



# 24X7 POWER FOR ALL UTTARAKHAND

A Joint Initiative of Government of India and  
Government of Uttarakhand





Government of India



**Piyush Goyal**

**Union Minister of State (IC)  
Power, Coal, New & Renewable Energy**

## **Foreword**

Electricity consumption is one of the most important indices that decide 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 Uttarakhand 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 Uttarakhand and wish them all the best for implementation of this programme. The Government of India will complement the efforts of Government of Uttarakhand in bringing uninterrupted quality power to each household, farmer, small & medium enterprises and establishment in the state.



**Harish Rawat**  
Chief Minister of Uttarakhand



उत्तराखण्ड शासन

Government of  
Uttarakhand

## Foreword

Uttarakhand, since the day of its inception is known as the “Urja Pradesh, Energy State”. Electricity is critical to the livelihood of almost everyone and essential in pursuit of life. Dependable electricity is essential to the bottom line of industrial and commercial businesses, as well as a necessity for the productivity and comfort of residential customers.

The verve of Uttarakhand is testimony to the fact that despite being severely affected by one of the worst natural calamities in June, 2013, causing widespread mass destruction & damage to the public property especially to the electrical establishment across the State, its distribution company ‘Uttarakhand Power Corporation Ltd.’ restored the electrical system at the earliest, has been accredited with category “A” for 2014, earned an operating profit of Rs. 68.24 Cr. (8 paisa per unit) in FY 14 and already has much lesser AT&C losses i.e. 18.50% compared to the target of 20.18% finalised by Govt. of India for FY 15.

In the light of above, I would like to thank and congratulate Government of India, for selecting Uttarakhand for implementation of 24x7 “Power For All” programme. At Uttarakhand we are continuously meeting more than 96% of our demand and offering one of the lowest tariffs in the country for almost all categories of consumers.

The present performance of power utilities of Uttarakhand convince me that we will certainly accomplish the target level of 14% AT&C losses earlier than the timeframe of FY 20, finalised by Govt. of India. As we are supplying reliable and affordable power to our consumers at present, the

programme of 24x7 “Power For All” will definitely add quality to it.

The programme will focus on harnessing the untapped potential of Renewable Energy Resources available in abundance in the state, bridging the gaps of transmission constraints and efficient use of available power at distribution end. Plenty of ‘sunshine’ is also available in ‘DEV BHOOMI’ Uttarakhand. The programme must also look for these Renewables to lit-up lamp in far flung inaccessible regions of hilly terrain and international border areas, where extending the grid is difficult and uneconomical also. I strongly believe the programme must redress the issues of reduction of AT&C losses, bridging the gap between ACS & ARR as well as customer centric initiatives for ultimate customer satisfaction. Availability of power and access to it will definitely bring upon a change in the socio-economic environment of rural hilly areas which is very important to check migration of population from hills.

I am optimistic that this 24x7 “Power For All” document prepared after several round of rigorous, strenuous meetings and negotiations between personnel at State and Central level, chaired by senior officers of Ministry of Power. This will play pivotal role and pave way forward for accomplishing Uttarakhand Government’s commitment and preparedness towards maintaining the status of Uttarakhand as a power-cut free state for providing every citizen access to 24x7 reliable, quality and affordable power supply, with cooperation from the Central Government.



Government of India



उत्तराखण्ड शासन

Government of Uttarakhand

## Joint Statement

Uttarakhand is third state in the country selected for '24x7 Power for All' (PFA) programme. This programme will be implemented by Government of Uttarakhand (GoU) with active support from Government of India with the objective to connect the unconnected in phased manner by FY 18, ensure 24x7 quality, reliable and affordable power supply to all Domestic, Commercial Agriculture and Industrial consumers within a fixed time frame.

Government of Uttarakhand is attaching highest priority to power sector and power supply position is been reviewed by the State Cabinet on periodic basis and is committed to provide full support to all utilities for ensuring quality power supply.

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

  
**Jyoti Arora, IAS**

Joint Secretary  
Ministry of Power (GoI)

Government of India (GoI) would supplement the efforts of Government of Uttarakhand by fast tracking resolution of key issues pertaining to generation, expediting the additional interstate connectivity 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 in a phased manner and provide 24x7 power supply to all domestic, agriculture industrial and commercial consumers for all connected households from FY 16 itself and to all un-connected households by FY 18.

However Government of Uttarakhand 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 4 years and would strive to achieve the objectives of the programme by taking the necessary steps as envisaged in the PFA document.



**Dr. Umakant Panwar, IAS**

Secretary, Energy & Non-conventional Energy,  
Government of Uttarakhand



## EXECUTIVE SUMMARY

24x7- Power for All (24x7 PFA) 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 entity and adequate power to agriculture farm holdings by FY 19. This roadmap document aims to meet the above objectives for the state of Uttarakhand.

Uttarakhand is one of the few states in India which not only have high hydro potential of 18,175 MW but also have higher per capita consumption than the national average of 1000 kWh. (Per capital consumption of the state has steadily grown from 1,012 kWh in FY 12 to 1,154 kWh in FY 15)

### CONNECTING THE UNCONNECTED

The state has already completed the RGGVY scheme. However, according to recent survey undertaken by the state, 1,00,407 households in rural areas are still un-electrified, whereas there are no un-electrified households in urban areas.

The state has planned to electrify 54,015 identified un-electrified households under the DDUGJY scheme of GoI and 2,229 households through off-grid solutions. The balance 44,163 households will be identified within next 6 months and a plan would be prepared to electrify the same by 2018 under DDUGJY/ State Plan

### FEEDER SEGREGATION

The state has proposed an outlay of Rs 479 Crores in the DDUGJY for segregation of agricultural feeders, which will be implemented judiciously by the state.

### 24 X 7 SUPPLY

The state is already supplying power to the extent of almost 24 hours in urban areas, 22-24 hours in rural areas and 19-22 hours to the industries.

However, with planned additional link connecting Uttarakhand to the Northern Grid, the import capability from Northern grid will increase and the state will not have to resort to unscheduled load restrictions.

The state will endeavor to ensure 24 hours supply from FY 16 itself.

### GROWTH IN DEMAND

In order to achieve the objective of 24 x 7 supply in the state, the state would see an increase in peak demand from 1,930 MW at present to 2,845 MW in FY 19 with corresponding increase in energy requirement from 12,617 MU in FY 15 to 18,062 MU in FY 19.

In the present conditions, the peak demand of 1930 MW in FY 15 was fully met owing to the availability of a large hydro-power capacity in the state.

The future demands have been derived by estimating the urban and rural household consumption after taking into account the growth in number of electrified households on the one hand and the growth in average consumption per household on the other hand. Individual category-wise growth rate equivalent to the 5 year CAGR has been considered for other than domestic sectors.

### SUPPLY ADEQUACY

The present firm availability of the state is 2,361 MW (excluding share from unallocated quota).

Historically, the state has to depend on short term procurement of power to the tune of 25% of its total energy requirement.

In order to meet the increasing demand, the state has already planned additional capacity availability of 1,035 MW through own generating stations, renewable energy sources and central generating stations in a phased manner by FY 19 by investing Rs 3,666 Crores (for own generation and renewable energy sources).

However, even with the availability of additional capacity, the state would still be facing a shortfall of 23-30% in terms of energy availability from FY 16 – FY 19, for which the state would progressively plan to tie-up additional power on short as well as medium/long term basis. The plan includes procurement of about 335 MW of firm power through competitive bidding and options for purchasing short term power through power exchange and other short term/medium term tie ups.

The state will also ensure the enhanced availability from their own existing stations, which have outlived their useful life, by undertaking RM&U worth Rs 982 Crores.

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#### ADEQUACY OF TRANSMISSION NETWORK

The existing ISTS transmission line capacity and transformation capacity is adequate for meeting the present requirements.

The transmission schemes planned in the state would increase the present transformation capacity by 5,180 MVA resulting in an overall transformation capacity of 13,698 MVA (both inter-state as well as intra-state).

The existing intra/ inter-state transmission system with the planned investment of Rs 4,702 Crores towards capacity addition would be adequate to meet the requirement as envisaged for 24x7 PFA.

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#### ADEQUACY OF DISTRIBUTION NETWORK

The ongoing R-APDRP scheme (covering 31 towns in Uttarakhand) is expected to be completed by Oct'16 (except Dehradun-Mar'17).

The state has proposed a requirement of capital expenditure of Rs. 706 Crores in IPDS and Rs. 3,433 Crores in DDUGJY for feeder segregation, providing access to all rural households, system strengthening and network upgradation, through a planned capacity addition of 1200 MVA at 33/11 kV level, 1235 MVA at DT level and creation of additional network of 1987 CKM, 5344, CKM and 7729 CKM of 33 kV, 11 kV and LT lines respectively.

The existing distribution network with projected addition would be adequate under projected peak load conditions but the state has to take necessary steps to complete the planned works within scheduled time period

The T&D Losses are also projected to be reduced to 13.70% by FY 19 from present level of 17.61% and AT&C to 14% by FY 19 from the present level of 20%.

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#### CLEAN ENERGY AND ENERGY EFFICIENCY

The State has also notified policies/schemes for promotion of clean energy and energy efficiency measures in the state. The state plans to add 345 MW of renewable energy plants and to save 358.64 MU by FY 19.

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#### FINANCIAL TURNAROUND

Although, UPCL is showing a net profit of Rs 323 Crores during FY 14 but due to historic accumulation of losses, the accumulated financial losses of UPCL stands as Rs 1695 Crores in FY 14. The accumulated financial losses may reduce to Rs. 305.23 Crores in the FY 19 from Rs. 1,695 Crores in FY 14 in normal circumstances but UPCL may achieve financial turnaround by FY 19 through a nominal tariff hike of 1.7% in FY 17.

On the basis of above considerations, a roadmap to achieve '24x7 Power for All' targets has been formulated and detailed in the report.

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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 the country and economic empowerment of the common man.

Under the Indian Constitution, electricity is a concurrent subject. As per Electricity Act 2003, it is the duty of a distribution licensee to develop and maintain an efficient, coordinated and economical distribution system in the mandated area of supply as well as to supply electricity in accordance with the provisions 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 Uttarakhand (GoU) with the objective to make 24x7 power available to all households, industry, commercial businesses, public needs, any other electricity consuming entity and adequate power to agriculture farm holdings.

Towards this goal the 24x7 PFA initiative seeks to:

- i. Ensure reliable 24x7 supply to consumers within a period of four years of commencement of the program. 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 19.
- 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 reliable supply.
- viii. Identify steps for monitoring timely commissioning of various generating plants, 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.

**An Action plan has been drawn to achieve the above aims and objectives. The plan will be executed by the State Government 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:

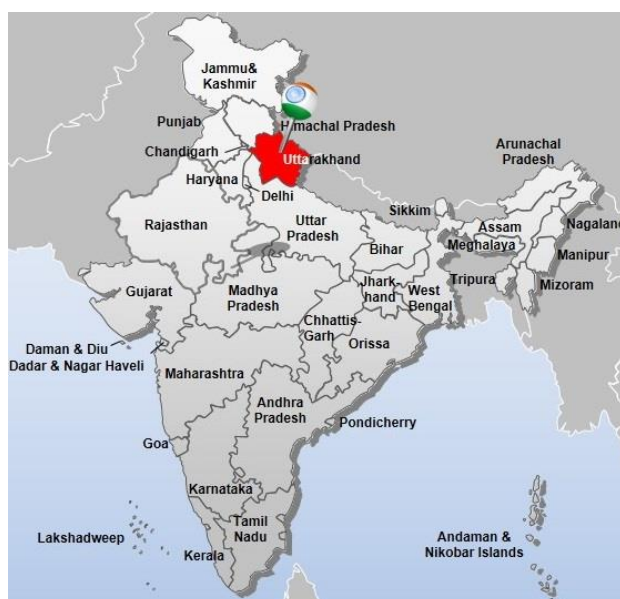
- (1) bridging the gap between the demand and supply for the already identified/registered consumers and other consuming entities,
- (2) connecting the unconnected households and unconnected farm holdings.

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

- 1) Projection of average per day consumption of rural and urban households based on respective historical compounded annual growth rates (CAGR) during the past five years.
- 2) Projection of demand 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 for additional procurement required.
- 6) Assess the additional energy requirement for providing 24x7 power supply to all households in the state as well as other consumer categories, financial implications on utilities for procuring additional energy and per unit 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) Conduct sensitivity analysis for cost of service and resulting Financial Gap under multiple scenarios on various parameters namely, tariff hike, reduction in power procurement cost, and increase in interest and moratorium period, AT&C loss reduction, etc
- 9) 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 UTTARAKHAND



Key Facts <sup>1</sup>	
Constituted on	9 <sup>th</sup> November 2000
<b>As per 2011 Census</b>	
<b>Total Area</b>	<b>53483 Sq. Km</b>
- Hilly Terrain	46035 Sq. Km (86%)
- Plain	7448 Sq. Km (14%)
- Forest cover	34651 Sq. Km (65%)
- Rural Areas	52,581 Sq. Km (98.31%)
- Urban Areas	902 Sq. Km (1.69%)
Administrative Districts	13
No. of Villages	16793
- Inhabited villages	- 15745
- Uninhabited villages	- 1048
<b>Population</b>	<b>1,00,86,292</b>
- Rural	- 70,36,954
- Urban	- 30,49,338

In accordance with the provisions of the Uttar Pradesh Reorganization Act 2000 (Act 29 of 2000), enacted by the Parliament of India on 25<sup>th</sup> August 2000, the state of Uttaranchal came into existence on 9<sup>th</sup> November 2000 as the 27<sup>th</sup> state of India, when it was carved out of northern Uttar Pradesh.

The state has literacy levels higher than the national average and has abundant availability of quality human resources. Within a short span of its existence, Uttarakhand has emerged as a significant destination for investments in manufacturing industry, tourism and infrastructure. Emphasis is on stimulating all the three sectors of its economy (agriculture, industry and services), to grow to their fullest potential in keeping with the geographic profile of the state. The Government of Uttarakhand has undertaken several policy measures and incentives to encourage inflow of investment into different sectors of its economy.

The area profile of districts is summarized in Table 40 in Annexure – 1. Further, the district wise population details as per 2011 Census is summarized in Table 41 in Annexure – 1.

As per the provisions of Electricity Act 2003, there are independent unbundled utilities operational in state namely:

1. Generating Company - Uttarakhand Jal Vidyut Nigam Limited (UJVNL)
2. Transmission Company - Power Transmission Corporation of Uttarakhand Limited (PTCUL)
3. Distribution Company - Uttarakhand Power Corporation Limited (UPCL)

The power sector of state is regulated by Uttarakhand Electricity Regulatory Commission (UERC).

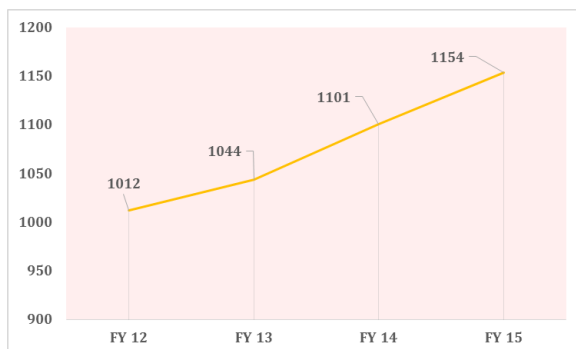
<sup>1</sup>Source: Official Website of Uttarakhand [www.uk.gov.in](http://www.uk.gov.in)

## CHAPTER 3: CONSUMPTION PATTERN AND ELECTRIFICATION STATUS

### ELECTRIFICATION STATUS AND PER-CAPITA CONSUMPTION

The population of Uttarakhand has grown from 84,89,349 in 2001 to 1,00,86,292 in 2011 at the decadal CAGR of 1.74%. This growth rate has been considered for estimating the population beyond 2011. Considering the annual energy availability from FY 12 to FY 15, the per-capita consumption of electricity is summarized below:

**Figure 1: Per-Capita Consumption of Electricity (kWh per person) in recent years**



- The per-capita consumption has grown at a CAGR of 4.46%.

### STATUS OF ELECTRIFICATION AND PROJECTION OF HOUSEHOLDS FOR FY 14

District-wise electrification in urban and rural areas is detailed in Table 42 in Annexure-2.

The summary of electrified and un-electrified households as per 2001 and 2011 census and projections for FY 14 based on CAGR for past 10 years is tabulated below:

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

Particulars	Electrified Households	Un-Electrified Households	Total Households
<b>Total</b>			
2001	9,56,995	6,29,326	15,86,321
in %	60.33%	39.67%	100%
2011	17,38,175	2,58,893	19,97,068
in %	87.04%	12.96%	100%
CAGR	6.15%	-8.50%	2.33%
<b>FY 14 (Projected Households)</b>	<b>19,60,326</b>	<b>1,34,210</b>	<b>20,94,536</b>
<b>Rural</b>			
2001	6,02,255	5,93,902	11,96,157
in %	50.35%	49.65%	100%
2011	11,66,756	2,38,089	14,04,845
in %	83.05%	16.95%	100%
CAGR	6.84%	-8.74%	1.62%
<b>FY 14 (Projected Households)</b>	<b>13,31,742</b>	<b>1,19,021</b>	<b>14,50,763</b>
<b>Urban</b>			
2001	3,54,740	35,424	3,90,164
in %	90.92%	9.08%	100%
2011	5,71,419	20,804	5,92,223
in %	96.49%	3.51%	100%
CAGR	4.88%	-5.18%	4.26%
<b>FY 14 (Projected Households)</b>	<b>6,28,584</b>	<b>15,189</b>	<b>6,43,773</b>

From above it is inferred that:

- 70% of the households are in rural areas and 30% are in urban areas.
- 87% households are electrified of which Dehradun district has the highest electrification of 96.29% and Champawat district has the lowest electrification of 72.05%.
- 96.5% of households in urban areas are electrified whereas 83% of households in rural areas are electrified.
- Overall number of households has grown at a decadal CAGR of 2.33%.

- *The decadal CAGR of urban households is 4.26% and the decadal CAGR of rural households is 1.62%.*
- *There has been a rapid decrease in un-electrified households during the past 10 years i.e. (2001 to 2011) which indicates that the State Distribution utility has taken measures to electrify un-electrified households during this period.*

The above projected figures does not match with records of state (UPCL) for FY 14 which shows a different position. The following table gives the projected number of households based on Census 2011 and as per UPCL records.

**Table 2: Census 2011 vs. UPCL's Household Data for Uttarakhand (Numbers)**

Particulars	Electrified Household	Un-Electrified Households	Total Households
<b>Total</b>			
FY 14 (Based on Census)	19,60,326	1,34,210	20,94,536
FY 14 (as per UPCL)	15,60,683	1,00,407	16,61,090
<b>FY 14 (Final Consideration)</b>	<b>19,94,129</b>	<b>1,00,407</b>	<b>20,94,536</b>
<b>Rural</b>			
FY 14 (Based on Census)	13,31,742	1,19,021	14,50,763
FY 14 (as per UPCL)	8,42,288	1,00,407	9,42,695
<b>FY 14 (Final Consideration)</b>	<b>12,75,734</b>	<b>1,00,407</b>	<b>13,76,141</b>
<b>Urban</b>			
FY 14 (Based on Census)	6,28,584	15,189	6,43,773
FY 14 (as per UPCL)	7,18,395	0	7,18,395
<b>FY 14 (Final Consideration)</b>	<b>7,18,395</b>	<b>0</b>	<b>7,18,395</b>

Following variations were observed in figures submitted by UPCL and census projections:

- a) There is a difference of 4,33,446 electrified households between census projections and UPCL's records.

- b) As per census projections, there are 13,31,742 electrified households in rural areas and 6,28,584 electrified households in urban areas. However, as per UPCL records, there are 8,42,288 electrified households in rural areas and 7,18,395 electrified households in urban areas.
- c) As per census projections, there are 1,19,021 un-electrified households in rural and 15,189 un-electrified households in urban areas. However, as per UPCL records, there are 1,00,407 un-electrified households in rural areas and Nil un-electrified households in urban areas.

This anomaly/discrepancy in figures was discussed with UPCL.

It was explained by UPCL that:

- a) Variation in total households is due to fact that more than one households (in same premises) are being served from common electric connection and there are households that are not drawing power through regular/legal connections.
- b) The census criteria for distinguishing rural and urban households differ from their own criteria as the utility considers a rural household as urban if it comes under urban electricity distribution division. So the number of urban domestic households as per UPCL is greater than the number projected as per census.
- c) The figures of un-electrified households are based on a recent survey and are being considered for rural electrification programs. According to the survey, all urban consumers have already been electrified.

The issue of demand projections for future years was discussed with the state. For the projection of daily household consumption (for the estimation of demand) of both rural and urban consumers in future years, following methodology has been adopted:

- (1) The figures of the urban households in FY 14 as given by UPCL has been considered. The number of un-electrified households in urban area has been taken as nil as per UPCL.
- (2) The figures of un-electrified households in rural areas has been taken at

1,00,407 as per UPCL. To arrive at the existing electrified rural households, the total urban households and the un-electrified rural households have been reduced from the overall households projected for FY 14 based on Census.

Based on the above, the number of electrified and un-electrified households in urban and rural areas of Uttarakhand in FY 14 have been arrived at. Accordingly, the demand projections for the state have been worked out in the next chapter.

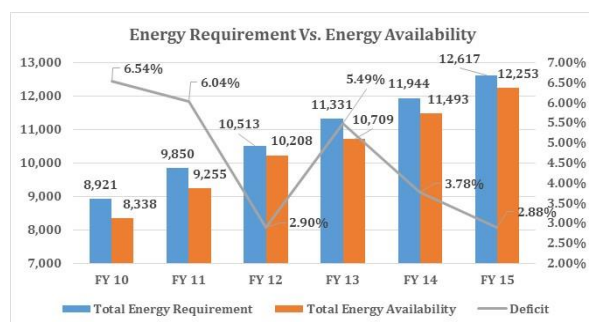


## CHAPTER 4: DEMAND AND SUPPLY SCENARIO

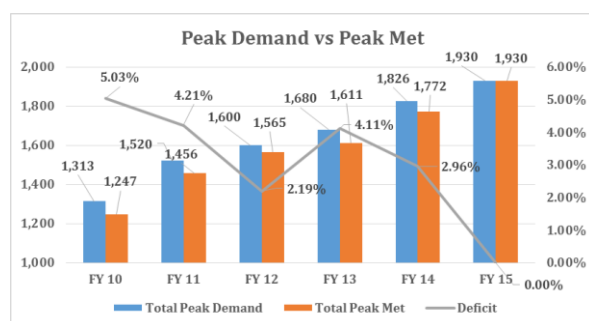
### PRESENT POWER SUPPLY POSITION

The actual energy and demand scenario during the past 6 years is shown below:

**Figure 2: Energy Requirement vs. Availability<sup>2</sup> (in MU)**



**Figure 3: Peak Demand vs. Peak Met (in MW)**



- *The deficit is being progressively bridged by UPCL.*

During the past few years, a number of Central Generating Stations in which Uttarakhand has a share and also State/Private Sector Generating Stations have been commissioned and the additional availability has outstripped the growth in demand resulting in reduced demand supply gap.

