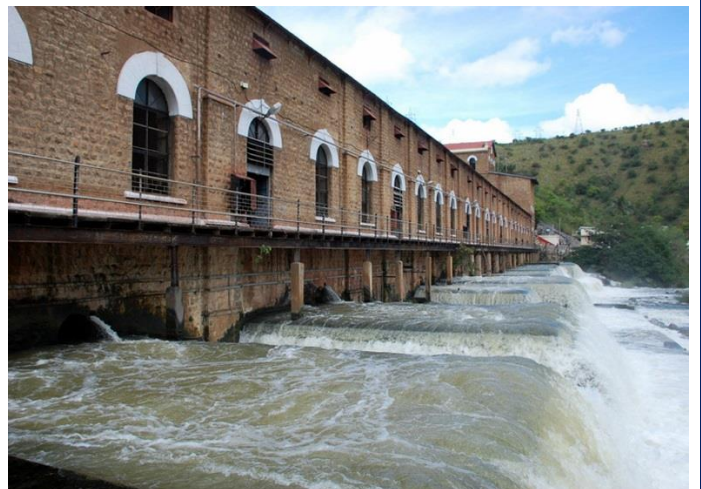


# 24 X 7 POWER FOR ALL – KARNATAKA

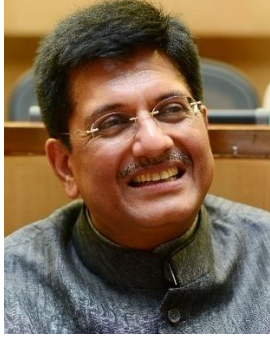
*A Joint Initiative of Government of India and  
Government of Karnataka*





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 Karnataka 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 Karnataka and wish them all the best for implementation of this programme. The Government of India will complement the efforts of Government of Karnataka 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.



**Siddaramaiah**  
Chief Minister of Karnataka



## Foreword

Power is one of the essential commodities for economic growth, development and livelihood of the people. The high expectations on the commodity for its continuous availability has increased the demand year after year whereas the supply is not matching the pace of the demand due to which there is a gap.

Even though Karnataka is a pioneer in Power generation since 1902, today the state is facing Power shortage. The hydro dependent state has hitherto harnessed all the available potential to generate power. As there is dearth of fossil fuels in the state, dependency on Coal allocation for thermal power generation is inevitable. Karnataka is making all efforts to harness renewable power like wind and Solar to meet the ever increasing demand.

Karnataka being a progressive state is providing conducive atmosphere for investors to set up their enterprises. We believe that facilitation of necessary infrastructural support is essential for industrial growth.

In this regard, the Centre's initiative for providing 24x7 Power for all is a welcome move and the state is also joining hands in supporting the joint initiative. Providing reliable, affordable power to all even in remote and inaccessible areas is the duty of the Government. This will lead to all round economic growth.

The state government is keen in implementing the effort of the Centre and provide all necessary support required to make the mission a success.



**D.K Shivakumar**  
Energy Minister,  
Govt. of Karnataka



## Foreword

Karnataka and Power are associated with each other for more than a century. Presently about 2 crore installations are connected with the state grid. We have achieved more than 95% electrification of households and a balance of about 39 remote villages are to be electrified. The power demand of the state is constantly increasing along with high expectation of consumers. To increase the capacity addition for emphasizing power availability, separate generating company, KPCL was formed during 1970. The installed capacity, which was 746 MW during 1970, has presently increased to 6508 MW. The state's total installed capacity including all sources is at 15,052 MW during 2014-15. Peak demand of 9549 MW has been met by the grid. Demand – Supply gap is still prevailing.

The state is mainly dependent on hydel sources for power generation. No fossil fuels are available for setting up of Thermal Plants. All efforts are being made to increase power generation through renewable and solar sources. More than 5000 MW capacity has been installed through renewable sources. The state is committed for solar power generation by establishing a 2000 MW Solar Park and 20 MW each solar projects in 60 taluks with net capacity of 1200 MW.

All the human activity in this civilized world starts with electricity for their livelihood and economic growth. In this regard, 24x7 Power for All is need of the hour. To provide 24 hours of power supply for all category of consumers and regulated hours to agriculture continuously is a big challenge before the state.

The people living in remote locations have to join the mainstream of civilization through Power accessibility and availability. The state Government also join hands with the Centre in providing all necessary support, co-ordination and committed to make this joint initiative a success.





सत्यमेव जयते

Government of India



Government of Karnataka

## Joint Statement

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

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

Government of Karnataka 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 & ARR, 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 Karnataka 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 for all connected households from FY 2015-16 itself and to all un-connected households by FY 2018-19.

However Government of Karnataka would endeavor to implement the programme much earlier than the above targeted dates.

The central and state governments would meet regularly to review the progress of the programme over the next 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)

*P. Ravikumar*

**P. Ravikumar I.A.S**

Additional Chief Secretary  
Energy Department, Government of Karnataka

# 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 agriculture farm holdings by FY 2018-19. This roadmap document aims to meet the above objectives for the state of Karnataka.**

## ELECTRIFICATION IN KARNATAKA

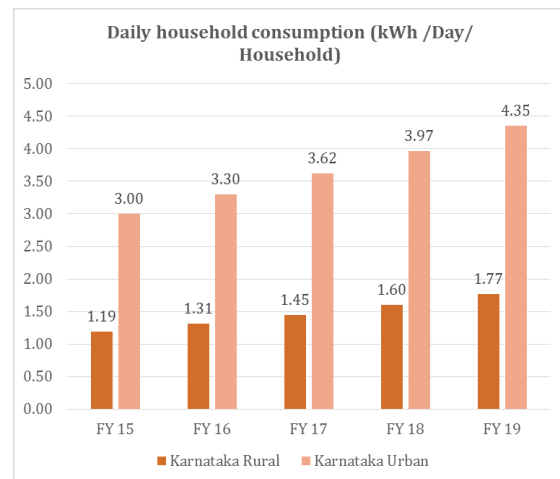
The population of Karnataka has grown from 5.28 crores in 2001 to 6.11 crores in 2011 at a decadal growth of more than 46%. As per the 2011 census, the number of households in Karnataka was 1.32 crores with 12.3 lakh households un-electrified.

During the last four years the state has undertaken extensive electrification under RGGVY scheme. Still, as on March 2015 there are 12,56,592 (10,15,586 rural and 2,41,006 urban) household left for electrification. These households have been planned under different rural electrification schemes. In DDUGJY the state has planned to cover 8,02,856 households and under RGGVY 12<sup>th</sup> plan 2,08,099 rural households will be covered. Some of the households will also be covered under DDG scheme which shall cover 4121 households covering 9 villages.

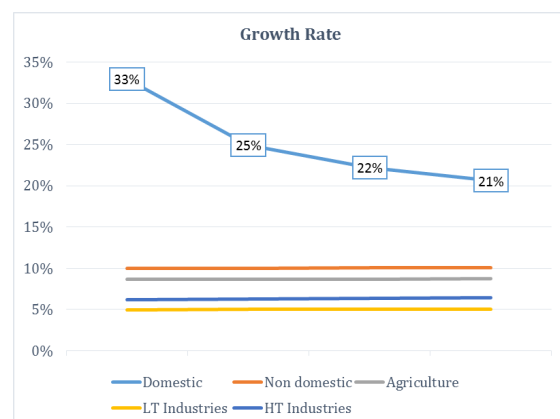
## DEMAND ESTIMATION

The present energy requirement of Karnataka during FY 2015 was 62,643 MU as per the CEA reports with 4% of deficit. The state currently provides on an average 22 hours of power supply in urban areas to

domestic consumers and 16-18 hours in rural areas. With the above hours of supply, the average daily consumption of registered rural domestic consumers has increased to 1.19 kWh in FY 2015 at a CAGR of 4% during the last 6 years. On the other hand, the average daily consumption of registered domestic urban consumers has increased to 3.00 kWh in FY 2015 at a CAGR of 3% during the same period. The projected daily household consumption till FY 2019 is given below. .



For projection of sales for FY 2016 to FY 19, the CAGR of previous 6 years has been considered for all categories other than domestic.



Based on the above demand projections the share of industrial sales (LT, HT) will decrease from 35% to 30% of the total consumption of the state whereas the share of domestic sales will increase from 25% to 30% of the total. The share of irrigation will remain practically unchanged at 33% to 34% from FY 2015 to FY 2019.

For the purpose of calculating peak demand, the load factor has been taken at 68% as considered in the 18<sup>th</sup> EPS. The maximum demand of the state is projected to increase from 9,549 MW in FY 2015 to 14,710 MW in FY 2019. The maximum increase in demand is observed in MESCOM at 46% from FY 2016 to FY 2019. However, BESCOM will have the maximum share at 7,022 MW in FY 2019 at 49% of the total maximum demand of the state.

#### SOURCE OF POWER

The total installed capacity in Karnataka including firm share in CGS as on 31<sup>st</sup> March 2015 (allocated capacity in state, private, joint and CGS) is 15,052 MW. The state generating company provides 50% of the total energy needs to the state at a cost of 2.38 Rs/kWh while central generating stations provide around 29% of the total energy need. The state is bestowed with ample hydro sources which makes them susceptible to any deficit in rainfall. The state has hydro capacity of 3,642 MW which constitutes the cheapest source of power for the state at 0.59 Rs/kWh.

Sources	Capacity Available (MW)
KPCL	6615
Central generation allocation	2169
UPCL (IPP)	1200

Sources	Capacity Available (MW)
Renewable Energy Sources	5068
<b>Total</b>	<b>15,052</b>

The state has planned to build Bellary Thermal Power Station U-3, Yermarus Thermal Power Station U-1 and U-2, Yelahanka Gas Based Power Plant, Bidadi Gas and CGS Share from NLC New TPP 1 and 2 etc. for meeting the increasing demand in the state.

The state will see power surplus position from FY 2017 if the above plants are commissioned in time and hydro power is available to its full capacity. Surplus energy to an extent of 30% above the requirement will become available in FY2019 with the above capacity addition and allocation from different central generating stations. In addition to the conventional source of power, the state has plan to add almost 5000MW of renewable energy in coming 4 years from solar, wind, small hydro and biomass.

#### TRANSMISSION PLAN

The interstate transmission network in Karnataka consists of 3996 ckt.km of 400 kV lines, 2738 ckt.km HVDC lines with capacity of 2000 MW and 918 ckt.km of 765 kV lines. By FY 2019 the quantum of power import will increase by ~200 MW which can be comfortably met by the transmission network with the planned augmentation to its capacity. However, while this is true for drawing power from plants in A.P, Telangana and Tamil Nadu, capacity constraints in inter-state transmissions system do not allow increase in drawal from other power surplus states like Chhattisgarh.

The state is expected to become power surplus from FY 2017 if power projects as planned are commissioned. Rise in maximum demand to 14,710 MW in 2018-19 from 10,000 MW in 2014-15 signifies an increase of 47%. Total transmission capacity is planned to be enhanced from 10,725 MVA to 16,595 MVA, an increase of 54% in the same period which is sufficient to meet the demand. However, evacuation of surplus power also needs to be planned.

## DISTRIBUTION PLAN

Discoms in Karnataka are currently serving more than 2 crore consumers of the state and providing 20-22 hours supply in urban and 16-18 hours of supply to rural consumers. Snapshot of key parameters for Karnataka distribution companies is given below:

Parameters	Units	Karnataka
Consumers	lakhs	206
Energy Consumption	MU	48,426
DTCs	Nos.	5,33,525
HT lines	Ckt. Kms	2,60,334
LT lines	Ckt. Kms	4,99,058
Demand	Rs. in Crores	25,633
Collection	Rs. in Crores	24,652

Parameters	Units	Karnataka
Collection efficiency	%	96%
Average realization	Rs /kWh	5.29

The AT&C losses for Karnataka DISCOMs has reduced from 37% in FY 2005-06 to 18% in FY 2014-15, which is an overall reduction of more than 19% in 10 years.

Karnataka	FY 2012-13	FY 2013-14	FY 2014-15
Distribution losses	15.96%	15.20%	15.86%
AT&C losses	20%	18.24%	18.05%

However, Karnataka DISCOMs have planned to reduce its losses from 18% in FY 2015 to 14.5% by the end of FY 2019.

Source	AT&C Loss Target			
	FY 2015-16	FY 2016-17	FY 2017-18	FY 2018-19
AT&C loss targets	15.9%	15.5%	15.1%	14.5%

To achieve 100% rural household electrification and to meet the AT&C losses targets, Karnataka DISCOMs have planned an investment of 10,945 crores which will be funded by central grant, state grant, equity from DISCOMs and debt from FIs



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# 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. For this 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 reliable distribution system in the mandated area of supply as well as to supply electricity in accordance with the provisions contained in 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 Karnataka (GoK) 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 agricultural 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. The hours of supply for agriculture consumers will be decided by the state government as per requirement.
- ii. 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.
- iii. Ensure adequate capacity addition planning and tie ups for power from various sources at affordable price to meet the projected power demand in future.
- iv. Strengthen the transmission and distribution network to cater to the expected growth in demand of existing as well as future consumers.
- v. Assess the financial measures including optimizing investments and undertaking necessary balance sheet restructuring measures to ensure liquidity in the finances of the utility.
- vi. 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.
- vii. Identify steps for implementation and adoption of modern technologies to monitor reliability of supply.
- viii. Identify steps for monitoring timely commissioning of various generating plants and transmission and distribution infrastructure to meet the expected growth in demand.
- ix. 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 Karnataka 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 already identified/registered consumers and other consuming entities,
2. Connecting the unconnected households and unconnected farm holdings.

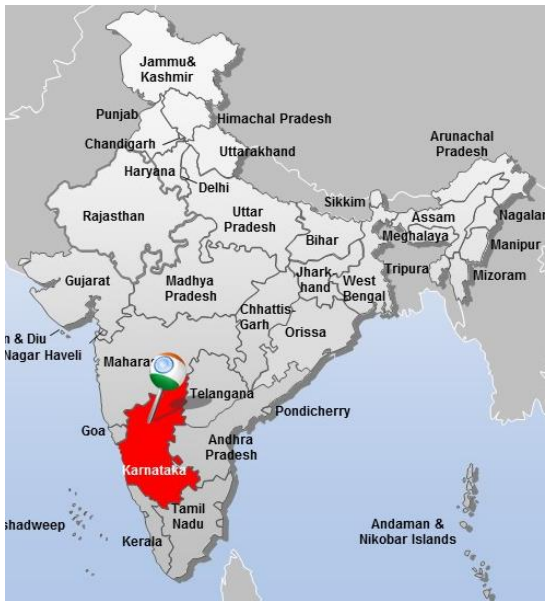
Accordingly the methodology adopted to prepare the 'Action Plan' for 24x7 PFA includes inter-alia:

- 1) Projection of average daily consumption of rural and urban households based on respective historical compounded annual growth rates (CAGR) during the past five years.
- 2) Projection of demand growth of commercial, industrial and agriculture consumers based again on past data and historical CAGR recorded during the past five years.
- 3) Assess the power requirement of un-electrified households and draw up 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 applying an appropriate load factor.

- 5) Draw up a broad plan to meet power demand in future through
  - ✓ State's own upcoming generation resources.
  - ✓ 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 increased / expected / 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 KARNATAKA



Key Statistics	
Area	191,791 sq.km
Districts	30
Villages	29,340
Population	61,095 thousand
Number of households	<i>Census 2011</i> 1,31,79,911
- Electrified	1,19,45,467
- Un-Electrified	12,34,444
Forest Cover	43,356 sq.km (22.61%)
Number of Domestic consumers	1,40,37,158
Capacity Installed	15,052 MW (March 2015)
Maximum Demand	9,549 MW (FY 2015)
GSDP	7% in FY 2015

Karnataka is home to close to 6.11 crore inhabitants as per 2011 census which accounts for 5.05% of India's population. Karnataka has 5.83% of India's geographical area. The state's population has grown by 15.7% during the last decade, while its population density has risen from 276 per sq. km in 2001 to 319 per sq.km. in 2011.

The state of Karnataka is abundant in mineral resources. It is said to be one of the most mineral rich states of India, endowed with valuable mineral resources such as gold, silver, copper, iron-ore, manganese, limestone, dolomite, asbestos, bauxite, chromite, kaolin and granite rock. The Kolar Gold Fields in Kolar used to be one of the major producers of gold in India, before it shut down. Presently the gold mines of Hutti and Raichur produce almost 84 per cent of the country's gold. The other major centers of gold mining are Dharwad and Chitradurga. The gold mines produce about 3,000 kg of gold per annum. The district of Raichur is also famous for its silver deposits.

Karnataka saw FDI investment of US \$14,174 million during the period of April 2000 to November 2014, constituting 5.99% of the all-India FDI. Karnataka stands 4th in merchandise exports and is also a leading state in export of industrial products and services. In FY 2013-14, Karnataka's exports amounted to about Rs. 2,90,418 crore which constituted about 12.37% of the country's exports.

## CHAPTER 3: POWER SECTOR IN KARNATKA

Power and Karnataka have been associated with each other since 110 years. The erstwhile Mysore state had the enviable and glorious position of establishing the first hydro-electric generating station at Shivasamudram (3.2 MW) as early as 1902 for commercial operation. The longest transmission line (140 km), at the then highest voltage (35kV) in the world, was constructed to meet the power needs of mining operations at Kolar Gold Fields. The generating capacity of the Shivasamudram Power House gradually increased to 42 MW in stages. To meet the increasing demand for power, the Shimsha Generating Station, with an installed capacity of 17.2 MW, was commissioned in the year 1940 (1<sup>st</sup> Unit 18-04-1940 and 2<sup>nd</sup> Unit 15-06-1940).

Karnataka was the first state having separate entities for generation and distribution. Karnataka Power Corporation Ltd. (KPCL), was formed in 1970 owning generation plants while the transmission and distribution sectors were owned by Karnataka Electricity Board (KEB). In 1999, Karnataka Electricity Reforms Act was passed by the state legislature and led to major reforms in the power sector. Along with the corporatization of KEB into Karnataka Power Transmission Corporation Ltd. (KPTCL). Karnataka Electricity Regulatory Commission (KERC) was also constituted in the year 1999 as an autonomous body to regulate all aspects of the power sector in the state. In 2002, KPTCL was further unbundled to form a transmission company and 4 distribution companies viz., BESCOM, HESCOM, GESCOM and MESCOM and in 2005 a 5<sup>th</sup> distribution company viz., CESC was formed with a mandate for power distribution and retail

supply of electricity to consumers in the state.

### REFORMS IN KARNATAKA

The generation, transmission and distribution systems in the state were under the control of the Government of Mysore Electrical Department (GOMED) till the year 1957. On 1<sup>st</sup> October 1957, Karnataka Electricity Board was formed and the private distribution companies were amalgamated with Karnataka Electricity Board.

Government of Karnataka announced its general policy on power reforms during January 1997. Karnataka Electricity Reforms Act 1999 was brought into effect in June 1999. Karnataka Electricity Board was restructured and new entities viz, Karnataka Power Transmission Corporation Limited and Visvesvaraiyah Vidyut Nigam Limited were incorporated in August 1999. Karnataka Electricity regulatory commission (KERC) was established and made functional in November 1999.

A policy was announced during January 2001, reaffirming the long term commitment of Government of Karnataka to reforms and the commitment to restructure power sector including privatization. Policy was announced in January 2001 enabling independent power producers for addition of power generation of 3500 – 4000 MW over the next ten years on least cost and with environment friendly measures in place.



The Karnataka Electricity Board ceased to exist and the Karnataka Power Transmission Corporation Limited was formed to look after transmission and distribution in the state and VVNL (Visweshwaraiah Vidyuth Nigama Limited) to look after the generating stations under the control of erstwhile Karnataka Electricity Board were constituted from 01.08.1999.

Karnataka Power Transmission Corporation Limited is a registered company under the Companies Act, 1956 incorporated on 28.07.1999 and is a company wholly owned by the Government of Karnataka. KPTCL was formed on 01.08.1999 by carving out the Transmission and Distribution functions of the erstwhile Karnataka Electricity Board. Consequent to this, function of distribution of power has been totally separated from KPTCL. KPTCL is now vested with responsibility of transmitting power all over the state and construction and maintenance of Sub stations and transmission lines of 66 kV and above. Distribution companies purchase power from various power producers and sell it to the consumer.

The four newly formed independent distribution companies, which were registered on 30.01.2002, are

- 1) *Bengaluru Electricity Supply Company Ltd. (BESCOM),*
- 2) *Mangalore Electricity supply company Ltd. (MESCOM),*
- 3) *Hubli Electricity supply company Ltd. (HESCOM) and*
- 4) *Gulbarga Electricity Supply Company Ltd. (GESCOM).*

These are functioning with effect from 01.06.2002. Further, MESCOM was bifurcated and new distribution company- Chamundeshwari Electricity Supply Corporation (CESC) was formed in 2005.

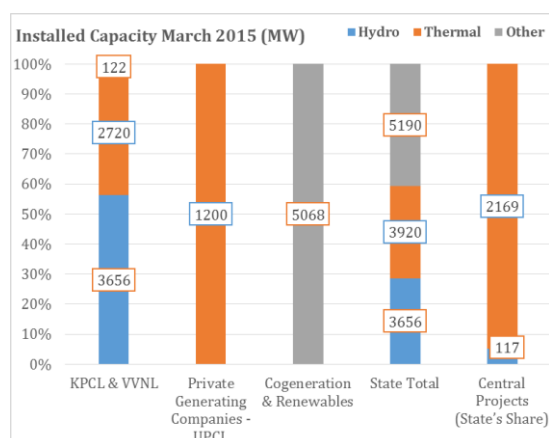
## GENERATION

The demand for power witnessed a phenomenal growth in the mid-sixties and onwards with the setting up of many public sector and private industries in the state. As power generation in the state was entirely dependent on monsoon and was subject to its vagaries, the state government went ahead to set up a coal based power plant at Raichur. Its first thermal unit of 210MW was commissioned in 1985. The present installed capacity of the power plant at Raichur is 1720 MW.

To augment the energy resources of the state, Kalinadi Project with an installed capacity of 810 MW at Nagihari Power House was set up and its first unit of 135 MW was commissioned on 22-12-1979. Next the 100 MW Supa Dam Power House, with an energy potential of 4,112 MU per annum, was installed.

Power for Karnataka state is procured from the generating stations under KPCL, independent power producers (IPP's) (Conventional and Non-conventional), central generating station (CGS) and from other states through bilateral trade, purchase and energy exchanges. The total installed capacity including CGS share of the state is 15,052 MW at the end of March 2015. State hydro sources contribute about 25% of the power requirement while renewable sources are contributing about 34% of the requirement during season.

