	CMD, Discom	Monthly

10 Time bound deliverables for achievement of 24x7

The Power Sector Value chain can be imagined as a chain with Fuel, Generation, Transmission, Distribution, etc, being the various links. The weakest link among these will create constraint for the entire sector & thus prevent 24x7 power.

Therefore, all sub-sectors have to work in tandem. The table below shows the milestones that have to be reached by the various arms, so that the ultimate goal can be achieved.

Table 22: Proposed communication responsibilities

Power for all - Roll out Plan	Units	FY 14-15	FY 15-16	FY 16-17	FY 17-18	FY 18-19	Total
State Sector- Capacity Additions	MW	1,770	750	690	0	0	3,210
Case 1 Long Term	MW	0	1,900	1,900	1,900	1,900	1,900
Transmission (addition) Inter State - APTRANSCO							
Substation	Nos	15	35	32	15	12	109
Lines	cKM	345	1,460	1,155	520	270	3,750
Inter State - PPP Mode- Additions							
Substation	Nos.	0	1	1	0	0	2
Lines	cKM	0	100	170	0	0	270
Inter State - APTRANSCO Renewable Energy Evacuation							
Substation	Nos.	0	0	12	0	0	12
Lines	cKM	0	0	977	0	0	977

Table 23: Proposed communication responsibilities

Power for all - Roll out Plan	Units	FY 14-15	FY 15-16	FY 16-17	FY 17-18	FY 18-19	Total
Inter-state							
Substation	Nos	1	1	1	0	0	3
Lines	ckt KM	2440	550	900	0	5100	8,990
Green energy							
Substation	Nos.	-	-	-	-	1	1
Lines	ckt KM	-	-	-	-	870	870
Distribution							
Substation	Nos.	0	0	12	0	0	12
AT&C Losses	%	13.13%	12.88%	12.58%	12.28%	12.00%	
DTR's Addition	Nos.	37806	39868	44481	45170	46414	2,13,739
33/11kV S/s - Additions	Nos.	249	213	203	178	195	1,038
Electrification of HH (RGGVY, RVEP-DDG, SC/Tribal Sub-plans, DISCOM electrification)	Nos.	1,37,337	2,23,125	2,23,125	-	-	5,83,487
Renewable Power							
Solar Capacity Addition	MW	30	800	1200	1500	1500	5,030
Solar Rooftop - Grid Connected	MW	10	10	10	10	10	50
Solar Off-Grid	MW	5	5	5	5	5	25
Wind Power Addition	MW	250	600	800	1000	1500	4,150
Solar Agl. pump-sets	Nos.	10,000	10,000	10,000	10,000	10,000	50,000
Energy Efficiency							
LED Distribution – Households	Nos.	3,00,000	12,00,000	12,00,000	12,00,000	12,00,000	51,00,000
Street lighting – Municipalities	Nos.	85,000	1,50,000	1,50,000	1,28,000	-	5,13,000
DSM in Agriculture pumps	Nos.	14,000	1,00,000	1,40,000	1,80,000	1,80,000	6,14,000
Energy Savings	MU	69	399	751	1,044	1,478	3,741
Consumer Initiatives							
DTR Replacement - (Compliance as per SOP)	%	98%	99%	100%	100%	100%	-
Feeder Interruptions - (Compliance as per SOP)	%	95%	98%	99%	99%	99%	-

10.1 Roll-Out Plan of "Power for All" Programme

OIt is proposed to roll out the "Power for All" from 2nd October 2014 in a phased manner.

To begin with, 2 Municipal Corporations / DHQs (Out of 13), 9 municipalities (out of 72) and 39 Mandals (out of 669) along with the villages, would be declared as free from load shedding. Once an area is declared as 'power-cut free', there shall not be any power-cuts other than technical exigencies.

Initially single phase supply will be extended to all rural consumers (excl. 7 hours agl. supply) which would be upgraded to 3 phase supply in a phased manner with segregation of feeders.

The "Power for All" scheme is expected to be fully implemented in AP by 2nd October 2016 for all connected households and by March 2017 for all unconnected households. However, GoAP would endeavor to complete the programme & cover the entire state much earlier than the above targeted dates.

Table 24: Roll out Plan of Power for All

Period	Corporation	Municipalities	Mandals
Oct – Dec 2014	2	9	39
Jan – Mar 2015	2	9	90
Apr – Jun 2015	2	9	90
Jul – Sep 2015	2	9	90
Oct – Dec 2015	2	9	90
Jan – Mar 2016	2	9	90
Apr – Jun 2016	1	9	90
Jul – Sep 2016	0	9	90
Total	13	72	669

*Permissible at current domestic coal availability

11 Summary of GoI Interventions requested

The magnitude of investments required from the Govt. sector (State and Central) to achieve the "Power for All" programme is huge and hence requires collaborative efforts from all stakeholders including GoAP, AP Utilities, GoI, Multi Lateral Agencies, Banks, etc.

Figure blow shows the source of capital outlay under major heads.

