A Joint Initiative of

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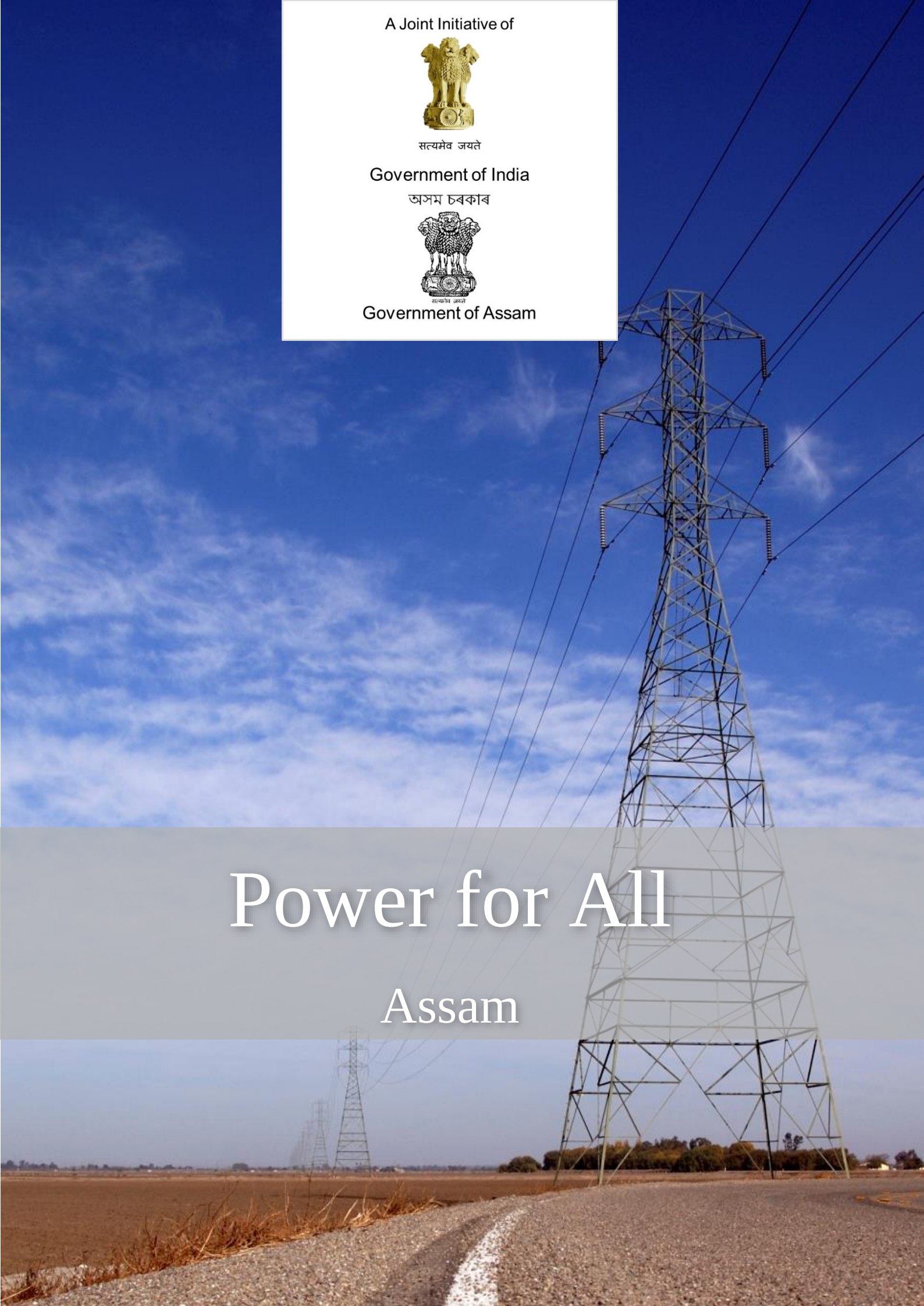
Government of India

অসম চৰকাৰ

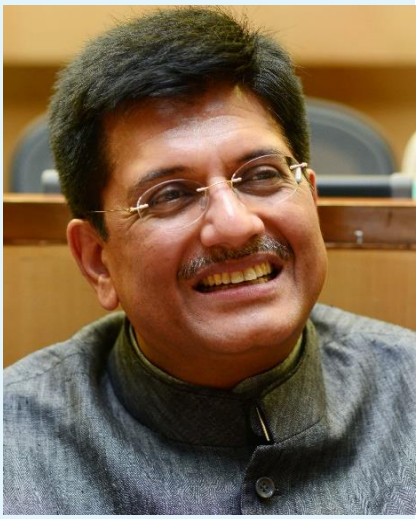
Government of Assam



Power for All

Assam

Foreword



Piyush Goyal

Minister of State (Independent Charge) for Power, Coal and New & Renewable Energy

सत्यमेव जयते

Government of India

Electricity consumption is one of the most important indices that decides the development level of a nation. 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' program is a major step in this direction.

Assam has a potential of developing into a tourism hub apart from economic powerhouse for the North East. However, slow pace of economic development has hindered its growth story. Access to electricity, being major factor for the economic development, will be a stepping stone in its journey towards economic progress.

This joint initiative of Government of India and Government of Assam 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.

I compliment the Government of Assam and wish them all the best for implementation of this programme. The Government of India will complement the efforts of Government of Assam in bringing uninterrupted quality power to each household, industry, commercial business, small & medium enterprise and establishment, any other public needs and adequate power to agriculture consumer as per the state policy.

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Foreword

অসম চৰকাৰ
সত্যমেব জয়তে
Government of Assam

Tarun Gogoi

Chief Minister, Assam

The economic growth of Assam is linked to the development of power sector in the State. Continued growth of power sector will help in achieving the larger objectives of poverty alleviation along with industrial and economic growth in the State.

While the State has made significant progress in expanding access and availability of electricity over the past, the same has remained an unfinished agenda so far. Providing quality and reliable power to all the households in the State remains a challenge.

The Government of Assam is committed to expand electricity access to all un-electrified households in the State. This can be achieved by means of necessary investments in the power generation, transmission and distribution infrastructure. The proposals outlined in this “Power for All” (PFA) document aim to achieve this goal.

The State Governments will provide all necessary support to the power utilities in achieving the various milestones and targets outlined in this PFA Roadmap.

I would like to thank the Government of India, Hon’ble Prime Minister and Hon’ble Union Minister of State for Power, for supporting Assam towards implementation of ‘Power for All’ program.

सत्यमेव जयते

Government of India

Joint Statement

অসম চৰকাৰ

सत्यमेव जयते

Government of Assam

24X7 Power for All Program for the State of Assam will be implemented by the Government of Assam with active support from the Government of India. The Program aims at providing 24X7 supply to all electricity consumers and providing electricity access to all unconnected households in the State.

This PFA Roadmap document highlights all-encompassing power sector interventions including generation, transmission, distribution, renewable energy and energy efficiency/DSM measures proposed to be implemented during FY16 to FY19.

The Government of Assam shall continue to support the power sector through targeted capital subsidy schemes aimed at supporting the poor and marginal consumers and elimination of regional disparities in the State.

The State Government is committed to support the utilities and other development agencies engaged in the power sector in implementation of the various measures and targets considered in the PFA Roadmap.

The State Government will put in place appropriate/ suggested State level governance mechanisms for periodic review and monitoring of the PFA Roadmap implementation.

The Ministry of Power, GoI would supplement the efforts of State on various issues to be dealt with at the Central Government level including those listed in this document. The MoP, GoI shall also endeavor to support the State in availing concessional financing arrangements for power utilities in the State.

The State Government shall endeavor to support utilities in improving/ maintaining their financial sustainability and credit worthiness.

The Central and State Governments would meet regularly over the next four years to review and monitor the progress on the rollout plan and strive to achieve the objectives of the program by taking the necessary steps as envisaged in the PFA document.

Jyoti Arora.

Jyoti Arora, IAS
Joint Secretary
Ministry of Power
Government of India

9.10.15

V. B. Pyarelal
Additional Chief Secretary
Department of Power
Government of Assam

Contents

List of Figures

List of Tables

1. Executive Summary

1.1. Introduction

24x7 Power for All (24x7 PFA) is a joint initiative of the Government of India (GoI) and State Governments, aiming to achieve 24X7 availability of reliable power to all households, industrial, commercial and all other electricity consuming entities by the end of FY19. This documents sets a roadmap to achieve the underlying objective of the PFA Program in the State of Assam.

As per 2011 census, Assam has low household (HH) level electrification of 37% compared to national average of 67.2%. Only 28% of the rural HHs in Assam were having access to electricity in 2011. Recurring floods, insurgency and inaccessible terrains have created hurdles in electrification of HHs and associated economic development in the State. Further, peak shortage of power in the State was around 13% during FY15 due to network constraints and low availability of generation capacity. This is indicative of the gaps to be addressed in this PFA Roadmap which also includes addressing the issues of un-electrified HHs and increasing energy availability to provide 24X7 power to all connected HHs in the State.

The State has undertaken structural reforms in the electricity sector in 2004. As present, the Assam Power Generation Company Limited (APGCL), Assam Electricity Grid Corporation Limited (AEGCL) and Assam Power Distribution Company Limited (APDCL) are functioning as the State owned generation, transmission and distribution utilities, respectively.

1.2. Connecting the Unconnected

The State has achieved 96.8% village level electrification by March, 2015. However, large section of the population including 36.36 lakh rural HHs and 1.74 lakh urban HHs are still un-electrified. The electrification plan is aimed towards achieving 100% electrification of rural HHs by FY22 and 100% urban HH by FY19. In addition to grid extension, 75 villages are proposed to be electrified by solar PV under remote village electrification program.

Rural areas receive only an average of 12 hours of electricity supply. In the current scenario, the peak demand is 1,450 MW (FY15) which is projected to increase to 2,417 MW by FY19. The future demand for electricity will be driven by the increased consumption from the already connected HHs and addition of about 22 lakh un-electrified HHs to the network by FY19. The schemes proposed in this document aim at addressing this growth in demand and removing all constraints in the generation, transmission and distribution systems in the State.

1.3. Available Generation Capacity

The State is facing high energy and peak deficits. This is due to multiple issues, including the following most prominent ones – (i) delays in commissioning of new thermal power plants in the State; and (ii) fuel shortages in gas-based plants. The power shortage situation is further aggravated by constraints in the inter-regional transmission network.

The total installed generation capacity available to the State including Central Sector allocations and Bhutan power projects is expected to reach 2,531 by FY19 (contributed mostly by NEEPCO at 679 MW followed by allocations from power plants from Bhutan at 500 MW) which can cater to a peak demand of 2,174 MW. Given the anticipated peak demand of 2,417 MW in FY19, this would leave of peak deficit of about 243 MW.

The State/ APDCL needs to tie up with IPPs and/ or make suitable short-term/ medium-term power procurement plan to bridge the projected peak and energy shortages.

1.4. Transmission plan

The existing transmission network comprises of 53 EHV grid substations with 4,972 MVA capacity along with 4,788 ckt kms of associated transmission lines. Further, the inter-regional corridor has a capacity of 6,500 MW comprising of two 400 KV D/C lines with the ER which offers limited connectivity to the NER during peak demand period.

With proposed investment of Rs. 5,397 Crs. the State transmission utility (AEGCL) plans to add another 55 substations which will increase the installed transformation capacity to 13,789 MVA. Funding arrangements are in place for all except 13 projects. AEGCL will require financial closure for an additional Rs. 2,650 Crs. for completing these projects. The proposed capacity addition in the transmission systems will be adequate to meet the peak demand of 2,417 MW in FY19.

PGCIL is undertaking implementation of high capacity corridors for increasing the inter-regional connectivity of the NER states with the NR and ER. With the proposed projects the ER-NER and NR-NER is expected to increase to 2,860 MW and 6,000 MW respectively. This will not only ensure evacuation of power from the upcoming hydro power projects in the NER but will also improve the availability of power within the NER.

1.5. Distribution Plan

The State distribution utility is in advanced stages of completing the RGGVY scheme. Further, APDCL has already started implementing R-APDRP Part-B schemes across Assam. In addition to these centrally sponsored schemes, APDCL is also undertaking distribution system investments under ADB funded schemes.

In order to ensure adequacy of distribution network for serving the existing consumers and extending supply to the unconnected HHs, the utility has proposed capacity addition by means of addition in HT network, LT network and additional power and distribution transformers among various other augmentation/ improvement works. The overall plan will increase the capacity of DTs from current level of 3,876 MVA to 4,586 MVA in FY19, similarly the LT network will increase from 1,22,295 kms to 1,39,699 kms in FY19. These network additions are proposed with a total investment of Rs. 9,626 Crs.

1.6. Renewable Energy and Energy Efficiency

The State has planned off-grid renewable solutions to cater to the growth in demand in far-flung areas with poor accessibility. This includes 2,500 standalone solar street light solutions, wind-solar hybrid of 0.9275 MW capacity. In addition, the State has planned to add about 113 MW of solar grid-connected systems by FY19. Further, the State Nodal Agency has planned capacity additions of 135 MW of solar roof top systems by FY20.

State's energy efficiency plan consists of Municipal DSM program in which the street lights of selected 5 cities will be replaced by LED lighting systems. The State Nodal Agency and utilities will need to prepare plans and additional proposals for realizing the complete 200 MW potential peak savings through DSM measures.

1.7. Financial Turnaround

Considering APDCL is able to meet the loss reduction targets, a tariff hike of about 9.8% YoY will help the utility operationally turnaround by FY19.

The State Government will need to consider extending financial support to the utility in terms of – a) Providing revenue subsidy to the economically weaker sections of consumers; b) Funding the service connection charges of rural HHs to make electricity connection affordable; and c) Financial restructuring of the distribution company by means waiving off of outstanding State Government loans thereby reducing the quantum of accumulated losses.

On the basis of above considerations, a plan to achieve '24x7 Power for All' along with a proposed rollout plan has been formulated and detailed in this document.

2. Background

2.1. The State of Assam

Assam is one of the 7 states in the North Eastern Region (NER) of India, surrounded by six sister states of the NER and shares international boundaries with Bhutan and Bangladesh. The State connects the NER to the rest of the country through the Chicken Neck – A narrow corridor of land surrounded by Bhutan on North and Bangladesh on the south.

Table 1 presents a broad overview of the State.

The pace of urbanization in Assam has been relatively slow with urban areas accounting for only 14% of its population in 2011. The population living in urban areas has increased marginally from 12.9% in 2001 to 14.09% in 2011, which remains considerably below the national average of 31.2% in 2011. The district wise urban and rural division of HHs in Assam is shown in Figure 2.

Assam's per capita income at constant prices (2004-05) stands at Rs. 23,448 as against the national per capita income of Rs. 38,856, at the end of FY14, as depicted in Figure 1. The gap between the national and State's per capita income has been rising since 1990-91, indicating that the State needs special focus on achieving economic growth. The electricity sector could be one of the key enabling and driving forces to achieve this growth.

Table 1: Key Highlights of State: Assam

Parameter	Information
Year of Creation	1947 and reorganized in 1972
Population & Demographics	Total Population at 3,11,69,272 as per 2011 census • 86% Rural, 14% Urban • Decadal population growth: 16.93%
Area	78,438 square kilometers (2.6% of country) • Forest cover – 34.21% • Total cropped area – 35.83%
Administrative Set-up	• 27 Districts • 56 sub-divisions • 219 Blocks • 25372 Villages
Natural Resources	• Crude oil 4861 MT • Coal 605 MT • Natural gas 2681 mmscm
Neighboring States	• North: Arunachal Pradesh • West: West Bengal • East:: Nagaland • South: Tripura, Manipur, Mizoram and Meghalaya
HHs	As per Census, 2011 Total 63,67,295 HHs (37% Electrified) • Urban 9,92,742 (84.1% Electrified) • Rural 53,74,553 (28.4% Electrified)

Figure 1: Per Capita Income Assam v National Average

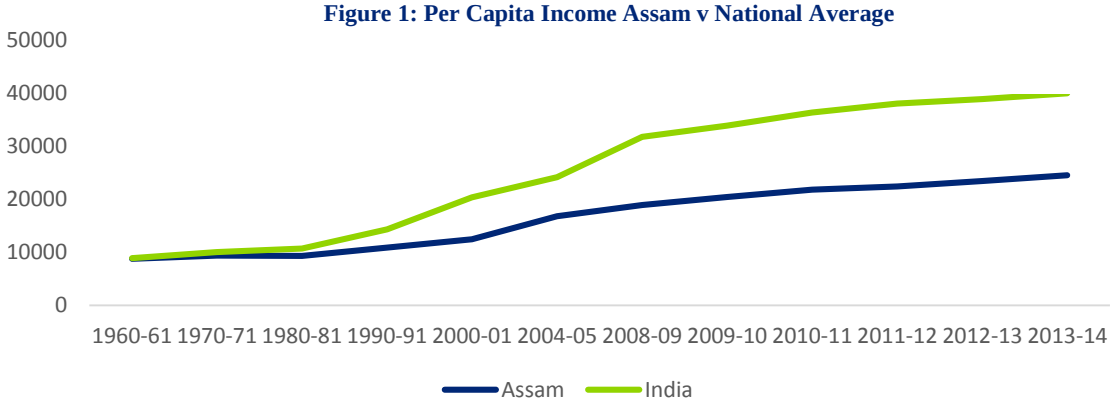
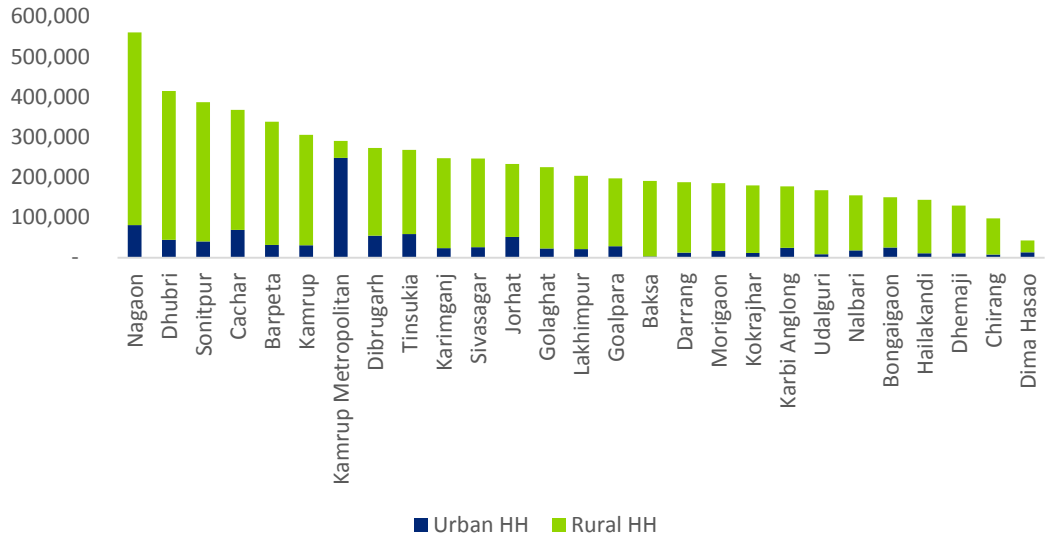


Figure 2: District Wise Urban and Rural Divide: No. of HHs (2011 Census)



Assam has low levels of electrification, with only 28% rural HHs having access to electricity, as per census 2011. The poor level of electricity access is due to several factors including difficulties associated with large sections of the HHs being located in the hilly districts which are not easily reachable. The areas in the Brahmaputra basin such as Dhemaji are prone to floods resulting in several HHs frequently shifting from one place to another. While districts like Kokrajhar, Chirang and Baksa have been subject to various forms of law and order related disturbances. Some border districts such as Dhubri and Karimganj show low level of electrification due to high influx of migrants.

2.2. Assam Power Sector At a Glance

The State's power sector went through the reforms in 2004, the erstwhile Assam State Electricity Board (ASEB) was restructured vide Government of Assam Memo No PEL.151/2003/Pt./165 dated 10th Dec' 2004 into following five entities to carry out functions of generation, transmission and distribution of electricity:

a) Assam Power Generation Corporation Limited (APGCL) (Generating Company)

b) Assam Electricity Grid Corporation Limited (AEGCL) (Transmission Company)

c) Lower, Central and Upper Assam Distribution Company Limited (Three Electricity Distribution Companies)

In May 2009, as per GOA notification No PEL.41/2006/199 dated 13th May'09, as per Assam State Reform (Transfer and merger of Distribution Functions and undertakings) Scheme, 2009,

CAEDCL & UAEDCL Distribution Company merged with the LAEDCL thereby forming a single distribution company for the State. Further, in October 2009, the name of the company was changed from LAEDCL to Assam Power Distribution Company Limited (APDCL) vide Certificate of Incorporation dated 23rd October'2009.

The Assam Electricity Regulatory Commission (AERC), established in August, 2001, has been regulating the electricity sector in the State in accordance with the provisions of the Electricity Act 2003. The AERC has put in place the key regulations governing the sector and has been issuing tariff orders for the utilities. Table 2 below shows the key highlights of the power sector in the State.

Re-bundling of Assam utilities

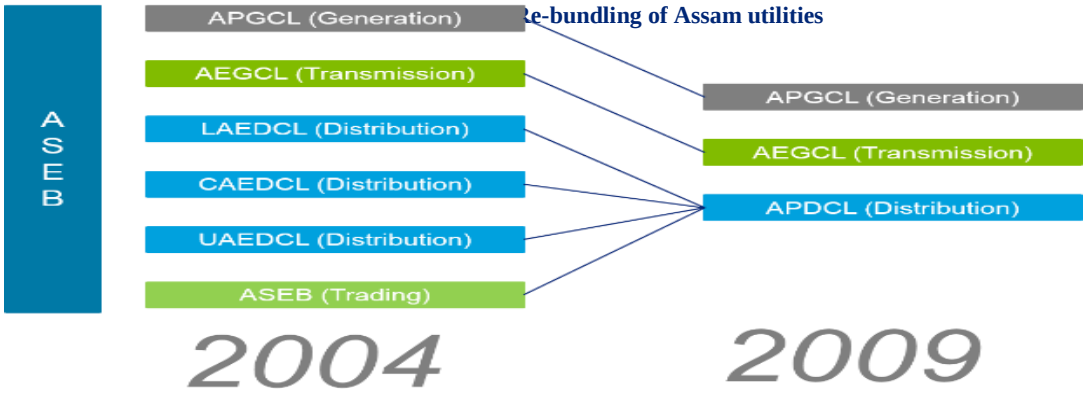


Table 2: Assam Power Sector at a Glance

<table>
<tr><th>Aspect</th><th>Key Highlights</th></tr>
<tr><td>Demand Supply Position</td><td>The State has had poorer than national average demand supply mismatch. The FY15 demand supply situation is highlighted in the table below:

<table>
<tr><th>Item</th><th>Peak</th><th>Energy</th></tr>
<tr><td>Requirement</td><td>1,457 MW</td><td>8,527 MU</td></tr>
<tr><td>Availability</td><td>1,250 MW</td><td>7,926 MU</td></tr>
<tr><td>Surplus/(Deficit)</td><td>-13.3%</td><td>-7.6%</td></tr>
</table></td></tr>
<tr><td>Generation</td><td>Assam Power Generating Corporation Ltd. Is the State generating company, owning and operating 407 MW of power generating capacities.
<table>
<tr><th>Mode</th><th>Thermal</th><th>Hydro</th><th>RE</th><th>Total (MW)</th></tr>
<tr><td>State</td><td>277</td><td>100</td><td>30</td><td>407</td></tr>
<tr><td>Private</td><td>24</td><td>0</td><td>4</td><td>28</td></tr>
<tr><td>Central</td><td>418</td><td>330</td><td>0</td><td>748</td></tr>
<tr><td>Total</td><td>719</td><td>430</td><td>34</td><td>1183</td></tr>
</table></td></tr>
<tr><td>Transmission</td><td>Assam Electricity Grid Corporation Ltd. is the State Transmission Utility, responsible for developing and operating transmission grid in the State.
<table>
<tr><th>Mode</th><th></th><th>MVAs</th></tr>
<tr><td>Intra-state</td><td>400/220 KV</td><td>1,260</td></tr>
<tr><td></td><td>400/132 KV</td><td>400</td></tr>
<tr><td></td><td>220/132</td><td>100</td></tr>
</table>
Additionally, the State also has some 11 KV import points with the MECL in intertwining geographies.</td></tr>
<tr><td>Distribution</td><td>Assam Power Distribution Company Limited (APDCL) is responsible for electricity distribution in the State of Assam with consumer base of about 28 Lakhs.</td></tr>
</table>

<table>
<tr><th>Aspect</th><th>Key Highlights</th></tr>
<tr><td></td><td>
<table>
<tr><th>Parameters</th><th>Unit</th><th>Total</th></tr>
<tr><td>33 kV Lines</td><td>ckm</td><td>6,348</td></tr>
<tr><td>11 kV Lines</td><td>ckm</td><td>54,349</td></tr>
<tr><td>LT Lines</td><td>Ckm</td><td>1,22,159</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td>33/ 11 kV S/Stn</td><td>No.</td><td>328</td></tr>
<tr><td>33/ 11 kV S/Stn</td><td>MVA</td><td>2,600</td></tr>
<tr><td>DTs</td><td>No.</td><td>56,847</td></tr>
<tr><td>DTs</td><td>MVA</td><td>3,678</td></tr>
</table>
</td></tr>
<tr><td>Financial Position</td><td>APDCL’s rating in the latest (2015) utility ranking by CARE and ICRA is “B” along with utilities from Telangana, Haryana, MP and Bihar. The State distribution utility has been accumulating losses since the last few years. The AT&C loss reported by the utility is 24.2% for FY 15.

Utility wise accumulated profits/ losses as at end of FY14 are as below:
<table>
<tr><th>Utility</th><th>Accumulated Profits/ Losses (Rs. Crs.)</th></tr>
<tr><td>APDCL (Discom)</td><td>-2,408</td></tr>
<tr><td>AEGCL (Transco)</td><td>-162</td></tr>
<tr><td>APGCL (Genco)</td><td>-173</td></tr>
<tr><td>Total</td><td>-2,743</td></tr>
</table>
</td></tr>
</table>

3.Power Supply Scenario

3.1. Power Supply Position

Assam's peak demand for power has grown by over 30% during the period from 2011 to 2015. The peak deficit has increased from 5.31% in FY12 to 13.31% in FY15.

