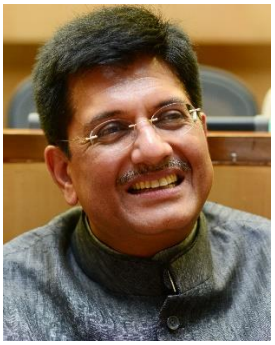
24 X 7 POWER FOR ALL ODISHA

A Joint Initiative of Government of India and Government of Odisha

सत्यमेव जयते

Government of India



Piyush Goyal

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

Foreword

Electricity consumption is one of the most important indicator 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' programme is a major step in this direction.

This joint initiative of Government of India and Government of Odisha aims to further 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 Odisha and wish them all the best for implementation of this programme. The Government of India will complement the efforts of Government of Odisha 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.

Naveen Patnaik
Chief Minister of Odisha

Foreword

Government of Odisha has all along recognized the power sector as the thrust sector to boost socio-economic development of the State. In order to harness benefits of modern management skills in different segments of the power sector, Odisha has pioneered in the country in unbundling the erstwhile Orissa State Electricity Board into professionally managed DISCOMs, transmission company (OPTCL), a company (GRIDCO) for bulk supply of power to DISCOMs and trading of electricity and a generating company (OHPC) to take care of the state's hydroelectric generating stations. Odisha is also the first state in the country to bring the power sector under regulatory regime by establishing the Odisha State Electricity Regulatory Commission.

Keeping in view the growing demand of electricity and abundant coal reserve in the State, Government of Odisha has entered into MoUs with 27 nos. of IPPs for establishing thermal power plants in the state with a total installed capacity of about 40,000 MW. Besides, 2,400 MW capacity thermal power plant is being set up by Odisha Thermal Power Corporation Ltd. (OTPCL), a State PSU and another plant of 1,320 MW capacity is being set up through OPGC, a joint venture company formed by Government of Odisha and AES Corporation.

OPTCL is implementing different schemes for establishing a robust transmission system, commensurate with growth in demand, targeting transformation capacity of about 26,000 MVA and 17,000 circuit-km in the State by the end of FY 2018-19.

In order to promote green energy in the State, it has been planned to establish 2,378 MW of solar capacity and 1,000 MW from other sources of green energy, viz., wind, bio-mass, including municipal solid waste etc. by 2022. This has been taken up by Green Energy Development Corporation Limited (GEDCOL) in coordination with Odisha Renewable Energy Development Agency (OREDA).

Government of Odisha has already initiated various schemes/programmes, like Odisha Distribution System Strengthening Project (ODSSP), State Capital Region Improvement of Power System (SCRIPS), Biju Gram Jyoti Yojana (BGJY), Odisha Dedicated Agriculture & Fishery Feeder Project (ODAFF), Biju Saharanchala Vidyutikaran Yojana (BSVY) etc. to create/strengthen the distribution network in the State for supply of adequate and quality power to the consumers of the State.

I look forward to successful implementation of the '24x7 Power for All' in Odisha.

सत्यमेव जयते

Government of India

Government of Odisha

Joint Statement

'24x7 Power for All' (PFA) programme will be implemented by Government of Odisha (GoO) with active support from Government of India with the objective to connect the unconnected consumers in a phased manner by FY 2018-19, ensure 24x7 quality, reliable and affordable power supply to all Domestic, Commercial Agriculture and Industrial consumers within the time frame.

Government of Odisha is attaching highest priority to the power sector and is committed to provide full support to all utilities for ensuring quality power supply.

Government of Odisha would try to ensure that all the necessary steps outlined in the PFA document are taken up in terms of village electrification, capacity addition, power purchase planning, strengthening the required transmission and distribution network, encouraging renewables, undertaking customer centric initiatives, reduction of AT&C losses, bridging the gap between ACS & ARRs, and following good governance practices in implementation of all Central and State Government schemes.

Government of India (GoI) would supplement the efforts of Government of Odisha by fast tracking resolution of key issues pertaining to generation and ensuring optimum allocations in various distribution schemes (as per provisions of applicable policies).

It is envisaged to cover the entire state under PFA programme for development of all the regions of the State for providing 24x7 power supply to all domestic, agriculture industrial and commercial consumers by FY 2018-19.

However, Government of Odisha would endeavor to implement the programme earlier than the above targeted dates.

The Central and State Governments would meet regularly to review the progress of the programme over the next 3 years and would strive to achieve the objectives of the programme by taking the necessary steps as envisaged in the PFA document.

Jyoti Arora

Jyoti Arora, IAS

Joint Secretary
Ministry of Power (GoI)

13.2.16

Rajesh Verma, IAS

Principal Secretary, Energy
Government of Odisha

EXECUTIVE SUMMARY

24x7 Power for All is a Joint Initiative of Government of India (GoI) and State Governments with the objective to provide 24x7 power available to all households, industry, commercial businesses, public needs, any other electricity consuming entities and adequate power to agricultural farm holdings by FY 2018-19. This roadmap document aims to meet the above objectives for the state of Odisha.

ELECTRIFICATION IN ODISHA

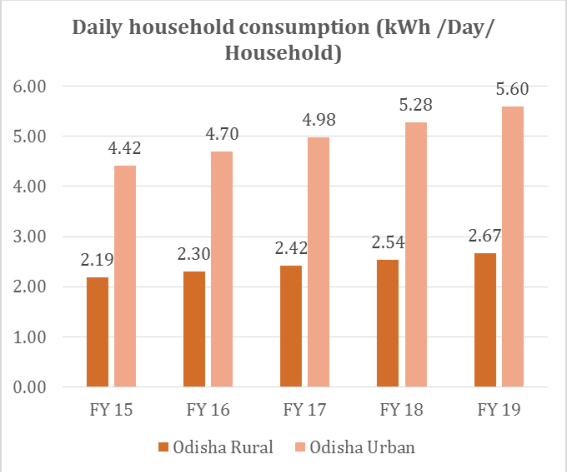
Odisha currently is estimated to have 1.04 crore households with 56% electrification as on March 2015. This leaves approximately 42 lakh households in rural and 3 lakh households in urban area for electrification. Electrification of the remaining villages and rural BPL households under RGGVY is currently being undertaken in Odisha as per the 12th Five Year Plan. The State proposes to electrify a total of 16.49 lakh households under this scheme. The targeted number of villages to be covered under this scheme are 3,144 as shown in the table below:

RGGVY	
UE Villages	3,144
Habitations	16,533
Households	16,48,883
Time line	FY 2014 - FY 2017
Budget	Rs 3550.75 Crore

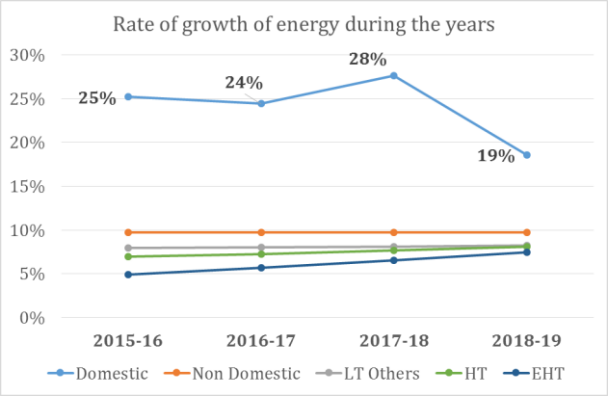
Apart from the above 3,144 villages targeted, there are 732 villages more which are to be electrified. The State has planned to undertake electrification of these villages through conventional and non-conventional sources under DDUGJY (central scheme) and BGJY (State scheme).

PROJECTED DEMAND

The demand projection for the state has been undertaken till FY 2018-19 considering FY 2014-15 as the base year. The demand estimate for domestic consumers has been made based on the number of units consumed per day per household. The number of households has been taken from 2011 census which has been projected based on CAGR growth observed during 2001 and 2011. The consumption per day has been projected based on the historical average for urban while for rural it has been taken at a higher rate. The daily household consumption for rural is 2.19 units/ day and for urban it is 4.42 units/day in FY 2015. The same has been projected to 2.67 units/day for rural and 5.60 units/day for urban household by FY 2018-19.



Demand estimates for other than domestic consumers has been made based on the historical CAGR observed in last 4-5 years.



Therefore, the state is estimated to observe a maximum demand of 5,268 MW in the FY 2018-19.

GENERATION PLAN

Odisha is one of the mineral rich states in India having major reserves of iron ore, coal, limestone, dolomite, tin ore, bauxite and chromite. Rich mineral resource base has resulted into a large number of mining based industries setting up their plants in the state. To support these industries and other consumers in the State power generation capacity of almost 9,000 MW has been installed by Central, State, IPPs and CGPs. In addition, state generating stations, IPPs and central generating plants are coming up to support the growing demand.

Odisha currently gets about 2,500 MW of power from state generating stations, 1050 MW from IPPs, 1820 MW from central allocation including power from Bhutan and 210 MW from different renewable sources. The total power available to the state is around 5,600 MW during FY 2015 which is expected to increase to 8920[1] MW by FY 2019 from different sources, which will make Odisha a power surplus state. Therefore, the state has planned to sell this surplus power to other states.

TRANSMISSION PLAN

The inter-state transmission capacity in the state is around 9,000 MVA at 765 kV, which is mainly being used for exporting power outside the state by CTU (PGCIL). This capacity is planned to be ramped up to 15,000 MVA by FY 2019 for meeting the export requirement of the state. Further, there is around 4,725 MVA capacity available for meeting the needs of the state at 400 kV which is expected to increase to 7,900 MVA by FY 2018-19 maintained by CTU.

In addition, the OPTCL has currently planned to increase the transformation capacity in the state from 13,700 MVA to 26,340 MVA by the end of FY 2018-19 at different voltage levels. The above intra-state capacity expansion will require an investment of Rs 4900 Crore.

DISTRIBUTION PLAN

There are four DISCOMs serving electricity consumers in Odisha i.e.; CESU, NESCO Utility, WESCO Utility and SOUTHCO Utility. They are currently serving more than 54 lakh consumers with almost 24 hours of power supply. CESU accounts for the highest number of consumer share with 34% and WESCO with the lowest at 20% as on March 2015.

The AT&C losses for Odisha DISCOMs has reduced from 57% in FY 1999 to 38% in FY 2014-15, which is an overall reduction of 19%. The DISCOMs have planned several investment schemes to reduce technical losses, system strengthening and rural electrification during next four years. An

[1] *The figures have been rounded off for the sake of convenience*

investment of Rs 18,580 Crore has been envisaged which include both Government of Odisha and Government of India funded schemes. Out of Rs 18,580 Crore required, there is still a gap of Rs 6,140 Crore which has been requested to GoI as additional funding under IPDS and DDUGJY schemes. During the next four years, 42 lakh households will be added in rural areas and 3 lakh households in urban areas which will double the existing consumer base.

FINANCIAL SUSTAINABILITY

The existing accumulated loss for the Odisha DISCOMs as per the provisional financial accounts of FY 2014-15 stands at Rs 6,120 Crore, which is ~70% of their revenue booked for the FY 2014-15. In addition to its huge accumulated losses, in the FY 2014-15 the DISCOMs have booked a net loss of Rs 1,400 Crore. Besides the losses of DISCOMs, GRIDCO has Rs 3,475 Crore of losses. Since, there is a gap in Average Collection Rate and Average Cost of Supply, corrective actions need to be taken so that the utilities can undertake initiative of "24 x 7 Power For All" while transforming themselves into financially sustainable units.

TABLE OF CONTENTS

CHAPTER 1: INTRODUCTION 1
CHAPTER 2: FACTS ABOUT ODISHA 3
CHAPTER 3: POWER SECTOR IN ODISHA 4
CHAPTER 4: DEMAND AND SUPPLY SCENARIO 9
CHAPTER 5: GENERATION PLAN 14
CHAPTER 6: TRANSMISSION PLAN 19
CHAPTER 7: DISTRIBUTION PLAN 25
CHAPTER 8: RENEWABLE ENERGY INITIATIVES 33
CHAPTER 9: ENERGY CONSERVATION AND ENERGY EFFICIENCY PROGRAM 34
CHAPTER 10: FINANCIAL SUSTAINABILITY 38
CHAPTER 11: OTHER INITIATIVES 48
CHAPTER 12: ROLL OUT PLAN 50
ANNEXURES 52

CHAPTER 1: INTRODUCTION

Power sector is a critical infrastructure element for growth of an economy. The availability of reliable, quality and affordable power is vital for rapid growth in agriculture, industry and for overall economic development of a State. An efficient, resilient and financially healthy power sector is an essential requirement for growth of a State and economic empowerment of the common man.

Under the Indian Constitution, electricity is a concurrent subject. As per Electricity Act 2003, it is the duty of a distribution licensee to develop and maintain an efficient, coordinated and economical distribution system in the mandated area of supply as well as to supply electricity in accordance with the provisions of the Act. The State Electricity Regulatory Commission (SERC), as per the provisions of the Act, specifies and enforces the standards with respect to quality and reliability of supply by licensees and also monitors the performance of distribution companies (Licensees) on the basis of notified performance standards.

OBJECTIVES AND KEY OUTCOMES OF THE 24X7 POWER FOR ALL – JOINT INITIATIVE

The 24x7 Power for All (24x7 PFA) is a Joint Initiative of Government of India (GoI) and Government of Odisha (GoO) with the objective to make 24x7 power available to all households, industry, commercial businesses, public needs, any other electricity consuming entity and adequate power to agriculture farm holdings.

Towards this goal the 24x7 PFA initiative seeks to:

i. Ensure reliable 24x7 supply to consumers within a period of four years of commencement of the program.

ii. The agricultural consumers will be provided with power supply as per requirement.

iii. Ensure that all unconnected households are provided access to electricity in a time bound manner in the next four years i.e. by end of FY 2019.

iv. Ensure adequate capacity addition planning and tie-ups with different power generation sources for availing power at affordable price to meet the projected power demand in future.

v. Strengthen the transmission and distribution network to cater to the expected demand growth.

vi. Assess the financial measures including optimization of investments and measures for restructuring the balance sheet to ensure liquidity in the finances of the utility.

vii. Put in place a strategy to ensure reduction of AT&C losses as per the agreed loss reduction trajectory and methodology and steps required to be taken at every level of distribution.

viii. Identify steps for implementation and adoption of modern technologies to monitor reliability of supply.

ix. Identify steps for monitoring timely commissioning of various generating plants and transmission and distribution infrastructure to meet the expected growth in demand.

x. To take measures for meeting the performance standards as laid down by SERC.

This document is an action plan drawn to achieve the above aims and objectives. The plan will be executed by the Government of Odisha with the support of Government of India, wherever necessary, as per their approved plans, schemes and policies.

METHODOLOGY FOR PREPARATION OF THE ACTION PLAN FOR 24X7 POWER FOR ALL

The plan aims at the following:

1. Bridging the gap between the demand and supply for the existing consumers and future growth,
2. Connecting the un-connected households and farm holdings.

Accordingly the methodology adopted to prepare the 'Action Plan' for 24x7 PFA includes inter-alia:

1) Projection of average per day consumption of rural and urban households considering the respective compounded annual growth rates (CAGR) during the past five years.

2) Projection of demand growth of commercial, industrial and agriculture consumers based again on the CAGR recorded during the past five years.

3) Assess the power requirement for all un-electrified households and preparation of a time bound plan for electrification of all households.

4) Project the annual energy requirement and maximum demand by aggregating the requirement of all consumer categories and using an appropriate load factor and diversity factor for calculating the maximum demand.

5) Draw up a broad plan to meet power demand in future through

   - ✓ State's own upcoming generation sources.
   - ✓ Allocation from upcoming central sector power plants
   - ✓ Quantum of additional procurement required.

6) Assess the additional energy requirement for providing 24x7 power supply to all households in the State as well as to other consumer categories and determine financial implications on utilities for procuring additional energy and its implication on tariff.

7) Assess the adequacy of the network - both inter-state and intra-state transmission as well as distribution so as to meet the projected power requirement of all consumer categories of the State.

8) To incorporate futuristic initiatives like smart grid, energy efficiency measures etc.

9) Conduct sensitivity analysis for cost of service and resulting financial gap under multiple scenarios, namely, tariff hike, reduction in power procurement cost and increase in interest and moratorium period and AT&C loss reduction, etc.

10) Set monitorable targets to achieve the goal of 24x7 Power for All in a cost effective manner to the consumers of the State.

CHAPTER 2: FACTS ABOUT ODISHA

Key Statistics	
Created in	1936
Reorganized In	1947
Total Area (Sq. km.)	155707
Administrative Districts	30
Gram Panchayats	6,225
Number of Blocks	314
Total Number of Villages	51,583
Number of Statutory Towns	223
Number of Municipal Corporations	5
Number of Municipalities	45
Number of Notified Area Councils	61
Number of Industrial Towns	2
Population	4,19,74,218
Number of households (2011)	96,61,085
Installed Capacity (MW)	9036
Number of consumers (Lakh) (as on March 2015)	~58

Odisha stands for its ancient glory and modern endeavor. It is endowed with nature's bounty, a 482 km stretch of coastline, serpentine rivers, mighty waterfalls, forest-clad and blue hills of Eastern Ghats with rich wild life.

Odisha is gifted with rich mineral reserves constituting 28% Iron ore, 24% coal, 59% Bauxite and 98% Chromite of India's total deposits. The State's gross State domestic product (GSDP) grew at a compound annual growth rate (CAGR) of 11.5% between 2004-05 and 2014-15.

The State offers a wide range of fiscal and policy incentives for businesses under the Industrial Policy Resolution, 2015. The industrial policy aims to promote industrial development in the State to effectively use its existing resources.

CHAPTER 3: POWER SECTOR IN ODISHA

POWER SECTOR DEVELOPMENTS IN ODISHA

Odisha has pioneered the Power Sector Reform in the country in 1990s. The main objective of the reform in state power sector was to unbundle Generation, Transmission & Distribution activities of OSEB and to establish an independent and transparent Regulatory regime in order to promote efficiency and accountability in the sector.

The reform process started with enactment of the Orissa Electricity Reform Act 1995, which came into force with effect from the 1st of April 1996.

The Transmission & Distribution assets and personnel of OSEB were transferred to the newly created GRID Corporation of Orissa Limited (GRIDCO) and all Hydro generating Stations of OSEB along with the personnel were transferred to Orissa Hydro Power Corporation Limited (OHPC) with effect from the 1st of April 1996.

One of the main objectives of the power sector reform was also to encourage Private Sector participation in the distribution business. With the privatization of distribution function, it was expected that the efficiency will improve which will result in reduction of losses, improvement in billing and collection, quality of supply of power at a reasonable price.

Keeping this in view 4 Distribution Companies viz. (i) Central Electricity Supply Company of Orissa Ltd. (CESCO), (ii) North-Eastern Electricity Supply Company of Orissa Ltd. (NESCO), (iii) Western Electricity Supply Company of Orissa Ltd. (WESCO) and (iv) Southern Electricity Supply Company of Orissa Ltd. (SOUTHCO) were registered on 19.11.97.

Through a process of International Competitive Bidding (ICB), 51% of the equity share capital of the three companies namely WESCO, NESCO & SOUTHCO held by GRIDCO were divested in favor of BSES, the private sector investor along with the management control w.e.f. 01.04.1999. Similarly, AES Corporation, USA in consortium with Jyoti Structure Ltd. acquired 51% of equity in CESCO on 01.09.1999 along with management control. With this disinvestment, the privatization of distribution activities of GRIDCO, which is first of its kind in India, was concluded.