In some cases such as Generation capacity addition (APGENCO), no financial assistance has been sought from GoI, as market funding for such projects can be arranged. On the other hand, for some schemes such as DDG-RVEP, 90% Central grants have been requested.

Whereas, in other projects such as APTRANSCO's network enhancement & APDISCOMs network augmentation, 40% central grants are requested after 20% equity participation by AP Utilities & 40% funding through soft loans.

The magnitude of investments required to make AP a 24x7 state is huge. Such investments cannot be made by any State Govt., as the revenue is not commensurate to the capital outlay required. The funds, in totality, cannot be loaned from the market, as the debt burden may have adverse impact on the financial health of the AP utilities, which are on the course to recovery.

In a scenario, where AP utilities make part equity contribution & remaining part is financed, the massive cost of new infrastructure will increase the burden on consumers.

Therefore the most optimum approach at this point of time is a mix of all funds from all sources, i.e Equity infusion by AP Utilities, Grants from GoI, Funding from REC/PFC and Soft Loans from multilateral agencies. The Figure below shows the proposed break-up of capital outlay required under various schemes / initiatives / sub-headings.

Apart from Financial Assistance, non-Financial interventions, some of them strategic in nature, some in the form of policy guidelines, and some as directions to Public Sector companies are requested from Govt. of India.

Table 25: GoI Assistance - Strategic Interventions, Directions to Public Sector& Policy Assistance

Generation - Fuel Security & Optimum PLF of APGENCO	
Capacity Allocation	Additional Unallocated CGS Share of 575 MW*
Rail Corridor	Dedicated Freight Corridor - Talcher to Vijayawada (ECR-SCR)
Coal Linkage	Ad-hoc linkage of 1.5 MTPA from WCL to compensate for MCL shortfall
Coal Blocks	Fast Tracking Land Acquisition & MoEF Clearances for 3 coal blocks
Higher Materialization of MCL Linkage	Materialization of Coal from MCL for Dr. NTTPS, Vijayawada from 60% to 100%
Gas Allocation	Immediate 1.5 mmscd Gas allocation from fields beginning production in 1-2 years and gas pooling
Transmission	
ER-SR Corridor	Request PGCIL to expedite Grid ER-SR & WR-SR corridors
Renewable Balancing	Request PGCIL to connect National Grid to Renewable Energy Evacuation for Balancing fluctuations & for fulfilling RPO requirements of other states
Renewable Energy	
Solar bundling scheme	Allocation of 500 MW Thermal for bundling with AP's Solar, by NVVN,
Solar Parks – NTPC/SECI	NTPC / NVVN/SECI participation in Solar Parks requested

*As the envisaged capacity additions will take 1-4 years to materialize, GoAP requests MoP, GoI for additional CGS allocation from following plants, especially those in the SR, to avoid transmission constraints.

Fig. 12: Source of Funds (Rs. Crs)

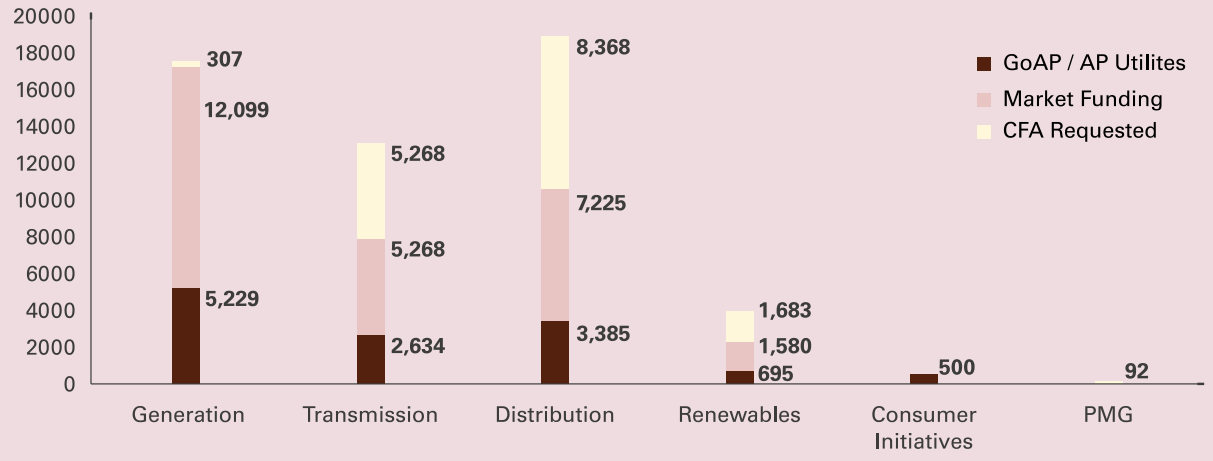
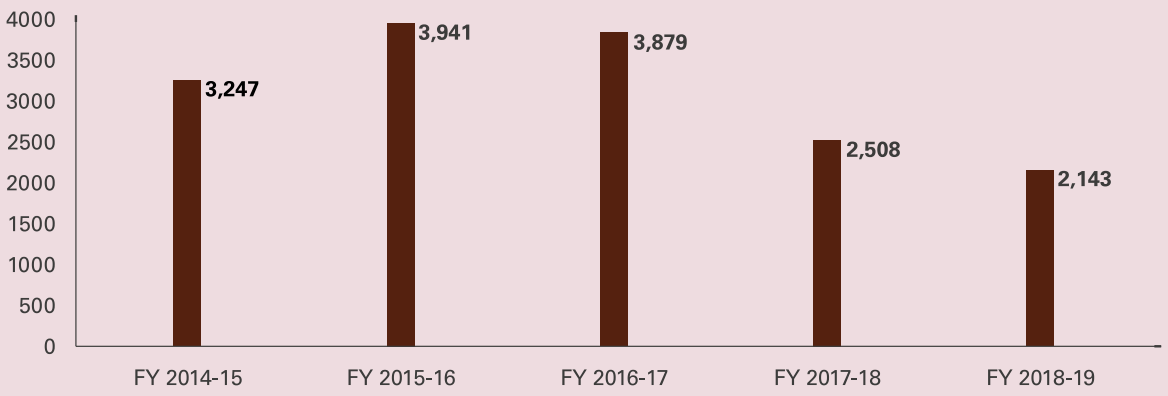