Table 3: State's Peak Deficit (%)

Particulars	FY12	FY13	FY14	FY15
Peak Demand (MW)	1,112	1,197	1,329	1,450
Peak Available (MW)	1,053	1,148	1,220	1,257
Peak Shortage (%)	5.31%	4.09%	8.20%	13.31%

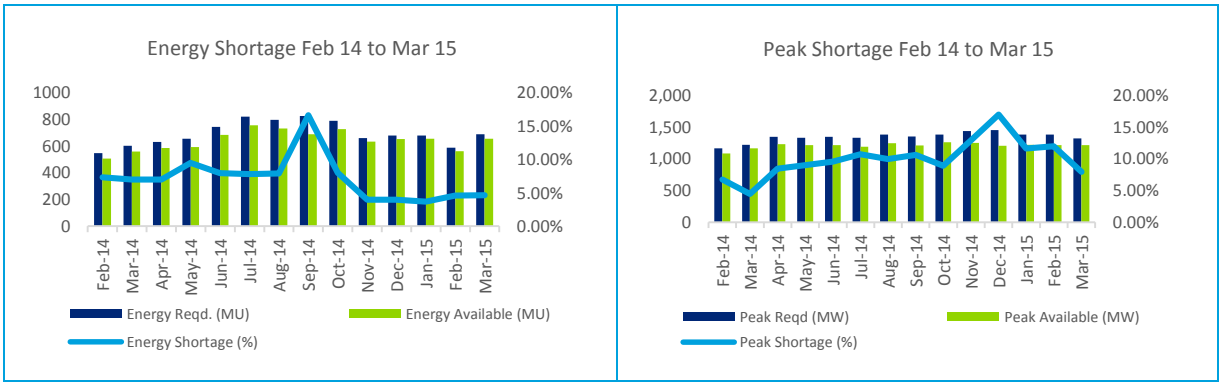
High share of hydro in the generation mix combined with outages in transmission and generation sources has led to significant seasonal variations in power availability situation in the State. During the last twelve months the energy shortage has been highest in September, 2014 at 16.61% and peak shortage has been highest in December, 2014 at 17%. Figure 4 shows the seasonal trend of peak and energy shortages for the period Feb, 14 to Mar, 15.

Currently, the city of Guwahati has an average supply of 20 hours while other urban areas get an average supply of only up to about 15 hours. The rural areas in the State have much lower power availability with average duration of supply being just about 12 hours. In addition to inadequacy of generation capacities, the power availability has also been severely constrained by network constraints (both inter and intra-state).

3.2. Consumer & Sales Mix

APDCL serves electricity to over 33 Lakh consumers in the State (FY15). The mix in terms of number of consumers and energy sales for the predominant consumer categories is provided in Figure 6. The domestic consumer category comprises over 92% of APDCL's consumer base and contributes to over 47% of its energy sales. Other categories comprising over 2.8 lakh consumers contributes to around 53% of energy sales. The State has added significant number of domestic/ HH consumers (above 5 lakhs) during the last 5 years under the RGGVY scheme which has led to a substantial increase in the contribution of the domestic category in the consumer mix as well as the sales mix of the State, as can be inferred

Figure 4: Peak and Energy Deficit Trends in Assam during FY15



from the category wise sales growth trend illustrated in Figure 5.

Commercial and Industrial categories have also seen robust growth over the last 5 years. It is reported that APDCL has not been able to meet the power demand from industrial consumers in several regions during the previous years due to various constraints.

While the tea estates form one of the most significant economic activities in the State, giving employment to over 35 lakh people, the power supply to the estates has been significantly constrained due to network inadequacies. Energy sales to tea estates has marginally declined over the period and consumers have been forced to use alternate sources of power.

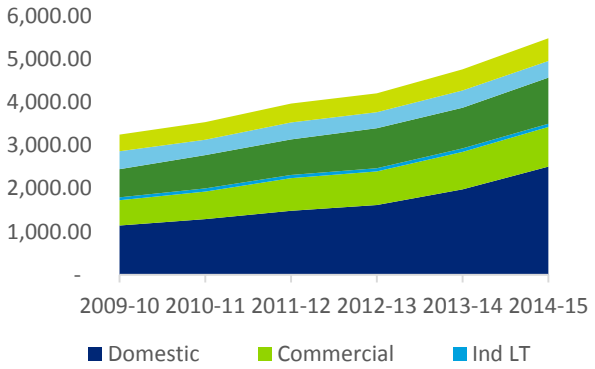
It is reported that power supply deficit to tea estates ranges from 40% to 50% across various regions.

Electricity consumption for agricultural purposes is limited as most Agricultural connections belong to the State Irrigation Department.

3.3. Methodology for Demand Projections

In line with the objective of PFA program, to provide 24X7 power to all HHs, the demand projection has been done separately for electrified and un-electrified rural and urban HHs. whereas, for rest of the consumer categories a growth rate based on APDCL's estimation of the expected growth along with a review/ validation with the past trend has been considered. The following steps detail out the approach adopted for estimation of energy requirement for the State.

Figure 5: Category Wise Sales (MU) Growth Trend – APDCL

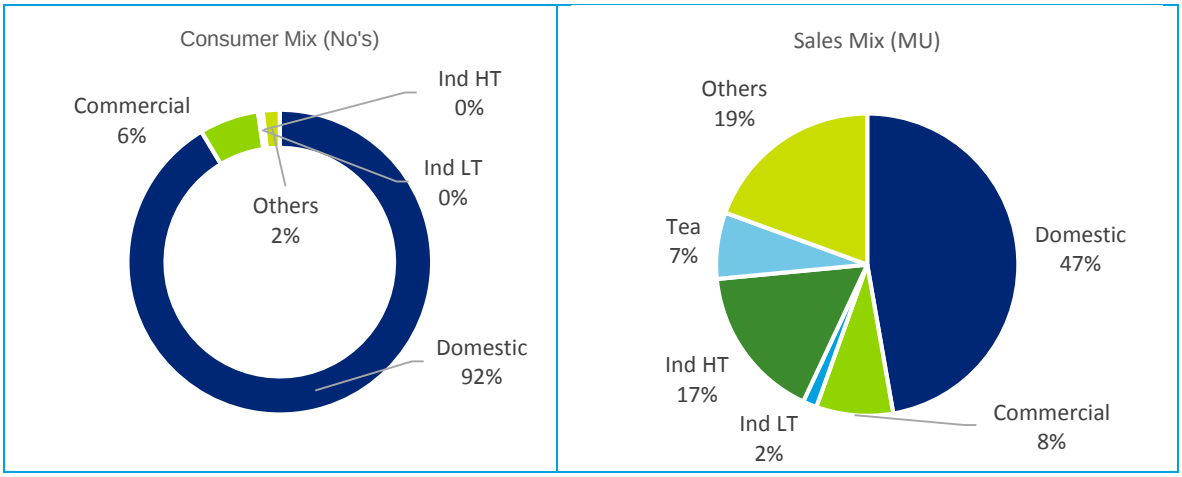


Estimation of Rural and Urban electrified and un-electrified HHs

The number of rural and urban HHs are estimated based on the available census data for 2011, extrapolated with past 10 years CAGR.

In addition to the level of electrification in rural areas as per 2011 census data, the actual rural HHs electrified since 2011 has been considered to arrive at the present level of electrification. In case of urban areas, the same level of access as in 2011 census (in percentage terms) has been assumed on the estimated HH numbers to arrive at the number of existing un-electrified HHs. The estimated urban and rural HHs along with the status

Figure 6: Consumer and Energy Sales Mix – FY15



of electrification as at the end of FY14 is provided in Table 4

Table 4: Estimated Un-electrified Households (end of FY14)

Particulars	Urban	Rural	Total
Total HHs	10,95,372	57,78,911	68,74,283
Electrified	9,20,969	21,42,778	30,63,747
Balance (covered under PFA)	1,74,404	36,36,133	38,10,536

Estimation of Energy Requirement from HHs

The energy requirement from domestic category consumers (HHs) has been estimated using the end use method under the following four broad categories:

a) Latent demand from existing HHs on account of increase in energy availability;

b) Additional energy requirement due to electrification of un-electrified HHs;

c) Additional energy requirement due to construction of new urban and rural HHs; and

d) Increase in specific consumption (kwh/HH/day) for each of the electrified HH due to life style advancements.

Latent demand growth from already electrified HHs has been estimated based on expected increase in consumption levels in accordance with the objectives of the PFA program. Such growth would not only include the increased energy requirement due to elimination of power shortages and network constraints but also the natural growth in consumption levels due to lifestyle changes. It is expected that the daily HH consumption in urban areas will increase from 3.36 kWh by FY14 to 4.77 kWh by FY19 and further to 6 kWh in FY22. Similarly, daily rural HH consumption will increase from 1.71 kWh in FY14 to 2.43 kWh by FY19 and 3 kWh by FY22.

Given the terrain of the State, past achievement of rural electrification, implementation capability of APDCL and the balance number of un-electrified HHs standing at over 38 lakhs, the State Government plans to achieve 100% electrification under the PFA Roadmap by the end of FY22. Nevertheless, the un-electrified urban HHs shall be completely covered by FY17. Accordingly, the year wise electrification plan considered for the purpose of power supply related projections is summarized in Table 5.

The increase in new rural and urban HHs has been estimated based on the past CAGR of 2.45% and 3.33% for urban and rural areas respectively, based on census data. The corresponding energy requirement from new HHs is estimated based on the estimated per HH per day consumption.

In addition to the grid based electrification plan and the balance number of HHs presented in the table above, the State has also planned to pursue electrification certain far flung villages under Decentralized Distributed Generation (DDG) based schemes.

Estimation of Energy Requirement from Other Consumer Categories

The energy requirement projections from other consumer categories have been done factoring the expected natural growth as well as the additional growth arising out of increased availability of electricity in accordance with the objectives of the PFA Roadmap.

Industrial and tea estate categories are faced with 30% to 40% load restrictions under the present scenario, which has been assumed to be phased out gradually by FY19. Additionally, there is expected to be a growth of demand to the extent of 5% per annum from these consumer categories.

For the remaining consumer categories such as commercial, public lighting, agriculture, public water works etc. the maximum of last 5 years CAGR has been considered to arrive at the projected demand.

3.4. Demand Projections

Based on above steps, the energy sales for APDCL is expected to increase by about 100%, from 5,485 MUs in FY15 to 10,978 MUs in FY19, as presented in Figure 7.

As can be seen in Figure 7, despite an increasing growth trajectory, the share of energy requirement

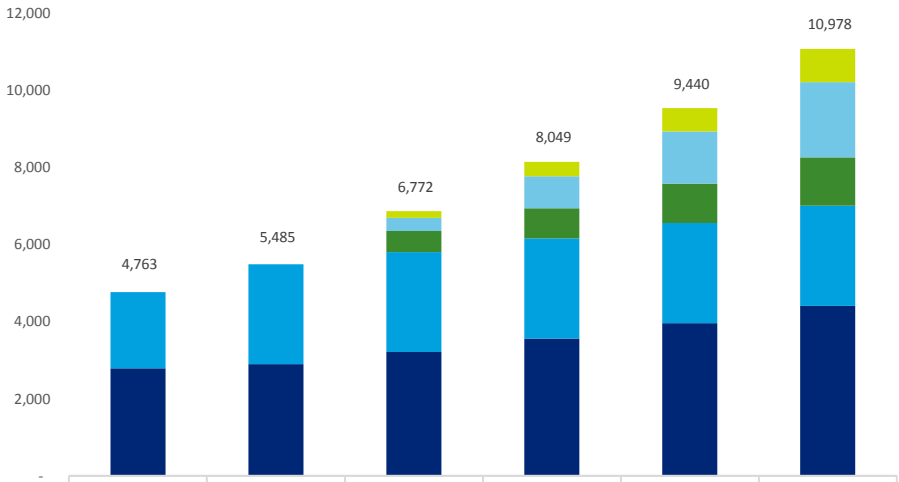
from other than domestic category consumers is expected to reduce from 54% in FY15 to 40% in FY19.

The share of energy requirement from urban and rural HHs is projected to grow significantly in the future due to the quantum leap in the access to energy in rural areas. The share of rural HH sales in the overall domestic category sales which stands at 57% in FY15 is expected to increase to 66% in FY19 as can be seen in Figure 8.

Table 5: Grid Electrification Plan (Urban & Rural HHs Nos.)

Particulars	FY15 (A)	FY16	FY17	FY18	FY19
Urban					
Opening Un-electrified HHs	174,404	165,683	113,362	-	-
Electrification of Newly Constructed HHs	36,516	74,249	113,240	153,531	195,166
Electrification of Existing UE HHs (Opening of FY15)	8,720	52,321	113,362	-	-
Balance Un-electrified HHs	165,683	113,362	-	-	-
Rural					
Opening Un-electrified HHs	3,636,133	3,454,326	3,090,713	2,727,099	2,181,680
Electrification of Newly Constructed HHs	141,437	286,335	434,780	586,858	742,657
Electrification of Existing UE HHs (Opening of FY15)	181,807	363,613	363,613	545,420	545,420
Balance Un-electrified HHs	3,454,326	3,090,713	2,727,099	2,181,680	1,636,260

Figure 7: Projected Energy Requirement/Sales (MU)



	FY14 (A)	FY15 (A)	FY16	FY17	FY18	FY19
Electrification of Newly constructed HH			170	368	598	862
Electrification of unelectrified HH			344	833	1,358	1,947
Additional requirement from existing HHs			544	781	1,018	1,255
Existing requirement	1,979	2,591	2,591	2,591	2,591	2,591
Other than Domestic	2,784	2,894	3,208	3,561	3,958	4,407
Total energy sales	4,763	5,485	6,772	8,049	9,440	10,978

Figure 8: Rural V Urban Sales (MUs)

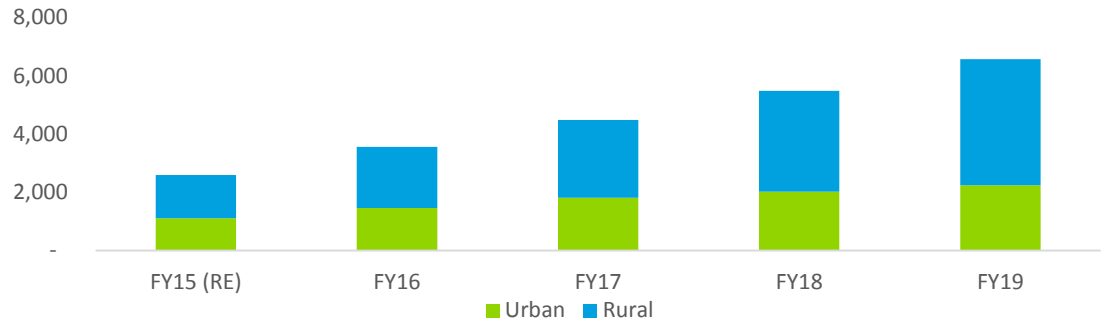


Table 6: Energy Requirement & Peak Demand Projections

Particulars	Units	FY15 (A)*	FY16	FY17	FY18	FY19
Energy requirement/ Sales	MU	5,485	6,772	8,049	9,440	10,978
Energy Saved by EE/DSM	MU	-	0.39	0.78	1.96	3.91
Distribution Losses	%	24.2%	20.0%	19.0%	18.7%	18.2%
Transmission Losses	%	4.0%	4.0%	4.0%	4.0%	4.0%
Energy Input Requirement	MU	8,527	8,817	10,345	12,085	13,967
Peak Demand	MW	**1,450**	**1,526**	**1,790**	**2,091**	**2,417**

* As per CEA Executive Summary for Mar 2015

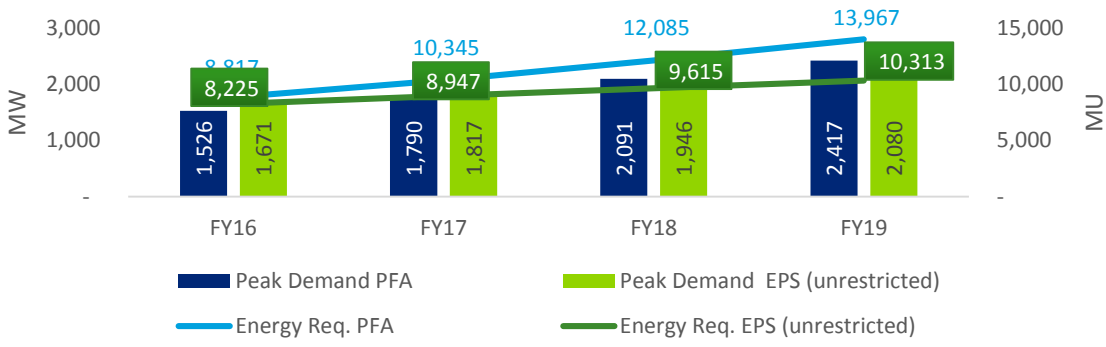
The energy input requirement at the State periphery has been calculated after applying savings from EE program and distribution and transmission loss reductions as shown in Table 6.

The distribution loss reduction targets used for the purpose of energy input requirement assessment have been taken as per the targets set by APDCL. Intra-State Transmission losses have been assumed to remain constant at 4% over the period.

Peak demand for power has been derived using the average load factor of previous two years (FY 14 and FY 15). The peak demand for the State is expected to increase from 1,450 MW in FY15 to 2,417 MW in FY19.

The consideration of rapid increase in electrification levels and improved power availability position in the State has enhanced the projected energy requirement and the peak demand projections up to the period FY19 which are now expected to surpass the 18th EPS projections. A comparison of the projected figures under the PFA Roadmap vis-à-vis the 18th EPS is shown in the bar chart in Figure 9

Figure 9: PFA Projected Energy Req. & Demand vs 18th EPS Projections



4. Generation Plan

4.1. Generation Capacity Requirement

The requirement of electricity in energy and peak demand terms for the State are expected to increase from the present level of 8,527 MU and 1,450 MW in FY15 to 13,967 MU and 2,417 MW in FY19. The State needs to relook its generation capacity addition and power procurement plans in order to meet the electricity demand in accordance with the projections under the 24X7 PFA Roadmap. This chapter elaborates on the aspect of adequacy of the tied-up and upcoming generation capacities for the State and identifies the key action points to address the identified gaps therein.

4.2. Existing Generation Capacity

The total installed capacity as on June 30, 2015 (including share allocated to Assam) is 1, 369 MW. The share of the installed generation capacity from thermal sources is 58.3%. Break-up of the installed capacity by ownership and fuel mix is provided in Table 7.

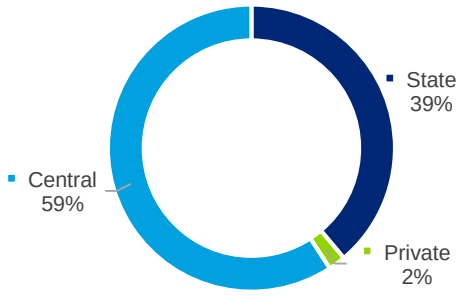
Assam Power Generation Company (APGCL) is the State generation company carved out of the erstwhile ASEB. The State's own generation capacity is mostly comprised of gas based thermal power plants. The present status of the State sector plants is summarized in Table 8.

As can be seen in Table 8, the gas based projects are unable to generate to their full capacities due to shortage of gas linkage made available to these plants and are able to generate only up to 185 MW vis-à-vis the installed capacity 276.7 MW.

Additionally, the furnace oil based Chandrapur TPS is not in operational condition. The Chandrapur TPS was an old furnace oil based station which is not operational since 1999, and APGCL is planning a 60 MW coal based thermal power plant in its place under JV mode. However, the plant is identified for decommissioning by CEA.

The other allocations are from central sector generating stations owned by NEEPCO and NHPC plants located in the NER. Assam also has allocations from NTPC's coal based thermal power plants located in the Eastern Region.

Table 7: Installed Capacity (MW) as on June, 2015 (CEA Executive Summary)

Share	Sector	Thermal	Hydro	RE	Total
	State	336	100	30	466
	Private	24	0	0	24
	Central	545	330	0	875
	Total	**905**	**430**	**34**	**1,369**

4.3. Generation Plan

State Sector

The generation capacities of proposed projects presently under various stages of development in the State total-up to over 1,000 MW. APGCL proposals include projects in hydro, thermal (gas and coal), small & mini hydro and solar power.

The status of development activities and readiness of the advanced State sector projects is summarized in Table 9.

As can be seen from the project wise detailing, the APGCL in all likelihood is expected to add only up to about 210.5 MW by FY19 out of the total 1,024.5 MW under development. Timely contracting, works monitoring and ensuring fuel (gas) availability would be key to ensuring timely commissioning of the proposed projects.

The Namrup Replacement Power Project (NRPP) and Lakwa Replacement Power Project (LRPP) are planned to replace old units of 119.5 MW and 60 MW of NTPS and LTPS, respectively. The reduction in the existing installed available capacities has been considered appropriately for assessing need for future generation capacities for the State.

Inter-State/ Central Sector/Bhutan Projects

In addition to the State owned generating plants, the stations shown in Table 10 situated in NER (owned by NEEPCO and NHPC and NTPC) have allocations for the State.

Table 8: Status of APGCL's Power Plants

Name of Plant	Fuel	Installed Capacity (MW)	PLF (FY15)	Remarks
Namrup TPP (NTPS)	Gas	119.5	57%	Gas linkage ~ 65 MW
Lakwa TPP (LTPS)	Gas	157.2	68%	Gas linkage ~ 120 MW
Chandrapur TPS	Coal	60		Not operational, Being identified by CEA for Decommissioning
Karbi Longpi HEP (KLHEP)	Hydro	100	42%	Operational
Myntriang	Hydro	3		Operational (currently shut down due to outage in evacuation)

Table 9: Status of Key State Generating Stations

Project/ Plan Name	Fuel	Capacity	Exp. CoD	Status
Namrup Replacement PP	Gas	100 MW	Dec 2015	Delayed in past due to contractual disputes/ contract replacements
Mytriang Stage II (3 MW already Commissioned)	SHP	10.5 MW	10.5 MW Dec,15	57% work is complete
Lungit (2 X 3 MW)	SHP	6 MW	FY18	Decision on new EPC contractor selection is pending due to high bid price
Lakwa Replacement PP	Gas	70 MW	FY 18	Technical bid evaluated and sent to ADB for approval
Lower Kopili	Hydro	120 MW	4 years from zero date	Recasted DPR is approved by CEA in July 2015.
Borpani Middle-II	SHP	24 MW	3 years from zero date	DPR approved by APGCL board. Preliminary survey work for road and building is in progress
Margherita	Coal	660 MW	4 and ½ years from zero date	Coal Block not available.
Titabor	Gas	40 MW		Land acquired, Gas allocation not finalized

Project/ Plan Name	Fuel	Capacity	Exp. CoD	Status
Cachar	Gas	30 MW	FY19	APGCL emerged as sole bidder for gas from targeted fields. Decision on Gas allocation to be finalized by ONGC.
NTPS Solar PV Project	Solar	2 MW	FY 16-17	DPR under preparation
LTPS Solar PV Project	Solar	2 MW	FY16-17	DPR under preparation

Table 10: Plant wise details of allocated capacity from Central sector projects

Plant Name	Fuel	Capacity (MW)	Allocated Capacity (MW)
NEEPCO Plants			***492.7***
Kopili – I	Hydro	200	94.0
Kopili - II	Hydro	25	10.0
Khangdong	Hydro	50	25.0
Ronganadi (RHEP)	Hydro	405	149.0
Doyang (DHEP)	Hydro	75	28.0
Kathalguri	Gas	291	153.7
Agartala GT	Gas	84	33.0
Other Central Sector Stations			***495***
NHPC, Loktak	Hydro	90	24.0
NTPC (Farakka , Kahalgaon and Talcher)	Thermal	4,940	111.0
OTPC Palatana	Thermal	726.6	240
Total		***5,756.6***	***987.7***

Table 11: Status of upcoming central sector and Bhutan projects

Plant Name	Fuel	Capacity (MW)	Allocated (MW)	Exp. CoD	Status
NTPC Bongaigaon	Coal	750	381	Jun 2015	Test Synchronisation achieved in Jun 2015.
NEEPCO Kameng	Hydro	600	65	Mar 2017	Under Construction
NHPC Subansiri	Hydro	2,000	208	Dec 2018 (Unlikely)	Works stopped since 2011 due to Agitations. Commissioning likely to be delayed further.
NEEPCO Turial	Hydro	60	20 (tentative)	Oct 2016	Under Construction
NEEPCO Pare	Hydro	110	37	Mar 2016	Under Construction
Total Central Sector			37		
Punatsangchhu I	Hydro	1,200	204	Dec-2018	Under Construction
Punatsangchhu II	Hydro	1,020	173	Jun-2017	Under Construction
Mangdechhu	Hydro	720	123	Sep-2017	Under Construction
Nikachhu LTOA	Hydro	118	118	FY 20	Under Construction
Total Bhutan Power			618		

NEEPCO in particular has a significant role from the perspective of being the largest supplier of power to the State of Assam, having a share even greater than the State Genco APGCL.

Table 11 shows the status of the upcoming central sector projects having capacity allocation to the state of Assam. Excluding the 208 MW of allocated capacity from Subhansiri, which is unlikely to be commissioned by FY19, the State is expected to get additional 503 MW of additional generation capacity from the central sector stations for meeting the increased demand for power arising as per the PFA Roadmap. Additionally, by FY20 all of the 618 MW hydro power sources from Bhutan are expected to be available for the State of Assam. Considering the project specific availability of existing and likelihood of commissioning of the tied-up projects expected to come-up in the future, the total available installed capacity of the State is projected increase from 1,263 MW in FY15 to over 1,966 MW by the end of FY19. In future, the capacity available from hydro sources is expected to increase from present level of 432 MW in FY16 to 1,102 MW in FY19. The share of Hydro generating sources is expected to vary between 28% in FY17 to as high as 50% in FY19.