The key observations are as follows:

- Barring a few industries, power is generally supplied to most of the consumers through mixed feeders.
- Present energy requirement is of the order of 1000 MU/ month with demand supply gap of 3%.
- In a few towns of the tourist interest, the state supplies power almost round the clock.
- During FY 15, average hours of supply to rural areas and agriculture sector varied in the range of 22:26 to 24:00 Hours.
- The induction furnaces and the rolling mills are supplied on an average of 19:51 hours/day while the non-continuous industries get 22:38 hours of supply/day.
- The state has peak demand of about 1930 MW which was fully met during FY 15 owing to the fact that Uttarakhand is a hydro dominated state.

### DEMAND PROJECTIONS

The present energy requirement of Uttarakhand during FY 15 was 12617 MU. With 24x7 supply to be provided across the state, the demand is likely to increase. The demand can be classified in three broad categories.

- Demand on account of 24x7 power supply to already electrified and newly built domestic households
- Demand from electrification of un-electrified domestic households.

<sup>2</sup> As per the data available in the CEA

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

#### DETERMINATION OF AVERAGE GROWTH RATE IN DAILY HOUSEHOLD CONSUMPTION

The actual daily household consumption of registered domestic consumers (both urban and rural) has grown from 3.04 kWh in FY 11 to 3.70 kWh in FY 14 at CAGR of 6.72%

For determination of consumption of domestic households up to FY 19, all the 4,33,446 rural households electrified as per Census but not in UPCL records have been considered as legal multiple households sharing common electrical connection in same premises.

The broad approach is highlighted below:

- (1) The daily household consumption has been computed separately for rural and urban households for FY 14 and escalated by 7% annually to arrive at the daily household consumption up to FY 19.
- (2) The annual sales in domestic category has been arrived on consideration that the projected households in both rural and urban categories (existing as well those converted from un-electrified to electrified) would be consuming electricity at their respective projected daily household consumptions.
- (3) Sales in categories other than household have been considered to increase at the respective CAGRs of past 5 years. During discussions with the state government, it was informed that the growth in electricity consumption in Industrial sector may not be of the same order (~11%) as experienced earlier due to ending of tax holidays for the industries, but after detailed discussion, it emerged that even then the industrial growth may not be less than previous years due to various other reasons like stable power supply and cheap labour in the state.

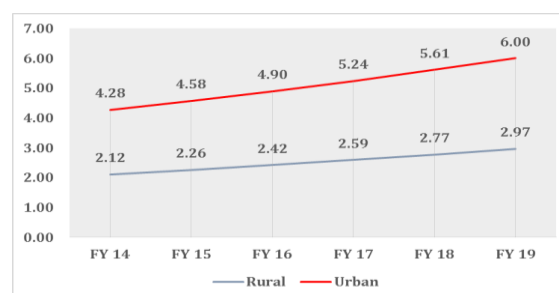
#### DETERMINATION OF CONSUMPTION OF HOUSEHOLDS (ELECTRIFIED AND UN-ELECTRIFIED)

The average daily household consumption of existing electrified rural and urban households in FY 14 has been arrived at by dividing the actual sales in rural and urban areas (as per the information provided by UPCL) by the projected number of electrified rural and urban households in FY 14 respectively.

Keeping in view the increase in supply hours in past few years and the fact that presently electricity is being supplied almost 24 hours to all domestic households, the demand of daily consumption of electricity is expected to continue to grow at a rate of 7% per year, in line with the past trend.

The projected daily household consumption in urban and rural areas is shown below:

**Figure 4: Projected Daily Household Consumption Electricity (kWh per person) for future years**



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 (which are presently at comparatively lower levels) play a significant role in determining the current and future demands.

The number of electrified households is expected to grow at the decadal CAGR of 1.62% in rural areas and at the decadal CAGR of 4.26% in urban areas.

Further, to electrify the remaining 1,00,407

households in rural areas, phasing of electrification of 20% households in FY 16, 35% in FY 17 and remaining 45% in FY 18 has been considered.

Accordingly, the annual consumption of the domestic households is tabulated below:

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

S. N.	Particulars	FY 14	FY 15	FY 16	FY 17	FY 18	FY 19
<b>A</b>	<b>Rural - Electrified Consumers (Existing + Projected Growth)</b>						
	Electrified Consumers (in Nos.)	12,75,734	12,96,415	13,17,432	13,38,789	13,60,493	13,82,548
	Daily Household Consumption (in kWh)	2.12	2.26	2.42	2.59	2.77	2.97
	Projected Annual Consumption (in MU)	985	1,071	1,165	1,266	1,377	1,497
<b>B</b>	<b>Rural - Electrification of Un-Electrified Consumers</b>						
	Targeted Annual Addition (in Nos.)	-	-	20,081	35,142	45,183	-
	Cumulative Annual Addition (In Nos.)	-	-	20,081	55,224	1,00,407	1,00,407
	Projected Annual Consumption (in MU)	-	-	9	36	79	109
<b>C=A+B</b>	<b>Total Projected Rural Consumption (MU)</b>	<b>985</b>	<b>1,071</b>	<b>1,173</b>	<b>1,302</b>	<b>1,456</b>	<b>1,606</b>
<b>D</b>	<b>Urban - Electrified Consumers (Existing + Projected Growth)</b>						
	Electrified Consumers (in Nos.)	7,18,395	7,49,009	7,80,928	8,14,207	8,48,904	8,85,080
	Daily Household Consumption (in kWh)	4.28	4.58	4.90	5.24	5.61	6.00
	Projected Annual Consumption (in MU)	1,122	1,252	1,396	1,558	1,738	1,939
	<b>Total Projected Urban Consumption (In MU)</b>	<b>1,122</b>	<b>1,252</b>	<b>1,396</b>	<b>1,558</b>	<b>1,738</b>	<b>1,939</b>
<b>E=C+D</b>	<b>Total Projected Domestic Consumption (In MU)</b>	<b>2,107</b>	<b>2,323</b>	<b>2,570</b>	<b>2,860</b>	<b>3,194</b>	<b>3,545</b>

#### DETERMINATION OF CONSUMPTION OF OTHER CONSUMERS

For projection of sales for FY 15 to FY 19, the CAGR of previous 5 years has been considered for all categories.

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

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

Categories	Growth Rate	FY 15	FY 16	FY 17	FY 18	FY 19
Domestic – Rural	-	1,071	1,173	1,302	1,456	1,606
Domestic – Urban	-	1,252	1,396	1,558	1,738	1,939
Non Domestic	8.40%	1,078	1,168	1,266	1,373	1,488
Industrial(LT)	8.33%	312	338	366	397	430
Industrial(HT)	11.50%	5,358	5,974	6,661	7,427	8,281
Mixed Load (HT)	12.22%	200	224	252	282	317
Industrial (Deemed Additional Sale due to Load Shedding)		0	371	371	371	371
Public Lighting	1.42%	45	45	46	47	47
Traction	0.00%	11	11	11	11	11
Private Tube-wells	5.45%	235	248	262	276	291
Government Irrigation	1.83%	106	108	110	112	114
Public Water Works & Sewage Pumping	7.09%	314	336	360	385	413
<b>Grand Total</b>		<b>9,980</b>	<b>11,393</b>	<b>12,564</b>	<b>13,874</b>	<b>15,307</b>

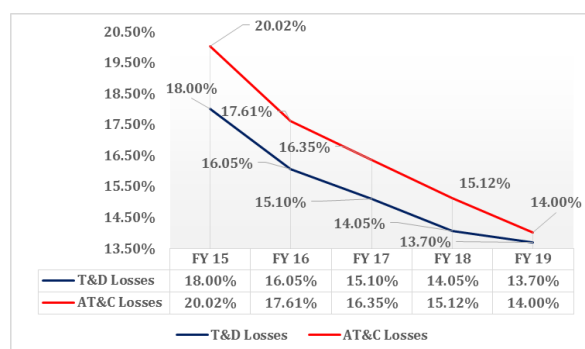
- As seen from above, the industrial sales (LT, HT) will continue to form the 58% -62% of overall consumption of the state of Uttarakhand

#### ENERGY AND DEMAND REQUIREMENT

Government of Uttarakhand has proposed an aggressive trajectory for T&D loss reduction and the same has been taken into account for preparing this roadmap document.

However, the AT&C targets have been recomputed for Uttarakhand to keep them in line with trajectory specified by MoP.

**Figure 5: Projected Loss Reduction Trajectory**



Based on the Loss Reduction Trajectory approved as above, the Energy and Demand Requirement for the future years is tabulated in table 5 below:

As per the power supply position up to March 15 as now provided by state, the actual unrestricted requirement for FY 15 is 12,617 MU which is almost in line with the figures calculated in the study (i.e. 12,394 MU), thereby validating the assumptions considered to project the power requirement in FY 19.

The load factor works out to be 72.47% for FY 15.

The two major categories i.e. Domestic and Industrial constitute more than 80% of total sales of Uttarakhand. As both these categories will be having similar growth rate between 10%-11%, therefore, sales mix in future is expected to remain similar to the current sales mix. Thus, the load factor has accordingly being assumed to remain constant up to FY 19.

As seen from above, the maximum demand requirement of the state is projected to increase from 1930 MW in FY 15 to **2845 MW in FY 19** assuming an unchanged annual load factor of 72.47%.

As per projections made in 18<sup>th</sup> EPS of CEA, the projected energy demand and peak load for the state of Uttarakhand was 14,223 MU and 2449 MW in FY 19 as against the now calculated energy demand of 18,062 MU and peak load of 2845 MW in FY 19.

Adoption of various energy efficiency measures like energy efficient irrigation pump-sets, energy efficient lighting (use of LEDs), adopting demand side management initiatives like introduction of Time of Day (TOD) tariff etc., would also help in reducing the peak demand of the state.

An assessment of the adequacy of generation, transmission and distribution infrastructure for meeting the projected annual energy demand of 18062 MU and peak demand of around 2845 MW has been made which is covered in the following chapters.

**Table 5: Energy Requirement (In MU) and Peak Demand (in MW)**

Particulars	FY 15	FY 16	FY 17	FY 18	FY 19
Sale within State (in MU)	9980	11,393	12,564	13,874	15,307
Distribution Losses	18.00%	16.05%	15.10%	14.05%	13.70%
Intrastate transmission losses	1.80%	1.80%	1.80%	1.80%	1.80%
<b>Total Energy Requirement within State (in MU)</b>	<b>12394</b>	<b>13,820</b>	<b>15,070</b>	<b>16,438</b>	<b>18,062</b>
Load Factor	72.47%	72.47%	72.47%	72.47%	72.47%
<b>Maximum Demand (in MW)</b>	<b>1,952</b>	<b>2,177</b>	<b>2,374</b>	<b>2,589</b>	<b>2,845</b>

## CHAPTER 5: GENERATION PLAN

### CUMULATIVE GENERATION AVAILABILITY

The total installed capacity in Uttarakhand including firm share of CGS as on 31<sup>st</sup> March 2015 (allocated capacity in State, Private, joint and CGS) is 2361.08 MW as detailed in table below. Station wise details are at Table 59 in Annexure – 9. Hydro based capacity constitutes about 76% of total capacity followed by thermal (coal based) 17%, gas based 3%, nuclear 1% and balance about 3% cogeneration plus solar. In addition to the above capacity, unallocated power from CGS at the disposal of Central Government is allocated to Uttarakhand from time to time.

**Table 6: Availability Mix from Firm Sources in FY 15 (in MW)**

Source	Latest Firm Entitlement (in MW)	%age of Total Firm Availability
<b>Own Generating Stations (OGS)</b>		
Hydro	1134.96	48.02%
Small Hydro	32.70	1.38%
<b>Subtotal – OGS</b>	<b>1167.66</b>	<b>49.40%</b>
<b>Private Generating Stations (PGS)</b>		
Non Solar (R.E.)	213.30	9.02
Solar	6.6	0.28%
Vishnugarh (J.P.)	48.00	2.03%
<b>Subtotal – PGS</b>	<b>267.90</b>	<b>11.33%</b>
<b>Central Generating Stations (CGS)</b>		
Coal based	400.10	16.93%
Gas Based	69.64	2.95%
<b>Subtotal-Thermal</b>	<b>469.75</b>	<b>19.87%</b>
Nuclear	31.24	1.32%
Hydro Based	427.13	18.07%
<b>Subtotal – CGS</b>	<b>928.12</b>	<b>39.27%</b>
<b>Grand Total</b>	<b>2361.08</b>	

Uttarakhand has met a max demand of about 1930 MW during FY 15 and the present annual energy requirement of the state is of the order of 12.6 BU.

The maximum demand is expected to increase to 2845 MW in FY 19 and the energy requirement would be of the order of 18.06 BU by FY 19, considering the additional energy requirement for providing 24x7 power supply to the State.

The actual energy availability from various sources in FY 14 and FY 15 is summarized below:

**Figure 6: Availability Mix from Various Sources in FY 14 and FY 15 (in MU)**



- During FY 15, about 31% of the power is being sourced from state owned generating stations, whose average rate has increased from Rs. 1.09/unit in FY 14 to Rs. 1.68/unit in FY 15.
- Another 30% power is being sourced from CGS whose average rate has increased from Rs. 3.24/unit in FY 14 to Rs. 3.51/unit in FY 15.
- IPPs and State Royalty power contributed 6.5% each in FY 15
- State was dependent on 26% of total power purchase (up from 24% in FY 14) from short term sources.



## PLANNED CAPACITY ADDITION

A number of generating stations (hydro, coal based etc.) are planned to be commissioned up to FY 19. The additional capacity available from various sources (along with the expected year of commissioning) is summarized below:

**Table 7: Summary of Additional Firm Availability from Various Sources**

Sr. No.	Source	Type	Capacity (MW)	Latest Firm Entitlement %*	MW*	Availability from Year
A	<b>Own &amp; Private</b>					
	<i>Vyasi</i>	Hydro	120.00	100.00%	120.00	FY 19
	<i>Dunao</i>	Small Hydro	1.50	100.00%	1.50	FY 17
	<i>Suwarigad</i>	Small Hydro	2.00	100.00%	2.00	FY 17
	<i>Limchagad</i>	Small Hydro	3.50	100.00%	3.50	FY 17
	<i>Asiganga-I</i>	Small Hydro	4.50	100.00%	4.50	FY 18
	<i>Asiganga-II</i>	Small Hydro	4.50	100.00%	4.50	FY 18
	<i>Suringad-II</i>	Small Hydro	5.00	100.00%	5.00	FY 18
	<i>Kaliganga-I</i>	Small Hydro	4.00	100.00%	4.00	FY 19
<b>Subtotal</b>	<b>Own &amp; Private</b>		<b>145.00</b>	<b>100.00%</b>	<b>145.00</b>	
B	<b>CGS – Located within State</b>					
	<i>Tapovan Vishnugad</i>	Hydro	520.00	17.88%	93.00	FY 18
	<i>Lata Tapovan</i>	Hydro	171.00	18.13%	31.00	FY 19
	<i>Vishugarh Pipalkoti</i>	Hydro	444.00	16.06%	71.30	FY 19
	<i>Tehri Pump Storage</i>	Hydro	1000.00	20.00%	200.00	FY 19
<b>Subtotal</b>	<b>CGS – Located within State</b>		<b>2135.00</b>	<b>18.52%</b>	<b>395.30</b>	
C	<b>CGS – Located outside State</b>					
	<i>Koldam</i>	Hydro	800.00	4.88%	39.00	FY 16
	<i>Meja-I</i>	Coal	1320.00	1.74%	23.00	FY 17
	<i>Kishanganga</i>	Hydro	330.00	4.85%	16.00	FY 17
	<i>RAPP U-7&amp;8</i>	Nuclear	1400.00	2.36%	33.00	FY 19
	<i>Parbati-II</i>	Hydro	800.00	4.88%	39.00	FY 19
<b>Subtotal</b>	<b>CGS – Located outside State</b>		<b>4650.00</b>	<b>3.23%</b>	<b>150.00</b>	

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

The additional availability from Renewable Energy sources (Grid and Off-Grid) is detailed in Table 21 in Chapter – 8.

The table below summarizes the availability of power from various sources keeping in view of the existing and upcoming capacity availability in FY 19:

**Table 8: Projected Firm Share Allocations from Various Sources (in MW)**

S. No.	Source	FY 16	FY 17	FY 18	FY 19
<b>Availability Within State</b>					
A	Own Generating Stations	1168	1168	1168	1168
B	New Stations-Own & Private	0	7	21	145
C	Private Generating Stations Existing	268	268	268	268
D	Renewable Energy Sources –Upcoming	37	71	140	270
E	Central Generating Stations	277	277	277	277
F	New Stations-CGS	0	0	93	395
<b>Sub-total</b>	<b>Availability Within State</b>	<b>1749</b>	<b>1791</b>	<b>1967</b>	<b>2523</b>
<b>Availability Outside State</b>					
G	Central Generating Stations	651	651	651	651
H	CGS - New	39	78	78	150
<b>Sub-total</b>	<b>Availability Outside State</b>	<b>690</b>	<b>729</b>	<b>729</b>	<b>801</b>
<b>Grand Total</b>		<b>2439</b>	<b>2520</b>	<b>2696</b>	<b>3324</b>

As seen from above, there is a substantial capacity addition from FY 15 to FY 19 both within state and outside state (based on the latest expected dates of commercial operation as available with Central Electricity Authority).

However, the availability is mostly from hydro and other renewable sources which inherently have low capacity utilization factor and same has been appropriately factored for computation of energy availability from existing and upcoming generating stations.

Accordingly, the projected energy availability from the above mentioned sources for future years is summarized in table below.

**Table 9: Projected Energy Availability from Firm Share/Long Term Tie-Ups (in MU)**

Source	Adequacy of Energy Availability			
	FY 16	FY 17	FY 18	FY 19
Total Energy Requirement within State	13,820	15,070	16,438	18,062
Energy Availability from Long Term Firm Tie-ups	10,270	10,555	11,397	13,909
<i>Energy Availability from Long Term Firm Tie-ups (In %age)</i>	<i>74.31%</i>	<i>70.04%</i>	<i>69.34%</i>	<i>77.01%</i>
<i>Targeted Energy Availability from Long Term Firm Tie-ups (In %age)</i>	<i>90.00%</i>	<i>90.00%</i>	<i>90.00%</i>	<i>90.00%</i>
Targeted Energy Availability from Long Term Firm Tie-ups (In MU)	12,438	13,563	14,794	16,256
<b>Adequacy of Power Supply</b>	<b>Inadequate</b>	<b>Inadequate</b>	<b>Inadequate</b>	<b>Inadequate</b>
<b>Additional Energy Required on Long Term Basis (in MU)</b>	<b>2,169</b>	<b>3,007</b>	<b>3,397</b>	<b>2,347</b>
Additional Firm Tie-up Required (80% PLF) on RTC Basis (in MW)	309	429	485	335
<b>Additional Energy Required on Short Term Basis (in MU)</b>	<b>1,382</b>	<b>1,507</b>	<b>1,644</b>	<b>1,806</b>

It is seen from above table that the availability from already tied-up firm share will continue to remain in the range of 70%-75% which is in line with the trend of previous years. And the state has to resort to market purchase/short term purchase to meet the balance power requirement of 25-30%.

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.

As Uttarakhand will be having projected energy availability of approximately 77.01% through firm share in FY 19, the state will take necessary measures to tie-up for additional 2,347 MU (i.e. approx. 335 MW) on long term basis so as to achieve an adequacy level of 90% of power availability from firm tie-ups by FY 19.

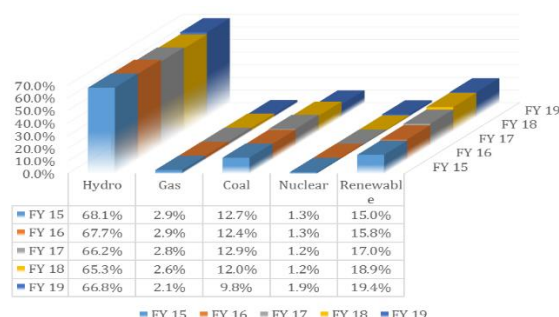
Further, the state will also plan for procurement of 1,806 MU by FY 19 on short term basis.

It is also worth mentioning that the firm tie-ups do not include the availability from the unallocated quota of existing as well as upcoming Central Generating Stations, which will be additionally available and can also be availed by Uttarakhand as an interim measure.

## AVAILABILITY MIX

The availability mix from various sources (Firm Tie-Ups only) for FY 16 and FY 19 is shown below:

**Figure 7: Availability Mix from Various Sources (Firm Tie-Ups only)**



- In case capacity addition goes ahead as planned, the share of Renewable Energy will go up from 15% to 19.4% which is a significant step towards achievement of green power targets.*

## FUND REQUIREMENT

The fund requirement for state projects is summarized below:

**Table 10: Fund Requirement for State Generation Projects (in Rs Crores)**

Sl. No.	Particulars	Fund Requirement (in Rs Crores)				
		FY 16	FY 17	FY 18	FY 19	Total
1	Own Generation (to be Commissioned up to FY 19)	369	337	75	7	788
2	Own Generation (to be Commissioned beyond FY 19)	1317	1499	1469	1464	5749
3	R&M of Existing Stations	35	247	398	302	982
4	Renewable Energy (Grid and Off-Grid)	281	435	885	1277	2878
	<b>Total Fund Requirement (Generation)</b>	<b>2002</b>	<b>2518</b>	<b>2827</b>	<b>3050</b>	<b>10397</b>

It is evident from the previous sections that there is a shortage in energy requirement to the tune of 20%-30% from FY 16 to FY 19 and the state has to procure for additional power both on long term and short term basis.

Also, against the hydro potential of 18175 MW in Uttarakhand (taking plants rated 25 MW and above), only 3426 MW capacity is installed and 2640 MW capacity is under construction.

Thus, the state will work aggressively on following action points:

## **ACTION POINTS FOR THE STATE**

### **POWER PURCHASE PLANNING**

The state will work towards institutionalizing and strengthening the Power Purchase Planning and Procurement cell, which will focus on the short/medium/long term power purchase planning and work on the procurement of power on cost effective basis.

This cell may also work on the monthly power availability from already tied-up sources (on the basis of annual schedules provided by these sources) and accordingly work out the requirement for tying up power on RTC basis through competitive bidding route keeping into consideration the huge seasonal variation in availability of energy from renewable and hydro sources across the year.

### **RM&U OF EXISTING STATIONS**

Most of the power stations of UJVNL have already outlived their useful lives.