Fig. 13: CFA Requested in next 5 years (Rs. Crs)



Annexures

Annexure I

Coal Procurement Plan for APGENCO's existing & upcoming units

APGENCO stations are required to perform at 90% PLF (gross generation), to enable Andhra Pradesh to achieve 'Power for All'. But, the stations of APGENCO are not able to generate to optimum limits due to fuel constraints. The current coal scenario and the projections for next 5 years have been presented below. The interventions required from Govt. of India, to enable 24x7 supply in Andhra Pradesh have also been listed below.

- Dr. NTTPS is totally linked to M/s. Mahanadi Coalfields Limited (MCL) and the FSA linkage is 7.50 MTPA for the year FY 2014-15 and FY 2015-16 onwards the linkages quantity would be 7.73 MTPA. The materialization of linkage is in the order of 60%, out of which, 3.00 Million tonnes is transported through Rail-Sea-Rail mode from Talcher mines to Dr. NTTPS at an additional cost of Rs. 1124.85 per metric tonne through All-Rail-Route.

Coal supply position for Dr. NTTPS, Vijayawada (MTPA)					
Particulars	**FY 14-15**	**FY 15-16**	**FY 16-17**	**FY 17-18**	**FY 18-19**
Raw Coal Requirement	10.62	10.62	10.62	10.62	10.62
Coal Linkage	7.50	7.62	7.73	7.73	7.73
Materialisation	4.50	4.57	4.64	4.64	4.64
Coal Import req. to meet deficit (A1)	3.40	3.36	3.32	3.32	3.32
Technical Limit for Import (B1)	1.93	1.96	1.99	1.99	1.99
Maximum Coal which can be imported C1= Min (A1, B1)	1.93	1.96	1.99	1.99	1.99

- The linkage quantity for RTPP, Muddanur is 1.68 MTPA from M/s. MCL and 3.88 MTPA from M/s. SCCL. The M/s. MCL linkage quantity is drawn through washeries and percentage of materialization is 80%, and similarly materialization from SCCL is only 80%. The expected date of commissioning of 600 MW Unit-6 of RTPP, Muddanur is August 2016. The FSA coal linkage is 1.85 MTPA from M/s. MCL. Blending of imported coal is technically permissible to an extent of 25% by weight.

Coal supply position for RTPP, Muddanur (MTPA)					
Particulars	**FY 14-15**	**FY 15-16**	**FY 16-17**	**FY 17-18**	**FY 18-19**
Raw Coal Requirement	6.34	6.34	8.74	9.96	9.96
Coal Linkage	5.56	5.56	6.80	7.40	7.40
Materialisation	4.45	4.45	5.44	5.92	5.92
Coal Import req. to meet deficit (A1)	1.05	1.05	1.83	2.24	2.24
Technical Limit for Import (B1)	1.48	1.48	1.81	1.97	1.97
Maximum Coal which can be imported C1= Min (A1, B1)	1.05	1.05	1.81	1.97	1.97

- SDSTPS, Krishnanapatnam has been designed for mandatory 30% blending of imported coal (by quantity) and 70% washed coal. The washed coal is approximately 73.5% of the raw coal, by weight. The blending proportion cannot exceed 30%.

Therefore, the linkage for SDSTPS, Krishnapatnam is only 5.50 MTPA, proportional to 64% of the energy requirement. But, the FSA materialization is still lower at 75% of linkage i.e., 3.75 MTPA from M/s. MCL