Subsequently with the enactment of the Electricity Act, 2003, the Government of Odisha transferred the transmission business of GRIDCO and vested the same with Orissa Power Transmission Corporation Limited (OPTCL) a wholly owned Government Company w.e.f. 1.4.2005. OPTCL has been notified as the State Transmission Utility (STU) and is also mandated to discharge the State Load Dispatch functions. OPTCL undertakes the activities of Intra- State transmission of electricity in the State of Orissa.

OERC revoked the license of CESCO in the year 2005 and constituted a utility namely Central Electricity Supply Utility of Odisha (CESU) under Section 22 of the Electricity Act 2003 and transferred the assets along with personnel and granted Electricity Distribution License to CESU to continue the distribution licensee in the central zone of Odisha.

In March, 2015 the Hon'ble Odisha Electricity Regulatory Commission (OERC) revoked the license of RIL (Reliance Infrastructure Limited) managed 3 DISCOMs namely, WESCO, NESCO & SOUTHCO under Section 19 of Electricity Act, 2003 on account of poor performance and appointed Chairman cum Managing Director, GRIDCO Ltd., as the Administrator under Section

20(d). The management & control of WESCO, NESCO & SOUTHCO Utilities along with their assets, interests and rights were vested with CMD GRIDCO who shall function under over all control of Principal Secretary, Energy. This was done in order to ensure the continued supply of Electricity in the respective regions of the State of Odisha in the interest of consumers and the public interest at large.

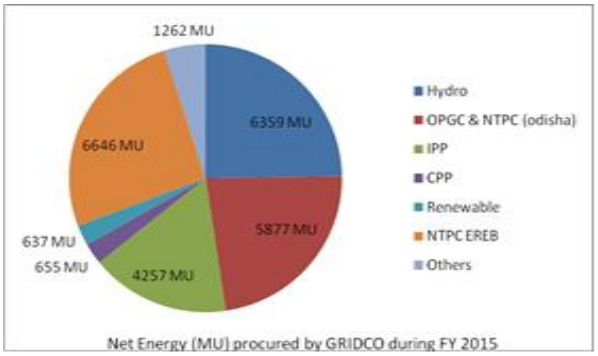
GENERATION

Odisha Power Generation Corporation Limited (OPGC) is the thermal power generating company under the joint venture of Government of Odisha (51% share) and AES (49% share).

It owns and operates 2X210 MW power plant at Ib Thermal Power Station (ITPS), Banharpali in Jharsuguda District of Odisha. Odisha Hydro Power Corporation Ltd (OHPC) is the hydropower generating company of the State Government. It operates hydro power plants of capacity 2085 MW (Burla Power House, Chiplima Power House, Balimela Power House, Rengali Power House, Upper Kolab Power House, Upper Indravati Power House) and 57 MW Machhkund Power House. Besides Odisha also receives 195 MW of renewable power.

State also receives power from central generating stations, renewable energy sources and IPPs to fulfill its power needs. In Odisha, GRIDCO is engaged in the business of bulk purchase and bulk sale of power to the four DISCOMs and trading of surplus power.

In the FY 2015, GRIDCO had purchased 25694 MU of energy at a cost of Rs 5841 Crore at an average rate of 2.27 Rs/kWh. However, out of the total purchase of 25,694 MU, GRIDCO had traded 972.52 MU at an average rate of 4.59 Rs/kWh. The details of share of power purchase from different sources in FY 2015 is shown below:



TRANSMISSION

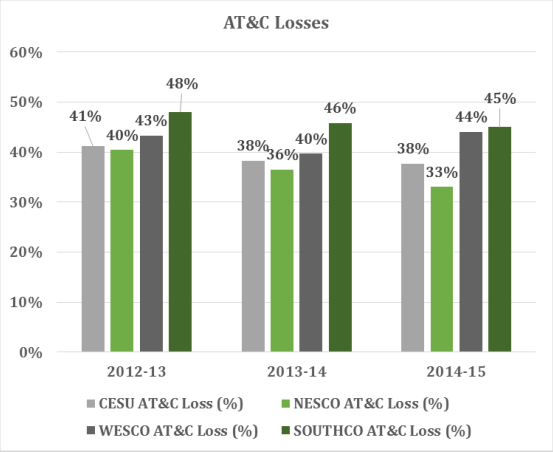
Odisha through notification of a Transfer Scheme transferred the transmission business of GRIDCO and vested the same with Odisha Power Transmission Corporation Limited (OPTCL) with effect from 1st April 2005. It owns and operates 113 nos. of grids with 13,692 MVA and 12,088 Ckt. Km of lines as on March 2015. It is mandated to discharge the State Load Dispatch functions also.

DISTRIBUTION

As a part of the reform process, the distribution of power was privatized in Odisha in 1999 and the management of the four companies in charge of distribution in the Central, Northern, Southern and Western zones of Odisha, namely CESCO, NESCO, SOUTHCO and WESCO was entrusted to private companies which took over 51% of the shares from GRIDCO.

The overall AT&C loss of the State has been reduced to 38% during FY 2015 from 57% in the FY 1999.

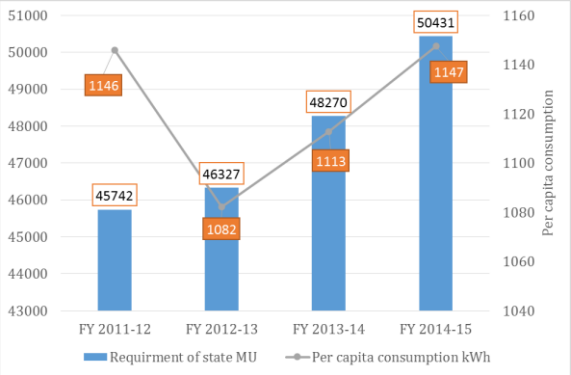
The AT&C loss levels for the four DISCOMs from FY 13 to FY 15 are shown in the figure.



PER-CAPITA ELECTRICITY CONSUMPTION

The per-capita electricity consumption in Odisha increased from 665 kWh in FY 2007 to 1,146 kWh in FY 2012, which is mainly led by growth in CPPs in the State. However, during FY 2013 the consumption in energy remained low due to recession in the metal & metallurgical industry followed by natural calamities like cyclone (Phylin) and flood in the State. The per capita consumption from FY 2013 has been calculated based on energy requirement of DISCOMs and open access consumers. Population growth has been considered based on the CAGR growth observed during 2001 to 2011.

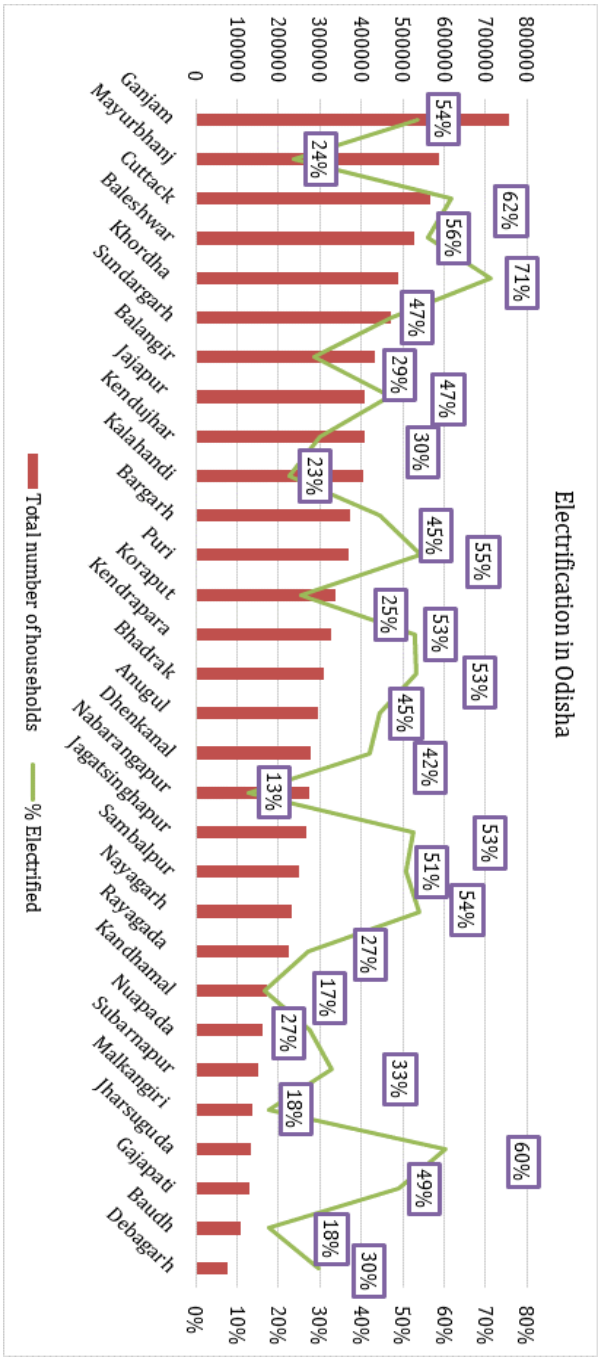
Figure 1: Per Capita Consumption



The per-capita electricity consumption of Odisha is higher than India which was 884 in FY 2012 and 1010 in FY 2015.

STATUS OF ELECTRIFICATION

District-wise electrification in Odisha as per census 2011 is detailed below:



The summary of electrified and un-electrified households as per 2001 and 2011 census and projections for FY 2015 based on CAGR for past 10 years is tabulated below:

Table 1: Projection of households based on Census 2001 and 2011

	Particulars	Total	Rural	Urban
2001	CESU	2282724	1874358	408366
	% of total	29%	28%	38%
	NESCO	1795163	1640926	154237
	% of total	23%	24%	14%
	WESCO	1968729	1659014	309715
	% of total	25%	24%	28%
	SOUTHCO	1823511	1608581	214930
	% of total	23%	24%	20%
	Odisha	**7870127**	**6782879**	**1087248**
2011	CESU	2824202	2254868	569334
	% of total	29%	28%	38%
	NESCO	2240783	2020338	220445
	% of total	23%	25%	15%
	WESCO	2455375	2040240	415135
	% of total	25%	25%	27%
	SOUTHCO	2140725	1828566	312159
	% of total	22%	22%	21%
	Odisha	**9661085**	**8144012**	**1517073**

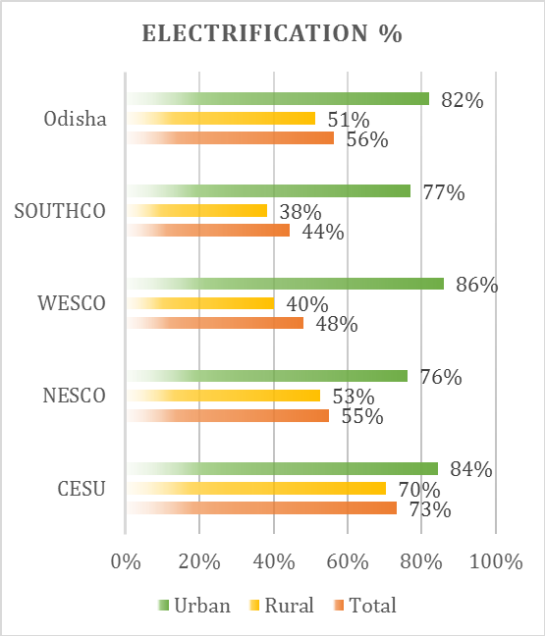
- *CESU had the highest number of households at 29% in 2011*
- *In 2011, 28% of the households were in rural areas of CESU and 38% in urban.*
- *In 2011, CESU had the highest share of urban households at 38% and NESCO had the lowest at 15%*
- *The share of rural households in SOUTHCO reduced by 1.26% from 24% in 2001 to 2011*
- *The share of urban households in WESCO reduced by 1.12% from 28% in 2001 to 2011*

For FY 2015 figures derived by extrapolating Census 2011 data, do not match with the records of number of consumers for FY 2015. The following table compares the projected number of electrified and un-electrified households based on Census 2011 and as per records of the four DISCOMs.

Table 2: Projection of Census 2011 vs. State's Consumer

		Total	Rural	Urban
Consumers	CESU	18,25,510	13,97,638	4,27,872
	% of total	34%	32%	40%
	NESCO	12,15,477	9,90,468	2,25,009
	% of total	22%	23%	21%
	WESCO	10,85,742	8,84,421	2,01,321
	% of total	20%	20%	19%
	SOUTHCO	12,85,227	10,75,304	2,09,923
	% of total	24%	25%	20%
	Odisha	**54,11,956**	**43,47,831**	**10,64,125**
2015 electified households	CESU	22,56,116	17,07,168	5,48,948
	% of total	38%	38%	39%
	NESCO	13,46,758	11,52,865	1,93,893
	% of total	23%	26%	14%
	WESCO	12,90,585	8,88,582	4,02,003
	% of total	22%	20%	28%
	SOUTHCO	10,16,248	7,37,433	2,78,816
	% of total	17%	16%	20%
	Odisha	**59,09,707**	**44,86,047**	**14,23,660**

Figure 2: Electrification Rate in FY 2015



Following variations were observed in DISCOM's consumer data and census projections:

I. Against the projections of 59,09,707 electrified households in FY 2015, there are 54,11,956 electrified consumers on record of DISCOMs i.e. 43,47,831 consumers in rural areas and 10,64,125 in urban areas.

II. As per the projections there are 45,88,525 households which are un-electrified i.e. 42,78,454 households in rural areas and 3,10,071 in urban areas.

Considering the above variances, for the projection of daily household consumption (for the estimation of demand) of both rural and urban consumers in future years for each DISCOM, following methodology has been adopted:

(1) The figures of the electrified urban and rural households in FY 2015 as per the census 2011 projection has been considered for each DISCOM.

(2) To arrive at the existing un-electrified urban and rural households, the electrified urban households and the electrified rural households have been reduced from the urban and rural households respectively projected for FY 2015 based on Census 2011.

Based on the above, the number of electrified and un-electrified households in urban and rural areas of Odisha in FY 2015 have been arrived.

CHAPTER 4: DEMAND AND SUPPLY SCENARIO

PRESENT POWER SUPPLY POSITION

The actual energy and demand scenario during the past 5 years is shown below:

Figure 3: Energy Requirement vs. Availability[2] (in MU)

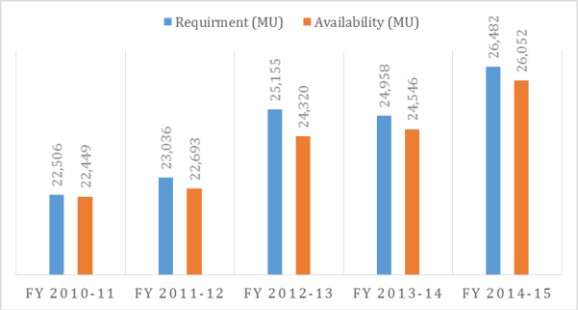
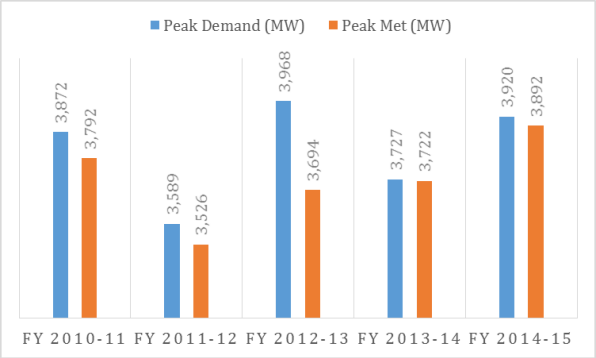


Figure 4: Peak Demand vs. Peak Met (in MW)



- *The peak demand deficit is being progressively bridged by Odisha*
- *The energy requirement in the State has increased on account of increase in domestic consumers which has increased its share from 26% to 36% in past 6 years*
- *However, the share of demand from HT and EHT consumers has dropped from 58% to 48% in past 6 years.*
- *The peak demand in the State has remained almost constant around 3,900 MW in past 3 years.*

DEMAND PROJECTIONS

The energy requirement of Odisha during FY 2015 was 25,694 MU. With 24 x 7 supply to be maintained across the State for all present and future consumers, the demand is likely to increase rapidly. The demand can be classified in three broad categories.

(a) Demand on account of 24x7 power supply to already electrified and newly built domestic households

(b) Demand from electrification of un-electrified domestic households.

(c) Demand on account of 24x7 power supply to other than domestic category.

DEMAND ESTIMATION FOR DOMESTIC CONSUMERS AND HOUSEHOLD ELECTRIFICATION

The actual daily electricity consumption in rural household is at 2.19 kWh in FY 2015. On the other hand, the daily electricity consumption of urban household has increased to 4.42 kWh in FY 2015 at CAGR of just 1%.

The broad approach considered during projection is highlighted below:

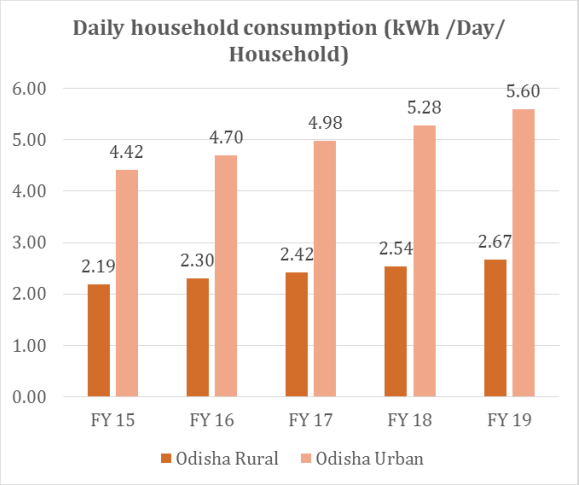
(1) The daily household consumption has been computed separately for rural and urban households for FY 2015 and escalated based on the expected growth rate of 5% and 6%

[2] *As per the data available in the monthly reports of CEA*

in rural and urban areas respectively to arrive at the daily household consumption up to FY 2019.

(2) The annual sales in domestic category has been arrived on consideration that the projected households in both rural and urban categories would be consuming electricity at their respective projected daily household consumptions.

Figure 5: Projected household consumption



The average daily household consumption of existing electrified rural and urban households in FY 2015 has been arrived at by dividing the actual sales in rural and urban areas for the whole State by the projected number of electrified rural and urban households in FY 2015 respectively.

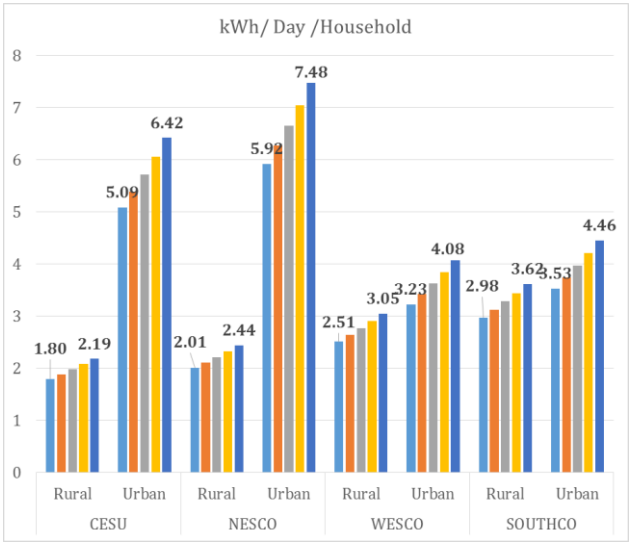
However, it may also be kept in view that the geographical features of the State (i.e. the location, accessibility, weather) along with current tariff structure are likely to play a significant role in determining the current and future demands.

The number of electrified households is expected to grow at the decadal CAGR of 2.09% in rural areas and at the decadal CAGR of 3.00% in urban areas.