The state has planned a capital expenditure of nearly Rs 1860 crores on RM&U (Renovation, Modernization & Upgradation) of its own generating stations which has been detailed in Table 43 in Annexure – 3 and the additional availability of power from these stations is detailed in Table 41 in Annexure – 3.

In order to continue generation from these power stations for another 35 years RM&U of existing power stations is essential. This will not only result in continued supply of cheaper power from the existing power stations but also result in an increase in generation capacity by 589 MU.

At present no financial assistance is being provided by the Government of India for RMU of medium and large hydroelectric projects. The RMU of above projects can also be taken up expeditiously if the Government of India sanctions the grant for carrying out these works under 24x7 Power for All scheme.

**Thus, the GoU requests GoI to kindly consider funding of around Rs. 980 crores for upcoming RMU projects to meet the real challenge of higher power generation at an optimal which will be a solid support in fulfilling the objectives of "24x7 Power for All" scheme.**

**Meanwhile, the state will approach the State Regulatory Commission for approval of this investment** citing the cost-benefit analysis of this investment on case to case basis and prevailing scenario in the state wherein the tapping of huge potential of the hydro power has slowed down considerably owing to issues beyond the control of Government of Uttarakhand.

## **GOVERNMENT OF INDIA INTERVENTION**

The State is facing hurdles in harnessing of its full hydro potential which is affecting economic growth of the state. The issues highlighted by the state for intervention of Government of India are detailed as follows:

### **COMBINED CYCLE GAS BASED POWER PROJECTS**

Around 6 mmscmd of gas will be required for the state of Uttarakhand. GoI has been requested to kindly allocate the same to Uttarakhand for setting-up of 350+ MW Gas based Combined Cycle Power projects each at Kashipur and Haridwar which will generate 5000 MU in three years. However, due to limited availability of gas, GoI presently, has advised the States not to take up any new gas based stations.

### **COAL BLOCK ALLOCATION AND FAST TRACK OF THE AWARD AND COMMISSIONING OF ODISHA UMPP**

As the Ministry of Power, Government of India itself is overseeing the fresh bidding, GoU requests them to fast track the whole proceedings for development of 4000 MW Odisha UMPP in which Uttarakhand share is 200 MW.

A coal block with 165 MT coal reserves should also be allocated to Uttarakhand through special dispensation for setting-up of a 2x660 MW project with an annual generating capacity of 9250 MU on 80% PLF.

### **COORDINATING WITH OTHER CENTRAL AGENCIES/STATE**

## **GOVERNMENTS FOR APPROVAL/CLEARANCES**

Ministry of Power, GoI is requested to expedite the investment clearance Lakhwar Multi-Purpose Project (300 MW) to be accorded by MoWR, GoI.

GoI is requested to kindly persuade GoHP for signing MOU with GoU for the development of Kishau Multipurpose Project (660 MW).

GoU requests that notification dated 18/12/2012 declaring entire watershed of about 100 km stretch of River Bhagirathi from Gaumukh to Uttarkashi as Eco-Sensitive Zone needs to be withdrawn by MoEF, GoI and fresh notification issued taking into consideration the views of GoU. The list of affected HEPs is detailed in Table 45 in Annexure – 3 resulting in substantial reduction in power potential and generation in the state, leading to power scarcity as well as unemployment in the remote and border areas of the state.

GoI is requested that clearances to all other projects (not included in the list of 24 projects being reviewed as per WII report) may be accorded as per guidelines by MoEF.

MoEF is requested to speedily submit its reply to Hon'ble Supreme Court in Civil Appeal No. 6736 of 2013 considering the views of GoU and allow projects having valid clearances to continue as the development of 24 projects totaling 2944.80 MW is affected in the state.

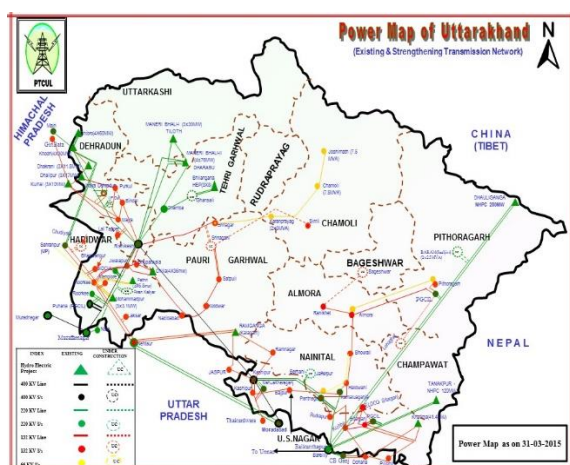
GoU requests the GoI to kindly consider the funding of the life extension & increase in generation through RM&U of existing power stations of UJVNL through grant of Rs 980 Crores.



## CHAPTER 6: TRANSMISSION PLAN

### POWER MAP OF UTTARAKHAND

**Figure 8: Power Transmission Map of Uttarakhand**



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

The state is well served by a network of Inter-state transmission lines at 765 kV (charged at 400 kV), 400 kV and 220 kV levels, as can be seen from the Table 51 in Annexure – 4. Presently, Uttarakhand draws its power from interstate transmission network mainly through Muzaffarnagar- Roorkee-Rishikesh 400 kV S/C line and Muradabad-Kashipur-Rishikesh 400 kV S/C line. In addition, drawal of power also takes place through Bareilly-Pithoragarh- Dhauliganga- 400 kV circuit (charged at 220 kV) and Tanakpur – Sitarganj – Bareilly 220 kV circuit.

The existing transformation capacity available at 220 kV for import from the northern grid is **1815 MVA** (Table 52 in Annexure – 4), which is comfortably above the maximum power Uttarakhand needs to

import when low hydro generation and peak demand conditions are coincident.

Under contingency of any one of the 400 kV interstate lines the system becomes vulnerable. Contingency of 400 kV Moradabad - Kashipur or 400 kV Muzaffarnagar - Roorkee line leads to overloading of 220 kV S/C Bakunthapur-Pantnagar line, low voltages at 400 kV Kashipur and at areas nearby Pantnagar like Kathgodam, Haldwani, Bowali, Almora etc.

Outage of 400 kV Meerut-Muzaffarnagar line is also very critical for the Uttarakhand system. This leads to overloading of 400 kV Dadri-Muradnagar and 400/220kV ICTs at Meerut.

In view of the constraints the drawal of the state from the ISTS in high hydro scenario is limited to 1020 MW. The drawal of the state from the ISTS in low hydro scenario can be increased to 1200 MW as the overall load met is less in this case.

The recent commissioning of 400 kV Bareilly-Kashipur line in May 2015, the situation has improved. With one more 400 kV link i.e. Kashipur – Roorkee 400 kV D/c line the reliability of power supply to the Uttarakhand system will further increase.

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

Four number 400 kV lines, three number 220 kV lines have been planned by PTCUL and four number new 400 kV lines have been planned by PGCIL for evacuating power from upcoming generation projects and for strengthening inter-state transmission capacity.

The additional transmission lines totaling 804.6 Ckt-km at an estimated cost of Rs. 1938.2 Crores have been planned by PTCUL to enhance the transmission capacity.

The target date of commissioning of these transmission lines is spread between December 2015 and June 2018. While three out of four new 400 kV transmission lines planned by PGCIL are likely to be commissioned by July 2015, the fourth line is planned to be commissioned in March 2016. Additional transmission capacity so created will be adequate to meet the increased demand on the inter-state transmission lines till the year FY 19. The details are shown in Table 48 at Annexure – 4.

Three new 400 kV substations (Srinagar: 400/220 kV, 2x315 MVA + 220/132 kV, 2x160 MVA; Pipalkoti: 400/132 kV, 2x315 MVA; Karanprayag: 400/132 kV, 2x315 kV) totalling 2210 MVA are planned by PTCUL at an estimated cost of Rs. 701.48 Crores.

These new substations are planned under deemed ISTS for evacuating power for export from upcoming generation projects and are scheduled to be commissioned between December 2015 and June 2017. Likewise, PGCIL have planned two new substations at Sherpur (Dehradun): 400/220 kV; 2x315 MVA and Jauljibi: 400/220 kV; 2x315 MVA scheduled to be commissioned in March 2016 and March 2018 respectively.

Details of additional capacity planned under ISTS for evacuating power for export from upcoming generation projects are shown at Table 46 in Annexure – 4.

Additional transformation capacity of 3470 MVA planned under ISTS (2210 MVA by PTCUL & 1260 by PGCIL) comfortably meets the additional requirement on account of upcoming generation projects planned till the year FY 19.

## EXISTING POWER EVACUATION & INTRA STATE TRANSMISSION SYSTEM

The existing intra-state transmission network for evacuation and transfer of power within the state is mainly at 220 kV and 132 kV level. Presently the state has 2958 Ckt. Km of intrastate lines at 220 kV and 132 kV level which are more or less adequate to meet the present peak requirements of the state.

The aggregate capacity of existing 220/132 kV transformers is 2460 MVA as detailed in Table 54 of Annexure – 4. Similarly the aggregate capacity at 220/33 kV + 132/33 kV + 132/66 kV is 3057.5 MVA (details as per Table 53 of Annexure-4). The above capacity is generally adequate to meet the present peak requirements of the state.

Load flow study carried out by PTCUL under the present peak demand conditions indicate that all transmission lines are loaded less than their capacity and the transmission system is adequate to meet the peak demand of the state.

## INTRA-STATE TRANSMISSION SYSTEM PLANNED UP TO FY 19

A total of seventeen new 220 kV & 132 kV lines totalling 567.31 Ckt. Km are planned to be installed for strengthening of intra-state transmission network to meet the projected peak demand of 2845 MW in FY 19 at an estimated cost of Rs. 644.79 Crores.

The lines are scheduled to be commissioned between June 2015 and March 2019. Table 48 in Annexure – 4 shows details of transmission lines planned for system strengthening.

Similarly Transformation capacity of 200 MVA is planned to be added at Almora 220/132 kV substation by FY 17.

A total of 1510 MVA additional transformation capacity by way of new 220/33 kV and 132/33 kV transformers scheduled to be commissioned between June 2015 and March 2019 at an estimated cost of Rs.1221.03 Crores. The details are shown in the Table 47 in Annexure – 4

## SYSTEM ANALYSIS UNDER PEAK DEMAND OF 2860 MW IN FY 19

### GENERAL

Computer load flow study has been carried by PTCUL to determine the adequacy of the existing and proposed system and to understand the system profile in terms of loading of the network during peak load condition.

The study has been carried out by simulating the system peak of 2860 MW (higher than the projected peak demand of 2845 MW) and all the hydro generators are scheduled to generate 35% of their respective installed capacities.

The summary of the load flow study conditions and the results is as follows:

### LOAD FLOW STUDY CONDITIONS: NORMAL & CONTINGENCY (N-1)

The base case is the normal one where all elements of the transmission network are available while the system demand is at peak and the hydro- generation is at low (35%) level.

Three contingencies that can cause the greatest disturbance to the transmission network of Uttarakhand, while the demand is at peak and the hydro-generation is low, are as follows:

- ✓ *Outage of 400 kV Muzaffarnagar – Puhana Line*
- ✓ *Outage of 400 kV Bareilly – Kashipur Line*

### ✓ *Outage of 220 kV Bareilly – Pantnagar Line*

These contingencies have been simulated in the load flow study. The summarized results of the study showing overloading of certain transmission lines and transformer under contingencies are discussed below:

## SUMMARY OF RESULTS

### Voltage Profile

The voltage profile at 400 kV, 220 kV & 132 kV level in Uttarakhand EHV network are within permissible limits.

### Transmission Line Loadings

Load flow results show that.

- There are NIL 400 kV lines out of total of 10 that are at a risk of getting overloaded under any contingency and only 220 kV Bareilly – Pantnagar line (out of 25 lines) gets overloaded in normal as well contingencies.
- Out of a total of 39 nos. 132 kV lines, lines which get overload under normal/contingency conditions are 132 kV Almora-Bhowali, 132 kV Rudrapur-Pantnagar, 132 kV Srinagar (400 kV)-Srinagar, 132 kV Rishikesh-Laltappar and 132 kV Sitarganj-Sitarganj(PGCIL).

### Solution for Overloading of Transmission Lines

PTCUL has to take measures for reconductoring of lines with high capacity conductor or plan alternate network to reduce overloading of the above lines.

### Overloading of Substations

2x315MVA, 400/220kV Kashipur Substation will be overloaded for which a 1x315MVA, 440/220kV transformer is proposed at 400 kV Kashipur Substation (keeping in view the future load demand and generation schedule

of 225 MW Gas based Power Plants in Kashipur area.

## FUND REQUIREMENT

The fund requirement for state projects is summarized below:

**Table 11: Fund Requirement for State Transmission Projects (in Rs Crores)**

Sl. No.	Category	Fund Requirement (in Rs Crores)					Remarks
		FY 16	FY 17	FY 18	FY 19	Total	
1	Inter State - Transmission Lines	116	429	988	406	<b>1939</b>	All lines except 400 KV Srinagar-Kashipur Line (PFC) are funded by ADB
2	Intra State - Transmission Lines	2	321	111	210	<b>644</b>	All lines are funded either by REC or by PFC
3	Inter State - Substations	264	0	0	438	<b>702</b>	All sub-stations are funded by ADB
4	Intra State - Substations	78	1103	108	20	<b>1309</b>	All substations are funded either by REC or by PFC
5	System for Power Evacuation	10	98	0	0	<b>108</b>	All schemes are funded by REC
	<b>Total Fund Requirement</b>	<b>470</b>	<b>1951</b>	<b>1207</b>	<b>1074</b>	<b>4702</b>	

- *The debt to equity ratio will be 70:30 for schemes funded by PFC/REC and the equity will be provided by Government of Uttarakhand.*
- *The funding by ADB is in the ratio of 90:10 where in 90% is in form of 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.
- PTCUL 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.
- PTCUL has to take measures for reconductoring of lines with high capacity conductor or plan alternate network to reduce overloading of the lines which are likely to be overloaded.
- The state will procure and deploy one Emergency Restoration System (ERS) to effectively restore transmission lines in case of emergency.
- The state will look for options for construction of new lines through tariff based competitive bidding (TBCB) route.

## CTU INTERVENTION

As stated earlier, Uttarakhand is linked to the Northern grid at 400kV through three transmission lines with Muzaffarnagar, Moradabad and Bareilly, all in Uttar Pradesh, which are subjected to frequent load restrictions imposed by the Northern Regional Load Dispatch Centre (NRLDC) when Uttar Pradesh overdraws. This in turn severely cuts the power flow to Uttarakhand requiring load restrictions to be imposed within Uttarakhand. To overcome this constraint a link connecting Uttarakhand to the Northern Grid without a UP substation coming in the way has been planned. The 400kV substation under construction at Sherpur, Dehradun will be connected to Abdullapur (Haryana) besides Saharanpur (UP). When this substation and the lines linking it to the Northern grid are commissioned, the constraint discussed above will be eliminated.

**PGCIL has to ensure timely commissioning of 400 kV substation in Sherpur, Dehradun i.e. by July 2015.**

## CHAPTER 7: DISTRIBUTION PLAN

### CONNECTING THE UNCONNECTED HOUSEHOLDS

As per the state, the district wise electrification plan is as follows:

**Table 12: Targeted Electrification under DDUGVY scheme**

District	Electrification Target		
	Households	Villages	Hamlets
Chamoli	3370	13	269
Udham Singh Nagar	7191	0	0
Uttarkashi	9670	29	514
Bageshwar	1977	4	208
Champawat	3316	3	378
Dehradun	6547	0	665
Almora	2224	5	310
Haridwar	109	0	7
Nainital	1086	0	107
Pauri (Garhwal)	2355	2	324
Pithoragarh	4315	21	282
Rudrapur	2399	0	153
Tehri Garhwal	9456	2	796
<b>Total</b>	<b>54015</b>	<b>79</b>	<b>4013</b>

As seen from above, the state proposes to cover a total of 54,015 households with electrification of 79 villages and 4,013 hamlets.

Further, 2229 households have been targeted to be electrified through off-grid Micro/Mini Hydel projects as detailed in Table 58.

**Thus, out of the total 1,00,407 un-electrified households, roadmap for electrification of remaining 44,163 households would have to be prepared by the state. The remote villages /habitations would also be identified by the state which may be electrified under DDG schemes or various schemes of MNRE as given in Annexure – 7.**

A detailed survey for providing access of power to remaining 44,163 households is being undertaken by UPCL. **The state will complete the detailed survey of the remaining villages/ hamlets within 6 months and would submit the supplementary DPR for funding under DDUGJY for these villages/ hamlets.** It is estimated that electrification of these villages and hamlets may require additional Rs. 400 Crores.

### EXISTING DISTRIBUTION SYSTEM

UPCL is the only distribution licensee in the state of Uttarakhand. It is serving more than 18 lakh consumers of the state and providing 20-24 hours supply to all the consumers in spite of hilly terrain and difficult areas in the state. Uttarakhand, in fact, is a special category state having hilly terrain of which 65% is covered by forest and the population is very thin in far-flung areas.

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

**Table 13: Existing Distribution System as on March 2015**

Particulars	Qty.
Electricity Consumers	18.6 Lacs
Connected Load	5055 MW
Peak Demand	1930 MW
33/11 KV Sub-stations	291 No.
Capacity of 33/11 KV Sub-stations	3203 MVA
33 KV Line	4488 Km.
11 KV Line	37278 Km.
LT Line	53203 Km.
11/0.4 KV DTR	57575 No.
Capacity of 11/0.4 KV DTR	3406 MVA



## INVESTMENTS PROPOSED IN NEW SCHEMES OF GOVERNMENT OF INDIA (GOI)

### INTEGRATED POWER DEVELOPMENT SCHEME (IPDS)

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 components at (i) and (ii) above will have an estimated outlay of Rs. 32,612 Crores including a budgetary support of Rs. 25,354 Crores from Government of India during the entire implementation period.

The R-APDRP scheme has been subsumed in this scheme as a separate component relating to IT enablement of distribution sector and strengthening of distribution network [component (iii) above] for which CCEA has already approved the scheme cost of Rs. 44,011 Crores, including a budgetary support of Rs. 22,727 Crores.

This outlay will be carried forward to the new scheme of IPDS in addition to the outlay indicated above. PFC is the nodal agency for the operationalization of IPDS in the country.

The earlier R-APDRP (Part-B) scheme covered 31 towns in Uttarakhand. The scheme was initially supposed to be completed in 3 years, but was extended by up to 5 years as per the decision arrived in the “28<sup>th</sup> Meeting of the Steering Committee for Implementation of R-APDRP (Part-B) in 11<sup>th</sup> Plan” held on 20<sup>th</sup> August 2013. Accordingly, the completion of this scheme is scheduled in October 2016 for 30 towns and March 2017 for Dehradun town. The total outlay of the scheme for Uttarakhand was Rs. 584.09 Crores, out of which Rs 175.24 Crores has been disbursed.

District wise progress achieved under R-APDRP (Part-B) ranges from as low as 6.72% in Bazpur district to 86.88% in Tanakpur. The overall program considering the state as a whole is 21%. Details of financial and physical progress can be seen at Table 55 and Table 56 respectively in Annexure – 5.

The new IPDS proposal aims to cover 39 New Towns apart from additional augmentation works in the existing R-APDRP towns.

The state has proposed work amounting to Rs 705.49 Crores to be undertaken under the new IPDS scheme which is summarized in Table 14 below.

The state has already submitted DPR of Rs 191.44 Crores for 39 towns under IPDS scheme and the same is being appraised by PFC.

**Table 14: Work proposed Under IPDS scheme**

S. N.	Item	Unit	Qty	Cost (Rs Cr)
1	33/11 KV or 66/11 KV SS : New /Additional Tr/ Capacity Enhancement	MVA	962	128.23
2	33/11 KV or 66/11 KV SS : R&M	Nos.	102	25.85
3	New 33 KV feeders- New/Bifurcation/Augmentation	Km	548	68.07
4	New 11 KV feeders- New/Bifurcation/Augmentation	Km	673	56.67
5	Distribution Transformer-New	MVA	333	6.52
6	Distribution Transformer-R&M	Nos.	3398	63.88
7	Capacity enhancement of LT sub-station	MVA	127	29.50
8	LT Line : New Feeder/ Feeder Bifurcation/Augmentation	Km	329	26.02
9	HVDS	Nos.	55	3.60
10	Capacitor Bank	MVAR	213	25.59
11	Aerial Bunched Cables	Km	1844	124.86
12	Under-ground cables	Km	292	56.43
13	Solar Panels with Net metering (in Government establishment)	Nos./KW	217	1.41
14	Metering - Feeder/ Boundary Point/DT /Consumer	Nos.	97369	28.45
15	Prepaid / smart meters in Government establishment	Nos.	1940	1.66
<b>Grand Total</b>				<b>705.49</b>

#### DEENDAYAL UPADHYAYA GRAM JYOTI YOJANA (DDUGJY)

Government of India launched “Deendayal Upadhyaya Gram Jyoti Yojna” (DDUGJY) on 3<sup>rd</sup> December, 2014 for

- Separation of agriculture and non-agriculture feeders facilitating judicious restoring of supply to agricultural & non-agriculture consumers in the rural areas; and
- Strengthening and augmentation of sub-transmission & distribution infrastructure in rural areas, including metering of distribution transformers /feeders/consumers.

- Rural electrification for completion of the targets laid down under RGGVY for 12<sup>th</sup> and 13<sup>th</sup> Plans by carrying forward the approved outlay for RGGVY to DDUGJY.

The components at (a) and (b) of the above scheme will have an estimated outlay of Rs. 43,033 Crores including a budgetary support of Rs. 33,453 Crores from Government of India during the entire implementation period.

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.

The earlier RGGVY scheme covered all 13 districts of Uttarakhand. The revised sanctioned cost of the scheme was Rs. 760.14 Crores. The scheme has been fully implemented by FY 14 with electrification of 2,51,827 consumers.

The state now has proposed work amounting to Rs. 3,433.20 Crores to be undertaken under the new scheme which is summarized in table below. The component wise details of proposed DDUGJY scheme is mentioned in Table 57 in Annexure – 5.