**Figure 1: Share of Installed Capacity**



## TRANSMISSION

Karnataka Power Transmission Corporation Ltd. (KPTCL) is the state owned Power Transmission Company which undertake intra state transmission of power to DISCOMs and to the open access consumers within the state. The transmission system of the state was upgraded to 220kV with Commissioning of the Sharavathi- Shimoga- Peenya line on 25<sup>th</sup> January 1965 of 361 km. Another three 220kV lines between Sharavathi-Shimoga-Peenya were subsequently energized. The first inter-state 220kV line between Peenya- Singarpet of 162 km route length was commissioned in 1965.

KPTCL is vested with the functions of transmission of power in the state covering construction and maintenance of substations & transmission Lines at 400/220/110/66 kV level. Energy is wheeled through this network at different voltage levels to the interface points with DISCOMs. Technical loss incurred in the transmission system stood at 3.66% in FY 2015. A summary of the network owned by KPTCL is shown below:

**Table 1: Existing network**

Voltage Level	No of Stations	Transmission line (ckt.km)
400	4	2650

Voltage Level	No of Stations	Transmission line (ckt.km)
220	94	10297
110	375	10021
66	585	10234
33	340	8713
<b>Total</b>	<b>1398</b>	<b>41915</b>

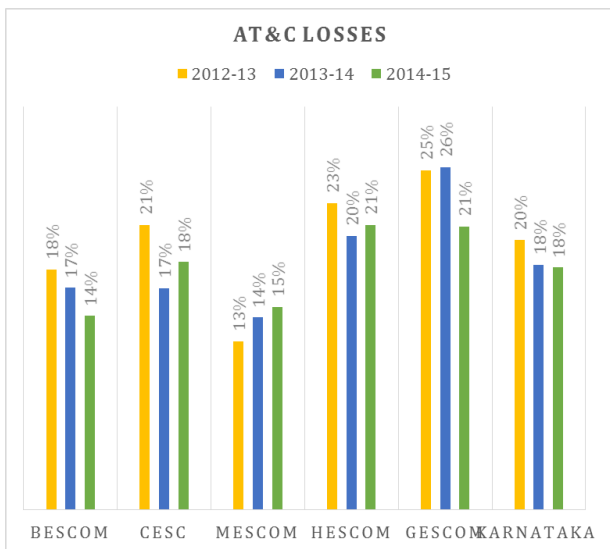
## DISTRIBUTION

The five electricity distribution companies, the Bengaluru Electricity Supply Company (BESCOM), the Mangalore Electricity Supply Company (MESCOM), the Hubli Electricity Supply Company (HESCOM), the Gulbarga Electricity Supply Company (GESCOM) and the Chamundeshwari Electricity Supply Corporation Limited (CESC) serve their respective service areas across the state of Karnataka. Additionally, Hukkeri Rural Electric Cooperative Society (HRECS), the only cooperative society in the state with a distribution license, distributes power to consumers in Hukkeri Taluk and a few other villages in the area. Some of the key highlights on the five DISCOMs:

- ✓ Out of the five DISCOMs in Karnataka, BESCOM has the highest number of consumers at 94 lakh out of total 209 lakh consumers in the state.
- ✓ BESCOM total energy requirement stands at 24,000 MU per annum which is 50% of the total state's requirement.
- ✓ Consumption per consumer per day in BESCOM is the highest among Discoms at 7.09 units compared to 6.43 units for the whole state (5.43 for MESCOM, 5.25 for CESC, 6.17 HESCOM and 6.48 for GESCOM).
- ✓ Amongst the five distribution utilities in the state, HESCOM has the largest area under its license.
- ✓ Average realization for BESCOM was the highest at 5.64 Rs/ kWh while CESC had the lowest at 4.72 Rs /kWh in the FY 2015

- ✓ The AT&C losses in the state is at 18% in the FY 2015

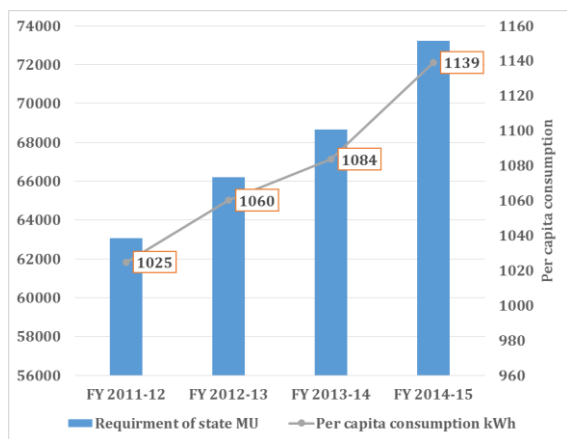
Figure 2: AT&C losses



### PER-CAPITA ELECTRICITY CONSUMPTION

The population of Karnataka has grown from 5.28 crores in 2001 to 6.11 crores in 2011 at a decadal growth of more than 46%. This growth rate has been considered for estimating the population beyond 2011. Based on the annual energy requirement from FY 2012 to FY 2015 including demand from open access consumers, the per-capita consumption of electricity during past 4 years has been as shown below:

Figure 3: Per-Capita Consumption of Electricity (kWh per person) in recent years

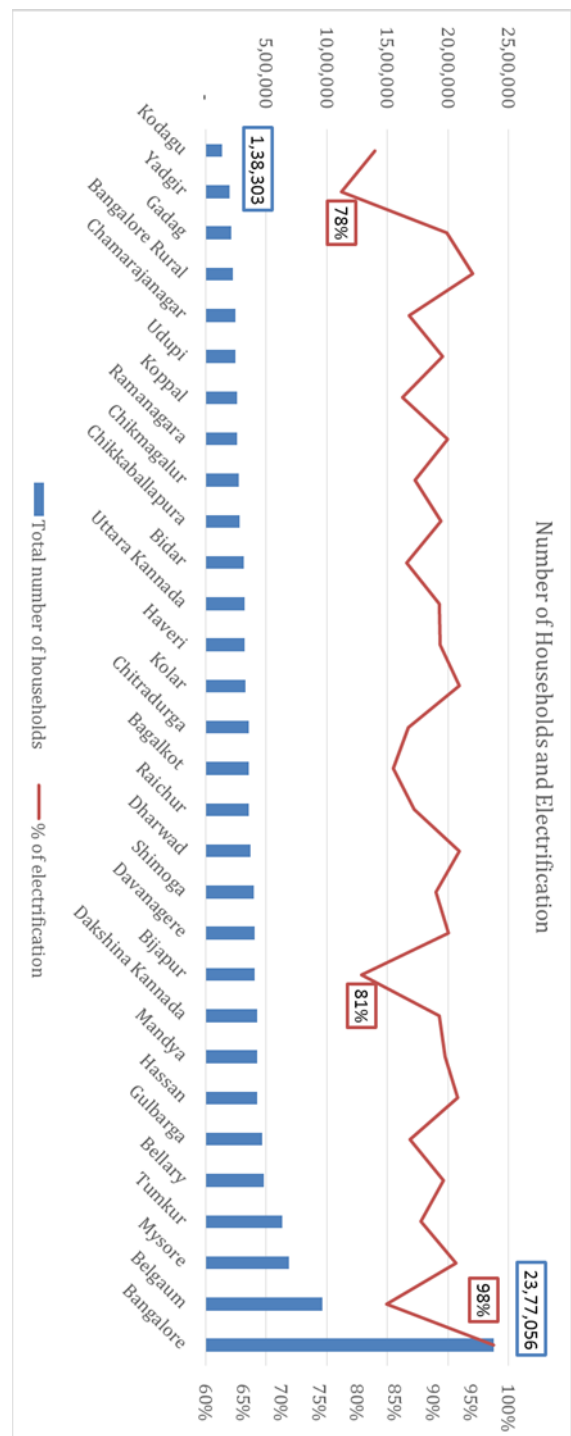


Note: Calculated based on energy demand and historical population growth

- The annual per-capita electricity consumption of Karnataka at 1025 kWh in FY 2012 and 1139 kWh in FY 2015 is higher than to the all India average.

### STATUS OF ELECTRIFICATION

District-wise electrification in urban and rural areas is detailed in Annexure-2.



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 2: Projection of households based on Census 2001 and 2011**

	Particulars	Total	Rural	Urban
2011	GESCOM	20,79,627	14,79,450	6,00,177
	% of total	16%	19%	11%
	BESCOM	48,70,273	20,67,584	28,02,689
	% of total	37%	26%	53%
	CESCOM	19,26,793	14,17,872	5,08,921
	% of total	15%	18%	10%
	HESCOM	29,57,302	20,31,542	9,25,760
	% of total	22%	26%	17%
	MESCOM	13,45,916	8,67,748	4,78,168
	% of total	10%	11%	9%
<b>Karnataka</b>	<b>13179911</b>	<b>78,64,196</b>	<b>53,15,715</b>	
2015 households	GESCOM	23,14,750	15,54,665	7,60,085
	% of total	14%	17%	9%
	BESCOM	73,28,940	25,14,198	48,14,742
	% of total	43%	28%	60%
	CESCOM	22,82,082	15,89,509	6,92,573
	% of total	13%	18%	9%
	HESCOM	34,42,327	22,65,383	11,76,944
	% of total	20%	25%	15%
	MESCOM	16,77,346	10,52,194	6,25,152
	% of total	10%	12%	8%
<b>Karnataka</b>	<b>17045444</b>	<b>89,75,949</b>	<b>80,69,495</b>	

From above it is inferred that:

- *BESCOM had the highest number of households at 37% in 2011*
- *In 2011, 26% of the households were in rural areas of BESCOM.*
- *In 2011, BESCOM had the highest share of urban households at 53% and MESCOM had the lowest at 9%*

- *In 2011, only Bengaluru district had electrification above 95%*
- *Out of 30 districts in 2011 census, 5 districts (Bengaluru, Belgaum, Mysore, Tumkur, Bellary) contributed 40% of the total households having electrification at 92%*
- *Out of 30 districts in 2011 census, only 2 districts, Yadgir and Kodagu had electrification below 85%.*
- *Overall number of households has grown at CAGR of 2.56% with urban areas showing higher CAGR of 4.10% as compared to 1.65% in rural areas.*

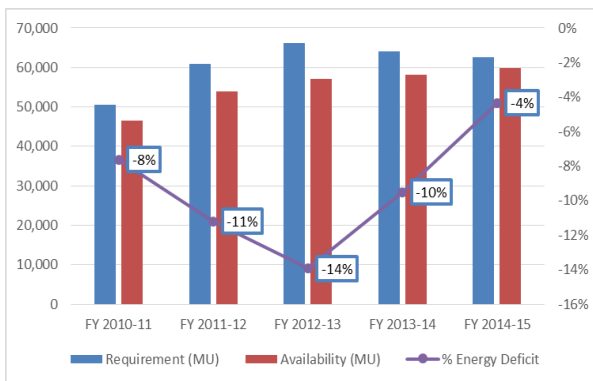
The projected figures, derived by extrapolating Census 2011 data, do not match with the records of the state for FY 2015 which shows a very different position. It has been observed that as per the 2011 census, the number of households in the Karnataka was 1.32 crores while the number of consumers in the books of DISCOMs was 1.40 crores. This can be attributed to multiples connections in a single house while census counting them under one household. Further, because some of the households are having more than 2-3 meters, such as domestic water pump, shops in villages, partitions rooms, Houses constructed in floors. Therefore, actual number of connections as on March 2015 for undertaking demand projections has been considered.

# CHAPTER 4: DEMAND AND SUPPLY SCENARIO

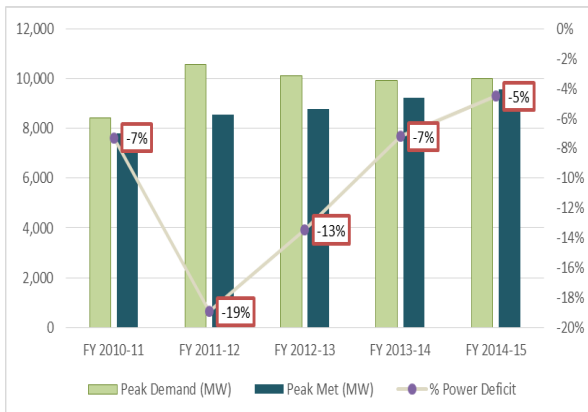
## PRESENT POWER SUPPLY POSITION

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

**Figure 4: Energy Requirement vs. Availability (in MU)**



**Figure 5: Peak Demand vs. Peak Met (in MW)**



- *The peak demand deficit is being progressively bridged by Karnataka.*

The maximum demand met by the state has increased from 7,815 MW in FY 2011 to 9,549 MW in FY 2015 showing a growth of 22% during the 4 year period, while energy requirement has increased by 29% during the same period. The maximum demand deficit has however reduced due to many DSM activities undertaken by DISCOMs and sourcing of power on short term basis to

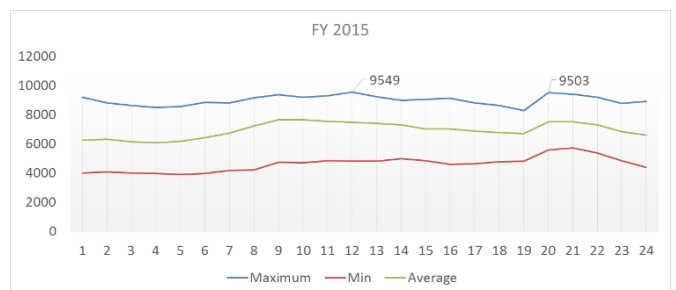
meet the need.

Government of Karnataka had taken up an ambitious feeder separation project under the scheme of “Niranthara Jyothi”, which aims to provide 24 hours power supply to non-agricultural loads like domestic, commercial, water supply, street light, rural industries, milk dairies etc., in rural areas by segregating the agricultural loads, which is a boon to the rural economy. This enables DISCOMs to give 24X7 supply to non-agricultural loads in rural areas and regulated hours of supply to agricultural consumers. The programme has the following benefits:

- Reduction in transformer failure,
- Increase in metered sales,
- Reduction in technical losses and
- Improved load management.

The DISCOMs have already completed 85% of feeder segregation and remaining 15% will be completed by the end of March 2018.

**Figure 6: Load curves for FY 2014 and FY 2015**





**Apart from NJY scheme the state has taken many steps to flatten the load curve:**

- *Making “Time of Day Tariff” compulsory for industrial consumers, which was hitherto optional*
- *Energy efficient street lighting and installing “Electronic Time Switches” for street lights*
- *Segregating agricultural loads from the existing 11kV feeders in the form of Niranthara Jyothi, a scheme to provide 24X7 uninterrupted power supply to non-agricultural loads in rural areas. (1500/1700 feeders)*
- *Adoption of HVDS for agricultural loads wherever necessary.*
- *Mandatory use of solar water heating systems for all residential buildings with a built up area of 600 Sq. feet and above falling within the limits of municipalities/corporations and Bengaluru Development Authority etc.*
- *Adoption of energy conservation initiatives by using CFL and LED bulbs in Domestic consumers.*
- *DSM initiatives in the form of using energy efficient pumps in place of conventional pumps in Irrigation.*

## DEMAND PROJECTIONS

The energy requirement of Karnataka during FY 2015 was 67,833MU as per the CEA reports with 4% energy deficit. The state currently provides on an average 22 hours of power supply in urban areas to domestic consumers and 16-18 hours in rural areas. With 24x7 supply to be achieved across the state, the demand is likely to increase significantly. 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, commercial and industrial consumers
- (b) Demand from electrification of un-electrified domestic households.
- (c) Demand on account of 24x7 power supply to other than domestic category consumers.

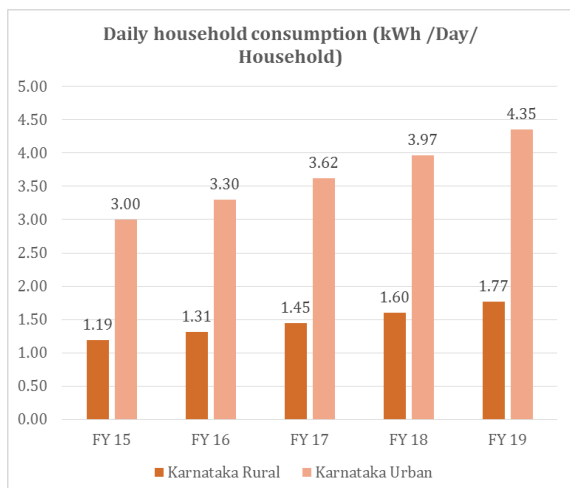
## DEMAND ESTIMATION OF DOMESTIC CONSUMERS AND HOUSEHOLD ELECTRIFICATION

The average daily consumption of registered rural domestic consumers has increased to 1.19 kWh in FY 2015 at CAGR of 4% during the last 6 years. On the other hand, the average daily consumption of registered domestic urban consumers has increased to 3.00 kWh in FY 2015 at CAGR of 3% during the same period.

The broad approach adopted for demand projection is as follows:

- (1) The daily household consumption has been computed separately for rural and urban households for FY 2015 and escalated based on the historical growth rate and based on 24 hours of power supply to arrive at the daily household consumption up to FY 2019.
- (2) The annual sales in domestic category has been estimated considering that the projected households in both rural and urban categories would be consuming electricity at their respective projected daily household consumption averages.

**Figure 7: Projected household consumption**

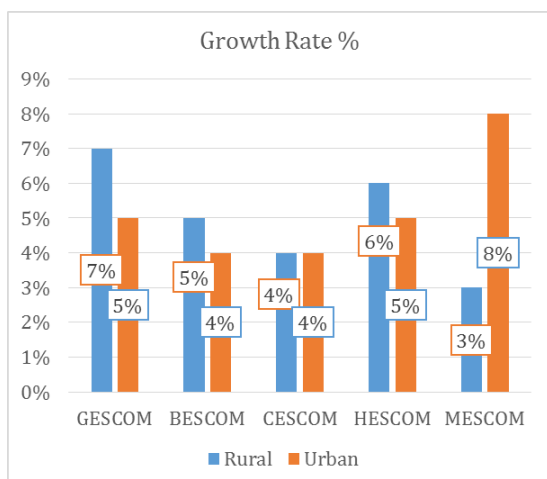


The average daily household consumption of existing electrified rural and urban households in FY 2015 has been arrived at by dividing the actual sales in rural and urban areas for the whole state by the projected number of electrified rural and urban consumers in FY 2015 respectively.

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 levels play a significant role in determining the current and future demands.

The number of electrified households is expected to grow at different rate for each DISCOM as shown below:

**Figure 8: Growth Rate**

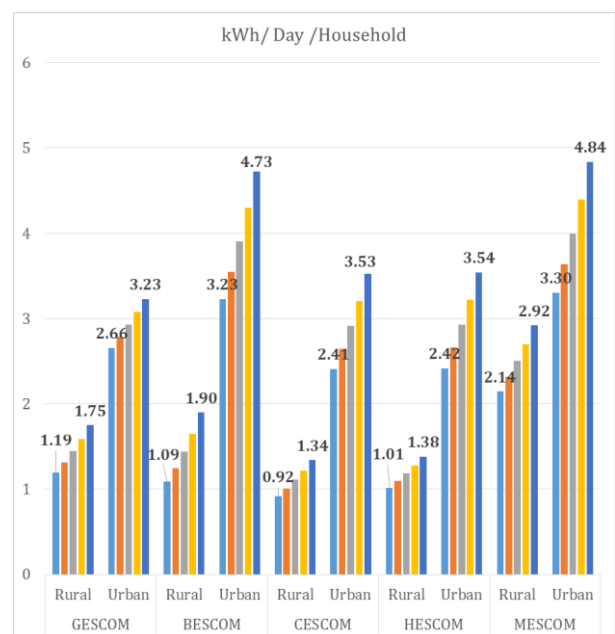


Also, to electrify the remaining 10,15,586 households in rural areas, phasing of electrification of 12.5% households in FY 2016, 25% households in FY 2017, 25% in FY 18 and remaining 37.5% in FY 2019 has been envisaged.

For electrification of balance 2,86,678 urban households, the connections will be released once strengthening works in the proposed rural urban strengthening schemes like IPDS are executed and accordingly phasing of 25% in FY 2016, 50% in FY 2017 and 25% in FY 2018 has been envisaged.

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

**Figure 9: Units consumption per day DISCOMs**



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

S.N.	Particulars	FY 15	FY 16	FY 17	FY 18	FY 19
<b>A</b>	<b>Rural - Electrified Consumers (Existing + Projected Growth)</b>					
	Electrified Consumers Rural (in Nos.)	79,60,363	83,71,844	88,05,981	92,64,086	97,47,556
	Actual Metered Sales (in MU)	3,445				
	Actual Daily Household Consumption	1.19				
	Projected Daily Household Consumption		1.31	1.45	1.60	1.77
	Projected Annual Consumption		3,995	4,637	5,388	6,265
<b>B</b>	<b>Rural - Electrification of Un-Electrified Consumes</b>					
	Targeted Annual Addition Rural (in Nos.)		2,02,467	4,06,465	3,56,363	50,291
	Cumulative Annual Addition (In No.s)		2,02,467	6,08,932	9,65,296	10,15,586
	Projected Annual Consumption		47	208	439	604
<b>C=A +B</b>	<b>Total Projected Rural Consumption (MU)</b>		<b>4,042</b>	<b>4,845</b>	<b>5,826</b>	<b>6,869</b>
<b>D</b>	<b>Urban - Electrified Consumers (Existing + Projected Growth)</b>					
	Electrified Consumers Urban (in Nos.)	78,28,489	81,99,959	85,89,821	89,99,037	94,28,625
	Actual Metered Sales (in MU)	8,576				
	Actual Daily Household Consumption	3.00				
	Projected Daily Household Consumption		3.30	3.62	3.97	4.35
	Projected Annual Consumption		9,848	11,310	12,993	14,930
	<b>Urban - Electrification of Un-Electrified Consumes</b>					
	Targeted Annual Addition urban (in Nos.)		1,15,265	1,29,302	42,110	0
	Cumulative Annual Addition (In No.s)		1,15,265	2,44,567	2,86,678	2,86,678
	Projected Annual Consumption		64	219	201	404
<b>E</b>	<b>Total Projected Urban Consumption (In MU)</b>		<b>9,912</b>	<b>11,529</b>	<b>13,195</b>	<b>15,334</b>
<b>F=C +E</b>	<b>Total Projected Domestic Urban Consumption (In MU)</b>		<b>13,954</b>	<b>16,375</b>	<b>19,021</b>	<b>22,204</b>

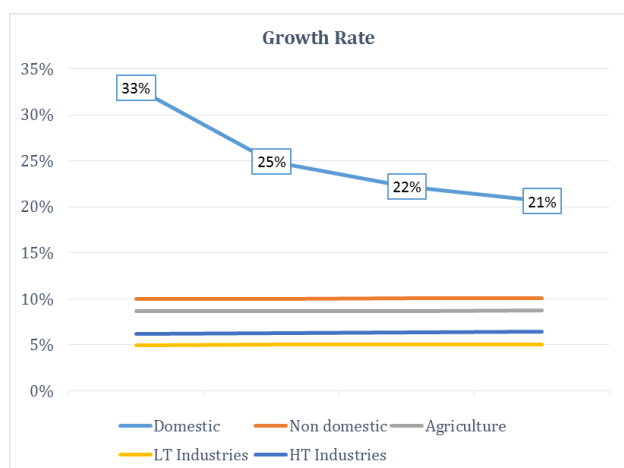
#### DETERMINATION OF CONSUMPTION OF OTHER CONSUMER CATEGORIES

For projection of sales for FY 2016 to FY 19, the CAGR of previous 6years has been

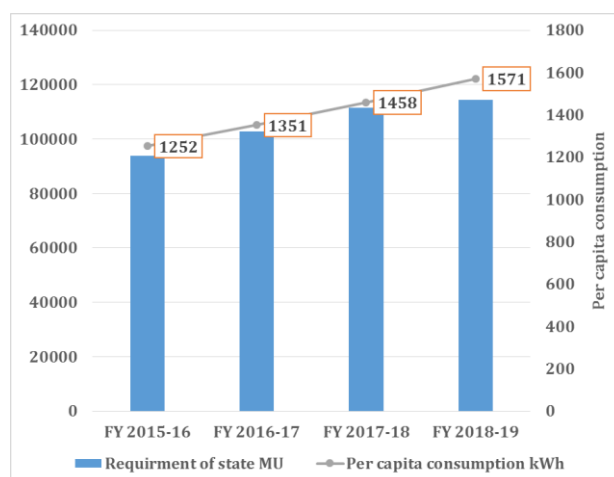
considered for all categories.