Also, to electrify the remaining 42,78,454 households in rural areas, phasing of electrification of 10% households in FY 2016, 32% households in FY 2017, 40% in FY 18 and remaining 18% in FY 2019 has been considered.

For electrification of balance 3,10,071 urban households, the connections will materialize along with the system strengthening works proposed under urban strengthening schemes like RAPDRP & IPDS and accordingly phasing of 36% in FY 2016, 41% in FY 2017 and 23% in FY 2018 has been considered.

Figure 6: Projected daily household consumption for Discoms



Accordingly, the annual consumption of the domestic households is tabulated below for all the four DISCOM's:

Table 3: Projected Sales from Existing and Newly Electrified Households (Odisha)

S.N.	Particulars	FY 15	FY 16	FY 17	FY 18	FY 19
A	**Rural - Electrified Consumers (Existing + Projected Growth)**					
	Electrified Consumers Rural (in Nos.)	44,86,047	45,79,805	46,75,522	47,73,239	48,72,999
	Actual Metered Sales (in MU)	3,584				
	Actual Daily Household Consumption	2.19				
	Projected Daily Household Consumption		2.30	2.42	2.54	2.67
	Projected Annual Consumption		3,841	4,118	4,414	4,732
B	**Rural - Electrification of Un-Electrified Consumes**					
	Targeted Annual Addition Rural (in Nos.)	1,11,376	4,19,314	13,48,588	17,13,887	6,68,907
	Cumulative Annual Addition (In No.s)		5,30,690	18,79,278	35,93,165	42,62,072
	Projected Annual Consumption		263	1,211	2,791	4,094
C=A +B	**Total Projected Rural Consumption (MU)**		**4,105**	**5,328**	**7,205**	**8,826**
D	**Urban - Electrified Consumers (Existing + Projected Growth)**					
	Electrified Consumers Urban (in Nos.)	15,24,983	15,70,318	16,17,001	16,65,072	17,14,572
	Actual Metered Sales (in MU)	2,460				
	Actual Daily Household Consumption	4.42				
	Projected Daily Household Consumption		4.70	4.98	5.28	5.60
	Projected Annual Consumption		2,685	2,931	3,199	3,492
	Urban - Electrification of Un-Electrified Consumes					
	Targeted Annual Addition urban (in Nos.)		1,11,194	1,28,081	70,797	0
	Cumulative Annual Addition (In No.s)		1,11,194	2,39,275	3,10,071	3,10,071
	Projected Annual Consumption		88	299	517	635
E	**Total Projected Urban Consumption (In MU)**		**2774**	**3230**	**3716**	**4127**
F=C +E	**Total Projected Domestic Urban Consumption (In MU)**		**6878**	**8558**	**10921**	**12953**

DETERMINATION OF CONSUMPTION OF OTHER CONSUMERS

For projection of sales for FY 2016 to FY 2019, the CAGR of previous 6 years has been considered for all categories.

Based on this, the category-wise sales is as per table below:

Figure 7: Growth Rate Observed in different categories

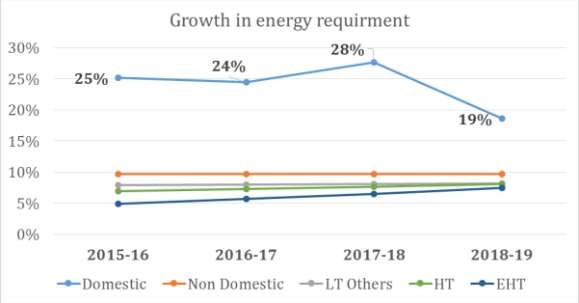


Table 4: Projected Category-wise Sales (In MU)

Sales	2015-16	2016-17	2017-18	2018-19
Rural Metered	4,105	5,328	7,205	8,826
Urban Metered	2,774	3,230	3,716	4,127
General Purpose	1,319	1,447	1,588	1,742
Irrigation /Pumping	209	223	239	257
Allied Agriculture Activities	27	30	35	40
Public Lighting	87	93	100	107
LT Industrial	343	347	352	357
Specified Public Purpose	121	131	143	155
Public Water Works	235	255	276	300
General Purpose (>110 KVA)	395	429	467	507
HT Bulk Supply (Domestic)	96	100	105	110
HT Irrigation Pumping	4	5	6	8
HT Allied Agriculture Activities	27	34	44	59
HT Specified Public Purpose	148	168	192	219
HT & EHV General Purpose	144	151	159	167
HT & EHV Large Industries	3,417	3,435	3,454	3,473
HT & EHV Mini Steel Plants	165	163	161	160
HT & EHV Colony Consumption	-	-	-	-
HT & EHV Traction	1,129	1,237	1,359	1,495
HT & EHV Power Intensive Industries	1,575	1,585	1,595	1,607
HT & EHV Heavy Industries	1,111	1,399	1,762	2,220
Total	**17,429**	**19,793**	**22,958**	**25,935**

- *As seen from above, the share of HT and EHT is likely to decrease from 45% to 37% of overall consumption of the State of Odisha whereas the share of domestic sales is likely to increase from 40% to 50%*

ENERGY AND DEMAND REQUIREMENT

The trajectory for AT&C loss reduction as per State targets has been taken into account for preparing this document.

Considering the collection efficiency to increase to 100% in Odisha, the AT&C Loss trajectory, energy requirement and maximum demand is shown below:

Table 5: AT&C loss targets and demand estimates for DISCOMs

	FY 2015-16	FY 2016-17	FY 2017-18	FY 2018-19
AT&C Losses				
NESCO	32%	29%	24%	19%
WESCO	35%	31%	26%	20%
SOUTH CO	40%	37%	29%	23%
CESU	34%	29%	24%	18%
Total	**35.1%**	**30.5%**	**25.1%**	**20%**
Energy Demand (MU)				
NESCO	5,698	5,934	6,099	6,302
WESCO	7,764	8,288	9,078	9,396
SOUTH CO	4,000	4,631	4,875	5,108
CESU	9,868	10,379	11,302	12,418
Odisha	**27,330**	**29,232**	**31,354**	**33,224**
Maximum Demand (MW)				
NESCO	903	941	967	999
WESCO	1,231	1,314	1,439	1,490
SOUTH CO	634	734	773	810
CESU	1,565	1,646	1,792	1,969
Odisha	**4,333**	**4,635**	**4,971**	**5,268**

Based on the loss reduction trajectory for each DISCOM, the energy and demand requirement for the future years has been derived.

The load factor has been taken as considered in 18th EPS at 72%. As seen from the above, the maximum demand requirement of the State is projected to increase from ~3,900 MW in FY 2015 to **5,268 MW in FY 2019**.

As per projections made in 18th EPS of CEA, the projected energy demand and maximum demand for the State of Odisha is 38,262 MU and 6066 MW in FY 2019 as against the now calculated energy requirement of 33,224 MU and maximum demand of 5,268 MW in FY 2019.

An assessment of the adequacy of generation, transmission and distribution infrastructure for meeting the projected annual energy requirement of 33,224 MU and maximum demand of around 5,268 MW has been made which is covered in the following chapters.

Table 6: Energy Requirement (In MU) and Peak Demand (in MW)

Source	Energy Scenario			
	FY 2015-16	FY 2016-17	FY 2017-18	FY 2018-19
Energy Requirement within State				
Sales (MU)	**17,429**	**19,793**	**22,958**	**25,935**
Distribution loss	34%	30%	24%	20%
AT&C losses	*35.1%*	*30.5%*	*25.1%*	*20%*
Collection Efficiency	98%	99%	99%	100%
Transmission losses	*3.75%*	*3.50%*	*3.20%*	*3.00%*
Total Energy Requirement within State (MU)	**27,330**	**29,232**	**31,354**	**33,224**
Maximum Demand (MW)	**4,333**	**4,635**	**4,971**	**5,268**

CHAPTER 5: GENERATION PLAN

CUMULATIVE GENERATION AVAILABILITY

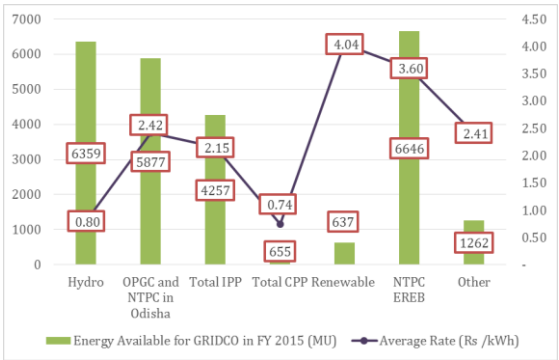
The total installed capacity in Odisha as on October 2015 is 9036 MW which includes share from central generating stations.

The State hydro generating company provides 25% of the total energy needs of the State at an average cost of Rs 0.80/kWh, which is the cheapest source of power in the State. However, while central generating stations provide around 26% of the total energy need it is one of the expensive source of power.

Odisha has met a maximum demand of 3920 MW in FY 2015 and the present annual energy requirement of the State is of the order of 25,698 MU.

The maximum demand is expected to increase to 5,268 MW by FY 2019 and the energy requirement is projected to rise to 33,224 MU in FY 2019, taking into account additional energy requirement for providing 24x7 power supply to the State over the normal load growth.

Figure 8: Source of power and average cost FY 2015



PLANNED CAPACITY ADDITION

A number of generating stations (hydro, coal based etc.) are planned to be commissioned up to FY 2019. The existing and additional capacity available from various sources (along with the expected year of commissioning) is summarized below:

Table 7: Summary of Existing Firm Availability from Various Sources

Source	Type	Installed Capacity (MW)	Latest Firm Entitlement		Year from which plant is available
			%	MW	
State Sector Thermal Generating Stations					
Ib Thermal Power Station, Jharsuguda	Coal	420	100	420	1994
State Sector Hydro Generating Stations					
Burla Power House	Hydro	275	98	270	1958
Chiplima Power House	Hydro	72	100	72	1962
Balimela Power House	Hydro	510	100	510	1973
Rengali Power House	Hydro	250	100	250	1985
Upper Kolab Power House	Hydro	320	100	320	1988
Upper Indravati Power House	Hydro	600	100	600	1999
Machhkund Power House	Hydro	114	50	57	1955
Total		**2561**		**2499**	
Central Sector Thermal Generating Stations					
TTPS, Talcher	Coal	460	100	460	1967

Source	Type	Installed Capacity (MW)	Latest Firm Entitlement		Year from which plant is available
			%	MW	
Farakka STPS, Stage-I & II	Coal	1600	13.81	221	1986
Farakka STPS, Stage-III	Coal	500	16.87	84	2012
Kahalgaon STPS, Stage-I	Coal	840	15.4	129	1995
Kahalgaon STPS, Stage-II	Coal	1500	2.24	34	2008
Talcher STPS, Stage-I	Coal	1000	31.97	319	1997
Talcher STPS, Stage-II	Coal	2000	10	200	2003
Barh STPS, Stage-II	Coal	1320	12.50	165	2014
Total		**9220**		**1612**	
Other					
Chukha Hydro Electric Project	Hydro	336	15.19	51	1988
Tala Hydro Electric Project	Hydro	1020	4.25	43	2006
Teesta-V Hydro Electric Project	Hydro	510	20.59	105	2008
Total		**1866**		**200**	
Independent Power Producers / Join Ventures (IPPs / JVs					
Vedanta Ltd., Jharsuguda	Coal	2400	25	600	2010
GMR Kamalanga Energy Ltd., Dhenkanal	Coal	1050	25	262.5	2013
Jindal India Thermal Power Ltd., Talcher	Coal	1200	12	144	2015
Total				**1007**	
Biomas/Bagasse/Cogeneration					
Shalivahana Green Energy Ltd.	Biomass	20	100	20	2011
Total		**20**		**20**	
Renewable Energy Sources - Solar					
Solar PV Total				138	
Renewable Energy Sources - Others					
Middle Kolab SHEP	Small HEP	25	100	25	2009
Lower Kolab SHEP	Small HEP	12	100	12	2009
Samal SHEP	Small HEP	20	100	20	2009
Total				**57**	
Grand Total		**5533**			

Table 8: Summary of Additional Firm Availability from Various Sources

Source	Type	Installed Capacity (MW)	Latest Firm Entitlement		Year from which plant is expected to be available
			%	MW	
State Sector Thermal Generating Stations					
Upcoming					
Ib Thermal Power Station, Jharsuguda	Coal	1320	50	660	FY 2017-18
Total		**1320**		**660**	
Central Sector Thermal Generating Stations					
Upcoming					
North Karanpura STPS	Coal	1980	20	396	FY 2018-19
Integrated Thermal Power Station, Darlipalli	Coal	1600	50	800	FY 2018-19
Total		**3580**		**1196**	

Source	Type	Installed Capacity (MW)	Latest Firm Entitlement		Year from which plant is expected to be available
			%	MW	
Independent Power Producers / Join Ventures (IPPs / JVs)					
Upcoming					
Ind-Barath Energy (Utkal) Ltd., Jharsuguda	Coal	700	12	84	FY 2015-16
Monnet Power Company Ltd., Angul	Coal	1050	12	126	FY 2016-17
Lanco Babandh Power Ltd., Dhenkanal	Coal	1320	25	330	FY 2016-17
Total		**3070**		**540**	
Grand Total		**2396**			

* *Share allocation of some of the CGS is tentative as firm allocation is yet to be done by MoP.*

The table below summarizes the availability of power from various sources including the existing and upcoming capacity availability in FY 2019:

Table 9: Projected Firm Share Allocations from Various Sources (in MU)

Source	Energy Availability in MU			
	FY 2015-16	FY 2016-17	FY 2017-18	FY 2018-19
Availability within State				
Own Generating Stations	8842	8842	10767	13462
Private Generating Stations	6139	8102	9834	9834
Renewable Energy Sources	326	670	1294	2075
Central Generating Stations	6627	6627	6627	12241
Availability Within State	**21935**	**24241**	**28522**	**37612**
Availability Outside State				
Central Generating Stations	4401	4401	4401	6254
Renewable Energy Sources	156	156	156	156
Others	900	900	900	900
Availability Outside State	**5457**	**5457**	**5457**	**7310**
Total	**27392**	**29698**	**33980**	**44922**

**Renewable energy source factored*

As seen from above, there is a substantial capacity addition from FY 2016 to FY 2019 both within State and outside State (based on the latest expected dates of commercial operation as available with Central Electricity Authority and State).

As Odisha will be having projected energy availability of more than 100% through firm share in FY 2019, the State has to optimize the power purchase and sale planning. However, the availability is mostly from hydro and other renewable sources which inherently have low capacity utilization factor and same has been appropriately factored for computation of energy availability from existing and upcoming generating stations. Accordingly, the projected energy availability from the above mentioned sources for future years is summarized in table below.

Table 10: Projected Energy Availability from Firm Share/Long Term Tie-Ups (in MU)

Source	Adequacy of Energy Availability			
	FY 2015 - 16	FY 2016 - 17	FY 2017 - 18	FY 2018 - 19
Total Energy Requirement	**27330**	**29232**	**31354**	**33224**
Proposed Energy Availability from Long Term Firm Tie-ups	27392	29698	33980	44922
Targeted Energy Availability from Long Term Firm Tie-ups	24597	26309	28218	29902
Adequacy of Power Supply	**Adequate**	**Adequate**	**Adequate**	**Adequate**
Excess power (MU)	**61**	**466**	**2,626**	**11,698**

It is seen from above table that the availability from already tied-up firm share will remain above 100% of the energy requirement during the whole period. For the purpose of determining the adequacy of energy availability, it is considered that the State should be able to meet 90% of its projected energy requirement through firm allocations/tie-ups only and for the balance 10%, the State has to effectively plan (through comprehensive power procurement planning on short term and medium term basis) and look for procurement of power either through competitive bidding or power exchange or through other sources on short term/medium term basis.

RENOVATION AND MODERNIZATION

IB Thermal Power Station (OPGC)

The generating company has planned to undertaken R&M work of IB Thermal Power Station Unit #1 & 2, of capacity 420 MW (2 x 210 MW). The investment towards R&M will be finalized once Plant Life Assessment Study is complete.

Odisha Hydro Power Corporation

R&M works of Unit 3 of CHEP Chiplima at Rs 65.67 Crore, Unit 1 to 6 of BHEP Balimela at estimated cost of Rs 664 Crore and Unit 5 and 6 of HHEP Burla at cost of Rs 158.77 Crore is planned.

- ✓ *HHEP Burla Unit 5 and 6: 2 x 37.5 MW expected to be commissioned in April 2018 from zero date of December 2016.*
- ✓ *CHEP Chiplima Unit 3: 24 MW expected to be commissioned in June 2017*
- ✓ *BHEP Balimela Unit 1 to 6: 6x60 MW expected to be completed by May 2019 as tendering for the same is under process*

ACTION POINTS FOR THE STATE

OPTIMIZED POWER PURCHASE AND SALE PLANNING

As seen from previous sections, there is considerable surplus (5%-30%) available with the State. The State needs to optimize its power purchase and should look forward for selling the surplus power to prospective deficit States so as to earn revenue for the State.

GOVERNMENT OF INDIA INTERVENTION

The issues highlighted by the State for intervention of Government of India are detailed as follows:

i. Surrender of Share Allocation from NTPC /NTPC JV Stations located Outside the State.

ii. Request for Tapering Coal Linkage from Lakhanpur (MCL) for 3 Years for OPGC units 3 & 4.

iii. Request for suitable Coal Block Allocation for 3 x 800 MW Odisha Thermal Power Corporation Ltd (JV of OHPC and OMC) since, UG Tentuloi Coal Block allocated by MoC cannot meet coal requirement of 12 MTPA apart from high cost & substantial delay in mining.

iv. Request for Assistance from NCEF-National Clean Energy Fund towards Pump Storage Projects of OHPC.

v. Request for financial assistance from Government of India towards Renovation and Modernisation of Hirakud and Chiplima Hydro Electric Project, Balimela Hydro Project.

CHAPTER 6: TRANSMISSION PLAN

The total energy requirement for Odisha for the FY 2018-19 as worked out in Chapter 4 (Demand Estimation) is 33,224 MU and the maximum demand comes out to be 5,268 MW. The assessment of transmission network availability and adequacy has been discussed in this chapter.

EXISTING INTER-STATE TRANSMISSION SYSTEM (ISTS)

The existing peak demand of the State is 3920 MW. The demand is met by own generation having installed capacity of 2965 MW consisting of 2085 MW – hydro and 880 MW- thermal and the State's share in central generating stations totaling 1750 MW. Following independent power plants partly cater to the State's power requirement:

- ✓ 4x600 MW (Sterlite) [1x600 MW for the State]
- ✓ 3x350 MW (GMR Kamalanga Energy Ltd) [1x350 MW to the State]
- ✓ 2x600 MW (JITPL)

Odisha State transmission network is connected to the inter-State transmission system (ISTS) through 765/400 kV substations at Angul (6000 MVA) and Jharsuguda (3000 MVA) overlaid on 8 nos. 440/220 kV ISTS substations having an aggregate capacity of 4,725 MVA. There is total of 575 ckt.-km 765 kV lines and 4,254 ckm of 400 kV lines within the State of Odisha forming part of the ISTS. Main connections between Odisha transmission network and neighboring States are as follows:

- ✓ Jharsuguda 765 kV (PGCIL): Dharamjaygarh (Chhattisgarh)
- ✓ Jharsuguda 400 kV (PGCIL): Raighar (Chattisgarh)
- ✓ Bisra (Rourkela) 400 kV (PGCIL): Chaibasa (Jharkhand) / Ranchi (Jharkhand)/ Raigarh (Chhatisgarh)
- ✓ Kuchei (Baripada) 400 kV (PGCIL): Kharagpur (West Bengal)/ Jamshedpur (Jharkhand)/ Jamshedpur (DVC)
- ✓ Jeypore 400 kV (PGCIL) – Gazuwaka: 2x500 MW HVDC back to back station

A snapshot of the inter-state transmission system of Odisha is given below:

Transmission Substations (ISTS):

1) 765/400kV: 2 nos. : 9,000 MVA
2) 400/220kV: 8 nos.: 4,725 MVA
3) 220/132kV: 1no.: 320 MVA

Transmission Line Capacity (ISTS):

1) 765 kV: 575 ckt-km
2) 400 kV: 4,254 ckt-km
3) HVDC East- South Link (ISTS)

HVDC East- South Link is a ± 500 kV bipolar high voltage DC (HVDC) link connecting Talcher super thermal power station at Kaniha near Talcher to transfer 2000 MW directly to Kolar in Karnataka.