Coal Supply Position for SDTPS, Krishnapatnam (MTPA)					
Particulars	**FY 14-15**	**FY 15-16**	**FY 16-17**	**FY 17-18**	**FY 18-19**
Raw Coal required @ 90% PLF (X)	2.50	5.50	5.50	5.50	5.50
Corresponding Washed Coal @ 90% PLF (Y=73.5% of X)	1.84	4.04	4.04	4.04	4.04
Mandatory Imported Coal @ 90% PLF (Z=Y/0.7*0.3)	0.79	1.73	1.73	1.73	1.73
Materialization of Coal Linkage	1.48	3.50	3.75	3.75	3.75
Mandatory Imported Coal @ above Materialization	0.47	1.10	1.18	1.18	1.18
Raw Coal deficit	1.02	2.00	1.75	1.75	1.75
Coal Import req. to meet deficit (A3)	0.57	1.11	0.97	0.97	0.97
Technical Limit for Import (B3)	0.47	1.10	1.18	1.18	1.18
Maximum Coal which can be imported C3=Min(A3, B3)	0.00	0.00	0.21	0.21	0.21
Raw Coal required to meet deficit	1.02	2.00	1.37	1.37	1.37

Coal deficit situation is projected to persist up to FY 2018-19 as APGENCO stations cannot use imported coal beyond a certain limit due to technical limitations. Therefore domestic raw coal has to be provided to enable APGENCO to run its plants up to 90% PLF. The following table provides the quantity of coal shortfall every year, even after importing coal to technical limits.

Coal Supply Position for APGENCO (MTPA)					
Particulars	**FY 14-15**	**FY 15-16**	**FY 16-17**	**FY 17-18**	**FY 18-19**
Domestic Raw Coal Requirement (A)	19.5	22.5	24.9	26.1	26.1
Coal Linkage (B)	15.6	18.7	20.0	20.6	20.6
Materialisation (C)	10.4	12.5	13.8	14.3	14.3
Overall Deficit (D=A-C)	9.0	9.9	11.0	11.8	11.8
Imported Coal to meet deficit (E=D/1.8)	5.0	5.5	6.1	6.5	6.5
Maximum Coal Imports (F=C1+C2+C3) (Excl. mandatory imports for Krishnapatnam)	3.0	3.0	4.0	4.2	4.2
Shortfall in Imports (G=E-F)	2.0	2.5	2.1	2.4	2.4
Raw Coal Reqd. to meet shortfall (I=G*1.8)	**3.7**	**4.5**	**3.8**	**4.3**	**4.3**

If above deficit in raw coal is not met, APGENCO's PLF will be limited around 75 %. Following is the projected PLF that APGENCO can achieve with above deficit in domestic coal.

Projected PLF in case shortfall is not met					
Particulars	**FY 14-15**	**FY 15-16**	**FY 16-17**	**FY 17-18**	**FY 18-19**
Gross APGENCO PLF if shortfall is not met	74.2%	74.1%	77.7%	76.9%	76.9%

It can be seen that the Gross APGENCO PLF is substantially lower than 90%. To meet the above deficit, the alternatives available for APGENCO are:

a. Augment the coal supplies from M/s. MCL to Dr. NTTPS from present 60% to 80%.

b. Operationalisation of M/s. SCPL washery at Talcher immediately so that the materialization of linkage to Dr. NTTPS, Vijayawada may increase from 60% to 80%.

PLF on increase in 20% realization of coal linkage from MCL & SCCL (MTPA)					
Particulars	**FY 14-15**	**FY 15-16**	**FY 16-17**	**FY 17-18**	**FY 18-19**
20% Increase in Coal Realization from MCL for NTTPS (J)	1.50	1.52	1.55	1.55	1.55
Additional Imports possible (enhanced Technical Limit)	0.64	0.65	0.66	0.66	0.66
Raw Coal equivalent of additional imports	1.16	1.18	1.19	1.19	1.19
Gross APGENCO PLF if 20% additional domestic coal & corresponding imports are received (at NTTPS)	86%	84%	87%	85%	85%
Ad-hoc linkage reqd. from WCL for 90% PLF (K=I-J)	1.01	1.82	1.08	1.53	1.53

c. In case the materialization of M/s. MCL linkage is increased to 80% the deficit would be in the range 1 – 1.5 MTPA for the next 5 years. A request has already been made to Ministry of Coal, Govt. of India for ad-hoc linkage of 1.00 Million tonnes from M/s. WCL mines.

d. The difference in Freight costs between All-Rail-Route & Rail-Sea-Rail-Route from MCL mines at Talcher to Dr. NTTPS Vijayawada is Rs 1125/ MT. At present 3 MTPA is being transported through Rail-Sea-Rail mode at a higher cost of Rs 2639.50 / MT, compared to Rs. 1514.65 through ARR. This results into APGENCO paying additional amount of Rs. 337.45 crs per annum. This is due to saturation of railway corridor from Talcher to Vijayawada, which is already running to 140% of its capacity utilization. A dedicated freight corridor between Talcher to Vijayawada (944 km) needs to be constructed by Indian Railways at the earliest.

e. The distance between M/s. WCL mines to Dr. NTTPS is 500 Km. This will also result in savings of freight charges at Rs. 76 Crs per annum at present railway freight charges.