**Table 15: Work proposed Under DDUGJY scheme**

Sl. No	Item	Total Amount in Rs. Crores
<b>A.</b>	<b><u>Feeder Separation</u></b>	
A1	33 KV Feeder	17.92
A2	11 kV Feeder (Physical) Separation	389.30
A3	11 KV Feeder (Virtual) Separation	72.20
	<b>Total (A)</b>	<b>479.43</b>
<b>B.</b>	<b><u>Strengthening of Sub-Transmission and Distribution Network</u></b>	
B1	33 kV WORKS	823.53
B2	R&M works in existing 33/11 KV or 66/11 KV substations	27.55
B3	11 kV Transmission Works	363.31
B4	11 kV Transformation Works	251.87
B5	Distribution Transformer-R&M	50.07
B6	LT Distribution Works	632.79
B7	Capacitor Bank	63.51
	<b>Total (B)</b>	<b>2212.64</b>
<b>C.</b>	<b><u>Metering</u></b>	
C1	11 kV feeder metering	1.27
C2	Meter at Distribution Transformer	87.73
C3	Consumer	68.33
	<b>Total (C)</b>	<b>157.33</b>
<b>D</b>	<b><u>Providing access to all rural households.</u></b>	
D1	11 kV Transmission Works	390.71
D2	11 kV Transformation Works	63.91
D3	LT Distribution Works	118.79
D4	Service Connections Works	10.40
	<b>Total (D)</b>	<b>583.81</b>
	<b>Grand Total</b>	<b>3433.20</b>

## ASSESSMENT OF ADEQUACY OF DISTRIBUTION SYSTEM

### AT 33/11 OR 66/11 LEVEL

The transformation capacity at 66/11 kV and 33/11 kV level is projected to grow from 3203 MVA in FY 15 to 4403 MVA in FY 19.

The peak demand of the state, including demand of large industrial consumers at 33 kV level, has been recorded at 1930 MW in FY 15.

The contracted load of 241 nos. 33 kV consumers is about 733 MW and the peak demand of direct 33 kV consumers works out to be 500 MW by applying a demand factor of 0.9 and diversity factor of 1.3 ( $500 = 733 \times 0.9/1.3$ ). Thus, a demand of 1430 MW (=1930-500) is met at 11 kV and below which corresponds to 1600 MVA considering a power factor of 0.9.

Against this peak demand, the aggregate installed capacity of 33/11 kV substations available in the state is 3203 MVA. This translates to an average loading of 50% on 33/11 kV transformers under peak demand conditions.

Following similar logic and taking the projected peak demand of 2845 MW in FY 19 and assuming the proportion of demand met at 33 kV in relation to the total peak demand remains the same as at present, the contribution of 33 kV direct consumers to the peak demand of the state comes to 730 MW.

Correspondingly, the demand met at 11 kV and below comes to 2115 MW (=2845-730) which corresponds to 2350 MVA considering a power factor of 0.9. Against this peak requirement, the installed capacity of 66/11kV or 33/11 kV transformers in FY 19 is projected at 4403 MVA. This translates to an average loading of 53 % on 33/11 kV transformers under peak demand conditions.

From the aforesaid it can be concluded that the overall substation capacity planned for FY 19 is adequate for meeting the projected demand.

### AT 11/.04 KV LEVEL

The existing aggregate 11/ 0.4 KV distribution transformer capacity of UPCL is about 3406 MVA.

Further, an additional transformer capacity of 460 MVA is planned to be added by FY 19 under IPDS Scheme and 775 MVA by FY 19 under DDUGJY Scheme which will result in overall distribution transformation capacity of 4641 MVA by FY 19.

Given that the contracted load of 2097 nos. 11 kV consumers totals around 800 MW, the peak demand of direct 11 kV consumers has been taken as 550 MW by applying a demand factor of 0.9 and diversity factor of 1.3 ( $550 = 800 \times 0.9 / 1.3$ ). This leaves a demand of 880 MW ( $= 1430 - 550$ ) to be met at LT (415V) level which corresponds to 980 MVA considering a power factor of 0.9.

Against this peak demand, the aggregate installed capacity of DT transformers in the state is 3406 MVA. This translates to an average loading of 30% on distribution transformers under peak demand conditions.

Following the same logic and taking the projected peak demand of 2845 MW 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 800 MW.

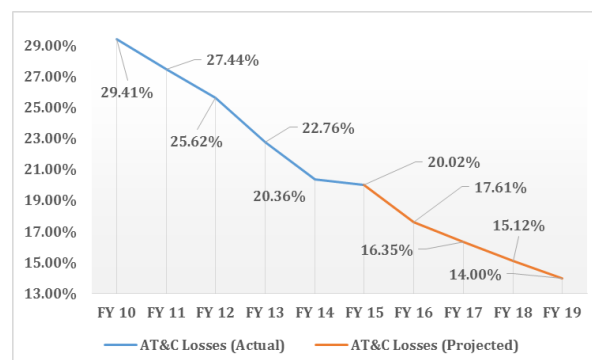
Correspondingly, the demand met below 11 kV comes to around 1315 MW ( $= 2115 - 800$ ) which corresponds to 1460 MVA considering a power factor of 0.9. Against this peak requirement, the installed capacity of distribution transformers in FY 19 is projected at 4641 MVA. This translates to an average loading of 31% on distribution transformers under peak demand conditions.

From the aforesaid it can be concluded that the distribution transformation capacity planned at DT level for FY 19 would be adequate for meeting the projected demand.

## AT&C LOSSES

The actual and projected AT&C losses is summarized below:

**Figure 9: AT&C Losses over the years**



The AT&C losses which were order of 29.41% in FY 10, have reduced to 20.36% in FY 14. The state has undertaken a number of steps such as defective meter replacement, raids for checking thefts, replacement of mechanical meters, metering of unmetered connections etc.

The state further plans to reduce the losses up to 14% by FY 19 with the help of existing measures as well as initiatives being taken under R-APDRP such as energy auditing etc. and new initiatives planned under IPDS.

## IT INITIATIVES TAKEN BY UPCL

In Uttarakhand, IT adoption on a massive scale is being pursued in the following areas:

- ✓ All offices of UPCL have been connected on MPLS connectivity with Data Centre in Dehradun enabling end users of the corporation to access all applications developed under R-APDRP in a centralized & secured network.
- ✓ At the corporate level, UPCL have developed the following mini-ERP system having the following modules enabling automation of UPCL core enterprise systems.

<b>Payroll Personnel Information System</b> <ul style="list-style-type: none"> <li>• Payroll</li> <li>• Personnel Information System</li> <li>• EPF/GPF</li> <li>• Employee Database</li> </ul>	<b>Financial Accounting System</b> <ul style="list-style-type: none"> <li>• Auto Accounting Generation</li> <li>• Online Accounting</li> <li>• Auto Account Consolidation</li> <li>• Project Accounting</li> </ul>
<b>Material Management System</b> <ul style="list-style-type: none"> <li>• Stores Systems</li> </ul>	<b>Management Information System</b> <ul style="list-style-type: none"> <li>• Pre-defined Monitoring Reports</li> </ul>

- ✓ High Value Consumers of the Corporation are included under separate focused billing system named “**Key Consumer Cell (KCC)**” and are covered under Automatic Meter Reading on GSM network.
- ✓ Feeders meters & distribution transformer meters under the identified R-APDRP towns have been installed for the purpose of energy accounting & auditing through GPRS network.
- ✓ New Web Self Service Portal has been developed and integrated with applications developed under R-APDRP to provide various value added services to UPCL consumers such as Online Payment, Application Tracking etc.
- ✓ UPCL has placed order for procurement of about 6000 nos. prepaid electronic meters and out of which 1200 meters have been received and 800 meters have already been installed.
- ✓ UPCL under R-APDRP developed a 24x7 Customer Care Center at Dehradun which caters to consumer calls from all over the state at a toll free number: 1800-419-0405 and provides the following benefits to consumers

- (i) Instant bill availability to consumers through spot billing machines.
- (ii) Bill details & payment alerts through SMS.
- (iii) Online bill view & past transactions details through website.
- (iv) Complaint handling & consumer feedback through 24x7 customer Care Centre on Toll Free No. 1800-419-0405.
- (v) Online tracking of new service connections & other applications.
- (vi) Reduction in cases of bill revisions due to minimum manual intervention.
- (vii) Easy monitoring at management level through MIS bringing discipline at field level resulting in consumer convenience.
- (viii) Tracking consumer through GIS code is easy & helpful for early rectification of faults.
- (ix) Online bill payment through debit/credit/net banking made bill payment easy.
- (x) Providing necessary applications forms through UPCL’s official website.

IT Initiatives to be taken by UPCL for consumer satisfaction and meeting the performance of Standards specified by SERC:



- ✓ End to end operations need to be integrated through implementation of Enterprise Resource Planning Systems (ERP). This would cover critical aspects like Finance and Accounts, Asset Management, Inventory Management, Human Resource Management, Project Management, Personal information System (PIS). ERP will help in timely capitalization of asset, deriving better business value of investment etc.
- ✓ In order to curb the malpractices being done at the level of meter readers while entering the meter reading of the consumers it has been planned to adopt the **“Mobile Based Photo Meter Reading & Billing System”**
- ✓ Centralized Information & Monitoring System for operational, enforcement & litigation, vigilance activities and analysis has 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 supply, but also thereafter for other functions like forecasting.
- ✓ **Power procurement planning and optimization tools will be implemented to reduce the power procurement costs and improve supply reliability which will be achieved through the institution of technically robust forecasting, scheduling and dispatch (Unit Commitment) and settlement tools.**
- ✓ 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.
- ✓ UPCL would install the already ordered prepaid meters shortly and would make a detailed plan for installation of pre-paid & smart meters under IPDS scheme. There is a provision of funding for smart meters at the tune of 5% of the project cost for each state. Government of Uttarakhand may also seek funding under National Smart Grid Mission (NSGM) for development of Smart cities in the state

The above measures, need to be implemented on priority basis by UPCL for more consumer satisfaction in the state.

## **FUND REQUIREMENT**

The fund requirement for state projects is summarized below:

**Table 16: Fund Requirement for Distribution Projects (in Rs Crores)**

Sl. No.	Category	Fund Requirement (in Rs Crores)				
		FY 16	FY 17	FY 18	FY 19	Total
1	IPDS	71	423	212	0	<b>706</b>
2	DDUGJY	343	2060	1030	0	<b>3433</b>
3	Ongoing Schemes	715	0	0	0	<b>715</b>
	<b>Total Distribution</b>	<b>1129</b>	<b>2483</b>	<b>1242</b>	<b>0</b>	<b>4854</b>

### **ACTION POINTS FOR STATE GOVERNMENT**

The proposed Need Assessment Document (NAD) for DDUGJY includes Rs. 479.43 Crores for Feeder Separation Component. As per the existing data, agriculture consumption in the state is at the level of approx. 5% only, which is expected to further reduce to the level of 3% considering that the growth in other categories of consumers in next 5 years. **Thus, the proposal of segregation of agricultural feeders may be covered judiciously by the state.**

The UPCL has presently surveyed the villages/hamlets having census population more than 50 households only for assessment of un-electrified households. Further, there are approximately 50,000 households in villages & hamlets having population below 50.

As these households constitute the last mile for achieving the end goal for 24x7 Power for All initiative, **the state will make rigorous and sustained efforts to identify these households within 6 months and submit the NAD/DPR for approval of concerned agencies.**

The state would also identify the remote villages / habitations and would make a detailed program for electrification of these villages / habitations as per MNRE or any other schemes.

The state **may revisit the overall plan for augmentation of distribution network** keeping in view of the increased load projections with overall system peak load of 2845 MW and would take necessary steps to meet the Performance of standards specified by SERC.

### **GOVERNMENT OF INDIA INTERVENTION**

Need Assessment Document (NAD) for "Deendayal Upadhyaya Gram Jyoti Yojana" (DDUGJY) envisaging an expenditure of Rs 3433 Crores has been submitted to REC New Delhi on 19.01.2015. **In order to ensure reliable and secure 24x7 quality power supply to all, the state requests that the above scheme needs to be sanctioned expediently by REC.**

Need Assessment Document (NAD) for "Integrated Power Development Scheme"(IPDS) amounting to Rs. 779 crores has been submitted to PFC, New Delhi on 19.01.2015. **In order to ensure reliable and secure 24x7 quality power supply to all, the state requests that the above scheme needs to be sanctioned expediently by PFC.**

**The request of Government of Uttarakhand would be considered by Government of India as per its policies/ frameworks or otherwise Government of Uttarakhand would make arrangements for funding from other sources.**

## CHAPTER 8: RENEWABLE ENERGY INITIATIVES

### ACHIEVEMENTS IN RENEWABLE ENERGY

An aggregate 252.60 MW capacity of grid-connected and 69.47 MW of Off-grid renewable energy systems / plants has been installed in the state of Uttarakhand which is tabulated below:

**Table 17: Installed Capacity Grid Connected Projects**

Source	Capacity (in MW)
Solar	6.6
Non-Solar (UJVNL)	32.70
Non-Solar (UREDA)	77.6
Non-Solar (Private)	135.7
<b>Total</b>	<b>252.60</b>

**Table 18: Installed Capacity Off-Grid Projects**

Source	Capacity (in MW)
Solar	19
Non-Solar (UREDA)	50.47
<b>Total</b>	<b>69.47</b>

### EXISTING AND PROPOSED ELECTRIFICATION THROUGH OFF-GRID MINI AND MICRO HYDEL PROJECTS

Till FY 14, 9678 households have been electrified through off-grid Mini/Micro Hydro Power Projects which has been detailed in Table 58 of Annexure – 6.

The proposed electrification through off-grid projects (mini/micro hydel projects) is shown below:

**Table 19: Proposed Electrification through Off-Grid Projects**

S.N .	Project Name	Capacity in KW	FY 16	FY 17	FY 18
1	Chiludgad	100	-	229	-
2	Khapugad	40	101	-	-
3	Kotijahala	200	-	435	-
4	Pinshwad	50	-		-
5 <sup>3</sup>	Gangi	200	-	203	-
6	Gondar	100	170	-	-
7	Wachham	250	-	-	694
8	Rongkong	50	-	67	-
9	Kutty	50	-	37	-
10	Naplchyu	50	-	57	-
11	Sela	50	-	23	-
12	Dugtu	25	-	98	-
13	Bundi	50	67	-	-
14	Nagling	50	-	48	-
<b>Total</b>		<b>1265</b>	<b>338</b>	<b>1197</b>	<b>694</b>

### RENEWABLE ENERGY POLICIES IN THE STATE

#### UTTARAKHAND SOLAR POWER POLICY-2013

GoU vide its notification no. 1044 / I / 2013-5/14/ 2009 dated 27/06/13 has issued Uttarakhand Solar Power Policy-2013 has set the target to install 500 MW SPP by FY 17. Uttarakhand Renewable Energy Development Agency (UREDA) has been designated as Nodal Agency for implementation of Solar Policy.

The solar power projects to be setup under this policy are categorized in 4 (four) types.

<sup>3</sup> MHPs mentioned above at S.N. 5 & 6 are sanctioned under DDG scheme of RGGVY and remaining projects are sanctioned by MNRE, GoI

The first type is reserved for UPCL for meeting their Renewable Purchase Obligation and the projects will be selected through the tariff based competitive bidding process.

The second type is for projects to be set up on private land for captive/3rd party sale/under REC mode.

The third type is similar to the second type with a difference that under the third type Government land will be used and will be given to developer who will provides maximum free power per MW to GoU.

Solar projects under Jawaharlal Nehru National Solar Mission, GoI will be setup under type four of solar policy.

Total cumulative of 5 MW capacity has already been commissioned. Under tariff based competitive bidding process, total cumulative 30 MW capacity have been allotted to 12 developers. Also, 20 MW solar PV power project on canal bank/top has been sanctioned by MNRE under its scheme for setting up 90 MW Grid Connected Solar PV Power Plants on Canal Banks/Canal Tops.

Beside this, MNRE has also given in principal approval for development of 39 MW solar park in the State of Uttarakhand. Approx. 74 hectare of government land is identified in district Almora and the PFR is being prepared.

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#### UTTARAKHAND GRID INTERACTIVE ROOFTOP AND SMALL SOLAR PV POWER PLANT SCHEME- SALIENT FEATURES

MNRE and GoU have approved/sanctioned the Uttarakhand Grid Interactive Rooftop and small SPV power plants Schemes with the target to install cumulative 7 MW grid interactive rooftop and small SPV power plant in Uttarakhand.

This scheme is based on net metering i.e. excess energy (after self-consumption) will be injected into the grid of UPCL.

Any individuals, residential/commercial/ Institutional/Government building owners, and industrial units are eligible to set up solar power plants with capacity: 300 Wp to 100 kWp (With Battery) & up to 500 KW (without battery). Under the scheme, up to 30% subsidy on the benchmark cost of the system or on the cost arrived through competitive bidding process, whichever is lower, is available from (MNRE), Government of India.

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#### UTTARAKHAND GRID INTERACTIVE ROOFTOP AND SMALL SOLAR PV POWER PLANT SCHEME – ACHIEVEMENTS

UREDA has registered 22 projects of cumulative capacity approx. 7 MW on first come first served basis. Power purchase agreements are being signed between the registered applicants and UPCL. UREDA as per the instructions from Ministry of New and Renewable Energy, GoI has invited EoI for empanelment of experienced firms to determine the competitive cost of each registered project in which 7 firms have been empanelled. 5 projects of cumulative capacity 1.612 MW have been commissioned

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#### POLICY FOR DEVELOPMENT OF MICRO & MINI HYDRO POWER

GoU vide its notification no. 54/I/2015-03/21/2014 dated 31/01/15 has notified Micro & Mini Hydro Policy in Uttarakhand State by name “**Policy for Development of Micro & Mini Hydro Power up to 2 MW-2015**”. Uttarakhand Renewable Energy Development Agency (UREDA) has been designated as the nodal agency for implementation of this policy. The brief points of the policy are given below:

The projects under this policy have been categorized into two types:

- ✓ *Micro Hydro Power Projects up to capacity 100 KW*
- ✓ *Mini Hydro Power Projects from 100 KW and up to 2 MW*

Mini and Micro hydro projects are reserved for Panchayati Raj Institutions (Gram Panchayat, Block Panchayat & Zila Panchayat).

Panchayat would have the option to execute the projects on their own or through formation of Special Purpose Vehicle (SPV).

Incentives/benefits available under this policy include eligibility for central financial assistance, no statutory levy (royalty, entry tax, water usage charges), exemption from court fees for registration of documents etc.

#### UTTARAKHAND GREEN ENERGY CESS ACT, 2014

Government of Uttarakhand has notified Green Energy Cess Act for promoting the generation of electricity through renewable energy and for taking initiatives for protecting environment in the State. Green Energy Cess shall be levied up to 10 paise per unit on the following entities:

- (1) Electricity generated in the State by those generators which are transmitting the generated power outside the State. However the cess shall not be levied on that percentage of generated electricity which is given to the Government as free power.
- (2) Electricity supplied to commercial and industrial consumers of the State and the amount of Cess should be collected by UPCL and remitted to the Fund, only after it is collected by UPCL.

It is estimated that approximately **Rs. 116 Crores** (@ Rs 10 paise per unit) will be collected in each year as green cess from the obligated entities.

#### RPO AND REC STATUS IN UTTARAKHAND STATE

##### RENEWABLE PURCHASE OBLIGATION – CURRENT STATUS

Hon'ble Uttarakhand Electricity Regulatory Commission (UERC), under its regulations "UERC (Tariff and Other Terms for Supply of Electricity from Renewable Energy Sources and non-fossil fuel based Co-generating Stations) Regulations, 2013" has specified Solar and Non-Solar Renewable Purchase Obligation.

As per UERC (Compliance of Renewable Purchase Obligation) Regulations, 2010, Hon'ble UERC may direct obligated entity, in case of non-fulfillment of its commitment towards RPO, to deposit into separate fund equivalent to applicable preferential tariffs in the state and forbearance price on the shortfall in units of RPO and also be liable for penalty as may be decided by the Hon'ble UERC under section 142 of the Act notwithstanding its liability for any other action under prevailing laws.

As per clause 7 of the UERC (Compliance of Renewable Purchase Obligation) Regulations, 2010 notification no. F-9(21)/RG/UERC/2010/1422 dated 03/11/2010, Uttarakhand Renewable Energy Development Agency is required to intimate shortfall in RPO to Hon'ble UERC within one month of close of that year.

Uttarakhand Power Corporation Limited (UPCL) has purchased 3,02,700 non-solar REC for fulfillment of its RPO compliance. The year wise RPO Statement of UPCL is given below:



**Table 20: Existing Status of RPO Compliance**

Particulars		FY 12	FY 13	FY 14	FY 15
<b>Compliance Requirement</b>					
Non-Solar	In %age	4.50%	5.00%	6.00%	7.00%
	In MU	481.3	555.82	663.64	823.71
Solar	In %age	0.025%	0.05%	0.05%	0.075%
	In MU	2.67	5.56	5.53	8.83
<b>Actual Purchase</b>					
Non-Solar	In %age	3.94%	3.78%	3.28%	4.15%
	In MU	422.18	420.74	362.91	488.6
Solar	In %age	0.006%	0.057%	0.06%	0.055%
	In MU	0.65	6.52	5.7	6.52
<b>(Shortfall)/Surplus</b>					
Non-Solar	In %age	0.56%	1.22%	2.72%	2.85%
	In MU	59.12	135.08	300.73	335.11
	Cumulative Shortfall				830.04
	Total non-solar REC purchased (302700)				302.70
	<b>Net Cumulative non-solar shortfall</b>				<b>527.34</b>
Solar	In %age	0.02%	-0.01%	-0.01%	0.02%
	In MU	2.02	-0.96	-0.17	2.31
	<b>Cumulative Shortfall</b>				<b>3.2</b>

## RENEWABLE ENERGY CERTIFICATES

Uttarakhand Electricity Regulatory Commission has designated UREDA as the State Agency for accreditation and recommending the renewable energy projects for registration with Central Agency and to undertake certain others functions as mention in the regulation.

The Commission through sub clause 7.1 of clause 7 of above said regulation has also provided the responsibility to UREDA for intimating shortfall in units of RPO to Commission.

UREDA has developed a detailed procedure that contains all the terms and conditions necessary for accreditation of renewable energy generation project and also define the role and responsibilities of each agency involved during the accreditation procedures and get it approved from Hon'ble Commission.

UREDA has received several applications for accrediting the RE projects under REC mechanism and recommending them to Central Agency for registration.

Six projects of total cumulative capacity 83.80 MW have been accredited under REC mechanism in the State of Uttarakhand and the same have been registered by Central Agency.