The intra-State transmission network is interconnected with the inter-State transmission system through a number of 400kV and 220kV transmission lines of OPTCL.

PLANNED INTER-STATE TRANSMISSION SYSTEM (ISTS)

The projected peak demand of Odisha in 2018-19 is 5268 MW. To meet the increased demand within the State and provide adequate capacity for inter-State power flows, it has been planned to add capacity at 765 kV & 400 kV levels of ISTS. The existing and future capacities (in 2019) are compared in the table below.

Substation	Existing Capacity	Planned Capacity in 2018-19
765/400 kV Substations		
Angul	4x1500 MVA	6x1500 MVA
Jharsuguda	2x1500 MVA	4x1500 MVA
Total Capacity	**9,000 MVA**	**15,000 MVA**
400/220 kV Substations		
Kuchei (Baripada)	2x315 MVA	1x500 + 2x315 MVA
Bolangir	2x315 MVA	2x315 MVA
Indravati	2x315 MVA	2x315 MVA
Jeypore	2x315 MVA	2x500 MVA
Keonjhar	2x315 MVA	2x315 MVA
Rengali	2x315 MVA	2x315 MVA
Bisra (Rourkela)	2x315 MVA	2x500 MVA
Talcher	2x315 MVA	2x315 MVA
Pandiabil	--	2x500 MVA
Behrampur	-	2x315 MVA
Total Capacity	**5,040 MVA**	**7,910 MVA**
Baripada:220/ 132 kV Substation	**2x160 MVA**	**2x160 MVA**

Concurrently it is planned to add 1750 ckt-km of new transmission lines (400 kV – 116 ckm: 765 kV – 1632 ckm) to the ISTS in Odisha by POWERGRID. In the table above, 400/220 kV, 2x 315 MVA substation at Behrampur and 400 kV Talcher-Behrampur- Gazuwaka double circuit transmission line (1342 ckm) are under implementation in the private sector. Further Sundargarh – OPGC (400 kV – 100 ckm) and Sundargarh – Raipur Pool (765 kV – 700 ckm) lines are to be implemented through TBCB route.

EXISTING POWER EVACUATION & INTRA STATE TRANSMISSION SYSTEM

Orissa Power Transmission Company Ltd. (OPTCL) owns and operates the intra-State transmission system of the State consisting broadly of 12,088 circuit km of transmission lines at 400 kV, 220 kV, 132 kV levels and 113 nos. of substations with transformation capacity of 13,692 MVA as on March 2015.

INTRA-STATE TRANSMISSION SYSTEM PLANNED UP TO FY 2019

The transmission utility in Odisha has planned to add 12,649 MVA capacity and 5337 ckt.km at intra State level to wheel required power for the State. Capacity addition at different voltages has been shown below:

Voltage Ratio	Number of Substations Planned	Aggregate Capacity in MVA
400/220 kV	4	3520
220/132 kV	21	5950
132/33 kV	57	2539
220/33 kV	9	640
Total	**94**	**12,649**

If the 220/132 kV sub-station has 132/33 kV transformer level then each level may be counted separately. If 220/132/33 kV sub-stations will be counted as one sub-station, then there will be 14 nos. of 220/132/33 kV sub-stations. Then total nos. of sub-stations will be 80 nos. instead of 94.

Table 11: State Transmission Network Plan

Capacity (MVA)	Existing	FY16	FY17	FY18	FY19	Total at the end of FY19
400/220 kV	1,890	945	315	1,630	630	5,410
220/132 kV	5,470	2,670	840	1,820	620	11,420
132/33 kV	6,032	798	918	503	320	8,571
220/33 kV	300	280	120	120	120	940
TOTAL	**13,692**	**4693**	**2193**	**4073**	**1690**	**26341**
Ckt.km						
400 kV	728	683	0	5	261	1,677
220 kV	5,730	567	474	585	454	7,810
132 kV	5,629	708	562	715	323	7,937
TOTAL	**12,088**	**1,958**	**1,036**	**1,305**	**1,038**	**17,425**

ADEQUACY OF TRANSMISSION SYSTEM (INTER-STATE & INTRA STATE)

Load flow, contingency and short circuit studies were carried out on the Odisha transmission network by OPTCL in October 2015 simulating 2018-19 network conditions by considering a peak demand of 5427 MW.

1) Discom-wise split

Discom-wise split of the load is given in the table below:

Sl. No.	Discom	Load (MW)
1	CESU	2107
2	NESCO	1198
3	SOUTHCO	666
4	WESCO	1456
Total		**5427**

2) Load Generation balance:

Load Generation balance is given in the following table:

Table 12: Load Generation Balance for 2018-19 conditions

Sl. No.	Particulars	Generation/ Load (MW)
1	State sector	4,122
2	Central sector allocation	4,232
3	IPPs/CPPs	7,767
4	Import	3,843
Total Power Available		19,964
5	Total Load	5,427
6	Total Losses	336
7	Export	14,201
Total Power Consumed		19,964

3) Broad Findings

The broad findings of the load flow study are as follows:

1 The loadings of transformers in intra-State as well as inter-State transmission substations are within their respective capacities in "n-1" contingencies except at Jayanagar 400/220 kV substation of PGCIL, where the two transformers are loaded to 93% of their rating in the base case and with the outage of one transformer the other one gets loaded to 154% of its rating. This may require a third 315 MVA transformer to ensure that there is no overloading with outage of one transformer under full hydro generation.

2 Line loadings under "n-1" contingencies considered are broadly within their respective thermal capacities. The study report has made certain recommendations to mitigate overloading of certain transmission

lines under contingencies. These will be looked into by OPTCL

To summarize, the State transmission network planned for 2018-19 conditions is adequate to meet the State's requirements. However, OPTCL needs to coordinate with the CTU to ensure that enough capacity is available in the inter-State transmission network to transmit power to power deficit regions outside the State, keeping in view the magnitude of surplus power

SPECIAL PROJECTS

A list of special projects being implemented by OPTCL for system improvement indicating their purpose, cost and timeline is given in the table below:

Table 13: Special Schemes by State

Projects	Project Estimate	Purpose	Timeline
RRCP (Radial to Ring Conversion Project)	Rs 250 Crore	Reduce Interruptions- Multi Source Connectivity	3 Years, FY 2015-16 to FY 2017-18 (3 Years)
DRC (Disaster Response Centre)	Rs 151 Crore	Quick restoration of power supply during natural disasters	FY 2015-16 to FY 2017-18 (3 Years)
DRPS (Disaster Resilient Power System)	Rs 231 Crore	Reduce damages to the transmission Infrastructure during natural disasters	FY 2015-16 to FY 2017-18 (3 Years)
SMART GRID AMI, GIS, OPGW, SCADA	Rs 250 Crore	More efficient, Reliable & Cost effective transmission of electricity	FY 2015-16 to FY 2017-18 (3 Years)
SCRIPS (State Capital Region Improvement of Power System)	Rs 1500 Crore	24x7 Un-interrupted and Reliable Power Supply in the State Capital Region	Phase 1: FY 2015-16 to FY 2018-19 (Rs 1492 Crore) Phase 2: FY 2020-21 to FY 2021-22 (2 Years)

1 RRCP (Radial to Ring Conversion Project)

RRCP projects of Rs 250 Crore are mainly planned for reducing interruption in power supply by providing multisource connectivity through construction of new lines. The radial sub-stations will be brought into the ring mode of operation meeting 'n-1'contigency condition. The scheme will be implemented over a period of 3 years from FY 2015-16 to 2017-18. In view of the plan budget allocation made during the previous year, OPTCL has already initiated 6 no of projects as advance projects which are in various stages of implementation.

2 DRC (Disaster Response Centre)

The DRC projects are mainly planned with an estimated cost of Rs. 151.33 Crore to facilitate quick restoration of power supply during natural disasters. The scheme will be implemented over a period of 3 years from FY 2015-16 to FY 2017-18. In view of the plan budget allocation made during the previous year, OPTCL has already initiated

the procurement action of the required materials.

3 DRPS (Disaster Resilient Power System)

The DRPS projects of Rs 231.43 Crore are mainly planned for reducing damage to the transmission infrastructure during natural disasters. The scheme will be implemented over a period of 3 years from FY 2015-16 to FY 2017-18.

4 Smart Grid

The smart grid projects are planned with an estimated cost of Rs 249.70 Crore to ensure more reliable, efficient and cost effective transmission of electricity by introducing new concept like advance metering infrastructure, GIS, Fault locators, Audit metering etc. in the system. The scheme will be implemented over a period of 3 years from FY 2015-16 to 2017-18.

5 SCRIPS (State Capital Region Improvement of Power System)

The SCRIPS projects have been planned in order to meet the energy needs of the State capital region up to 2030 ensuring 24 x 7 uninterrupted, reliable and stable power supply in the geographical areas covering under the Comprehensive Development Plan (CDP) for Bhubaneswar and Cuttack urban complex. The project is to be implemented in two phases i.e. 1st phase from FY 2015-16 to FY 2018-19 and 2nd phase from 2019-20 to 2021-22. The project cost for 1st phase implementation is estimated to be Rs 1492.07 Crore.

ACTION POINTS FOR THE STATE

- State will implement the projects as listed on time to ensure availability of transmission system for 24 x 7 supply and will monitor the loading of lines and substations on periodic basis keeping in view the actual growth in loading of the load centers along with changes in consumer mix.
- The State will procure and deploy adequate Emergency Restoration Systems (ERSs) to effectively restore transmission lines in case of emergency.
- The State will look for options for construction of new lines through tariff based competitive bidding (TBCB) route.

ACTION POINTS FOR THE CENTER

1. RRCP projects of Rs 250 Crore are mainly planned for reducing interruption in power supply by providing multisource connectivity through construction of new lines. Government of Odisha would like to request Government of India to provide financial assistance of Rs 250 Crore towards the above scheme.
2. The State proposes to take up Smart Grid project under the NSGM at Bhubaneswar and Rourkela for which support from Govt. of India is requested.

Table 14: Fund Requirement for Intra State Network (Rs. Crores)

Fund Requirement	FY 16	FY 17	FY 18	FY 19	Total
Lenders					
JICA	279	343	319	205	1146
PFC	27	34	31	20	112
State Schemes					
RRCP	61	75	70	45	250
DRC	37	45	42	27	151
DRPS	56	69	64	41	231
SMART GRID	41	50	46	30	167
SCRIPS	366	449	417	268	1500
OPTCL	338	415	386	248	1387
Total Fund Requirement	**1205**	**1480**	**1375**	**884**	**4944**

Best Practices

- ✓ Use of HTLS conductors and UG cabling
- ✓ Provision of Multi Circuit Lines for saving cost and utilizing right of way in an efficient manner.
- ✓ Use of Gas Insulated Sub stations
- ✓ Use of hybrid bays in Sub stations where there is space constraint.
- ✓ Use of OPGW in place of earth wire for establishing easy and faster communication network
- ✓ Sub-station automation system to control the sub-station remotely
- ✓ Adoption of advanced technologies like Advanced Metering Infrastructure (AMI)
- ✓ Asset mapping through Geographical Information System (GIS)
- ✓ Fully functional ERP

CHAPTER 7: DISTRIBUTION PLAN

CONNECTING THE UNCONNECTED HOUSEHOLDS

The household electrification in the State as per the census 2011 was 43% which has increased to 56% by FY 2015 which leaves 45 lakh households for electrification. The State has added around 25 lakh BPL Consumers in past 5 years under RGGVY, BGJY & BSVY Schemes. The remaining households account for 3,876 villages which are un-electrified and the partially electrified villages and hamlets.

Some of the challenges which Odisha face in electrification:

- ✓ Dearth of local contractors who can take up large scale works on EPC basis
- ✓ Multiple Subcontracting by large EPC contractors
- ✓ Right of Way issues
- ✓ Weak Financial Status of DISCOMs who are not in a position to mobilise counterpart funding or invest in backend infrastructure
- ✓ Lack of skilled manpower

To connect the un-connected the State has planned many schemes. Electrification of the remaining villages under RGGVY is currently being undertaken in Odisha as per the 12th Five Year Plan. The State proposes to electrify a total of 16.49 lakh households under this scheme. The targeted number of villages to be covered under this scheme are 3,144 as shown in the below table:

Table 15: Villages covered in RGGVY XII plan

RGGVY	
UE Villages	3,144
Habitation	16,533
Households	16,48,883
Time line	FY 2014 - FY 2017
Budget	Rs 3550.75 Crore

Apart from the above 3,144 villages targeted, there are another 732 villages, which are planned under DDUGJY. The State has planned to undertake electrification of these villages through conventional and non-conventional sources under DDUGJY (central scheme) and BGJY (State scheme) as shown below:

Table 16: Targeted Electrification under various schemes

	Number of villages	From Conventional Sources	From Non-Conventional Sources
Odisha	732	521	211

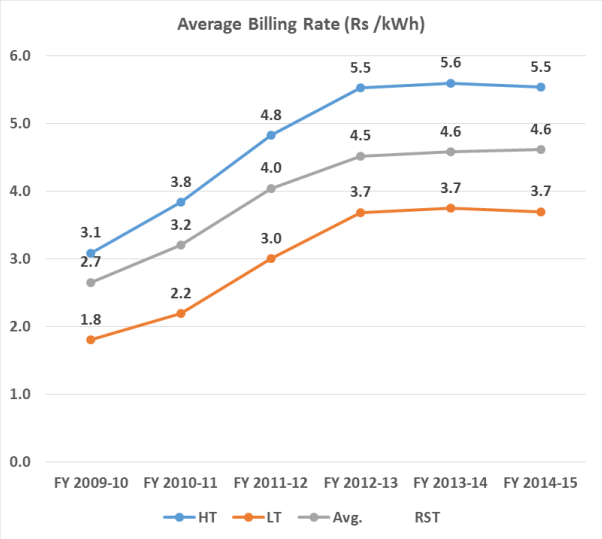
EXISTING DISTRIBUTION SYSTEM

DISCOMs in Odisha are currently serving more than 54 lakh consumers of the State and supplying power for 24 hours. There are four DISCOMs serving these consumers, CESU, NESCO, WESCO and SOUTHCO in their respective geographical areas. CESU accounts for the highest number of consumers with 34% share and WESCO the lowest at 20% as on March 2015.

All the four utilities were operated by private companies which was the first of its kind reform measure in India. However, due to lack of capital investment by the DISCOMs to upgrade infrastructure and high loss levels, the financial position of the DISCOMs deteriorated.

The average billing rate during last 6 years is shown below:

Figure 9: Average Billing Rate



A snapshot of the existing distribution system serving Odisha is given below:

Table 17: Distribution System

Particulars	Unit	FY 2000	FY 2015
Consumers	Lakh	16	58
Peak Demand	MVA	1,679	3,958
Energy	MU	9,997	23,555
33/11 KV S/s	Nos.	551	648
DTR	Nos.	40,172	1,76,898
HT Line	Kms	60,107	1,29,305
LT Line	Kms	54,155	1,42,854

PERFORMANCE OF DISCOMS

METERING STATUS

Energy accounting can only be possible if efficient metering infrastructure is build. In Odisha metering at different levels is shown below:

FY 2015	No	% Metering
At 33 kV feeders	502	78%
At 11 kV feeders	2351	42%
At 33 / 11 kV transformers	1426	22%
At Distribution transformers (11/0.4 & 33/ 0.4 kV)	1,76,898	10%
Consumer metering	54 Lakh	86%

Among the four DISCOMs, NESCO has the lowest consumer metering at 81% and CESU has the highest at 91%. NESCO also has the lowest DT metering in the State at 1% while CESU has the highest at 23%.

DISCOMs have planned to undertake metering at all feeders, transformers and consumers under different schemes which will help DISCOMs account for energy accurately. Funds under CAPEX, DDUGJY, IPDS, BGJY, BSVY etc. shall be used for achieving 100% metering in the State.

AT&C LOSSES

The distribution business incur losses of two different types: technical losses and non-technical losses. The technical losses are due to energy dissipated in the conductors, equipment used for transmission line, transformer, sub-transmission line and distribution line and magnetic losses in transformers. The sum of both technical and non-technical is AT&C losses which gives overall performance of the distribution company.

The AT&C losses for Odisha DISCOMs has reduced from 57% in FY 2000 to 38% in FY 2014-15, which is an overall reduction of more than 19%.

Table 18: Historical losses for Discoms

	Particulars	2011-12	2012-13	2013-14	2014-15
CESU	Dist. Loss (%)	38%	37%	35%	34%
	Collection Efficiency (%)	90%	93%	94%	94%
	AT&C Loss (%)	44%	41%	38%	38%
NESCO	Dist. Loss (%)	34%	35%	34%	31%
	Collection Efficiency (%)	94%	92%	96%	97%
	AT&C Loss (%)	38%	40%	36%	33%
WESCO	Dist. Loss (%)	39%	38%	37%	39%
	Collection Efficiency (%)	95%	92%	95%	92%
	AT&C Loss (%)	42%	43%	40%	44%
SOUTHC	Dist. Loss (%)	46%	44%	41%	39%
	Collection Efficiency (%)	92%	92%	92%	91%
	AT&C Loss (%)	51%	48%	46%	45%

However, Odisha Discoms have planned to reduce its losses from 38% in FY 2015 to 20% by the end of FY 2019.

T&D Losses	FY 2015-16	FY 2016-17	FY 2017-18	FY 2018-19
T&D Losses				
NESCO	31%	28%	23%	19%
WESCO	34%	30%	25%	20%
SOUTH CO	39%	36%	28%	23%
CESU	33%	28%	23%	18%
Total	**34%**	**30%**	**24%**	**20%**
Collection Efficiency				
NESCO	98%	99%	99%	100%
WESCO	98%	99%	99%	100%
SOUTH CO	98%	99%	99%	100%
CESU	98%	99%	99%	100%
Total	**98%**	**99%**	**99%**	**100%**
AT&C Losses				
NESCO	32%	29%	24%	19%
WESCO	35%	31%	26%	20%
SOUTH CO	40%	37%	29%	23%
CESU	34%	29%	24%	18%
Total	**35.1%**	**30.5%**	**25.1%**	**20%**

Measures envisaged for bringing down AT&C loss as per agreed trajectory are:

1. Arrear collection drive initiated with following responsibilities:
   (a) Corp. Office for cases having arrear of Rs 1.00 lac & above
   (b) Executive Engineer / division for cases having arrear of Rs 50,000 < Rs 1.00 lac
   (c) SDO / Sub-divn for cases having arrear of Rs 10,000 < Rs 50,000.
   (d) JE / section for cases having arrear of Rs 2,000 <Rs 10,000.
2. Delegation for bill revision / resolution of disputed arrears has been decentralized & delegated to field offices with a committee approach to improve arrear realization.
3. Daily upload of spot billing data on web server to improve collection coverage & consumers payment through alternate collection route.
4. DISCOM operated online collection centres are set up at 26 locations facilitating collection monitoring on daily basis. More online centres are being opened during FY 2015-16 covering all sub-stations / block headquarters.
5. Mass intervention in improving collection coverage and arrear realization through effective disconnection in high loss divisions.
6. Support of police & external agencies taken to reinforce disconnection/ collection/consumer regularization initiatives, resulting in improved collection & consumer regularization.
7. 100% metering of all consumers, feeders and transformers with Energy accounting and auditing.
8. Declaring JEs as Feeder Managers and effectively checking theft.
9. All EHT, HT and high value consumers to be brought under AMR/AMI.
10. Anti-theft technical measures like AB cabling.