Annexure II

Gas supplies to the power projects in Andhra Pradesh					
Sl. No	**Project**	**Capacity (MW)**	**Gas Requirement**	**Gas Received**	**Deficit**
	Old IPPs				
1	Jegurupadu CCGT (GVK)	216	1.05	0.45	0.60
2	Godavari CCGT (Spectrum)	208	1.05	0.43	0.62
3	Kondapalli CCGT (Lanco) [ISO]	355	1.75	0.65	1.10
4	Samalkot CCPP/Peddapuram (Reliance Infrastructure)	220	1.00	0.17	0.83
	Total	**999**	**4.85**	**1.70**	**3.15**
5	Vijjeswaram CCGT (JV)	272	1.42	0.80	0.62
	Sub Total (a)	**1271**	**6.27**	**2.50**	**3.77**
	New IPPs				
6	Vemagiri CCPP	370	1.64	0	1.64
7	Jegurupadu CCGT (GVK Extn)	220	1.10	0	1.10
8	Gautami CCPP	464	1.96	0	1.96
9	Konaseema CCPP	445	2.00	0	2.00
	Sub Total (b)	**1499**	**6.70**	**0**	**6.70**
	Total	**2770**	**12.97**	**2.50**	**10.47**

*Quantity of Gas required for 100% generation as allocated by GLC from ONGC sources

^ Present Gas supplies from ONGC & RAVVA (MMSCMD)

Annexure III

Inter State Transmission System

Presently about 5250 ckt km of transmission lines comprises of 765kV (110 ckt km) and 400kV (5140 ckt km) lines & 8 no. of substations (1 nos. of 765 kV, 6 nos. of 400kV & 1 nos. of HVDC station) with total transformation capacity of about 8,131 MVA are existing in Andhra Pradesh under the Inter State transmission system. In Andhra Pradesh, one (1) no. of Central Sector generating station viz. Simhadri – I & II with a cumulative installed capacity of 2000MW (out of which Simhadri –I of 1000 MW is dedicated to Andhra Pradesh only) evacuation is being made through ISTS network for supply of power to various load centres.

The details of major existing ISTS lines for transfer power from these Inter-state Generating Stations (ISGS) are as given below:

Simhadri Phase – II (1000 MW):

- LILO of Gazuwaka – Vemagiri/Vijayawada 400 kV D/c line at Simhadri – II

A strong, reliable and secure ISTS network has already been established in the State of Andhra Pradesh for facilitating drawl of allocated power from Central Sector generating stations. Further various Inter-Regional links are also established for import of power from National Grid. Towards this major ISTS Transmission lines and Inter – Regional Links are given below:

Major Transmission lines:

- Gajuwaka – Vijayawada 400 kV D/c & S/c line.
- Vijayawada – Nellore 400 kV D/c line.
- Nellore – Sripreumbudur 400 kV D/c line.
- Nagarjuna Sagar – Cuddapah 400 kV D/c line with series compensation.
- Nellore Pool Station – Gooty 400 kV D/c Quad Line.
- Cuddapah – Sriperumbudur 400 kV D/c line.
- Khammam – Vijayawada 400 kV S/c line.
- Nagarjuna Sagar – Kurnool (New) – Gooty 400 kV S/c line.
- Cuddapah – Kolar 400 kV S/c line.
- Raichur – Kurnool 765kV S/c line.
- Nellore Pooling Station – Kurnool 765kV D/c line (near completion)

Inter- Regional Link:

- Gajuwaka 1000 MW HVDC back-to back link

Looking into the power demand of various load centres in Andhra Pradesh, 1 no. of 765/400kV, 6 nos. of 400/220kV and 1 no. of HVDC substations have already established for reliable and quality power supply. The details of substations and their transformation capacity are listed below:

S.No	Name of the S/S	Voltage ratio	No. of Trans-formers	MVA Ca-pacity	Total Trf. Ca-pacity
1	Gajuwaka	400/220	2	315	630
2	Vizag DC substation		12	218	2611
3	Vijayawada	400/220	2	315	630
4	Gooty	400/220	2	315	630
5	Cuddapah	400/220	2	315	630
6	Nellore	400/220	-	-	-
7	Nellore Pooling Stn (charged @ 400kV)	765/400	-	-	-
8	Kurnool (New)	765/400	2	1500	3000
	Total MVA Capacity			**8131**	

Annexure IV

Angul – Srikakulam 765 kV D/c line

The Angul – Srikakulam 765 kV D/c line is under implementation as an inter-regional link between Eastern region (Angul, Odisha) & Southern Region (Srikakulam, Andhra Pradesh). However for further transfer of power beyond Srikakulam this scheme shall facilitate import of power from Eastern Region available in the Odisha generation complex.