## PLAN FOR RENEWABLE ENERGY ADDITION UP TO FY 19

### PROPOSED ADDITION IN RENEWABLE ENERGY

The proposed year-wise addition in Grid Connected Renewable Energy is shown below:

**Table 21: Proposed Capacity Addition (in MW)**

S.N.	Particulars	FY16			FY17			FY18			FY19			Total Addition
		Grid	Off Grid	Total	Grid	Off Grid	Total	Grid	Off Grid	Total	Grid	Off Grid	Total	Total
i	Mini Hydel	0.6	0.2	0.7	4.5	0.8	5.3	5.0	0.3	5.3	5.0	-	5.0	16.3
ii	Solar	31.6	0.5	32.1	15.0	0.4	15.4	45.0	1.5	46.5	100.0	2.0	102.0	196.0
iii	Co-generation	-	-	-	7.9	2.0	9.9	10.0	2.0	12.0	10.0	3.0	13.0	34.9
iv	Bio-mass	1.5	-	1.5	3.5	5.5	9.0	5.0	5.0	10.0	10.0	10.0	20.0	40.5
v	W2E	-	0.6	0.6	2.0	0.5	2.5	22.2	1.0	23.2	2.0	1.0	3.0	29.2
vi	Others	-	-	-	1.0	7.2	8.2	2.0	5.0	7.0	3.0	10.0	13.0	28.2
<b>Total</b>		<b>33.7</b>	<b>1.2</b>	<b>34.9</b>	<b>33.9</b>	<b>16.4</b>	<b>50.3</b>	<b>89.2</b>	<b>14.8</b>	<b>103.9</b>	<b>130.0</b>	<b>26.0</b>	<b>156.0</b>	<b>345.1</b>

## PROPOSED INVESTMENT IN RENEWABLE ENERGY

The proposed investment in additional renewable energy projects is shown below:

**Table 22: Proposed Investment in New Renewable Projects (in Rs Crores)**

S.N.	Particulars	FY 16	FY 17	FY 18	FY 19	Total
1	Mini Hydel	9	63	63	60	<b>195</b>
2	Solar	257	123	372	816	<b>1568</b>
3	Co-generation	0	89	108	117	<b>314</b>
4	Bio-mass	11	63	70	140	<b>284</b>
5	W2E	5	23	209	27	<b>263</b>
6	Others	0	74	63	117	<b>254</b>
<b>Total</b>		<b>281</b>	<b>435</b>	<b>885</b>	<b>1277</b>	<b>2878</b>

## FUNDING OF PROPOSED INVESTMENT

The total proposed investment of Rs 2,878 Crores for deployment of additional 345 MW capacity of renewable energy projects will met from:

1. *Central Financial Assistance provided from Ministry of New and Renewable Energy, GoI under its various schemes*
2. *Central Financial Assistance provided from Ministry of Power, GoI under DDG schemes*
3. *Grant provided from State Government*
4. *Uttarakhand Green Energy Cess Fund*
5. *Various private developers.*

## CHAPTER 9: ENERGY CONSERVATION AND ENERGY EFFICIENCY PROGRAM

### GOVERNMENT POLICY TOWARDS ENERGY CONSERVATION AND ENERGY EFFICIENCY

In an effort to support energy conservation and energy efficiency in the state, the Government of Uttarakhand has formulated guidelines under the title "Uttarakhand: Regarding Efficient Use of Energy and Its Conservation". The following energy efficient systems have been made mandatory:

- (1) Mandatory use of solar water heating systems in notified buildings (Govt., schools, colleges, hostels, housing complex, hospitals, hotels etc.) and industries where hot water is required for processing.
- (2) Mandatory use of Compact Fluorescent Lamp (CFL) and Energy efficient tube light in Government buildings/Government Aided Institutions/Boards/ Corporations.
- (3) Mandatory use of Star Labeled Motor pump, Power capacitor, Foot reflex valve in agriculture sector.

Government of Uttarakhand has also issued the notification for Energy Conservation Building Code (ECBC) for its adoption in various existing and new coming buildings on dated 21st May, 2013.

- 1) State Government will ensure formulation of a detailed action plan along with time line in consultation with concerned Departments like Public Works Department, municipalities, Urban Development Department etc.

- 2) Government of Uttarakhand will create ECBC Cell for effective compliance & enforcement of ECBC.

### ESTABLISHMENT OF STATE ENERGY CONSERVATION FUND

Energy Conservation Fund Rule has been prepared and approved by cabinet on 16<sup>th</sup> November, 2010 and amended on 15<sup>th</sup> March, 2013. The fund shall be constituted with the grant and loans received from the Central Government, State Government and any organization or person and share of income of the electricity duty of every year shall be transferred to the fund by the State Government.

BEE has sanctioned Rs 2 Crores and the same amount has been sanctioned and released by GoU under this fund. This fund shall be utilized for carrying out energy conservation and awareness programme as per guidelines issued by BEE. Some energy conservation activities which are not in BEE guidelines but define in SECF rules will be implemented through the State Government's contribution to fund.

### PRESENT STATUS OF ENERGY CONSERVATION ACTIVITIES

UREDA is the State Designated Agency (SDA) of Bureau of Energy Efficiency (BEE), Government of India for carrying out various energy conservation activities and programmes in the State of Uttarakhand.

The various energy conservation activities performed in the state of Uttarakhand and approximately energy saving during the last year is given below:

**Table 23: Net Savings due to Energy Conservation Activities in FY 14**

Energy Conservation Activities	Energy Saved (In MU)
Installation of 26.40 Lakhs LPD Solar Water Heating Systems	29.68
Replacement of inefficient equipment with energy efficient equipment (LED street lights/lamps etc.) at Secretariat	0.33
Replacement of HPSV Street light (577 nos. 250 watt each) with energy efficient LED Street light (74 Watt) at Haldwani.	0.44
Replacement of Sodium Street light (500 nos. 250 W each) with LED Street light (500 nos. 74 W each) at Mussoorie	0.39
Revamping of Drinking Water Pumping System at Uttarakhand Jal Sansthan, Dehradun	0.29
Energy Efficient Street Lighting in the City of Dehradun (86 nos. 150 W replaced by 70 W)	0.06
Replacement 2484 Incandescent bulbs of 100 Watt each with LED bulbs of 12 Watts in village Rasoolpur of district Haridwar	0.64
Replacement 1000 Incandescent bulbs of 100 Watt each with LED bulbs of 8 Watts in district Nainital	0.27
Distribution of CFL/Replacement of Incandescent bulbs with CFL (Approx. 725000 nos. of Average 18 Watt each)	139.18
<b>Total</b>	<b>171.28</b>

Energy saved by carrying out EC Activities during FY 14 is **171.28 MU** which is equivalent to avoided capacity generation of **35.8 MW**.

Present energy saving on total energy consumption of state is approx. 1.5%.

#### PROPOSED ACTIVITIES FOR ENERGY CONSERVATION

The energy conservation activities proposed to be undertaken are summarized below:

1. Replacement of Incandescent lamp/CFL of the consumers of UPCL with LED bulbs
2. Replacement of conventional street lights with LED street lights in Urban Local Bodies.

3. Replacement of inefficient equipment/devices with energy efficient devices in buildings of Urban Local Bodies.
4. Replacement of inefficient pumps with energy efficient pumps in Jalsanathan.
5. Installation of Solar Water Heating Systems.

The detailed cost-benefit against each program is summarized below:

#### REPLACEMENT OF INCANDESCENT LAMP/CFL OF THE CONSUMERS OF UPCL WITH LED BULBS

##### 3 LED bulbs to each non BPL family having electricity connection in Uttarakhand

Detailed computation of savings potential after considering distribution of 3 LED bulbs to each non BPL family is summarized below:

S.N.	Particulars	Costs/ Savings
1	No. of Non-BPL connection/Domestic family (Nos.)	1314000
2	No. of LED bulbs to be distributed (@3Nos. to each)	3942000
3	Wattage of ICLs to be replaced (Watt)	60
4	Wattage of LEDs (Watt)	7
5	Reduction of power consumption per bulb (Watt)	53
6	<b>Total annual energy consumption reduction in State (MU)</b>	<b>219</b>
7	Energy bill reduction for Households per year (Rs.)	300-400
8	Total monetary savings @ Rs. 2.73/unit (Rs.)	59.8 Cr.
9	Total investment @ Rs. 120 each for 7 watt LED bulb (Rs.)	47.30 Cr.

##### 3 LED bulbs to each BPL family having electricity connection in Uttarakhand

Detailed computation of savings potential after considering distribution of 3 LED bulbs to each BPL family is summarized below:

S. N.	Particulars	Costs/ Savings
1	No. of BPL family having electricity connection (Nos.)	316000
2	No. of LED bulbs to be distributed (@3Nos. to each)	948000
3	Approximate cost of each 7 Watt LED bulb (Rs.)	120
4	Approximate cost of procuring 948000 LED bulbs	11.376 Cr.
5	Expected energy saving by replacing 60 watt ICLs by LED	63600 Watt/year
6	<b>Total annual energy saving by all BPL families (in Peak hrs.) [MU]</b>	<b>60.29</b>
7	Total saving in monetary terms @ Rs. 2.73/unit	16.5 Cr./year
8	Payback period (months)	9

The most optimum investment and cost recovery model shall be developed for implementing the above projects.

#### OTHER ACTIVITIES FOR ENERGY CONSERVATION

The following activities are proposed to be undertaken for energy conservations:

- Replacement of conventional street lights with LED street lights (savings potential detailed in Annexure 7).

- Replacement of inefficient equipment /devices with energy efficient devices in buildings of Urban Local Bodies.
- Replacement of inefficient pumps with energy efficient pumps in Jal Sansthan.
- Installation of Solar Water Heating Systems.

Apart from above energy conservation activity in buildings of Urban Local Bodies, the Uttarakhand Government will also consider inclusion of other public buildings as well which may be maintained by the Public Works Department of the state. Government of Uttarakhand may consider mandatory retrofitting in Government buildings with an objective of reduction of electricity bills, which state government is paying against electricity bill of these buildings. This would also demonstrate impact of ESCO based retrofitting projects to private building owners to adopt the same.

Detailed computation of savings potential after considering above activities for energy conservations is given below:

Sl. No	Particulars	No. of Street Light	Expected Savings (in MU)	Expected Savings (in Rs. Crores)	Investment (in Rs Crores)
Replacement of conventional street lights with LED street lights					
1	Nagar Nigams (6 nos.)	46228	18.7	7.65	39.04
2	Nagar Palikas (24 Nos.)	22183	16.5	6.76	22.28
3	Nagar Panchayats (16 nos.)	2487	1.8	0.74	2.64
Sub-total		70898	36.9	15.15	63.96
Replacement of inefficient equipment with energy efficient devices in buildings of Urban Local Bodies					
1	Nagar Nigams (6 nos.)		0.49	0.04	0.11
2	Nagar Palikas (24 Nos.)		0.16	0.07	0.24
3	Nagar Panchayats (16 nos.)		0.032	0.01	0.06
Sub-total			0.682	0.12	0.40
Replacement of inefficient pumps with energy efficient pumps in Jal Sansthan					
1	Jal Sansthan (20 locations)		30.48	11.36	21.97
Installation of Solar Water Heating System					
1	10 Lakh Litres Per day		11.25	4.5	15



## TOTAL SAVING OF ELECTRICITY BY IMPLEMENTATION OF ENERGY CONSERVATION AND ENERGY EFFICIENCY ACTIVITIES

Detailed computation of total savings potential after considering all energy conservation activities is given below:

S.N.	Activities for energy conservation and energy efficiency	Expected Annual Savings (in MU)	Investment (in Rs Crores)
1	Replacement of Incandescent lamp/CFL of the consumers of UPCL with LED bulbs	279.29	58.68
2	Replacement of conventional street lights with LED street lights in Urban Local Bodies	36.94	63.96
3	Replacement of inefficient equipment /devices with energy efficient devices in buildings of Urban Local Bodies	0.682	0.40

S.N.	Activities for energy conservation and energy efficiency	Expected Annual Savings (in MU)	Investment (in Rs Crores)
4	Replacement of inefficient pumps with energy efficient pumps in Jalsanasthan	30.48	21.97
5	Installation of Solar Water Heating Systems	11.25	15.00
<b>Total</b>		<b>358.64</b>	<b>160.01</b>

Keeping in view the above, the state will be able to save 358.64 MU of additional energy demand across various categories of consumers which will translate into an opportunity cost saving of Rs. 99.24 Crores in the FY 19, which will continue in future periods as well. This will also translate into lower power generation from thermal generating stations which would have generated power in case of this demand had to be met otherwise.

### PROPOSED INVESTMENT

The total proposed investment of **Rs 160.01 Crores** has been envisaged for achieving electricity saving of **358.64 MU** in FY 19.

The phasing of investment is tabulated below.

Project Phasing	FY 17	FY 18	FY 19
<b>DELP Scheme</b>			
Number of consumers under DELP scheme	652000	652000	326000
Number of LEDs to be distributed	1956000	1956000	978000
<b>LED street light Scheme</b>			
No. of Street Light	46228	22183	2487
Number of ULBs	6 Nagar Nigams	24 Nagar Palikas	16 Nagar Panchayats

### SOURCE OF FUNDING

The total proposed investment of **Rs 160.01 Crores** has been proposed to be funded through:

1. Beneficiaries / End Users.
2. Uttarakhand State Energy Conservation Fund.
3. Central financial assistance, wherever applicable, as available under various schemes of BEE, GoI and MNRE, GoI.

## CHAPTER 10: FINANCIAL VIABILITY OF DISTRIBUTION COMPANY

### FINANCIAL POSITION OF DISTRIBUTION UTILITIES

The existing accumulated loss for the Uttarakhand Power Corporation Limited (UPCL) as per the audited financial accounts of FY 2014 stands at Rs. 1695 Crores, which is 44% of their revenue booked for the FY 2014.

In contrast to its historical accumulated losses, in the FY 2013-14 the utility has booked a net profit of Rs 323 Crores on stand-alone basis. Further, profit of Rs 323 Crores includes prior period expenses of Rs 261 Crores written back on the account of higher power purchase cost booked in previous years..

Since, UPCL is eligible to claim 16% of return on its equity which comes to around Rs 124 Crores, the utility is still under recovering Rs 73 Crores in the FY 2014.

Since, the utility is already generating positive net profit, but it still has to meet its required level of return as defined and recover its accumulated losses.

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 existing Profit and Loss statement of the UPCL for FY 14 is given below:

**Table 24: Profit and Loss Statement of the UPCL – FY 14 (In Rs Crores)**

Particulars	FY 14
Income	
Net Sales	3773.78
Other Income	111.03
<b>Total Income</b>	<b>3884.80</b>
Expenditure	
Transmission Charges	385.07
Power & Fuel Cost	2789.26
Employee Cost	258.71
R&M cost	77.18
Admin and General Expenses	18.01
<b>Total Expenses</b>	<b>3528.23</b>
<i>Operating Profit</i>	<i>356.58</i>
PBDIT	356.58
Interest	128.51
PBDT	228.07
Depreciation	92.87
<i>Profit Before Tax</i>	<i>135.21</i>
Provision for bad and doubtful debts	66.96
<i>PBT (Post Extraordinary Items)</i>	<i>68.25</i>
Exceptional Item	244.12
Deferred Tax	11.02
<b>Reported Net Profit for the year</b>	<b>323.39</b>
<b>Accumulated losses</b>	<b>1695</b>

Based on the road map discussed in the previous chapters, various scenarios have been prepared to understand the sensitivity analysis of targeted parameters. However, the impact analysis on financial position has been restricted up to FY 19 as the projections of key drivers of expense and revenue items as power purchase mix and sales mix has not been projected beyond FY 19.

The following scenarios have been detailed in subsequent sections:

- a) At targeted growth rate as per “24x7 Power for All” Road Map (Base case).
- b) At targeted growth rate as per “24x7 Power for All” along with Financial Turnaround.
- c) Non-Adherence to Loss Reduction Trajectory and subsequent dependence on Higher Tariff Hike.
- d) 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.

#### COMMON ASSUMPTIONS

- ✓ Any change in the power purchase cost will be taken care by the Fuel and Power Purchase Cost Adjustment mechanism.
- ✓ Power from short term sources considered at the average rate of Rs. 4 per unit
- ✓ No revenue subsidy.
- ✓ Escalation towards O&M cost has been considered at 6% based on year on year increase in WPI inflation index in FY 14.
- ✓ Phasing of capital expenditure in IPDS and DDUGJY schemes has been considered as 10% in FY 16, 60% in FY 17 and 30% in FY 18.
- ✓ Asset Additions has been considered as 50% in same year of capital expenditure. Interest is calculate on assets capitalized only and no IDC has been considered.
- ✓ Interest computations has been done as per the existing loan profile of UPCL and addition of new loans on the prevailing market rates
- ✓ Category-wise average billing rate for computation of revenue for FY 15 has been taken as per the tariff order dated 10<sup>th</sup> April, 2014.
- ✓ Category-wise average billing rate for computation of revenue for FY 16 and onwards has been taken as per the latest tariff order dated 11<sup>th</sup> April, 2015.
- ✓ 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 of FY 14.
- ✓ 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 ratio is 90:10 for centrally sponsored schemes is as per the provisions of the respective schemes for special category states (**except scenario 4 where no grant has been considered against 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.

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

### ASSUMPTIONS

- ✓ No tariff hike
- ✓ T&D losses as per targeted trajectory.

**Table 25: Assumptions for Scenario A**

Year	Units	FY 16	FY 17	FY 18	FY 19
<b>Energy Related Assumptions</b>					
Energy Demand	MU	13,820	15,070	16,438	18,062
Sales	MU	11,393	12,564	13,874	15,307
T&D Losses	%	16.05%	15.10%	14.05%	13.70%
Power purchase cost per unit sold	Rs /kWh	3.14	3.25	3.28	3.35
<b>Revenue parameters</b>					
Tariff Increase	%	0.00%	0.00%	0.00%	0.00%
Average Billing Rate	Rs /kWh	4.41	4.41	4.41	4.41
<b>Expense</b>					
Employee Cost Escalation	%	6%	6%	6%	6%
Repair & Maintenance Escalation	%	6%	6%	6%	6%
Administrative & General Escalation	%	6%	6%	6%	6%

**Table 26: Impact (in per unit terms) of key financial components (Scenario A)**

Particulars	UoM	FY 16	FY 17	FY 18	FY 19
Revenue	Rs. Crores	₹ 5,022.09	₹ 5,539.77	₹ 6,117.87	₹ 6,752.67
Total Expense	Rs. Crores	₹ 4,647.57	₹ 5,272.13	₹ 5,836.93	₹ 6,486.62
PBT	Rs. Crores	₹ 374.52	₹ 267.64	₹ 280.94	₹ 266.04
ABR	Rs. per unit	₹ 4.41	₹ 4.41	₹ 4.41	₹ 4.41
ACS	Rs. per unit	₹ 4.08	₹ 4.20	₹ 4.21	₹ 4.24
Interest Cost	Rs. Crores	₹ 220.34	₹ 256.55	₹ 271.97	₹ 268.35
Tariff Increase	In %age	0.00%	0.00%	0.00%	0.00%
O&M cost	Rs. per unit	₹ 0.35	₹ 0.34	₹ 0.32	₹ 0.31
R&M cost per unit	Rs. per unit	₹ 0.08	₹ 0.07	₹ 0.07	₹ 0.07
Employee cost per unit	Rs. per unit	₹ 0.26	₹ 0.25	₹ 0.24	₹ 0.23
Interest cost per unit	Rs. per unit	₹ 0.19	₹ 0.20	₹ 0.20	₹ 0.18
A&G cost per unit	Rs. per unit	₹ 0.02	₹ 0.02	₹ 0.02	₹ 0.02

**Table 27: Financial Position of the Utility (Scenario A)**

Particulars	FY 14	FY 15	FY 16	FY 17	FY 18	FY 19
<b>Income</b>						
Net Sales	₹ 3,773.78	₹ 4,108.02	₹ 5,022.09	₹ 5,539.77	₹ 6,117.87	₹ 6,752.67
Other Income	₹ 111.03	₹ 116.58	₹ 122.41	₹ 128.53	₹ 134.95	₹ 141.70
<b>Total Income</b>	<b>₹ 3,884.80</b>	<b>₹ 4,224.59</b>	<b>₹ 5,144.49</b>	<b>₹ 5,668.29</b>	<b>₹ 6,252.82</b>	<b>₹ 6,894.37</b>
<b>Expenditure</b>						
Transmission Charges	₹ 385.07	₹ 396.46	₹ 442.07	₹ 482.04	₹ 525.80	₹ 577.78
Power & Fuel Cost	₹ 2,789.26	₹ 2,973.63	₹ 3,572.37	₹ 4,081.36	₹ 4,555.31	₹ 5,131.10
Employee Cost	₹ 258.71	₹ 274.24	₹ 290.70	₹ 308.15	₹ 326.65	₹ 346.26
R&M cost	₹ 77.18	₹ 81.81	₹ 86.72	₹ 91.93	₹ 97.45	₹ 103.30
Admin and General Expenses	₹ 18.01	₹ 19.09	₹ 20.23	₹ 21.45	₹ 22.74	₹ 24.10
<b>Total Expenses</b>	<b>₹ 3,528.23</b>	<b>₹ 3,745.23</b>	<b>₹ 4,412.10</b>	<b>₹ 4,984.94</b>	<b>₹ 5,527.94</b>	<b>₹ 6,182.54</b>
<i>Operating Profit</i>	<i>₹ 356.58</i>	<i>₹ 479.37</i>	<i>₹ 732.40</i>	<i>₹ 683.36</i>	<i>₹ 724.88</i>	<i>₹ 711.83</i>
PBDIT	₹ 356.58	₹ 479.37	₹ 732.40	₹ 683.36	₹ 724.88	₹ 711.83
Interest	₹ 128.51	₹ 168.30	₹ 220.34	₹ 256.55	₹ 271.97	₹ 268.35
PBDT	₹ 228.07	₹ 311.06	₹ 512.05	₹ 426.81	₹ 452.91	₹ 443.48
Depreciation	₹ 92.87	₹ 110.44	₹ 137.53	₹ 159.17	₹ 171.97	₹ 177.43
<i>Profit Before Tax</i>	<i>₹ 135.21</i>	<i>₹ 200.62</i>	<i>₹ 374.52</i>	<i>₹ 267.64</i>	<i>₹ 280.94</i>	<i>₹ 266.04</i>
Provision for bad debts	₹ 66.96					
<i>PBT (Profit before exceptional &amp; extraordinary items &amp; tax)</i>	<i>₹ 68.25</i>	<i>₹ 200.62</i>	<i>₹ 374.52</i>	<i>₹ 267.64</i>	<i>₹ 280.94</i>	<i>₹ 266.04</i>
<b>Reported Net Profit</b>	<b>₹ 68.25</b>	<b>₹ 200.62</b>	<b>₹ 374.52</b>	<b>₹ 267.64</b>	<b>₹ 280.94</b>	<b>₹ 266.04</b>
<b>Accumulated Losses</b>	<b>-₹ 1,695.00</b>	<b>-₹ 1,494.38</b>	<b>-₹ 1,119.86</b>	<b>-₹ 852.22</b>	<b>-₹ 571.27</b>	<b>-₹ 305.23</b>

Based on the above assumptions, it is evident that if UPCL adheres to the target electrification and reduction of T&D losses, the accumulated financial losses will reduce to Rs. 305.23 Crores in the FY 19 from Rs 1,695 Crores in FY 14.

Based on the above scenario, it is evident that timely tariff hike is also required to achieve the financial turnaround.



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

### ASSUMPTIONS

- ✓ Nominal Tariff Hike of 1.7% in FY 17 on latest category-wise average billing rates approved by the Commission for FY 16.
- ✓ T&D losses as per targeted trajectory.