Figure 10 shows the share of various sources in the period FY15 to FY19. The share of other RE sources (solar and bio mass) is expected to be 34 MW. Considering the peak availability as per the recommendations of CEA for Gas stations at 89.1%, CCGT at 85.36%, Coal based stations at 77.78% and Hydro stations at 86.89% the power supply position vis-à-vis the expected base load and peak load demand up to FY19 is projected in Figure 11.Projections for peak shortages show that in FY16 there will be shortage of 328 MW which is expected to go down to 243 MW in FY19 owing to large quantum of hydro power being added during FY19 and FY20. Further, Addition of hydro sources will impact the availability during lean hydro season (Off peak). Table 16 shows the impact of hydro capacities in peak and off peak demand scenario of the State. The energy balance of the State for the period FY16 to FY19 shows similar increasing energy requirement and availability deficit for the State during the period, as presented Figure 12

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Figure 10: Installed capacity (MW) including central sector allocation for Assam FY 16 to FY 19

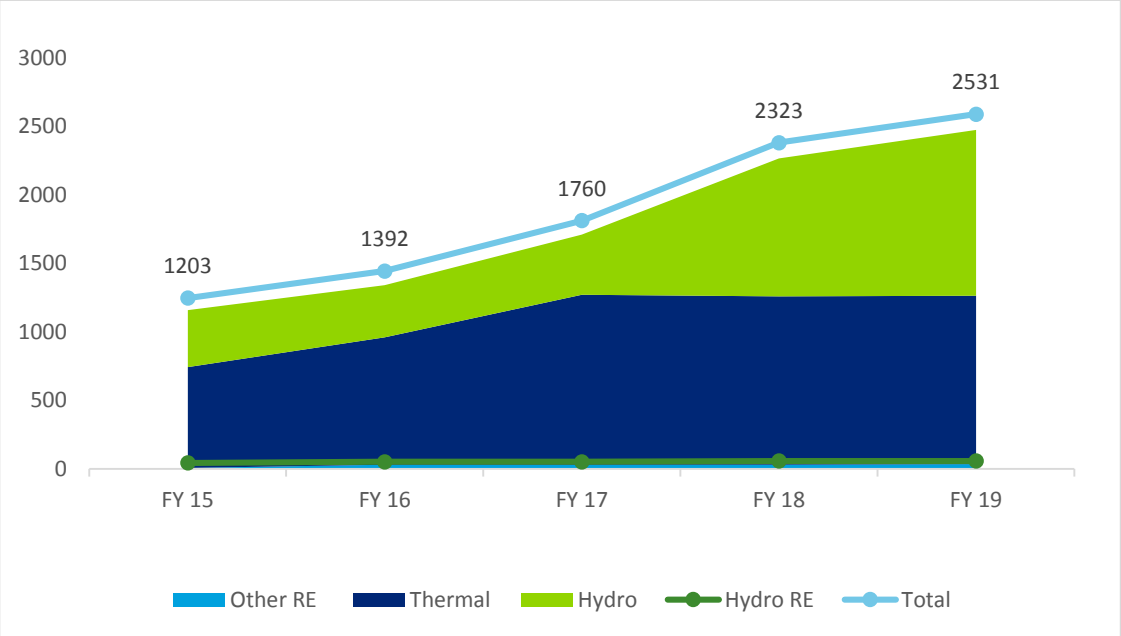
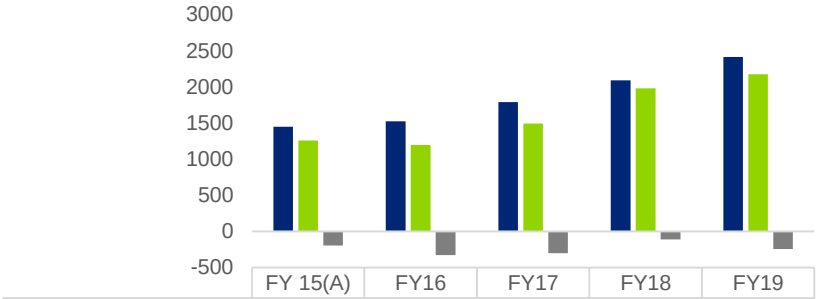
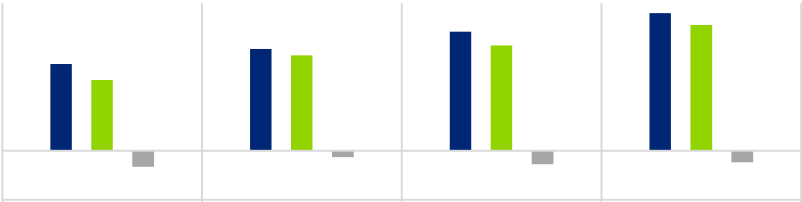


Figure 11: Projected Peak Demand and Availability (MW)



	FY 15(A)	FY16	FY17	FY18	FY19
Peak Demand	1450	1,526	1,790	2,091	2,417
Peak Availability	1257	1,198	1,492	1,981	2,174
Surplus/(Deficit) - Peak	(193)	(328)	(299)	(111)	(243)

Figure 12: Projected Energy Requirement and Availability (MU)



	FY16	FY17	FY18	FY19
Energy Required	8,817	10,345	12,085	13,967
Energy Available	7171	9669	10708	12789
Surplus/(Deficit)	(1,645)	(677)	(1,376)	(1,177)

Table 12: Investment Plan - APGCL (Rs. Crs.)

Project	Capacity MW	Project Cost	Est. Exp. Upto FY15	FY16 to FY19	Beyond FY19	Fund Availability
On-going Projects						
NRPP	100	694	444	250	0	PFC Loan Rs.485 Crs.
Myntriang SHEP	14	147	91	56	0	NABARD Grant Rs.46.14 Crs.
Lungnit SHEP	6	73	4	69	0	MNRE Grant Rs. 5.4 crs. **Decision on new EPC contractor selection is pending due to high bid price**
New-Projects						
LRPP	70	338		338	0	ADB Loan Rs. 265 crs.
Cachar TPP	30	163		163	0	
Margherita TPP	660	4,993		3,327	1,666	
Namrup TPS Solar PV	2	17		17	0	
LTPS Solar PV Project	2	17		17	0	
Lower Kopili HEP	120	1,490		1,350	140	ADB Loan Rs. 1050 crs.
Karbi Langpi Middle St-II SHEP	24	235		198	36	

Project	Capacity MW	Project Cost	Est. Exp. Upto FY15	FY16 to FY19	Beyond FY19	Fund Availability
Total	1,028	8,167	544	5,781	1,842	

4.4. Power Procurement

As can be seen from Figure 11, the shortfall in power for Assam is expected to be about 328 MW in FY16, 299 MW in FY17, 111 MW in FY18 and 243 MW in FY19. Further, upon analysis of the upcoming projects by Central and State agencies as well as IPPs, it is observed that APGCL would likely add only about 210.5 MW power by FY19 vis-à-vis the total targeted quantum of about 1,000 MW.

In order to balance this shortfall in addition of generation capacities, APDCL should plan sourcing of additional power for FY16 – FY19 on medium-term/ short-term basis.

The medium-term interim procurement would shield APDCL from the price volatility of the short-term procurement which could be a big exposure if undertaken for a large quantum, and would ensure steady power supply for its progressively increasing demand. Procurement of power on short-term basis can be done for the balance quantum, after finalizing the medium-term procurement, which is ideally around 10% of the total power portfolio. The quantum of short-term procurement shall have to be planned on year-on-year basis taking into consideration the medium-term and long-term availability from various sources, and with an objective to meet the peaking demands during any given season/ month. APDCL already does the same in the case of procurement on short-term basis on a monthly basis from the market.

Considering that the hydro share is going to increase substantially, the State may require additional procurement during low-hydro period. Analysis of peak and off-peak requirements are provided in Table 16

4.5. Fund Requirement

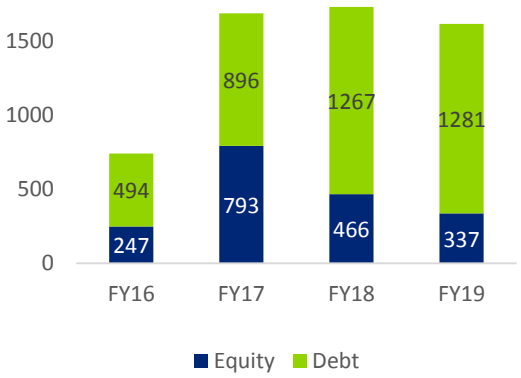
The funding requirement for the State sector projects covers 10 projects totaling 1,028 MW of proposed generation capacity addition, 4 projects totaling 213.5 MW out of which are expected to be commissioned by FY19. The total fund requirement for the generation plan along with year wise phasing of debt and equity is presented in. table 12

Out of the total investment of Rs. 5,786 Crs. proposed during FY16 to FY19, Rs. 644 pertains to 3 projects where external funding/ financial closure has already been achieved. Rs. 5,142 crs pertains to the remaining 7 projects where financial closure is yet to be achieved.

4.6. Generation Planning Issues

For success of the generation plan it is important that the plants achieve commissioning targets scheduled. Adequacy of fuel for existing plants and allocations for upcoming projects is the biggest risk facing the power generation scenario for the State. Of Assam. Not only the APGCL, but the NEEPCO and OTPC are also facing shortages in fuel availability which is adversely impacting the capacity available for the state of Assam. This issue needs attention of the MoPNG and the ONGC for immediate resolution.

Figure 13: Year wise Funding plan of APGCL (Rs. Crs.)



One of the other major risk factors impacting execution of a large number of projects, especially those being developed by the APGCL, are contractual issues involving disputes with contractors leading to cancellation of orders and retendering in several cases. Such issues cause

severe loss of time and it is important that the contracting and the contract management practices of the APGCL are reviewed to ensure any lacunae therein is addressed and dealt with appropriately to avoid future contractual disputes.

Owing to the fact that a significant proportion of the proposed generation capacities comprises of hydro-generating sources, such projects are often faced with delays including those arising from environmental/ hydrological/ ecological/ seismic compliances, land acquisition, absence of roads/ access to project sites and public opposition etc.

4.7. IT Initiatives

APGCL has received a fund of USD 5 Million for implementation of capacity development initiatives. A sizeable amount of the funds (around USD 1.7 Million) for capacity building is allocated for Enterprise Resource Planning (ERP) Consultant- and - ERP hardware, software etc. All back end office processes like Financial Management, Accounting, Asset Management, Human Resource Management, Inventory Management, Equipment and Material Procurement, Project monitoring etc., are planned to be integrated through the ERP package. Year wise proposed investments in ERP during the period covered under this Roadmap is shown in Table 13

Table 13: Year-Wise Investments in ERP by APGCL (in USD)

	2015-16	2016-17	2017-18	2018-19
Amt	126,932	220,000	1,024,500	400,000

APGCL has identified organization wide ERP implementation as one of the key IT initiatives going forward. It is planned to undertake a need assessment and solution design for the APGCL by September, 2015. The completion of process including selection of implementing, design and implementation and go-live of the ERP systems is envisaged to be completed within a period 2 years.

Table 14: IT Action Plan by APGCL

Deliverables(For Individual ERP Consultant)	Target Date
ERP Needs Assessment, ERP solution and IT Infrastructure Design, Budget for implementing ERP system in APGCL	2 months (June 2015)
Prepare Draft RFP for Selection of Implementing Agency	3 months (July 2015)
Assistance in Bid Management including bid evaluation	5 months (September, 2015)
Selection of Implementing Agency	6 months (October, 2015)
Supervision of: (i) ERP implementation, (ii) training and change management, (iii) Data Migration, (iv) Testing and (v) Successful implementation of the ERP system	24 months (April 2017)

4.8. Action Plan & Support Required

The State (discom) will need to tie-up with alternative generating sources to be able to meet the demand supply gap expected in the future years. Such additional capacities to be tie-up should be assessed appropriately considering a margin for spinning reserves and reasonable level of availability factor depending on the type of plant. The year wise additional capacities required are shown in Table 15. The action points have been identified for respective stakeholders in Table 17 which are deemed necessary to be able to make suitable arrangements for making adequate power available for the State in accordance with the requirements of the PFA Roadmap.

Table 15: Additional Generation Capacity Requirement (MW)

Description	FY16	FY17	FY18	FY19
Total Demand (MW)	1,526	1,790	2,091	2,417
Total Availability (MW)	1,198	1,492	1,981	2,174
Surplus/Deficit (MW)	(328)	(299)	(111)	(243)

Description	FY16	FY17	FY18	FY19
Additional Capacity to be tied-up (Considering 85% PAF for thermal sources)	405	4	-	-
Procurement on MT (MW)	365	4	-	-
Procurement on ST (MW)	41	0	-	-

Table 16: Peak and Off Peak Analysis for Assam

Particulars		FY 16	FY 17	FY 18	FY 19
Availability	Assumption (% peak Availability)	MW	MW	MW	MW
Hydro					
Peak	100%	375	424	924	1,101
Off Peak	20%	75	85	185	220
Thermal					
Peak	100%	792	1,037	1,026	1,026
Off Peak	100%	792	1,037	1,026	1,026
Others					
RE		31	31	31	47
Total Availability					
Peak		1,198	1,492	1,981	2,174
Off Peak		898	1,152	1,241	1,293
Demand		FY16	FY17	FY18	FY19
Max		1,526	1,790	2,091	2,417
Peak	100%	1,526	1,790	2,091	2,417
Off Peak	80%	1,224	1,436	1,677	1,939
Surplus/(Deficit)					
Peak		328	299	111	243
Off Peak		326	284	436	646

Table 17: Action Points & Timelines

Stakeholder	Action Points
State Government	• Provide timely equity funding for ongoing and future projects proposed to be taken-up by the APGCL. • Provide debt funding for State sector projects facing difficulty in achieving financial closure from FIs/ Banks.
APGCL	• To ensure timely execution of ongoing projects as per the schedule. • Ensure increased availability of existing thermal projects through proper maintenance practices. • Expedite DPR preparation and award of EPC contracts on upcoming projects with the objective of preponing their schedule to match with the power requirement envisaged under the PFA Roadmap. • Relook procurement process and contractual documents for award of EPC works to ensure upfront agreement and clarity on various terms and conditions with the objective of minimizing disputes/ delays and ensuring smooth execution of works in future. A benchmarking and alignment of the same with NHPC for Hydro projects and NTPC for Thermal projects would be desirable.
APDCL	• Initiate Case-1 competitive procurement process for procurement of the indicated quantity under medium-term on immediate basis from FY16 onwards. • Initiate process for competitive procurement of balance requirement in future years on timely basis.
Government of India	• Arrange for increased gas allocation and availability to gas based thermal power projects owned by the APGCL, NEEPCO and the OTPC.

5. Transmission Plan

5.1. Transmission capacity requirement

The transmission function in the state of Assam is performed by Assam Electricity Grid Company Limited (AEGCL) and Inter-State Transmission System (ISTS) network. While the intra-state transmission of power is undertake by AEGCL, the inter-state transmission of power is done by ISTS grid. A well planned and strong transmission system will ensure not only optimal utilization of transmission capacities but also of generation facilities and would further facilitate achieving ultimate objective of cost effective delivery of reliable power to end consumers.

The requirement of electricity in energy and peak demand terms for the State are expected to increase from the present level of 8,527 MU and 1,450 MW in FY15 to 13,967 MU and 2,417 MW in FY19.

The generation plan has outlined the upcoming intra-state, inter-state projects and the need for additional capacities to be tied-up under competitive bidding processes (Case-1). The transmission plan proposed in this chapter aims at ensuring adequacy of transmission infrastructure for evacuation of power from the inter-state boundary/ proposed generating plants to the end consumers located across various geographies of the State.

5.2. Existing Transmission System

Intra State Transmission System

AEGCL, formed in 2003 had inherited 3,862 ckt kms of EHV Lines above 66 kV voltage class and 38 numbers of EHV sub-stations having a total transformation capacity of 1,636.50 MVA from the erstwhile ASEB. Since then, AEGCL has added 902.36 ckt kms of EHV lines and 1,764.30 MVA transformation capacity by way of commissioning 15 new EHV sub-stations and augmenting existing sub-stations. It has also added reactive power compensation at 33 kV bus to the tune of 195 MVAR. As on date, AEGCL has 53 EHV grid substations with 4,972 MVA capacity along with 4,788 ckt kms associated transmission lines. The total infrastructure of the AEGCL is summarized in Table 18.

Table 18: Intra-state Transmission System

Voltage	Transformation Capacity (MVA)	Line Length (ckt kms)
400 KV	630	7.2
220 KV	1,590	1,435
132 KV	2,584	2,744
66 KV	168	602
Total	**4,972**	**4,788**

The availability of AEGCL's transmission system is over 99% and it operates at a loss level of 4.08% which are at par with other leading state transmission utilities in the country. However, the existing intra-state transmission systems are not adequate for meeting the demand in the State and there are several reported instances of load curtailments due to network constraints caused therefrom.

Inter-state Transmission System

Energy requirement of Assam is more than 55% of the total energy required by the NER states which comprises of Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland and Tripura. Unlike other regions which have multiple inter-regional interface points, the inter-state transmission system for the NER, which covers 7 states, has only one interface with the Eastern Region (ER). The inter-regional corridor comprises of two 400 KV D/C lines (one quad moose D/c and other twin moose D/c) and one 220 kV D/C with the

ER to transfer power from other part of the grid to NER which has an overall peak demand of over 2,500 MW.

At present, the inter-state transmission system has about 3,773 ckt kms of transmission line with a total transformation capacity of 2,550 MVA, with the following voltage wise break-up shown Table 19.

Table 19: Inter- state Transmission System

Voltage	Transformation Capacity (MVA)	Line Length (cKM)
400 KV	2,290	3,000
220 KV	260	541
132 KV	-	232
Total	**2,550**	**3,773**

The inter-regional power systems in the NER connect the various inter-state/ Central Sector Generating Stations located in different states in the NER to the rest of the states within the region. There are 7 such generating stations operational in the NER. Additionally, there are certain links between the various states in the NER which help in trading/ inter-state sale of power amongst the NER states. Such inter-state links connecting Assam to various CGS and other NER states are listed in Table 20.

In addition, the Motonga/ Deothang (Bhutan), Rangia (India) and Bongaigaon/ Salakati (India) – Gelyphu (Bhutan) 132 kV S/C lines are inter-country lines connecting the State of Assam (India) to Bhutan, which are used for cross border trade of electricity.

Table 20: Inter- state Network Connection Assam to CGS and other States in the NER

CGS Supplying to Assam	Details of Inter-State Network
295 MW AGBPP (Kathalguri)	• 2 Nos. of 400 kV S/C • One 220kV D/c • One 220 kV S/c
225 MWKopili HEP	• One 220 kV S/C • One220 kV D/C • Two 132 S/C
405 MWRanganadi	• One 400 kV D/C • Three132kV S/c
105 MWLoktak HEP	• Four132 kV S/C
75 MWDoyang HEP	• One 132 kV D/C • Two 132 kV S/c
135MW AGTPP	• One 132 kV D/C • One 132 kV S/C
50 MW Khandong	• Two 132 kV D/c • One 132 kV S/c
726 MW Pallatana (OTPC) Plant	• One 400 kV D/C • One400 kV D/c (charged at 132 kV)
NER State Connected to Assam	**Details of Inter-State Network**
From Arunachal Pradesh	• One 400kV D/c • Two 132 kV S/C
From Meghalaya	• One 220 kV D/c • Two 132 kV D/C • One 132 kV S/C
From Tripura	• One 400 kV D/c • Two 132 kV S/C
From Nagaland	• One 220 kV D/c • Two132 kV S/C • One 66 kV S/C

5.3. Intra-state Transmission Plan

Ongoing schemes

AEGCL is working on a number of transmission projects with the financial assistance of ADB and the Government of Assam to improve the network

infrastructure and to ensure reliability and quality of supply to end consumers.

AEGCL has identified such projects in order to meet the following requirements:

a) Meet demand for power arising from existing and future end-consumers in various load centers/ pockets in the state;

b) Providing connectivity for evacuation of power from various upcoming intra and inter-state power plants and for onward delivery of such power to load centers/ drawl points;

c) Improving the availability and reliability of the intra-state transmission systems in the State; and

d) Improving efficiency by way of reducing technical losses in the intra-state transmission systems.

The plan covers both, system for intra-state transmission network strengthening as well as evacuation of power from State owned generating stations. There is only one HEP of 110 MW capacity likely to be added by the end of 2019, as such power evacuation scheme for the same is included in the plan. The summarized list of planned schemes and proposed capacity additions at various voltage levels is summarized in Table 21.

The substation and line wise details of ongoing intra-state transmission system have been provided in Annexure 1 & 2.

Out of 51 proposed substations, schemes for 30 sub-stations scheduled to come up by FY18 have been approved by competent authorities. Schemes for the remaining 21 proposed projects to be executed by the year FY19 are yet to be finalized. Out of the same 13 sub-stations are proposed under NERPSIP 2nd and 3rd Tranche. The list of such projects is given below:

a) **400 kV projects:-** Sonapur, Rangia

b) **220 kV projects:-** Shankardebnagar (upgradation of existing 132kV S/S to 220kV), Boragaon (Jalukbari) Panjabari, Narayanpur

c) **132 kV projects:-** Nathkuchi, Chaygaon, Ghungur, Nagaon-2, Dhupdhara, Agomoni, Kumarikata

Table 21: Ongoing schemes of AEGCL

Parameter	FY 16	FY17	FY18	FY19	Total
Substations (Numbers)	14	4	11	22	**51**
Transformation Capacity (MVA)	**1,366**	**200**	**1,110**	**4,910**	**7,586**
400/220 KV				1,630	**1,630**
220/132 kV	700		520	1,240	**2,460**
220/33 kV				600	**600**
132/33 KV	666	200	590	810	**2,266**
Lines (Ckt. Kms)	**830**	**217**	**431**	**1,384**	**2,862**
400 KV				250	**250**
220 KV	502		190	415	**1,107**
132 KV	328	217	241	719	**1,505**

Augmentation Schemes

Additionally, new transformers are proposed for installation in existing GSS for enhancement of capacity. The year wise capacity addition after implementation of augmentation schemes will result in overall capacity addition of 1,231 MVA scheduled to be achieved by FY18. The total project cost for augmentation of existing grid substations is estimated at Rs. 180 Crs.

Table 22: Sub-station Augmentation Schemes Proposed by AEGCL

Parameter	FY16	FY17	FY18	Total
Transformation (MVA)	**66**	**224**	**941**	**1,231**
400 KV	0	0	0	0
220 KV	0	170	230	400
132 KV	66	54	711	831

AEGCL is also planning to install infrastructure for diagnostics and communication which will help the utility in the below mentioned areas:

a) Modern diagnostic tools are planned to be procured for each transmission circle;

b) Strengthening of Communication Network i.e. Optical Ground Wire etc.;

c) Proposal for Zone wise Remote Control Centers;

d) Emergency Restoration System (ERS); and

e) Mobile substations.

5.4. Inter-state Transmission System Plan

Ongoing schemes

Strengthening of the inter-regional and inter-state transmission systems in the NER has started and focus is on capacity augmentation of existing substations and transmission lines. Post commissioning of the ongoing/ proposed projects by the end of the 12th Five Year Plan period i.e. by FY17, the inter-regional transmission capacity between ER – NER and NR – NER is expected to increase to 2,860 MW and 3,000 MW, respectively.

The expansion plan includes development of the following 6 key inter-state transmission lines which would add around 4,451 ckt kms in the inter-state network connecting the NER:

a) Biswanath Chariali to Agra, 800 kV double circuit line with route length of 1742 kilometers, connecting the NER to the NR;

b) Biswanath Chariali to Balipara, 400 kV double circuit line with route length of 65 kilometers;

c) Biswanath Chariali – D/C LILO of Ranganadi – Balipara, 400 kV double circuit line with route length of 27 kilometers;

d) Biswanath Chariali to Subhansiri I & II, 400 kV double circuit with route length of 167 kilometers;

e) Biswanath Chariali to Subhansiri III & IV, 400 kV double circuit with route length of 170 kilometers; and

f) Balipara to Kameng, 400 kV double circuit with route length of 55 kilometers.

As is evident from the location/ name of the proposed inter-state transmission lines, the focus is on providing evacuation arrangement for the upcoming large hydro generation projects in the NER, in addition to increasing the inter-regional capacity available to the NER states for drawing power from other regions in the country.

Augmentation Schemes

Implementation of 2 new substations along with augmentation of 5 existing substations is being carried out to further boost the transformation capacity of the inter-state systems in the NER by an additional 2,880 MVA. The voltage wise break-up of the same is shown in Table 23.

Table 23: Augmentation of Inter State Transmission Sub Stations

Sl.	Name of the S/S	Voltage Class	Capacity Addition (MVA)
1	Bangaigaon	400/220	315
2	Bongaigaon TPS	400/220	630
3	Balipara	400/220	315
4	Misa	400/220	685
5	Silchar	400/132	315
6	Bis. Chariali	400/132	400

Sl.	Name of the S/S	Voltage Class	Capacity Addition (MVA)
7	Balipara	220/132	220
		Total	**2,880**

Proposed New Schemes

Assam being rich in hydel resources would not face shortage of power during high hydro periods once the ongoing HEP projects are completed, however, during lean hydro period, Assam along with other NER states would continue to face power shortage due to lack of commensurate thermal generating stations within the region. As per the prevailing plans, only 750 MW of thermal generation capacity is being added to the NER system under the central sector during the period of FY15 to FY19 which will not be sufficient to meet the projected demand growth under the PFA Roadmap. Therefore, in order to overcome this challenge, availability of adequate inter-state transmission infrastructure becomes critical. Such systems would also include appropriate connectivity with neighboring country of Bhutan which is already exporting power to India. AEGCL, which is responsible for adequacy of power transmission infrastructure for the Assam, has proposed the following additional transmission systems between Bhutan – Rangia and inter-state transmission system between Assam – Meghalaya and Assam – Tripura with the objective of improving the power availability situation in the state of Assam/ NER:

a) Bhutan – Rangia Quad Moose D/C (400 kV) line from Bhutan.

b) Existing 2 circuit 132 kV Kahilipara – Umtru line to terminated at Byrnihat (MeTCL) 400/220/132 kV S/S from Meghalaya (14 ckt Kms);

c) Stringing of 2nd Circuit of Dharmatala-Durlavcherrav line from Tripura (29 ckt Kms); and

5.5. Adequacy of Transmission Planning:

The intra-state transmission plan prepared by the AEGCL is adequate to meet the projected demand by FY19. The total capacity (including existing GSS and Lines) after implementation of all schemes which are expected to be completed by end of FY19 is shown in Table 24.

With the total anticipated demand for power reaching 2,417 MW in FY19, the ongoing/ proposed projects for capacity additions and augmentations will be adequate to cater to the increasing load and also improve reliability of the system by building in redundancies in the system. With the proposed capacity additions there would not be any bottlenecks in transmitting power from various generating stations up to the 132 kV network of the AEGCL, provided the identification of locations has been done in accordance with the detailed district/ area wise load growth assessments prepared by APDCL.

5.6. Fund Requirement (Intra-state only)

For projects scheduled to be completed by FY16, funding has already been made available by the Government of Assam and Asian Development Bank (ADB).

The above projects also include the 11 substations along with associated transmission lines covered under the 1st tranche NER Power Sector Improvement Project (NERPSIP) funded by the Government of India and the World Bank. Additional 9 projects are proposed under the 2nd tranche of the NERPSIP. A large proportion of the planned projects are approved under the 2nd and 3rd trance of the NERPSIP.

The remaining 13 sub-station projects including Remote Control Stations and capacity augmentation with an estimated cost of Rs. 2,650.33 crores for which funding has not been arranged are proposed to the GoA and GoI for providing funding support. These may also be taken up under funding support from multilateral funding agencies such as JICA, ADB and World Bank through the Government of India.

The year wise phasing of the proposed works and the status of fund availability is summarized in Table 25.