Inter State Transmission System

A. Transmission Schemes under Implementation (765kV – 1942 Ckt. Km & 400kV – 2608 Ckt. Km, Tx. Capacity – 10,500 MVA)

1. System Strengthening in Southern Region for import of power from Eastern Region through TBCB route*
   a. Srikakulam PP - Vemagiri-II Pooling Station 765kV D/C line

2. Southern Region System Strengthening – XX:
   a. Augmentation of 1x500 MVA 400/220kV Transformer with associated 400kV & 220kV bays at each substations of ((1) Vijayawada, (2) Gooty, (3) Cuddapah, 2x125 MVAR Bus Reactor at Vijayawada 400kV substation

3. Common System associated with ISGS Projects in Krishnapatnam Area of Andhra Pradesh
   a. Establishment of 765/400kV 2x1500MVA Pooling station at Nellore by LILO of Simhapuri – Nellore 400kV D/c line
   b. Nellore Pooling station – Kurnool 765 kV D/c
   c. Associated 765kV & 400kV bays at Nellore Pooling station and Kurnool substations

4. Common System associated with LTOA Generation Projects in Srikakulam Area – Part-A
   a. Establishment of 765 kV pooling station in Srikakulam (initially charged at 400kV)
   b. Srikakulam Pooling Station – Angul 765 kV D/c (initially charged at 400kV)

5. Common System associated with LTOA Generation Projects in Srikakulam Area – Part-C
   a. Provision of 2x1500 MVA, 765/400 kV transformers at Srikakulam Pooling Station
   b. Charging of Srikakulam Pooling station – Angul 765 kV D/c at its rated voltage.

6. Southern Region System Strengthening – XIII:
   a. Gooty – Madhugiri 400 kV D/c line

7. Southern Region System Strengthening – XVIII:
   a. Vijayawada – Nellore (AP) 400 kV D/C line with 63 MVAR line reactors at both ends of each Circuit

8. Southern Region System Strengthening – XIX:
   a. Kurnool – Thiruvalam 765 kV D/C line with 1x240 MVAR line reactors at both ends of each circuit

9. Southern Region System Strengthening – XXII:
   a. Kurnool (New) – Raichur 765 kV S/c

10. Transmission System for Connectivity for NCC Power Projects Ltd. (1320 MW)
    a. NCC Generation Switchyard-Nellore Pooling Station 400 kV (quad) D/c line
    b. 2 nos. 400 kV line bays at Nellore Pooling Station for termination of the line

Total Estimated Cost Rs 9,403 Cr

* The scheme is being implemented by POWERGRID through TBCB route

B. New Transmission Schemes

I. Strengthening Works related with Angul – Srikakulam 765 kV Transmission Corridor through TBCB route ** (765kV – 1080 Ckt. Km & 400kV – 1560 Ckt. Km, Tx. Capacity – 6000 MVA)

a. Vemagiri-II – Chilakaluripeta 765kV D/c line
b. Chilakaluripeta – Cuddapah 765kV D/c line
c. Chilakaluripeta – Narsaraopeta 400kV (quad) D/c line
d. Cuddapah – Madhugiri 400kV (quad) D/c line
e. Cuddapah-Hindupur 400kV (quad) D/c line
f. Srikaukulam Pooling Station – Garividi 400 kV (Quad) D/c line
g. Establishment of 765/400kV substations at Chilakaluripeta and Cuddapah with 2x1500 MVA transformation capacity

II. Strengthening Works related with Warora – Warangal 765kV Transmission Corridor through TBCB route ** (765kV – 1320 Ckt. Km & 400kV – 480 Ckt. Km.)

a. Hyderabad – Kurnool 765 kV D/c line with 240 MVAR switchable line reactor at both ends.
b. Warangal (New) – Chilakaluripeta 765kV D/c line
c. LILO of Kurnool-Thiruvelam 765 kV D/c at Cuddapah
d. Cuddapah- Hoodi 400kV (quad) D/c line.

III. Southern Region System Strengthening – XXIII:

a. Installation of 1x125 MVAR 400kV bus reactor at Gooty,
b. Provision of 1x63MVAR switchable line reactors at Nellore pooling station on each ckt of Nellore pooling station – Gooty 400 kV Qaud d/c line.

IV. Transmission System associated with Krishnapatnam UMPP – Part-C2

a. Krishnapatnam UMPP – Kurnool (New) 400 kV D/c Quad

V. Sub-Station works associated with "System Strengthening in Southern Region for import of power from Eastern Region"

a. Establishment of 765/400kV GIS Pooling station at Vemagiri with 2x1500 MVA, 765/400 kV transformers
b. 2 nos. 240 MVAR, 765 kV Bus Reactors at Vemagiri Pooling Station
c. 1 no. 80 MVAR, 400 kV Bus Reactors at Vemagiri Pooling Station
d. LILO of Gazuwaka – Vijayawada 400kV S/c line at Vemagiri Pooling Station
e. 2 nos. 765kV bays each at Vemagiri Pooling Station and Srikakulam Pooling Station for terminating Srikakulam PP - Vemagiri-II Pooling Station 765kV D/C line being implemented under Tariff Based Competitive Bidding
f. 1 no. 240 MVAR switchable line reactor at Vemagiri Pooling Station and Srikakulam Pooling Station each for both circuits of Srikakulam PP – Vemagiri-II Pooling Station 765kV D/C line

Total Estimated Cost Rs 12,881 Cr

** These schemes being taken up by transmission license being identified through TBCB route

Annexure V

Renewable capacity is mainly confined in Anantapur, Kurnool &Kadapa districts of Andhra Pradesh. Details of pocket wise envisaged wind and solar capacity in Andhra Pradesh are as under:

Pocket wise Wind capacity addition in Andhra Pradesh		
S.No	**Pocket**	**Addition by FY 2018-19**
1	Anantapur	2,820
2	Kurnool	560
3	Kadapa	770
	Total(MW)	**4,150**

Pocket wise solar capacity addition in Andhra Pradesh		
S.No	**Pocket**	**Addition by FY 2018-19**
1	Anantapur	1,100
2	Kurnool	500
3	Kadapa	500
4	Gubtur	300
5	Chittoor	150
6	Ongole	100
7	Srikakulam	50
8	Vizianagaram	50
9	Visakhapatnam	50
10	East Godavari	50
11	West Godavari	50
12	Krishna	50
13	Nellore	50
	Total(MW)	**3,000**

Annexure VI

Investment Planned by APTRANSCO for network strengthening (Rs. Crs)														
Sl. No	**Project**	**Cap.**	**FY 2014-15**		**FY 2015-16**		**FY 2016-17**		**FY 2017-18**		**FY 2018-19**		**Total**	
		KV	Nos/ RKM	Cost	Nos/ RKM	Cost	Nos/ RKM	Cost	Nos/ RKM	Cost	Nos/ RKM	Cost	Nos/ RKM	Cost
1	Substation													
a	400 kV Substations for System Improvement plan & Case - I bidding	400 KV				184	5	393	3	304		36	8	917
													IDC	200
b	220,132 kV Substations for System Improvement plan	220 KV	1	40	12	324	8	216	3	75	2	50	26	705
		132 KV	14	65	23	161	19	125	9	63	10	70	75	484
2	Trans. Lines													
a	400 kV Lines for System Improvement plan & Case - I bidding	400 KV		110	210	735	440	580	220	488		61	1.05	1.05
													IDC	100
b	220,132 kV Lines for System Improvement, Ring Main & Strengthening plan	220 KV	125	117	650	875	235	420	75	60	50	40	1,135	1,512
		132 KV	220	99	600	383	480	246	225	101	250	90	1,775	919
3	Augmentation of PTRs		MVA/ MVAR											
		400 KV	MVA	-	-	-	315	17	-	2	-	-	315	19
	Reactors		MVAR	-	375	43	-	5	-	-	-	-	375	48
		220 KV	776	13	885	88	973	87	1,070	96	1,117	105	4,821	389
		132 KV	318		219								537	-
4	a) Renovation and Modernization of 220,132 kV SS and lines			43		57		57		57		71		285
	b) R&M of system protection and communication network of AP State			25		50		60		56		-		191
5	Creation of New main and Backup SLDC of AP state			30		15								45
6	Data acquisition system for 33 kV feeders of existing 160 Nos. 132kV Substations.			20		60		65		50				195
	TOTAL w/o IDC			562		2,974		2,270		1,352		524		7,683
	Total with IDC			568		3,052		2,385		1,443		535		7,983

Annexure VII

Project	Capacity	Proposed investment in the year 2014-15		Proposed investment in the year 2015-16		Proposed investment in the year 2016-17		Proposed investment in the year 2017-18		Proposed investment in the year 2018-19		Total Proposed investment for the period from 2014-15 to 2018-19	
		Nos/ RKM	Cost	Nos/ RKM	Cost	Nos/ RKM	Cost	Nos/ RKM	Cost	Nos/ RKM	Cost	Nos/ RKM	Cost
Substation		Nos		Nos		Nos		Nos		Nos		Nos	
Green Energy Corridor (Wind, Solar)	400 KV			-	125	4	438	-	62.61			4	626
	220 KV		-	-	91	8	136					8	226
Transmission Lines		RKM		RKM		RKM		RKM		RKM		RKM	
Green Energy Corridor (Wind, Solar)	400 KV			-	263	436	819		160			436	1,242
	220 KV			-	245	541	367					541	612
	132 KV					32	21					32	21
Augmentation of sub-stations	400 kV	MVA				1,260	77		9			1,260	85
		MVAR				240	26		7			240	33
TOTAL Funding required			0		724		1,885		238		0.00		2,847
Interest during Construction (IDC)					43		200		14				258
Total Including IDC					767		2,085		252				3,105

Annexure VIII

Financial restructuring of APDISCOMs					
Sl.No	**Details**	**Amount**	**Bonds Issued to**		
		Rs. Crs	**Banks**	**APGENCO**	**APTRANSCO**
1	**Total 9,95% Bonds issued by DIS-COMS under FRP**	**8,600**	**5,613**	**2,400**	**587**
	Bonds issued by APDISCOMS	4,046.15	2,909	913.68	223.47
	Bonds issued by TGDISCOMS	4,553.85	2704	1486.32	363.53
2	**Short Term Loans of DISCOMS restructured by Banks**	**5,258**	(a) Tenure of bonds is 15 years (b) State Govt. may take over the bonds during 2-5 years		
	Short Term Loans (STL) of APDIS-COMS	2,808			
	Short Term Loans (STL) of TGDIS-COMS	2,450	Rs. 1,600 Crs. to APGENCO + Rs. 800 Crs. to SCCL		
3	**Total Financial Restructuring of DISCOMS (Bonds + STLs)**	**13,858**			
	APDISCOMS	**6,854.15**			
	TGDISCOMS	7,003.85			