**Table 28: Assumptions for Scenario B**

Year	Units	FY 16	FY 17	FY 18	FY 19
<b>Energy Related Assumptions</b>					
Energy Demand	MU	13,820	15,070	16,438	18,062
Sales	MU	11,393	12,564	13,874	15,307
T&D Losses	%	16.05%	15.10%	14.05%	13.70%
Power purchase cost per unit sold	Rs /kWh	3.14	3.25	3.28	3.35
<b>Revenue parameters</b>					
Tariff Increase	%	0.00%	1.70%	0.00%	0.00%
Average Billing Rate	Rs /kWh	4.41	4.48	4.48	4.49
<b>Expense</b>					
Employee Cost Escalation	%	6%	6%	6%	6%
Repair & Maintenance Escalation	%	6%	6%	6%	6%
Administrative & General Escalation	%	6%	6%	6%	6%

**Table 29: Impact (in per unit terms) of key financial components (Scenario B)**

Particulars	UoM	FY 16	FY 17	FY 18	FY 19
Revenue	Rs. Crores	₹ 5,022.09	₹ 5,633.94	₹ 6,221.88	₹ 6,867.46
Total Expense	Rs. Crores	₹ 4,647.57	₹ 5,272.13	₹ 5,836.93	₹ 6,486.62
PBT	Rs. Crores	₹ 374.52	₹ 361.82	₹ 384.95	₹ 380.84
ABR	Rs. per unit	₹ 4.41	₹ 4.48	₹ 4.48	₹ 4.49
ACS	Rs. per unit	₹ 4.08	₹ 4.20	₹ 4.21	₹ 4.24
Interest Cost	Rs. Crores	₹ 220.34	₹ 256.55	₹ 271.97	₹ 268.35
Tariff Increase	In %age	0.00%	1.70%	0.00%	0.00%
O&M cost	Rs. per unit	₹ 0.35	₹ 0.34	₹ 0.32	₹ 0.31
R&M cost per unit	Rs. per unit	₹ 0.08	₹ 0.07	₹ 0.07	₹ 0.07
Employee cost per unit	Rs. per unit	₹ 0.26	₹ 0.25	₹ 0.24	₹ 0.23
Interest cost per unit	Rs. per unit	₹ 0.19	₹ 0.20	₹ 0.20	₹ 0.18
A&G cost per unit	Rs. per unit	₹ 0.02	₹ 0.02	₹ 0.02	₹ 0.02

**Table 30: Financial Position of the Utility (Scenario B)**

Particulars	FY 14	FY 15	FY 16	FY 17	FY 18	FY 19
<b>Income</b>						
Net Sales	₹3,773.78	₹4,108.02	₹5,022.09	₹5,633.94	₹6,221.88	₹6,867.46
Other Income	₹ 111.03	₹ 116.58	₹ 122.41	₹ 128.53	₹ 134.95	₹ 141.70
<b>Total Income</b>	<b>₹ 3,884.80</b>	<b>₹ 4,224.59</b>	<b>₹ 5,144.49</b>	<b>₹ 5,762.47</b>	<b>₹ 6,356.83</b>	<b>₹ 7,009.16</b>
<b>Expenditure</b>						
Transmission Charges	₹ 385.07	₹ 396.46	₹ 442.07	₹ 482.04	₹ 525.80	₹ 577.78
Power & Fuel Cost	₹ 2,789.26	₹ 2,973.63	₹ 3,572.37	₹ 4,081.36	₹ 4,555.31	₹ 5,131.10
Employee Cost	₹ 258.71	₹ 274.24	₹ 290.70	₹ 308.15	₹ 326.65	₹ 346.26
R&M cost	₹ 77.18	₹ 81.81	₹ 86.72	₹ 91.93	₹ 97.45	₹ 103.30
Admin and General Expenses	₹ 18.01	₹ 19.09	₹ 20.23	₹ 21.45	₹ 22.74	₹ 24.10
<b>Total Expenses</b>	<b>₹ 3,528.23</b>	<b>₹ 3,745.23</b>	<b>₹ 4,412.10</b>	<b>₹ 4,984.94</b>	<b>₹ 5,527.94</b>	<b>₹ 6,182.54</b>
<i>Operating Profit</i>	<i>₹356.58</i>	<i>₹479.37</i>	<i>₹732.40</i>	<i>₹777.53</i>	<i>₹828.88</i>	<i>₹826.63</i>
PBDIT	₹ 356.58	₹ 479.37	₹ 732.40	₹ 777.53	₹ 828.88	₹ 826.63
Interest	₹ 128.51	₹ 168.30	₹ 220.34	₹ 256.55	₹ 271.97	₹ 268.35
<i>PBDT</i>	<i>₹228.07</i>	<i>₹311.06</i>	<i>₹512.05</i>	<i>₹520.98</i>	<i>₹556.91</i>	<i>₹558.27</i>
Depreciation	₹ 92.87	₹ 110.44	₹ 137.53	₹ 159.17	₹ 171.97	₹ 177.43
<i>Profit Before Tax</i>	<i>₹135.21</i>	<i>₹200.62</i>	<i>₹374.52</i>	<i>₹361.82</i>	<i>₹384.95</i>	<i>₹380.84</i>
Provision for bad debts	₹ 66.96					
<i>PBT (Profit before exceptional &amp; extraordinary items &amp; tax)</i>	<i>₹68.25</i>	<i>₹200.62</i>	<i>₹374.52</i>	<i>₹361.82</i>	<i>₹384.95</i>	<i>₹380.84</i>
<b>Reported Net Profit</b>	<b>₹ 68.25</b>	<b>₹ 200.62</b>	<b>₹ 374.52</b>	<b>₹ 361.82</b>	<b>₹ 384.95</b>	<b>₹ 380.84</b>
<b>Accumulated Losses</b>	<b>-₹ 1,695.00</b>	<b>-₹ 1,494.38</b>	<b>-₹ 1,119.86</b>	<b>-₹ 758.04</b>	<b>-₹ 373.09</b>	<b>₹ 7.74</b>

Based on the above assumptions, it is evident that if UPCL adheres to the target electrification and reduction of losses, and the SERC approves a nominal tariff hike of 1.7% in FY 17, the accumulated losses will progressively reduce and UPCL will be able to start earning overall profit from FY 19 onwards which will in turn enable it to realize the eligible return on equity.

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

### ASSUMPTIONS

- ✓ **T&D losses higher than the targeted trajectory.**
- ✓ Higher Tariff Hike of 3.5% each in FY 17 & FY 18 on latest category-wise average billing rates approved by the Commission for FY 16.

**Table 31: Assumptions for Scenario C**

Year	Units	FY 16	FY 17	FY 18	FY 19
<b>Energy Related Assumptions</b>					
Energy Demand	MU	14,157	15,433	16,829	18,491
Sales	MU	11,393	12,564	13,874	15,307
T&D Losses	%	18.05%	17.10%	16.05%	15.70%
Power purchase cost per unit sold	Rs /kWh	3.25	3.36	3.40	3.46
<b>Revenue parameters</b>					
Tariff Increase	%	0.00%	3.50%	3.50%	0.00%
Average Billing Rate	Rs /kWh	4.41	4.56	4.72	4.73
<b>Expense</b>					
Employee Cost Escalation	%	6%	6%	6%	6%
Repair & Maintenance Escalation	%	6%	6%	6%	6%
Administrative & General Escalation	%	6%	6%	6%	6%

**Table 32: Impact (in per unit terms) of key financial components (Scenario C)**

Particulars	UoM	FY 16	FY 17	FY 18	FY 19
Revenue	Rs. Crores	₹ 5,022.09	₹ 5,733.66	₹ 6,553.62	₹ 7,233.63
Total Expense	Rs. Crores	₹ 4,794.93	₹ 5,430.97	₹ 6,008.02	₹ 6,673.85
PBT	Rs. Crores	₹ 227.16	₹ 302.69	₹ 545.59	₹ 559.78
ABR	Rs. per unit	₹ 4.41	₹ 4.56	₹ 4.72	₹ 4.73
ACS	Rs. per unit	₹ 4.21	₹ 4.32	₹ 4.33	₹ 4.36
Interest Cost	Rs. Crores	₹ 222.00	₹ 258.33	₹ 273.90	₹ 270.46
Tariff Increase	In %age	0.00%	3.50%	3.50%	0.00%
O&M cost	Rs. per unit	₹ 0.35	₹ 0.34	₹ 0.32	₹ 0.31
R&M cost per unit	Rs. per unit	₹ 0.08	₹ 0.07	₹ 0.07	₹ 0.07
Employee cost per unit	Rs. per unit	₹ 0.26	₹ 0.25	₹ 0.24	₹ 0.23
Interest cost per unit	Rs. per unit	₹ 0.19	₹ 0.21	₹ 0.20	₹ 0.18
A&G cost per unit	Rs. per unit	₹ 0.02	₹ 0.02	₹ 0.02	₹ 0.02

**Table 33: Financial Position of the Utility (Scenario C)**

Particulars	FY 14	FY 15	FY 16	FY 17	FY 18	FY 19
<b>Income</b>						
Net Sales	₹3,773.78	₹4,108.02	₹5,022.09	₹5,733.66	₹6,553.62	₹7,233.63
Other Income	₹ 111.03	₹ 116.58	₹ 122.41	₹ 128.53	₹ 134.95	₹ 141.70
<b>Total Income</b>	<b>₹ 3,884.80</b>	<b>₹ 4,224.59</b>	<b>₹ 5,144.49</b>	<b>₹ 5,862.18</b>	<b>₹ 6,688.57</b>	<b>₹ 7,375.33</b>
<b>Expenditure</b>						
Transmission Charges	₹ 385.07	₹ 406.37	₹ 452.86	₹ 493.67	₹ 538.33	₹ 591.48
Power & Fuel Cost	₹ 2,789.26	₹ 3,097.57	₹ 3,707.28	₹ 4,226.79	₹ 4,711.95	₹ 5,302.51
Employee Cost	₹ 258.71	₹ 274.24	₹ 290.70	₹ 308.15	₹ 326.65	₹ 346.26
R&M cost	₹ 77.18	₹ 81.81	₹ 86.72	₹ 91.93	₹ 97.45	₹ 103.30
Admin and General Expenses	₹ 18.01	₹ 19.09	₹ 20.23	₹ 21.45	₹ 22.74	₹ 24.10
<b>Total Expenses</b>	<b>₹ 3,528.23</b>	<b>₹ 3,879.08</b>	<b>₹ 4,557.80</b>	<b>₹ 5,141.99</b>	<b>₹ 5,697.11</b>	<b>₹ 6,367.65</b>
<i>Operating Profit</i>	<i>₹356.58</i>	<i>₹345.51</i>	<i>₹586.69</i>	<i>₹720.19</i>	<i>₹991.46</i>	<i>₹1,007.67</i>
PBDIT	₹ 356.58	₹ 345.51	₹ 586.69	₹ 720.19	₹ 991.46	₹ 1,007.67
Interest	₹ 128.51	₹ 169.83	₹ 222.00	₹ 258.33	₹ 273.90	₹ 270.46
<i>PBDT</i>	<i>₹228.07</i>	<i>₹175.69</i>	<i>₹364.69</i>	<i>₹461.86</i>	<i>₹717.56</i>	<i>₹737.21</i>
Depreciation	₹ 92.87	₹ 110.44	₹ 137.53	₹ 159.17	₹ 171.97	₹ 177.43
<i>Profit Before Tax</i>	<i>₹135.21</i>	<i>₹65.25</i>	<i>₹227.16</i>	<i>₹302.69</i>	<i>₹545.59</i>	<i>₹559.78</i>
Provision for bad debts	₹ 66.96					
<i>PBT (Profit before exceptional &amp; extraordinary items &amp; tax)</i>	<i>₹68.25</i>	<i>₹65.25</i>	<i>₹227.16</i>	<i>₹302.69</i>	<i>₹545.59</i>	<i>₹559.78</i>
<b>Reported Net Profit</b>	<b>₹ 68.25</b>	<b>₹ 65.25</b>	<b>₹ 227.16</b>	<b>₹ 302.69</b>	<b>₹ 545.59</b>	<b>₹ 559.78</b>
<b>Accumulated Losses</b>	<b>-₹ 1,695.00</b>	<b>-₹ 1,629.75</b>	<b>-₹ 1,402.59</b>	<b>-₹ 1,099.90</b>	<b>-₹ 554.31</b>	<b>₹ 5.47</b>

Based on the above assumptions, it is evident that if UPCL does not adheres to the target electrification and reduction of losses, it will have to depend on the higher tariff hikes of the order of 3.5% each in FY 17 & FY 18 to achieve the financial turnaround. Which inter-alia means that the UPCL will have to stick to the loss trajectory as agreed in this road map to be self-sustainable on its own in long run with lesser dependency on tariff hike.

## SCENARIO D: AT TARGETED GROWTH RATE AS PER 24X7 ROAD MAP PLUS FINANCIAL TURNAROUND-PROPOSED INVESTMENTS FUNDED THROUGH LOAN ONLY

### ASSUMPTIONS

- ✓ The proposed investments under IPDS and DDUGJY are funded through debt and equity in ratio 70:30.
- ✓ Nominal Tariff Hike of 3% each in FY 17 to FY 19 on latest category-wise average billing rates approved by the Commission for FY 16.
- ✓ T&D losses as per targeted trajectory.

**Table 34: Assumptions for Scenario D**

Year	Units	FY 16	FY 17	FY 18	FY 19
<b>Energy Related Assumptions</b>					
Energy Demand	MU	13,820	15,070	16,438	18,062
Sales	MU	11,393	12,564	13,874	15,307
T&D Losses	%	16.05%	15.10%	14.05%	13.70%
Power purchase cost per unit sold	Rs /kWh	3.14	3.25	3.28	3.35
<b>Revenue parameters</b>					
Tariff Increase	%	0.00%	3.00%	3.00%	3.00%
Average Billing Rate	Rs /kWh	4.41	4.54	4.68	4.82
<b>Expense</b>					
Employee Cost Escalation	%	6%	6%	6%	6%
Repair & Maintenance Escalation	%	6%	6%	6%	6%
Administrative & General Escalation	%	6%	6%	6%	6%

**Table 35: Impact (in per unit terms) of key financial components (Scenario D)**

Particulars	UoM	FY 16	FY 17	FY 18	FY 19
Revenue	Rs. Crores	₹ 5,022.09	₹ 5,705.96	₹ 6,490.45	₹ 7,378.82
Total Expense	Rs. Crores	₹ 4,659.74	₹ 5,380.85	₹ 6,133.12	₹ 6,908.69
PBT	Rs. Crores	₹ 362.35	₹ 325.11	₹ 357.33	₹ 470.14
ABR	Rs. per unit	₹ 4.41	₹ 4.54	₹ 4.68	₹ 4.82
ACS	Rs. per unit	₹ 4.09	₹ 4.28	₹ 4.42	₹ 4.51
Interest Cost	Rs. Crores	₹ 228.41	₹ 328.37	₹ 465.66	₹ 538.71
Tariff Increase	In %age	0.00%	3.00%	3.00%	3.00%
O&M cost	Rs. per unit	₹ 0.35	₹ 0.34	₹ 0.32	₹ 0.31
R&M cost per unit	Rs. per unit	₹ 0.08	₹ 0.07	₹ 0.07	₹ 0.07
Employee cost per unit	Rs. per unit	₹ 0.26	₹ 0.25	₹ 0.24	₹ 0.23
Interest cost per unit	Rs. per unit	₹ 0.20	₹ 0.26	₹ 0.34	₹ 0.35
A&G cost per unit	Rs. per unit	₹ 0.02	₹ 0.02	₹ 0.02	₹ 0.02



**Table 36: Financial Position of the Utility (Scenario D)**

Particulars	FY 14	FY 15	FY 16	FY 17	FY 18	FY 19
<b>Income</b>						
Net Sales	₹3,773.78	₹4,108.02	₹5,022.09	₹5,705.96	₹6,490.45	₹7,378.82
Other Income	₹ 111.03	₹ 116.58	₹ 122.41	₹ 128.53	₹ 134.95	₹ 141.70
<b>Total Income</b>	<b>₹ 3,884.80</b>	<b>₹ 4,224.59</b>	<b>₹ 5,144.49</b>	<b>₹ 5,834.49</b>	<b>₹ 6,625.40</b>	<b>₹ 7,520.52</b>
<b>Expenditure</b>						
Transmission Charges	₹ 385.07	₹ 396.46	₹ 442.07	₹ 482.04	₹ 525.80	₹ 577.78
Power & Fuel Cost	₹ 2,789.26	₹ 2,973.63	₹ 3,572.37	₹ 4,081.36	₹ 4,555.31	₹ 5,131.10
Employee Cost	₹ 258.71	₹ 274.24	₹ 290.70	₹ 308.15	₹ 326.65	₹ 346.26
R&M cost	₹ 77.18	₹ 81.81	₹ 86.72	₹ 91.93	₹ 97.45	₹ 103.30
Admin and General Expenses	₹ 18.01	₹ 19.09	₹ 20.23	₹ 21.45	₹ 22.74	₹ 24.10
<b>Total Expenses</b>	<b>₹ 3,528.23</b>	<b>₹ 3,745.23</b>	<b>₹ 4,412.10</b>	<b>₹ 4,984.94</b>	<b>₹ 5,527.94</b>	<b>₹ 6,182.54</b>
<i>Operating Profit</i>	<i>₹356.58</i>	<i>₹479.37</i>	<i>₹732.40</i>	<i>₹849.55</i>	<i>₹1,097.46</i>	<i>₹1,337.99</i>
PBDIT	₹ 356.58	₹ 479.37	₹ 732.40	₹ 849.55	₹ 1,097.46	₹ 1,337.99
Interest	₹ 128.51	₹ 168.30	₹ 228.41	₹ 328.37	₹ 465.66	₹ 538.71
<i>PBDT</i>	<i>₹228.07</i>	<i>₹311.06</i>	<i>₹503.98</i>	<i>₹521.17</i>	<i>₹631.80</i>	<i>₹799.27</i>
Depreciation	₹ 92.87	₹ 110.44	₹ 141.63	₹ 196.07	₹ 274.47	₹ 329.13
<i>Profit Before Tax</i>	<i>₹135.21</i>	<i>₹200.62</i>	<i>₹362.35</i>	<i>₹325.11</i>	<i>₹357.33</i>	<i>₹470.14</i>
Provision for bad debts	₹ 66.96					
<i>PBT (Profit before exceptional &amp; extraordinary items &amp; tax)</i>	<i>₹68.25</i>	<i>₹200.62</i>	<i>₹362.35</i>	<i>₹325.11</i>	<i>₹357.33</i>	<i>₹470.14</i>
<b>Reported Net Profit</b>	<b>₹ 68.25</b>	<b>₹ 200.62</b>	<b>₹ 362.35</b>	<b>₹ 325.11</b>	<b>₹ 357.33</b>	<b>₹ 470.14</b>
<b>Accumulated Losses</b>	<b>-₹ 1,695.00</b>	<b>-₹ 1,494.38</b>	<b>-₹ 1,132.03</b>	<b>-₹ 806.92</b>	<b>-₹ 449.59</b>	<b>₹ 20.54</b>

Based on the above assumptions, it is evident that if UPCL adheres to the target electrification and reduction of losses, and funds the entire capital expenditure proposed under IPDS and DDUGJY through loans from FI/World Bank etc., the accumulated losses will marginally reduce from Rs. 1,695 Crores to Rs. 1144.38 Crores. The accumulated losses will progressively reduce if the SERC approves a nominal tariff hike of 3% each in FY 17 to FY 19 and UPCL will be able to start earning overall profit from FY 19 onwards which will in turn enable it to realize the eligible return on equity.

## 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 UPCL for looking at activities of overall communication strategy.

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

**Table 37: Proposed Communication Responsibilities**

Communication Objective	Responsibility	Frequency
"Power for All" - Roll Out Plan	Secretary, Energy	Quarterly
Status update on Deliverables	Secretary, Energy	Quarterly
Generation Projects <i>Physical Progress, Achievements and Other Relates Issues</i>	Managing Director, UJVNL	Quarterly
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, PTCUL	Monthly
Distribution Progress, Achievements, Losses, Consumer Initiatives etc.	Managing Director, UPCL	Monthly
Renewable Power	Chairman, UREDA	Quarterly

### INFORMATION TECHNOLOGY

The 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, Personal 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, “**Mobile Based Photo Meter Reading & Billing System**” 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 Centres (RDCC) within the State will be identified in view of upcoming projected load. These will initially cater to the principal load centres, but would thereafter be expanded to all load centres of the state. This will be a key initiative, not only for effectively managing 24x7 supply, but also thereafter for other functions like forecasting.
  - ✓ 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.
- The above measures, need to be implemented on priority basis by UPCL 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 the projects are progressing as per the action plan. This committee will undertake progress reviews on a monthly basis.
- **District Level Committee** – It is proposed to constitute a district level committee headed by the S.E. to take action that is necessary to ensure the projects are completed in a timely manner and address any issues pertaining to land or other relevant approvals.
- **Project Monitoring Unit (PMU)** – A project monitoring unit shall be set up for monitoring the progress of the works being undertaken under this scheme. The PMU will operate under the Secretary, Energy and shall be operated by an external independent agency.

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

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

#### 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 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 (DMS) 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.