Table 24: Total Intra-Transmission Capacity (in MVAs) Post Implementation Of Schemes

Particulars	Existing	Additions after implementation of Schemes			Cumulative Capacity	
		FY16	FY17	FY18	FY19	Till FY19
Grid Substations (Nos)	53	14	4	11	22	104
Transformation Capacity (MVA						
400 KV	630				1,630	1,630
220 KV	1590	700	170	750	1840	5050
132 KV	2584	732	254	1301	810	5681
66 KV	168					168
Sub Total	**4972**	**1432**	**424**	**2051**	**4910**	**13789**

Table 25: Year-wise fund requirement (Rs. Crs.)

Sl.	Name of Intra State Scheme	FY16	FY17	FY18	FY19	Total
1A	Assam Energy Enhancement Programme (ADB),Ongoing projects	132	0	0	0	132
1B	TDF (GoA), Ongoing	45	22	7	0	74
1C	NLCPR, ongoing	6	0	0	0	6
1D	State Plan, ongoing	32	0	0	0	32
1E	NERPSIP, Tranche-1, ongoing (11 nos. new S/S, cap. Augmentationetc)	201	269	331	211	1012
	NERPSIP-Tranche2 (9 nos. substations)	0	298	746	447	1491
1F	Proposed Projects (13 new substations, associated lines, capacity augmentation of existing 20 substations & Remote control Centre)	0	530	1325	795	2650
1G	Total Requirement	416	1119	2409	1453	5397
2	Fund availability from various sources					
2A	Govt of Assam	113	22	7	0	142
2B	ADB	98	0	0	0	98
2C	NERPSIP	201	567	1,077	659	2,504
2D	NLCPR (GoI)	3	0	0	0	3
	Total Availability	**416**	**589**	**1,084**	**659**	2,748
3	Balance fund to be arranged	0	**530**	**1,325**	**795**	2,650

5.7. Transmission Planning Related Issues

The State has faced severe constraints due to lack of adequate inter and intra-state transmission capacities in the past, including the following:

a) The State has not been able to draw upon its allocated share of power from the central sector generating stations both within the region and outside the region, leading to severe shortages, especially during the non-hydro season;

b) Adequate interstate system has been planned to take care of the power supply requirement of the state. Recently, as per the requirement of Assam, interconnection with ISTS system for

supply of power to Rangia, Sonapur and Khumtai area has also been finalized;

c) The intra-state transmission networks have constraints in meeting the demand for power in several pockets/ regions within the State of Assam. The NER comprehensive scheme covering intra-state transmission/sub-transmission elements being implemented by POWERGRID as a consultancy project would help in mitigating the constraints in intra-state system to a great extent; and

d) Suitable mechanism may be introduced to take care of RoW issues. Presently, RoW constraints are causing delays in completion of projects.

The planned inter-state transmission system would be adequate to meet the power supply requirement of the state.

5.8. Action Plan & Support Required

In line with the proposed transmission plan, the action points shown in Table 26 have been identified for respective stakeholders to be able to make suitable arrangements for making adequate power transmission systems available for the State in accordance with the requirements of the PFA Roadmap:Table 26: Action Points & Timelines

Stakeholder	Action Points
State Government	• Consideration of funding support for the remaining intra-state transmission projects to be taken up by AEGCL in FY19 under appropriate arrangements with JICA/ ADB/ World Bank.
AEGCL	• Setting up of project management cell along with necessary enablement including adequate manpower, project monitoring tool etc. to monitor the various works proposed to be taken up under the PFA Roadmap. Prepare scheme for creation of Zonal Remote Control Centres and various automation works. • • Organize training of personnel for network diagnostic analysis and planning using PSSE tool made available to the AEGCL through the PGCIL. • Prepare investment proposals for strengthening of communication network systems within 6 months. • Evaluate Smart Grid related interventions and prepare phased introduction plan in view of the emerging needs of the State.
Government of India	• Support AEGCL in securing financing for the remaining schemes proposed under the PFA Roadmap from suitable multilateral/ bilateral donor funding organizations.
PGCIL	• Quarterly reporting of the various intra-state works being undertaken by the PGCIL under the NERPSIP.

6. Distribution Plan

6.1. Objectives of the Distribution Plan

Being the sole distribution licensee, Assam Power Distribution Company Limited (APDCL) is responsible for development and management of power sub-transmission and distribution infrastructure in the State. The significant increase in the access and availability of electricity proposed under the PFA Roadmap and the consequent increase in power demand to be catered, from existing level of 1,450 MW in FY15 to over 2,417 MW in FY19, would require commensurate investments in the sub-transmission and distribution infrastructure by APDCL.

Accordingly, the objectives of this distribution plan, in accordance with the 24X7 PFA objectives, includes the following:

a. Making provision for 24X7 supply to all connected consumers through capacity augmentations and building redundancies in the upstream network for improving reliability of supply;

b. Ensuring provision of electricity access to the over 21.74 Lakhs rural and urban unconnected households in the State;

c. Provision of 24X7 supply to support demand growth from existing consumers and that arising from new consumer growth in the State;

d. Making system improvements for reducing AT&C losses in accordance with the targets agreed with the MoP; and

e. Adopting appropriate technologies and systems to support RE integration and EE/ DSM measures in the State.

The distribution plan encompasses an appraisal of the existing distribution system, assessment of additional infrastructure requirements, investment needs and different schemes – ongoing and proposed, to fund such expansion. It also lays down the level as well as nature of intervention required from the State and Central governments to ensure adequate infrastructure is developed to meet the PFA program objectives.

6.2. Existing Distribution System

APDCL's systems comprise of 33 kV sub-transmission systems which forms the distribution backbone at the district level and 11 kV and LT distribution systems which deliver electricity to the majority of end consumers. An overview of APDCL's network infrastructure in terms of installed transformation capacity and line lengths of feeders at various voltage levels is provided for reference in Table 27.

Table 27: APDCL's Network (March, 2015)

Particulars	Capacity
Transformation Capacity	
33/11 kV Substations	2,600 MVA (328 Numbers)
11/0.4 kV LT Distribution Transformers	3,678 MVA (56,847 Numbers)
Lines	
33 kV Feeders	6,348 Ckt kms.
11 kV Feeders	54,349 Ckt kms.
LT Feeders	1,22,159 Ckt kms.

One of the primary challenges of APDCL is to cover the un-electrified HH in the State as almost all districts in the State have less than 40% rural HH electrification. However, the urban electrification levels are above 70% in all the districts, as evident from the chart shown in Figure 15. APDCL's plan for extending the distribution network to rural areas are mainly covered through works proposed under

the RGGVY and DDUGJY schemes of Govt. of India.

Out of the 25,372 villages in the State, 96.8% i.e. 24,569 villages have been electrified while 3.2% i.e. 803 villages are still un-electrified. It is worthwhile to note that 22 out of the 27 districts in the State continue to have un-electrified villages. Further, 8 districts – Lakhimpur, Sivasagar, Nagaon, Dhemaji, Dhubri, Dibrugarh, Karbi Anglong and Dima Hasao, have most of the un-electrified villages in the State.

The reliability indices for APDCL's system at 33 kV and 11 kV over the period FY12 to FY15, presented in

Figure 14 show a considerable improvement in availability of power at the customer end. However, given that these values are for customers connected at 33 kV and 11 kV levels in APDCL's network, the performance still remains worrisome. On an average every 11 kV customer faces 722 outages in a year (60 in a month) and a 33 kV customer faces 227 outages in a year (19 in a month).

Figure 14 is indicative of the situation that would be prevalent at lower voltage levels which would be far worse than that achieved at higher voltages. In addition to the outages in the upstream network, the customers connected at lower voltages are subject to additional interruptions arising out of failures in the DT and below level systems. The DT failure rate recorded by APDCL in FY15 is at 5.3%. Additionally, the customers located in far flung/ rural areas are subject to higher incidences and duration of outages vis-à-vis those located in urban areas.

Out of the 19 circles under APDCL, 14 circles continue to have losses higher than APDCL's overall loss levels. Figure 15 indicates that few urban circles with high consumption, especially Guwahati which has a large consumer base and better supply availability, is able to maintain lower level of losses and contributes significantly to lowering overall APDCL loss levels. As the access and supply availability in the other circles is increased in the coming years in accordance with the PFA Roadmap, controlling losses in other circles will become imminent for APDCL to be able to meet its overall AT&C targets.

APDCL has achieved 100% metering at consumer, feeder and distribution transformer levels. Going forward the focus of shall be on replacement of old, defective and faulty meters, as a part of metering plan.

Figure 14: Reliability Indices - CAIFI (Numbers), CAIDI (Hrs) for APDCL Network

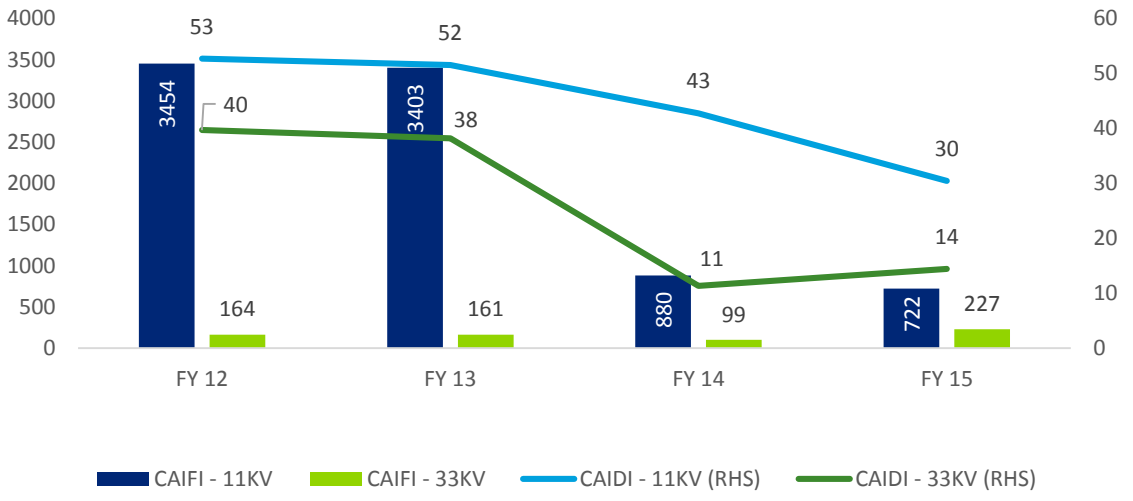
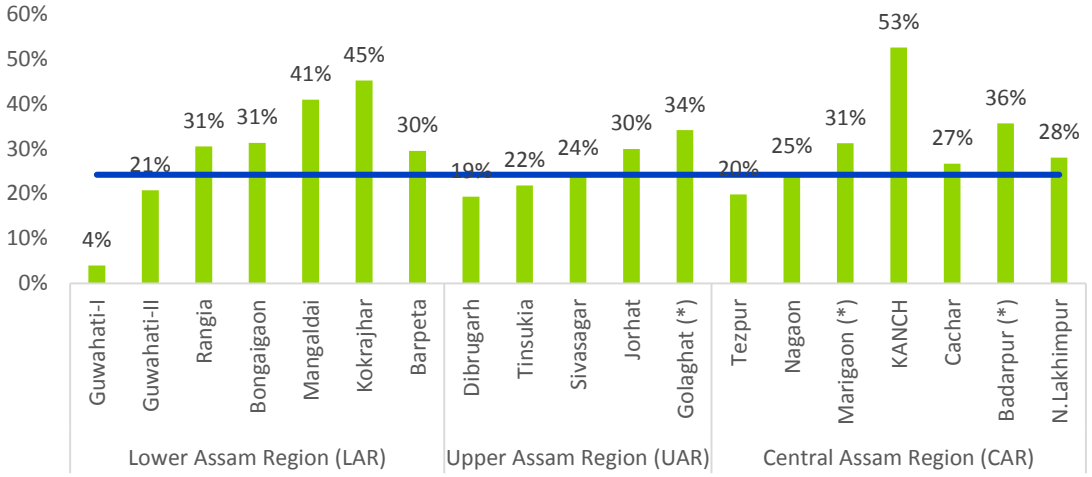


Figure 15: Circle Wise AT&C Losses - FY15



6.3. Central and State Government Schemes

The collective objective of all the Central/ State Government schemes has been to enhance the reach, reliability and quality of electricity to end consumers and to improve the financial position of utility by way of reducing AT&C losses. The following schemes are presently underway at various stages of implementation in Assam, which not only provide the much needed funding assistance but also aim towards enhancing the technical capacity of utilities.

Schemes for Rural Areas

The State has been carrying out electrification of rural areas under RGGVY scheme since the 10th plan period. For the balance electrification related works, during the 12th plan period, a total of 16 districts have been covered under the RGGVY program focusing on un-electrified villages and already electrified villages for intensive electrification, at an estimated cost of Rs. 1,621 Crs. Further, the State has proposed electrification of remaining 11 districts under DDUGJY scheme covering 1,40,000 BPL households with a fund layout of about Rs. 2,450 Crs. A summary of the village level coverage of these schemes is provided in Table 28.

Schemes for Urban Areas

The RAPDRP scheme covers 67 towns in the State of Assam. Part-A implementation of the program covers 72 towns, including 5 additional towns supported by APDCL's own funds. The status of various works under Part-A of the scheme are shown in Table 29.

The works under part B of RAPDRP have been commenced in all 67 towns covered under the scheme which includes consumer metering, augmentation and strengthening of the electrical network etc. All Part-B works are scheduled for completion by December, 2015

Table 28: RGGVY/ DDUGJY Coverage - Villages

Villages Covered	10th Plan	11th Plan	12th Plan (16 Dist)	DDUGJY (11 Dist)
De-electrified/un-electrified Covered /Target	894	7,533	1,009	602
De-electrified/un-electrified Completed/Achieved	894	7,455	In Progress	NA

Villages Covered	10th Plan	11th Plan	12th Plan (16 Dist)	DDUGJY (11 Dist)
Intensive electrification - Covered /target	1,744	11,162	10,259	NA
Intensive electrification - Completed/Achieved	1,744	11,108	In Progress	NA
Total – Covered	2,638	18,695	11,268	NA
Total – Completed (%)	2,638 (100%)	18,566 (99.29%)	In Progress	

Table 29: Status of Works Under Part A of R-APDRP Scheme

Description	Progress
Data Centre commissioning with all Hardware, Operating System & availability of network connectivity	• Data Centre commissioned on 25.03.2013
Data Recovery Centre (at Agartala)	• Work awarded to selected bidder on 28.03.2014. Work is under progress.
GIS survey & Validation. (Asset mapping & Consumer Indexing)	• Asset Mapping: Submitted by ITIA – 67 (67), Approved by Utility – 60 (67) • Consumer Indexing: Submitted by ITIA – 58 (67), Approved by Utility – 51 (67) towns
Meter & Modems at all DTs, Feeders, Boundary points, HT consumers etc.	• All 67 towns: Total meters installed – 8747 (9225) • 8005 (9225) modem installed.
Go Live	• 29 towns are Go-live and 46 towns on commercial run.
Baseline Reports	• Baseline of 67 town are established
Customer Care Centre (CCC)	• CCC is ready for operationalization.
SCADA for Guwahati City	• Works awarded to selected bidder on 24.09.2012 and are presently under implementation. • Procurement of SCADA compatible equipment have been ordered on 20.02.2014 under Part-B of the Scheme. • All SCADA related works are scheduled for completion by September,2015

Under the IPDS scheme, APDCL has proposed for strengthening works for 88 towns with a layout of Rs. 1,600 Crs. DPR of schemes totaling Rs 582 Crs. covering 19 circles has been prepared and submitted to PFC for approval. APDCL has planned to introduce HVDS, Arial Bunched Conductor, sectionalizers, auto-reclosures and installation of solar panels in Government establishments in addition to other system improvement works such as construction of new 33/11 KV sub-stations, augmentation and R&M works of 33/11 KV sub-stations, construction of new 33 KV, 11 KV, LT line, re-conductoring of 33 KV, 11 KV, LT line, new DTR installation, capacity enhancement of existing DTR etc.

APDCL also has various proposed network extension, strengthening and augmentation works under TDF (Trade Development Fund), State Annual Plan, ADB (MFF-I Tranche-3 & 4, MFF-II Tranche-2), NERPSIP, Non-Lapsable Central Pool of Resources (NLCPR) totaling Rs 2,851 crores during the period FY16 to FY19.

APDCL is carrying out the following activities in order to curb the AT&C losses in the State:

a) Mass disconnection drives, anti-theft/ pilferage drives and load surveys with the help CVO, APDCL & special police stations in addition to Technical Inspection Wing and concerned T&C and Industrial Revenue Collection Area (IRCA);Opening of cash counters in remote areas for ease of energy bill payment of rural

consumers;Special drives to bring all the RGGVY /Rural consumers in billing cycle. As a result, there is significant increase in number BPL as well as low consumption connections;

b) Field officers have been asked to monitor the consumption of IRCA consumer on a monthly basis to arrest any leakage of power; and

c) Replacement of all stopped, slow and defective meters of LT and HT consumers. Meter replacement for all government connections has already been completed.

6.4. Proposed Distribution Infrastructure Addition & Funding

In view of the burgeoning power demand to fulfill the 24X7 PFA objectives, APDCL will require to undertake a comprehensive distribution system capacity addition plan encompassing around two fold increase in the existing infrastructure. As can be seen in Figure 17, APDCL's sub-transmission infrastructure is expected to increase to 475 sub-stations with nearly 4,201 MVA by FY19 from existing number of 328 sub-station with 2,820 MVA capacity in FY15.

It is estimated (by APDCL) that in order to ensure that all households, urban and rural, are connected and supplied with adequate energy, the total asset base of APDCL will need increase to 9,444 ckt kms of 33 KV lines, 66,131 ckt kms of 11 kV lines and 1,39,699 ckt kms of LT lines.

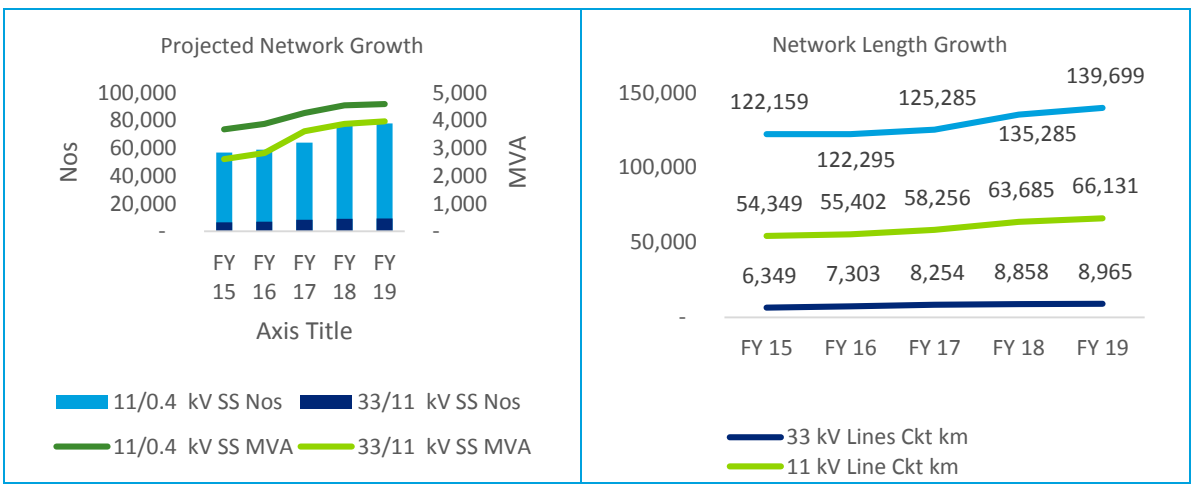
The total investment requirement of all works envisaged under the PFA Roadmap is estimated at Rs. 9,626 Crs. between FY16 to FY19, which is proposed to be covered under various schemes under implementation/ proposal stage. The scheme wise break-up of the proposed investments is summarized in Table 30.

Further, system strengthening and augmentation works are required for additional 104 towns, which are not covered in any of the State or central sector schemes. These are small urban pockets having low population and are located in the vicinity of bigger towns in the State. An estimated amount of Rs. 257 Crs. is required to complete the pending electrification works and system strengthening work in these areas.

6.5. Key Issues in Distribution Planning

The number of un-electrified HHs worked out on the basis of Census 2011, the decadal HH growth rate therein and actual number of HHs electrified by APDCL between 2011 and 2014 stands at 38.10 lakhs (1.74 lakh urban HH and 36.36 lakh rural HH). Given that the State has already electrified 96.8% of the villages, APDCL feels that the number of

Figure 16: APDCL's proposed distribution infrastructure Development Plan



balance UE HH arrived at on the basis of the Census data is on a higher side. Accordingly, the proposed plan under the PFA Roadmap considers electrification of 21.74 lakh UE HHS only. The utility shall undertake a detailed assessment of the balance household after FY19 and plan for coverage of the same in future programs until FY22 based on the number of HHs that are identified as un-electrified.

The other key issue is that even the 21.74 lakh HHs proposed to be covered until FY19 have not yet been physically identified. The schemes, DPR for which have already been prepared, list only a small fraction of the balance un-electrified HHs in the State. APDCL needs to initiate detailed primary surveys for physically identifying the balance un-electrified HHs for preparation of DPRs and taking appropriate measures for electrification of the remaining HHs in accordance with the targets agreed upon in the PFA Roadmap.

Table 30 Proposed investments in Distribution Network by FY 19 (Rs. Crs.)

Sl.	Name of Scheme	2015-16	2016-17	2017-18	2018-19	Total	Available funds	Gap
1	TDF 2011-14 (State scheme)	245	0	0	0	245	245	0
2	RGGVY (XII plan)	486	486	486	163	1621	1621	0
3	DDUGJY	383	735	735	598	2450	1275	1175
4	RAPDRP	612	0	0	0	612	612	0
5	IPDS	70	190	671	669	1600	585	1015
6	Network extension in Towns not covered under IPDS & RAPDRP	0	50	50	157	257	0	257
7	IT expansion to cover all consumers of APDCL	0	20	30	100	150	0	150
8	Refurbishment of 33/11 kV Substations	5	40	40	0	85	5	80
9	State Annual Plan	206	227	250	275	958	206	752
10	APSEIP under ADB MFF-I, Tranche -3	190	30	0	0	220	220	0
11	APSEIP under ADB MFF-I, Tranche -4	107	179	54	18	358	358	0
12	APSIP under ADB MFF-II, Tranche -2	85	169	68	17	339	339	0
13	NERPSIP phase-I	25	100	100	167	392	392	0
14	NERPSIP phase-II	0	30	150	150	330	0	330
15	NLCPR	9	0	0	0	9	9	0
	Total	**2423**	**2256**	**2634**	**2314**	**9626**	**5867**	**3759**

A sizeable number of the balance 803 villages and additional smaller habitations (hamlets etc.) are located at far-flung and difficult hilly terrains of the State where electrifying them through grid extension may not be feasible. This makes the need for DDG based schemes of paramount importance for achieving 100% HH electrification in the State. The various DDG based proposals planned as of now are inadequate to make a sizeable impact in respect of the PFA objectives.

A very large proportion of the proposed schemes under the DDUGJY and the IPDS schemes are yet to be approved by the respective nodal agencies. APDCL may need to consider alternative financing arrangements in case the proposals are not approved in entirety due to limited availability of funds under the respective schemes. Further, there is additional fund requirement of Rs. 150 Crs. for extension of IT infrastructure to cover all consumers of APDCL. In total additional funds required by APDCL is about Rs. 3,706 Crs. APDCL may need to tie up with funding agencies for arranging this amount.

6.6. District Wise Action Plan

Circle Wise Network Rollout Plan

The circle wise physical rollout plan of the proposed infrastructure additions under the PFA Roadmap comprising all works proposed under various schemes is as outlined in Table 31.

As per the overall schedule of investment proposals, an indicative year wise phasing of the circle wise rollout plan would be 24% in FY16, 18% in FY17, 17% in FY18 and the remaining 41% in FY19. It may be noted that the phasing of the infrastructure rollout would vary from one circle to another depending on the extent of coverage of various circles under respective schemes and implementation schedule thereof.

District Wise Plan for Increased Access

The district wise rollout targets for electrification of UE HH's, as arrived at on the basis of 2011 census numbers and APDCL 's proposed plan under the PFA Roadmap is provided in Table 32.

Table 31: District Wise Infrastructure Rollout Plan

Sl.	Circle Name	33 kV line Ckt Kms	11 kV line Ckt Kms	LT line Ckt Kms	33/11 kV S/S No.	33/11 kV S/S MVA	11/0.4 kV S/S No.	11/0.4 kV S/S MVA
Lower Assam Region (LAR)								
1	Guwahati-I	168	385	236	14	230	452	104
2	Guwahati-II	197	71	38	7	90	254	23
3	Rangia	113	804	1,423	10	90	1,241	46
4	Bongaigaon	202	1,351	2,440	5	50	2,537	80
5	Mangaldai	185	748	1,430	5	50	1,267	20
6	Kokrajhar	211	112	68	8	75	243	23
7	Barpeta	132	619	1,471	3	30	1,385	55
	Total LAR	**1,207**	**4,090**	**7,106**	**52**	**615**	**7,379**	**352**
Upper Assam Region (UAR)								
8	Dibrugarh	279	266	66	11	140	252	23
9	Tinsukia	251	1,913	3,080	14	160	2,797	102
10	Sivasagar	191	1,049	1,089	11	110	1,981	69
11	Jorhat	124	282	81	6	70	253	26
12	Golaghat	126	253	5	6	60	65	7
	Total UAR	**970**	**3,762**	**4,321**	**48**	**540**	**5,348**	**228**
Central Assam Region (CAR)								
13	Tezpur	326	697	672	16	155	1,085	50
14	Nagaon	169	616	1,170	5	50	1,452	70
15	Marigaon	39	40	30	3	25	76	8
16	KANCH	106	66	31	5	45	96	8
17	Cachar	75	1,019	542	5	55	1,986	67
18	Badarpur	57	771	1,973	3	26	1,648	54
19	N.Lakhimpur	149	722	1,696	10	90	1,939	82
	Total CAR	**920**	**3,930**	**6,114**	**47**	**446**	**8,282**	**338**
	Total APDCL	**3,096**	**11,783**	**17,540**	**147**	**1,601**	**21,009**	**918**

Table 32: District Wise Electrification Plan of HHs

District	FY16		FY17		FY18		FY19	
	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural
Nagaon	5,764	32,846	12,489	32,846	-	49,270	-	49,270
Dhubri	4,814	30,967	10,429	30,967	-	46,451	-	46,451
Sonitpur	1,694	23,459	3,671	23,459	-	35,189	-	35,189

District	FY16		FY17		FY18		FY19	
	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural
Cachar	4,651	20,189	10,078	20,189	-	30,284	-	30,284
Barpeta	2,136	23,346	4,628	23,346	-	35,019	-	35,019
Kamrup	2,090	16,700	4,528	16,700	-	25,050	-	25,050
Kamrup Metropolitan	6,334	1,926	13,724	1,926	-	2,888	-	2,888
Dibrugarh	1,586	12,415	3,437	12,415	-	18,623	-	18,623
Tinsukia	2,380	9,394	5,157	9,394	-	14,091	-	14,091
Karimganj	1,638	16,181	3,549	16,181	-	24,272	-	24,272
Sivasagar	854	11,424	1,850	11,424	-	17,136	-	17,136
Jorhat	2,239	9,849	4,851	9,849	-	14,773	-	14,773
Golaghat	802	13,229	1,738	13,229	-	19,844	-	19,844
Lakhimpur	1,435	13,093	3,110	13,093	-	19,639	-	19,639
Goalpara	3,348	10,274	7,254	10,274	-	15,411	-	15,411
Baksa	277	13,732	600	13,732	-	20,598	-	20,598
Darrang	803	13,238	1,740	13,238	-	19,858	-	19,858
Morigaon	1,342	12,188	2,908	12,188	-	18,283	-	18,283
Kokrajhar	559	12,939	1,212	12,939	-	19,408	-	19,408
KarbiAnglong	1,571	11,175	3,403	11,175	-	16,762	-	16,762
Udalguri	474	10,682	1,027	10,682	-	16,022	-	16,022
Nalbari	1,251	7,863	2,710	7,863	-	11,794	-	11,794
Bongaigaon	1,620	9,021	3,510	9,021	-	13,532	-	13,532
Hailakandi	545	9,234	1,180	9,234	-	13,851	-	13,851
Dhemaji	857	9,328	1,856	9,328	-	13,992	-	13,992
Chirang	847	6,818	1,836	6,818	-	10,227	-	10,227
DimaHasao	410	2,102	888	2,102	-	3,153	-	3,153
Total	**52,321**	**363,613**	**113,362**	**363,613**	**-**	**545,420**	**-**	**545,420**

6.7. Action Points & Support Required

In line with the proposed distribution plan, the following action points have been identified for respective stakeholders to be able to make suitable arrangements for making adequate power distribution infrastructure rollout in accordance with the requirements of the PFA Roadmap.