INVESTMENTS PROPOSED

The Discoms have planned many investment schemes for feeder segregation, system strengthening, rural electrification. Some of the schemes are listed below:

RURAL ELECTRIFICATION

Rajiv Gandhi Grameen Vidyutikaran Yojana - II (RGGVY- II)

This flagship programme of Govt. of India launched in April, 2005 to provide access to electricity to villages having population of 100 or more envisages 90% capital subsidy and 10% as loan component for the State. Financial assistance to the tune of Rs. 3550 Crore has been envisaged under this scheme. There is a target to electrify un-electrified villages to the tune of 3,144 having 16,48,883 number of BPL households in all 30 districts.

The Government of Odisha is supporting the Discoms through funding of 4% of the project cost towards agency charges, additional cost towards bid premium and increase in scope of work, electrical inspections by Discom engineers to avoid delay, dedicated nodal officers for each package to assist in RoW forest clearance, site selection etc.

DDUGJY

The main agenda in rural area is to provide access to electricity to each households and provide power round the clock. The Government of India under the flagship scheme of DDUGJY has an estimated outlay of Rs 43,033 Crore including a budgetary support of Rs 33,453 Crore. The scheme of RGGVY as approved by CCEA for continuation in 12th and 13th plans has been subsumed in this scheme as a separate rural electrification component for which CCEA has already approved the scheme cost of Rs 39,275 Crore including a budgetary support of Rs 35,447 Crore. This outlay will be carried forward to the new scheme of DDUGJY in addition to the outlay of Rs 43,033 Crore. REC is the nodal agency for the operationalization of DDUGJY in the Country. Odisha has a total requirement of Rs 4,700 Crore under DDUGJY. In the first phase DPRs for Rs 2,937.48 Crore was submitted for execution of works during 2015-2017, against which Government of India has sanctioned Rs 1,648.26 Crore. In the total approved budget, Rs 302 Crore towards electrification, Rs 441 Crore for metering and Rs 727 Crore for system strengthen against Rs 2015 Crore as submitted, has been approved. The breakup of estimate submitted and approved under DDUGJY is shown below:

Utility	Submitted	Approved
CESU	670.96	302.61
NESCO	814.56	470.15
WESCO	862.06	434.76
SOUTHCO	589.87	440.74
Odisha	**2937.45**	**1648.26**

However, the project cost against system strengthening and connection to un-connecting households in PE villages has been curtailed by the Government of India. For strengthening rural electrification distribution backbone, further fund of Rs 1200 Crore during 2015-17 and Rs 1900 Crore during 2017-19 is required. This additional funding is being requested from Government of India for achieving the given target.

Biju Gram Jyoti Yojana (BGJY)

In order to ensure "Electricity to all" the Government of Odisha had launched a flagship scheme called Biju Gram Jyoti Yojana in the mid of 2007-08 for electrification of habitations having less than 100 population and the BPL Household Electrification in those habitations which are not covered under RGGVY.

Achievement as on 31st March 2015

Nos. of Habitations Taken up: 18,015

Nos. of Habitations Electrified: 14,374

Nos. of BPL Households Electrified: 1,71,422

Financial Status on 31st March 2015

Total Fund Allotted: Rs 635.91 Crore

Total Expenditure Made: Rs 416.29 Crore

A total of Rs 200 Crore has been planned to be spent during FY 2015 to FY 2019 under this scheme.

Biju Saharanchala Vidyutikaran Yojana-BSVY

Biju Saharanchal Vidyutikaran Yojana is a flagship programme of the Government of Odisha for attaining the goal of providing access to electricity to the people living in un-electrified villages/ward/slums with minimum population of 100 along with system improvement within the limits of Municipal corporations/ Municipalities/ Notified Area Councils. The scheme was launched on 3rd February 2010. Under this scheme an electrical committee has been constituted under the chairmanship of the

District Collector to decide the list of villages/wards/slums with a minimum population of 100 for electrification and list of BPL households to be electrified.

Achievement on 31st March 2015

Nos. of habitations Taken up: 2,804

Nos. of habitations Electrified: 2,171

Nos. of BPL households Electrified: 23,285

Financial Status on 31st March 2015

Total Fund Allotted: Rs 111.13 Crore

Total Expenditure Made: Rs 49.54 Crore

A total of Rs 80 Crore has been planned to be spent during FY 2015 to FY 2019 under this scheme.

SYSTEM IMPROVEMENT

IPDS

The Central Government has sanctioned "Integrated Power Development Scheme" (IPDS) on 3rd December, 2014 for urban area for:

1. Strengthening of sub-transmission and distribution networks in the urban areas.
2. Metering of distribution transformer/ feeders/consumers in the urban areas.
3. IT enablement of distribution sector and strengthening of distribution network, for completion of the targets laid down under R-APDRP for 12th and 13th Plans by carrying forward the approved outlay for R-APDRP to IPDS.

Initially Odisha had submitted requirement of Rs 2207.17 Crore for metering and system strengthening and Rs 330 Crore for ERP/IT initiative, however, the nodal agency (PFC) of Government of India has proposed the project cost for only Rs 1079 Crore.

Utility	System	ERP	Total	Recommended
CESU	485	30	515.00	233
NESCO	727	100	826.91	328
WESCO	541	100	640.81	259
SOUTHCO	454	100	553.98	259
TOTAL	**2207**	**330**	**2535.9**	**1079**

Since, Odisha had not received any assistance in R- APDRP except for 12 towns in CESU, It is important for the State to get sufficient funds from Government of India in the new scheme of IPDS. However, there is a drastic cut in the proposal submitted which may not be sufficient. Further, the loss reduction strategy agreed by State Government and fixed by the Government of India cannot be achieved. Therefore, State requests for additional funding of Rs 1,400 Crore during 2015-17 and Rs 2,000 Crore during 2017-19 for building an efficient system.

Apart from the above schemes for rural electrification and system strengthening, the State has planned many other schemes as listed below:

1. Restructured Accelerated Power Development & Reforms Programme
   - ✓ Actual demonstrable performance in terms of sustained loss reduction
   - ✓ Establishment of reliable and automated systems for sustained collection of accurate base line data
   - ✓ Adoption of Information Technology in the areas of energy accounting

CESU	Budget (Rs Crore)
Part A-IT	105.65
Part A-SCADA	26.57
Part-B	263.64
TOTAL	**395.86**

2. Odisha Distribution System Strengthening Project- ODSSP
   - ➢ Construction of 500 nos. of 33/11 kV Sub-stations
   - ➢ Period: 2014-2019
   - ➢ Amount Sanctioned - Rs 2600 Crore
3. Odisha Dedicated Agriculture & Fishery Feeder Project- ODAFFP
   - ✓ Construction of 11 kV Dedicated Agriculture & Fishery Feeders for uninterrupted power supply to Agriculture & Fishery clusters.

- ✓ Period: 2014-15 to 2016-17
- ✓ Amount: Rs 1,000 Crore

From the above investments, the Discoms will add following new assets by FY 2019 in the State:

Table 19: Network addition plan

Particulars	Unit	Quantity
33 kV Line	Km	5,351
33/11 kV s/s and capacity	MVA	5255
11 kV Line	Km	46,255
11/0.4 kV DT S/S and Capacity	MVA	3,834
LT Line	Km	85,582

ASSESSMENT OF ADEQUACY OF DISTRIBUTION SYSTEM

AT 33/11 LEVEL

The transformation capacity at 33/11 kV level is projected to grow from 6,147 MVA in FY 2015 to 11,402 MVA in FY 2019.

The peak demand of the State, including demand of large industrial consumers has been recorded at 3,920 MW in FY 2014-15. The contracted load of 33 kV consumers and above is about 2888 MW and the peak demand of direct 33 kV consumers works out to be 2000 MW by applying a demand factor of 0.9 and diversity factor of 1.3 (2000 = 2888 x 0.9/1.3). Thus, a demand of 1920 MW (=3,920-2000) is met at 11 kV and below which corresponds to 2133 MVA considering a power factor of 0.9.

Against this peak demand, the aggregate installed capacity of 33/11 kV substations available in the State is 6,147 MVA. This translates to an average loading of 35% on 33/11 kV transformers under peak demand conditions.

Following similar logic and taking the projected peak demand of 5,268 MW in FY 2019 and assuming the proportion of demand met at 33 kV in relation to the total peak demand remains the same as at present, the contribution of 33 kV direct consumers to the peak demand of the State comes to 2675 MW.

Correspondingly, the demand met at 11 kV and below comes to 2593 MW which corresponds to 2880 MVA considering a power factor of 0.9. Against this peak requirement, the installed capacity of 33/11 kV transformers in FY 19 is projected at 11,402 MVA. This translates to an average loading of 25% on 33/11 kV transformers under peak demand conditions.

AT 11/.04 KV LEVEL

The existing aggregate 11/ 0.4 KV distribution transformer capacity of Odisha is about 8,010 MVA in FY 2015.

Further, an additional transformer capacity of 3,834 MVA is planned to be added by FY 2019 under various initiatives which will result in overall distribution transformation capacity of 11,845 MVA by FY 2019.

Given that the billed maximum demand of 11 kV consumers totals around 665 MW. This leaves a demand of 1460 MW (1920-460) to be met at LT (415V) level which corresponds to 1622 MVA considering a power factor of 0.9.

Against this peak demand, the aggregate installed capacity of DT transformers in the State is 8010 MVA. This translates to an average loading of 20% on distribution transformers under peak demand conditions.

Following the same logic and taking the projected peak demand of 5268 MW in FY 2019 and assuming the proportion of demand met at 11 kV in relation to the total peak demand remains the same as at present, the contribution of 11 kV direct consumers to the peak demand of the State comes to 574 MW.

Correspondingly, the demand met below 11 kV comes to around 2018 MW which corresponds to 2242 MVA considering a power factor of 0.9. Against this peak requirement, the installed capacity of distribution transformers in FY 2019 is projected at 11,845 MVA. This translates to an average loading of 19% on distribution transformers under peak demand conditions.

FUND REQUIREMENT

The fund requirement for State projects is summarized below:

Table 20: Fund Requirement for Distribution Projects (in Rs Crore)

Scheme	Required	Sanctioned	State/Utilities	Central	Additional Support required
RGGVY- II	3,551	3,551	355	3,196	-
DDUGJY	4,700	1648	660	988	3020
IPDS	4,200	1078	432	646	3122
RAPDRP	396	396	198	198	-
ODSSP	4,500	4,500	4,500	-	-
ODAFF (Fishery)	150	150	150	-	-
CAPEX-I	205	205	155	50	-
BGJY	200	200	200	-	-
BSVY	80	80	80	-	-
DESI	600	600	600	-	-
Total	**18,582**	**12,408**	**7,330**	**5,078**	**6,142**

Table 21: Roll out plan

Category	Base year scenario (FY 2015)	FY 2016	FY 2017	FY 2018	FY 2019	Total	End of FY 2019
Connecting the Unconnected							
Target Electrification – Rural	44,86,047	4,19,314	13,48,588	17,13,887	6,68,907	41,50,696	86,36,743
Target Electrification – Urban	15,24,983	1,11,194	1,28,081	70,797	-	3,10,071	18,35,054
Efficiency Improvement							
T&D Losses	35.87%	33.75%	29.83%	24.36%	20%		20%
AT&C Losses	37.80%	35.07%	30.54%	25.1%	20%		20%
Capacity Addition/ Augmentation							
33 kV Substation (MVA Capacity)	6,147	1,555	1,403	1,322	975	5,255	11,402
33 kV Lines (CKT Km.)	11,944	1,492	1,299	1,602	958	5,351	17,295
11 kV Lines (CKT Km.)	1,19,316	9,521	13,903	13,851	8,980	46,255	1,65,570
LT Lines (CKT Km.)	68,950	16,930	21,895	22,773	21,375	82,972	1,51,922
DT Capacity	8,010	821	1,210	1,194	609	3,834	11,845

ACTION POINTS FOR STATE

1. State will implement the projects as listed on time to ensure access to power to each household 24 x 7.
2. 100% metering at consumers, feeders and DTs by FY 2019.

GOVERNMENT OF INDIA INTERVENTION

1. In order to ensure reliable and secure 24x7 quality power supply to all, the State requests that the investment
2. Odisha has planned to undertake capex plan as shown in the above table, which shows that there is around Rs 6142 Crore still left as gap for funding the project. **The state requests Government of India to provide 70% of the additional fund required left as gap in the above plan. Since, Odisha was left out of RAPDRP, investment in infrastructure is very much necessary.**

Best Practices:

1 **Photo based spot billing through mobile**

a. Introduced to achieve 100% billing of LT consumers through outsource agencies

2 **Distribution Franchisee**

a. In CESU input based franchisee, NESCO rural franchisee, WSHG in DISCOMs

3 **Various state funded system improvement schemes**

a. Construction of 500 nos. of 33/11 KV sub-stations under Odisha Distribution System Strengthening Project (ODSSP) and construction of 11 KV dedicated Agriculture and Fishery feeders under ODAFFP

4 **Disconnection Squads and Energy police station**

a. Disconnection Squads have been created to disconnect service connection of defaulting consumers. Energy police station have been created for early redressal of energy theft cases

5 **Installation of AMRs and Energy Audit**

a) More than 10,000 nos. AMRs are already installed for CD 10 KW & above consumers

b) Energy Audit for 33 KV and 11 KV feeders is carried out to target high loss feeders to prioritize AB cabling and consumer metering

c) All 11 KV feeders have been segregated as unique and Non-unique feeders for exact assessment of loss in that particular feeder.

CHAPTER 8: RENEWABLE ENERGY INITIATIVES

Government of Odisha has planned to add 3.078 GW of renewable energy capacity by 2022 which will commensurate India's overall target to add around 175 GW of renewable energy capacity.

The capacity addition target includes 2.378 GW of solar power, 350 MW wind energy, 150 MW of small-scale hydro power, 180 MW of biomass-based power and 20 MW of municipal solid waste-based power capacity.

Solar power capacity addition would be divided into 4 segments: 328 MW capacity would be in the form of normal utility-scale projects, 50 MW capacity on water bodies, 1 GW capacity rooftop projects in the commercial and domestic consumers segment, and 1 GW capacity through large-scale solar parks.

At present Odisha has an installed solar capacity of 43 MW. Power from these plants is being purchased by GRIDCO to partially fulfill its renewable purchase obligation. The State also has 58.7 MW of small-scale hydro and 20 MW of biomass-based power generation capacity.

To achieve this capacity addition target, the State government plans to create a separate Odisha Renewable Energy Development Fund. The Government of Odisha has planned to earmark these funds over the next 5 years and also look for other financial mechanisms to support the development of renewable energy infrastructure in the State.

Table 22: Proposed Capacity Addition (MW)

	2015 -16	2016 -17	2017- 18	2018 -19	2019 -20	2020 -21	2021 -22	Total
Solar Target	7	165	172	207	241	276	310	**1378**
Roof-top Solar target	5	120	125	150	175	200	225	**1000**
Total Solar	**12**	**285**	**297**	**357**	**416**	**476**	**535**	**2378**
Wind								350
Small Hydro								150
Biomass								180
MSW								20
Total	**12**	**285**	**297**	**357**	**416**	**476**	**535**	**3078**

CHAPTER 9: ENERGY CONSERVATION AND ENERGY EFFICIENCY PROGRAM

PRESENT STATUS OF ENERGY CONSERVATION ACTIVITIES

ODISHA ENERGY CONSERVATION BUILDING CODE (OECBC)

The office of Engineer-in-Chief (E)-cum – Principal Chief Electrical Inspector as the State Designated Agency (SDA), Odisha has taken up the activity of amending the Energy Conservation Building code for the State of Odisha. The SDA after extensive consultation with different stakeholders has finalized the Odisha Energy Conservation Building code (OECBC) which aims at improving the Energy efficiency and utilization in the building sector of the State. The aim is to enforce OECBC in the building regulations of the state. The OECBC follows the same structure as the ECBC.

Odisha Energy Conservation Building Code (OECBC) has been made mandatory since July 2011 for commercial buildings with a connected load of 100 KW or contract demand of 120 KVA or more. Bhubaneswar Development Authority (BDA) as the first development authority has already included OECBC in its Planning & Building Standards Regulations, 2008 (Amended 2013).

The SDA conducted stake holder consultations and workshops on Energy Conservation Building Code (ECBC) in 2014 to facilitate implementation and capacity building in the state, such as:

I. One day stakeholder consultation on fiscal & regulatory study,
II. One day workshop for on Energy efficiency in commercial building &
III. Two days training program on implementation of ECBC.

These workshops were organized as part of a study commissioned by the Bureau of Energy Efficiency (BEE), Ministry of Power Government of India as part of UNDP-GEF-BEE initiative. The objective of this workshop was to analyze the current regulatory & fiscal mechanism for OECBC implementation and identify state specific gaps so as to prepare state wise roadmap and suggest state specific strategies including policies and financial incentives to facilitate implementation of OECBC in the state.

LED LIGHTING PROJECTS

The Hon'ble Prime Minister has launched a national programme for LED based energy efficient street lights and domestic lights on 5th January 2015. This programme has targeted 100 cities initially for LED based street lighting and domestic lighting by March 2016 and will continue to be rolled out across the country.

Lighting accounts for about 20% of the total electricity consumption in India. Most of the lighting needs in domestic and public lighting sectors are met by conventional lights, including highly inefficient incandescent bulbs in domestic sector. Use of LEDs in domestic and public lighting could result in substantial reduction in energy consumed by lighting.

DELP

In order to promote energy efficiency measures and stimulate demand for LED lighting in domestic sector, Energy Efficiency Services Ltd. (EESL) has evolved an innovative scheme where high quality LED lamps are proposed to be given to households at the cost of incandescent lamps (ICLs).

The main features of Domestic Efficient Lighting Programme (DELP) includes provision of four 9 watt LED bulbs that can replace a 60 W incandescent bulb or 14 W CFL with a 3 years free replacement warranty against technical defects.

EESL has developed a tentative business model where it works with electricity distribution companies (DISCOMs) through a benefit sharing approach. DISCOMs do not need to invest in the upfront cost of LED bulbs; EESL procures the LED bulbs and provides to consumer at a reduced rate of Rs 105 each as against the market price of Rs. 400-500. The upfront investment made by EESL is paid back by DISCOMs in installments over a period of time. The DISCOMs secure this payment in one of the two ways.

(a) A beneficiary can pay the full up front cost each costing Rs:100/- OR

(b) By recovering the total cost of LEDs from the electricity bill of the consumers over a period of 10 months.

EESL proposed draft petitions to be filed before the State Regulatory Commission by the DISCOMs for implementation of the DELP in Odisha. Two DISCOMs have already filed the petition while other DISCOMs of the state are being urged to file the petition immediately.