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

**Figure 10: Growth Rate observed**



**Figure 11: Per capita consumption**



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

Categories	2015-16	2016-17	2017-18	2018-19
Domestic	13,954	16,375	19,168	22,204
Non Domestic	3,196	3,518	3,874	4,271
Public Lighting	919	967	1,017	1,070
Public Water works LT	1,094	1,162	1,233	1,309
Public Water works HT	1,531	1,634	1,744	1,861
Irrigation LT	19,158	20,826	22,652	24,654
Lift Irrigation HT	382	448	533	643
Industrial LT	1,948	2,014	2,082	2,154
Industrial HT	12,559	13,325	14,148	15,031
Non - industrial HT	805	850	900	955
<b>Total Sales</b>	<b>55,547</b>	<b>61,118</b>	<b>67,351</b>	<b>74,152</b>

- As seen from above, the share of industrial sales (LT, HT) will decrease from 35% to 30% of overall consumption of the state of Karnataka whereas the share of domestic sales will increase from 25% to 30%. Irrigation will remain close to 33% to 34% from FY 2015 to FY 2019.

## ENERGY AND DEMAND REQUIREMENT

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

Considering the collection efficiency of 99% in Karnataka, the AT&C Loss trajectory is shown below:

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

T&D Losses	FY 2015-16	FY 2016-17	FY 2017-18	FY 2018-19
BESCOM	13.00%	12.50%	12.00%	12.00%
HESCOM	17.00%	16.70%	16.70%	15.40%
CESCOM	13.59%	12.99%	12.51%	12.00%
GESCOM	17.00%	16.50%	16.00%	14.10%
MESCOM	11.28%	10.79%	10.00%	10.00%
<b>Total</b>	<b>14.2%</b>	<b>13.7%</b>	<b>13.3%</b>	<b>12.7%</b>
<b>Collection efficiency</b>				
BESCOM	98%	98%	98%	98%

T&D Losses	FY 2015-16	FY 2016-17	FY 2017-18	FY 2018-19
HESCOM	98%	98%	98%	98%
CESCOM	98%	98%	98%	98%
GESCOM	98%	98%	98%	98%
MESCOM	98%	98%	98%	98%
Total	<b>98%</b>	<b>98%</b>	<b>98.1%</b>	<b>98%</b>
AT&C Losses				
BESCOM	15%	14%	14%	14%
HESCOM	19%	18%	18%	17%
CESCOM	15%	15%	14%	14%
GESCOM	19%	18%	18%	16%
MESCOM	13%	13%	12%	12%
Total	<b>15.9%</b>	<b>15.5%</b>	<b>15.0%</b>	<b>14.5%</b>

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 same as in 18<sup>th</sup> EPS at 68% in FY 2019. The maximum demand requirement of the state is projected to increase from 9,549 MW in FY 2015 to **14,710 MW in FY 2019**. The highest increase in demand from FY 2016 to FY 2019 is observed in case of MESCOM at 46%. However, BESCOM will continue to have the maximum share of the total demand of the state at 7,022 MW in FY 2019 at 49% of the total maximum demand generating from this region.

**Table 6: Energy and Maximum Demand**

Energy Demand (MU)	FY 2015-16	FY 2016-17	FY 2017-18	FY 2018-19
<b>BESCOM</b>	32,651	35,383	38,312	41,830
<b>HESCOM</b>	13,141	14,648	16,305	17,822
<b>CESCOM</b>	7,044	7,656	8,335	9,068
<b>GESCOM</b>	8,526	9,227	10,015	10,677
<b>MESCOM</b>	5,731	6,509	7,307	8,229
<b>Total</b>	<b>67,094</b>	<b>73,423</b>	<b>80,274</b>	<b>87,626</b>
<b>Maximum Demand (MW)</b>				
<b>BESCOM</b>	5,402	5,854	6,432	7,022
<b>HESCOM</b>	2,174	2,423	2,737	2,992
<b>CESCOM</b>	1,165	1,267	1,399	1,522
<b>GESCOM</b>	1,411	1,527	1,681	1,792
<b>MESCOM</b>	948	1,077	1,227	1,381
<b>Total</b>	<b>11,100</b>	<b>12,147</b>	<b>13,476</b>	<b>14,710</b>

As per projections made in 18<sup>th</sup> EPS of CEA, the projected energy demand and maximum demand for the state of Karnataka was 89,285 MU and 14,945 MW in FY 2019 as against the now calculated energy requirement of 87,626 MU and maximum demand of 14,710 MW in FY 2019. Further, T&D losses as projected in 18<sup>th</sup> EPS were higher compared to the target agreed by the state by FY 2019 (15.56% in 18<sup>th</sup> EPS against the 14.5%). An assessment of the adequacy of generation, transmission and distribution infrastructure for meeting the projected annual energy requirement of 87,626 MU and maximum demand of around 14,710 MW has been made which is covered in the following chapters.

**Table 7: Energy Requirement (In MU) and Peak Demand (in MW)**

Source	Energy Scenario			
	FY 2015-16	FY 2016-17	FY 2017-18	FY 2018-19
<b>Energy Requirement within State</b>				
<b>Sales (MU)</b>	<b>55,547</b>	<b>61,118</b>	<b>67,351</b>	<b>74,152</b>
Distribution loss	14.21%	13.74%	13.32%	12.76%
AT&C losses	15.92%	15.47%	15.00%	14.50%
Collection Efficiency	98.00%	98.00%	98.07%	98.00%
Transmission losses	3.50%	3.50%	3.20%	3.00%
<b>Total Energy Requirement within state (MU)</b>	<b>67,094</b>	<b>73,423</b>	<b>80,274</b>	<b>87,626</b>
<b>Maximum Demand (MW)</b>	<b>11,100</b>	<b>12,147</b>	<b>13,476</b>	<b>14,710</b>



## CHAPTER 5: GENERATION PLAN

In 1970, the independent generating company Karnataka Power Corporation Limited (KPCL) was set up to meet the growing energy demand of the state. KPCL today has an installed capacity of 6615 MW comprising of hydel, thermal, solar and wind energy. The remarkable growth and progress of the state in commerce and industry in the last decade has led to increase in demand at an average CAGR of 5%. In recent years Karnataka is reeling under severe power shortage mainly on account of dependence on hydro power which is monsoon driven.

However, KPCL has signed many PPAs and has planned to procure power from other states and construct own power plants in the state to meet this shortfall. Karnataka will have surplus power if every project planned is commissioned in time by FY 2019 which includes power plants from state, central and private generating companies.

### CUMULATIVE GENERATION AVAILABILITY

The total installed capacity in Karnataka including firm share of CGS as on 31<sup>st</sup> March 2015 (allocated capacity in state, private, joint and CGS) is 15,052 MW.

The state generating company provides 50% of the total energy needs of the state at a cost of 2.38 Rs/kWh while central generating stations provide around 29% of the total energy requirement. The state is bestowed with ample hydro sources which makes them susceptible to any short fall in rainfall. The state has hydro capacity of 3642 MW which is one of the cheapest sources of power at 0.59 Rs/kWh. In addition to the

above capacity, unallocated power from CGS at the disposal of the central government, power from DVC, IPPs including power from renewable energy sources, etc .is available for the state.

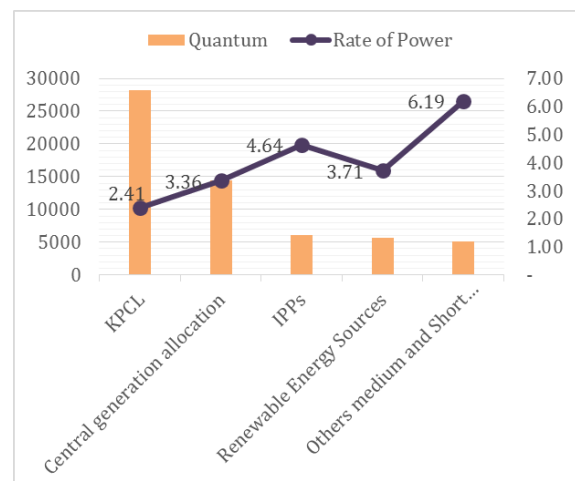
**Table 8: Availability Mix from Firm Sources**

Sources	Capacity Available
KPCL	6615
Central generation allocation	2169
UPCL (IPP)	1200
Renewable Energy Sources	5068
<b>Total</b>	<b>15052</b>

Karnataka has met a maximum demand of 9549MW in FY 2015 and the present annual energy requirement of the state is of the order of 62,643MU as per the CEA's monthly report.

The maximum demand is expected to increase to 14,710 MW by FY 2019 and the energy requirement is projected to rise to 87,626MU in FY 2019, taking into account additional energy requirement for providing 24x7 power supply to the state over the normal load growth.

**Figure 12: Power purchase for FY 2015**



## PLANNED CAPACITY ADDITION

A number of generating stations (hydro, coal based etc.) are planned to be commissioned

up to FY 2019. The additional capacity available from various sources (along with the expected year of commissioning) is summarized below:

**Table 9: Summary of Additional Firm Availability from Various Sources**

Sr. No.	Source	Type	Capacity (MW)	Entitlement		Availability
				%	MW	
<b>A</b>	<b>New Stations</b>					
	<i>BTPS U-3</i>	Coal	700	100%	700	March 2016
	<i>YTPS U-1</i>	Coal	800	100%	800	March 2016
	<i>YTPS U-2</i>	Coal	800	100%	800	Oct 2017
	<i>YCCP</i>	Gas	350	100%	350	March 2018
	<i>Bidadi</i>	Gas	350	100%	350	March 2018
	<i>MBD Unit-4</i>	Hydro	10	100%	10	March 2016
	<i>Ghatprabha additional</i>	Hydro	20	100%	20	March 2017
<b>Subtotal</b>	<b>New Stations-Own</b>		<b>3030</b>		<b>3030</b>	
<b>B</b>	<b>Private Generating Station</b>					
	<i>UPCL Expansion Project</i>	Coal	1200	90%	1080	March 2018
			<b>1200</b>		<b>1080</b>	
<b>C</b>	<b>Renewable Energy Sources</b>					
	<i>Solar PP</i>	Solar	-	-	3000	-
	<i>Wind PP</i>	Wind	-	-	1700	-
	<i>Small Hydro</i>	Hydro	-	-	425	-
	<i>Bio Mass/Bio gas Plants</i>	Other RE	-	-	290	-
<b>Subtotal</b>	<b>Renewable Energy Sources</b>		<b>-</b>	<b>-</b>	<b>5415</b>	
<b>D</b>	<b>CGS - New</b>					
	<i>Kudgi Unit 1</i>	Coal	800	50%	400	April 2016
	<i>Kudgi Unit 2</i>	Coal	800	50%	400	Oct 2016
	<i>Kudgi Unit 3</i>	Coal	800	50%	400	April 2017
	<i>NLC New TPP unit-1</i>	Coal	500	7%	35	Oct 2017
	<i>NLC New TPP unit-2</i>	Coal	500	7%	35	April 2018
	<i>Kudamkulam unit-2</i>	Nuclear	1000	22%	220	April 2016
	<i>Kalpakkam PFBR</i>	Coal	500	17%	85	April 2017
<b>Subtotal</b>	<b>CGS - New</b>		<b>4900</b>		<b>1575</b>	

\* 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 10: Projected Firm Share Allocations from Various Sources (in MW)**

Source	Capacity Available in MW			
	FY 2015-16	FY 2016-17	FY 2017-18	FY 2018-19
<b>Availability Within State</b>				
Own Generating Stations thermal	2,720	4,220	5,020	5,720
Own Generating Stations hydro	3,657	3,667	3,687	3,687
Private Generating Stations	1,080	1,080	1,080	1,080
Renewable Energy Sources	5,718	6,568	8,740	10,390
Central Generating Stations	264	1,064	1,464	1,464
<b>Availability Within State</b>	<b>13,438</b>	<b>16,598</b>	<b>19,990</b>	<b>22,340</b>
<b>Availability Outside State</b>				
Shared Generating Stations	131	131	131	131
Central Generating Stations	2,347	2,652	2,687	2,722
<b>Availability Outside State</b>	<b>2,478</b>	<b>2,783</b>	<b>2,818</b>	<b>2,853</b>
<b>Total</b>	<b>15,916</b>	<b>19,381</b>	<b>22,808</b>	<b>25,193</b>

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).

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

**Table 11: 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
<b>Total Energy Requirement</b>	67,094	73,423	80,274	87,626
% of total long term available and total energy requirement	99%	116%	123%	122%
Proposed Energy Availability from Long Term Firm Tie-ups	59,608	76,347	89,100	96,048
% of total long term available and targeted	89%	104%	111%	110%
<b>Targeted Energy Availability from Long Term Firm Tie-ups (95% long term)</b>	60,384	66,081	72,247	78,864
<b>Adequacy of Power Supply</b>	<b>Inadequate</b>	<b>Adequate</b>	<b>Adequate</b>	<b>Adequate</b>
<b>Surplus / (Deficit) Energy</b>	<b>-7,486</b>	<b>2,924</b>	<b>8,826</b>	<b>8,421</b>

*Note: Even though tied up power looks to be sufficient in energy terms, meeting peak demand will be a challenge considering the intermittent nature of huge amount of RE power*

It is seen from the above table that the availability from already tied-up firm share will remain above 104% of the energy requirement from FY 2016. 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.

## FUND REQUIREMENT

The fund requirement for state projects is summarized below:

**Table 12: Fund Requirement for State Generation Projects (in Rs Crores)**

S N o	Plant name	Capacity (MW)	Type	Scheme	Estimate	Phasing (Rs Crores)				
						Up to FY 2014-15	FY 2015-16	FY 2016-17	FY 2017-18	FY 2018-19
<b>Ongoing Projects</b>										
1	Bellary Thermal Power Plant- Unit 3	700 MW	Thermal	New Plant	4686	4135	551	-	-	-
2	Yaramarus Thermal Power Plant unit 1 & 2	2x800 MW	Thermal	New Plant	11333	9008	2325	-	-	-
3	Yelahanka Combined cycle Power Plant	350 MW	Gas	New	1516	-	-	624	624	312

## ACTION POINTS FOR THE STATE

### OPTIMIZED POWER PURCHASE AND SALE PLANNING

As seen from previous sections, there is going to be considerable surplus 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

### Coal Block Allocation

Allocation of coal for thermal power projects in the state for which captive coal blocks are already allotted at DeochaPachami, West Bengal and also for projects which are nearing completion viz., Bellary Thermal

Power Plant, Yeramarus Thermal Power Project and 800 MW Edlapura Thermal Power Project. Allocation of Coal block to 1600 MW Thermal Power Plant at Godhna in Chhattisgarh being established by KPCL is required. Allocation of coal block for 1320 MW Gulbarga coal based thermal power plant and increasing the capacity of the project to 2640 MW for project development under case II bidding.

1. KPCL has been re-allotted Baranj I-IV, Manoradeep and Koloni coal block. KPCL has already filed applications with the respective departments of state and central governments for transfer of all the licenses/ permits/clearances in favor of KPCL. It is being requested to expedite the transfer of all the licenses /permits/clearness in favor of KPCL to commence the mining operations at Baranh in Maharashtra.
2. Direction from MOC/CIL to WCL

regarding execution of MOU, based on the revised COD date for Yeramarus Thermal Power Project is requested.

3. The number of coal based power plants in the state has led to increase in coal import from neighboring states. However, due to limited railway lines movement of coal from the coal producing areas is getting difficult, especially to Raichur and Bellary thermal stations. Further, with Yeramarus and Bellary unit-3 getting commissioned, the movement of coal could become more difficult. Therefore, it is requested to augment existing

railway infrastructure to facilitate handling of larger volumes of coal for these power stations.

Allocation of power from central generating stations

1. Request for allocation of 50% i.e. 660 MW power from Ramagundam STPP Stage – IV expansion.
2. Request for allocation of power from unallocated power from Kudankulam Atomic Power Plant.

## CHAPTER 6: TRANSMISSION PLAN

The total energy requirement projected for Karnataka during the FY 2018-19 is 87,626 MU and the maximum demand comes out to be 14,710 MW. To meet this demand the assessment of transmission network availability and adequacy has been undertaken.

### EXISTING INTER-STATE TRANSMISSION SYSTEM (ISTS)

The interstate transmission network consists of 3996 ckt.km of 400 kV lines, 2738 ckt.km HVDC lines with capacity 2000 MW and 918 ckt.km of 765 kV lines.

Transformation capacity of 3,000 MVA is currently available at 765/400 kV in the state Karnataka inter-state transmission system has a transformation capacity of 6150 MVA at 400/220 kV level.

**Table 13: Existing Transformation capacity (MVA)**

Name of Substation	District	Capacity (MVA)
<b>Existing 765/400kV S/s</b>		
Raichur (New)	Raichur	3,000
<b>Total</b>		<b>3,000</b>
<b>Existing 400/220kV S/s</b>		
Mysore	Mysore	630
Narendra	Dharwad	630
Kolar AC Substation	Kolar	1000
Hiriyur	Chitradurga	630
Hassan	Hassan	630
Munirabad	Koppal	630
Bengaluru (Somanhally)	Bengaluru	1000
Bidadi	-	1000
<b>Total</b>		<b>6150</b>

### PLANNED INTER-STATE TRANSMISSION SYSTEM (ISTS)

There are two lines of 765kV under construction by PGCIL for wheeling power into the state from upcoming generation

projects and for strengthening inter-state transmission capacity. These lines will connect new Raichur with Kurnool in Andhra Pradesh and Madhugiri to Salem in Tamil Nadu. Both these projects have been planned under TBCB route.

In addition to the above, PGCIL has also planned to strengthen connectivity to the state at 400 kV level with additional lines of 342 ckt.km planned till FY 2019.

**Table 14: Upcoming lines at 400 kV**

Name of the Project	Voltage level (KV)	Total Ckt-km
Madhugiri - Yelahanka 400 kV D/c quad line	400kV	61
Gooty - Madhugiri 400 kV D/c line	400kV	209
Salem New - Somanahalli 400kV Quad D/c line	400kV	122
LILO of Neelamangla-Hoody 400kV S/c at Yelahanka	400kV	34
LILO of Cuddapah - Kolar 400kV S/c line at NP Kunta	400kV	11
Madhugiri - Bidadi 400 kV quad D/c line (Under TBCB)	400kV	95
<b>Total</b>		<b>342</b>

The target date of commissioning of these transmission lines is spread between 2016 and 2019. Additional transmission capacity so created will be adequate to meet the increased demand on the inter-state transmission lines till the year FY 2019.

**It to be mentioned here that to evacuate power from a large number of coal projects planned in the north eastern part of Karnataka, 1000 km (route length) 400kV intra- state lines have been planned at an estimated cost of Rs 3500**



**crores, the execution of the first stage of which is already in progress.**

By FY 2019 the quantum of power import will increase by ~200 MW which can be comfortably met by the transmission network with the planned augmentation to its capacity. However, while this is true for drawing power from plants in A.P, Telangana and Tamil Nadu, capacity constraints in inter-state transmission network do not allow increase in drawal from power surplus states like Chhattisgarh.

#### EXISTING POWER EVACUATION & INTRA STATE TRANSMISSION SYSTEM

The existing intra-state transmission network for evacuation and transfer of power within the state is at 400 kV, 220 kV, 110 kV and 66 kV level. Presently the intra-state transmission network has 2650ckt.km of intra-state lines with 4575 MVA transformation capacity at 400/220kV kV level, which together with 6150 MVA transformation capacity available at 400/220kV level in the inter-state transmission network is adequate to meet the present peak requirements of the state at 9,549 MW. The loading condition in 400 kV substations is optimal, however, at Hoody substation connecting Bengaluru Urban district the lines are loaded above 100%. The same condition was observed in 220 kV substations as well for the same district. Apart from Bengaluru, 66/11 kV substations connecting Kolar at Malur, Tayalur and Dalasanur saw loading above 100%.

The aggregate capacities at 220 kV, 110kV and 66 kV levels are 20,682 MVA, 12,046 MVA and 14,778 MVA respectively. The capacity of the existing transmission network is adequate to meet the present peak demand of the state. The loading at 220 kV lines is optimal except for a few

interconnecting lines connecting Bengaluru and Kolar.

#### INTRA-STATE TRANSMISSION SYSTEM PLANNED UP TO FY 2019

A total of 5,722 ckt.km of transmission line has been planned at 400 kV, 220 kV, 110kV and 66 kV at an estimated cost of Rs 7,400 crores. These are planned for strengthening of intra-state transmission network to meet the projected maximum demand of 14,710 MW by FY 2019.