Table 33: Action Points & Timelines

Stakeholder	Action Points
State Government	• State Government to arrange for equity component and counter-part funding (for central schemes) in accordance with the investment plan proposed under the PFA Roadmap. • State Government to arrange for timely release of all balance amounts of the already sanctioned funds against the ongoing projects under State schemes, such as TDF-2011-14, State Annual Plan etc.

Stakeholder	Action Points
	• State Government to devise schemes for funding the initial payment required (service connection charges) for poor families in rural areas
APDCL	• Field survey of all 27 districts to physically identify un-electrified HHs to be initiated with immediate effect and completed before December, 2015. • Finalization of DPRs for IPDS and onward submission to nodal agency. • Evaluate introduction of smart meters under the IPDS scheme. • Finalize DPR for system strengthening and augmentation works in the 104 towns not covered under any of the listed schemes and seek funding from financial institutions/ multilateral agencies for the same. If funding arrangement is finalized by December, 2015, works can be taken up during FY17.
Government of India	• Ensure timely approval of sanctioned projects/ cost under IPDS and DDUGJY by September, 2015 to enable APDCL to consider alternative financing arrangements for the left-out amounts, if any. • The Government of India may consider increased allocation to Assam which has more 38 lakh un-electrified consumers to support achievement of the PFA program objectives. • Finalize scope of Phase-2 of the NERPSIP with focus on investment requirements identified under the PFA Roadmap.
PGCIL	• Finalize DPRs under the distribution component of the NERPSIP in consultation with APDCL in accordance with the PFA Roadmap by September, 2015.

7. Renewable Energy Plan

7.1. Renewable energy sector in Assam

The energy requirement of the State of Assam is predominantly fulfilled by thermal (gas based) generating plants and large hydro plants. The role of renewable energy sources like small hydro, solar and biomass etc. in the energy mix of Assam is not significant as of now and the government needs to emphasize on accelerating development of renewable energy resources.

Assam has a modest renewable energy potential in the form of solar, biomass and wind energy. The State's potential from RE sources is given below:

a) Solar – 13.76 GWp

b) Wind – 112 MW

c) Biomass – 165.5 MW

Presently, there is no State policy for promotion of investments in renewable energy projects. The Government of Assam is presently working on developing a policy for encouraging utilities and private players to invest in RE generation in State. Further, MNRE has proposed addition of 688 MW (663 MW solar and 25 MW SHP) in the State from renewable sources by the year 2022.

Assam Electricity Regulatory Commission (AERC) has framed the "Co-generation and Generation of Electricity from Renewable Sources of Energy Regulations, 2009" and "Renewable Purchase Obligation and its Compliance Regulations, 2010" with the objective of promoting renewable energy generation in the State. The prescribed RPO obligation increases from 7.25% FY16 to 8.5% in the FY19.

The AERC is in the process of introducing "Grid Interactive Solar PV Systems Regulations" which would apply on APDCL and electricity consumers and facilitate widespread installation of solar generating units in the State.

Further, as part of the planned 175 GW capacity addition of RE sources in the country, MNRE has targeted 688 MW capacity addition from RE sources till FY 22 for Assam. This includes 663 MW from Solar sources and 25 MW from SHPs. The State Nodal Agency AEDA has proposed capacity addition of 117 MW grid connected roof top solar and 18 mw off-grid roof top solar PV systems by FY 19. The solar PV capacity additions are a part of the 250 MW solar capacity addition target of the State under the 40,000 MWp national Grid Connected Solar Rooftop Systems target of MNRE. The State utilities and AEDA would have to prepare plans to meet these capacity addition targets by FY 22.

The following sub-sections of this chapter elaborate on the RE generation related plans of various agencies in the State.

7.2. APDCL's Action Plan

APDCL has planned to set-up RE projects with proposed capacities totaling over 113.23 MW over the next five years. These projects are expected to include, grid connected solar PV plant, solar rooftops, solar street lightning system, solar wind hybrid, off grid solar application for rural electrification etc. as outlined in Table 35.

APDCL's proposed schemes include the following off-grid electrification related applications of solar energy:

a) Installation of nearly 2,500 off-grid standalone solar street lighting system (200 Wp) at important towns/ historical locations, with Government of Assam's funding support of Rs. 22.50 Crores.

b) Promotion of solar wind hybrid systems with a target to install 0.9275 MW over the next five years period, at an estimated capital outlay of Rs. 23.33 Crores, from Govt. of Assam.

c) Promotion of solar pump-sets for agriculture/ micro irrigation in the State under MNRE scheme with a target to install 150 pump-sets over for the next five years period, with Central Financial Assistance (CFA) of nearly 30% from MNRE.

d) Electrification of un-electrified and remote villages/ hamlets through DDG under, RGGVY/DDUGJY. A total of 75 remote un-electrified villages/ hamlets covering 6,881 HHs are proposed to be electrified under DDG projects. This would require 90% CFA amounting to Rs. 47.25 crores from MNRE, GOI and 10% assistance amounting to Rs. 5.25 crores from Government of Assam.

In addition to the above off-grid applications, following grid connected solar interventions are planned to be pursued by APDCL:

a) Solar grid interactive system to be setup in government buildings, educational institutions in rural and semi-urban areas ranging from 5 kW to 50 kW. 1 MW of Solar Grid interactive systems are proposed to be installed every year. This would require 90% central financial assistance, amounting to Rs. 66.50 crores from MNRE, GOI and 10% financial assistance amounting to Rs. 7.39 crores from Government of Assam.

b) APDCL is planning to develop 25 MW aggregate capacity of grid connected solar power plant at an identified vacant land with the support of State Government. This would require an investment of Rs. 153 Crores from Govt. of Assam.

c) APDCL has planned to buy 80 MW power from grid connected solar power plant through IPPs in the state of Assam during the next five years.

d) APDCL is also planning to develop 50 MW grid connected solar power plant under the Viability Gap Funding (VGF) mechanism of MNRE. It is proposed to develop the utility scale project with support of Solar Energy Corporation of India (SECI). Solar power developers would be responsible for acquiring the land required for setting up the projects within the State and obtaining the necessary clearances required for setting up the projects. Further details are provided in Table 34.

Table 34: Solar grid connected projects

Proposed Scheme	Category of the Project	Proposed Capacity per site	No's	Total Proposed Capacity	Proposed VGF	Total proposed VGF (Rs. Crs.)
50 MW Grid Connected Solar PV power projects under Viability Gap Funding	Open category	10	4	40	Rs. 1.0 Crs./MW	40
	Domestic Content Requirement (DCR)	10	1	10	Rs. 1.31 Crs./MW	13.1
	Total			50		53.1

Table 35: APDCL RE Development Plan (MW)

Sl	Proposed Scheme	FY 16	FY 17	FY 18	FY 19	FY 20	MW
1	Installation and Promotion of 25 MW aggregate capacity of Grid connected solar photovoltaic power plant at different vacant land of APDCL with capacity ranging from 1 MW to 5 MW	5	5	5	5	5	25
2	Grid interactive Rooftop/Ground mounted SPV Power Plant (With battery backup) at important Govt. buildings of Assam with capacity ranging from 5 kW to 50 kW	1	1	1	1	1	5

Sl	Proposed Scheme	FY 16	FY 17	FY 18	FY 19	FY 20	MW
3	Illumination of important towns/historical locations of Assam through 200 Wp Stand Alone Solar Street Lighting system	0.1	0.1	0.1	0.1	0.1	0.5
4	Installation of 1 MW aggregate capacity of Solar Wind hybrid System with capacity ranging from 600 Wp to 10 kW	0.1055	0.2055	0.2055	0.2055	0.2055	0.9275
5	Installation & Promotion of 150 nos. of Solar Water pumping system for irrigation @ 2 HP Pump	0.06	0.06	0.06	0.06	0.06	0.3
6	Electrification of **75 nos. of** remote villages through Solar PV based power plant under DDG of RGGVY	0.3	0.3	0.3	0.3	0.3	1.5
7	Setting up 80 MW Grid Connected Solar Power Plant through IPP in BOO Mode	0	20	20	20	20	80
	Total	**6.566**	**26.666**	**26.666**	**26.666**	**26.666**	**113.228**

Table 36: Status of various non-solar RE sources of APDCL

Plant	Capacity (MW)	Status
Hyden Hydel SHEP	4.05	Commissioned
Pohmura SHEP	2	PPA Signed – Not yet commissioned
NewGen Bio	1.6	Under Process of commisisoning
Cleanopolis Energy Systems Bio gas	2.4	Tariff Fixed; Not yet Commisioned
Amrit Bio-mass	10	Tariff Fixed; not yet commissioned
Bordikorai SHEP	4.7	Scrapped by GoA due to environmental issues

In addition to the solar plan, APDCL has signed PPA's with various non-solar RE developers in the State totalling 24.75 MW. These plants are in various stages of development as detailed out in Table 36.

7.3. AEDA 's Action Plan

The Assam Energy Development Energy (AEDA) acts independently as the nodal agency for new and renewable sources of energy under the Ministry of New and Renewable Energy, Govt. of India for the state of Assam. As per the latest MNRE letter no DO .03/13/2015-16/GCRT dated. 30th June 2015 targets for RE generation is provided for Assam and accordingly the targets in Table 38 have been fixed by AEDA for implementation in the State.

7.4. APGCL's Action Plan

Solar Based Projects

APGCL has planned to undertake implementation of the following Solar PV Projects:

Table 37: APGCL's Solar Project

Project Name	Capacity (MW)	Status
Namrup Solar PV Project	2	DPR under preparation
Lakwa Solar PV Project	2	DPR under preparation
Amguri Solar PV Project	60	Draft DPR prepared and is under review

APGCL would be able to finalize the implementation schedule for the above projects on finalization of DPRs and its ability to secure funding arrangements, including capital subsidies, from the central and State governments.

Small Hydroelectric Projects (SHP)

In addition to harnessing solar energy, the APGCL has planned for developing SHPs in the State. The small Hydro Power Policy notified by the State Government includes 90 potential small hydro generating stations ranging from 0.1 MW to 20 MW (totaling to 148.50 MW), in different parts of the State. However, out of the 148.50 MW only 91.5 MW has the proven potential for small hydro power as per recent investigations carried out. These will be developed through IPPs/ User Societies while the State generation utility is considering additional small hydro based projects outlined in **Table** 38

The overall investment plan for RE projects in the State is as outlined in Table 40.

APDCL's total investment requirement for the proposed projects is around Rs. 1,134.21 Crs. out of which Rs 800 Crs.is expected to come from private investors, whereas the remaining amount is proposed to be invested by the State (Rs 217.76 Crs.) and Central Government (Rs 116.45 Crs.).
Fund requirement for achievement of AEDA's action plan for rooftop solar have been estimated using Rs.9 Crs. per MW as capital cost. Using this, the total fund requirement for AEDA's plan is about Rs. 1,215 Crs.

7.5. Action Plan & Support Required

The interventions from State and Central government as shown in Table 41 are required to materialize the above RE plan and ensure a sustainable development of the sector as one of the objectives of 24X7 PFA program.

Table 38: AEDA Solar Targets

Particulars	FY 16	FY 17	FY 18	FY 19	FY 20
Grid Connected Rooftop Solar PV	2	10	30	35	40
Off Grid Rooftop Solar	1	2	4	5	6

Table 39 : APGCL's Action Plan for Hydro Power

Sl.	Project Name	Capacity (MW)	Status
1	Myntriang Small Hydro Electric Project - (3 units each of 3 MW & 1.5 MW)	13.5	Commercial operation of 3 MW St-II Project started on 08/08/2014. Balance capacity of 10.5 MW expected by December, 2015.
2	Lungnit Small Hydro Electric Project	6	Project work started in 2009 but was suspended soon due to contractual issues. Selection of new EPC contractor is pending due to high bid value
3	Borpani Middle St-I	21	DPR under preparation.
4	Borpani Middle St-II	24	DPR has been approved by APGCL Board on 03-12-14.
5	Borpani Barrage Toe Project	12	DPR under preparation.

Table 40: RE Plan Fund Requirement

Proposed Scheme	1st Year	2nd Year	3rd Year	4th Year	5th Year	Total
APDCL RE Plan Investment	64.84	267.34	267.34	267.34	267.34	1134.21
APGCL RE Plan Investment (With estimated Project cost of Lungnit SHP, NTPS & LTPS Solar PV Projects, Borpani Middle-II SHEP and excluding Project Cost of Amguri Solar PV)	0.00	125.64	76.61	82.53	72.71	489.04
Fund Requirement for AEDA's roof top solar plan	27	108	306	360	414	1215

Table 41: Action Points & Timelines

Stakeholder	Action Points
State Government	• Support RE plan through plan fund outlays to meet the balance amount apart from the subsidy received from GOI. • To consider sanctioning the 25 MW grid connected solar power plant at the vacant land of APDCL and provide plan fund outlay (at Rs. 6.12 Crs./MW), so that the said project can be implemented within the stipulated time. • Declaration of solar tariff for 25 MW State based projects.
Government of India	• To consider sanctioning the 5 MW Grid interactive Rooftop SPV Power Plant at 90% capital subsidy & 150 nos. of 2 HP Solar Water Pump at 30% capital subsidy, so that the project can be implemented within the stipulated time period. • To consider sanctioning the 1.5 MW solar based power plant for the electrification of 75 remote villages at 90% capital subsidy, so the project can be implemented with the stipulated time period. • Sanction of VGF from MNRE for development of 50 MW Grid Connected Solar PV Power Projects to the tune of Rs. 1.0 Crs./ MW for open category and Rs. 1.31 Crs./ MW for DCR category (Total Rs. 53.1 Crs for 50 MW) may be provided to SECI for development of the said project.
APDCL/AEDA/APGCL	• To develop plans for addition of another 688 MW of solar installations in the State as outlined in the 175 GW plan of MNRE within 3 months . Further, the State utilities will need to review the demand and supply position considering the additional solar power.

8. Energy Efficiency Plan

8.1. Energy Efficiency Plan

The State set a target of 10% reduction in peak demand through adoption of DSM/ EE measures. APDCL EE Wing has identified the interventions shown in Table 42

8.2. Proposed schemes

Domestic Efficient Light Programme (DELP) for the State of Assam

The Domestic Efficient Lighting Programme (DELP) seeks to promote high quality LED lighting in the domestic sector by overcoming the high initial/ entry cost barrier. DELP will enable sale of LED bulbs from designated places at a cost that is much less than the market price of Rs.400-500 as replacements of Incandescent Lamps (ICLs) and Compact Fluorescent Lamps (CFLs). As per the load research study conducted, it involves provision of distribution of about 42 lacs of LED lamps to the domestic grid connected HHs in the State and is expected to reduce peak demand by about 40 MW and annual energy savings of the State by about 65 MUs. However, the actual savings is a function of variables such as appliance penetration, appliance density, running hours. The saved energy can be sold to cross subsidizing consumers like industrial and commercial units, which will provide additional revenue stream to APDCL.

APDCL has secured funds of Rs. 2 Crs. for execution of a restructured DELP program for the State. In this program it is proposed that APDCL will buy the LED lights from EESL at pooled bidding price and distribute the bulbs to consumers through its subdivisions at a price which recovers the costs of distribution of LED bulbs.

Municipal DSM Programme

LED Based Street Light Programme (MuDSM) seeks to replace all the conventional HPSV lights with LED fixtures. Guwahati is planned to be covered in the first phase. In Guwahati, replacing of all the present street lights with LED fixtures would lead to an annual savings of 3.91 MU and is expected to reduce the peak demand by 0.85 MW. In second phase, the Government of Assam has proposed 5 others cities namely 1. Silchar, 2. Dhurbri, 3. Dibrugarh, 4. Tezpur and 5.Jorhat for the replacement of all conventional lights with LED Lights. The proposal for these cities is being examined. Details of MuDSM project in Guwahati is provided in Table 43.

Table 42: Year wise EE Plan for Assam

Year	Interventions
FY 16	•100% LED installation in Bijulee Bhawan •Set up of LED distributing kiosks/teller machine Replacement of the conventional street lights with LED street lights. •DSM in new service connection and add message in electricity bill. •Super-efficient fans program phase I. •Solar panel for charging of invertors. •DSM interventions for Substations illumination. •

Year	Interventions
FY 17	• Super-efficient fans phase II. •Awareness programs for Domestic consumers •Awareness program for builders about ECBC. •Conversion of conventional lights to LED lights in all government office
FY 18	•DSM interventions for Industrial consumers •Super-efficient fans phase III •DSM interventions for commercial consumers

APDCL has proposed Kiosks to sell the energy efficient LED lights through their customer care units of different locations at a concessional rate to its consumers. This will increase the use of LED lights which will lead to reduced power consumption. APDCL has awarded the contract to three private LED manufactures & one government party to ensure competitive rates.

As per load survey report penetration of ceiling Fan is 96%, APDCL is working on a DSM plan for super-efficient fans which will reduce the energy consumption by 50% for conditioning by fans.

8.3. Potential savings

The Load Research and Analysis project has been concluded and the peak load reduction and energy savings have been assessed to be about 200 MW and more than 750 MUs respectively.

8.4. Action Plan

The Load Research and Analysis project has been concluded and the DSM action plan is underway. The proposed rollout plan developed by APDCL is outlined in Table 42

The State has proposed investment of Rs 20 Crs. Per year for DSM and Energy Efficiency measures. The proposed source of funding is shown in Table 44.

Table 43: Details of MuDSM Scheme in Guwahati

Particulars	Estimates
No. of Street lights	11,148
Total Energy Consumption (Conventional street lights)	6.36 (MU)
Projected energy savings	3.91 (MU)
Total project cost	10 Crs.
Upfront investment by State govt/ GMC	Nil
Upfront investment by EESL	10 Crs.

Table 44: Proposed Fund requirement (Rs Crs.)

	FY16	FY17	FY18	FY19
APDCL Own Source	10	10	10	10
Govt. of Assam	10	10	10	10
Total Fund Requirement (Rs Crs.)	**20**	**20**	**20**	**20**

9. Financial Position of utilities

9.1. Introduction

Post unbundling in 2004, the financial position of utilities of Assam have not seen significant improvement and they continue to reel under financial losses. This is mainly on account of regulatory disallowances arising out of non-achievement of stipulated T&D loss trajectory by the distribution company. Amongst all three utilities, the AEGCL has been relatively better-off with accumulated losses limited to Rs.162.7 Crs. till FY13.

The State Government has intervened from time to time to provide financial support, by way of revenue subsidy. APDCL is working on a financial restructuring plan to improve the financial performance of the utility.

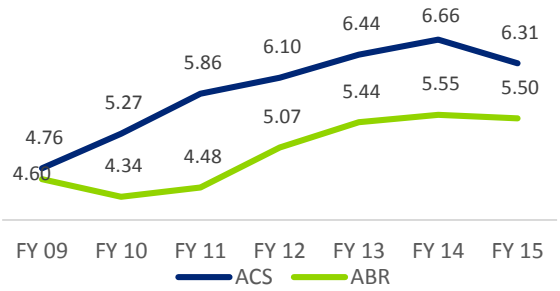
In comparison to average AT&C losses of the other states in North East region APDCL has low AT&C loss levels. In the latest (2015) rankings published by PFC APDCL has been rated as "B" by ICRA which is essentially due to its below average operational and financial performance. The following sub-sections discuss the existing as well as projected financial position of APDCL, considering the impact of PFA program.

9.2. Commercial Viability

Commercial viability of power sector largely depends on the performance of APDCL as the performance the transmission and generation utilities depend on APDCL's technical and commercial performance.

APDCL's commercial and financial performance may be observed by the gap between the average cost of supply and realization. As can be seen in Figure 17, the gap has increased from Rs.0.16/ kWh in FY09 to Rs.1.11/ kwh in FY14.

Figure 17: ACS vs ABR (As per APDCL)



It is pertinent to mention that the regulator has allowed only 21.60%, 20.60% and 19.60% as T&D loss over the three years period ending FY13, as against actual T&D losses of 25.44%, 26.59% and 25.85%. It may be noted that in FY09 APDCL was able to reduce losses to the Commission approved value but with ongoing implementation of RGGVY, large no. of rural BPL consumers have been inducted in the network. Total number of BPL consumers as on March 2015 stands at more than 11 lakhs against only 78,000 at the beginning of FY09.

In the context of tariff revisions, it may be noted that there was no tariff hike till FY11 which shows the sensitivity of tariff in the perspective of the State.

It is evident that commercial viability of the utility is directly linked with the adequacy of the tariff. Inadequate tariff results in concurrent reduction in liquidity of the utility thereby restricting the R&M expenditure leading to increase in T&D loss.

Table 45: Summary of Regulatory highlights

Year	Regulatory Highlights
FY09	No tariff hike.
FY10	Tariff effective from July'09
FY11	No tariff hike.
FY12	Tariff effective from 24th May, 2011. ARR for the MYT 10-13 is approved with a loss of Rs. 258 Crore.
FY13	No tariff hike
FY14	Tariff effective from December, 2013 with regulatory assets worth Rs. 291.09 Crore consequent to Truing Up proceeds from FY08 to FY11 pending for adjustment in subsequent periods.
FY15	Tariff effective from December, 2014 with allowance of recovery for outstanding Regulatory assets worth Rs. 496.22 Crore up to Truing Up proceeds till to FY13with Rs. 100 Crore pending adjustment in subsequent period. Rs. 56.96 Crore was also allowed as Carrying cost.

Looking forward, the utility has planned for significant reduction in AT&C losses. As can be seen in Figure 18, the AT&C losses are expected to reduce from 20% in FY16 to 18.15% in FY19.

During the period from FY16 to FY19, owing to significant planned electrification, the volume of energy handled is expected to grow nearly 1.7 times from 8,527 MUs in FY15 to 13,967 MUs in FY19. As the energy handled increases, the AT&C loss level approved and achieved will be a key factor in ensuring commercial viability of the utility and non-achievement of the AT&C loss targets will lead to incremental financial burden on the utility.

Figure 18 Energy Input (MU) v Losses

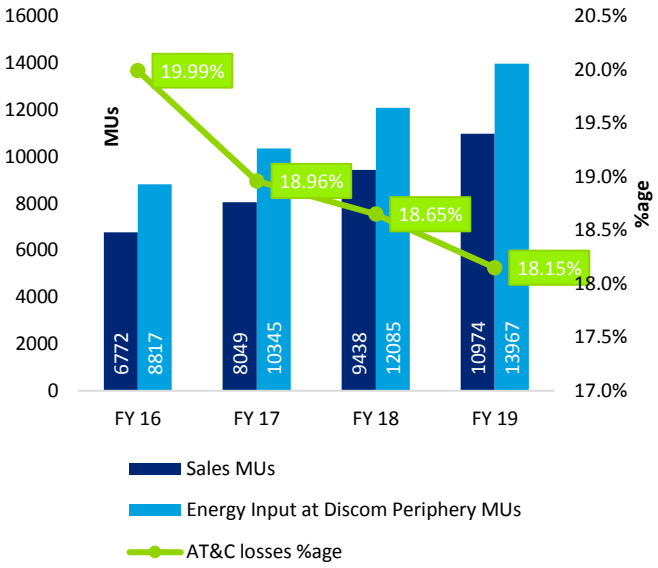
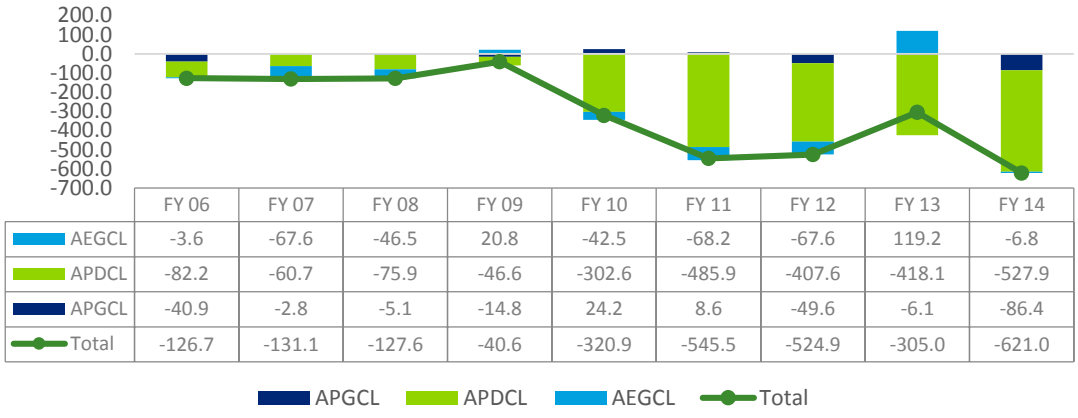


Figure 19: Financial Losses of Utilities (Rs. Crs.)