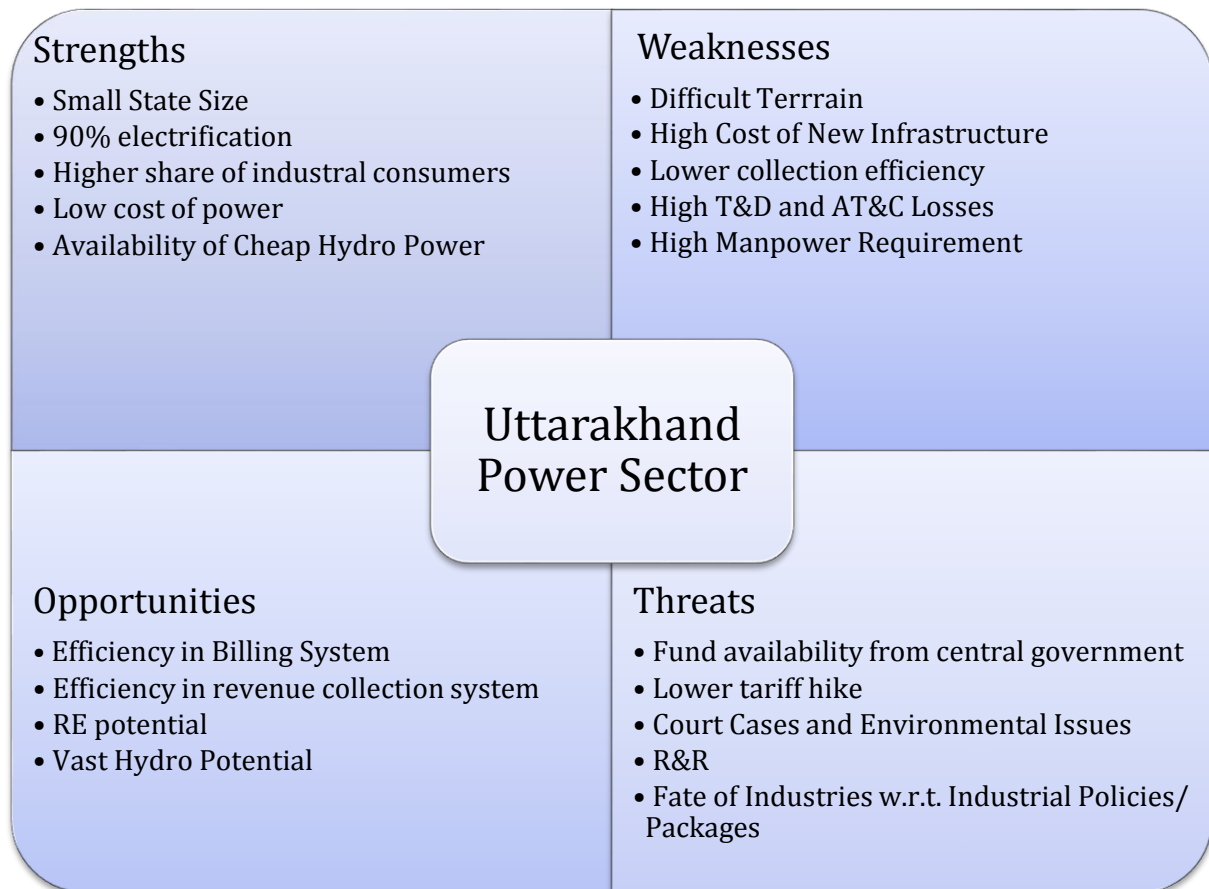
A state level officers training institute may be required to be opened in the state to fulfil the ongoing training requirement for employees of Uttarakhand Power Utilities. This also helps in training of subordinate technical staff. Following training programmes are proposed to be implemented for the 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: YEAR WISE 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 Uttarakhand in achieving the set goal. Before structuring the above targets, SWOT analysis of existing power sector in Uttarakhand has been discussed. The exercise has been done to bring out some of the key risk indicators which affect the overall market in Uttarakhand along with advantages present.



From the above analysis it is quite evident that most of the threats are external factors which would need continuous efforts from Uttarakhand to mitigate them as soon as possible. Further, from the weaknesses tabulated it is seen that, with some strong and bold measures Uttarakhand will be able to attain the target.

Based on the above observations, a road map for Uttarakhand has been developed to mitigate the above weaknesses and threats.



## ROAD MAP FOR POWER FOR ALL

Table 38: Roll Out Plan

Sl. N o.	Category	Base year scenario (FY 15)	Rollout Plan				Total	Total expected capacity FY 19
			FY 16	FY 17	FY 18	FY 19		
GENERATION								
A	Availability (MW):							
	State Sector							
1	Hydro	1135	0	0	0	120	120	1255
2	Renewable	322	35	57	118	160	370	692
3	Renewable -UJVNL	33	0	7	14	4	25	58
a.	Grid (UREDA + Private)	220	34	34	89	130	287	506
	Mini Hydel		1	4	5	5	15	
	Solar		32	15	45	100	192	
	Other R.E.		2	14	39	25	80	
b.	Off Grid	69	1	16	15	26	58	128
	Mini Hydel		0	1	0	-	1	
	Solar		1	0	2	2	4	
	Other R.E.		1	15	13	24	53	
	Central Sector							
4	Thermal-Gas	70	0	0	0	0	0	70
5	Thermal-Coal	400	0	23	0	0	23	423
6	Hydro + Free Power Share	475	39	16	93	341	489	964
7	Nuclear	31	0	0	0	33	33	64
	Total Availability (MW)	2433	79	100	194	662	1035	3468
B	Peak Demand (MW):							
1	Peak Demand (MW)	1,930	2,177	2,374	2,589	2,845		2,845
2	Per Capita Consumption	1,154	1,279	1,371	1,470	1,587		1,587
TRANSMISSION								
C	Transmission Lines (CKM):							
1	Inter State	2115	632	433	304	184	1553	3668
	400 kV	988	621	116	304	184	1225	2213
	220 kV	1127	11	317	0	0	328	1455
2	Intra State	2958	8	329	50	180	567	3525
	220 kV	2958	0	188	40	120	348	3525
	132 kV		8	141	10	60	219	
Total Transmission Line		5073	640	762	354	364	2120	7193
D	Transformation Capacity (MVA):							
1	Inter State	1815	1580	0	630	1260	3470	5285
	400/220 kV	1815	1260	0	630	0	1890	5285
	400/132 kV		0	0	0	1260	1260	
	220/132 kV		320	0	0	0	320	
2	Intra State	6703	430	920	280	80	1710	8413
	400/220 kV	1185	0	0	0	0	0	1185
	220/132 kV	2460	0	0	200	0	200	2660
	220/33 kV	200	150	610	0	0	760	960
	132/66 and 132/33 kV	2858	280	310	80	80	750	3608
Total Transformation Capacity		8518	2010	920	910	1340	5180	13698

Sl. N o.	Category	Base year scenario (FY 15)	FY 16	FY 17	Rollout Plan		FY 18	FY 19	Total	Total expected capacity FY 19
DISTRIBUTION										
E	Connecting the Unconnected									
1	Village Electrification		4	28	47			79		
2	Hamlet Electrification		201	1405	2408			4013		
3	Target Electrification – Rural	-	20,081	35,143	45,183	-		1,00,407	1,00,407	
4	Target Electrification – Urban	Nil								
F	Efficiency Improvement									
1	T&D Losses (19.18% - FY14)	18.00%	16.05%	15.10%	14.05%	13.70%		13.70%		
2	AT&C Losses (20.36% - FY 14)	20.02%	17.61%	16.35%	15.12%	14.00%		14.00%		
G	Capacity Addition/Augmentation									
1	33 kV Substation (MVA Capacity)	3203	217	295	295	393	1200	4403		
2	33 kV Lines (CKT Km.)	4488	199	397	596	795	1987	6475		
3	11 kV Lines (CKT Km.)	37278	534	1069	1603	2138	5344	42622		
4	LT Lines (CKT Km.)	53203	773	1546	2319	3091	7729	60932		
ENERGY EFFICIENCY										
H	DELP Scheme									
	Number of consumers under DELP scheme			652000	652000	326000	1630000	1630000		
	Number of LEDs to be distributed			1956000	1956000	978000	4890000	4890000		
I	LED street light Scheme									
	No. of Street Light			46228	22183	2487	70898	70898		
	Number of ULBs			6 Nagar Nigams	24 Nagar Palikas	16 Nagar Panchayats				

**The district-wise / division-wise actionable roll-out plan has been detailed in Annexure – 9.**

## CHAPTER 13: FUND REQUIREMENT

The fund requirement for various schemes (ongoing and proposed) for Generation, Transmission, Distribution and Renewable energy plan as discussed in previous chapters is tabulated below:

**Table 39: Fund Requirement**

Sl. No.	Category	Fund Requirement (in Rs Crores)				
		FY 16	FY 17	FY 18	FY 19	Total
<b>A</b>	<b>Generation</b>					
1	Own Generation (to be Commissioned up to FY 19)	369	337	75	7	<b>788</b>
2	Own Generation (to be Commissioned beyond FY 19)	1317	1499	1469	1464	<b>5749</b>
3	R&M of Existing Stations	35	247	398	302	<b>982</b>
4	Renewable Energy (Grid and Off-Grid)	281	435	885	1277	<b>2878</b>
	<b>Total Fund Requirement (Generation)</b>	<b>2002</b>	<b>2518</b>	<b>2827</b>	<b>3050</b>	<b>10397</b>
<b>B</b>	<b>Transmission <sup>4</sup></b>					
1	Inter State - Transmission Lines	116	429	988	406	<b>1939</b>
2	Intra State - Transmission Lines	2	321	111	210	<b>644</b>
3	Inter State – Substations	264	0	0	438	<b>702</b>
4	Intra State – Substations	78	1103	108	20	<b>1309</b>
5	System for Power Evacuation	10	98	0	0	<b>108</b>
	<b>Total Fund Requirement (Transmission)</b>	<b>470</b>	<b>1951</b>	<b>1207</b>	<b>1074</b>	<b>4702</b>
<b>C</b>	<b>Distribution<sup>5</sup></b>					
1	IPDS	71	423	212	0	<b>706</b>
2	DDUGJY	343	2060	1030	0	<b>3433</b>
3	Ongoing Schemes	715	0	0	0	<b>715</b>
	<b>Total Distribution</b>	<b>1129</b>	<b>2483</b>	<b>1242</b>	<b>0</b>	<b>4854</b>

The request of Government of Uttarakhand for funds under IPDS and DDUGJY would be considered by Government of India as per its policies/ frameworks or otherwise Government of Uttarakhand would make arrangements for funding from FIs/Banks/Multilateral funding agencies.

<sup>4</sup> The DPR of some of the schemes to be executed in FY 18 and FY 19 is under preparation.

<sup>5</sup> The phasing of capital expenditure under IPDS and DDUGJY has been considered as 10% in FY 16, 60% in FY 17 and balance in FY 18

## CHAPTER 14: CONCLUSION

24x7 Power for All (24x7 PFA) is a Joint Initiative of Government of India (GoI) and State Governments with the objective to make 24x7 power available to all households, industry, commercial businesses, public needs, any other electricity consuming entity and adequate power to agriculture farm holdings by FY 19. This report draws a roadmap to achieve the above aims for the state of Uttarakhand.

The per-capita consumption of electricity in Uttarakhand has steadily grown from 1,012 kWh in FY 12 to 1,154 kWh in FY 15 at a CAGR of 4.46%.

The state will connect the 1,00,407 un-electrified households by FY 18 of which 54,015 households have already been planned to be connected under the DDUGJY scheme of GoI and 2,229 households will be connected through off-grid solutions. The state will prepare the roadmap for balance 44,163 households within next 6 months and submit the DPR for approval. The state will ensure 24 hours supply to all consumers from FY 16 onwards.

To serve the additional consumers and load, the planned capacity addition in both transmission and distribution system is adequate. However, as there is shortfall in supply requirement and the projected availability from existing as well as upcoming sources, the state will take necessary measures to tie-up additional power on short as well as long term basis to bridge this gap.

The step by step approach for determination of targets against key objectives is summarized below:

### Present Power Supply Position

The energy requirement of the state in FY 15 was 12,617 MU against the availability of 12,253 MU, the deficit at 364 MU being 2.88% of the requirement. The peak demand of 1930 MW in FY 15 could be fully met owing to the availability of a large of hydro-power capacity in the state.

Barring towns of tourist interest where no load restrictions are imposed, the state resorts to unscheduled load shedding of varying magnitude and duration in the rest of the state. While average hours of supply to agriculture sector varied in the range of 18:29 to 24:00 Hours, the industries received power for an average of 22:38 hours except induction furnaces which were supplied for an average of 19:58 hours per day.

### Demand Projections

The population of the state has grown from 84,89,349 in 2001 to 1,00,86,392 in 2011 at a decadal growth rate of 1.74%. There are a total of 7,18,395 urban households (consumers) and all of them are electrified. Out of 13,76,141 rural households (consumers), 1,00,407 are still un-electrified.

Demand trajectory till FY 19 has been projected taking into account the growth rates of each of the consumer categories observed in the past and the targeted loss trajectory.

The average household consumption has grown from 2.85 kWh/day in FY 10 to 3.70 kWh/day in FY 14 exhibiting a compounded annual growth rate (CAGR) of 6.74%. The average consumptions of urban and rural households in FY 14 were 4.28kWh/day and 2.12kWh/day respectively.

The future demands of urban and rural household consumption have been projected by taking into account the growth in number of electrified households on the one hand and the growth in average consumption on the other.

For all other categories, 5 years' CAGR in sales of each consumer category has been applied on the present figures to project sales for the next four years till FY19. The CAGR has varied between the lowest of 1.42% for Public Lighting to the highest of 12.22% for Mixed Load (HT).

Accordingly, energy sales are projected to grow from 9980 MU in FY 15 to 15307 MU in FY 19 with following key takeaways:

- Agricultural consumption accounts for a mere 5% of the total electricity consumption in the state and its percentage share is expected to go down to just 3% of the total by FY19.
- Share of industry as a percentage of total electricity consumption will continue to remain in the 58%-62% range.

Based on the projected consumption and the loss reduction trajectory set by UPCL for the coming four years, the energy requirement and peak demand of the state have been projected. The demand factor has been taken as the same as in FY15 (72.5%) to compute peak demand from energy requirement.

The energy requirement is projected to increase from 12,394 MU in FY 15 to 18,062 MU in FY 19 and the peak demand is projected to increase from 1,952 MW in FY 15 to 2,845 MW in FY 19.

However, as per the power supply position up to Mar-15 as now provided by state, the actual unrestricted requirement for FY 15 is 12,617 MU which is almost in line with the figures calculated in the study (i.e. 12,394 MU), thereby validating the assumptions considered for projecting the power requirement in FY 19.

As per projections made in 18<sup>th</sup> EPS of CEA, the projected energy demand and peak load for the state of Uttarakhand was 14,223 MU and 2,449 MW in FY 19 respectively as against the now calculated energy demand of 18,062 MUs and peak load of 2,845 MW in FY 19,

## Generation Plan

During FY 15, about 31% of the power is being sourced from state owned generating stations, whose average rate has increased from Rs. 1.09/unit in FY 14 to Rs. 1.68/unit in FY 15. Further, another 30% power is being sourced from CGS whose average rate has increased from Rs. 3.24/unit in FY 14 to Rs. 3.51/unit in FY 15. IPPs and State Royalty power contribute 6.5% each in FY 15, **State was dependent on 26% of total power purchase (up from 24% in FY 14) from short term sources (UI/market purchase/through exchange etc.).**

The following additional capacities will be available in phased manner by FY 19:

- 145 MW of own generating stations.
- 270 MW of grid connected and 76 MW of off-grid renewable energy sources.

- *Allocation of 395 MW from CGS located within the state.*
- *Allocation of 150 MW from CGS located outside the state.*

There is a substantial capacity addition planned between FY 15 to FY 19 both within state and outside state.

The capacity addition figures are based on the latest expected dates of commercial operation as available with CEA.

On projecting the energy availability considering the actual/projected PLF of all the stations, it is observed that the ratio of availability from firm share to short term market purchase will continue to remain in the range of 70:30 to 75:25 in line with the previous years.

For the purpose of determining the adequacy of energy availability and optimizing energy cost, 90% of its projected energy requirement should be planned through firm allocations/tie-ups 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.

As Uttarakhand will be having projected energy availability of approximately 79% through firm share in FY 19, the state will take necessary measures to tie-up for additional 2,347 MU (i.e. approx. 335 MW) on long term basis so as to achieve an adequacy level of 90% of power availability from firm tie-ups by FY 19.

Further, the state will also plan for procurement of 1,806 MU by FY 19 on short term basis.

Meanwhile, additional power procurement required in the intervening years will be met through the above mentioned routes only.

The firm tie-ups do not include the availability from the unallocated quota of existing as well as upcoming CGS, which will be additionally available and can also be availed by Uttarakhand as an interim measure.

### **Transmission Plan**

The state is well served by a network of Inter- state transmission lines at 765 kV (charged at 400 kV), 400 kV and 220 kV levels. The existing ISTS transmission line capacity is adequate for meeting the present requirements.

The existing transformation capacity available at 220kV for import from the northern grid is 1815 MVA, which is comfortably above the maximum power Uttarakhand needs to import when low hydro generation and peak demand conditions are coincident.

The aggregate capacity of existing 400/220kV is 1185 MVA & aggregate capacity of 220/132kV transformers is 2160 MVA, whereas the aggregate capacity of 220/33kV + 132/33kV + 66/33 kV transformers at 3057.5MVA is comfortably above the all-time peak demand served at 33kV (<1930MW).

Load flow study carried out by PTCUL in the present peak demand conditions shows that all the lines are comfortably loaded within their rated capacities.



Capacity addition of 200 MVA in 220/132kV substation capacity and 1510 MVA in the aggregate capacity of 220/33kV & 132/33kV substations has been planned to be commissioned by FY 19 over the existing capacity of 3057.5 MVA. This will result in an aggregate capacity of 4567.5 MVA, which is considered adequate to meet a peak demand of 2845 MW in FY 19.

Computer load flow study has been carried by PTCUL to determine the adequacy of the existing and proposed system and to understand the system profile in terms of loading of the network during peak load condition by simulating the system peak of 2860 MW (higher than the projected peak demand of 2845 MW) and all the hydro generators are scheduled to generate 35% of their respective installed capacities.

The voltage profile at 400 kV, 220 kV & 132 kV level in Uttarakhand EHV network are within permissible limits and the loadings on 400 kV, 220 kV and 132 kV transmission lines of Uttarakhand EHV network are within permissible limit except one 220kV line and three 132kV lines for which reconductoring with high capacity conductors is recommended.

The transmission network planned to be commissioned by FY 19 will be adequate to meet the power demand of the state under “n-1” contingency.

### **Distribution Plan**

Uttarakhand Power Corporation Limited (UPCL) is the only distribution licence for distribution and retail supply of electricity in the state. It serves more than 18 lakh consumers and provides 20-24 hours supply to all the consumers in spite of hilly terrain and difficult areas in the state.

Uttarakhand, in fact, is a special category state having hilly terrain of which 65% is covered by forest and the population is very thin in far-flung areas.

The state has met a peak demand of 1930 MW through a vast network of 291 Nos. 33/11 KV Sub-stations having an aggregate capacity of 3203 MVA. In FY 15, the state had 4488 km of 33 kV lines, 37278 km of 11 kV lines and 53203 km of LT lines. At DT level, the state has an aggregate of 3406 MVA of transformation capacity.

The actual AT&C Losses of FY 14 were 20.36%, which is projected to come down to the level of 16% in FY 19.

While the RGGVY scheme has been already completed, the ongoing R-APDRP scheme (covering 31 towns in Uttarakhand) is expected to be completed by November 2016 (except Dehradun which is expected to be completed by March 2017).

The state has proposed a requirement of capital expenditure of Rs. 705.49 Crores in IPDS for system strengthening and network upgradation.

The state has also proposed a requirement of capital expenditure of Rs. 3433.20 Crores in DDUGJY for feeder segregation, providing access to all rural households and system strengthening with a proposal to cover a total of 54,015 households under electrification of 79 villages and 4,013 hamlets. Also, 2229 households have been targeted to be electrified through off-grid micro/mini hydel projects.

**Out of a total 1,00,407 households identified as un-electrified, roadmap for electrification of remaining 44,163 households will be prepared by the state within next six months.** The remote villages /habitations would also be identified by the state which may be electrified under DDG scheme of RGGVY or under various schemes of MNRE.

The transformation capacity at 33 kV level is projected to grow from 3203 MVA in FY 15 to 4403 MVA in FY 19.

The existing aggregate 11/0.4 KV distribution transformer capacity of UPCL is about 3406 MVA. Further, an additional transformer capacity of 460 MVA is planned to be added by FY 19 under IPDS Scheme and 775 MVA by FY 19 under DDUGJY Scheme which will result in overall distribution transformation capacity of 4641 MVA by FY 19.

Given the planned capacity addition, the distribution network is adequate with average 53% loading at 33/11 level and 31% loading at DT level under projected peak load conditions.

### **Clean Energy Initiatives**

The State has already notified the following policies/schemes for promotion of clean energy:

- ✓ *Uttarakhand Solar Power Policy-2013*
- ✓ *Uttarakhand Grid Interactive Rooftop and Small Solar PV Power Plant Scheme.*
- ✓ *Policy for Development of Micro & Mini Hydro Power up to 2 MW-2015.*
- ✓ *Uttarakhand Green Energy Cess Act, 2014.*

With the planned capacity addition of 270 MW of grid connected and 76 MW of off-grid renewable energy sources, the share of renewable energy (other than hydro) is expected to grow from the present level of 15% to 19.4% by FY 19. This is quite significant from the standpoint of achieving green energy targets.

### **Energy Efficiency Measures**

Energy saved by carrying out energy conservation activities during FY 14 is 171.28 MU (which is equivalent to 1.5% of state consumption and avoided capacity generation of 35.8 MW).

The energy conservation activities proposed to be undertaken are summarized below:

- ✓ *Replacement of incandescent lamp/CFL of the consumers of UPCL with LED bulbs*
- ✓ *Replacement of conventional street lights with LED street lights in urban local bodies.*
- ✓ *Replacement of inefficient equipment/devices with energy efficient devices in buildings of urban local bodies.*
- ✓ *Replacement of inefficient pumps with energy efficient pumps in Jalsanathan.*
- ✓ *Installation of solar water heating systems.*

The state will be able to save 358.64 MU of additional energy demand across various categories of consumers which will translate into an opportunity cost saving of Rs. 99.24 Crores in the FY 19, which will continue in future periods as well. This will also result in lower power generation from thermal generating stations which would have generated power in case of this demand had to be met otherwise.

### **Financial Position**

The state will require Rs 10,397 Crores in Generation, Rs 4,702 Crores in Transmission and Rs. 4,854 Crores in Distribution to undertake the planned capital expenditure.

In case UPCL adheres to the target electrification and reduction of T&D losses, the accumulated financial losses will reduce to Rs. 305.23 Crores in the FY 19 from Rs. 1,695 Crores in FY 14 and will require a nominal hike of 1.7% in FY 17 to achieve the financial turnaround.

In case UPCL does not adhere to the target electrification and reduction of losses, it will have to depend on the higher tariff hikes of the order of 3.5% each in FY 17 & FY 18 to achieve financial turnaround.

Also, the request of Government of Uttarakhand for funds under IPDS and DDUGJY would be considered by Government of India as per its policies/framework or otherwise Government of Uttarakhand would make arrangements for funding from FIs/Banks/Multilateral funding agencies.

In case UPCL does not receive any funding under IPDS and DDUGJY and undertakes the proposed capital expenditure through loan from market, it will have to depend on the higher tariff hikes of the order of 3% each in FY 17 to FY 19 to achieve financial turnaround.