Name of the Project	Voltage level (KV)	Total Ckt-km
Madhugiri (Tumkur) – Bellary Pooling Station (BPS) 400 kV D/c quad line	400kV	464
Yeramarus – Bellary Pooling Station (BPS) 400 kV D/c quad line	400kV	320
CN Halli – Bellary Pooling Station (BPS) 400 kV D/c quad line	400kV	512
Edlapura – Bellary Pooling Station (BPS) 400 kV D/c quad line	400kV	320
Edlapura – Yeramarus 400 kV D/c quad line	400kV	50
Yeramarus – Gulbarga 400 kV D/c quad line	400kV	320
JSW – Bellary Pooling Station (BPS) 400 kV D/c quad line	400kV	10
<b>Total</b>		<b>1996</b>

New 220kV, 110kV and 66kV Transmission line addition is as follows:

Voltage Class in kV	Length of Transmission line in ckm.
220kV	1553
110kV	1187
66kV	986
<b>TOTAL</b>	<b>3726</b>

**The state is expected to become power surplus from FY 2017 if power projects as planned are commissioned in time. The state maximum demand of 10,000 MW in 2014-15 is envisaged to rise to 14,710 MW in 2018-19 - an increase of 47%.**

Correspondingly, the total transformation capacity at 400/220kV (inter-state + intra-state) is planned to be enhanced from 10,725 MVA to 16,595 MVA in the same period - an increase of 54%. Commensurate capacity additions are planned at 132kV, 66kV and 33kV levels. The transmission network so augmented will be adequate to meet the demand of the state in 2018-19. However,

evacuation of surplus power needs to be planned methodically.

## FUND REQUIREMENT

The fund requirement for state projects is summarized below:

Table 15: Fund Requirement for State Transmission Projects (in Rs Crores)

Name of Scheme	Capital Expenditure (Rs in Crores)			
	2015-16(Prov)	2016-17 (Prov)	2017-18(Prov)	2018-19 (Prov)
Allocation for all projects	1400	2000	2000	2000
Equity	-	-	-	-
Loan	1400	2000	2000	2000
Grant	-	-	-	-

## 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.
- 400kV D/c Yelahanka LILO (Sch. Comp.- June'2012)
  - Total 4 km stringing stretch is held up due to RoW constraints in Bengaluru (Urban) District due to obstruction for demanding more compensation for value of land in tower footings and corridor.
  - State government to support POWERGRID in construction of the line by payment of compensation as finalized by the High Powered Committee in Ministry of Power @ 85% tower land and @ 15% corridor based on recent guidelines vide Order dated 15<sup>th</sup> Oct'15.
- 400kV D/c Dharmapuri (Salem New) – Somanahalli (Sch. Comp.- Aug'2014)
  - 25 locations/ 34.5km held up due to severe Right of Way (RoW) problems being faced at locations falling in Bengaluru (Urban) District (28.5km in Anektal Taluk, 6km in Bengaluru South Taluk).
  - State Govt. to support POWERGRID in construction of the line by payment of compensation as finalized by the High Powered Committee in Ministry of Power @ 85% tower land and @ 15% corridor based on recent guidelines vide Order dated 15<sup>th</sup> Oct'15.
- 400kV D/c Madhugiri – Yelahanka line (Sch. Comp.- June'2014)
  - Villagers are demanding higher compensation per location and are not agreeing to the compensation decided by district collectors. Over and above this, they are demanding compensation towards diminishing value of land for the line corridor.

- Total 47 locations held up due to RoW issues & obstruction for demanding more compensation in Districts – Tumkur (1 location.), Bengaluru (Urban) (10 locations) and Bengaluru (Rural) (35 locations)
  - State Govt. to support POWERGRID in construction of the line by payment of compensation as finalized by the High Powered Committee in Ministry of Power @ 85% tower land and @ 15% corridor based on recent guidelines vide Order dated 15th Oct'15.
- 5 765kV S/c Madhugiri – Dharmapuri (Salem New) line (Sch. Comp.- June'2014)
- Total 65 locations held up due to RoW in Districts - Tumkur (10 locations), Bengaluru (Rural) (40 locations) & Chick Ballapur (2 locations) due to obstructions for demanding more compensation.
  - State Govt. to support POWERGRID in construction of the line by payment of compensation as finalized by the High Powered Committee in Ministry of Power @ 85% tower land and @ 15% corridor based on recent guidelines vide Order dated 15<sup>th</sup> Oct'15.

### Best Practices

- 1) Implementation of SCADA Technology with 16 control centers, which includes the main control centers, a disaster recovery center, area load dispatch centers for transmission zones and distribution control centers for the ESCOMs. The total system is configured with 72 servers and 115 operator workstations. Communication is based on own VSAT HUB and leased lines for inter control center communication. A total of 1243 stations of KPTCL and ESCOMs are covered by SCADA.
- 2) Construction of 400/220 kV MCMV line using monopole for line deviation in Bengaluru city.
- 3) Construction of 188.5 Kms 400kV Quad Moose DC Line from M/s. Udupi Power Corporation Limited, Udupi to Shantigrama, Hassan.
- 4) Construction of 33 Ckm 400kV Quad Moose MC Line from Yeramarus Thermal Power Station to LILO RTPS-Guttur.
- 5) Infrared Cameras are used to detect hot spots and weak joints so that preventive maintenance can be carried out at the earliest.
- 6) 2 Nos. of 220kV and 5 Nos. of 66kV gas insulated sub-stations are in operation. Also, 2 Nos. of 400kV and 4 Nos. of 220kV gas insulated sub-stations are proposed.
- 7) Use of hybrid switchgears in 3 Nos. of 66kV Sub-stations.
- 8) EHV Cable Testing Van is used to locate faults in cables.
- 9) Hot Line Technology has been adopted in the state which enables working on live conductor, thereby reducing the interruption time.
- 10) Replacement of existing Coyote Conductor by High Temperature Low Sag (HTLS) Conductors in the following major 66kV Transmission Lines:
  - ITI – Hebbal Transmission Line
  - Peenya – Brindavan Alloy Transmission Line
  - Peenya – CB Halli Transmission Line
  - CB Halli – Hosakote Transmission Line
- 11) Covered Conductor is used for bypassing the existing 66kV Line between Yelahanka DG Plant and CB Halli.

## CHAPTER 7: DISTRIBUTION PLAN

### CONNECTING THE UNCONNECTED HOUSEHOLDS

Electrification of villages under RGGVY 12<sup>th</sup> plan is currently being undertaken in Karnataka. Existing status of electrification in the state as on March 2015 (village wise and household wise):

- ✓ Total No. of un-electrified villages: 39
- ✓ Total No. of un-electrified rural households: 10,15,076
- ✓ Total No. of un-electrified BPL households: 6,31,414

Following actions have been initiated to electrify all the remaining villages and households in the state:

#### Out of 39 Un-Electrified Villages,

- ✓ 30 Villages sanctioned for electrification under Deendayal Upadhyaya Gram Jyothi Yojana (DDUGJY)
- ✓ 09 Villages will be electrified through off-grid solutions under Decentralized Distributed Generation (DDG) Scheme.

#### Out of 10,15,076 Un-electrified Rural Households,

- ✓ 8,02,856 Rural Households covered under DDUGJY,
- ✓ 2,08,099 Rural Households covered under RGGVY XII Plan and
- ✓ 4121 RHH covered under DDG.

#### Out of 6,31,414 Un-electrified BPL Households,

- ✓ 4,96,636 BPL Households covered under DDUGJY,
- ✓ 1,30,785 BPL Households covered under RGGVY XII Plan and 3993 BPL HH covered under DDG.

### EXISTING DISTRIBUTION SYSTEM

Discoms in Karnataka are currently serving more than 2 crore consumers of the state and providing 20-22 hours supply in urban and 16-18 hours of supply to rural areas. Snapshot of coverage of DISCOMs in Karnataka:

Parameters	Units	Karnataka
Area	Sq. km	1,93,461
Districts	Nos.	30
Taluks	Nos.	177
Population	lakhs	628
Consumers*	lakhs	206
Energy Consumption*	MU	48,426
Zone	Nos.	9
DTCs	Nos.	5,33,525
Assets	Rs. in Crores	23,448
HT lines	Ckt. Kms	2,60,334
LT lines	Ckt. Kms	4,99,058
Sanctioned	Nos.	53,001
Working	Nos.	32,488
Demand	Rs. in Crores	25,633
Collection	Rs. in Crores	24,652
Consumption per consumer per day	kWh /Day/Consumer	6.44
Asset turnover ratio		1.09
Collection efficiency	%	96%
Consumers per employee		634
LT: HT ratio		1.86 : 1
Average revenue / consumer / month	Rs / consumer / month	1,037
Average realization	Rs /kWh	5.29

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

**Table 16: Distribution System**

Particulars	Unit	FY 2014-15
66/11 KV Substations	MVA	14,013
33/11 KV Substations	MVA	7,439
11 KV Lines	Kms	2,71,835
LT Lines	Kms	5,05,661
DT	MVA	20,282

## PERFORMANCE OF DISCOMS

### NETWORK RELIABILITY

SAIFI, SAIDI and CAIDI for DISCOMs in Karnataka is shown below. It can be seen that BESCO performs better in SAIFI compared to other DISCOMs in the state. However, duration of interruptions in BESCO is higher, which shows that power disruption has been for higher duration compared to other DISCOMs.

Year	SAIFI	SAIDI (Hrs)	CAIDI (Hrs)
<b>BESCO</b>			
2012-13	0.187	48:55.5	21:21.9
2013-14	0.173	17:38.2	50:21.5
2014-15	0.165	25:47.4	41:11.4
<b>CESC</b>			
2012-13	0.158	0:07:49	0:49:29
2013-14	0.143	0:06:29	0:45:24
2014-15	0.173	0:07:42	0:44:25
<b>MESCO</b>			
2012-13	0.274	0:21:53	1:19:42
2013-14	0.212	0:12:10	0:57:20
2014-15	0.291	0:19:27	1:06:56
<b>HESCO</b>			
2012-13	0.215	0:11:54	0:55:20
2013-14	0.215	0:11:33	0:53:43
2014-15	0.246	0:14:24	0:58:36
<b>GESCO</b>			
2012-13	0.278	7:49:29	4:10:30
2013-14	0.223	13:45:24	13:47:15
2014-15	0.193	12:43:48	17:53:51

The AT&C losses for Karnataka DISCOMs has reduced from 37% in FY 2005-06 to 18% in

FY 2014-15, which is an overall reduction of more than 19% in 10 years.

Karnataka	FY 2012-13	FY 2013-14	FY 2014-15
Distribution losses	15.96%	15.20%	15.86%
AT&C losses	20%	18.24%	18.05%

However, Karnataka DISCOMs have planned to reduce their losses from 18% in FY 2015 to 14.5% by the end of FY 2019.

Source	AT&C Loss Target			
	FY 2015-16	FY 2016-17	FY 2017-18	FY 2018-19
AT&C loss targets	15.92%	15.47%	15.00%	14.50%

To achieve 100% rural household electrification and to meet the AT&C loss targets, Karnataka DISCOMs have planned the following investments.

## INVESTMENTS PROPOSED

### System Strengthening

The DISCOMs determine annually the capital budget that is required to take up various system strengthening/ works for providing reliable and quality power supply to its consumers. Provisions are made by the DISCOMs in the capital budget to take up the following works:

- I. System strengthening works like establishment of 33kV sub-stations, re-conductoring of HT/LT lines, enhancement of existing transformer capacity, and bifurcation of load by providing new feeders/distribution transformers etc.
- II. System improvement works like providing UG cables/ aerial bunched cables, replacement of deteriorated poles, conductors etc.
- III. Creation of infrastructure for providing new service connections.



- IV. Metering of installations and distribution transformers for energy accounting and auditing.
- V. Replacement of electro-mechanical meters by static meters.
- VI. Projects/Schemes which help in reduction of technical and commercial losses.
- VII. Segregating agricultural loads from the existing 11kV feeders under Niranthara Jyothi, a scheme to provide 24X7 uninterrupted power supply to non-agricultural loads in rural areas.

**Rural Electrification:** The GoI has proposed to assist the state governments to connect the un-connected households in every village in the country. Providing power to each household is considered vital for the state and Government of Karnataka has planned to achieve the same under DDUGJY and RGGVY schemes.

#### SYSTEM STRENGTHENING AT SUB TRANSMISSION

The State DISCOMs have planned to invest 5,044 crores towards system strengthening which is currently undertaken with the help of Government of Karnataka. Further, under IPDS scheme the DISCOMs have planned to invest Rs.1139 crores by the end of FY 2019. The new IPDS scheme also aims to cover 222 new towns apart from additional augmentation in the existing R-APDRP towns. The state has now assessed the requirement of strengthening of urban infrastructure and has accordingly proposed works amounting to Rs 1139 crores to be undertaken under the new IPDS scheme.

BESCOM has planned to invest Rs 459 crore, CESC Rs 170 crores, GESCOM Rs 184 Crores, MESCOM Rs 158 Crores and HESCOM Rs 171 crores under this scheme.

#### RURAL INFRASTRUCTURE

The main agenda in rural area is to provide access to electricity to each household and provide power round the clock. The Government of India under the flagship scheme of DDUGJY has an estimated outlay of Rs. 43,033 crores including a budgetary support of Rs. 33,453 Crores. The scheme of RGGVY as approved by CCEA for continuation in 12<sup>th</sup> and 13<sup>th</sup> 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 Crores including a budgetary support of Rs. 35,447 Crores. This outlay will be carried forward to the new scheme of DDUGJY in addition to the outlay of Rs. 43,033 crores. REC is the nodal agency for the operationalization of DDUGJY in the country.

Under DDUGJY Karnataka has planned to cover 8,02,856 households with an outlay of Rs 1754 Crores which will also cover the following aspects:

- (a) Separation of agriculture and non-agriculture feeders facilitating 24- hour supply to rural domestic consumers and different supply hours to agricultural consumers; and
- (b) Strengthening and augmentation of sub-transmission & distribution infrastructure in rural areas, including metering of distribution transformers /feeders/consumers.

However, out of Rs 3481 crores required, Karnataka has received sanction for Rs 279 crores towards system strengthening under DDUGJY scheme which leaves 3201 Crores as balance requirement still not sanctioned.



## IPDS SCHEME

The central government has sanctioned “Integrated Power Development Scheme” (IPDS) on 3<sup>rd</sup> 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 12<sup>th</sup> and 13<sup>th</sup> Plans by carrying forward the approved outlay for R-APDRP to IPDS.

The project has been approved at Rs 1139 Crores which will be funded through central grant.

### ASSESSMENT OF ADEQUACY OF DISTRIBUTION SYSTEM

#### AT 66/11 AND 33/11 LEVEL

The transformation capacity at 33/11 kV level is projected to grow from 7,439 MVA in FY 2015 to 9,574MVA in FY 2019. Similarly, capacity at 66/11 kV level is projected to grow from 14,013 MVA in FY 2015 to 17515 MVA in FY 2019.

The peak demand of the state, including demand of large industrial consumers has been recorded at 9,549 MW in FY 2014-15. The contracted load of 33 kV consumers and above is about 6358 MW and the peak demand of direct 66 kV and 33 kV consumers works out to be 3913 MW by applying a demand factor of 0.9 and diversity factor of 1.3 ( $3913 = 6358 \times 0.9/1.3$ ). Thus, a demand of 5,636 MW (9,549-3,913) is met at 11 kV and below which corresponds to 5072 MVA considering a power factor of 0.9.

Against this peak demand, the aggregate installed capacity of 66/11 kV and 33/11 kV substations available in the state is 21,452 MVA. This translates to an average loading of 24% on transformers under peak demand conditions.

Following similar logic and taking the projected peak demand of 14,710 MW in FY 2019 and assuming the proportion of demand met at 66kV and 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 5558 MW.

Correspondingly, the demand met at 11 kV and below comes to 9152 MW which corresponds to 8237 MVA considering a power factor of 0.9. Against this peak requirement, the installed capacity of 66/11 kV and 33/11 kV transformers in FY 19 is projected at 27,089 MVA. This translates to an average loading of 30% 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 Karnataka is about 20,282 MVA in FY 15.

Further, an additional transformer capacity of 7962MVA is planned to be added by FY 19 under various initiatives which will result in overall distribution transformation capacity of 28,245 MVA by FY 19.

Given that the billed maximum demand of 11 kV consumers totals around 10,314MW (considering a power factor of 0.9). This leaves a demand of 9,833 MW to be met at LT (415V) level which corresponds to 6,807 MVA considering a power factor of 0.9.

Against this peak demand, the aggregate installed capacity of DT transformers in the state is 20,282MVA. This translates to an

average loading of 34% on distribution transformers under peak demand conditions.

Following the same logic and taking the projected peak demand of 14,710MW in FY 19 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 4948 MW.

Correspondingly, the demand met below 11 kV comes to around 14,750 MW which corresponds to 10,211 MVA considering a power factor of 0.9. Against this peak requirement, the installed capacity of distribution transformers in FY 19 is projected at 28,245MVA. This translates to an average loading of 36% on distribution transformers under peak demand conditions.

#### INITIATIVES TAKEN BY KARNATAKA DISCOM'S

##### **Bengaluru Electricity Supply Company:**

- 1) Modern automated energy meter testing laboratory has been set up for ensuring the quality, accuracy and efficiency of energy meters.
- 2) 24x7 computerized consumer grievance redressal division has been established in Bengaluru City to address consumer complaints and provide satisfactory service to the consumers.
- 3) "24x7 SMS Facility" has been implemented where a consumer can register complaint by sending an SMS. Consumers can also log on to 24X7online integrated PGRS Application (live.bescompgrs.org) to register grievances.
- 4) 11kV Feeder Simulation Software has been implemented in 4 Circles and 62 Sub-division to assess 11kV Line loss and voltage regulation.

5) Smart Grid Project has been taken up in BESCO:

- The project is being implemented in Electronic city sub-division by M/s. KEMA, USA with the financial assistance of USTDA (United State Trade and Development Agency) as a grant amount of U.S \$453,350.
- Smart grid project is also taken up in Indiranagar in Bengaluru with M/s. PGCIL as consultants to the project at an approx. cost of Rs. 32 crores.
- Smart grid project has also been taken up in Chandapura area of BESCO and is jointly implemented by CSTEP & IIT-BHU. The Project cost of Rs. 2.13 crores is funded by Department of Science & Technology (DST), Govt. of India.

6) Pilot implementation of "Pre-paid Meters" using Card technology to Temporary Installation in Indiranagar Division of BESCO.

7) BESCO has implemented "Master Mobile Application" which enables consumers to view their outstanding bills and payment status, gain better understanding of their BESCO services, schedule and unscheduled outage information and submit service request and grievances etc.

8) BESCO has taken up Distribution Automation System project to automate the 11kV Distribution network for efficient monitoring, control and operation of the network in Bengaluru City (BMAZ area). The project is funded through external aided resources by Japan International Cooperation Agency (JICA). The cost of the Project is Rs. 563.7 Crores.

9) SCADA Data Reporting and Analysis (SDRA) has been implemented which enables analysis of the huge volume of data recorded by SCADA System, and producing reports/alerts for effectively monitoring the operations of 11KV

Power Distribution Infrastructure and to access the performance of Zone, Circle, Division, Sub-Division, Section and 11kV feeders. It also enables to know the hours of power supply arranged Geographical wise, MP, MLA Constituency wise etc.

- 10) Feeder shutdown protocol has been implemented which sends SMS information to customers through a mobile /web solutions on unscheduled power outages, thereby minimizing inconvenience to the consumers.
- 11) The existing 11kV GOS are being modified to make the footpath pedestrian friendly and thereby avoiding accidents during the night time, due to non-visibility of GOS pipes and protruding angles
- 12) Implementation of Innovative Structural Design of Distribution Transformer Centre located on footpath which occupies less space and is safe to public.
- 13) Installation of numerical over load protection relays to agricultural feeders during single phase power supply for restriction of power during single phase.
- 14) Pilot implementation of new structural designs for Distribution Transformers.

#### **Chamundeshwari Electricity Supply Corporation Limited:**

- 1) Modern Automated Energy Meter testing laboratory has been setup in Mysore and Hassan for ensuring the quality, accuracy and efficiency of the energy meters.
- 2) The Smart Grid Pilot project is being implemented at VV Mohalla, Metagally, Hebbal, Vijayanagara, Hootagally and Ilawala in Mysore City at a cost of Rs. 32.59 Crores. Of this, 50% will be funded by MoP, 25% by CESC and 25% by Enzen as the Technology partner.

- 3) 24x7 computerized consumer grievance redressal division has been established in Mysore City to address the consumer complaints and provide satisfactory service to the consumers.
- 4) Distribution Up-gradation Project is being taken up in the Mysore City limits by providing LT Polyolefin insulation cover to rabbit and weasel ACSR conductor by releasing the existing bare conductor and restringing the insulated covered conductor.
- 5) Under Distribution Energy Efficiency Project (DEEP) scheme, the DTC's will be provided with capacitors and controlling mechanisms so as to have the dynamic power factor compensation which reduces the current in the transformer and I<sup>2</sup>R losses. In addition, other benefits like overload protection, load balancing and energy audit & accounting are other possibilities possible. Accordingly a detailed project report for Distribution Energy Efficiency Project (DEEP) has been prepared by M/s EESL on 5907 transformers of 74 feeders.
- 6) Under Belakuyojana, replacement of 2 nos. of incandescent lamps in 'Anthyodaya Anna Yojana (AAY) households with 2 nos. of CFLs is under progress with assistance of KREDL. Around 153676 AAY beneficiaries will be benefited.
- 7) The DSM Based Efficient Lighting Program (DELP) programme aims at distribution of LED bulbs in its operation area. Through the Energy Service Company (ESCO), M/s. Energy Efficiency Services Limited, New Delhi distribution of upto five numbers of 9W LED Bulbs to the domestic consumers having connected load of upto 2kW and upto ten numbers 9W LED Bulbs to the domestic consumers having connected load of more than 2kW is envisaged. Around 1532706 households will be covered under this scheme.

- 8) Around 2 lakh installations with single phase/3phase electro-mechanical/high precision meters will be replaced by static meters during 2015-16 at a cost of Rs. 40.0 crores.
- 9) Around 14,000 nos. of Distribution Transformer Centre covering 100% urban and partially rural will be provided with meters for energy audit for which award is given at cost of Rs.63.92 crores.