	FY 06	FY 07	FY 08	FY 09	FY 10	FY 11	FY 12	FY 13	FY 14
AEGCL	-3.6	-67.6	-46.5	20.8	-42.5	-68.2	-67.6	119.2	-6.8
APDCL	-82.2	-60.7	-75.9	-46.6	-302.6	-485.9	-407.6	-418.1	-527.9
APGCL	-40.9	-2.8	-5.1	-14.8	24.2	8.6	-49.6	-6.1	-86.4
Total	-126.7	-131.1	-127.6	-40.6	-320.9	-545.5	-524.9	-305.0	-621.0

The financial losses of all utilities put together, for FY14 have been around Rs. 621 Crs., majority (~85%) of which are attributable to APDCL alone. The losses of Generation Company are a result of disallowances in fuel cost on account of lower approved SHR than design SHR of LTPS and NTPS..

Regulatory disallowances combined with operational constraints have deteriorated the financial health of the utilities in the State. This can be seen from the fact that as of FY 14 the utilities have outstanding payments of State Government Loans of around Rs. 1285 Crs. including interest. This includes long outstanding (as on FY14) GoA loans since 2005-06 of Rs. 298.08 Crs. and additional support of Rs. 346 Crs. for payment of supplementary power purchase bills of CGS (NEEPCO, NTPC and NHPC).

With the substantial capital expenditure planned by utilities in the State, as discussed in previous chapters, achieving the 24X7 PFA Program objectives is expected to have a significant impact on the financial position of the utilities. Although the projected AT&C loss reduction trajectory may provide some room for covering the associated costs, adjustment in tariff or support from State/ central government may be required to ensure the financial viability of utilities. The following sub-section discusses the impact of PFA on the financial position of utilities.

State Government of Assam has intervened from time to time to help the State utilities and provided financial support to facilitate additional procurement of power, thereby mitigating the supply demand gap to serve the end consumers properly. In addition to the financial support, Govt. of Assam also provides targeted subsidy for a specific set of consumers as tariff subsidy. It has provided Rs. 200 Crs.in the FY 2013-14 (Rs. 100 Crs. adjusted against regulatory assets and balance as targeted subsidy) Rs. 309 Crs. in the FY 2014-15 of which only Rs. 274 Crs. was released during the year and in the current year as well there is a provision of Rs. 361.8 Crs.as per the State budget.

9.3. Financial Projections

Assumptions outlined in Table 46 form the basis for projection of impact of PFA on financial position of APDCL.

Table 46: Assumptions for financial projections

Particulars	Assumptions
Power purchase	• The firm allocation from the Central Generating Stations shall remain stable at current levels (July 2015) over the period of projection (FY 16 to FY19) • Commissioning of new plants in state sector assumed as per State's projections • Commissioning of new plants of central sector as per CEA's monitoring reports
Power Purchase Rate	• The following assumptions are based on discussions with APDCL) • The present stations have been projected at current PP Rate as per the tariff petition of APDCL • New hydro stations of NEEPCO are projected at Rs. 3.5/Unit • Short term power purchase rate Rs. 3.5 / unit • Medium term power purchase rate Rs. 4.5/Unit • NTPC BTPS projected at Rs. 4.5/ unit • Bhutan Hydro Power Purchase rate Rs. 3.95/Unit including PTC margin • Composite RE Power purchase rate Rs. 5.5/unit • Transmission charges: CTU charges (Rs. 328107/MW/month) at average demand of 900 MW escalated at 10% per year, BST of 0.2 Rs/unit, STU Charges Rs. 161 Crs. • Additional component of Rs. 70 Crs. in FY 17 to FY 19 to reflect the revision of pay of STU and Genco.
Tariff	• Domestic Tariff 3.87 Rs./ kWh (FY 15 sales data) • Other than domestic tariff 7.03 Rs./kWh (FY 15 sales data)

<table>
<tr><th>Particulars</th><th>Assumptions</th></tr>
<tr><td>Other income</td><td>• Escalated at 5% based on FY 15 value</td></tr>
<tr><td>Sales growth</td><td>• Sales growth of domestic consumer is as per projections in Power Supply Scenario (Chapter 4)
• Energy sales growth of other than domestic consumers is considered at highest CAGR of last 5 years growth rate to account for natural growth and additional growth due to availability of 24x7 power.
• Additional 5% growth considered for Industrial and Tea garden categories
• Effective growth rate considered is given below:
<table>
<tr><th>Category</th><th>Highest 5 years CAGR (%)</th><th>Additional growth expected (%)</th><th>Growth Rate considered (%)</th></tr>
<tr><td>Commercial</td><td>11.5%</td><td>0%</td><td>11.5%</td></tr>
<tr><td>Ind LT</td><td>5.4%</td><td>5%</td><td>10.4%</td></tr>
<tr><td>Ind HT</td><td>11.7%</td><td>5%</td><td>16.7%</td></tr>
<tr><td>Tea</td><td>2.6%</td><td>5%</td><td>7.6%</td></tr>
<tr><td>Others</td><td>6.9%</td><td>0%</td><td>6.9%</td></tr>
</table></td></tr>
<tr><td>Losses (%)</td><td>• Losses projections as per following trajectory:
<table>
<tr><th></th><th>FY16</th><th>FY17</th><th>FY18</th><th>FY19</th></tr>
<tr><td>AT&C Loss (%)</td><td>20%</td><td>19%</td><td>18.7%</td><td>18.2%</td></tr>
<tr><td>Intra State transmission loss</td><td>4%</td><td>4%</td><td>4%</td><td>4%</td></tr>
</table></td></tr>
<tr><td>Capex& capitalization</td><td>• Capex as per budgeted plans and requirement to fulfill PFA targets of APDCL
• 100% Capitalization within two years (60% in first year and 40% in second year)</td></tr>
<tr><td>Employee cost, R&M, A&G costs</td><td>• Employee cost: Based on employee cost for FY15 with an escalation of 10% for p.a over the period of projection (FY 17 to FY19). 20% escalation for FY 17 to reflect the proposed revision of pay of employees.
• A&G cost: Based on A&G cost for FY15 with escalation of 6% p.a over the period of projection (FY 16 to FY19)
• R&M cost:
– For existing assets: Based on the actual R&M cost as percentage of GFA (Past 2 years Average has been considered)
– For New Assets – 1% of GFA</td></tr>
<tr><td>Depreciation</td><td>• For existing assets: Based on the existing rate of depreciation
• For new assets: Based on AERC rate of 5.28%p.a.</td></tr>
<tr><td>Funding of capex</td><td>• Debt : Equity ratio as per the submission of APDCL where project wise debt to equity ratio has been considered to arrive at weighted average ratio
• Repayment schedule of 10 years
• Debt to Equity ratio assumed at 70:30 under no grants scenario</td></tr>
<tr><td>Working capital and cash deficit loan</td><td>• Working capital as per regulatory provisions
• Working capital loan assumed at 13.5% (Bank Base rate + 350bps)
• Cash deficit during the year is assumed to be funded from short term loan @ 13.5%p.a.</td></tr>
<tr><td>Other income</td><td>• Based on values for FY15 with escalation of 5% p.a over the period of projection (FY 16 to FY19</td></tr>
<tr><td>Regulatory parameters</td><td>• No disallowance in power purchase or any other cost element.
• Subsidies continue to be available to APDCL at existing level
• No regulatory assets of past have been considered</td></tr>
</table>

9.4. Base Case: Grants available as per the projections of the State utility

The State utility has prepared capex plans according to the need and adequacy of network for achieving the HH electrification and consumption targets set under the 24X7 PFA roadmap for the State. The schemes prepared by APDCL are proposed to be funded by Central Government, State Government and Multilateral Banks. In the base case it is assumed that the funds will be available as projected

and APDCL will be able to secure the grants as expected in the capital expenditure plan.

Considering the above assumptions, the impact of PFA program on the overall financial health of the sector can be gauged from the increase in tariff due to incidental power purchase and additional capital expenditure to be incurred by APDCL. The details of additional capital expenditure, sources of funding and incidental costs of such expenditure are provided in Table 47. The impact of capital expenditure incurred by AEGCL has been considered as part of power purchase cost. The parameters for formulating the base case have been shown in Table 48.

Table 47: Impact of Asset Additions for APDCL (Rs. Crs.)

Particulars	FY16	FY17	FY 18	FY 19
Capital expenditure	2,021	2,730	2,244	2,631
Grants	967	1,360	1,201	1,428
Debt	784	1,022	736	846
Equity	270	348	307	357
Incidental Cost of Capital expenditure due to PFA				
Depreciation on new assets	208	274	336	396
Interest on debt – corresponding to PFA capex	56	134	198	241
Return on equity - corresponding to PFA capex	21	69	120	171
Total capex related Cost	285	477	653	808

Table 48: Parameters for Base Case

Particulars	Units	FY 16	FY 17	FY 18	FY 19
Energy Balance					
Sales	MUs	6,772	8,049	9,438	10,974
Savings due to EE/DSM	MUs	0.39	0.78	1.96	3.91
AT&C losses	%age	20.0%	19.0%	18.7%	18.2%
Energy reqd. at Discom Periphery	MUs	8,464	9,932	11,601	13,408
Intra State Transmission Losses	%age	4.0%	4.0%	4.0%	4.0%
Energy reqd. at State Periphery	MUs	8,817	10,345	12,085	13,967
Revenue & expenditure parameters					
Tariff Increase	%age	0.0%	0.0%	0.0%	0.0%
Collection efficiency	%age	100%	100%	100%	100%
Average billing rate - Domestic	Rs./kWh	3.87	3.87	3.87	3.87
Average billing rate - Other than domestic (weighted avg.)	Rs./kWh	7.03	7.03	7.03	7.03
Employee cost escalation	%age	10%	20%	10%	10%
A&G cost escalation	%age	6%	6%	6%	6%

Table 49: Impact on tariff due to PFA

Particulars	Formula	FY 16	FY 17	FY 18	FY 19
Additional recovery due to incremental energy sales (Rs. Crs.)	A	598	1,203	1,867	2,605
Incremental power purchase cost (inc. transmission charges and incremental transmission cost due to PFA program (Rs. Crs.)	B	1,192	2,021	2,805	3,635

Particulars	Formula	FY 16	FY 17	FY 18	FY 19
Add: Cost related to capital expenditure (interest, depreciation and equity return, Rs. Crs.)	B1	285	477	653	808
Gap of additional cost and additional recovery	C=(B+B1-A)	880	1,294	1,592	1,839
Energy sales (MU)	D	6,772	8,049	9,438	10,974
Impact on tariff (Rs./kWh)	**CX10/D**	1.30	1.61	1.69	1.68

It can be observed from Table 49, the likely impact on tariff increases from Rs.1.30/kWh in FY16 to Rs.1.68/kWh in FY19 as the share of domestic sales increase from 47% in FY15 to 60% in FY19. Although there is an annual increase of nearly 11.0% in the other than domestic energy sales from FY15 to FY19, the estimated average annual increase in domestic sales during the same period is projected at nearly 26%. The burden due to tariff impact is either required to be passed on to the consumers by way of tariff increase or may be compensated by way of government subsidies. Such subsidy support shall be required in addition to the various grants provided under the central and State government schemes to fund the expansion of T&D network.

Figure 20 Projected Revenue and Profit for APDCL (Rs. Crs.)

As a base case with underlying assumptions discussed in section above and considering that the T&D loss reduction targets are achieved, the financial position of utility has been projected in following tables. It is important to note that the financial projections are developed considering that while approving the ARR, the SERC would consider the AT&C loss trajectory proposed by APDCL in this roadmap and any increase in power purchase cost will be passed through completely.

As can be seen in Figure 20 Projected Revenue and Profit for APDCL (Rs. Crs.) the increase in domestic energy consumption may lead to reduction in average billing rate, thus leading to increase in annual losses of the utility. The summarized profit and loss statement of the utility for the projected period are presented in table 50.

Table 50: Projected P&L statement in Base Case (Rs. Crs.)

Particulars	FY16	FY17	FY18	FY19
Revenue				
Revenue from Sale of Power within State	3,634	4,240	4,903	5,639
Others	490	514	540	567
Total revenue	4,124	4,754	5,443	6,206
Expenditure	**-**	**-**	**-**	**-**
Power Purchase cost	4,136	4,965	5,749	6,579
O&M Cost	**824**	**982**	**1,081**	**1,188**
Employee cost	705	847	931	1,024

Particulars	FY16	FY17	FY18	FY19
A&G Expenses	35	37	39	41
R&M Expenses	84	99	111	122
EBIDTA	(836)	(1,193)	(1,388)	(1,561)
Depreciation	264	329	391	451
Interest and finance charges	296	391	469	597
PBT	**(1,396)**	**(1,914)**	**(2,249)**	**(2,610)**
Provision for tax	-	-	-	-
PAT	(1,396)	(1,914)	(2,249)	(2,610)

Table 51: Cash Flow Statement

Cash Flow Statement		FY 16	FY 17	FY 18	FY 19
Cash from Operations					
Revenue	Rs. Crs.	4,124	4,754	5,443	6,206
Operating Costs	Rs. Crs.	(4,960)	(5,947)	(6,830)	(7,767)
Increase in Short term capital requirements	Rs. Crs.	(156)	(124)	(106)	(105)
Tax	Rs. Crs.	-	-	-	-
Net Cash from Operations		**(992)**	**(1,317)**	**(1,494)**	**(1,666)**
Cash from Investment Activities					
Capex	Rs. Crs.	(1,054)	(1,370)	(1,043)	(1,203)
Net Cash from Investment Activities	**Rs. Crs.**	**(1,054)**	**(1,370)**	**(1,043)**	**(1,203)**
Cash from Financing Activities	-				
Equity Investments	Rs. Crs.	270	348	307	357
Debt Drawn	Rs. Crs.	784	1,022	736	846
Loan Repayment	Rs. Crs.	(255)	(357)	(431)	(515)
Increase in working capital loan	Rs. Crs.	156	124	106	105
Payment of past current liabilities	Rs. Crs.	-	-	-	-
Grants	Rs. Crs.	967	1,360	1,201	1,428
Interest on cash deficit loan	Rs. Crs.	-	-	-	(70)
Interest on Loans	Rs. Crs.	(230)	(308)	(372)	(416)
Interest on Working Capital Loan	Rs. Crs.	(66)	(83)	(97)	(111)
Net Cash from Financing Activities		**1,626**	**2,105**	**1,449**	**1,624**
Net Cash Balances					
Cash BF	Rs. Crs.	2,300	1,880	1,298	210
Cash Flow during the year	Rs. Crs.	(420)	(582)	(1,088)	(1,246)
Cash	Rs. Crs.	**1,880**	**1,298**	**210**	**(1,035)**
Cash CF to balance sheet - post deficit loan	**Rs. Crs.**	**1,880**	**1,298**	**210**	**-**

The base case analysis reveals that the utility is likely to become cash deficit due to increasing pressure of debt. Further, it is evident that timely tariff hike, availability of grants for capital projects and achievement of estimated AT&C loss targets are essential for APDCL to become viable by FY19.

Any change in tariff or under achievement of AT&C loss trajectory considered for the base case or non-availability of funding in form of grants will translate into additional impact on the financial position of the utility. Therefore, an analysis of following three scenarios has been carried out:

9.5. Scenario Analysis

a) Tariff hike required in base case for profitability
b) Non-Availability of grants for approved projects
c) Under achievement of AT&C loss targets
d) Adjustment of outstanding dues against accumulated loss

Scenario 1: Tariff hike required in base case for profitability

This scenario analysis reveals that the utility will be able to sustain its profitability provided there is tariff hike of around 9.8% YoY and it is able to achieve the set AT&C loss targets. In this case, it is expected that the impact on tariff will decrease vis-à-vis the base case. Due to the tariff hike the revenue from sale of power shows improvement in FY 19 (Rs 8,196 Crs. as compared to Rs. 5,639 Crs. in base case), the PAT shows improvement at Rs. 9 Crs. in FY 19 vis-à-vis loss of Rs 2,610 Crs. in FY 19 under base case, thus emphasizing the impact of annual tariff hike on the overall financial health of the utility. The cash flow statement suggests that the utility will be able to sustain cash surplus status.

In this case it is expected that the impact on tariff will decrease vis-à-vis the base case, as summarized in the following tables

Table 52: Parameters for Scenario 1 (Tariff Hike)

Particulars	Units	FY 16	FY 17	FY 18	FY 19
Energy Balance					
Sales	MUs	6,772	8,049	9,438	10,974
Savings from EE/DSM	MUs	0.39	0.78	1.96	3.91
AT&C losses	%age	20.0%	19.0%	18.7%	18.2%
Energy reqd. at Discom Periphery	MUs	8,464	9,932	11,601	13,408
Intra State Transmission Losses	%age	4.0%	4.0%	4.0%	4.0%
Energy reqd. at State Periphery	MUs	8,817	10,345	12,085	13,967
Revenue & expenditure parameters					
Tariff Increase	%age	9.8%	9.8%	9.8%	9.8%
Collection efficiency	%age	100%	100%	100%	100%
Average billing rate - Domestic	Rs./kWh	4.25	4.67	5.12	5.63
Average billing rate - Other than domestic (weighted avg.)	Rs./kWh	7.72	8.47	9.30	10.22
Employee cost escalation	%age	10%	20%	10%	10%
A&G cost escalation	%age	6%	6%	6%	6%
Capital expenditure funding					
Capital expenditure	Rs. Crs.	2,021	2,730	2,244	2,631
Grants	Rs. Crs.	967	1,360	1,201	1,428
Debt	Rs. Crs.	784	1,022	736	846
Equity	Rs. Crs.	270	348	307	357

Table 53: Impact on tariff - Scenario 1 (Tariff Hike)

Particulars	Derivation	FY 16	FY 17	FY 18	FY 19
Additional recovery due to incremental energy sales (Rs. Crs.)	A	656	1,451	2,472	3,786
Incremental power purchase cost (inc. transmission charges and incremental transmission cost due to PFA program (Rs. Crs.)	B	1,192	2,021	2,805	3,635
Add: Cost related to capital expenditure (interest, depreciation and equity return, Rs. Crs.)	B1	285	477	653	808
Gap of additional cost and additional recovery	C=(B+B1-A)	821	1,047	987	657
Energy sales (MU)	D	6,772	8,049	9,438	10,974

Impact on tariff (Rs./kWh)	CX10/D	1.21	1.30	1.05	0.60

Table 54: Profit and loss statement (Rs. Crs.) - Scenario 1 (tariff hike)

Particulars		FY16	FY17	FY18	FY19
Revenue from Sale of Power	Rs. Crs.	3,990	5,112	6,490	8,196
Others	Rs. Crs.	490	514	540	567
Total revenue	**Rs. Crs.**	4,480	5,626	7,030	8,763
Expenditure		-	-	-	-
Power Purchase cost	Rs. Crs.	4,136	4,965	5,749	6,579
O&M Cost	**Rs. Crs.**	**824**	**982**	**1,081**	**1,188**
Employee cost	Rs. Crs.	705	847	931	1,024
A&G Expenses	Rs. Crs.	35	37	39	41
R&M Expenses	Rs. Crs.	84	99	111	122
EBIDTA	**Rs. Crs.**	(480)	(322)	199	996
Depreciation	Rs. Crs.	264	329	391	451
Interest and finance charges	Rs. Crs.	295	389	466	520
PBT	**Rs. Crs.**	**(1,039)**	**(1,040)**	**(657)**	**24**
Provision for tax	Rs. Crs.	-	-	-	8
PAT	Rs. Crs.	(1,039)	(1,040)	(657)	16

Table 55: Cash Flow Statement (Scenario 1: Tariff Hike) Rs. Crs.

Cash Flow Statement		FY 16	FY 17	FY 18	FY 19
Cash from Operations					
Revenue	Rs. Crs.	4,480	5,626	7,030	8,763
Operating Costs	Rs. Crs.	(4,960)	(5,947)	(6,830)	(7,767)
Increase in Short term capital requirements	Rs. Crs.	(149)	(114)	(93)	(87)
Tax	Rs. Crs.	-	-	-	(8)
Net Cash from Operations	**-**	**(629)**	**(436)**	**107**	**901**
Cash from Investment Activities					
Capex	Rs. Crs.	(1,054)	(1,370)	(1,043)	(1,203)
Net Cash from Investment Activities	**Rs. Crs.**	**(1,054)**	**(1,370)**	**(1,043)**	**(1,203)**
Cash from Financing Activities					
Equity Investments	Rs. Crs.	270	348	307	357
Debt Drawn	Rs. Crs.	784	1,022	736	846
Loan Repayment	Rs. Crs.	(255)	(357)	(431)	(515)
Increase in working capital loan	Rs. Crs.	149	114	93	87
Payment of past current liabilities	Rs. Crs.	-	-	-	-
Grants	Rs. Crs.	967	1,360	1,201	1,428
Interest on cash deficit loan	Rs. Crs.	-	-	-	-
Interest on Loans	Rs. Crs.	(230)	(308)	(372)	(416)
Interest on Working Capital Loan	Rs. Crs.	(65)	(81)	(93)	(105)
Net Cash from Financing Activities	**-**	**1,620**	**2,098**	**1,440**	**1,682**
Net Cash Balances					
Cash BF	Rs. Crs.	2,300	2,237	2,529	3,032
Cash Flow during the year	Rs. Crs.	(63)	292	504	1,380
Cash	Rs. Crs.	**2,237**	**2,529**	**3,032**	**4,412**
Cash CF to balance sheet - post deficit loan	**Rs. Crs.**	**2,237**	**2,529**	**3,032**	**4,412**

Scenario 2: Non availability of Grants available as per approved DPR

One of the key assumptions in this scenario analysis is the availability of grants for executing the proposed capital expenditure. The utility will be able to secure grants from both State and central govt. for executing the schemes. This scenario evaluates the impact of non-availability grants. In this scenario it is assumed that the State will be executing the capital works and all the works are to be funded through Debt and Equity in the ratio 70:30. In this scenario only the grants from State Govt schemes are available to the utility and the remaining schemes are funded through debt and equity. The annual financial losses of utility are expected to increase as compared to base case, thus emphasizing the impact of grants on the overall financial health of the utility.

In this scenario an additional amount of Rs. 4,262 Crs. is proposed to be taken as loan instead of grant. This puts further financial burden on the utility as can be seen from the fact that APDCL will require 11.5% YoY tariff increase in order to post positive PAT by FY 19, provided the utility achieves the T&D loss targets.

The parameters for the scenario and the associated financial statements are shown in the following tables.

Table 56: Parameters for Scenario 2 (Grants not available)

Particulars	Units	FY 16	FY 17	FY 18	FY 19
Energy Balance					
Sales	MUs	6,772	8,049	9,438	10,974
Savings through EE/DSM	MUs	0.39	0.78	1.96	3.91
AT&C losses	MUs	20.0%	19.0%	18.7%	18.2%
Energy reqd. at Discom Periphery	MUs	8,464	9,932	11,601	13,408
Intra State Transmission Losses	%age	4.0%	4.0%	4.0%	4.0%
Energy reqd. at State Periphery	MUs	8,817	10,345	12,085	13,967
Revenue & expenditure parameters					
Tariff Increase	%age	0.0%	0.0%	0.0%	0.0%
Collection efficiency	%age	100%	100%	100%	100%
Average billing rate - Domestic	Rs./kWh	3.87	3.87	3.87	3.87
Average billing rate - Other than domestic (weighted avg.)	Rs./kWh	7.03	7.03	7.03	7.03
Employee cost escalation	%age	10%	20%	10%	10%
A&G cost escalation	%age	6%	6%	6%	6%
Capital expenditure funding					
Capital expenditure	Rs. Crs.	2,021	2,730	2,244	2,631
Grants	Rs. Crs.	114	83	201	296
Debt	Rs. Crs.	1,339	1,856	1,400	1,590
Equity	Rs. Crs.	568	791	643	746

Table 57: Impact on tariff - Scenario 2 (Grants not Available)

Particulars	Derivation	FY 16	FY 17	FY 18	FY 19
Additional recovery due to incremental energy sales (Rs. Crs.)	A	598	1,203	1,867	2,605
Incremental power purchase cost (inc. transmission charges and incremental transmission cost due to PFA program (Rs. Crs.)	B	1,192	2,021	2,805	3,635
Add: Cost related to capital expenditure (interest, depreciation and equity return, Rs. Crs.)	B1	366	748	1,116	1,442

Particulars	Derivation	FY 16	FY 17	FY 18	FY 19
Gap of additional cost and additional recovery	C=(B+B1-A)	961	1,566	2,055	2,472
Energy sales (MU)	D	6,772	8,049	9,438	10,974
Impact on tariff (Rs./kWh)	CX10/D	1.42	1.95	2.18	2.25

Table 58: Profit and loss statement (Rs. Crs.) - Scenario 2 (Grants not Available)

		FY16	FY17	FY18	FY19
Revenue					
Revenue from Sale of Power	Rs. Crs.	3,634	4,240	4,903	5,639
Others	Rs. Crs.	490	514	540	567
Total revenue	**Rs. Crs.**	4,124	4,754	5,443	6,206
Expenditure		**-**	**-**	**-**	**-**
Power Purchase cost	Rs. Crs.	4,136	4,965	5,749	6,579
O&M Cost	**Rs. Crs.**	**826**	**993**	**1,103**	**1,221**
Employee cost	Rs. Crs.	705	847	931	1,024
A&G Expenses	Rs. Crs.	35	37	39	41
R&M Expenses	Rs. Crs.	86	109	133	155
EBIDTA	**Rs. Crs.**	(839)	(1,204)	(1,410)	(1,594)
Depreciation	Rs. Crs.	291	415	535	652
Interest and finance charges	Rs. Crs.	329	590	1,026	1,589
PBT	**Rs. Crs.**	**(1,459)**	**(2,209)**	**(2,971)**	**(3,835)**
Provision for tax	Rs. Crs.	-	-	-	-
PAT	Rs. Crs.	(1,459)	(2,209)	(2,971)	(3,835)

Table 59: Cash Flow Statement (Rs. Crs.) (Scenario 2: No Grants)

Cash Flow Statement		FY 16	FY 17	FY 18	FY 19
Cash from Operations					
Revenue	Rs.Crs.	4,124	4,754	5,443	6,206
Operating Costs	Rs.Crs.	(4,963)	(5,958)	(6,852)	(7,800)
Increase in Short term capital requirements	Rs.Crs.	(170)	(162)	(151)	(146)
Tax	Rs.Crs.	-	-	-	-
Net Cash from Operations		**(1,009)**	**(1,366)**	**(1,560)**	**(1,740)**
Cash from Investment Activities					
Capex	Rs.Crs.	(1,907)	(2,647)	(2,043)	(2,336)
Net Cash from Investment Activities	**Rs.Crs.**	**(1,907)**	**(2,647)**	**(2,043)**	**(2,336)**
Cash from Financing Activities					
Equity Investments	Rs.Crs.	568	791	643	746
Debt Drawn	Rs.Crs.	1,339	1,856	1,400	1,590
Loan Repayment	Rs.Crs.	(310)	(496)	(636)	(795)
Increase in working capital loan	Rs.Crs.	170	162	151	146
Payment of past current liabilities	Rs.Crs.	-	-	-	-
Grants	Rs.Crs.	114	83	201	296

Cash Flow Statement		FY 16	FY 17	FY 18	FY 19
Interest on cash deficit loan	Rs.Crs.	-	(86)	(365)	(808)
Interest on Loans	Rs.Crs.	(261)	(414)	(550)	(651)
Interest on Working Capital Loan	Rs.Crs.	(68)	(90)	(110)	(130)
Net Cash from Financing Activities		**1,551**	**1,806**	**732**	**394**
Net Cash Balances					
Cash BF	Rs.Crs.	2,300	936	(1,272)	(4,142)
Cash Flow during the year	Rs.Crs.	(1,364)	(2,207)	(2,871)	(3,682)
Cash	Rs.Crs.	**936**	**(1,272)**	**(4,142)**	**(7,824)**
Cash CF to balance sheet - post deficit loan	**Rs.Crs.**	**936**	**-**	**-**	**-**

Scenario 3: Under achievement of AT&C loss reduction trajectory

One of the key assumptions in the base case analysis is the achievement of AT&C loss trajectory by the utility. However, in case the utility misses T&D loss reduction and achieves only 1% yearly reduction to reach at T&D loss level of only 20.2 % by FY19, the impact on financial position is going to be significant. The table below summarizes the key parameters underlying the analysis of Scenario 3.