In Odisha, it has been planned that under the DELP programme 9W bulbs will be made available through upfront payment model at a cost of 100/- per bulb and through on-bill financing model at a cost of Rs.105/- per bulb. The draft petition has been prepared and submitted to DISCOMs for reference. The capacity avoided by implementing the DELP scheme in state of Odisha is estimated to be about 185 MW.

LED Street Lighting

Street light use is growing at the rate of 7-8% per year due to rapid urbanisation. A vast majority of street lights still use conventional technology which is inferior to cost effective LED based efficient retrofits that not only reduce energy consumption by as much as 60%, but also lead to additional social and service quality benefits as a Demand Side Management initiative. An estimated 15MW of capacity can be avoided by use of efficient street lights besides reaping financial benefits.

EESL has evolved a business model to facilitate ULBs/DISCOMs to replace conventional lights with LEDs. EESL proposes to replace the conventional street lights with LEDs at its own cost (without any need for initial investment by ULBs/DISCOMs) and the consequent reduction in energy and maintenance cost of the ULBs/DISCOMs is used to repay EESL over a period of time.

Bhubaneswar Municipal Corporation has already commissioned a project for replacement of inefficient street lights with energy efficient LEDs with support of IFC in the ESCO model. The H&UD Department, Govt. of Odisha is taking up the replacement of inefficient lights with LEDs in PPP mode under the Odisha Street Lighting Project for the other four Municipal Corporations i.e Berhampur, Rourkela, Cuttack and Sambalpur.

LED Village Campaign

The LED Village Campaign sponsored by Bureau of Energy Efficiency, Ministry of power, Government of India was launched by SDA with the support of the DISCOMs. The scheme aims to promote energy efficiency in the rural household sector of India.

In Odisha in two villages i.e. Satyabhamapur (Cuttack Dist.) and Raghurajpur (Puri Dist.) the project has been implemented by SDA with the support of CESU. Under this project 3 Nos., 10W LED bulbs have been given to each family and 20W LED street lights have been installed in these two villages.

In the 2nd phase of the project 4 Villages (Sarei, Barun, Sasad, Khandahata) under NESCO have been chosen for the LED Village Campaign and implementation is under progress.

ENERGY EFFICIENCY IMPROVEMENT OF BUILDINGS

To address the issue of growing demand for power, there is an urgent need to save energy use which can reduce the demand supply gap and contribute towards climate change abatement. A study conducted by Bureau of Energy Efficiency, Govt. Of India has indicated substantial energy saving potential in different sector of the state including industries buildings, agriculture and municipality. IGEA (Investment Grade Energy Audit) of buildings have shown encouraging energy conservation potential that can be realized through implementation of energy efficiency measures across a wide spectrum of energy usage in the State. The present scheme of IGEA is proposed to encourage energy conservation by providing financial support to the Government organizations willing to implement energy efficiency measures.

The objective of the IGEA is to promote energy efficiency in the buildings and other facilities owned by Public Sector, Cooperative and other Autonomous Bodies of the State of Odisha.

More than 100 Nos. of IGEAs of buildings have been completed and energy efficiency measure implementations are in progress. Nearly 77 lakh units of electricity is estimated to be saved once the energy efficiency measures are implemented.

The General Electrical Division, Works Department, Govt. of Odisha has implemented the recommendations of the IGEA in 16 important Govt. Buildings resulting in energy efficiency improvement of lighting and air conditioning systems through replacement/ retrofitting

DRINKING WATER PUMPING SYSTEM (DWPS)

The Public Health Division under the Housing & Urban Development Department, Govt. of Odisha owns and operates the Drinking Water Supply Systems that benefit the public at large. In Phase I, energy efficiency implementation has been taken up in 6 pumping stations viz. Palasuni and Bhuasuni in Bhubaneswar, Badamadhapur in Berhampur, Nandanmal and Sibtala in Bolangir and Mundali in Cuttack. Capacity avoidance of around 9 MW is estimated in the above pumping stations. Implementation in most of the above DWPS is in various stages of completion. In the second phase, energy audit of nine DWPS viz. Dakhinpur, Paralakhimundi (Berhampur PH Division), Titlagarh, Baraipali, Modipara (Sambalpur PH Division), Rourkela, and Sunabeda, Rayagada, Jeypore (Koraput PH Division) which account for a large amount of energy bills have been facilitated. A capacity avoidance of around 4.6 MW has been estimated in the above stations. The comprehensive Investment Grade Energy

Audit (IGEA) of these major drinking water pumping systems was undertaken with funding support of Bureau of Energy Efficiency (BEE), Govt. of India and State Plan to identify the savings opportunities. A plan to replicate the success stories in 137 other drinking water pumping systems has been initiated with the commencement of IGEA study.

ENERGY EFFICIENCY IN LIFT IRRIGATION SYSTEMS

Lift irrigation (LI) projects of the State are being managed and operated by the Pani Panchayats for the benefit of the farmers of the state. In general, these LI systems have been designed for 5 to 15 HP capacities with 65% efficiency. The project proposes to replace the old inefficient pumps with BEE star labelled pumps. The project also includes installation of electrical accessories for successful implementation of the project. Project is being implemented by the Odisha Lift Irrigation Corporation (OLIC). The capacity that could be avoided by implementing energy efficiency measures in the lift irrigation systems is estimated to be around 25 MW. Nearly 4800 pumps have been proposed to be replaced in phases.

ENERGY EFFICIENCY IN DAIRIES

To promote energy conservation in the dairy sector, SDA had facilitated energy audit of Bhubaneswar Dairy plant of OMFED, a state level cooperative society. An annual energy saving potential of 3 MUs and 2.8 lakh liters of furnace oil contributing towards an annual saving potential of more than 25% with attractive payback period was projected by the study. OMFED has implemented some of the recommendations and has reported encouraging results in terms of realizing energy savings. Implementation of many more measures with funding support from the revolving investment fund is being actively pursued as a unique project of its kind in the country. SDA has also provided funding to OMFED for creating awareness amongst the users on energy efficiency.

CHAPTER 10: FINANCIAL SUSTAINABILITY

FINANCIAL POSITION OF DISTRIBUTION UTILITIES

The existing accumulated loss for the Odisha DISCOMs as per the provisional financial accounts of FY 2014-15 stands at Rs. 6,121 Crore, which is ~72% of their revenue booked for the FY 2014-15 including a net loss of Rs. 1,414 Crore in the FY 2014-15.

Since, the utility has a gap in Average Collection Rate and Average Cost of Supply, corrective actions needs to be taken so that utility can undertake initiative of "24 X 7 Power For All" while converting itself into a financially sustainable company. Further, it is not dependent on any Government subsidy.

The below table shows some of the key items under provisional accounts for FY 2014-15:

Table 23: Profit and loss Statement for FY 2014-15 (Rs Crore)

Particulars	FY 2014-15
Sales Turnover	7,874
Other Income	455
Total Income	**8329**
Expenditure	
Transmission Charges	599
Power & Fuel Cost	6452
Employee Cost	991
R&M cost	162
A&G	476
Provision for bad debt	456
Total Expenses	**9136**
PBDIT	-806
Finance costs	394
PBDT	*-1200*
Depreciation	214
Profit Before Tax	***-1414***

A detailed scenario analysis has been done to measure the financial performance in coming 4 years.

Table 24: Status of losses as on March 2015 (Rs Crore)

Name of Units	Losses for current year	Cumulative losses	Loan
CESU	509	2,641	2,496
NESCO	285	1,240	1,366
WESCO	517	1,322	1,373
SOUTHCO	103	918	861
TOTAL	**1,414**	**6,121**	**6,096**
GRIDCO	271	3476	5552
Total Odisha	**1,685**	**9,597**	**11,648**

This analysis provided hereafter decipher that with improvement in performance to the required levels, the utility will be able to recover its accumulated losses while targeting to provide 24x7 Power to all in the State. The calculations have been based on the assumption that utilities should function without any subsidy from government.

The following scenarios have been detailed in subsequent sections:

a) At targeted growth rate as per "24x7 Power for All" Road Map (Base case).

b) At targeted growth rate as per "24x7 Power for All" along with Financial Turnaround.

c) Non-Adherence to Loss Reduction Trajectory and subsequent dependence on Higher Tariff Hike.

d) Funding of grant through loan Scenario

e) GRIDCO under UDAY scheme

COMMON ASSUMPTIONS

- ✓ Any change in the power purchase cost will be taken care by the Fuel and Power Purchase Cost Adjustment mechanism.
- ✓ Rate of sale of surplus power considered at the average rate of power purchase.
- ✓ Escalation towards employee cost has been considered at 10% based on increase observed in CPI for FY 2013-14 and for A&G expenses 6% has been considered based on WPI inflation index for the FY 2013-14. In the FY 2016-17 escalation in employee expense has been considered at 18% to factor in the impact of 7th pay commission.
- ✓ R&M cost has been computed at 5.4% of GFA.
- ✓ Phasing of capital expenditure in IPDS and DDUGJY schemes has been considered as 10% in FY 2015-16, 60% in FY 2016-17 and 30% in FY 2017-18.
- ✓ Asset Additions has been considered as 50% in same year of capital expenditure and balance in the next year. Interest is calculate on assets capitalized only and no IDC has been considered.
- ✓ Interest computations has been done as per the existing loan profile at 10% and addition of new loans at 12%.
- ✓ Interest on working capital and cash deficit loan at 14%.
- ✓ Category-wise average billing rate for computation of revenue for FY 2014-15 has been taken as per the billing done.
- ✓ Category-wise average billing rate for computation of revenue for FY 2015-16 and onwards has been taken as per the tariff hike provided.
- ✓ Transmission charges has been escalated in proportion to the increase in power purchase quantum and allocation.
- ✓ Depreciation has been computed at the actual average depreciation rate 5% of FY 2014-15 for existing assets and 5.28% for new assets.
- ✓ Non-tariff Income has been projected to increase at 5% annually.
- ✓ The average cost of supply has been computed after deducting non-tariff income from the expenses.
- ✓ Debt: Equity ratio is 70:30 wherever applicable for internal schemes.
- ✓ Grant, Loan and equity ratio has been considered based on the guidelines of centrally sponsored schemes (**except scenario 4 where no grant has been considered against IPDS and DDUGJY**). Further, additional grant of 15% has been considered as per the terms and conditions in IPDS and DDUGJY.
- ✓ The capital expenditure pertaining to energy efficiency measures has not been considered as either these schemes are primarily funded through grant or have short payback period, thus having negligible impact on the financials of the distribution company.
- ✓ The Average Cost of Supply (ACS) has been computed by dividing the total expenditure (including purchase of surplus power) by total sale of power within the State.
- ✓ Similarly, O&M cost per unit and interest cost per unit has been calculated by dividing their respective cost by sale of power within the State.

SCENARIO A: AT TARGETED GROWTH RATE AS PER 24X7 ROAD MAP (BASE CASE)

ASSUMPTIONS

- ✓ No tariff hike
- ✓ T&D losses as per targeted trajectory.
- ✓ Cash deficit loan in case of short fall

Table 25: Key assumptions

	Units	31-Mar-16	31-Mar-17	31-Mar-18	31-Mar-19
Energy Demand	MU	27,330	29,232	31,354	33,224
Sales	MU	17,429	19,793	22,958	25,935
Power Available	MU	27,392	29,698	33,980	44,922
Surplus power	MU	61	466	2,626	11,698
Power purchase rate	Rs/kWh	2.43	2.54	2.70	3.02
AT&C losses	%	35.07%	30.54%	25.11%	20.00%
T&D Losses	%	33.75%	29.83%	24.36%	19.52%
Collection Efficiency	%	98%	99%	99%	99%
Provision for Bad Debt	% of revenue	5%	4%	3%	2%

Table 26: Key parameters

Key Parameters	Units	31-Mar-16	31-Mar-17	31-Mar-18	31-Mar-19
Revenue	Rs Crore	9,274	10,322	11,682	13,002
Total Expense excluding other income	Rs Crore	9,915	11,182	12,898	14,981
PBT	Rs Crore	-642	-860	-1216	-1979
ABR	Rs/ kWh	5.32	5.22	5.09	5.01
Rate of sale of surplus power	Rs /kWh	2.43	2.54	2.70	3.02
ACS	Rs/ kWh	5.69	5.65	5.62	5.78
Interest Cost	Rs Crore	555	626	818	1064
O&M cost per unit	**Rs/ kWh**	1.06	1.08	1.02	0.94
R&M cost per unit	Rs/ kWh	0.14	0.16	0.16	0.11
Employee cost per unit	Rs/ kWh	0.63	0.65	0.62	0.60
A&G cost per unit	Rs/ kWh	0.29	0.27	0.25	0.23
Interest cost per unit	Rs/ kWh	0.32	0.32	0.36	0.41

Table 27: Profit and loss Statement under Scenario A (Rs Crore)

P&L (Rs Crore)	31-Mar-16	31-Mar-17	31-Mar-18	31-Mar-19
Net Sales	*9,274*	*10,322*	*11,682*	*13,002*
Other Income	478	502	527	553
Revenue from surplus power	15	118	708	3,502
Total Income	**9,767**	**10,942**	**12,917**	**17,057**
Expenditure				
Transmission Charges	655	700	751	796
Power Cost	6,660	7,536	9,159	13,447
Employee Cost	1,090	1,287	1,415	1,557
R&M cost	237	273	284	238
A&G Cost	504	534	566	600
Provision for bad debt	464	413	350	260
Total Expenses	**9,610**	**10,744**	**12,527**	**16,898**
Finance costs	555	626	818	1,064
PBDT	*-398*	*-427*	*-428*	*-905*
Depreciation	219	268	341	390
Profit Before Tax	-617	-696	-769	-1,295
Accumulated losses by end of the year	-6,738	-7,434	-8,203	-9,498

In the above scenario it is evident that utility will incur losses from FY 2016 and accumulate losses to an extent of Rs 9,498 Crore by FY 2019. Further, the net worth of the company in FY 2013-14 is negative which shows that equity contribution for undertaking capex plan will be difficult for DISCOMs, since any surplus generated during these years will be used for repaying short term loans used for funding the losses incurred in previous years.

Table 28: Cash flow Statement (Rs Crore)

Cash Flow (Rs Crore)	31-Mar-16	31-Mar-17	31-Mar-18	31-Mar-19
Cash flow arising from Operating Activities	**(62)**	**(70)**	**49**	**(231)**
Depreciation and Amortisation expenses	219	268	341	390
Operating profit	**157**	**199**	**390**	**159**
Subsidy	-			
Increase / (Decrease) in current liability	34	95	150	368
(Increase) in current Asset	(130)	(235)	(440)	(643)
Cash Flow from Operation	**60**	**58**	**99**	**(116)**
Cash from Investment Activities				
Capex	**(1,781)**	**(4,994)**	**(4,518)**	**(1,448)**
Net Cash from Investment Activities	(1,781)	(4,994)	(4,518)	(1,448)
Cash from Financing Activities				
Equity Investments	333	815	836	79
Debt Drawn	561	857	537	291
Loan Repayment	(621)	(660)	(726)	(780)
WC loan	(34)	(95)	(150)	(368)
Interest cost	(555)	(626)	(818)	(1,064)
Grant	887	3,322	3,145	1,078
Net Cash from Financing Activities	571	3,613	2,825	(763)
Net Cash Balances				
Cash BF	1,481	330	(992)	(2,585)
Cash Flow during the year	(1,150)	(1,322)	(1,594)	(2,327)
Cash	330	(992)	(2,585)	(4,913)
Cash CF to balance sheet - post deficit loan	330	-	-	-
Cash deficit Loan				

Cash Flow (Rs Crore)	31-Mar-16	31-Mar-17	31-Mar-18	31-Mar-19
Opening loan	-	-	*992*	*2,585*
Additions	-	*992*	*2,585*	*4,913*
Repayment	-	-	*992*	*2,585*
Closing	-	*992*	*2,585*	*4,913*

SCENARIO B: AT TARGETED GROWTH RATE AS PER 24X7 ROAD MAP PLUS FINANCIAL TURNAROUND

ASSUMPTIONS

- ✓ Tariff hike of 12% in FY 2016-17, 11% in FY 2017-18 and 11% in FY 2018-19 on latest category-wise average billing rates as per the existing tariff to recover its accumulated losses.
- ✓ T&D losses as per targeted trajectory.

Table 29: Key parameters under scenario B

	Units	31-Mar-16	31-Mar-17	31-Mar-18	31-Mar-19
Energy Demand	MU	27,330	29,232	31,354	33,224
Sales	MU	17,429	19,793	22,958	25,935
Power Available	MU	27,392	29,698	33,980	44,922
Surplus power	MU	61	466	2,626	11,698
Power purchase rate	Rs/kWh	2.43	2.54	2.70	3.02
AT&C losses	%	35.07%	30.54%	25.11%	20.00%
T&D Losses	%	33.75%	29.83%	24.36%	19.52%
Collection Efficiency	%	98%	99%	99%	99%
Provision for Bad Debt	% of revenue	5%	4%	3%	2%

Table 30: Key parameters under Scenario -B

	Units	31-Mar-16	31-Mar-17	31-Mar-18	31-Mar-19
Revenue excluding subsidy	Rs Crore	9,274	11,561	14,523	17,943
Total Expense excluding other income	Rs Crore	9,891	10,998	12,286	13,871
PBT	Rs Crore	-617	563	2237	4072
ABR	Rs/ kWh	5.32	5.84	6.33	6.92
Rate of sale of surplus power	Rs /kWh	2.29	2.41	2.58	3.07
ACS	Rs/ kWh	5.68	5.56	5.35	5.35
Interest Cost	Rs Crore	555	557	568	539
O&M cost per unit	**Rs/ kWh**	**1.05**	**1.06**	**0.99**	**0.92**
R&M cost per unit	Rs/ kWh	0.14	0.14	0.12	0.09
A&G cost per unit	Rs/ kWh	0.29	0.27	0.25	0.23
Employee cost per unit	Rs/ kWh	0.63	0.65	0.62	0.60
Interest cost per unit	Rs/ kWh	0.32	0.28	0.25	0.21

Table 31: Profit and loss under Scenario B

P&L (Rs Crore)	31-Mar-16	31-Mar-17	31-Mar-18	31-Mar-19
Net Sales	*9,274*	*11,561*	*14,523*	*17,943*
Other Income	478	502	527	553
Revenue from surplus power	15	118	708	3,502
Total Income	**9,767**	**12,181**	**15,758**	**21,998**
Expenditure				
Transmission Charges	655	700	751	796
Power Cost	6,660	7,536	9,159	13,447
Employee Cost	1,090	1,287	1,415	1,557
R&M cost	237	273	284	238
A&G Cost	504	534	566	600
Provision for bad debt	464	462	436	359
Total Expenses	**9,610**	**10,793**	**12,612**	**16,997**
Finance costs	555	557	568	539
PBDT	*-398*	*831*	*2,578*	*4,462*
Depreciation	219	268	341	390
Profit Before Tax	-617	563	2,237	4,072
Accumulated losses by end of the year	-6,738	-6,175	-3,939	133

Based on the above assumptions, it is evident that if DISCOMs adheres to the target electrification, reduce losses, and receives tariff increase of 12%, 11% and 11% in the FY 2016-17, FY 2017-18 and FY 2018-19 respectively, as per the assumptions, the accumulated losses will progressively reduce and DISCOMs will be able to recover its accumulated losses.