#### **Mangalore Electricity Supply Company:**

- 1) Purchase order has been placed to establish Modern Automated Energy Meter testing laboratory for ensuring the quality, accuracy and efficiency of the energy meters.
- 2) 24x7 computerized consumer grievance redressal division has been established in Mangalore to address the consumer complaints and provide satisfactory service to the consumers.
- 3) MESCOM has implemented Integrated Extended SCADA in 33 Nos. of 33/11kV Sub-stations.
- 4) Distribution Up-gradation Project is being taken up in selected areas of Mangalore and Shimoga Municipal Corporation by replacing the existing overhead HT/LT conductors by UG Cables.
- 5) MESCOM has contemplated to introduce metering of all Distribution Transformer centers with RRAMR facility to carry out energy audit in a more effective manner. 18415 Nos. of DTCs have been already metered. Further, it is proposed to provide meters to balance 27301 Nos. of Distribution Transformer Centers.
- 6) MESCOM has provided an opportunity to its consumers for establishing Solar Plants on the Rooftop of Residential / Commercial / Industrial / Educational Institutions on net metering. Consumers can earn money for the

excess Solar Energy injected into the MESCOM grid over & above the import from MESCOM grid.

- 7) Under Belaku Yojana replacement of 2 nos. of incandescent lamps in 'Anthyodaya Anna Yojana (AAY) households with 2 nos. of CFLs is under progress with assistance of KREDL. MESCOM has been allotted 2,00,400 Nos. of CFLs for distribution.
- 8) Solar LED Lanterns scheme aims at distribution of 'Solar LED Lanterns' to the beneficiaries who are economically backward, living in remote & isolated locations & are not supplied with electricity. MESCOM has been allotted 6500 no.s of 'Solar LED Lanterns' for distribution.
- 9) Under 1st Phase it is proposed to replace 5 Lakhs of existing Electromechanical meters by Static meters. And also it is proposed to provide SMC meter protection box wherever required. The approximate total cost works out to Rs. 65.00 Crores.

#### **Hubli Electricity Supply Company:**

- 1) Purchase order has been placed to establish Modern Automated Energy Meter testing laboratory for ensuring the quality, accuracy and efficiency of the energy meters.
- 2) 24x7 computerized consumer grievance redressal division has been established in Hubli to address the consumer complaints and provide satisfactory service to the consumers.
- 3) Metering of Distribution Transformer Centers is being carried out in two phases, for metering 40793 DTCs at a cost of Rs. 181.21 Crores.
- 4) Installation of Solar RTPV Grid connected power plants in 31 nos. of HESCOM office buildings in Belgaum Zone and 29 nos. of HESCOM office

buildings in Hubli Zone at a total cost of Rs. 288.47 Lakhs.

- 5) HESCOM has taken up conversion of existing 11kV overhead line to underground cable system in Hubli & Belgaum cities at a cost of Rs.566.16 Crores.
- 6) 590 nos. of conventional type Irrigation pump sets are being replaced by star rated Energy efficient pump sets in in Byadagi and Nippani, HESCOM.

#### **Gulbarga Electricity Supply Company:**

- 1) Purchase order has been placed to establish Modern Automated Energy Meter testing laboratory for ensuring the quality, accuracy and efficiency of the energy meters.
- 2) 24x7 computerized consumer grievance redressal division has been established in Kalaburgi to address the consumer complaints and provide satisfactory service to the consumers.

- 3) Tender has been floated for setting up of 5 Nos. of 33/11kV Gas Insulated Sub-stations in GESCOM.
- 4) Distribution Up-gradation Project is being taken up in Kalaburgi Municipal Corporation for replacing the overhead HT conductor by UG Cable in Siddeshwara feeder.
- 5) Electro Mechanical meters are being replaced by Electro Static Meters implemented.
- 6) 74% of Distribution Transformer Centre is being metering and work in taken up to meter the remaining DTCs on Total Turnkey basis.
- 7) The work for providing Aerial Bunched cable in 21cities /towns under R-APDRP scheme has been taken up.

### **FUND REQUIREMENT**

The fund requirement for projects is summarized below:

**Table 17: Fund Requirement for Distribution Projects (in Rs Crores)**

Capex	Phasing				Funding		
	FY 2015-16	FY 2016-17	FY 2017-18	FY 2018-19	Debt	Grant	Equity
Infrastructure Upgradation	602	607	634	603	1713	0	734
Metering, DTC metering, Smart meters, replacement of HTMC of HT installation	160	145	120	130	387	0	166
IPDS	114	456	569	0	342	683	114
DDUGJY	184	735	919	0	551	1103	184
RGGVY	80	94	0	0	0	174	0
HVDS	100	100	100	100	280	0	120
NJY	666	310	277	95	944	0	404
DSM	65	77	73	59	192	0	82
Planned works (Ganga Kalyan, TSP, SCSP, SDP, Water works, Service connection, electrification of hamlets & BPL Households)	208	303	350	353	849	0	364
R- APDRP.	145	70	45	30	29	261	0
Other	276	361	359	358	948	0	406
<b>Total</b>	<b>2598</b>	<b>3257</b>	<b>3446</b>	<b>1728</b>	<b>6234</b>	<b>2221</b>	<b>2574</b>

### **GOVERNMENT OF INDIA INTERVENTION**

In order to ensure reliable and secure 24x7 quality power supply to all, the state requests that the investment sought under IPDS and DDUGJY needs to be sanctioned expediently by PFC/REC.



## CHAPTER 8: RENEWABLE ENERGY INITIATIVES

Karnataka Renewable Energy development limited was formed on 8<sup>th</sup> March 1996 as state nodal agency to facilitate the development of Non-Conventional Energy sources for Power generation. Prior to formation of KREDL, the Karnataka State Council for Science and Technology (KSCST), the erstwhile KEB, KPCL functioned as nodal agencies of the government.

The nodal agency was established with an objective of development, propagation and promotion of renewable energy sources and technologies for promoting eco-friendly projects and harnessing of natural resources to avail green power in the state. Since inception 5044MW capacity has been commissioned and expecting additional 7700MW during the RE and solar Policy period 2014 to 2021.

### Solar Policy 2014-21

Considering developments in technology and benefits of solar power, Government has issued Revised Solar policy 2014-2021. As per new policy minimum of 2000 MW of solar projects have to be established within policy period. Accordingly, 700 MW of solar power projects were allotted through bidding process. Solar projects can be established anywhere in the state.

The various categories under Utility Scale grid connected projects are:

- 1) Projects to promote distributed generation by land owning farmers throughout the state.
- 2) Projects selected based on competitive bidding process for capacities more than 3MWp.

- 3) Projects under Renewable Energy Certificates (REC) Mechanism.
- 4) Projects under Captive/Group Captive Generation.
- 5) Projects under Independent Power Producer.
- 6) Projects under Bundled Power.

Under distributed generation by land owning farmers the applications were invited online and 295 applications were received for setting up of 300 MW projects across the state. Accordingly allotment letters issued as per guidelines and PPAs have been signed. These projects would be commissioned within 18 months.

### 2000 MW Pavagada Solar Park

MNRE has sent a proposal to all states for development of Solar Parks and Ultra Mega Solar power projects. This proposal is envisaged to achieve development of one lakh MW of solar projects in the country. Under this scheme for development of solar Parks in Karnataka, a JV company "M/s. Karnataka Solar Power Development Corporation Pvt. Ltd (KSPDCPL)" has been formed by KREDL and SECI. 11,000 acres of land has been identified at Pavagada Taluk in Tumkur District, Karnataka.

After land acquisition through lease, turnkey tenders will be floated by KSPDCPL for creating infrastructure like Road, Water, Layout along with 220/33kV pooling stations to evacuate the power generated by the solar developers. The work will be executed by through eligible EPC contractor.

After the infrastructure is created, solar developers will install their panels under plug and play model and generate power.



The power generated at the Solar Park will be evacuated to the central Grid by M/s. Powergrid by constructing 400/220kV station within the Solar Park. The LTA and Grid connectivity applications have been submitted by KSPDCPL on 24-06-2015 to M/s. Powergrid for approval to evacuate the power generated at Solar Park to CTU grid.

### Canal Projects

In Karnataka Canal corridor is owned by Water Resources Department. Krishna BhagyaJalanigam Limited has already commissioned 1 MW canal corridor project. They are planned to set up one more project of 10 MW capacity on Almatti Dam canal, under MNRE proposed scheme for which MNRE has given its approval.

### Progress of Solar Water pump by KREDL

KREDL has taken up 1009Nos.of SWP in nine selected taluks of the, state out of which 807Nos. for General category, 146Nos. for SC and 55Nos. for ST. The LOI has been issued to the Successful Bidders M/s Novus Green Energy Systems Private Limited (Non MSME) and M/s Bright Solar Pvt. Ltd. (MSME), In this regard the successful bidders have executed an agreement with KREDL as per tender norms. ESCOMs have been requested to identify and furnish the list of beneficiaries as per the Government Order.

**The RPO compliance as per the revised Tariff Policy issued on 28<sup>th</sup> January 2016 and subsequent amendments in regulations to be issued by KERC to effect changes in policy will be ensured.**

**Table 18: Existing Capacity (MW)**

Sl. No	RE Sources	Total Allotted Capacity in MW	Commissioned Capacity in MW	Balance Allotted Capacity to be Commissioned
1	Wind	13416	2720	7754
2	Hydro	2957	835	1575
3	Solar	5697	124	5573
4	Co-gen	1782	1252	519
5	Bio Mass	369	113	256
6	Waste to Energy	25	0.0	25
	<b>Total</b>	<b>24,246</b>	<b>5,044</b>	<b>15,702</b>

**Table 19: Proposed Capacity Addition (MW)**

Renewable Power (MW)	FY 2016	FY 2017	FY 2018	FY 2019
Wind	400	425	450	475
Mini hydro	100	100	100	100
Biomass	65	75	75	75
Solar	1500	750	750	750
Solar Park	-	-	1000	1000
Solar (1-3 MW)	-	300	-	-
<b>Total</b>	<b>2065</b>	<b>1650</b>	<b>2375</b>	<b>2400</b>

## CHAPTER 9: ENERGY CONSERVATION AND ENERGY EFFICIENCY PROGRAM

### PROJECTS UNDERTAKEN

#### **Agriculture Demand Side Management, WENEXA-USAID**

BESCOM has implemented WENEXA scheme for replacing inefficient irrigation pump sets by high energy efficient pump sets on HVDS feeders at Doddaballapur Sub-Division as a pilot project. M/s ENZEN Global Solutions, an ESCO was engaged for replacement of conventional pumps existing in IP sets on 11KV feeders under USAID – WENEXA scheme in Doddaballapur area. This ESCO Agriculture Demand Side Management model was designed by BESCOM in association with USAID-PA Consulting. BESCOM was able to successfully establish a system of appointing ESCO and has been awarded with “National Power Award-2009” under category “ENERGY EFFICIENCY, CONSERVATION AND DEMAND SIDE MANAGEMENT” for Agriculture Demand Side Management initiative. This pilot project was the first of its kind in India to undertake Agriculture Demand Side Management under ESCO model. A total number of 277 inefficient Pump sets at metered locations in Doddaballapur Sub-Division were replaced by High Energy Efficient Pump Sets. BESCOM has saved 5.75 Million units (35% energy savings) from this project during April 2011 to December 2014 at Doddaballapur.

A contract agreement was signed on 7.8.2013 between BESCOM and M/s. Energy Efficiency Service Ltd., a joint venture company of public sector units (PSU's) of Ministry of Power, New Delhi for Agriculture Demand Side Management i.e., for preparation of DPR to replace **one lakh nos.**

of less efficient IP sets by highly efficient pump sets without any financial commitment to BESCOM as follows:

Sl. No.	Name of the district	Taluk selected for preparation of DPR	No. of pump sets to be replaced
1	Tumkur	Pavagada	13,864
2	Chikkaballapura	Bagepally	15,903
3	Ramanagara	Kanakapura	18,371
4	Davanagere	Channagiri	22,966
5	Kolar	Mulabagilu	17,197
6	Chitradurga	Molakalmuru	12,102
<b>Total for BESCOM Area</b>			<b>1,00,403</b>

#### **Implementation of Mandatory use of Solar Water Heaters**

A rebate of 50 paise per unit of electricity consumed subject to a maximum of Rs.50/- per installation per month will be allowed to Tariff schedule LT 2(a), if solar water heater are installed and used. Where bulk solar water heating system is installed, solar water heater rebate shall be allowed to each of the individual installations, provided that, the capacity of solar water heater in such apartment/group housing shall be a minimum capacity of 100 Ltr. Per household. A total of 4,19,493 Solar Water Heating Systems have been installed in BESCOM. This has led to savings of 553 MU of energy each year.

#### **Providing timer switches to the street lights and Smart Energy saver units**

BESCOM has requested BBMP and other local municipalities to install timer switches to street lights resulting in energy savings and reduce evening peak hour load on grid. Also requested to provide Smart Energy

Saver Units so as to reduce energy cost of monthly electric bill and energy savings in peak hours and to get good impression from public. Out of 52,652 streetlights, 14,760 streetlights have been installed with timer switches.

### **Surya Raitha Scheme**

BESCOM has initiated to arrange power supply to 250 no.s of IP sets of Harobele 11 kV feeder of Kanakapura sub-division on pilot basis. The project promotes replacing existing inefficient IP sets with efficient pump sets and energizing these IP sets with solar power and feed in excess energy to the grid on net-metering concept. The excess energy fed into the grid will be paid back to the farmers as per tariff fixed by KERC resulting in additional income to the farmers apart from the income earned through crops. The scheme is being financed by a combination of farmer investment, GoK investment, MNRE subsidy and BESCOM investment through soft loans to be repaid by the farmer through net metering tariff revenues in initial years. The net metering revenues will be deposited into an escrow account and will be diverted first to the loan account and, if surplus, to the farmer's account.

### **Distribution Energy Efficiency Project (DEEP) by providing Dynamic Reactive Compensation (DRC) for power factor improvement scheme on 11 kV feeders**

BESCOM has proposed to implement Distribution Energy Efficiency Project (DEEP) by providing Dynamic Reactive Compensation (DRC) for power factor improvement scheme on selected 11 kV feeders on pilot basis. DEEP system consists of Multifunction Measurement and Control unit (MFM), GSM/GPRS modem, capacitors, capacitor-duty contractors, isolation transformers and associated. The DEEP

systems address the following functional need:

- DTC metering towards energy audit and accounting.
- Dynamic Reactive Compensation to improve power factor to  $> 0.95$  lag &  $< 1.0$  for all normal operating conditions of DT towards line loss reduction.
- Programmable threshold limit alerts to eliminate DT burnouts due to overloading.
- Load balancing opportunity towards enhanced performance.

A pilot project consisting of 1x25 KVA, 1x63 KVA and 1x100 KVA is implemented through EESL in 66/11 kV V.R.Doddi substation of Sathnur (O&M) sub-division in Kanakapura division.

### **DELP:-Domestic Efficient Lighting Programme**

Under DELP user can monetizes the energy saving accrued as a result of replacement of 4 nos. of 60W inefficient incandescent lamps by 9W LED lamps. The programme is being implemented through M/s EESL. The cost differential shall be recovered through savings in peak power procurement by the distribution utility. The utility has planned to distribute of 4 LEDs to each households at 25/- per lamp on getting back working ICLs. The DISCOMs are targeting to distribute 6 crores LEDs which will cost almost Rs 600 Crores. As per EESL, the total energy savings 1,474 MU and avoided capacity addition of 1,404 MW is expected out of this project. The whole project is expected to be completed in one year. Domestic Efficient Lighting Programme (DELP) has been initiated in the last week of Dec 2015 in the State of Karnataka in Bengaluru and Mysore cities and more than 19 Lakh LED bulbs have been distributed till 1<sup>st</sup> week of February 2016.

Schedule	Mar 2016	June 2016	Sept 2016	Dec 2016
Number of LEDs to be distributed	1.35 Cr	1.35 Cr	1.35 Cr	1.35 Cr

In addition to domestic consumers, street lights have also been planned to be replaced with LED lights. A total of 12-15 lac streetlights are present in the state with an estimated energy consumption of 800 MU.

Once the replacement is undertaken almost 50% savings in expected. The programme is

implemented with the EESL with an investment Rs. 2000 Crores. The project will be completed by March 2017.

Schedule	Mar 2016	June 2016	Sept 2016	Dec 2016	Mar 2017
Number of streetlight installations	Upto 0.75lac	2.5lac	3.0lac	3.0lac	3.0lac

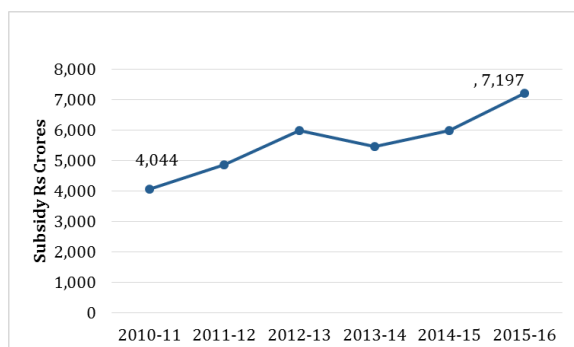
## CHAPTER 10: FINANCIAL SUSTAINABILITY

### FINANCIAL POSITION OF DISTRIBUTION UTILITIES

The existing accumulated loss for the Karnataka DISCOMs as per the provisional financial accounts of FY 2014-15 stands at Rs. 2,561 Crores, which is ~10% of their revenue booked for the FY 2014-15.

In contrast to its historical accumulated losses, in the FY 2014-15 the DISCOMs have booked a net profit of Rs 169 Crores. However, it is important to note that the profit is on the account of government subsidy to the tune of Rs 5,983 Crores.

Figure 13: Subsidy during last 6 years (Rs Crores)



Since, the utility has started to post profit, recovering the existing losses will be possible with limited efforts since already 93% of the household are electrified and covering remaining 7% will take more 3-4 years.

The below table shows some of the key items under P&L account for FY 2014-15:

Table 20: Profit and loss Statement for FY 2014-15 (Rs Crores)

Particulars	FY 2014-15
Sales Turnover	26,122
Other Income	684
<b>Total Income</b>	<b>26,807</b>
<b>Expenditure</b>	
Power and transmission charges	21,717
Employee Cost	2,054

Particulars	FY 2014-15
R&M cost	175
A&G	1,085
<b>Total Expenses</b>	<b>25,031</b>
PBDIT	1,776
Finance costs	1,108
<i>PBDT</i>	668
Depreciation	499
<b>Profit Before Tax</b>	<b>169</b>

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

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:

- At targeted growth rate as per “24x7 Power for All” Road Map (Base case).
- At targeted growth rate as per “24x7 Power for All” along with Financial Turnaround.
- At targeted growth rate as per “24x7 Power for All” Road Map with funding of proposed investments in distribution through state funds and financial institutions.
- Financial performance at higher AT&C losses

**Karnataka has planned to fulfill only the efficiency requirements under the UDAY scheme which will help DISCOMs in the State to deliver better service.**

## COMMON ASSUMPTIONS

- ✓ Any change in the power purchase cost will be taken care by the Fuel and Power Purchase Cost Adjustment mechanism.
- ✓ Short term power during FY 2016 has been considered at 4 Rs/kWh.
- ✓ 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 7<sup>th</sup> pay commission.
- ✓ R&M cost has been computed at 2% 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 calculated 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 3% 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 21: Assumptions for Scenario A**

	Units	31-Mar-16	31-Mar-17	31-Mar-18	31-Mar-19
Energy Demand	MU	67,094	73,423	80,274	87,626
Sales	MU	55,547	61,118	67,351	74,152
Power Available	MU	59,608	76,347	89,100	96,048
Surplus / (Deficit) Energy	MU	-7,486	2,924	8,826	8,421
Power purchase rate	Rs/kWh	3.19	3.42	3.59	3.74
AT&C losses	%	15.92%	15.47%	15.00%	14.50%
T&D Losses	%	14.21%	13.74%	13.32%	12.76%
Collection Efficiency	%	98.00%	98.00%	98.07%	98.00%

**Table 22: Key Parameters under Scenario A**

Key Parameters	Units	31-Mar-16	31-Mar-17	31-Mar-18	31-Mar-19
Revenue excluding subsidy	Rs crores	29,860	32,715	35,895	39,364
Total Expense excluding other income	Rs crores	28,744	33,433	38,256	43,637
PBT	Rs crores	1116	-718	-2361	-4273
ABR	Rs/ kWh	5.38	5.35	5.33	5.31
Rate of sale of surplus power	Rs /kWh	-	3.42	3.59	3.74
ACS	Rs/ kWh	5.17	5.47	5.68	5.88
Interest Cost	Rs crores	1054	1236	1697	2377
O&M cost per unit	Rs/ kWh	0.66	0.68	0.67	0.66
R&M cost per unit	Rs/ kWh	0.04	0.04	0.04	0.04
Employee cost per unit	Rs/ kWh	0.41	0.44	0.44	0.44
A&G cost per unit	Rs/ kWh	0.21	0.20	0.19	0.18
Interest cost per unit	Rs/ kWh	0.19	0.20	0.25	0.32

**Table 23: Profit and loss Statement under Scenario A (Rs Crores)**

P&L (Rs crores)	31-Mar-16	31-Mar-17	31-Mar-18	31-Mar-19
<b>Sales Turnover</b>	<b>29,860</b>	<b>32,715</b>	<b>35,895</b>	<b>39,364</b>
Net Sales	29,860	32,715	35,895	39,364
Other Income	719	755	792	832
Revenue from surplus power	0	1,001	3,166	3,146
<b>Total Income</b>	<b>30,578</b>	<b>34,470</b>	<b>39,854</b>	<b>43,342</b>
<b>Expenditure</b>				
Transmission Charges	2,531	2,770	3,028	3,306
Power Cost	21,431	26,142	31,962	35,882
Employee Cost	2,260	2,666	2,933	3,226
R&M cost	238	267	297	318
A&G Cost	1,150	1,219	1,293	1,370
Provision for bad debt	280	292	295	319
<b>Total Expenses</b>	<b>27,890</b>	<b>33,356</b>	<b>39,808</b>	<b>44,420</b>
<i>PBDIT</i>	2,688	1,114	46	-1,078
<b>Finance costs</b>	<b>1,054</b>	<b>1,236</b>	<b>1,697</b>	<b>2,377</b>
Depreciation	518	597	710	817
<i>Profit Before Tax</i>	1,116	-718	-2,361	-4,273
Accumulated losses by end of the year	-1,445	-2,164	-4,525	-8,797

In the above scenario it is evident that utility will incur losses from FY 2016 and accumulated losses will increase to Rs 8,797 Crores 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 24: Cash flow Statement (Rs crores)**

Cash Flow (Rs crores)	31-Mar-16	31-Mar-17	31-Mar-18	31-Mar-19
<b>Cash flow arising from Operating Activities</b>	<b>2,170</b>	<b>517</b>	<b>(664)</b>	<b>(1,896)</b>
Depreciation and Amortisation expenses	518	597	710	817
<b>Operating profit</b>	<b>2,688</b>	<b>1,114</b>	<b>46</b>	<b>(1,078)</b>
subsidy	-			
Increase / (Decrease) in current liability	(1,000)	290	437	281
(Increase) in current Asset	(1,045)	(597)	(654)	(693)
<b>Cash Flow from Operation</b>	<b>643</b>	<b>807</b>	<b>(172)</b>	<b>(1,490)</b>
<b>Cash from Investment Activities</b>				
<b>Capex</b>	<b>(2,590)</b>	<b>(3,223)</b>	<b>(3,404)</b>	<b>(1,728)</b>
Net Cash from Investment Activities	(2,590)	(3,223)	(3,404)	(1,728)
<b>Cash from Financing Activities</b>				
Equity Investments	652	687	719	509
Debt Drawn	1,215	1,533	1,634	1,141

Cash Flow (Rs crores)	31-Mar-16	31-Mar-17	31-Mar-18	31-Mar-19
Loan Repayment	(571)	(631)	(763)	(898)
WC loan	1,000	(290)	(437)	(281)
Interest cost	(1,054)	(1,236)	(1,697)	(2,377)
Grant	723	1,004	1,051	78
Net Cash from Financing Activities	1,965	1,067	508	(1,828)
<b>Net Cash Balances</b>				
Cash BF	97	115	(1,235)	(4,303)
Cash Flow during the year	18	(1,350)	(3,068)	(5,046)
Cash	115	(1,235)	(4,303)	(9,349)
Cash CF to balance sheet - post deficit loan	115	(0)	(0)	(0)
<b>Cash deficit Loan</b>				
Opening loan	-	-	1,235	4,303
Additions	-	1,235	4,303	9,349
Repayment	-	-	1,235	4,303
Closing	-	1,235	4,303	9,349
	14%	14%	14%	14%
<b>Interest on cash deficit loan</b>	-	<b>86.43</b>	<b>387.62</b>	<b>955.59</b>

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

### ASSUMPTIONS

- ✓ Tariff hike of 3%, 4% and 3% in each year from FY 2017 to FY 2019 on latest category-wise average billing rates as per the existing tariff to recover its accumulated losses.
- ✓ AT&D losses as per targeted trajectory.