In a scenario where APDCL under achieves the T&D loss reduction target as above, the impact on tariff is expected to increase further vis-à-vis the base case, as summarized in the table below.

As can be seen in the following tables, the annual financial losses of utility are expected to increase to Rs.2,928 Crs. in FY19 vis-à-vis Rs.2,610 Crs.in FY19 under base case , thus emphasizing the need for focusing on reduction in AT&C losses. Further, this scenario will create disallowances of power purchase cost from the State Regulatory Commission.

The cash flow statement of the utility in this scenario shows that the utility will become cash deficit by FY18. The projected cash flow statement is shown below:

Table 60: Parameters for Scenario 3 (Under-achievement of T&D losses)

Particulars	Units	FY 16	FY 17	FY 18	FY 19
Energy Balance					
Sales	MUs	6,772	8,049	9,438	10,974
Savings from EE/DSM	MUs	0.39	0.78	1.96	3.91
AT&C losses	%age	23.2%	22.2%	21.2%	20.2%
Energy reqd. at Discom Periphery	MUs	8,822	10,351	11,983	13,759
Intra State Transmission Losses	%age	4.0%	4.0%	4.0%	4.0%
Energy reqd. at State Periphery	MUs	9,190	10,782	12,482	14,333
Revenue & expenditure parameters					
Tariff Increase	%age	0.0%	0.0%	0.0%	0.0%
Collection efficiency	%age	100%	100%	100%	100%
Average billing rate - Domestic	Rs./kWh	3.87	3.87	3.87	3.87
Average billing rate - Other than domestic (weighted avg.)	Rs./kWh	7.03	7.03	7.03	7.03
Employee cost escalation	%age	10%	20%	10%	10%
A&G cost escalation	%age	6%	6%	6%	6%
Capital expenditure funding					
Capital expenditure	Rs. Crs.	2,021	2,730	2,244	2,631
Grants	Rs. Crs.	967	1,360	1,090	1,263

Particulars	Units	FY 16	FY 17	FY 18	FY 19
Debt	Rs. Crs.	784	1,022	846	1,011
Equity	Rs. Crs.	270	348	307	357

Table 61: Impact on tariff - Scenario 3 (Under-Achievement of T&D loss targets)

Particulars	Derivation	FY 16	FY 17	FY 18	FY 19
Additional recovery due to incremental energy sales (Rs. Crs.)	A	598	1,203	1,867	2,605
Incremental power purchase cost (inc. transmission charges and incremental transmission cost due to PFA program (Rs. Crs.)	B	1,365	2,221	2,988	3,800
Add: Cost related to capital expenditure (interest, depreciation and equity return, Rs. Crs.)	B1	285	477	663	840
Gap of additional cost and additional recovery	C=(B+B1-A)	1,052	1,494	1,783	2,036
Energy sales (MU)	D	6,772	8,049	9,438	10,974
Impact on tariff (Rs./kWh)	CX10/D	1.55	1.86	1.89	1.86

Table 62: Profit and loss statement - Scenario 3 (Under-Achievement of T&D loss targets)

	FY16	FY17	FY18	FY19
Revenue				
Revenue from Sale of Power	3,634	4,240	4,903	5,639
Others	490	514	540	567
Total revenue	4,124	4,754	5,443	6,206
Expenditure	-	-	-	-
Power Purchase cost	4,309	5,165	5,932	6,744
O&M Cost	**824**	**982**	**1,081**	**1,190**
Employee cost	705	847	931	1,024
A&G Expenses	35	37	39	41
R&M Expenses	84	99	111	124
EBIDTA	(1,009)	(1,393)	(1,570)	(1,728)
Depreciation	264	329	395	462
Interest and finance charges	298	393	513	738
PBT	**(1,571)**	**(2,116)**	**(2,478)**	**(2,928)**
Provision for tax	-	-	-	-
PAT	(1,571)	(2,116)	(2,478)	(2,928)

Table 63: Cash Flow Statement: (Scenario 3) (under-achievement of T&D loss targets) (Rs. Crs.)

Cash Flow Statement		FY16	FY17	FY18	FY19
Cash from Operations					
Revenue	Rs. Crs.	4,124	4,754	5,443	6,206
Operating Costs	Rs. Crs.	(5,133)	(6,147)	(7,013)	(7,934)
Increase in Short term capital requirements	Rs. Crs.	(171)	(126)	(106)	(108)
Tax	Rs. Crs.	-	-	-	-
Net Cash from Operations		**(1,180)**	**(1,520)**	**(1,676)**	**(1,836)**
Cash from Investment Activities					
Capex	Rs. Crs.	(1,054)	(1,370)	(1,153)	(1,369)
Net Cash from Investment Activities	**Rs. Crs.**	**(1,054)**	**(1,370)**	**(1,153)**	**(1,369)**
Cash from Financing Activities					

Cash Flow Statement		FY16	FY17	FY18	FY19
Equity Investments	Rs. Crs.	270	348	307	357
Debt Drawn	Rs. Crs.	784	1,022	846	1,011
Loan Repayment	Rs. Crs.	(255)	(357)	(442)	(543)
Increase in working capital loan	Rs. Crs.	171	126	106	108
Payment of past current liabilities	Rs. Crs.	-	-	-	-
Grants	Rs. Crs.	967	1,360	1,090	1,263
Interest on cash deficit loan	Rs. Crs.	-	-	(35)	(187)
Interest on Loans	Rs. Crs.	(230)	(308)	(378)	(437)
Interest on Working Capital Loan	Rs. Crs.	(68)	(85)	(100)	(114)
Net Cash from Financing Activities		**1,639**	**2,105**	**1,395**	**1,458**
Net Cash Balances					
Cash BF	Rs. Crs.	2,300	1,705	921	(514)
Cash Flow during the year	Rs. Crs.	(595)	(784)	(1,435)	(1,746)
Cash	Rs. Crs.	**1,705**	**921**	**(514)**	**(2,260)**
Cash CF to balance sheet - post deficit loan	**Rs. Crs.**	**1,705**	**921**	**-**	**-**

In this scenario, the utility will require 10.5% YoY tariff increase (in addition to FPPPA adjustment) to achieve positive PAT by FY19. This translates to additional burden for the consumers of the State. Thus, achievement of the T&D loss targets is a key parameter for achieving the goals of the PFA 24X7 program.

Scenario 4: Adjustment of past dues to reduce accumulated losses

Government of Assam provides loan to APDCL for various capex related activities as well as payment of power purchase dues of the utility. However, owing to its financial performance, the utility has not paid back the principal as well as the interest on the Govt. of Assam loans. As on FY 14 the accumulated losses of the utility is around Rs. 2,400 Crs. which reflects in the outstanding GoA loans (including interest amount) at Rs. 1285 Crs.

This scenario evaluates the impact of waiving off the outstanding dues of GoA from the financial statements. This will help in improving the credit ratings as the outstanding liabilities will be reduced by this amount. In this scenario as the loans are taken up by the State government due to which the interest burden of the utility reduces and the accumulated financial losses are reduced to the extent. It is assumed that in FY 16 GoA will wipe out current loan amount of Rs. 1285 Crs. Due to this change the outstanding loans in FY 16 consists of only the loans received under various central Govt schemes (RGGVY, R-APDRP) Table 64 shows the impact of this scenario on the profit and loss account of APDCL. It can be seen that the losses in FY 19 are Rs.2,461 Crs. as compared to Rs. 2,610 Crs. in the base case thereby highlighting the impact of reduced interest burden as seen on Table 64

Table 64: Profit and loss statement - Scenario 4 (Adjustment of past dues)

Particulars		FY16	FY17	FY18	FY19
Revenue					
Revenue from Sale of Power	Rs. Crs.	3,634	4,240	4,903	5,639
Others	Rs. Crs.	490	514	540	567
Total revenue	**Rs. Crs.**	4,124	4,754	5,443	6,206
Expenditure		**-**	**-**	**-**	**-**
Power Purchase cost	Rs. Crs.	4,136	4,965	5,749	6,579
O&M Cost	**Rs. Crs.**	**824**	**982**	**1,081**	**1,188**
Employee cost	Rs. Crs.	705	847	931	1,024

Particulars		FY16	FY17	FY18	FY19
A&G Expenses	Rs. Crs.	35	37	39	41
R&M Expenses	Rs. Crs.	84	99	111	122
EBIDTA	**Rs. Crs.**	(836)	(1,193)	(1,388)	(1,561)
Depreciation	Rs. Crs.	264	329	391	451
Interest and finance charges	Rs. Crs.	238	280	370	448
PBT	**Rs. Crs.**	**(1,337)**	**(1,802)**	**(2,149)**	**(2,461)**
Provision for tax	Rs. Crs.	-	-	-	-
PAT	Rs. Crs.	(1,337)	(1,802)	(2,149)	(2,461)

9.6. Action Points for Government of Assam/Utilities

The utility and State government need to reach an agreement for addressing the accumulated losses of the utility. This will help the utility to repay the existing Government of Assam loans The scenarios above show that the utility requires tariff hikes in the range of 9.8 % to 11.5% in order to become financially viable by FY19. These scenarios also demonstrate that the utility needs to have financial support and access to grant funds to avoid tariff hikes.

Further, the rural consumers in the State will need financial support to fund the initial charges for obtaining a service connection. The State Government may have to provide additional financial support to HHs willing to obtain electrical connection in rural areas.

It can be seen that APDCL may not be able to financially sustain in case there is no tariff hike. Additionally, the tariff hike of 9.4% YoY can become burden for the economically backward section of population in the State. Considering this, additional targeted subsidy support of about Rs 1,000 Crs annually to economically weaker HHs for their electricity consumption may be required. This will ease the financial burden on the utility and will avoid higher cross subsidies in the State.

Further in the area of regulatory support, intervention from State and central governments is required to align the loss trajectory proposed in PFA Roadmap with the State Regulator's trajectory. This will help the utility to reduce the disallowed expenses towards power purchase costs.

9.7. Support requested from Govt. of India

The State will require additional funding support by means of either grants or loans to carry out the unapproved portion of IPDS and DDUGJY. This will ensure that the utility is able to execute the electrification plans laid out to achieve the objectives of 24X7 PFA program.

Figure 21: Key Action Points

Key Action points
The following action items are imperative for a financial turnaround: 1. A YoY tariff hike of around 9.8% in addition to the FPPPA charges. This will require APDCL to achieve the AT&C loss targets as proposed under the 24X7 PFA roadmap 2. APDCL must initiate a dialogue with the State regulator to align the AT&C loss reduction trajectory with that envisaged for this PFA road-map, to avoid power purchase cost disallowances. 3. The State Government is required to increase the revenue subsidy support as the number of HH under lower consumption group is expected to increase during the period. Additional revenue support is also required in order to reduce the tariff hike projected in the PFA roadmap. 4. The State Government may start to initiate process of conversion of outstanding dues of APDCL into equity for the company. Further, an action plan to wipe out the accumulated losses of the utility should be developed. This will give APDCL a fresh start in terms of financial performance and financing abilities for future investments. 5. It is seen that affordability of electrical connection is an issue even for non-BPL families in the State. The State Government may have to propose a plan for funding the initial service connection charges to support the electrification of rural HHs in the State. 6. The State will go through major changes in the infrastructure as it plans to add about 22 lakh HH by FY 19. Majority of these HHs proposed to be electrified are in rural areas. This will put further stress on revenue recovery process and will tend to increase technical losses. The utility will have to devise plans to curb the commercial and technical losses in wake of these changes in the network.

10. Other Initiatives

10.1. IT initiatives in Assam – Distribution

The following IT initiatives have been introduced by APDCL:

- **Computerized Billing System**: Computerized billing system has been successfully implemented in all the billing locations under APDCL to facilitate proper billing since 2005-06.

- **Online view and payment of Electricity bills:** APDCL's official website www.apdcl.gov.in facilitates online viewing and payment of electricity bills for consumers falling under R-APDRP areas the consumers can also view their consumption history by registering on the website. Bill and payment related information are sent via SMS to consumers in R-APDRP areas. These facilities will shortly be made available to all consumers of APDCL.

- **ERP Initiatives:** ERP modules like Financial Accounting and analysis, Human Resources Management System, Payroll Management System and Procurement Management System (including Inventory and Material Management) are being currently implemented. Target date for Go-Live of pilot locations has been set as January, 2016.

- **Smart Grid:** As a part of the Smart Grid related initiatives under the Govt. of India supervised by the Indian Smart Grid Task Force, work order for implementing Smart Grid in 3 Sub-Divisions in Guwahati (Paltanbazar, Ulubari and Narengi) has been awarded and work has already been started.

APDCL is in advanced stages of implementing R-APDRP Part A projects covering the following:

- **Centralized Customer Care Centre**: A centralized Customer Care Centre for 67 towns plus an additional five (5) self-financed towns in Assam is being set up at Guwahati which will facilitate –

  I. A prospective new customer to register/track/check the status of his service request like a new service connection application online.

  II. Existing customers to be able to check the status of their service request(s) like enhancement of load/meter change/category change etc. online.

  III. Effective and quick resolution of customer complaints lodged online as well as by telephone to register their complaints through the Integrated Voice Response System (IVRS) facility. They can track the status of their complaints online. Also the complaint resolution mechanism would be integrated with the Maintenance Module for better maintenance.

- **Implementation of SAP (ERP) Modules:** The following modules of SAP ERP – Metering, Billing, Collection, Energy Accounting and Auditing have been

implemented in 61 towns throughout Assam out of a total scope of 72.

- **Meter Data Acquisition System (MDAS)**: All DTR meters, High End Consumers and Ring Fence Meters have modems fitted on the meters. The data from the feeders in the sub-stations aggregates on the Data Concentrator Unit (DCU) in the sub-stations. The modems in the Meters and DCU's are fitted with a GSM SIM card and all data available in the meters is transmitted to the central Data Centre (at Guwahati) via GPRS network for processing. Apart from preparation of energy bills, the meter information is used for load flow and other network analysis. This module has been successfully implemented in 63 towns out of a total scope of 72.

- **GIS based integrated network analysis module**: Load flow and voltage drop analysis, Optimization studies like capacitor placement, network reconfiguration, conductor upgradation requirements, load balancing and load allocation, integration with new service connection module for checking the network capability/feasibility etc. This module has been successfully implemented in 69 towns out of a total scope of 72.

- **Establishment of KIOSKS**: Two 'unmanned' cash/ cheque collection KIOSKS are being established in a central area of Guwahati wherein customers can view and pay their bills in the cash/ cheque collection machines. This is in addition to the regular payment counters.

- **Interconnectivity among different offices of APDCL**: 67 towns plus an additional five (5) self-financed towns of Assam (176 offices and establishments) are connected to the central data center at Guwahati. The primary connectivity is being established through BSNL networks and additionally secondary connectivity for the sub-division offices is envisaged by using VSAT connectivity.

- **SCADA system**: A SCADA system covering the distribution network of Guwahati city is being implemented. This will enable efficient power distribution management and less outages through real time data acquisition. SCADA control center has been successfully commissioned at the Data Center. 19 of the 33/11 KV Sub-Stations have been integrated with the system till date.

10.2. Capacity Building and Training

The total number employees of APDCL was 11,095 as on Apr, 2015 including 6,023 technical employees and 5,072 non-technical employees. For the training needs of employees there are two training institutes in Guwahati – One run by APDCL and another National Power Training Institute's Guwahati Campus, managed by the Ministry of Power. Further, the employees of the companies are sent to other institutions like Central Board of Irrigation and Power, New Delhi, Engineering Staff College of India, Hyderabad etc.

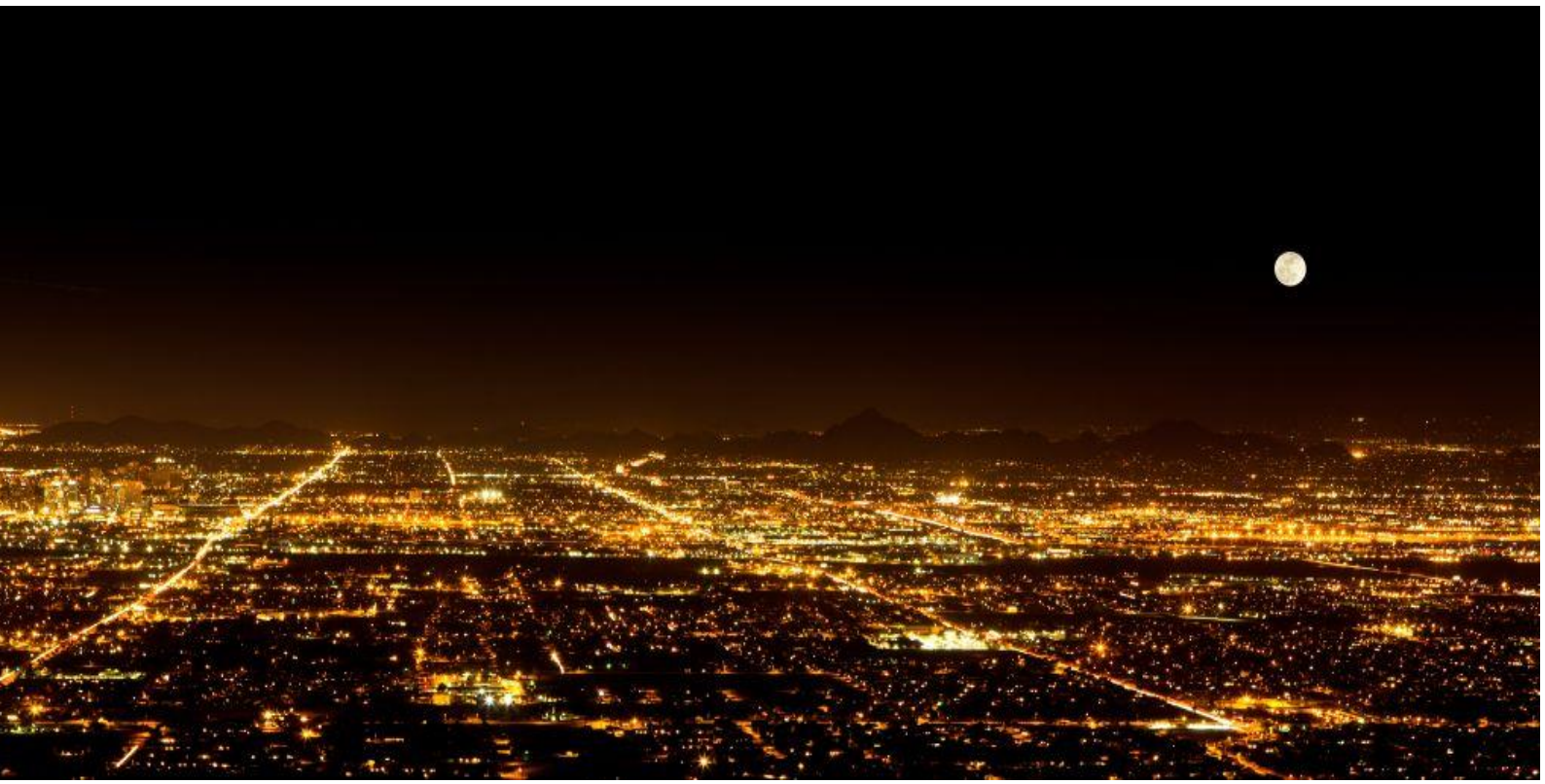
The employees are sent for training on various technical aspects like Operation and Maintenance of Plant Machineries, training of transmission and distribution systems, renewable energy, commercial and tariff determination, energy efficiency and disaster management etc. Further, senior and mid-level management staff are provided training on managerial topics like human resource development, organization behavior, financial management etc.

10.3. Institutional arrangement for Monitoring of PFA 24X7

A strong monitoring framework is essential to ensure the success of "Power for All" scheme. The following structure shown in Table 65 is being proposed to undertake regular monitoring of the progress of all initiatives being undertaken in this Roadmap.

Table 65: Institutional arrangement for monitoring 24x7 PFA scheme

Sl.	Institutional arrangement	Responsibilities	Monitoring frequency
1	**Government of India (GOI) Committee**	It is proposed that this committee will review the overall progress of the scheme and provide necessary support to ensure a coordinated response from Central Government – where necessary. This committee may be constituted with the following members – PFC, REC, CEA, SECI, EESL, BEE, Ministry of Coal, MNRE, MoPNG and Ministry of Power.	Quarterly
2	**State Government Level Committee**	It is proposed that a State level committee headed by the Secretary (Power) will be formed to review the progress of the scheme. This Committee will monitor the progress of the works undertaken as a part of the scheme and issue directions to enable faster execution.	Quarterly
3	**Department Level Committee**	It is proposed that a department level committee headed by Nodal Officer will be formed which shall undertake steps required to ensure the projects are progressing as per the action plan.	Monthly
4	**Circle Level Committee**	It is proposed to constitute a circle level committee headed by GM to take action that is necessary to ensure the projects are completed in a timely manner.	Monthly
5	**Project Monitoring Unit (PMU)**	A PMU shall be set up for monitoring the progress of works being undertaken under this scheme. The PMU will operate under Secretary (Power) and shall be operated by an independent agency.	Weekly



11. Rollout Plan

Particular	Unit	Existing ending FY 15	Year wise addition FY 16	FY 17	FY 18	FY 19	Total additions Till FY19
GENERATION							
State Projects	MW	379.7	(81)	57	(6)	-	(30)
Central Sector Allocations	MW	748	247	311	273	-	831
RE	MW	34	-	-	-	4	4
Bhutan Power		0	-	-	296	204	500
Total IC including Allocation	**MW**						
Peak Demand	**MW**						
TRANSMISSION							
Grid Substations (Nos)	**No.**	53	16	4	11	24	108
Intra-State Lines addition							
400 KV	**cKm**	7.2	16	4	11	24	108
220 KV	**cKm**	1,435					
132 KV	**cKm**	2,744				250	**257.2**
66 KV	**cKM**	602	502		190	415	**2542**
Total	**cKM**	**4,788**	328	217	241	719	**4249**
Intra-State Capacity Addition							
400 KV	**MVA**	630				2,260	2,890
220 KV	**MVA**	1,590	700	170	750	1,840	5,050

Particular	Unit	Existing ending FY 15	Year wise addition FY 16	FY 17	FY 18	FY 19	Total additions Till FY19
132 KV	**MVA**	2,584	732	254	1301	810	5,681
66 KV	**MVA**	168					168
Total	**MVA**	**4,972**	**1,432**	**424**	**2,051**	**4,910**	**13,789**
DISTRIBUTION							
No. of PSS	**No.**	328	36	52	52	25	165
PSS Capacity	**MVA**	2,600	321	483	483	114	1,401
33 kV Lines	**cKM**	6,349	630	939	939	261	2,769
11 kV Feeders	**cKM**	54,349	2,368	3,544	3,544	899	10,355
DTS	**Nos**	56,847	4,211	6,312	6,312	1,620	18,455
DTs Capacity	**MVA**	3,678	192	284	284	78	838
LT Line	**cKm**	122,159	3,517	5,269	5,269	1,375	15,430

District wise Quarterly HH Electrification Plan

Urban Household Electrification Plan

	FY 16				FY 17			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Nagaon	577	1,153	1,730	2,304	1,249	2,498	3,747	4,995
Dhubri	482	963	1,445	1,924	1,043	2,086	3,129	4,171
Sonitpur	170	339	509	676	368	735	1,102	1,466
Cachar	466	931	1,396	1,858	1,008	2,016	3,024	4,030
Barpeta	214	428	641	853	463	926	1,389	1,850

	FY 16				FY 17			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Kamrup	209	418	627	836	453	906	1,359	1,810
Kamrup Metropolitan	634	1,267	1,901	2,532	1,373	2,745	4,118	5,488
Dibrugarh	159	318	476	633	344	688	1,032	1,373
Tinsukia	239	477	715	949	516	1,032	1,548	2,061
Karimganj	164	328	492	654	355	710	1,065	1,419
Sivasagar	86	171	257	340	186	371	556	737
Jorhat	224	448	672	895	486	971	1,456	1,938
Golaghat	81	161	241	319	174	348	522	694
Lakhimpur	144	288	431	572	311	622	933	1,244
Goalpara	335	670	1,005	1,338	726	1,451	2,177	2,900
Baksa	28	56	84	109	60	120	180	240
Darrang	81	161	241	320	174	348	522	696
Morigaon	135	269	403	535	291	582	873	1,162
Kokrajhar	56	112	168	223	122	243	364	483
Karbi Anglong	158	315	472	626	341	681	1,021	1,360
Udalguri	48	95	143	188	103	206	309	409
Nalbari	126	251	376	498	271	542	813	1,084
Bongaigaon	162	324	486	648	351	702	1,053	1,404
Hailakandi	55	109	164	217	118	236	354	472
Dhemaji	86	172	257	342	186	372	557	741
Chirang	85	170	255	337	184	368	551	733
Dima Hasao	41	82	123	164	89	178	267	354
Total	5,245	10,476	15,710	20,890	11,345	22,683	34,021	45,313