Table 32: Cash flow Statement for scenario B

Cash Flow (Rs Crore)	31-Mar-16	31-Mar-17	31-Mar-18	31-Mar-19
Cash flow arising from Operating Activities	**(62)**	**1,120**	**2,804**	**4,611**
Depreciation and Amortisation expenses	219	268	341	390
Operating profit	**157**	**1,388**	**3,146**	**5,001**
subsidy	-			
Increase / (Decrease) in current liability	34	95	150	368
(Increase) in current Asset	(130)	(405)	(687)	(951)
Cash Flow from Operation	**60**	**1,078**	**2,608**	**4,418**
Cash from Investment Activities				
Capex	**(1,781)**	**(4,994)**	**(4,518)**	**(1,448)**
Net Cash from Investment Activities	(1,781)	(4,994)	(4,518)	(1,448)
Cash from Financing Activities				
Equity Investments	333	815	836	79
Debt Drawn	561	857	537	291
Loan Repayment	(621)	(660)	(726)	(780)
WC loan	(34)	(95)	(150)	(368)
Interest cost	(555)	(557)	(568)	(539)
Grant	887	3,322	3,145	1,078
Net Cash from Financing Activities	571	3,683	3,076	(239)
Net Cash Balances				
Cash BF	1,481	330	98	1,263
Cash Flow during the year	(1,150)	(233)	1,165	2,731
Cash	330	98	1,263	3,994
Cash CF to balance sheet - post deficit loan	330	98	1,263	3,994

SCENARIO C: NON-ADHERENCE TO PERFORMANCE PARAMETERS (LOSS REDUCTION TRAJECTORY) AND SUBSEQUENT DEPENDENCE ON HIGHER TARIFF HIKE

ASSUMPTIONS

- ✓ **T&D losses higher than the targeted trajectory.**
- ✓ Higher Tariff Hike of 14% in FY 2016-17, 12% hike in FY 2017-18 and 11% hike in FY 2018-19 on latest category-wise average billing rates.

Table 33: Assumptions under scenario C

Year	Units	31-Mar-16	31-Mar-17	31-Mar-18	31-Mar-19
Energy Demand	MU	26,943	29,424	32,837	35,188
Sales	MU	17,429	19,793	22,958	25,935
Power Available	MU	27,392	29,698	33,980	44,922
Surplus power	MU	449	274	1,143	9,734
Power purchase rate	Rs/kWh	2.43	2.54	2.70	3.02
AT&C losses	%	34.14%	30.99%	28.49%	24.46%
T&D Losses	%	32.79%	30.29%	27.77%	24.01%
Collection Efficiency	%	98%	99%	99%	99%
Provision for Bad Debt	% of revenue	5%	4%	3%	2%

Table 34: Key parameters (Rs Crore)

	Units	31-Mar-16	31-Mar-17	31-Mar-18	31-Mar-19
Revenue excluding subsidy	Rs Crore	9,274	11,767	14,915	18,428
Total Expense excluding other income	Rs Crore	9,787	11,060	12,733	14,515
PBT	Rs Crore	-514	708	2182	3912
ABR	Rs/ kWh	5.32	5.95	6.50	7.11
Rate of sale of surplus power	Rs /kWh	2.43	2.54	2.70	3.02
ACS	Rs/ kWh	5.62	5.59	5.55	5.60
Interest Cost	Rs Crore	555	557	568	539
O&M cost per unit	**Rs/ kWh**	1.05	1.06	0.99	0.92
R&M cost per unit	Rs/ kWh	0.14	0.14	0.12	0.09
Employee cost per unit	Rs/ kWh	0.63	0.65	0.62	0.60
A&G cost per unit	Rs/ kWh	0.29	0.27	0.25	0.23
Interest cost per unit	Rs/ kWh	0.32	0.28	0.25	0.21

Table 35: P&L under scenario C

P&L (Rs Crore)	31-Mar-16	31-Mar-17	31-Mar-18	31-Mar-19
Net Sales	*9,274*	*11,767*	*14,915*	*18,428*
Other Income	478	502	527	553
Revenue from surplus power	109	69	308	2,914
Total Income	**9,861**	**12,339**	**15,751**	**21,895**
Expenditure				
Transmission Charges	646	705	787	843
Power Cost	6,660	7,536	9,159	13,447

P&L (Rs Crore)	31-Mar-16	31-Mar-17	31-Mar-18	31-Mar-19
Employee Cost	1,090	1,287	1,415	1,557
R&M cost	237	273	284	238
A&G Cost	504	534	566	600
Provision for bad debt	464	471	447	369
Total Expenses	**9,601**	**10,806**	**12,659**	**17,054**
Finance costs	555	557	568	539
PBDT	*-295*	*976*	*2,524*	*4,302*
Depreciation	219	268	341	390
Profit Before Tax	-514	708	2,182	3,912
Accumulated losses by end of the year	-6,635	-5,927	-3,745	167

Based on the above assumptions, it is evident that if DISCOMs does not adheres to the target electrification and reduction of losses, it will have to depend on the higher tariff hikes of the order of 14%, 12% and 11% in FY 2015-16, FY 2016-17 & FY 2017-18 to achieve the financial turnaround. Which inter-alia means that the DISCOMs will have to stick to the loss trajectory as agreed in this road map to be self-sustainable on its own in long run with lesser dependency on tariff hike.

Table 36: Cash flow under scenario C

Cash Flow (Rs Crore)	31-Mar-16	31-Mar-17	31-Mar-18	31-Mar-19
Cash flow arising from Operating Activities	**41**	**1,264**	**2,750**	**4,451**
Depreciation and Amortisation expenses	219	268	341	390
Operating profit	**260**	**1,533**	**3,091**	**4,841**
Subsidy	-			
Increase / (Decrease) in current liability	34	95	150	368
(Increase) in current Asset	(146)	(409)	(658)	(1,042)
Cash Flow from Operation	**148**	**1,219**	**2,582**	**4,167**
Cash from Investment Activities				
Capex	**(1,781)**	**(4,994)**	**(4,518)**	**(1,448)**
Net Cash from Investment Activities	(1,781)	(4,994)	(4,518)	(1,448)
Cash from Financing Activities				
Equity Investments	333	815	836	79
Debt Drawn	561	857	537	291
Loan Repayment	(621)	(660)	(726)	(780)
WC loan	(34)	(95)	(150)	(368)
Interest cost	(555)	(557)	(568)	(539)
Grant	887	3,322	3,145	1,078
Net Cash from Financing Activities	571	3,683	3,076	(239)
Net Cash Balances				
Cash BF	1,481	418	326	1,466
Cash Flow during the year	(1,062)	(92)	1,140	2,481
Cash	418	326	1,466	3,946
Cash CF to balance sheet - post deficit loan	418	326	1,466	3,946

SCENARIO D: FUNDING OF GRANTS THROUGH LOAN

ASSUMPTIONS

- ✓ Funding of grant through loan
- ✓ Nominal Tariff Hike of 15%, 14% and 14% each in FY 2016-17, FY 2017-18 and FY2018-19

Table 37: Assumptions under scenario D

Year	Units	31-Mar-16	31-Mar-17	31-Mar-18	31-Mar-19
Energy Demand	MU	27,330	29,232	31,354	33,224
Sales	MU	17,429	19,793	22,958	25,935
Power Available	MU	27,392	29,698	33,980	44,922
Surplus power	MU	61	466	2,626	11,698
Power purchase rate	Rs/kWh	2.43	2.54	2.70	3.02
AT&C losses	%	35.07%	30.54%	25.11%	20.00%
T&D Losses	%	33.75%	29.83%	24.36%	19.52%
Collection Efficiency	%	98%	99%	99%	99%
Provision for Bad Debt	% of revenue	5%	4%	3%	2%

Table 38: Key parameters (Rs Crore)

	Units	31-Mar-16	31-Mar-17	31-Mar-18	31-Mar-19
Revenue excluding subsidy	Rs Crore	9,274	11,664	15,049	18,927
Total Expense excluding other income	Rs Crore	9,928	11,246	12,872	14,634
PBT	Rs Crore	-654	418	2177	4293
ABR	Rs/ kWh	5.32	5.89	6.55	7.30
Rate of sale of surplus power	Rs /kWh	2.43	2.54	2.70	3.02
ACS	Rs/ kWh	5.70	5.68	5.61	5.64
Interest Cost	Rs Crore	569	668	862	977
O&M cost per unit	**Rs/ kWh**	1.06	1.10	1.04	0.95
R&M cost per unit	Rs/ kWh	0.14	0.18	0.18	0.12
Employee cost per unit	Rs/ kWh	0.63	0.65	0.62	0.60
A&G cost per unit	Rs/ kWh	0.29	0.27	0.25	0.23
Interest cost per unit	Rs/ kWh	0.33	0.34	0.38	0.38

Table 39: P&L under Scenario D

P&L (Rs Crore)	31-Mar-16	31-Mar-17	31-Mar-18	31-Mar-19
Net Sales	*9,274*	*11,664*	*15,049*	*18,927*
Other Income	478	502	527	553
Revenue from surplus power	15	118	708	3,502
Total Income	**9,767**	**12,284**	**16,283**	**22,982**
Expenditure				
Transmission Charges	655	700	751	796
Power Cost	6,660	7,536	9,159	13,447
Employee Cost	1,090	1,287	1,415	1,557
R&M cost	252	352	407	300
A&G Cost	504	534	566	600
Provision for bad debt	464	467	451	379
Total Expenses	**9,625**	**10,876**	**12,751**	**17,079**
Finance costs	569	668	862	977
PBDT	*-428*	*740*	*2,671*	*4,926*
Depreciation	226	322	494	633
Profit Before Tax	***-654***	***418***	***2,177***	***4,293***
Accumulated losses by end of the year	***-6,775***	***-6,357***	***-4,180***	***113***

SCENARIO E: AT TARGETED GROWTH RATE AS PER 24X7 ROAD MAP PLUS FINANCIAL TURNAROUND UDAY SCHEME

Under UDAY scheme as per the Government of India, Odisha Government will take over loans from GRDICO which is to the tune of Rs 5,552 Crore. This will benefit GRIDCO to fund its losses to the tune of Rs 3476 Crore. This will help GRIDCO in reducing its interest burden.

CHAPTER 11: OTHER INITIATIVES

COMMUNICATION

Successful implementation of 24x7 Power Supply Scheme requires clear communication among all the stakeholders across the value chain, including the consumers. In order to avoid potential roadblocks in implementation due to poor communication and flow of information, the following table lists the primary responsibility of each stakeholder and the corresponding method in which it will be carried out.

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

The financial situation in Odisha makes it imperative to raise tariffs while other initiatives including 24x7 supply are implemented. Such tariff increases would inevitably impact consumers and meet with resistance. To address this, the utilities should clearly communicate their plans on implementing the reliable 24x7 supply scheme along with the other reliability and efficiency improvement measures that they are implementing. A high level of involvement of the Government of Odisha will also be required:

Table 40: Proposed Communication Responsibilities

Communication Objective	Responsibility	Frequency
"Power for All" - Roll Out Plan	Secretary, Energy	Quarterly
Status update on Deliverables	Secretary, Energy	Quarterly
Generation Projects *Physical Progress, Achievements and Other Relates Issues*	Managing Director, OPGCL	Quarterly
Inter-State Transmission Projects *Physical Progress, Achievements and Other Relates Issues*	Director (Projects), PGCIL	Monthly
Intra-State Transmission Projects *Physical Progress, Achievements and Other Relates Issues*	Managing Director, OPTCL	Monthly
Distribution *Progress, Achievements, Losses, Consumer Initiatives etc.*	Managing Director, DISCOMS	Monthly
Renewable Power	ORIDA	Quarterly

INSTITUTIONAL ARRANGEMENT

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

- **Government of India (GOI) Level Committee:** It is proposed that this committee will review the overall progress of the scheme on a quarterly basis and provide necessary support to ensure a coordinated response from the Central Government - where necessary. The committee may be constituted with the following members – PFC, REC, CEA, SECI, EESL, BEE, Ministry of Power, MoEF and MNRE.

- **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 on a quarterly basis. This committee will monitor the progress of the works undertaken as part of the scheme and issue directions to enable faster execution.

- **Department Level Committee:** It is proposed that a Department level committee headed by the Nodal Officer will be formed which shall undertake steps required to ensure the projects are progressing as per the action plan. This committee will undertake progress reviews on a monthly basis.

- **District Level Committee** – It is proposed to constitute a district level committee headed by the S.E. to take action that is necessary to ensure the projects are completed in a timely manner and address any issues pertaining to land or other relevant approvals.

- **Project Monitoring Unit (PMU)** – A project monitoring unit shall be set up for monitoring the progress of the works being undertaken under this scheme. The PMU will operate under the Secretary, Energy and shall be operated by an external independent agency.

  The PMU shall be responsible for undertaking coordination, preparing the action plans and monitoring progress of all works under the "Power for all" scheme. The PMU would also help facilitate in tracking the action steps and providing feedback to the various committee that are proposed to be set up under the scheme. Government of India shall provide grants for the PMU operations.

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

CHAPTER 12: ROLL OUT PLAN

SWOT ANALYSIS

In the above sections we have discussed in detail the existing status and future needs. We have also provided some actionable targets which will help Odisha in achieving the set goal. Before structuring the above targets, SWOT analysis of existing power sector in Odisha has been discussed. The exercise has been done to bring out some of the key risk indicators which affect the overall power sector in Odisha along with advantages present.

Odisha Power Sector

Strength

- Long history of power sector reforms
- Availability of cheap hydro and pit head coal power
- Highest installed capacity of CPPs

Weaknesses

- Insufficient ring system to provide uninterrupted power supply.
- Poor Financial position of DISCOMs
- High T&D and AT&C Losses (35%-45%)
- Very low investment in distribution sector for past 15 years
- No funding under RAPDRP was provided
- Tariff revised after a gap of 9 years in 2011

Opportunities

- Surplus power in future
- Participation of private sector in Generation & Distribution
- Scope of Industrial development due to presence of natural Resources (and resultant favorable consumer mix)
- Upcoming Central Government funded scheme of IPDS and DDUJGY
- Un tapped latent demand in the state

Threats

- High cost of CGS contracted Power in future.
- Non-availability of loans from FIs/ Banks due to poor financial position of DISCOMs.
- Difficult Land Acquisition
- Payment discipline lacking in consumers
- Left wing extremist movements (18/30 Districts)
- Threat of cyclone and other natural disasters

ROAD MAP FOR POWER FOR ALL

Sl. No.	Category	Base year scenario (FY 15)	FY 16	FY 17	FY 18	FY 19	Total	End of FY 2019
GENERATION								
A	**Availability (MW):**							
	State Sector							
1	Hydro including small hydro	2336	0	0	0	100	**100**	**2,436**
2	Biomass	20	0	0	0	0	**-**	**20**
3	Solar	138	0	220	400	400	**1,020**	**1,158**
4	Thermal	3215	42	498	660	1724	**2,924**	**6,139**
	Total Availability (MW)	**5,709**	**42**	**718**	**1,060**	**2,224**	**4,044**	**9,753**
B	**Peak Demand (MW):**							
1	**Peak Demand (MW)**	**3,920**	**4,333**	**4,635**	**4,971**	**5,268**		
TRANSMISSION								
C	**Transmission Lines (CKM):**							
1	Inter State	3,433		875	875		1,750	5,183
2	Intra State	12,088	1,958	1,036	1,305	1,038	5,337	17,425
	Total Transmission Line							
D	**Transformation Capacity (MVA):**							
1	Inter State	4,725			2,870		2,870	7,595
2	Intra State	13,692	4693	2193	4073	1690	12,649	26,341
	Total Transformation Capacity	**18417**	**4693**	**2193**	**6943**	**1690**	**15519**	33,936
DISTRIBUTION								
E	**Connecting the Unconnected**							
1	Target Electrification – Rural	44,86,047	4.19 lakh	13.48 Lakh	17.13 lakh	6.68 lakh	41.50 Lakh	86.36 Lakh
2	Target Electrification – Urban	15,24,983	1.11 lakh	1.28 lakh	0.70 lakh	-	3.10 lakh	18.35 Lakh
F	**Efficiency Improvement**							
1	T&D Losses	35.87%	33.75%	29.83 %	24.36 %	20%		20%
2	AT&C Losses	37.80%	35.07%	30.54 %	25.1%	20%		20%
G	**Capacity Addition/ Augmentation**							
1	33 kV Substation (MVA Capacity)	6,147	1,555	1,403	1,322	975	5,255	11,402
2	33 kV Lines (CKT Km.)	11,944	1,492	1,299	1,602	958	5,351	17,295
3	11 kV Lines (CKT Km.)	1,19,316	9,521	13,903	13,851	8,980	46,255	1,65,570
4	LT Lines (CKT Km.)	68,950	16,930	21,895	22,773	21,375	82,972	1,51,922
5	DT Capacity	8,010	821	1,210	1,194	609	3,834	11,845

ANNEXURES

ANNEXURE – 1

Table 41: District wise Households and their Electrification Status [3]

Area Name	Electricity	Total number of households	% Electrified
Ganjam	405298	756894	54%
Mayurbhanj	140189	587648	24%
Cuttack	349587	566831	62%
Baleshwar	296834	529407	56%
Khordha	349860	489636	71%
Sundargarh	223537	473293	47%
Balangir	123446	432081	29%
Jajapur	192249	407572	47%
Kendujhar	121830	406629	30%
Kalahandi	91171	404814	23%
Bargarh	166909	373391	45%
Puri	201605	369482	55%
Koraput	85766	338205	25%
Kendrapara	173107	327405	53%
Bhadrak	164636	309527	53%
Anugul	131916	295922	45%
Dhenkanal	117172	278370	42%
Nabarangapur	34570	273663	13%
Jagatsinghapur	139646	265588	53%
Sambalpur	126498	248829	51%
Nayagarh	124984	230968	54%
Rayagada	61543	225964	27%
Kandhamal	28736	172004	17%
Nuapada	43976	159947	27%
Subarnapur	50028	152454	33%
Malkangiri	24604	137450	18%
Jharsuguda	81433	134624	60%
Gajapati	63112	128818	49%
Baudh	19191	107727	18%
Debagarh	22453	75942	30%

[3] *As per the information available in http://censusindia.gov.in/*

Table 42: Electrification status Rural and Urban

Districts	Rural	Urban	Rural	Urban
	Electrified		Total Number of households	
Khordha	141984	207876	247940	241696
Sundargarh	79585	143952	310762	162531
Cuttack	219784	129803	425082	141749
Ganjam	278201	127097	602216	154678
Sambalpur	63987	62511	178958	69871
Baleshwar	249429	47405	473512	55895
Puri	155294	46311	317002	52480
Jharsuguda	37112	44321	83664	50960
Koraput	42352	43414	283522	54683
Kendujhar	80481	41349	349736	56893
Anugul	94796	37120	249585	46337
Balangir	87948	35498	387345	44736
Mayurbhanj	107023	33166	544764	42884
Bargarh	136817	30092	339364	34027
Rayagada	33587	27956	191615	34349
Bhadrak	138080	26556	274191	35336
Jajapur	169035	23214	378135	29437
Kalahandi	70132	21039	377001	27813
Dhenkanal	97381	19791	253118	25252
Jagatsinghapur	121609	18037	237411	28177
Nayagarh	111131	13853	213265	17703
Kendrapara	159811	13296	311465	15940
Nabarangapur	21511	13059	253461	20202
Gajapati	50484	12628	112872	15946
Kandhamal	17001	11735	155335	16669
Subarnapur	41563	8465	140714	11740
Malkangiri	16964	7640	126306	11144
Nuapada	37851	6125	151921	8026
Debagarh	18487	3966	70511	5431
Baudh	15832	3359	103239	4488

Table 43: Projected Sales from Existing and Newly Electrified Households (CESU)