**Table 25: Key parameters under scenario B**

	Units	31-Mar-16	31-Mar-17	31-Mar-18	31-Mar-19
Energy Demand	MU	67,094	73,423	80,274	87,626
Sales	MU	55,547	61,118	67,351	74,152
Power Available	MU	59,608	76,347	89,100	96,048
Surplus / (Deficit) Energy	MU	-7,486	2,924	8,826	8,421
Power purchase rate	Rs/kWh	3.19	3.42	3.59	3.74
AT&C losses	%	15.92%	15.47%	15.00%	14.50%
T&D Losses	%	14.21%	13.74%	13.32%	12.76%
Collection Efficiency	%	98.00%	98.00%	98.07%	98.00%

**Table 26: Key parameters under Scenario -B**

	Units	31-Mar-16	31-Mar-17	31-Mar-18	31-Mar-19
Revenue excluding subsidy	Rs crores	29,860	33,696	38,451	43,432
Total Expense excluding other income	Rs crores	28,744	33,384	37,975	42,859
PBT	Rs crores	1116	312	476	573
ABR	Rs/ kWh	5.38	5.57	5.76	5.97
Rate of sale of surplus power	Rs /kWh	-	3.42	3.59	3.74
ACS	Rs/ kWh	5.17	5.46	5.64	5.78
Interest Cost	Rs crores	1054	1186	1415	1597
<b>O&amp;M cost per unit</b>	<b>Rs/ kWh</b>	0.66	0.68	0.67	0.66
R&M cost per unit	Rs/ kWh	0.04	0.04	0.04	0.04
A&G cost per unit	Rs/ kWh	0.21	0.20	0.19	0.18
Employee cost per unit	Rs/ kWh	0.41	0.44	0.44	0.44
Interest cost per unit	Rs/ kWh	0.19	0.19	0.21	0.22

**Table 27: Profit and loss under Scenario B**

P&L (Rs crores)	31-Mar-16	31-Mar-17	31-Mar-18	31-Mar-19
<b>Sales Turnover</b>	<b>29,860</b>	<b>33,696</b>	<b>38,451</b>	<b>43,432</b>
Net Sales	29,860	33,696	38,451	43,432
Other Income	719	755	792	832
Revenue from surplus power	0	1,001	3,166	3,146
<b>Total Income</b>	<b>30,578</b>	<b>35,452</b>	<b>42,410</b>	<b>47,410</b>
<b>Expenditure</b>				
Transmission Charges	2,531	2,770	3,028	3,306
Power Cost	21,431	26,142	31,962	35,882
Employee Cost	2,260	2,666	2,933	3,226
R&M cost	238	267	297	318
A&G Cost	1,150	1,219	1,293	1,370
Provision for bad debt	280	292	295	321
<b>Total Expenses</b>	<b>27,890</b>	<b>33,356</b>	<b>39,809</b>	<b>44,422</b>
<i>PBDIT</i>	2,688	2,095	2,601	2,988
<b>Finance costs</b>	<b>1,054</b>	<b>1,186</b>	<b>1,415</b>	<b>1,597</b>
<i>PBDT</i>	1,634	909	1,186	1,390
Depreciation	518	597	710	817
<i>Profit Before Tax</i>	1,116	312	476	573
Accumulated losses by end of the year	-1,445	-1,133	-657	-84

Based on the above assumptions, it is evident that if DISCOMs adheres to the target electrification and reduction of losses, and the DISCOMs receives tariff increase of 3%, 4% and 3% in respective years FY 2016-17, FY 2017-18 and FY 2018-19, as per the

assumptions, the accumulated losses will progressively reduce and Discoms will be able to recover its accumulated losses.

**Table 28: Cash flow Statement for scenario B**

Cash Flow (Rs crores)	31-Mar-16	31-Mar-17	31-Mar-18	31-Mar-19
<b>Cash flow arising from Operating Activities</b>	<b>2,170</b>	<b>1,499</b>	<b>1,891</b>	<b>2,171</b>
Depreciation and Amortisation expenses	518	597	710	817
<b>Operating profit</b>	<b>2,688</b>	<b>2,095</b>	<b>2,601</b>	<b>2,988</b>
Subsidy	-			
Increase / (Decrease) in current liability	(1,000)	453	699	533
(Increase) in current Asset	(1,045)	(597)	(674)	(742)
<b>Cash Flow from Operation</b>	<b>643</b>	<b>1,952</b>	<b>2,626</b>	<b>2,779</b>
<b>Cash from Investment Activities</b>				
<b>Capex</b>	<b>(2,590)</b>	<b>(3,223)</b>	<b>(3,404)</b>	<b>(1,728)</b>
Net Cash from Investment Activities	(2,590)	(3,223)	(3,404)	(1,728)
<b>Cash from Financing Activities</b>				
Equity Investments	652	687	719	509
Debt Drawn	1,215	1,533	1,634	1,141
Loan Repayment	(571)	(631)	(763)	(898)
WC loan	1,000	(453)	(699)	(533)
Interest cost	(1,054)	(1,186)	(1,415)	(1,597)
Grant	723	1,004	1,051	78
Net Cash from Financing Activities	1,965	952	528	(1,300)
<b>Net Cash Balances</b>				
Cash BF	97	115	(204)	(454)
Cash Flow during the year	18	(319)	(250)	(249)
Cash	115	(204)	(454)	(704)
Cash CF to balance sheet - post deficit loan	115	-	-	(0)
<b>Cash deficit Loan</b>				
Opening loan	-	-	204	454
Additions	-	204	454	704
Repayment	-	-	204	454
Closing	-	204	454	704
	14%	14%	14%	14%
<b>Interest on cash deficit loan</b>	<b>-</b>	<b>14.28</b>	<b>46.09</b>	<b>81.06</b>

**SCENARIO C: AT TARGETED GROWTH RATE AS PER “24X7 POWER FOR ALL” ROAD MAP WITH FUNDING OF PROPOSED INVESTMENTS IN DISTRIBUTION THROUGH STATE FUNDS AND FINANCIAL INSTITUTIONS.**

**ASSUMPTIONS**

- ✓ **AT&C losses as per the target.**
- ✓ Funding through loan and equity in place of grant from Government of India.
- ✓ Tariff hike of 4%, 4% and 3% in FY 2017, FY 2018 and FY 2019 respectively is required.

**Table 29: Assumptions under scenario C**

Year	Units	31-Mar-16	31-Mar-17	31-Mar-18	31-Mar-19
Energy Demand	MU	67,094	73,423	80,274	87,626
Sales	MU	55,547	61,118	67,351	74,152
Power Available	MU	59,608	76,347	89,100	96,048
Surplus / (Deficit) Energy	MU	-7,486	2,924	8,826	8,421
Power purchase rate	Rs/kWh	3.19	3.42	3.59	3.74
AT&C losses	%	15.92%	15.47%	15.00%	14.50%
T&D Losses	%	14.21%	13.74%	13.32%	12.76%
Collection Efficiency	%	98.00%	98.00%	98.07%	98.00%

**Table 30: Key parameters (Rs Crores)**

	Units	31-Mar-16	31-Mar-17	31-Mar-18	31-Mar-19
Revenue excluding subsidy	Rs crores	29,860	34,023	38,824	43,853
Total Expense excluding other income	Rs crores	28,779	33,518	38,240	43,244
PBT	Rs crores	1081	505	584	609
ABR	Rs/ kWh	5.38	5.57	5.76	5.91
Rate of sale of surplus power	Rs /kWh	-	3.42	3.59	3.74
ACS	Rs/ kWh	5.18	5.48	5.68	5.83
Interest Cost	Rs crores	1072	1255	1544	1787
O&M cost per unit	Rs/ kWh	0.66	0.68	0.68	0.67
R&M cost per unit	Rs/ kWh	0.04	0.05	0.05	0.05
Employee cost per unit	Rs/ kWh	0.41	0.44	0.44	0.44
A&G cost per unit	Rs/ kWh	0.21	0.20	0.19	0.18
Interest cost per unit	Rs/ kWh	0.19	0.21	0.23	0.24

**Table 31: P&L under scenario C**

P&L (Rs crores)	31-Mar-16	31-Mar-17	31-Mar-18	31-Mar-19
Sales Turnover	<b>29,860</b>	<b>34,023</b>	<b>38,824</b>	<b>43,853</b>
Net Sales	29,860	34,023	38,824	43,853
Other Income	719	755	792	832



P&L (Rs crores)	31-Mar-16	31-Mar-17	31-Mar-18	31-Mar-19
Revenue from surplus power	0	1,001	3,166	3,146
<b>Total Income</b>	<b>30,578</b>	<b>35,779</b>	<b>42,783</b>	<b>47,831</b>
Expenditure				
Transmission Charges	2,531	2,770	3,028	3,306
Power Cost	21,431	26,142	31,962	35,882
Employee Cost	2,260	2,666	2,933	3,226
R&M cost	245	290	341	373
A&G Cost	1,150	1,219	1,293	1,370
Provision for bad debt	280	292	295	321
<b>Total Expenses</b>	<b>27,897</b>	<b>33,380</b>	<b>39,852</b>	<b>44,477</b>
<i>PBDIT</i>	2,681	2,399	2,931	3,354
<b>Finance costs</b>	<b>1,072</b>	<b>1,255</b>	<b>1,544</b>	<b>1,787</b>
<i>PBDT</i>	1,609	1,144	1,387	1,567
Depreciation	528	639	803	958
<i>Profit Before Tax</i>	1,081	505	584	609
Accumulated losses by end of the year	-1,480	-975	-391	218

Since, the amount of grant is not very high the impact in the above scenario is very limited on the tariff hike required.

#### SCENARIO D: FINANCIAL PERFORMANCE UNDER HIGHER AT&C LOSSES

##### ASSUMPTIONS

- ✓ AT&C losses above agreed trajectory
- ✓ Tariff hike to compensate higher energy requirement (4%, 4% and 3% in FY 2017, FY 2018 and FY 2019)

**Table 32: Assumptions under scenario D**

Year	Units	31-Mar-16	31-Mar-17	31-Mar-18	31-Mar-19
Energy Demand	MU	67,108	73,840	80,698	88,552
Sales	MU	55,547	61,118	67,351	74,152
Power Available	MU	59,608	76,347	89,100	96,048
Surplus / (Deficit) Energy	MU	-7,500	2,507	8,402	7,495
Power purchase rate	Rs/kWh	3.18	3.40	3.57	3.86
AT&C losses	%	15.94%	15.94%	15.44%	15.40%
T&D Losses	%	14.22%	14.23%	13.78%	13.67%
Collection Efficiency	%	98.00%	98.00%	98.07%	98.00%

**Table 33: Key parameters (Rs Crores)**

	Units	31-Mar-16	31-Mar-17	31-Mar-18	31-Mar-19
Revenue excluding subsidy	Rs crores	29,860	34,023	38,824	43,853
Total Expense excluding other income	Rs crores	28,750	33,535	38,113	43,207
PBT	Rs crores	1109	489	711	646
ABR	Rs/ kWh	5.38	5.57	5.76	5.91
Rate of sale of surplus power	Rs /kWh	-	3.42	3.59	3.74
ACS	Rs/ kWh	5.18	5.49	5.66	5.83
Interest Cost	Rs crores	1054	1179	1383	1554
O&M cost per unit	Rs/ kWh	0.66	0.68	0.67	0.66
R&M cost per unit	Rs/ kWh	0.04	0.04	0.04	0.04
Employee cost per unit	Rs/ kWh	0.41	0.44	0.44	0.44
A&G cost per unit	Rs/ kWh	0.21	0.20	0.19	0.18
Interest cost per unit	Rs/ kWh	0.19	0.19	0.21	0.21

**Table 34: P&L (Rs Crores)**

P&L (Rs crores)	31-Mar-16	31-Mar-17	31-Mar-18	31-Mar-19
<b>Sales Turnover</b>	<b>29,860</b>	<b>34,023</b>	<b>38,824</b>	<b>43,853</b>
Net Sales	29,860	34,023	38,824	43,853
Other Income	719	755	792	832
Revenue from surplus power	0	858	3,014	2,800
<b>Total Income</b>	<b>30,578</b>	<b>35,636</b>	<b>42,631</b>	<b>47,486</b>
<b>Expenditure</b>				
Transmission Charges	2,532	2,786	3,044	3,341
Power Cost	21,437	26,142	31,962	35,882
Employee Cost	2,260	2,666	2,933	3,226
R&M cost	238	267	298	322
A&G Cost	1,150	1,219	1,293	1,370
Provision for bad debt	280	292	295	321
<b>Total Expenses</b>	<b>27,896</b>	<b>33,372</b>	<b>39,826</b>	<b>44,461</b>
<b>PBDIT</b>	<b>2,682</b>	<b>2,264</b>	<b>2,805</b>	<b>3,024</b>
<b>Finance costs</b>	<b>1,054</b>	<b>1,179</b>	<b>1,383</b>	<b>1,554</b>
Depreciation	518	597	711	824
<i>Profit Before Tax</i>	<i>1,109</i>	<i>489</i>	<i>711</i>	<i>646</i>
Accumulated losses by end of the year	-1,452	-963	-252	395

**Table 35: Cash Flow (Rs Crores)**

Cash Flow (Rs crores)	31-Mar-16	31-Mar-17	31-Mar-18	31-Mar-19
<b>Cash flow arising from Operating Activities</b>	<b>2,164</b>	<b>1,667</b>	<b>2,094</b>	<b>2,200</b>
Depreciation and Amortisation expenses	518	597	711	824
<b>Operating profit</b>	<b>2,682</b>	<b>2,264</b>	<b>2,805</b>	<b>3,024</b>
subsidy	-			
Increase / (Decrease) in current liability	(1,000)	485	705	509
(Increase) in current Asset	(1,045)	(597)	(680)	(749)
<b>Cash Flow from Operation</b>	<b>637</b>	<b>2,151</b>	<b>2,830</b>	<b>2,784</b>
<b>Cash from Investment Activities</b>				
<b>Capex</b>	<b>(2,590)</b>	<b>(3,223)</b>	<b>(3,404)</b>	<b>(1,728)</b>
<b>Net Cash from Investment Activities</b>	<b>(2,590)</b>	<b>(3,223)</b>	<b>(3,404)</b>	<b>(1,728)</b>
<b>Cash from Financing Activities</b>				
Equity Investments	652	687	719	509
Debt Drawn	1,215	1,533	1,634	1,141
Loan Repayment	(571)	(631)	(763)	(902)
WC loan	1,000	(485)	(705)	(509)
Interest cost	(1,054)	(1,179)	(1,383)	(1,554)
Grant	723	1,004	1,051	78
<b>Net Cash from Financing Activities</b>	<b>1,965</b>	<b>929</b>	<b>553</b>	<b>(1,237)</b>
<b>Net Cash Balances</b>				
Cash BF	97	109	(34)	(55)
Cash Flow during the year	12	(143)	(21)	(181)
Cash	109	(34)	(55)	(236)
Cash CF to balance sheet - post deficit loan	109	-	(0)	(0)
<b>Cash deficit Loan</b>				
Opening loan	-	-	34	55
Additions	-	34	55	236
Repayment	-	-	34	55
Closing	-	34	55	236
	14%	14%	14%	14%
Interest on cash deficit loan	-	2.39	6.22	20.33

Under this scenario since the AT&C losses have been considered to be higher than the agreed trajectory, the tariff hike requirement is also higher in the last year. Therefore, to contain the tariff raise, adherence to AT&C losses will be very important.

## 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 BESCOM or any other DISCOM for looking at activities of overall communication strategy.

The financial situation in Karnataka makes it imperative to raise tariffs marginally 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 Karnataka will also be required:

**Table 36: Proposed Communication Responsibilities**

Communication Objective	Responsibility	Frequency
"Power for All" - Roll Out Plan	Additional Chief Secretary, Energy	Quarterly
Status update on Deliverables	Additional Chief Secretary, Energy	Quarterly
Generation Projects <i>Physical Progress, Achievements and Other Relates Issues</i>	Managing Director, KPCL	Quarterly

Communication Objective	Responsibility	Frequency
Inter-State Transmission Projects <i>Physical Progress, Achievements and Other Relates Issues</i>	Director (Projects), PGCIL	Monthly
Intra-State Transmission Projects <i>Physical Progress, Achievements and Other Relates Issues</i>	Managing Director/Director Transmission, KPTCL	Monthly
Distribution <i>Progress, Achievements, Losses, Consumer Initiatives etc.</i>	Managing Director, DISCOMS	Monthly
Renewable Power	Managing Director KREDL	Quarterly

### INFORMATION TECHNOLOGY

Need to adopt IT in every sphere of utility operation is self-evident. Power is a complex product that must be consumed on a real time basis. The overall value involved in the process is very high. Even more importantly it touches all citizens. Yet, the information systems that drive the operations of the sector are generally very basic and information transparency and consistency is poor.

While sporadic efforts have been made in the past to improve this, quantum changes are required to increase IT adoption in all spheres of power sector operation.

- ✓ Power procurement planning and optimization tools will be implemented to reduce the power procurement costs and improve supply reliability. This will be achieved through the institution of technically robust forecasting, scheduling and dispatch (Unit Commitment) and settlement tools. The tools shall be used to ensure that the control room operators

- have the ability to take real time decisions to ensure cost reduction.
- ✓ Implementation of Enterprise Resource Planning Systems (ERP) which would cover critical aspects like Finance and Accounts, Asset Management, Inventory Management, Human Resource Management, Project Management, Personnel Information System (PIS). ERP will help in timely capitalization of asset, deriving better business value of investment etc.
  - ✓ In order to curb the malpractices being done at the level of meter readers while entering the meter reading of the consumers, various schemes may be adopted.
  - ✓ Centralized Information & Monitoring System for operational, enforcement & litigation, vigilance activities and analysis have to be operationalized.
  - ✓ Power management would require tools like SCADA and Distribution Management Systems (DMS) that allow for adequate visualization of the networks and response capabilities. Technologies for sub-station automation, GIS, SCADA, DMS, OMS, etc., shall be adopted. For the urban areas SCADA is very useful for improving reliability and reduction of network downtime.
  - ✓ Requirement of Regional Distribution Control Centers (RDCC) within the state will be identified in view of upcoming projected load. These will initially cater to the principal load centers, but would thereafter be expanded to all load centers of the state. This will be a key initiative, not only for effectively managing 24x7 power supply, but also thereafter for other functions like load forecasting.
  - ✓ Project monitoring tools shall be incorporated in the PMU to ensure that progress on the investments in the state are monitored rigorously and bottlenecks identified.
  - ✓ Standards of service specified under Section 57 of the Electricity Act 2003 will be monitored. The utilities shall use IT tools to gather the information with regard to service standards with minimal manual intervention.
  - ✓ The above measures, need to be implemented on priority basis by distribution companies and also to be integrated with each other to ensure that the systems are inter-operable (i.e., they can talk to each other). For this the utilities shall evolve a detailed IT plan to implement the above in a well-coordinated manner.

#### 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 that 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 Superintendent Engineer (S.E.) to take action that is necessary to ensure that 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 facilitate in tracking the action taken / to be taken 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.

## CAPACITY BUILDING

With the increase of IT applications in the Transmission & Distribution system and to meet the expectations of 24x7 power supply for the consumers in the state, it is important to focus on capacity building of the employees for enhancement of technical know-how and keeping abreast with latest technological developments. The capacity building may also include consumer grievance redressal system, awareness regarding importance of working with safety, outage management system, demand side management etc. It is also imperative that for transforming the distribution utility into a customer friendly one, change of mind-set of the employees would be required. It is critical that Change Management initiatives are rolled out and institutionalized for achieving better results.

In view of the importance of training on new technologies, there is a requirement for development and implementation of a well-structured Human Resource Training Programme to help realize the dream of 24x7 power supply system in the state in its true sense.

There is already a provision for Demand Side Management (DSM) training under various programmes of Bureau of energy Efficiency (BEE) and the same should be implemented to achieve the goal of 24 x 7 power. The training for the class C & D employees is also



being provided under RAPDRP Part C scheme.