Annexure IX

DISCOM wise Distribution implementation plan				
Sl.No	**Details**	**Amount**	**Details**	**Details**
A	Total Base Capex Requirement	3,038	3,505	6,542
B	Total Other Capex Requirement	1,508	3,795	5,303
C	Total Investment - RGGVY	121	211	332
D	Total Investment - Household Metering	297	348	646
E	Total Investment - DTR Metering	153	431	584
F	Total Investment - Agl Feeder Segregation	589	2,593	3,182
G	Total Investment - HVDS	124	2,264	2,388
SUM(A:G)	**Total Investment Requirement**	**5,830**	**13,147**	**18,977**

Glossary of Terms

ACS	Average Cost to Serve
AP	Andhra Pradesh
APDISCOMs	Power Distribution Companies of Andhra Pradesh
APEPDCL	Eastern Power Distribution Company of Andhra Pradesh Limited
APGENCO	Andhra Pradesh Power Generation Corporation Limited
APMDC	Andhra Pradesh Mineral Development Corporation Limited
APSEB	Andhra Pradesh State Electricity Board
APSPDCL	Southern Power Distribution Company of Andhra Pradesh Limited
APTRANS-CO	Transmission Corporation of Andhra Pradesh Limited
ARR	Average Revenue Realized
ARR	Aggregate Revenue Requirement
AT&C	Aggregate Technical & Commercial Losses
BEE	Bureau of Energy Efficiency
BHEL	Bharat Heavy Electricals Limited
BPL	Below Poverty Line
CEA	Central Electricity Authority
CEO	Chief Executive Officer
CERC	Central Electricity Regulatory Commission
CGS	Central Generating Stations
CIL	Coal India Limited
CKM	Circuit Kilometer
CMD	Chairman & Managing Director
CRISIL	Credit Rating Information Service of India
CTU	Central Transmission Utility
DDG	Decentralized Distributed Generation
DGM	Deputy General Manager
DISCOM	Power Distribution Company
Dr. NTTPS	Dr. Narla Tata Rao Thermal Power Station
DSM	Demand Side Management
DTR	Distribution Transformer
EA	Electricity Act, 2003
EESL	Energy Efficiency Services Limited
EPDCL	Eastern Power Distribution Company of Andhra Pradesh Ltd
ER-SR	Eastern Region-Southern Region

FSA	Fuel Supply Agreement
FSRU	Floating Storage Regasification Unit
FY	Financial Year
GAIL	Gas Authority of India Limited
GM	General Manager
GoAP	Government of Andhra Pradesh
HT	High Tension
HVDS	High Voltage Distribution System
IPP	Independent Power Producer
IVRS	Interactive Voice Response System
JICA	Japan International Cooperation Agency
kV	Kilo Volt
LED	Light Emitting Diode
LT	Low Tension
MCL	Mahanadi Coalfields Limited
MoP	Ministry of Power
MTPA	Million Tonnes Per Annum
MU	Million Unit
MVA	Million Volt-Ampere
MW	Mega Watt
NCE	Non-Conventional Energy
NCEF	National Clean Energy Fund
NHPC	National Hydroelectric Power Corporation Limited
NPCIL	Nuclear Power Corporation of India Limited
NPP	Kudankulam Nuclear Power Plant
NREDCAP	New & Renewable Energy Development Corporation of Andhra Pradesh Limited
NTPC	National Thermal Power Corporation Limited
NVVNL	NTPC Vidyut Vyapar Nigam Limited
ONGC	Oil & Natural Gas Corporation Limited
PCPIR	Petroleum, Chemicals and Petrochemical Investment Corridor
PFA	Power For All Scheme
PFC	Power Finance Corporation
PFC	Power Finance Corporation
PGCIL	Power Grid Corporation of India Limited

PLF	Plant Load Factor
PMU	Project Management Unit
PSU	Public Sector Undertaking
PTR	Power Transformer
R-APDRP	Restructured Accelerated Power Development and Reforms Programme
REC	Rural Electrification Corporation Limited
REC	Renewable Energy Certificate
REC	Renewable Energy Certificate
RGGVY	Rajiv Gandhi Grameen Vidyutikaran Yojana
RLNG	Re-gasified Liquefied Natural Gas
RTPP	Rayalaseema Thermal Power Plant
RVEP	Remote Village Electrification Programme
SCCL	Singareni Collieries Company Limited
SECI	Solar Energy Corporation of India Limited
SLDC	State Load Dispatch Center
SOP	Standard of Performance
SPDCL	Southern Power Distribution Company of Andhra Pradesh Ltd
SS	Sub-Station
STPS	Super Critical Thermal Power Station
TGENCO	Telangana Power Generation Corporation Limited
TPS	Thermal Power Station
ULB	Urban Local Body
ULDC	Unified Load Dispatch and Communication
UMPP	Ultra Mega Power Plant
VGF	Viability Gap Funding
WCL	Western Coalfields Limited
WR-SR	Western Region-Southern Region

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