S.N.	Particulars	FY 15	FY 16	FY 17	FY 18	FY 19
A	**Rural - Electrified Consumers (Existing + Projected Growth)**					
	Electrified Consumers Rural (in Nos.)	17,07,168	17,42,848	17,79,273	18,16,459	18,54,423
	Actual Metered Sales (in MU)	1120				
	Actual Daily Household Consumption	1.80				
	Projected Daily Household Consumption		1.89	1.98	2.08	2.19
	Projected Annual Consumption		1,201	1,287	1,380	1,479
B	**Rural - Electrification of Un-Electrified Consumes**					
	Targeted Annual Addition Rural (in Nos.)		67,669	1,95,338	5,90,677	4,47,669
	Cumulative Annual Addition (In No.s)		67,669	2,63,008	8,53,685	13,01,354
	Projected Annual Consumption		23	120	424	860
C=A +B	**Total Projected Rural Consumption (MU)**		**1,224**	**1,407**	**1,804**	**2,339**
D	**Urban - Electrified Consumers (Existing + Projected Growth)**					
	Electrified Consumers Urban (in Nos.)	650271	669602	689508	710006	731114
	Actual Metered Sales (in MU)	1208				
	Actual Daily Household Consumption	5.09				
	Projected Daily Household Consumption		5.39	5.72	6.06	6.42
	Projected Annual Consumption		1318	1439	1570	1714
	Urban - Electrification of Un-Electrified Consumes					
	Targeted Annual Addition urban (in Nos.)		16,887	33,774	50,661	
	Cumulative Annual Addition (In No.s)		16,887	50,661	1,01,323	1,01,323
	Projected Annual Consumption		17	70	168	238
E	**Total Projected Urban Consumption (In MU)**		**1335**	**1509**	**1738**	**1952**
F=C +E	**Total Projected Domestic Urban Consumption (In MU)**		**2559**	**2916**	**3543**	**4291**

Table 44: Projected Sales from Existing and Newly Electrified Households (NESCO)

S.N.	Particulars	FY 15	FY 16	FY 17	FY 18	FY 19
A	**Rural - Electrified Consumers (Existing + Projected Growth)**					
	Electrified Consumers Rural (in Nos.)	11,52,865	1176960	1201558	1226670	1252307
	Actual Metered Sales (in MU)	846				
	Actual Daily Household Consumption	2.01				
	Projected Daily Household Consumption	5.00%	2.11	2.22	2.33	2.44
	Projected Annual Consumption		907	973	1,043	1,118
B	**Rural - Electrification of Un-Electrified Consumes**					
	Targeted Annual Addition Rural (in Nos.)	3,853	41,596	1,93,532	1,56,721	1,16,210
	Cumulative Annual Addition (In Nos.)		45,449	2,38,981	3,95,701	5,11,911
	Projected Annual Consumption		18	115	270	405
C=A +B	**Total Projected Rural Consumption (MU)**		**925**	**1,088**	**1,312**	**1,523**
D	**Urban - Electrified Consumers (Existing + Projected Growth)**					
	Electrified Consumers Urban (in Nos.)	193893	199657	205593	211705	217998
	Actual Metered Sales (in MU)	419				
	Actual Daily Household Consumption	5.92				
	Projected Daily Household Consumption	6.00%	6.28	6.65	7.05	7.48
	Projected Annual Consumption		457	499	545	595
	Urban - Electrification of Un-Electrified Consumes					
	Targeted Annual Addition urban (in Nos.)		20,135	20,135	20,135	
	Cumulative Annual Addition (In Nos.)		20,135	40,271	60,406	60,406
	Projected Annual Consumption		23	73	130	165
E	**Total Projected Urban Consumption (In MU)**		**481**	**573**	**675**	**760**
F=C +E	**Total Projected Domestic Urban Consumption (In MU)**		**1405**	**1660**	**1987**	**2282**

Table 45: Projected Sales from Existing and Newly Electrified Households (WESCO)

S.N.	Particulars	FY 15	FY 16	FY 17	FY 18	FY 19
A	**Rural - Electrified Consumers (Existing + Projected Growth)**					
	Electrified Consumers Rural (in Nos.)	8,88,582	907153	926112	945468	965228
	Actual Metered Sales (in MU)	815				
	Actual Daily Household Consumption	2.51				
	Projected Daily Household Consumption		2.64	2.77	2.91	3.05
	Projected Annual Consumption		874	937	1,004	1,076
B	**Rural - Electrification of Un-Electrified Consumes**					
	Targeted Annual Addition Rural (in Nos.)	0	1,78,385	7,09,276	7,13,540	60,883
	Cumulative Annual Addition (In No.s)		1,78,385	8,87,661	16,01,200	16,62,083
	Projected Annual Consumption		86	539	1,321	1,819
C=A+B	**Total Projected Rural Consumption (MU)**		**960**	**1,476**	**2,325**	**2,895**
D	**Urban - Electrified Consumers (Existing + Projected Growth)**					
	Electrified Consumers Urban (in Nos.)	402003	413954	426260	438932	451981
	Actual Metered Sales (in MU)	474				
	Actual Daily Household Consumption	3.23				
	Projected Daily Household Consumption		3.42	3.63	3.85	4.08
	Projected Annual Consumption		517	565	617	673
	Urban - Electrification of Un-Electrified Consumes					
	Targeted Annual Addition urban (in Nos.)		32,371	32,371		
	Cumulative Annual Addition (In No.s)		32,371	64,742	64,742	64,742
	Projected Annual Consumption		20	64	91	96
E	**Total Projected Urban Consumption (In MU)**		**538**	**629**	**707**	**769**
F=C+E	**Total Projected Domestic Urban Consumption (In MU)**		**1497**	**2105**	**3033**	**3665**

Table 46: Projected Sales from Existing and Newly Electrified Households (Southco)

S.N.	Particulars	FY 15	FY 16	FY 17	FY 18	FY 19
A	**Rural - Electrified Consumers (Existing + Projected Growth)**					
	Electrified Consumers Rural (in Nos.)	7,37,433	752845	768579	784642	801041
	Actual Metered Sales (in MU)	802				
	Actual Daily Household Consumption	2.98				
	Projected Daily Household Consumption	5.00%	3.13	3.28	3.45	3.62
	Projected Annual Consumption		859	921	987	1,058
B	**Rural - Electrification of Un-Electrified Consumes**					
	Targeted Annual Addition Rural (in Nos.)	1,07,523	1,31,664	2,50,442	2,52,950	44,144
	Cumulative Annual Addition (In No.s)		2,39,187	4,89,629	7,42,579	7,86,724
	Projected Annual Consumption		136	437	775	1,010
C= A+ B	**Total Projected Rural Consumption (MU)**		**996**	**1,358**	**1,763**	**2,069**
D	**Urban - Electrified Consumers (Existing + Projected Growth)**					
	Electrified Consumers Urban (in Nos.)	278816	287104	295640	304429	313479
	Actual Metered Sales (in MU)	359				
	Actual Daily Household Consumption	3.53				
	Projected Daily Household Consumption	6.00%	3.74	3.97	4.21	4.46
	Projected Annual Consumption		392	428	467	510
	Urban - Electrification of Un-Electrified Consumes					
	Targeted Annual Addition urban (in Nos.)		41,800	41,800		
	Cumulative Annual Addition (In No.s)		41,800	83,600	83,600	83,600
	Projected Annual Consumption		29	91	128	136
E	**Total Projected Urban Consumption (In MU)**		**421**	**519**	**596**	**646**
F=C +E	**Total Projected Domestic Urban Consumption (In MU)**		**1417**	**1877**	**2358**	**2715**

ANNEXURE – 2

Table 47: Historical Sales (MU)

Sales (MU)	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15
Kutri Jyoti (Unmetered)	5	48	68	144	247	379	472
Rural Metered	1,228	1,679	1,827	2,028	2,174	2,321	2,786
Urban Metered	1,062	1,508	1,678	1,754	1,835	2,013	2,237
General Purpose	690	823	963	1,006	1,041	1,086	1,202
Irrigation /Pumping	132	140	163	139	145	164	195
Allied Agriculture Activities	9	10	11	13	14	19	23
Public Lighting	54	56	58	60	65	75	81
LT Industrial	319	321	330	319	311	322	338
Specified Public Purpose	69	73	81	85	91	98	112
Public Water Works	134	154	171	182	194	205	216
General Purpose (>110 KVA)	219	251	277	295	323	338	363
HT Bulk Supply (Domestic)	73	79	79	79	80	84	92
HT Irrigation Pumping	1	1	1	2	2	2	3
HT Allied Agriculture Activities	8	9	11	12	14	18	21
HT Specified Public Purpose	64	73	80	89	107	117	130
HT & EHV General Purpose	92	94	118	133	149	137	138
HT & EHV Large Industries	3,593	3,495	3,551	3,188	3,280	3,405	3,400
HT & EHV Mini Steel Plants	326	358	236	133	137	149	168
HT & EHV Colony Consumption	-	-	-	-	-	-	-
HT & EHV Traction	627	735	797	883	930	1,020	1,031
HT & EHV Power Intensive Industries	2,195	2,127	2,226	2,037	1,924	1,680	1,566
HT & EHV Heavy Industries	223	249	419	478	511	867	882
Total	**11,124**	**12,282**	**13,146**	**13,060**	**13,574**	**14,496**	**15,458**

Table 48: Year-wise Projection of Category-wise Revenue (In Rs Crore) – Base Case

Revenue Billed (Rs Crore)	2015-16	2016-17	2017-18	2018-19
Kutri Jyoti	215	332	508	677
Rural	1,306	1,866	2,766	3,762
Urban	1,022	1,335	1,703	2,095
General Purpose	908	1,115	1,358	1,654
Irrigation /Pumping	30	36	43	51
Allied Agriculture Activities	5	7	8	11
Public Lighting	55	66	78	93
LT Industrial	240	273	307	345
Specified Public Purpose	79	96	116	140
Public Water Works	152	185	223	269

Revenue Billed (Rs Crore)	2015-16	2016-17	2017-18	2018-19
General Purpose (>110 KVA)	261	318	384	463
HT Bulk Supply (Domestic)	36	42	48	55
HT Irrigation Pumping	-	-	-	-
HT Allied Agriculture Activities	11	14	19	26
HT Specified Public Purpose	100	128	162	205
HT & EHV General Purpose	94	111	129	150
HT & EHV Large Industries	2,227	2,507	2,797	3,122
HT & EHV Mini Steel Plants	99	109	119	130
HT & EHV Colony Consumption	-	-	-	-
HT & EHV Traction	740	908	1,107	1,351
HT & EHV Power Intensive Industries	958	1,079	1,205	1,345
HT & EHV Heavy Industries	666	940	1,313	1,836
Total	**9,205**	**11,465**	**14,392**	**17,781**

Table 49: Year-wise Projection of Power Purchase/Availability (in MU)

Source	Energy Availability in MU			
	FY 2015-16	FY 2016-17	FY 2017-18	FY 2018-19
Availability Within State				
Own Generating Stations	8842	8842	10767	13462
Private Generating Stations	7106	9068	10801	10801
Renewable Energy Sources	280	623	1247	2028
Central Generating Stations	6627	6627	6627	16873
Availability Within State	**22854**	**25161**	**29442**	**43164**
Availability Outside State				
Central Generating Stations	3243	3243	3243	6022
Availability Outside State	**4346**	**4346**	**4346**	**7125**
	27201	**29507**	**33788**	**50289**

Table 50: Year-wise Circle wise asset addition plan

Sl. No.	Name of Circle	Existing	Proposed capacity addition (MVA)				Total Capacity by FY 19
		FY 2014-15	FY 2015-16	FY 2016-17	FY 2017-18	FY 2018-19	
NESCO							
1	Balasore	359.2	112.0	60.0	60.0	10.0	931.9
2	Bhadrak	213.0	56.0	60.0	13.0	5.0	556.6
3	JajpurRoad	246.0	80.0	20.0	20.0	10.0	603.8
4	Keonjhar	205.3	100.0	160.0	50.0	12.0	732.5
5	Mayurbhanj	231.6	90.0	60.0	100.0	12.0	718.0
Total		**1254.9**	**438**	**360**	**243**	**49**	**2344.9**
CESU							
1	Circle-I, BBSR	54.35	65	75	85	95	1009.85
2	Circle-II, BBSR	90.22	93	96	99	102	967.15
3	Cuttack	54.2	57	60	63	66	870.3
4	Dhenkanal	64.6	67	70	73	76	730.9

Sl. No.	Name of Circle	Existing	Proposed capacity addition (MVA)				Total Capacity by FY 19
		FY 2014-15	FY 2015-16	FY 2016-17	FY 2017-18	FY 2018-19	
5	Paradeep	46.25	49	52	55	58	595.7
Total		**2714**	**331**	**353**	**375**	**397**	**4173.9**
SOUTHCO							
1	CITY	151.25	52	157	92	76	719.25
2	BAM	105.8					
3	ASKA	161.2					
4	BNJR	151.55	51.3	50.2	20	30	303.05
5	RYGD	147.43	50	51.84	70	116	435.27
6	JYPR	273.44	165.4	165.55	80	116	800.39
Total		**990.67**	**318.7**	**424.59**	**262**	**338**	**2257.96**
WESCO							
1	Rourkela	694	75	155	267	127	1317
2	Sambalpur	795	107	174	320	175	1571
3	Bargarh	468	60	136	221	90	975
4	Balangir	629	127	177	281	107	1320
5	Kalahandi	431	98	164	250	80	1023
Total		**3016.5**	**468**	**805**	**1338**	**579**	**6207**
Odisha		**7,976.07**	**1,555.21**	**1,942.88**	**2,218.14**	**1,363.10**	**14,983.30**

Sl. No.	Existing	Proposed LT Length addition Ckt. Km.				Total Length by FY 2019
	FY 14-15	FY 15-16	FY 16-17	FY 17-18	FY 18-19	
CESU						
Circle-I, BBSR	6296.6	610	615	620	625	14457
Circle-II, BBSR	11059	600	610	620	625	23197
Cuttack	9881	510	515	520	525	21328
Dhenkanal	11248	250	300	350	400	22961
Paradeep	9805.5	300	350	400	450	11305
Total	**48290**	**2270**	**2390**	**2510**	**2625**	
NESCO						
Balasore	10826	0	3400	3000	2800	20026
Bhadrak	4662	1300	1300	1500	1200	9962
Jajpur	9489	1600	1200	2000	2300	16589
Keonjhar	7741	2000	3700	3000	2500	18941
Baripada	12463	2490	1400	2500	2200	21053
TOTAL	**45181**	**7390**	**11000**	**12000**	**11000**	**86571**
WESCO						
Rourkela	5594	226	1464	1464	1255	10003
Sambalpur	4882	543	939	905	790	8058
Bargarh	3430	263	534	505	445	5177
Balangir	5246	206	723	703	611	7489
Kalahandi	4127	212	887	848	744	6817
Total	**23279.00**	**1449**	**4547**	**4425**	**3845**	**37545**
SOUTHCO						
CITY	1369	204	111	111	121	1917
BAM	1379	205	112	112	122	1931
ASKA	2149	320	175	175	190	3009
BNJR	6795	1012	553	553	601	9513
RYGD	5063	754	412	412	448	7088
JYPR	9058	1348	737	737	801	12680
Total	**25814**	**3843**	**2100**	**2100**	**2281**	**36138**

Sl. No.	Name of Circle	Existing Ckt. Km.	Proposed Length addition Ckt. Km. (11 kV)				Total Length by FY 2019
		FY 14-15	FY 15-16	FY 16-17	FY 17-18	FY 18-19	
CESU							
1	Circle-I, BBSR	3752	340	350	360	365	5167
2	Circle-II, BBSR	7922	300	350	370	400	9342
3	Cuttack	5218	110	115	120	125	5688
4	Paradeep	6906	200	250	300	350	8006
5	Dhenkanal	8488	200	250	300	350	9588
Total		**32286**	**1150**	**1315**	**1450**	**1590**	**37791**
NESCO							
1	Balasore	6790	870	840	620	450	**15267**
2	Bhadrak	3128	430	450	300	100	**7522**
3	Jajpur	3856	560	170	560	400	**8941**
4	Keonjhar	6000	630	1300	1100	250	**15210**
5	Baripada	6666	710	740	420	300	**14683**
Total		**26,440**	**3,200**	**3,500**	**3,000**	**1,500**	**61,623**
SOUTHCO							
1	CITY	1,024	145	141	143	158	1,612
2	BERHUMPUR	1,232	175	170	172	191	1,939
3	ASKA	2,334	331	322	326	361	3,674
4	BHANJANAGAR	7,960	1,128	1,098	1,111	1,231	12,527
5	RAYAGADA	6,486	919	894	905	1,003	10,209
6	JOYPUR	12,594	1,784	1,737	1,758	1,948	19,821
Total		**31,631**	**4,482**	**4,362**	**4,415**	**4,893**	**49,782**
WESCO							
1	Rourkela	**6549**	**163**	**1452**	**1495**	**223**	**9882**
2	Sambalpur	**6149**	**152**	**899**	**982**	**252**	**8434**
3	Bargarh	**3807**	**100**	**552**	**569**	**137**	**5165**
4	Balangir	**6691**	**128**	**866**	**929**	**167**	**8781**
5	Kalahandi	**5763**	**145**	**956**	**1012**	**218**	**8095**
Total		**55901**	**689**	**4726**	**4986**	**997**	**40357**
Odisha		**1,46,258**	**9,521**	**13,903**	**13,851**	**8,980**	**46,255**

Sl. No.	Name of Circle	33 kV line proposed Length addition Ckt. Km.					Total Length by FY 2019
		FY 14-15	FY 15-16	FY 16-17	FY 17-18	FY 18-19	
CESU							
1	Circle-I, BBSR	514.75	18	21	24	27	604.75
2	Circle-II, BBSR	809.04	40	42	44	46	981.04
3	Cuttack	650.3	11	12	13	14	700.3
4	Paradeep	440.31	11	13	15	17	496.31
5	Dhenkanal	694.01	30	31	32	33	820.01
	Total	**3,108**	**110**	**119**	**128**	**137**	**3602.41**
SOUTHCO							
1	CITY	130	12.31	8.42	8.42	7.96	167
2	BERHUMPUR	255	24.07	16.46	16.46	15.55	327
3	ASKA	288	27.21	18.60	18.60	17.58	370
4	BHANJANAGAR	714	67.43	46.10	46.10	43.57	917
5	RAYAGADA	651	61.46	42.02	42.02	39.71	836
6	JOYPUR	1,059	100.03	68.39	68.39	64.63	1,360
	Total	**3,096**	**293**	**200**	**200**	**189**	**3,978**
WESCO							
1	Rourkela	711	92.30	86.34	176.82	113.47	1179.92
2	Sambalpur	714	144.11	145.57	268.66	142.79	1415.13
3	Bargarh	312	84.45	89.59	165.49	88.12	739.65
4	Balangir	1,121	145.21	116.92	166.07	67.39	1616.59
5	Kalahandi	619	123.87	111.31	146.71	60.24	1061.12
	Total	**3477.00**	**589.93**	**549.73**	**923.74**	**472.00**	**6012.41**
NESCO							
1	Balasore	535	128	86	74	44	**867**
2	Bhadrak	320	64	65	36	15	**499**
3	Jajpur	326	98	22	68	33	**547**
4	Keonjhar	445	102	194	128	30	**899**
5	Baripada	638	108	65	44	38	**893**
	Total	**2264**	**500**	**430**	**350**	**160**	**3704**
	Grand Total	**11946**	**1492**	**1299**	**1602**	**958**	**5351**