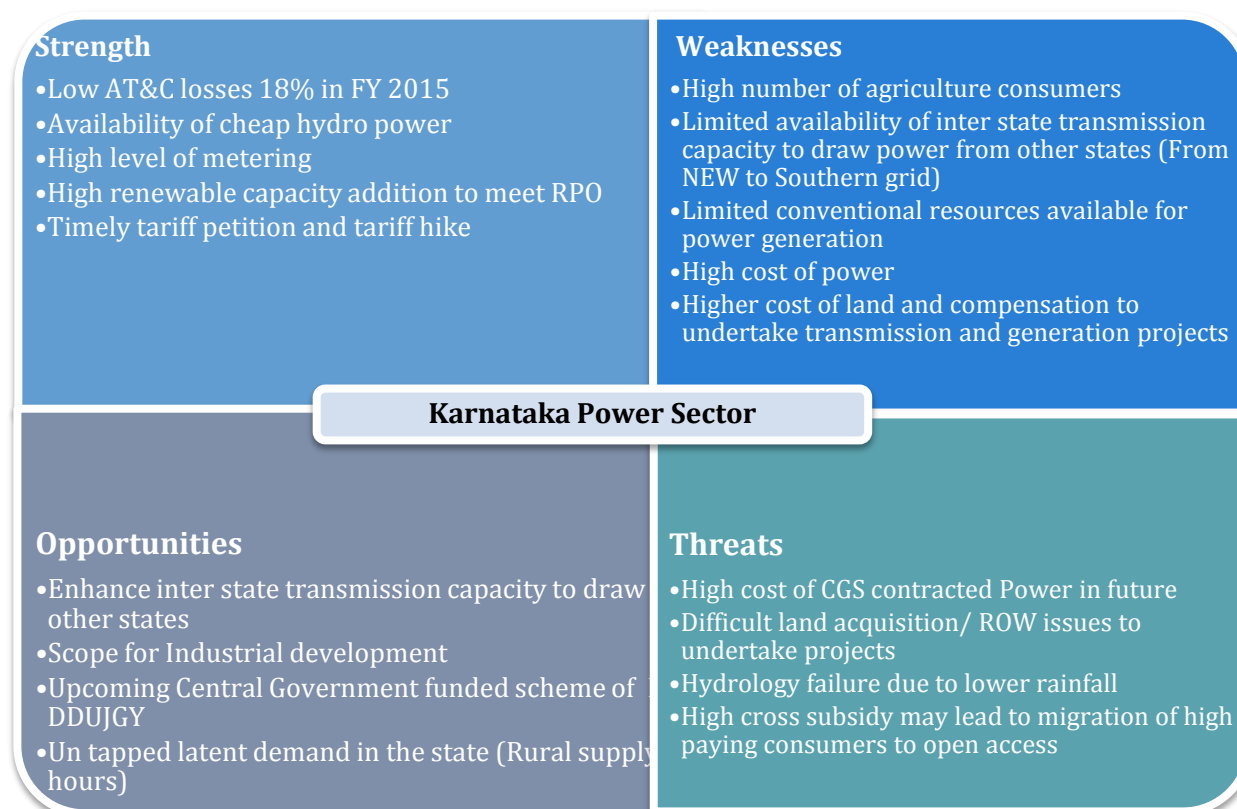
A state level officers training institute may be required to be opened in the state to fulfil the ongoing training requirement for employees of MP Power Utilities. This also helps in training of subordinate technical staff. Following training programmes are proposed to be implemented for the utility:

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

## CHAPTER 12: ROLL OUT PLAN

### SWOT ANALYSIS

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



## ROLL OUT PLAN FOR 24 X 7 POWER FOR ALL

Year wise roll out plan for the State is summarized in the following table:

Sl. No.	Category	Base year scenario (FY 15)	FY 16	FY 17	FY 18	FY 19	Total	
<b>GENERATION</b>								
<b>A</b>	<b>Availability (MW):</b>							
	<b>State Sector</b>							
1	State Sector	6362	15	1510	820	2300	4,645	11,007
2	Central Sector	2611	0	1105	435	35	1,575	4,186
3	Renewable Sector	4903	815	850	2172	1650	5,487	10,390
4	Other (Private and Shared)	971	0	0	0	0	-	971
	<b>Total Availability (MW)</b>	<b>14,846</b>	<b>830</b>	<b>3,465</b>	<b>3,427</b>	<b>3,985</b>	<b>11,707</b>	<b>26,553</b>
<b>B</b>	<b>Peak Demand (MW):</b>							
1	Peak Demand (MW)	10,000	11,100	12,147	13,476	14,710		14,710
<b>TRANSMISSION</b>								
<b>C</b>	<b>Transmission Lines (CKM):</b>							
1	Inter State	3,996		270	167	475	912	4,908
2	Intra State	2,650	33	550	320	300	1,203	3,853
	<b>Total Transmission Line</b>	<b>6,646</b>	<b>33</b>	<b>820</b>	<b>487</b>	<b>775</b>	<b>2,115</b>	<b>8,761</b>
<b>D</b>	<b>Transformation Capacity (MVA):</b>							
1	Inter State (400 kV)	6,150		500	370	500	1,370	7,520
2	Intra State (400 kV)	4,575	0	0	3500	1000	4500	9075
	<b>Total Transformation Capacity</b>	<b>10,725</b>	<b>0</b>	<b>500</b>	<b>3,870</b>	<b>1,500</b>	<b>5,870</b>	<b>16,595</b>
<b>DISTRIBUTION</b>								
<b>E</b>	<b>Connecting the Unconnected</b>							
1	Target Electrification - Rural	79,60,363	2,02,467	4,06,465	3,56,363	50,291	10,15,586	89,75,949
2	Target Electrification - Urban	78,28,489	1,15,265	1,29,302	42,110	-	2,86,678	81,15,167
<b>F</b>	<b>Efficiency Improvement</b>							
1	T&D Losses	15.22%	14.21%	13.74%	13.32%	12.76%		12.76%
2	AT&C Losses	17.76%	15.92%	15.47%	15.00%	14.50%		14.50%
<b>G</b>	<b>Capacity Addition/Augmentation</b>							
1	66 kV Substation (MVA Capacity)							
2	33 kV Substation (MVA Capacity)	7439	534	534	534	534	2135	9574
3	11 kV Lines (CKT Km.)	267871	15867	17302	18229	19252	70649	338521
4	LT Lines (CKT Km.)	81727	3015	3158	3302	3445.61	12,921	94648
5	DT Capacity	20,282	1,867	1,939	2,022	2,133	7,962	28,245

# ANNEXURES

## ANNEXURE – 1

Table 37: District wise Households and their Electrification Status <sup>1</sup>

District	Total number of households	Electrified Households	Electrified Households
Kodagu	1,38,303	1,13,931	82%
Yadgir	2,00,424	1,56,222	78%
Gadag	2,15,602	1,98,064	92%
Bengaluru Rural	2,24,745	2,14,253	95%
Chamarajanagar	2,44,198	2,12,156	87%
Udupi	2,46,313	2,24,814	91%
Koppal	2,59,396	2,23,166	86%
Ramanagara	2,59,794	2,38,926	92%
Chikmagalur	2,72,173	2,38,505	88%
Chikkaballapura	2,82,311	2,57,243	91%
Bidar	3,13,521	2,71,439	87%
Uttara Kannada	3,19,912	2,90,791	91%
Haveri	3,25,456	2,95,937	91%
Kolar	3,30,990	3,09,494	94%
Chitradurga	3,54,143	3,07,257	87%
Bagalkot	3,55,377	3,01,389	85%
Raichur	3,59,337	3,14,547	88%
Dharwad	3,72,054	3,47,962	94%
Shimoga	4,02,139	3,63,835	90%
Davanagere	4,04,840	3,72,671	92%
Bijapur	4,05,076	3,26,594	81%
Dakshina Kannada	4,25,291	3,86,300	91%
Mandya	4,26,578	3,91,033	92%
Hassan	4,29,292	4,00,702	93%
Gulbarga	4,65,245	4,04,767	87%
Bellary	4,81,704	4,40,374	91%
Tumkur	6,36,394	5,62,769	88%
Mysore	6,88,422	6,40,868	93%
Belgaum	9,63,825	8,08,827	84%
Bengaluru	23,77,056	23,30,631	98%
<b>Grand Total</b>	<b>1,31,79,911</b>	<b>1,19,45,467</b>	<b>91%</b>

<sup>1</sup>As per the information available in <http://censusindia.gov.in/>

**Table 38: Electrification status Rural and Urban**

Districts	DISCOMS	Total		Rural		Urban	
		Total number of households	Electrified	Electrified	Total number of households	Electrified	Total number of households
Bagalkot	HESCOM	3,55,377	3,01,389	1,95,847	2,38,746	1,05,542	1,16,631
Bengaluru	BESCOM	23,77,056	23,30,631	1,98,822	2,07,628	21,31,809	21,69,428
Bengaluru Rural	BESCOM	2,24,745	2,14,253	1,53,944	1,62,398	60,309	62,347
Belgaum	HESCOM	9,63,825	8,08,827	5,65,135	7,08,069	2,43,692	2,55,756
Bellary	GESCOM	4,81,704	4,40,374	2,59,439	2,91,383	1,80,935	1,90,321
Bidar	GESCOM	3,13,521	2,71,439	2,01,272	2,37,380	70,167	76,141
Bijapur	HESCOM	4,05,076	3,26,594	2,37,181	3,07,984	89,413	97,092
Chamarajanagar	CESC	2,44,198	2,12,156	1,74,499	2,03,748	37,657	40,450
Chikkaballapura	BESCOM	2,82,311	2,57,243	1,97,413	2,20,309	59,830	62,002
Chikmagalur	MESCOM	2,72,173	2,38,505	1,83,737	2,15,334	54,768	56,839
Chitradurga	BESCOM	3,54,143	3,07,257	2,40,398	2,82,019	66,859	72,124
Dakshina Kannada	MESCOM	4,25,291	3,86,300	1,86,967	2,20,806	1,99,333	2,04,485
Davanagere	BESCOM	4,04,840	3,72,671	2,45,923	2,72,929	1,26,748	1,31,911
Dharwad	HESCOM	3,72,054	3,47,962	1,43,454	1,57,960	2,04,508	2,14,094
Gadag	HESCOM	2,15,602	1,98,064	1,26,805	1,37,799	71,259	77,803
Gulbarga	GESCOM	4,65,245	4,04,767	2,59,604	3,11,531	1,45,163	1,53,714
Hassan	CESC	4,29,292	4,00,702	3,13,271	3,39,911	87,431	89,381
Haveri	HESCOM	3,25,456	2,95,937	2,29,348	2,54,181	66,589	71,275
Kodagu	CESC	1,38,303	1,13,931	94,751	1,18,509	19,180	19,794
Kolar	BESCOM	3,30,990	3,09,494	2,08,976	2,26,245	1,00,518	1,04,745
Koppal	GESCOM	2,59,396	2,23,166	1,81,159	2,13,217	42,007	46,179
Mandya	CESC	4,26,578	3,91,033	3,21,501	3,54,049	69,532	72,529
Mysore	CESC	6,88,422	6,40,868	3,60,495	4,01,655	2,80,373	2,86,767
Raichur	GESCOM	3,59,337	3,14,547	2,27,259	2,64,274	87,288	95,063
Ramanagara	BESCOM	2,59,794	2,38,926	1,81,246	2,00,171	57,680	59,623
Shimoga	MESCOM	4,02,139	3,63,835	2,24,484	2,57,060	1,39,351	1,45,079
Tumkur	BESCOM	6,36,394	5,62,769	4,28,121	4,95,885	1,34,648	1,40,509
Udupi	MESCOM	2,46,313	2,24,814	1,55,753	1,74,548	69,061	71,765
Uttara Kannada	HESCOM	3,19,912	2,90,791	2,01,620	2,26,803	89,171	93,109
Yadgir	GESCOM	2,00,424	1,56,222	1,21,388	1,61,665	34,834	38,759
<b>Total</b>		<b>13179911</b>	<b>11945467</b>	<b>68,19,812</b>	<b>78,64,196</b>	<b>51,25,655</b>	<b>53,15,715</b>

## ANNEXURE – 2

Table 39: Planned ISTS Substations

S No.	Name of Substation	District	Voltage Ratio (kV)	Capacity (MVA)	Owner	Project Cost (Rs. Crore)
1	Kudgi GIS	Bijapur	765 kV (400 kV initial)	0	POWERGRID	140.31
2	Madhugiri (Tumkur)	Tumkur	765 kV (400 kV initial)	1000	POWERGRID	135.8

Table 40: Planned Intra-state Substations

Sl. No.	Name of Station	District	Voltage Ratio (kV)	Capacity (MVA)	Owner	Project Cost (Rs Crores)	Target Date
1	<b>Doni 400kV (Gadag):</b> Establishing 2x500MVA, 400/220kV Station with associated 400kV & 220kV link lines	Gadag	400/220	1000	KPTCL	132.49	17-18
2	<b>Mughalkod:</b> Establishing 2x100MVA, 220/110kV & 1x10MVA, 110/11kV Station with associated 220kV & 110kV lines	Belgaum	220/110	200	KPTCL	72.49	18-19
3	<b>Sindagi:</b> Establishing 2x100MVA, 220/110kV Receiving Station with associated 220kV and 110kV lines	Bijapur	220/110	200	KPTCL	80.00	18-19
4	<b>Mughalkod:</b> Establishing 2x315MVA, 400/220kV Station with associated 400kV & 220kV lines	Belgaum	400/220	630	KPTCL	250.00	19-20
5	<b>Vikas Tech park:-Est</b> 2x150MVA, 220/66 kV S/S & Construction of 220KV LILO line from one of the circuits of the proposed 220KV DC Somanahalli - Malur line to the proposed S/s for a distance of 4.6 Kms.	Bengaluru Urban	220/66	300	KPTCL	59.84	15-16
6	<b>Yelahanka (DG Plant):</b> Establishing 2x150MVA, 220/66kV Station	Bengaluru Urban	220/66	300	KPTCL	99.02	16-17
7	<b>Jigani:</b> Establishing 2x150MVA, 220/66kV Station with LILO of 220kV Somanahalli - Malur MC line & 66kV link lines for a distance of 7.356 Kms..	Bengaluru Rural	220/66	300	KPTCL	72.32	16-17
8	<b>Kothipura (Ramanagara):</b> Establishing 2x100MVA, 220/66kV Station with 220/66kV MC lines from Bidadi & SC line from	Ramanagara	220/66	200	KPTCL	105.01	16-17



Sl. No.	Name of Station	District	Voltage Ratio (kV)	Capacity (MVA)	Owner	Project Cost (Rs Crores)	Target Date
	Tubinakere. 220 KV DC line -68.82 Kms, MCMV 18.117 Kms						
9	<b>Electronic City (Mylasandra):</b> Establishing 2x500MVA 400/220kV Station.	Bengaluru Urban	400/220	1000	KPTCL	17.69	17-18
10	<b>Srinivasapura:</b> Establishing 2x100MVA, 220/66kV Station with associated lines	Kolar	220/66	200	KPTCL	30.00	17-18
11	<b>Koppal :</b> Establishing 2x100MVA, 220/110kV and 1x10MVA, 110/11kV Station at Koppal (Halavarthi) along with associated lines & TB's. 11.06 (11KM-110KV&0.06KM-220KV)	Koppal	220/110	200	KPTCL	29.98	16-17
12	<b>Ramsamudra:</b> Establishing 2x100MVA, 220/110kV Sub Station with associated 220kV and 110kV lines	Yadgiri	220/110	200	KPTCL	50.00	17-18
13	<b>Gulbarga switching station - 400kV:</b> Establishment of 400/220 kV Sub Station at Gulbarga	Gulbarga	400/220	1000	KPTCL	200.00	18-19
14	<b>Deodurga:</b> Establishing 1x100MVA, 220/110kV Sub-Station with associated line	Raichur	220/110	100	KPTCL	40.00	18-19
15	<b>Tavaragera :</b> Establishing 220kV Switching station by Terminating 220kV Lingapur-Kushtagi line and 220kV Lingasugur - Kushtagi line	Bellary	220		KPTCL	35.00	17-18
16	<b>Arasikere:</b> Establishing 2x100MVA, 220/110kV and 1x10MVA, 110/11kV Station with associated lines for a distance of 9.883 Kms.	Hassan	220/110	200	KPTCL	33.19	15-16
17	<b>Muthinakoppa:</b> Establishing 1x100MVA, 220/110kV Station with associated 220kV and 110kV lines	Chikka-magalur	220/110	100	KPTCL	50.00	17-18
18	<b>220kV Shivanasamudra:</b> Establishing 2x100MVA, 220/66kV Station with associated lines to be funded by IPP firms	Mandya	220/66	200	KPTCL	94.01	17-18
19	<b>Hunsur:</b> Establishing 2x100MVA,220kV Station	Mysore	220/66	200	KPTCL	50.00	17-18

Sl. No.	Name of Station	District	Voltage Ratio (kV)	Capacity (MVA)	Owner	Project Cost (Rs Crores)	Target Date
	with 220kV line and 66kV evacuation lines .						
20	<b>220kV Nagamangala:</b> Establishing 2X100MVA, 220/66kV Station with associated lines	Mandya	220/66	200	KPTCL	35.00	18-19
21	<b>Maddur :</b> Establishing 2x100MVA,220/66 kV <b>Gas Insulated Substation .</b>	Mandya	220/66	200	KPTCL	120.00	17-18
22	<b>Pavagada:</b> Establishing 2x100MVA, 220/66kV Station with associated lines for a distance of 120.00 Kms.	Tumkur	220/66	200	KPTCL	76.99	15-16
23	<b>Benkikere (Channagiri):</b> Establishing 2x100MVA, 220/66kV Station with associated 220kV line.	Davanagere	220/66	200	KPTCL	83.42	16-17
24	<b>Jagalur (Hiremallanahole):</b> Establishing 2x500MVA,400/220 KV GIS S/S with associated 220kV line to 220kV Thallak Station in JagalurTalukDavanagere Dist.	Davanagere	400/220	1000	KPTCL	484.36	17-18
25	<b>Hosadurga:</b> Establishing 2x100MVA, 220/66 KV S/S with associated 220kV line HosdurgaTalukChitradurga Dist.	Chitradurga	220/66	200	KPTCL	74.68	17-18

Table 41: Planned ISTS Transmission Lines

Sl No.	Name of the Project	Project Cost (in Crores)	Voltage level (KV)	Total Ckt-km	Target Date of Commercialisation
<b>Name of the Transmission Utility POWERGRID</b>					
1	765 kV D/C (Hex) Kudgi-Kholhapur transmission line	748.49	765 kV (400 kV initial)	198	Oct'15
2	765 kV S/C (Salem New) Dharmapuri-Madhugiri transmission line	513	765 kV (400 kV initial)	245	Mar'16
3	400 kV D/C (Quad) (Salem New) Dharmapuri-Somanahalli transmission line	323	400 kV	121	Jun'16
4	400 kV D/C Mysore-Kozhikode transmission line	566	400 kV	175	Sep-15
5	Gooty -Madhugiri 400kV D/C line	400	400kV	208	Oct'15
<b>TOTAL</b>		<b>2550.49</b>		<b>739.45</b>	

**Table 42: Transmission Lines Planned for System Strengthening**

Sl No.	Name of the Project	Project Cost (in Crores)	Voltage level (KV)	Total Ckt-km	Target Date of Commercialisation
1	400kV DC line Quad Moose Madhugiri (Vasanthnarasapura) – Bellary Pooling Station (BPS) line	400	400	188	March'16
2	400kV DC line Quad Moose Yeramarus - BPS line	350	400	160	Dec'16
3	400kV MC line Quad Moose BPS – Ramapura limits line	350	400	44	March'16
4	400kV DC line Quad Moose Ramapura limits – CN Halli line	450	400	180	Dec'16
5	400kV DC line Quad Moose Edlapur - BPS line	350	400	160	Mar'17
6	400kV DC line Quad Moose Yeramarus- Edlapur line	100	400	30	Mar'17
7	400kV DC line Quad Moose Yeramarus- Gulbarga line	350	400	160	Dec'16
<b>TOTAL</b>		<b>2350</b>	<b>2800</b>	<b>922</b>	

**Table 43: Inter-State Transmission Lines Existing**

Sl. No	Name of the Transmission line	Voltage Classes	SC/ DC / MC	Name of the conductor	Length of the line in Kms	End 1 (Sub-Station Owned by) Name of Transco	End 2 (Sub-Station Owned by) Name of Transco	Peak Load Recorded 14-15 (MW)
1	Hoody- Nelamangala 1	400	DC/ SC	Double Moose	69.81	Hoody	Nelamangala	380
2	Hoody- Nelamangala 2 (From Sept-12)	400	DC/ SC	Double Moose	43.45	Hoody	Nelamangala	380
3	Hassan line	400	D/C	Double Moose	213	Nelamangala	Shantigrama (PGCIL)	341
4	400kv Talaguppa 2	400	D/C	Double Moose	348	Nelamangala	Talaguppa	300
5	400kV Hiriyur 1	400	D/C	Double Moose	130.5	Nelamangala	Beeranahalli (PGCIL)	698
6	400kV Hiriyur 2	400	D/C	Double Moose	130.5	Nelamangala	Beeranahalli (PGCIL)	700
7	400kV Hoody (Hoody-1 line)	400	D/C	Double Moose	70	Nelamangala	Hoody	376
8	400kV Somanahally (Hoody-2 line)	400	D/C	Double Moose	70	Nelamangala	Hoody	374
9	400kV Mysore 1	400	D/C	Double Moose	138	Nelamangala	Bastipura (PGCIL)	251
10	400kV Mysore 2	400	D/C	Double Moose	138	Nelamangala	Bastipura (PGCIL)	259

Sl. No	Name of the Transmission line	Voltage Classes	SC/DC / MC	Name of the conductor	Length of the line in Kms	End 1(Sub-Station Owned by) Name of Transco	End 2(Sub-Station Owned by) Name of Transco	Peak Load Recorded 14-15 (MW)
11	400kV Somanahally 1 (Bidadi-1 line)	400	D/C	Double Moose	42	Nelamangala	Bidadi (PGCIL)	680
12	400kV Somanahally 2 (Bidadi-2 line)	400	D/C	Double Moose	42	Nelamangala	Bidadi (PGCIL)	680
13	400kV Gooty	400	S/C	Double Moose	256	Nelamangala	Gooty\ (PGCIL)	616
14	400kV Gudadahalli-Guttur line	400	SC	Moose Twine	121.039	Gudadhalli(PGCIL)	Guttur	254.0
15	400kV RTPS Guttur line	400	SC	Moose Twine	292	RTPS(KPCL)	Guttur	0.0
16	400kV RTPS - BTPS line	400				RTPS(KPCL)	BTPS (KPCL)	702.0
17	400 KV Guttur - JSW line	400				Guttur	JSW (IPP)	1120.0
18	400 KV JSW - BTPS line	400				JSW(IPP)	BTPS (KPCL)	910.0
19	400kV BTPS-Hiriyur-I	400	DC	Moose twine	156.4	BTPS(KPCL)	Beeranahalli (PGCIL)	777.0
20	400kV BTPS-Hiriyur-II	400	DC	Moose twine	156.4	BTPS(KPCL)	Beeranahalli (PGCIL)	905.0
21	Talaguppa - PGCIL Shantigrma	400	DC	Twin Moose	284	Talaguppa	PGCIL Santigrma	390.0
22	Talaguppa - Nelamangala line -2	400	DC	Twin Moose	360	Talaguppa	Nelamangala	290.0
23	400 KV Guttur-Guddadahalli	400 KV	SC	Double Moose	121.17	Guttur	Guddadahalli (PGCIL)	254.0
24	400 KV Guttur-BTPS	400 KV	SC	Double Moose	292	Guttur	BTPS	480.0
25	400 KV Guttur - Beeranahalli-1	400 KV	DC	Double Moose	121.17	Guttur	Beeranahalli(PGCIL)	480.0
26	400 KV Guttur-Beeranahalli-2	400 KV		Double Moose		Guttur	Beeranahalli(PGCIL)	530.0
27	400 KV Guttur-Kaiga-I	400 KV	DC	Double Moose	169	Guttur	Kaiga (NPC)	460.0
28	400 KV Guttur-Kaiga-II	400 KV		Double Moose		Guttur	Kaiga (NPC)	362.0
29	400 KV Guttur-Narendra-I	400 KV	DC	Double Moose	158	Guttur	Narendra (PGCIL)	368.0
30	400 KV Guttur-Narendra-II	400 KV		Double Moose		Guttur	Narendra (PGCIL)	440.0
31	400kV BTPS-Beeranahalli	400 KV	DC	Double Moose	156.41	BTPS	Beeranahalli (PGCIL)	800.0