Rural Household Electrification Plan

	FY 16				FY 17				FY 18				FY 19			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Nagaon	3,285	6,570	9,854	13,137	3,285	6,570	9,854	13,137	4927	9854	14781	19,708	4927	9854	14781	19,708
Dhubri	3,097	6,194	9,291	12,385	3,097	6,194	9,291	12,385	4646	9291	13936	18,578	4646	9291	13936	18,578
Sonitpur	2,346	4,692	7,038	9,383	2,346	4,692	7,038	9,383	3519	7038	10557	14,075	3519	7038	10557	14,075
Cachar	2,019	4,038	6,057	8,075	2,019	4,038	6,057	8,075	3029	6057	9086	12,112	3029	6057	9086	12,112
Barpeta	2,335	4,670	7,004	9,337	2,335	4,670	7,004	9,337	3502	7004	10506	14,007	3502	7004	10506	14,007
Kamrup	1,671	3,341	5,011	6,677	1,671	3,341	5,011	6,677	2506	5011	7516	10,017	2506	5011	7516	10,017
Kamrup Metropolitan	193	386	578	769	193	386	578	769	289	578	867	1,154	289	578	867	1,154
Dibrugarh	1,242	2,484	3,725	4,964	1,242	2,484	3,725	4,964	1863	3725	5587	7,448	1863	3725	5587	7,448
Tinsukia	940	1,879	2,819	3,756	940	1,879	2,819	3,756	1410	2819	4228	5,634	1410	2819	4228	5,634
Karimganj	1,619	3,237	4,855	6,470	1,619	3,237	4,855	6,470	2428	4855	7282	9,707	2428	4855	7282	9,707
Sivasagar	1,143	2,285	3,428	4,568	1,143	2,285	3,428	4,568	1714	3428	5141	6,853	1714	3428	5141	6,853
Jorhat	985	1,970	2,955	3,939	985	1,970	2,955	3,939	1478	2955	4433	5,907	1478	2955	4433	5,907
Golaghat	1,323	2,646	3,969	5,291	1,323	2,646	3,969	5,291	1985	3969	5954	7,936	1985	3969	5954	7,936
Lakhimpur	1,310	2,619	3,928	5,236	1,310	2,619	3,928	5,236	1964	3928	5892	7,855	1964	3928	5892	7,855
Goalpara	1,028	2,055	3,083	4,108	1,028	2,055	3,083	4,108	1542	3083	4624	6,162	1542	3083	4624	6,162
Baksa	1,374	2,747	4,120	5,491	1,374	2,747	4,120	5,491	2060	4120	6180	8,238	2060	4120	6180	8,238
Darrang	1,324	2,648	3,972	5,294	1,324	2,648	3,972	5,294	1986	3972	5958	7,942	1986	3972	5958	7,942
Morigaon	1,219	2,438	3,657	4,874	1,219	2,438	3,657	4,874	1829	3657	5485	7,312	1829	3657	5485	7,312
Kokrajhar	1,294	2,588	3,882	5,175	1,294	2,588	3,882	5,175	1941	3882	5823	7,762	1941	3882	5823	7,762
Karbi Anglong	1,118	2,235	3,353	4,469	1,118	2,235	3,353	4,469	1677	3353	5029	6,703	1677	3353	5029	6,703
Udalguri	1,069	2,137	3,205	4,271	1,069	2,137	3,205	4,271	1603	3205	4807	6,407	1603	3205	4807	6,407
Nalbari	787	1,573	2,359	3,144	787	1,573	2,359	3,144	1180	2359	3539	4,716	1180	2359	3539	4,716

	FY 16				FY 17				FY 18				FY 19			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Bongaigaon	903	1,805	2,707	3,606	903	1,805	2,707	3,606	1354	2707	4060	5,411	1354	2707	4060	5,411
Hailakandi	924	1,847	2,771	3,692	924	1,847	2,771	3,692	1386	2771	4156	5,538	1386	2771	4156	5,538
Dhemaji	933	1,866	2,799	3,730	933	1,866	2,799	3,730	1400	2799	4198	5,595	1400	2799	4198	5,595
Chirang	682	1,364	2,046	2,726	682	1,364	2,046	2,726	1023	2046	3069	4,089	1023	2046	3069	4,089
Dima Hasao	211	421	631	839	211	421	631	839	316	631	947	1,259	316	631	947	1,259
Total	36,374	72,735	109,097	145,407	36,374	72,735	109,097	145,407	54,557	109,097	163,641	218,125	54,557	109,097	163,641	218,125

12. List of Abbreviations

Abbreviation	Expansion
A&G	Administrative and General
ABR	Average Billing Rate
ACS	Average Cost of Supply
ADB	Asian Development Bank
AEGCL	Assam Electricity Grid Corporation Limited
APDCL	Assam Power Distribution Company Limited
APGCL	Assam Power Generating Corporation Limited
ARR	Aggregate Revenue Requirement
ASEB	Assam State Electricity Board
AT&C	Aggregate Technical and Commercial
BTPS	Bongaingaon Thermal Power Station
CFL	Compact Fluorescent Lamp
DDUGJY	Deen Dayal Upadhayay Grameen Jyoti Yojna
DPR	Detailed Project Report
DSM	Demand Side Management
EBIDTA	Earnings before interest depreciation taxes and amortization
ECBC	Energy Conservation and Building Code
ERP	Enterprise Resource Planning
FPPPA	Fuel and Power Purchase Price Adjustment
FY	Financial Year
GFA	Gross Fixed Assets
HH	Households
IPDS	Integrated Power Development Scheme
KLHEP	Karbi Longpi Hydro Electric Project
LED	Light Emitting Diode
LRPP	Lakwa Replacement Power Plant
MU	Million Units
MW	Mega Watt
NEEPCO	North Eastern Electric Power Corporation
NERPSIP	North Eastern Region Power System Improvement Plan
NRPP	Namrup Replacement Power Plant
O&M	Operation and Maintenance

Abbreviation	Expansion
OTPC	ONGC-Tripura Power Company
PAT	Profit After Taxes
PFA	Power for All
PLF	Peak Load Factor
R&M	Repair and Maintenance
R-APDRP	Restructured – Accelerated Power Development and Reforms Program
RE	Renewable Energy
RGGVY	Rajiv Gandhi Grameen Vidyutikaran Yojna
ROE	Return on Equity
SCADA	Supervisory Control and Data Acquisition
T&D	Transmission and Distribution
YoY	Year on Year

13. Annexure

Annexure 1: Details of Ongoing Intra-State Substation Projects

Sl No.	Name of Substation	400/220 kV	220/132 kV	220/33 kV	132/33 kV	132/11 kV	Completion Target
1	Bilasipara				2x16		2015-16
2	Kokrajhar				2x25		2015-16
3	Matia				2x16		2015-16
4	Kamalpur				2x40		2015-16
5	Rangia		2x100				2015-16
6	Azara				2X40		2015-16
7	Azara (Kukurmara)		2x50		2x10		2015-16
8	Kamakhya				2x40		2015-16
9	Sonapur		2X100		2X25		2015-16
10	Sonabil		2x100				2015-16
11	Bordubi				2x40		2015-16
12	Jorhat(W)				2x40		2015-16
13	Hailakandi				2X16		2015-16
14	Doomdoma(Rupai)				2x25		2015-16
	SUB TOTAL MVA for 2015-16	**0**	**700**	**0**	**666**	**0**	**2015-16**
1	Karimganj				2X25		2016-17
2	Hatsingimari				2x25		2016-17
3	Dhekiajuli				2x25		2016-17
4	Barpeta				2x25		2016-17
	SUB TOTAL MVA for 2016-17	**0**	**0**	**0**	**200**	**0**	**2016-17**
1	Silapathar				2x31.5		2017-18
2	Sarupathar				2x31.5		2017-18
3	Teok				2x31.5		2017-18
4	Amingaon		2x160				2017-18
5	Hazo				2x31.5		2017-18
6	Guwahati Medical College				2x50		2017-18
7	Paltanbazar				2x50		2017-18
8	Tangla				2x31.5		2017-18
9	Behiating		2x100				2017-18
10	Tezpur (New)				2x50		2017-18
11	Chapakhowa				3x8.33		2017-18
	SUB TOTAL MVA for 2017-18	**0**	**520**	**0**	**590**	**0**	**2017-18**
1	Rangia	2x500					2018-19

Sl No.	Name of Substation	400/220 kV	220/132 kV	220/33 kV	132/33 kV	132/11 kV	Completion Target
2	Sonapur	2x315					2018-19
3	Bornagar		2x100				2018-19
4	Silapathar		2x100				2018-19
5	Khumtai		2x100				2018-19
6	Shankardebnagar		2x160				2018-19
7	Boragaon (Jalukbari)			2x100			2018-19
8	Panjabari			2x100			2018-19
9	Narayanpur			2x50			2018-19
10	Makum		2x160		2x40		2018-19
11	Jakhalabandha			2x50			2018-19
12	Nathkuchi				2x40		2018-19
13	Dhing				2x40		2018-19
14	Chhaygaon				2x40		2018-19
15	Ghungur				2x40		2018-19
16	Nagaon-2				2x40		2018-19
17	Baithalangshu				2x25		2018-19
18	Dhupdhara				2x25		2018-19
19	Agomoni				2x25		2018-19
20	Kumarikata				2x25		2018-19
21	Jonai				2x25		2018-19
22	Titabor				2x40		2018-19
	SUB TOTAL for 2018-19	**1630**	**1240**	**600**	**810**	**0**	
	Total up to 2018-19	**1630**	**2460**	**600**	**2266**	**0**	

Annxure 2: Details of ongoing Intra-State Transmission Line Projects

	Line Description	No. of Circuit	Route Length (KM)	Voltage Level/Circuit KM			Completion Target
				400 kV	220 kV	132 kV	
1	Kokrajhar – Bilasipara	1	23.72			23.72	2015-16
2	BTPS – Kokrajhar	1	9.5			9.5	2015-16
3	Bilasipara – Gauripu	1	38.6			38.6	2015-16
4	Agia – Matia	1	22.557			22.557	2015-16
5	LILO of Rangia – Kamakhya at Kamalpur	2	0.9			1.8	2015-16
6	LILO of Rangia – Sishugram at Kamalpur	2	0.9			1.8	2015-16
7	BTPS – Rangia	2	164		328		2015-16
8	Azara (Kukurmara) – Azara	1	4.83			4.83	2015-16
9	LILO of one circuit of Kahilipara – Kamalpur at Kamakhya	2	0.3			0.6	2015-16
10	LILO of Samaguri – Sarusajai at Sonapur	2	13.8		27.6		2015-16
11	LILO of one circuit of KLHEP –Sarusajai at Sonapur	2	0.3		0.6		2015-16
12	Sonapur – Jagiroad(Baghjap)	2	25.875			51.75	2015-16
13	LILO of Dispur – CTPS line at Sonapur	2	14.219			28.438	2015-16
14	Double Circuit LILO of Balipara – Samaguri at Sonabil	2x2	1.2		4.8		2015-16
15	Double circuit LILO of Depota – B.Chariali/Gohpur at Sonabil	2x2	1.227			4.908	2015-16
16	LILO of Namrup – Tinsukia S/C line at Bordubi	2	2.19			4.38	2015-16
17	LILO of Jorhat – Bokakhat S/C line at Jorhat (West)	2	1.612			3.224	2015-16
18	LILO of Panchgram – Durlavcherra at Hailakandi	2	0.616			1.232	2015-16
19	Namrup – Mariani S/C on D/C Tower	1	141.203		141.203		2015-16
20	Re-conductoring of existing BTPS-Dhaligaon D/C line by HTLS conductor	2	37			74	
	SUB TOTAL for 2015-16			**0**	**502**	**328**	**2015-16**
1	BTPS – APM (Jogighopa) S/C on D/C Tower	1	42.2			42.2	2016-17
2	Hailakandi – Karimganj S/C on D/C tower	1	26			26	2016-17
3	Agia – Hatsingimari S/C on D/C Tower	1	102			102	2016-17
4	LILO of one circuit of Rowta – Depota at Dhekiajuli	2	0.6			1.2	2016-17
5	LILO of Bornagar – Rangia at Barpeta	2	23			46	2016-17
	SUB TOTAL for 2016-17				**0**	**217**	**2016-17**
1	Dhemaji – Silapathar S/C on D/C line	1	30			30	2017-18
2	LILO of Golaghat – Bokajan line at Sarupathar	2	1.2			2.4	2017-18
3	LILO of Nazira – Gormur S/C line at Teok	2	2.5			5	2017-18
4	Rangia – Amingaon D/C line	2	40		80		2017-18
5	Amingaon - Hazo D/C line	2	35			70	2017-18
6	Kahilipara – Guwahati medical College	1	4.5			4.5	2017-18
7	Kamakhya – Paltanbazar UG S/C line	1	8			8	2017-18

	Line Description	No. of Circuit	Route Length (KM)	Voltage Level/Circuit KM			Completion Target
				400 kV	220 kV	132 kV	
8	LILO of Rangia – Rowta 132kV Ckt-I at Tangla	2	15			30	2017-18
9	Tinsukia – Behiating D/C line	2	55		110		2017-18
10	Rupai – Chapakhowa S/C on D/C tower	1	41			41	2017-18
11	Sonabil – Tezpur (New) D/C line	2	25			50	2017-18
	SUB TOTAL Ckt-KM for 2017-18			**0**	**190**	**241**	**2017-18**
1	LILO of one Ckt of Balipara(PG)-Bongaigaon(PG) Quad Moose line at Rangia	4	20	80			2018-19
2	LILO of one Ckt of Silchar (PG) – Byrnihat (MeTCL) line at Sonapur	2	40	80			2018-19
3	LILO of one Ckt of BTPS-Rangia line at Bornagar	2	15		30		2018-19
4	Behiating – Silapathar D/C line	2	55		110		2018-19
5	LILO of one circuit of Silchar (PG) - Byrnihat (Mrghalaya)	2	20	40			2018-19
6	LILO of Samaguri – Mariani Ckt I & II at Khumtai	2x2	10		40		2018-19
7	LILO of Jorhat(W) – Bokakhat at Khumtai	2	6			12	2018-19
8	Khumtai – Sarupathar D/C line	2	65			130	2018-19
9	Lower Kopili HEP – Shankardevnagar D/C line	2	60		120		2018-19
10	LILO of Kopili (Gen) – Misa (PG) line at Shankardevnagar	2	10		20		2018-19
11	Azara 400kV S/S – Boragaon D/C line	2	25		50		2018-19
12	LILO of Sonapur – Sarsajai line at Panjabari	2	0.5		1		2018-19
13	LILO of one Ckt of Sonabil – Silapathar at Narayanpur	2	10		20		2018-19
14	Double Ckt LILO of Tinsukia – Namrup D/C line at Makum	2	7		14		2018-19
15	LILO of Tinsukia – Rupai S/C line at Makum	2	5			10	2018-19
16	LILO of Samaguri – Mariani Ckt-I at Jakhalabandha	2	5		10		2018-19
17	LILO of Bornagar – Nalbari at Nathkuchi	2	5			10	2018-19
18	Stringing of 2nd Ckt of Samaguri – Nagaon line	1	35			35	2018-19
19	LILO of one Ckt of Samaguri – Nagaon line at Dhing	2	20			40	2018-19
20	Boko – Chhaygao D/C line	2	35			70	2018-19
21	Srikona – Ghungur S/C line	1	18			18	2018-19
22	LILO of one Ckt of Samaguri – Nagaon at Nagaon-2	2	5			10	2018-19
23	Nagaon – Baghjap D/C line	2	60			120	2018-19
24	LILO of one Ckt of Samaguri – Shankardevnagar at Baithalangshu	2	25			50	2018-19
25	Boko – Dhupdhara S/C line on D/C tower	1	35			35	2018-19
26	LILO of Gossaigaon – Gauripur at Agamoni	2	15			30	2018-19

	Line Description	No. of Circuit	Route Length (KM)	Voltage Level/Circuit KM			Completion Target
				400 kV	220 kV	132 kV	
27	LILO of Deothang – Rangia line at Kumarikata	2	12			24	2018-19
28	Silapathar – Jonai S/C on D/C tower	1	70			70	2018-19
29	Bokajan – Diphu S/C Line on D/C Tower	1	55			55	2018-19
30	Samaguri - Mariani 2 x 220kV S/C line to be terminated at proposed New Mariani (PG) 400/220kV Substation.	1	5				
31	Mariani - New Mariani (PG): 1 no 220kV D/C by HTLS Zebra equivalent Conductor.						
	SUB TOTAL Ckt-KM for 2018-19			**200**	**415**	**719**	
	TOTAL			**200**	**1107**	**1505**	

Annexure 3: Details of Intra-State Augmenting Projects of Substations

Sl No.	Name of Substation	400/220 kV	220/132 kV	220/33 kV	132/33 kV	Completion Target
1	Nalbari				1x16 +1x40 to 2x40=48	2015-16
2	Gauripurr				2x16 to 2x25=18	2015-16
	Sub Total for 2015-16 (MVA)				**66**	
3	Dhaligaon				2x25 to 2x40=30	2016-17
4	Samaguri		3x50 to 2x160=170		1x16+2x25 to 1x40+2x25=24	2016-17
	Sub Total for 2016-17 (MVA)		**170**		**54**	
5	Rangia				2x25 to 2x50=50	17-18
6	Sishugram				1X40+2x31.5 to 3x40=17	17-18
7	Salekati		1x80+1x160 to 2x160=80		1x16 to 2x25=34	17-18
8	Agia		1x50+1x100 to 2x100=50		1x12.5+1x40 to 2x40=27.5	17-18
9	Kahilipara				2X40+2x30+1x31.5 to 5x40=28.5	17-18
10	Narengi				2x25 to 2x40=30	17-18
11	Sipajhar				2x16 to 2x40=48	17-18
12	B.Chariali				2x16 to 2x40=48	17-18
13	Dhemaji				2x16 to 2x40=48	17-18
14	Sivasagar				2x16 to 2x40=48	17-18
15	APM				2x12.5 to 2x25=25	17-18
16	Samaguri				1x40+2x25 to 3x40=30	17-18
17	Pailapool				3x10+1x16 to 2x25+1x16=20	17-18
18	Srikona				2x25 to 2x40=30	17-18
19	Panchgram				1x16+2x25 to 1x40+2x25=24	17-18
20	Bokajan				2x16 to 2x40=48	17-18
21	Golaghat				2x25 to 2x40=30	17-18
22	Gormur (Jorhat)				3x25 to 3x40=45	17-18
23	Namrup		2x50 to 2x100=100		1x31.5 to 2x31.5=31.5	17-18
24	Moran				2x16 to 2x40=48	17-18
	Sub Total for 2017-18 (MVA)	**0**	**230**	**0**	**710.5**	
	Augmented Capacity Till 2018-19	**0**	**400**	**0**	**830.5**	

Annexure 4: Details of Ongoing Inter-State Transmission Projects

Sl No	Name of Element	Voltage Level	Nos. of Ckt	Route length (km)	Ckt -km
1	B. Chariali – Agra	800 kV	2	1741.5	2*1741.5
2	B. Chariali – Balipara	400 kV	2	65	2*65
3	B. Chariali – D/C LILO of Ranganadi-Balipara	400 kV	2	27	2*27
4	B.Chariali – Subansiri I & II	400 kV	2	167	2*167
5	B.Chariali – Subansiri III & IV	400 kV	2	170	340
6	Balipara – Kameng	400 kV	2	55	110

Annexure 5: Details of Capacity Augmentation Projects for Substations

Sl. No	Name of the S/S	Voltage ratio	No. of Trf.	MVA Capacity	Tot. trf Capacity
1	Bangaigaon	400/220	1	315	315
2	Balipara	400/220	1	315	315
3	Misa	400/220	1	685	685
4	Balipara	220/132	2	160	320
			Total MVA Capacity		**1635**

Annexure 6: Balance Sheets of scenarios

Projected Balance Sheet for APDCL (Rs. Crs.) – Base Case

Balance Sheet	FY16	FY17	FY18	FY19
Assets				
Current Assets				
Cash @ Bank	1,880	1,298	210	(0)
Stocks – Stores	304	322	334	346
Receivables	1,707	1,896	2,063	2,234
Total	3,891	3,515	2,607	2,580
Non-current Assets				
Gross Fixed Assets	5,748	6,991	8,165	9,304
Less: Accumulated Depreciation	(1,366)	(1,695)	(2,086)	(2,538)
Other current assets	917	917	917	917
Loans and Advances	167	167	167	167
Capital Works in Progress	633	759	628	692
Net Fixed Assets	6,098	7,139	7,791	8,543
Total Assets	9,990	10,655	10,398	11,123
Long Term Debt	2,398	3,063	3,368	3,699
Working Capital Loan/ Short term borrowings	618	742	848	952
Cash deficit loan	-	-	-	1,035
Trade payables	2,051	2,051	2,051	2,051
Short term provisions	87	87	87	87
Current Liabilities	1,696	1,779	1,852	1,930
Total	6,851	7,722	8,207	9,755
Equity				
Share Capital	521	869	1,176	1,533
Grants	5,932	7,292	8,493	9,921
Consumer Contributions	132	132	132	132
Capital Liabilities	845	845	845	845
Retained Earnings	(4,292)	(6,206)	(8,455)	(11,064)
Total	3,139	2,933	2,192	1,367
Total Liabilities	9,990	10,655	10,398	11,123

Balance Sheet (Rs. Crs.) - Scenario 1 (tariff hike)

Items	FY 16	FY 17	FY 18	FY 19
Current Assets				
Cash @ Bank	2,237	2,529	3,032	4,412
Stocks – Stores	304	322	334	346
Receivables	1,701	1,880	2,033	2,186
Total	4,242	4,730	5,400	6,944

Items	FY 16	FY 17	FY 18	FY 19
Non-current Assets				
Gross Fixed Assets	5,748	6,991	8,165	9,304
Less: Accumulated Depreciation	(1,366)	(1,695)	(2,086)	(2,538)
Other current assets	917	917	917	917
Loans and Advances	167	167	167	167
Capital Works in Progress	633	759	628	692
Net Fixed Assets	6,098	7,139	7,791	8,543
Total Assets	10,340	11,870	13,191	15,487
Liabilities				
Long Term Debt	2,398	3,063	3,368	3,699
Working Capital Loan/ Short term borrowings	611	726	818	905
Cash deficit loan	-	-	-	-
Trade payables	2,051	2,051	2,051	2,051
Short term provisions	87	87	87	87
Current Liabilities	1,696	1,779	1,852	1,930
Total	6,844	7,706	8,177	8,672
Equity				
Share Capital	521	869	1,176	1,533
Grants	5,932	7,292	8,493	9,921
Consumer Contributions	132	132	132	132
Capital Liabilities	845	845	845	845
Retained Earnings	(3,935)	(4,975)	(5,632)	(5,617)
Total	3,496	4,164	5,014	6,815
Total Liabilities	10,340	11,870	13,191	15,487

Balance Sheet (Rs. Crs.) - Scenario 2 (Grants not Available)

Items	FY 16	FY 17	FY 18	FY 19
Current Assets				
Cash @ Bank	936	-	-	(0)
Stocks – Stores	304	327	350	373
Receivables	1,722	1,944	2,146	2,348
Total	2,961	2,271	2,496	2,721
Non-current Assets				
Gross Fixed Assets	6,259	8,610	10,895	13,113
Less: Accumulated Depreciation	(1,393)	(1,808)	(2,343)	(2,996)
Other current assets	917	917	917	917
Loans and Advances	167	167	167	167
Capital Works in Progress	974	1,270	1,028	1,145
Net Fixed Assets	6,924	9,157	10,664	12,347
Total Assets	9,886	11,428	13,160	15,068
Liabilities				
Long Term Debt	2,897	4,257	5,021	5,815
Working Capital Loan/ Short term borrowings	632	794	945	1,091
Cash deficit loan	-	1,272	4,142	7,824
Trade payables	2,051	2,051	2,051	2,051
Short term provisions	87	87	87	87
Current Liabilities	1,697	1,780	1,854	1,933
Total	7,364	10,241	14,100	18,802
Equity				
Share Capital	820	1,611	2,254	3,000
Grants	5,079	5,162	5,363	5,659
Consumer Contributions	132	132	132	132
Capital Liabilities	845	845	845	845
Retained Earnings	(4,355)	(6,564)	(9,535)	(13,370)
Total	2,521	1,187	(940)	(3,734)
Total Liabilities	9,886	11,428	13,160	15,068

Balance Sheet for Scenario 3 (under-achievement of T&D loss targets)

Items	FY 16	FY 17	FY 18	FY 19
Current Assets				
Cash @ Bank	1,705	921	-	-
Stocks – Stores	304	322	334	347
Receivables	1,737	1,929	2,095	2,267
Total	3,745	3,172	2,429	2,614
Non-current Assets				
Gross Fixed Assets	5,748	6,991	8,231	9,514
Less: Accumulated Depreciation	(1,366)	(1,695)	(2,090)	(2,552)
Other current assets	917	917	917	917
Loans and Advances	167	167	167	167
Capital Works in Progress	633	759	672	758
Net Fixed Assets	6,098	7,139	7,898	8,804
Total Assets	9,844	10,311	10,327	11,418
Liabilities				
Long Term Debt	2,398	3,063	3,467	3,936
Working Capital Loan/ Short term borrowings	633	759	865	973
Cash deficit loan	-	-	514	2,260
Trade payables	2,051	2,051	2,051	2,051
Short term provisions	87	87	87	87
Current Liabilities	1,711	1,795	1,868	1,944
Total	6,880	7,756	8,852	11,251
Equity				
Share Capital	521	869	1,176	1,533
Grants	5,932	7,292	8,382	9,645
Consumer Contributions	132	132	132	132
Capital Liabilities	845	845	845	845
Retained Earnings	(4,467)	(6,583)	(9,061)	(11,990)
Total	2,964	2,555	1,475	167
Total Liabilities	9,844	10,311	10,327	11,418

Balance Sheet for Scenario 3 (Loans taken over by GoA)

Items	FY 16	FY 17	FY 18	FY 19
Current Assets				
Cash @ Bank	2,078	1,722	848	0
Stocks – Stores	304	322	334	346
Receivables	1,698	1,877	2,046	2,219
Total	4,080	3,921	3,229	2,565
Non-current Assets				
Gross Fixed Assets	5,748	6,991	8,165	9,304
Less: Accumulated Depreciation	(1,366)	(1,695)	(2,086)	(2,538)
Other current assets	917	917	917	917
Loans and Advances	167	167	167	167
Capital Works in Progress	633	759	628	692
Net Fixed Assets	6,098	7,139	7,791	8,543
Total Assets	10,178	11,060	11,020	11,108
Liabilities				
Long Term Debt	1,253	2,033	2,452	2,897
Working Capital Loan/ Short term borrowings	608	723	831	938
Cash deficit loan	-	-	-	134
Trade payables	2,051	2,051	2,051	2,051
Short term provisions	87	87	87	87
Current Liabilities	1,056	1,779	1,852	1,930
Total	5,055	6,673	7,274	8,038
Equity				
Share Capital	521	869	1,176	1,533
Grants	5,932	7,292	8,493	9,921
Consumer Contributions	132	132	132	132
Capital Liabilities	845	845	845	845
Retained Earnings	(3,593)	(6,036)	(8,185)	(10,646)
Total	3,838	3,102	2,461	1,786
Total Liabilities	8,893	9,775	9,735	9,823