## ANNEXURE – 5

### MNRE Schemes/options for electrification of remote households

#### SCHEMES FOR INDIVIDUAL HOUSEHOLDS

OPTION I	
System Proposed	100 Wp Solar system
Solar PV Module	100 Wp
Battery Storage (Tubular type)	12V, 75 AH
Estimated Project Cost	<b>Rs. 25,000/</b>

The above system is adequate to meet consumer demand with autonomy for two(2) non-sunshine days for consumption profile of estimated 0.3 units per day considering following inclusions in the scheme:

Inclusions	Nos.	Unit Load (W) [DC]	Total Load (W)	Hours of use per day	Energy Consumption (kWh/day)
D.C. operated LED Lights	3	8	24	4	0.096
D.C. operated LED Lights	2	5	10	4	0.040
D.C. Fan	1	12	12	10	0.120
D.C. B&W TV	1	12	12	4	0.048
Mobile Charger	1	5	5	3	0.015
<b>Total</b>					<b>0.319</b>

OPTION 2	
System Proposed	200 Wp Solar system
Solar PV Module	200 Wp
Battery Storage (Tubular type)	12V, 75 AH
Estimated Project Cost	<b>Rs. 50,000/</b>

The above system is adequate to meet consumer demand with autonomy for two(2) non-sunshine days for consumption profile of estimated 0.6 units per day considering following inclusions in the scheme:

Inclusions	Nos.	Unit Load (W) [DC]	Total Load (W)	Hours of use per day	Energy Consumption (kWh/day)
D.C. operated LED Lights	3	8	24	6	0.144
D.C. operated LED Lights	2	5	10	6	0.060
D.C. Fan (1*24W or 2*12W)	2	12	24	12	0.288
D.C. Color TV	1	30	30	4	0.120
Mobile Charger	1	5	5	3	0.015
<b>Total</b>					<b>0.627</b>

## SCHEMES FOR VILLAGE WITH A CLUSTER OF “HOUSEHOLDS” – OFF GRID

OPTION III	
Target Cluster of Households	15
Total Load (500 Whrs/ Household)	7500 Whrs
System Proposed	Solar PV Mini Grid And Central Control Room
Solar PV Panel	2.5 KWp
Battery Storage	48V, 600AH
Off Grid PCU (Inverter and Charge controller)	48 V, 2.5 KW
Other balance of System Components	As per actual
Estimated Project Cost	<b>Rs. 7,50,000/</b>

Inclusions	Nos.	Unit Load (W) [DC]	Total Load (W)	Hours of use per day	Energy Consumption (kWh/day)
A.C. operated LED Lights	3	8	24	6	0.144
A.C. operated LED Lights	2	5	10	6	0.060
Power for A.C. Fan and or Power for A.C. Loads like Color TV, Set top/ PC and Mobile Charger etc.	1	50	50	6	0.300
<b>Total</b>					<b>0.504</b>

OPTION IV	
Target Cluster of Households	50
Total Load (700 Whrs/ Household)	35,000 Whrs
System Proposed	Solar PV Mini Grid And Central Control Room
Solar PV Panel	12.5 KWp
Battery Storage	240V, 600AH
Off Grid PCU (Inverter and Charge controller)	240V, 12.5 KW
Other balance of System Components	As per actual
Estimated Project Cost	<b>Rs. 30,00,000/</b>

Inclusions	Nos.	Unit Load (W) [DC]	Total Load (W)	Hours of use per day	Energy Consumption (kWh/day)
A.C. operated LED Lights	3	8	24	6	0.144
A.C. operated LED Lights	2	5	10	6	0.060
Power for A.C. Fan and or Power for A.C. Loads like Color TV, Set top/ PC and Mobile Charger etc.	1	50	50	10	0.500
<b>Total</b>					<b>0.704</b>

### **PROPOSED SCHEME:**

- MNRE may provide subsidy at the rate of 40%.through NCEFA network of local technicians will have to be created for service and repair.
- Some local agencies / NGO's will have to be involved to ensure upkeep and proper use through awareness and training of users.
- The beneficiary may be asked to keep some fixed amount as “Reserves” like for battery replacement in future



ANNEXURE – 6

Table 44: Year-wise Projection of Power Purchase/Availability (in MU)

Source	Type	Capacity (MW)	Latest Firm Entitlement		Energy Availability in MU			
			%	MW	FY 16	FY 17	FY 18	FY 19
<b>Availability Within State</b>								
<b>Own Generating Stations thermal</b>								
RTPS-1	Coal	210.00	100%	210.00	1214	1214	1214	1214
RTPS-2	Coal	210.00	100%	210.00	1254	1254	1254	1254
RTPS-3	Coal	210.00	100%	210.00	1338	1338	1338	1338
RTPS-4	Coal	210.00	100%	210.00	1379	1379	1379	1379
RTPS-5	Coal	210.00	100%	210.00	1358	1358	1358	1358
RTPS-6	Coal	210.00	100%	210.00	1409	1409	1409	1409
RTPS-7	Coal	210.00	100%	210.00	1218	1218	1218	1218
RTPS-8	Coal	250.00	100%	250.00	733	733	733	733
BTPS-1	Coal	500.00	100%	500.00	2436	2436	2436	2436
BTPS-2	Coal	500.00	100%	500.00	2558	2558	2558	2558
BTPS U-3	Coal	700	100%	700.00		4899	4899	4899
YTPS U-1	Coal	800	100%	800.00		5599	5599	5599
YTPS U-2	Coal	800	100%	800.00			5599	5599
YCCP	Gas	350	100%	350.00				2450
Bidadi	Gas	350	100%	350.00				2450
<b>Own Generating Stations thermal</b>		<b>5720</b>		<b>5720</b>	<b>14897</b>	<b>25395</b>	<b>30994</b>	<b>35894</b>
<b>Own Generating Stations hydro</b>								
Lingnamakki	Hydro	55	100%	55.00	250	250	250	250
Sharavathy	Hydro	1,035	100%	1035.00	5147	5147	5147	5147
Gerusoppa	Hydro	240	100%	240.00	540	540	540	540
Supa DPH	Hydro	100	100%	100.00	444	444	444	444
Kalinadi (NPH)	Hydro	885	100%	885.00	3177	3177	3177	3177
Kodasali	Hydro	120	100%	120.00	374	374	374	374
Kadra	Hydro	150	100%	150.00	392	392	392	392
MANI DAM PH	Hydro	9	100%	9.00	28	28	28	28
Varahi	Hydro	460	100%	460.00	1102	1102	1102	1102
Almatti Dam	Hydro	290	100%	290.00	469	469	469	469
Ghatprabha	Hydro	32	100%	32.00	64	64	64	64
Bhadra	Hydro	39	100%	39.20	49	49	49	49
MGHE (Jog)	Hydro	139	100%	139.20	337	337	337	337
Shivasamudram	Hydro	42	100%	42.00	217	217	217	217
Munirabad	Hydro	28	100%	28.00	104	104	104	104
SHIMSHAPUR PH	Hydro	17	100%	17.20	83	83	83	83
Mini Hydro	Hydro	11	0%	0.00	0	0	0	0
Kalinadi (NPH) U-6	Hydro	15.00	100%	15	58	58	58	58
MBD Unit-4	Hydro	10.00	100%	10	39	39	39	39

Source	Type	Capacity (MW)	Latest Firm Entitlement		Energy Availability in MU			
			%	MW	FY 16	FY 17	FY 18	FY 19
<i>Ghatprabha additional</i>	Hydro	20.00	100%	20			77	77
<b>Own Generating Stations hydro</b>		<b>3697.35</b>		<b>3686.60</b>	<b>12873</b>	<b>12873</b>	<b>12950</b>	<b>12950</b>
<b>Private Generating Stations</b>								
<i>UPCL</i>	Coal	1200.00	90%	1080.00	5817	5817	5817	5817
<b>Private Generating Stations</b>		<b>1200.00</b>		<b>1080.00</b>	<b>5817</b>	<b>5817</b>	<b>5817</b>	<b>5817</b>
<b>Renewable Energy Sources</b>								
<b>NCE</b>	Other RE	4874.00	100%	4874.00	5203	5203	5203	5203
<b>New</b>	Other RE			0.00	0	0	0	0
<b>Wind</b>	Other RE	1700	100%	1700.00	420	867	1314	1787
<b>Small hydro</b>	Other RE	425	100%	425.00	105	210	315	447
<b>Biomass</b>	Other RE	290	100%	290.00	68	147	226	305
<b>Co Gen</b>	Other RE				0	0	0	0
<b>Solar</b>	Other RE	3000	100%	3000.00	263	526	2102	3154
	Other RE		100%	0.00		0	0	0
<b>Wind state owned</b>	Other RE	4.50	100%	4.50	10	10	10	10
<b>Solar state owned</b>	Solar	24.00	100%	24.00	17	17	17	17
<b>Wind state owned new</b>	Other RE	62.00	100%	62.00			141	141
<b>Solar state owned new</b>	Solar	10.00	100%	10.00			7	7
<b>Renewable Energy Sources</b>		<b>10389.5</b>		<b>10389.5</b>	<b>6086.8</b>	<b>6980.4</b>	<b>9336.1</b>	<b>11070.63</b>
<b>Central Generating Stations</b>								
KAIGA	Nuclear	880	30%	264.00	1828	1828	1828	1828
Kudgi Unit 1	Coal	800	50%	400.00		2770	2770	2770
Kudgi Unit 2	Coal	800	50%	400.00		1385	2770	2770
Kudgi Unit 3	Coal	800	50%	400.00			2770	2770
<b>Central Generating Stations</b>		<b>0.00</b>		<b>1464.00</b>	<b>1828</b>	<b>5983</b>	<b>10138</b>	<b>10138</b>
<b>Availability Within State</b>		<b>23407</b>	<b>101%</b>	<b>23940.1</b>	<b>41503</b>	<b>57050</b>	<b>69238</b>	<b>87070</b>
<b>Availability Outside State</b>								
<b>Shared Generating Stations</b>								
<i>Jurala</i>	Hydro	234.00	50.00%	117.00	410	410	410	410
<i>TBHE</i>	Hydro	70.00	20.00%	14.00	49	49	49	49
<b>Shared Generating Stations</b>		<b>304.00</b>		<b>131.00</b>	<b>459</b>	<b>459</b>	<b>459</b>	<b>459</b>
<b>Central Generating Stations</b>								
NTPC-Ramagundam: Stage-I & II	Coal	2100	20.00%	420.00	2874	2874	2874	2874
Ramagundam: Stage-III (1x500MW)	Coal	500	21.00%	105.00	727	727	727	727
Talcher: Stage-II	Coal	2000	18.40%	368.00	2548	2548	2548	2548
Simhadri: Stage-II	Coal	1000	22.00%	220.00	1452	1452	1452	1452
NLC;TPS-II:Stage-I	Coal	630	22.00%	138.60	915	915	915	915
NLC;TPS-II:Stage-II	Coal	840	22.00%	184.80	1280	1280	1280	1280
NLC;TPS-I:Exp	Coal	420	25.00%	105.00	778	778	778	778
Vallur STPS Unit 1&2	Coal	1000	10.00%	100.00	611	611	611	611
NPCIL;MAPS	Nuclear	440	8.00%	35.20	232	232	232	232
Kudankulam (2x1000MW)	Nuclear	2000	11.00%	220.00	1523	1523	1523	1523
NLC New TPP unit-1	Coal	500	7.00%	35.00			105	209

Source	Type	Capacity (MW)	Latest Firm Entitlement		Energy Availability in MU			
			%	MW	FY 16	FY 17	FY 18	FY 19
NLC New TPP unit-2	Coal	500	7.00%	35.00				209
Kudamkulam unit-2	Nuclear	1000	22.00%	220.00		1193	1193	1193
Kalpakkam PFBR	Nuclear	500	17.00%	85.00			461	461
DVC	Coal			450.00	3043	3043	3043	3043
<b>Central Generating Stations</b>		<b>13430</b>	<b>20.27%</b>	<b>2721.60</b>				<b>18055</b>
<b>Availability Outside State</b>		<b>13734</b>	<b>21%</b>	<b>2852.60</b>	<b>16443</b>	<b>17635</b>	<b>18201</b>	<b>18515</b>
<b>Grand Total</b>		<b>37141</b>	<b>72%</b>	<b>26792.7</b>	<b>57946</b>	<b>74685</b>	<b>87438</b>	<b>105585</b>

**Table 45: Year-wise Projection of Category-wise Revenue (In Rs Crores) – Base Case**

Revenue Billed (Rs Crores)	2015-16	2016-17	2017-18	2018-19
LT-1 BhagyaJyoti, KutirJyoti	394	515	666	833
LT 2a (ii) Rural	927	1,215	1,572	1,973
LT 2a (i) Urban	4,438	5,529	6,747	8,120
LT 2b (i) Educational Institute	42	49	55	62
LT 2b (ii) Educational Institute	9	11	13	15
LT 3(i) Commercial	2,008	2,362	2,728	3,119
LT 3(ii) Commercial	341	431	536	660
LT 4 (a) IP < 10 HP	6,857	8,047	9,272	10,586
LT 4 (b) IP > 10 HP	11	14	17	21
LT 4 (c) i	3	4	4	4
LT 4 (c) ii	2	3	4	4
LT Industrial	1,182	1,323	1,452	1,579
Water Supply (LT)	658	752	843	936
Public Lightening	558	636	711	788
Temporary Supply	341	409	480	559
HT-1 Water Supply	568	652	736	822
HT 2 (a) Industrial	5,610	6,440	7,258	8,104
HT 2 (b) Commercial	2,801	3,188	3,562	3,943
HT 2 © (i) Government Hospital and Educational	102	111	117	123
HT 2 © (ii) Hospital and Educational	107	116	123	129
HT 3 (a) (i) Lift Irrigation Government	76	97	124	159
HT 3 (a) (ii) Lift Irrigation Private	5	6	7	8
HT 3 (b) Horticulture and Others	1	1	2	2
HT-4 Residential Apartments	140	159	177	196
HT-5 Temporary Supply	113	127	141	155
<b>Total</b>	<b>27,295</b>	<b>32,197</b>	<b>37,346</b>	<b>42,904</b>

ANNEXURE – 7

Table 46: Roll Out Plan Distribution (Capacity Augmentation) – 33 kV Substations (in MVA)

Sl. No.	FY 2013-14	Proposed capacity addition					Total Capacity by FY 19
		FY 2014-15	FY 2015-16	FY 2016-17	FY 2017-18	FY 2018-19	
<b>BESCOM</b>							
1	Not Applicable						
<b>CESC</b>							
1	127	127	-	-	-	-	-
<b>GESCOM</b>							
1	2528.09	2528.09	126.40	252.81	379.21	505.62	3792.14
<b>Total</b>	<b>2528.09</b>	<b>2528.09</b>	<b>126.40</b>	<b>252.81</b>	<b>379.21</b>	<b>505.62</b>	<b>3792.14</b>
<b>HESCOM</b>							
1	3192.34	0	15	12	10	10	3239.34
<b>Total</b>	<b>3192.34</b>	<b>0</b>	<b>15</b>	<b>12</b>	<b>10</b>	<b>10</b>	<b>3239.34</b>
<b>MESCOM</b>							
1	692.311	0	36	33	32	30	823.311
<b>Total</b>	<b>692.311</b>	<b>0</b>	<b>36</b>	<b>33</b>	<b>32</b>	<b>30</b>	<b>823.311</b>
<b>Hukkeri</b>							
1	-	-	-	-	-	-	-

Table 47: Roll Out Plan Distribution (Capacity Augmentation) –11 kV Lines (in Ckt. Km)

Sl. No.	Existing (Ckt Km)	Proposed capacity addition (Ckt. Km)					Total Capacity by FY 19 (Ckt Km)	
		FY 2013-14	FY 2014-15	FY 2015-16	FY 2016-17	FY 2017-18		FY 2018-19
<b>BESCOM</b>								
<b>Total</b>		<b>1</b>	<b>82291.34</b>	<b>3965.13</b>	<b>4361.69</b>	<b>4797.8</b>	<b>5277.58</b>	<b>5805.39</b>
<b>CESC</b>								
1	NR Mohalla	875	49	70	74	76	76	1220
2	VV Mohalla	1030	41	44	45	45	45	1249
3	Nanjangudu	2670	234	229	238	241	248	3860
4	Hunsur	4378	305	609	669	710	702	7373
5	Chamarajanagar	3044	414	520	567	595	610	5750
6	Kollegal	2130	431	527	591	632	657	4969
7	Madikeri	3101	129	136	139	140	141	3786
8	Mandya	1147	136	94	96	95	101	1667
9	Maddur	2994	319	253	260	261	273	4360
10	Pandavapura	4051	608	781	861	911	934	8147
11	Nagamangala	1524	143	329	380	420	412	3209
12	Hassan	3856	1196	985	1061	1087	1197	9382
13	CR Patna	2514	71	124	129	131	131	3101
14	HN Pura	2085	1007	832	920	957	1089	6891
15	Arasikere	2094	80	206	221	232	228	3061
<b>Total</b>		<b>37493</b>	<b>5165</b>	<b>5739</b>	<b>6250</b>	<b>6534</b>	<b>6844</b>	<b>68024</b>
<b>GESCOM</b>								
<b>Total</b>		45131.79	4650.16	4882.67	5115.18	5347.69	5580.19	25575.89
<b>HESCOM</b>								
<b>Total</b>		<b>60619</b>	<b>2477</b>	<b>80</b>	<b>75</b>	<b>50</b>	<b>50</b>	<b>63351</b>
<b>MESCOM</b>								
1		<b>28356.5</b>	<b>1687.71</b>	<b>1200</b>	<b>1500</b>	<b>1500</b>	<b>1500</b>	<b>35744.23</b>
<b>Hukkeri</b>								
1	-	-	-	-	-	-	-	-
<b>Total</b>	-	-	-	-	-	-	-	-

**Table 48: Roll Out Plan Distribution (Capacity Augmentation) – LT Lines (in Ckt. Km)**

Sl. No.		Existing (Ckt Km)	Proposed capacity addition (Ckt. Km)					Total Capacity by FY 19 (Ckt Km)
			FY 2013-14	FY 2014-15	FY 2015-16	FY 2016-17	FY 2017-18	
<b>BESCOM</b>								
<b>Total</b>		<b>158464</b>	<b>2721</b>	<b>2585.9</b>	<b>2456.14</b>	<b>2333.33</b>	<b>2216.66</b>	
<b>CESC</b>								
<b>1</b>	NR Mohalla	2339	33	44	45	46	47	2555
<b>2</b>	VV Mohalla	3424	26	39	40	40	41	3610
<b>3</b>	Nanjangudu	5913	158	138	141	144	147	6641
<b>4</b>	Hunsur	7712	120	171	175	178	182	8538
<b>5</b>	Chamarajanagar	5808	103	98	100	101	103	6314
<b>6</b>	Kollegal	5936	135	138	142	145	148	6643
<b>7</b>	Madikeri	5810	116	180	186	191	197	6681
<b>8</b>	Mandya	3224	63	44	45	45	46	3467
<b>9</b>	Maddur	7262	338	249	257	266	274	8647
<b>10</b>	Pandavapura	6117	157	254	265	275	287	7356
<b>11</b>	Nagamangala	1704	95	134	144	155	166	2397
<b>12</b>	Hassan	5687	257	179	184	190	195	6692
<b>13</b>	CR Patna	4694	28	53	54	55	55	4939
<b>14</b>	HN Pura	5118	202	110	112	114	117	5772
<b>15</b>	Arasikere	2526	12	42	43	43	44	2710
<b>Total</b>		<b>73275</b>	<b>1842</b>	<b>1875</b>	<b>1931</b>	<b>1990</b>	<b>2050</b>	<b>82963</b>
<b>HESCOM</b>								
<b>Total</b>		<b>110115</b>	<b>2169</b>	<b>125</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>112709</b>
<b>MESCOM</b>								
<b>Total</b>		<b>73414.1</b>	<b>1931.9</b>	<b>1200.00</b>	<b>1500.00</b>	<b>1500.00</b>	<b>1500.00</b>	<b>81046.1</b>
<b>GESCOM</b>								
<b>Total</b>		<b>78855.6</b>	<b>81727</b>	<b>3014.90</b>	<b>3158.47</b>	<b>3302.04</b>	<b>3445.60</b>	<b>94648.0</b>

**Table 49: Roll Out Plan Distribution (Capacity Augmentation) – Distribution Transformers (in MVA)**

Discom	FY 2014-15 - (MVA) Existing	FY 2015-16- (MVA)	FY 2016-17- (MVA)	FY 2017-18- (MVA)	FY 2018-19 - (MVA)
<b>BESCOM</b>	1200	1221	1295	1385	1481
<b>GESCOM</b>	4288.55	176.46	184.86	193.27	193.27
<b>HESCOM</b>	7421.534	95	64.51	34	34
<b>MESCOM</b>	3036	210	230	245	260
<b>CESC</b>	4336	165	165	165	165
<b>Total</b>	<b>20282</b>	<b>1867</b>	<b>1939</b>	<b>2022</b>	<b>2133</b>

The concerned officials of the Discoms at division level should be apprised about their individual targets and effective and robust monitoring mechanism is required to be evolved and put in place to achieve these targets.