**On the basis of above considerations, a roadmap to achieve '24x7 Power for All' targets has been formulated and detailed in the report.**

# ANNEXURES

## ANNEXURE – 1

**Table 40: Area Details as per 2011 Census (in Sq. Km.)**

S. No.	District Name	Total (in Sq. Km)	Rural		Urban	
			In Sq. Km	In %age	In Sq. Km	In %age
1	Uttarkashi	8,016	7,989	99.66%	27	0.34%
2	Chamoli	8,030	7,990	99.51%	40	0.49%
3	Rudraprayag	1,984	1,971	99.36%	13	0.64%
4	Tehri Garhwal	3,642	3,576	98.18%	66	1.82%
5	Dehradun	3,088	2,816	91.18%	272	8.82%
6	Garhwal	5,329	5,257	98.65%	72	1.35%
7	Pithoragarh	7,090	7,074	99.77%	17	0.23%
8	Bageshwar	2,241	2,236	99.75%	6	0.25%
9	Almora	3,144	3,108	98.87%	36	1.13%
10	Champawat	1,766	1,753	99.26%	13	0.74%
11	Nainital	4,251	4,153	97.70%	98	2.30%
12	Udham Singh Nagar	2,542	2,420	95.19%	122	4.81%
13	Haridwar	2,360	2,239	94.86%	121	5.14%
<b>Overall</b>		<b>53,483</b>	<b>52,581</b>	<b>98.31%</b>	<b>902</b>	<b>1.69%</b>

**Table 41: Population Details as per 2011 Census (In No.s)**

S. No.	District Name	Total (in No.s)	Rural		Urban	
			In No.s	In %age	In No.s	In %age
1	Uttarkashi	3,30,086	3,05,781	92.64%	24,305	7.36%
2	Chamoli	3,91,605	3,32,209	84.83%	59,396	15.17%
3	Rudraprayag	2,42,285	2,32,360	95.90%	9,925	4.10%
4	Tehri Garhwal	6,18,931	5,48,792	88.67%	70,139	11.33%
5	Dehradun	16,96,694	7,54,753	44.48%	9,41,941	55.52%
6	Garhwal	6,87,271	5,74,568	83.60%	1,12,703	16.40%
7	Pithoragarh	4,83,439	4,13,834	85.60%	69,605	14.40%
8	Bageshwar	2,59,898	2,50,819	96.51%	9,079	3.49%
9	Almora	6,22,506	5,60,192	89.99%	62,314	10.01%
10	Champawat	2,59,648	2,21,305	85.23%	38,343	14.77%
11	Nainital	9,54,605	5,82,871	61.06%	3,71,734	38.94%
12	Udham Singh Nagar	16,48,902	10,62,142	64.42%	5,86,760	35.58%
13	Haridwar	18,90,422	11,97,328	63.34%	6,93,094	36.66%
<b>Overall</b>		<b>1,00,86,292</b>	<b>70,36,954</b>	<b>69.77%</b>	<b>30,49,338</b>	<b>30.23%</b>

## ANNEXURE – 2

**Table 42: District wise Households and their Electrification Status (in %age)**

S.No.	District Name	Households		Electrification Status - Rural		Electrification Status - Urban	
		Rural	Urban	Electrified	Un-Electrified	Electrified	Un-Electrified
1	Uttarkashi	91.87%	8.13%	77.38%	22.62%	98.02%	1.98%
2	Chamoli	84.82%	15.18%	80.82%	19.18%	97.79%	2.21%
3	Rudraprayag	95.46%	4.54%	91.64%	8.36%	98.35%	1.65%
4	Tehri Garhwal	87.64%	12.36%	86.33%	13.67%	98.43%	1.57%
5	Dehradun	42.47%	57.53%	94.47%	5.53%	97.64%	2.36%
6	Garhwal	84.79%	15.21%	87.40%	12.60%	98.16%	1.84%
7	Pithoragarh	85.29%	14.71%	83.26%	16.74%	98.82%	1.18%
8	Bageshwar	96.60%	3.40%	81.03%	18.97%	97.30%	2.70%
9	Almora	90.82%	9.18%	76.96%	23.04%	98.11%	1.89%
10	Champawat	84.78%	15.22%	68.34%	31.66%	92.75%	7.25%
11	Nainital	60.22%	39.78%	85.87%	14.13%	97.07%	2.93%
12	Udham Singh Nagar	64.89%	35.11%	80.46%	19.54%	93.15%	6.85%
13	Haridwar	61.36%	38.64%	79.20%	20.80%	96.18%	3.82%
<b>Overall</b>		<b>70.35%</b>	<b>29.65%</b>	<b>83.05%</b>	<b>16.95%</b>	<b>96.49%</b>	<b>3.51%</b>

## ANNEXURE – 3

**Table 43: Proposed Capital Expenditure of RM&U of Existing Stations (in Rs Crores)**

S. No.	Plant	Total	up to FY 15	FY 16	FY 17	FY 18	FY 19	FY 20	FY 21	FY 22	FY 23
1	Tiloth	384.66			46.14	132.19	57.36	62.81	86.16		
2	Dhalipur	152.65			14.23	26.89	37.95	38.75	34.83		
3	Khatima	256.77	68.45	35.00	100.00	53.32					
4	Kulhal	118.72			47.49	35.62	35.62				
5	Ramganga	455.21			39.01	81.44	119.79	162.85	52.12		
6	Chilla	490.70				68.50	51.52	102.37	119.16	52.96	65.47
<b>Total RMU works</b>		<b>1858.71</b>	<b>68.45</b>	<b>35.00</b>	<b>246.87</b>	<b>397.96</b>	<b>302.24</b>	<b>366.78</b>	<b>292.27</b>	<b>52.96</b>	<b>65.47</b>

**Table 44: Availability after RM&U of Existing Stations (in MU)**

Sl. No.	Name of Project	Capacity (MW)	Type Of Project	Present Generation	Generation after R&M	Enhancement in Energy (MU)	Start Date	Completion Schedule	Remarks
1	Khatima	41.40	ROR	149	235	86	FY 13	FY 17	Under RM&U
2	Kulhal	30.00	ROR	145	183	38	FY 16	FY 19	Under Process
3	Ramganga	198.00	Reservoir	283	450	167	FY 17	FY 21	Under Process
4	Dhalipur	51.00	ROR	240	276	36	FY 18	FY 22	Under Process
5	Tiloth	90.00	Pondage	446	484	38	FY 17	FY 21	Under Process
6	Chilla	144.00	ROR	805	1029	224	FY 18	FY 23	Under Process
<b>Total</b>		<b>554.4</b>		<b>2068</b>	<b>2657</b>	<b>589</b>			

**Table 45: Hydro Stations falling under Eco Sensitive Zone**

SN	Name of Project	Capacity (MW)	Project Cost (Rs Crores)	Expenditure incurred till 31.03.2013 (Rs Crores)	Total Generation Loss @ Rs 5/Unit (Rs. Crs)	Status	Agency
1	Pala Maneri	480	1922.8	113.88	996.50	Discontinued by NGRBA	UJVNL
2	Bhaironghati	381	2033.37	20.00	703.00		UJVNL
3	Assiganga-I	4.50	40.41	25.63	11.25		UJVNL
4	Assiganga-II	4.50	36.97	16.10	11.25	Under Construction	UJVNL
5	Kaldigad	9.00	76.19	30.92	22.50	Under Construction	UJVNL
6	Limchi Gad	3.50	26.59	2.19	8.75	Ready for Construction	UJVNL
7	Sawari Gad	2.00	16.07	1.76	5.00	Ready for Construction	UJVNL
8	Assiganga-III	9.00	94.00	0.27	22.50	Ready for Construction	UJVNL
9	Son Gad	7.50	80.00	0.06	18.75	DPR Prepared	UJVNL
10	Pilangad- II	4.00	40.00	0.13	10.00	DPR under preparation	UJVNL
<b>Sub Total</b>		<b>905</b>	<b>4366.40</b>	<b>210.94</b>	<b>1809.50</b>		
11	Loharinag Pala	600	2776.00	800.00	1176.50	Discontinued by NGRBA	NTPC
12	Karmoli	140	1400	48.00	350.00	Under Investigation	THDC
13	Jadhganga	50	500		125.00	Under Investigation	THDC
<b>Sub Total</b>		<b>790</b>	<b>4676.00</b>	<b>848.00</b>	<b>1651.50</b>		
14	Jalandharigad	24.00	197.00	1.40	60.00	DPR approved, Under Implementation as per terms of I.A.	Harsil Hydro Pvt. Ltd
15	Kakoragad	12.50	91.00	0.64	31.25		
16	Syangad	11.50	94.00	0.57	28.75		
<b>Sub Total</b>		<b>48.00</b>	<b>382.00</b>	<b>2.61</b>	<b>120.00</b>		
<b>Grand Total</b>		<b>1743.00</b>	<b>9424.40</b>	<b>1061.55</b>	<b>3581.00</b>		



## ANNEXURE – 4

**Table 46: Planned ISTS Substations**

Sl. No.	Name of the Project	Project Cost (in Crores)	Voltage level (KV)	MVA Capacity	Total MVA	Target Date
<b>PTCUL Substations</b>						
1	400 KV S/S Srinagar	263.84	400/220	2x315	630 MVA	Dec-15
			220/132	2x160	320 MVA	
2	400 KV GIS S/S Pipalkoti	218.82	400/132	2x315	630 MVA	Dec-18
3	400 KV GIS S/S Karanprayag	218.82	400/132	2x315	630 MVA	Mar-19
	<b>Total</b>	<b>701.48</b>			<b>2210 MVA</b>	
<b>PGCIL Substations</b>						
1	400/220 KV S/s Sherpur, Dehradun		400/220	2x315	630 MVA	Mar-16
2	400/220 kV Jauljibi S/S		400/220	2x315	630 MVA	Mar-18

**Table 47: Planned Intra-state Substations**

Sl No.	Name of the Project	Project Cost (in Crores)	Voltage level (KV)	No. of ICTs x MVA Capacity	Total MVA/ CKM	Target Date
<b>220/132kV Transformers</b>						
1	220/132 KV S/s Almora	87.5	220/132	2x100	200 MVA	Dec-17
	<b>Total: 220/132kV Transformers</b>	<b>87.5</b>			<b>200 MVA</b>	
<b>220/33kV &amp; 132/33kV Transformers</b>						
1	Increasing capacity at 220 KV S/s SIDCUL Haridwar	9.20	220/33	1 x 50	50	Dec-15
2	Increasing capacity at 132 KV S/s Jwalapur	4.32	132/33	1 x 40	40	Dec-15
3	Increasing Capacity at 220/132 KV S/s Pantnagar	15.81	220/132	2x80to 2x80+2x50	100	Dec-15
4	Increasing Capacity of 132 KV S/s Bhupatwala	6.49	132/33	1 x 40	40	Dec-15
5	Increasing Capacity of 132 KV S/s Bazpur	11.9	132/33	2x40 to1x40+1x80	40	Sept-15
6	Increasing Capacity of 132 KV S/s Kathgodam	4.44	132/33	1x40 To2x40	40	Sept-15
7	Increasing Capacity of 132 KV S/s Bhowali	4.79	132/33	2x15 To2x15+20	20	Sept-15
8	Increasing Capacity of 132 KV S/s Almora	4.22	132/33	2x20 To3x20	20	Sept-15
9	132 KV S/s Chudiyala	16.88	132/33	2x40	80	Dec-15
10	220 /33 KV S/s Pirankaliyar	66.12	220/33	2 x 50	100	Dec-16
11	220/33 KV S/S IIP, Harrawala, Dehradun	131.14	220/33	2x50	100	Dec-16
12	132 KV S/s Lohaghat	93.16	132/33	2x20	40	Mar-17
13	132 KV S/s Khatima – II	20	132/33	2x40	80	Mar-17
14	220/33 KV S/s Jaffarpur	74.61	220/33	2x50	100	Dec-16
15	220/33 KV GIS S/s Puhana	70	220/33	2x50	100	Mar-17
16	132/33 KV GIS S/s Selaqui, Dehradun	65	132/33	2x40	80	Mar-17
17	132 KV S/s Bageshwar	92.78	132/33	2X15	30	Dec-16
18	220/33 KV GIS S/s Ghansali	122.65	220/33	2x30	60	Mar-17
19	220/33 KV S/S Baram (Jauljibi)	120.85	200/33	2x25	50	Mar-17
20	220/33 KV S/s Barahamwari	181.67	200/33	2x50	100	Mar-17
21	132 KV S/S Araghar, D.Dun	65	132/33	2x40	80	Mar-17
22	132 KV S/S Raipur	20	132/33	2x40	80	Mar-18
23	132 KV S/S Gairsain	20	132/33	2x40	80	Mar-19
	<b>Total: 220/33kV + 132/33kV Transformers</b>	<b>1221.03</b>			<b>1510 MVA</b>	

**Table 48: Planned ISTS Transmission Lines**

Sl. No.	Name of the Project	Project Cost (in Crores)	Voltage level (KV)	Total Ckt-km	Target Date
<b>PTCUL Lines</b>					
1	400 KV D.C. Srinagar 400 KV S/s - Srinagar Power House line	115.92	400	28 CKM	Dec-15
2	220 KV D.C. Brahmwari - Srinagar Line	156.55	220	182 CKM	Mar-17
3	220 KV Joshimath -Pipalkoti (400 kV) 2xD/C Line	110.75	220	40.6 CKM	Mar-17
4	220 KV Tapovan-Joshimath D/C line	45.74	220	24 CKM	Mar-17
5	400 KV Srinagar-Kashipur Line	988.02	400	304 CKM	Dec-17
6	400 KV S Kuwaripass (Pipalkoti)-Karanprayag Srinagar Line	405.72	400	184 CKM	Dec-18
7	400 KV D.C. Vishnugad - Kuwari Pass (Pipalkoti) line and LILO of 400 KV D/C Muzaffarnagar-Vishnuprayag line at Pipalkoti	115.92	400	42CKM	Mar-17
<b>TOTAL</b>		<b>1938.62</b>		<b>804.6 CKM</b>	
<b>PGCIL Lines</b>					
1	400 KV DC Bareilly –Kashipur-Puhana line		400	200 CKM	Jul-15
2	400 KV DC Sherpur(Dehradun)-Abdullapur line		400	144 CKM	Jul-15
3	400 KV D/C Dehradun – Bagapat		400	249 CKM	Jul-15
4	Roorkee – Saharanpur		400	74 CKM	Mar-17

**Table 49: Transmission Lines Planned for System Strengthening**

Sl No.	Name of the Project	Project Cost (in Crores)	Voltage level (KV)	Total MVA/ CKM	Target Date
1	220 KV LILO line at 220 KV S/s Piran Kaliyar	7.96	220	10.4	Dec-16
2	132 KV LILO line at 132 KV S/s Chudiyala	0.7	132	1	Dec-15
3	LILO of 132 KV Dhalipur-Purkul line at 220 KV S/s Dehradun	0.8	132	5	Oct-15
4	LILO of 132 KV Kulhal-Majra Line at 220 KV S/s Dehradun	0.8	132	2	Jun-15
5	132 KV Purkul-Bindal link line	5.24	132	10.91	Jun-16
6	132 KV S/C Lohaghat - Pithoragarh line	37.99	132	50	Mar-17
7	LILO of 132 KV Khatima – Sitarganj (PGCIL) line at 132 KV S/s Khatima – II	7	132	10	Mar-17
8	220 KV Almora –Jaulijivi (400kV PGCIL line) Line	165	220	146	Mar-17
9	LILO of 220 KV S/C of Khodri-Dehradun line at 220 KV S/S Selaqui	11.52	220	12	Mar-17
10	LILO of 220 KV S/C of Rishikesh - Dehradun line at 220 KV S/S IIP, Harrawala.	0.53	220	10	Dec-16
11	132 KV Ranikhet - Bageshwar line	53.13		60	Dec-16
12	LILO of 220 KV Dhauliganga- Pithoragarh line at 220 KV S/S Baram (Jauljivi)	26.09	220	10	Mar-17
13	LILO of 132 KV Laltappar –Majra line at 132 KV S/S Araghar	7	132	10	Mar-17
14	LILO of 132 KV Bindal-Rishikesh line at 132 KV S/S Raipur	7	132	10	Mar-18
15	132 KV Simli-Gairsain line	53.13	132	60	Mar-19
16	220 kV D/C Jauljibi (400 KVP GCIL) – Baram (Jauljibi )	104.36	220	40	Mar-18
17	220 kV D/C Almora – Karanpryag	156.54	220	120	Mar-19
<b>Total</b>		<b>644.79</b>		<b>567.31</b>	

**Table 50: Planned Lines for Power Evacuation**

Sl No.	Name of the Line	Project Cost (in Crores)	Voltage level (KV)	Total MVA/ CKM	Target Date
1	220 KV Dehradun (PTCUL)-Dehradun (PGCIL) Line	9.51	220	11 CKM	Dec-15
2	220 KV D.C. Twin Zebra Line from Vyasi HEP – Dehradun* (* The interconnection point at Dehradun will be the LILO Point on Proposed 220KV D/C Twin Zebra Line from Dehradun (PTCUL ) S/s to Dehradun (PGCIL ) S/s .	98.45	220	70 CKM	Mar-17
<b>Total</b>		<b>107.96+</b>		<b>81 CKM</b>	

**Table 51: Inter-State Transmission Lines in Uttarakhand**

Sl. No.	Line Name	Ckts.	Line Length (km)	Conductor	End 1	End 2
<b>765kV Lines Charged at 400kV</b>						
1	Tehri-Tehri Pooling	S/C	15	Quad Bersimis	THDC Generation	POWERGRID
2	Tehri-Tehri Pooling	S/C	17	Quad Bersimis	THDC Generation	POWERGRID
3	Tehri Pooling- Meerut	S/C	176	Quad Bersimis	POWERGRID	POWERGRID
4	Tehri Pooling- Meerut	S/C	179	Quad Bersimis	POWERGRID	POWERGRID
<b>400kV Lines</b>						
1	Muradabad-Kashipur	S/C	108	Twin Moose	UPPTCL	PTCUL
2	Rishikesh-Kashipur	S/C	172	Twin Moose	PTCUL	PTCUL
3	Roorkee-Rishikesh	S/C	50	Twin Moose	POWERGRID	PTCUL
4	Roorkee- Muzaffarnagar	S/C	71	Twin Moose	POWERGRID	UPPTCL
5	Bareilly-Kashipur	D/C		Quad Moose	POWERGRID	PTCUL
<b>400kV Lines Charged at 220Kv</b>						
1	Dhauliganga-Bareilly(UP) (POWERGRID Line)	S/C	235	Twin Moose	NHPC	UPPTCL
2	Dhauliganga-Pithoragarh	S/C	59	Twin Moose	NHPC	POWERGRID
3	Pithoragarh-Bareilly(UP)	S/C	178	Twin Moose	POWERGRID	UPPTCL
<b>220kV Lines</b>						
1	Baikunthpur-Pantnagar	S/C	71		UPPTCL	PTCUL
2	Khodri-Majri	S/C	35		PTCUL	HPPTCL
3	Khodri-Majri	S/C	35		PTCUL	HPPTCL
4	Nara-Roorkee	S/C	55		UPPTCL	PTCUL
5	Saharanpur-Khodri	S/C	81		UPPTCL	PTCUL
6	Saharanpur-Khodri	S/C	81		UPPTCL	PTCUL
7	Sitarganj-Tanakpur (POWERGRID Line)	S/C	42.5		PGCIL	NHPC
8	Sitarganj-Bareilly (POWERGRID Line)	S/C	106		PGCIL	UPPTCL
9	Tanakpur-Bareilly (POWERGRID Line)	S/C			PGCIL	UPPTCL

**Table 52: Existing Interconnecting Transformers (400/220kV): ISTS**

Sl. No.	Name	Voltage Ratio (kV)	MVA Rating	Configuration	Owner
1	Roorkee	400/220	315	3ø	POWERGRID
2	Roorkee	400/220	315	3ø	POWERGRID
3	Kashipur	400/220	315	3ø	PTCUL
4	Kashipur	400/220	315	3ø	PTCUL
5	Rishikesh	400/220	240	3ø	PTCUL
6	Rishikesh	400/220	315	3ø	PTCUL
<b>Total</b>		<b>400/220 kV</b>	<b>1815 MVA</b>	<b>3ø</b>	

**Table 53: Existing 220/33 kV + 132/33 kV + 66/33 kV Substation Capacity**

Sl No.	Name of the station	Voltage level in kV	No. x Rating in MVA	Capacity in MVA
1	UTTARKASHI PH	220/33	2X25	50
2	RISHIKESH	132/33	2x40	80
3	ROORKEE	220/33	2x50	100
4		132/33	2x40	80
5		132/66	2X20	40
6	HARIDWAR (SIDCUL)	132/33	2x80	160
7	PANTNAGAR (SIDCUL)	132/33	2x80	160
8	HALDWANI	132/66	2x20	40
9	KATHGODAM	132/33	1x40	40
10	CHAMBA	220/33	2x25	50
11	KOTDWAR	132/33	2x40	80
12	LAKSAR	132/33	2x40	80
13	MANGALORE	132/33	2x40	80
14	JWALAPUR	132/33	2x40	80
15	BHUPATWALA	132/33	2x40	80
16	BHAGWANPUR	132/33	3X40	120
17	IDPL, Rishikesh	132/33	1x12.5	12.5
18	MAJRA	132/33	3x40	120
19	SRINAGAR	132/33	1X40 +1X20	60
20		132/66	1x3x5+1x20	35
21	PURKUL GAON	132/33	1x40 +1x20	60
22	BINDAL	132/33	2x40	80
23	DHAKRANI	132/33	2x40	80
24	JASPUR	132/33	2x40	80
25	RAMNAGAR	132/33	1x40 +1x20	60

Sl No.	Name of the station	Voltage level in kV	No. x Rating in MVA	Capacity in MVA
26	KASHIPUR OLD	132/33	3x40	120
27	BAZPUR	132/33	2X40	80
28	BHOWALI	132/33	2x3x5	30
29	ALMORA	132/33	2x20	40
30	RANIKHET	132/33	6x5	30
31	PITHORAGARH	132/33	2x3X5+2x20	70
32	RUDRAPUR	132/33	2x40	80
33	KICHHA	132/33	2x40	80
34	SITARGANJ	132/33	2x40	80
35	KATHIMA	132/33	1x40 +1x20	60
36	MAHUAKHERAGANJ	132/33	2x80	160
37	SITARGANJ(SIDCUL)	132/33	2x40	80
38	SATPULI	132/33	2x20	40
39	LALTAPPAR(HARIDWAR ROAD)	132/33	2x40	80
40	DEHRADUN	132/33	2x40	80
41	SIMLI	132/33	2x20	40
Capacity Available at 33kV				3057.5 MVA
Industrial Feeders Supplied at 132 kV & 220kV				
1	220kV Tata			15
2	132kV Century Paper			10
3	132kV IGL			30
4	132kV KVS			30
5	132kV Hero Honda			10
6	132kV Polyflex			10
7	132kV Asahi Glass			15
Total EHT				120 MVA

**Table 54: 400/220kV & 220/132kV Transformer Capacity**

Sl. No.	Substation Name	Rating in MVA	Capacity in MVA	Sl. No.	Substation Name	Rating in MVA	Capacity in MVA
<b>400/220kV</b>				4	KASHIPUR	2x160	320
1	RISHIKESH	1x240+1x315	555	5	HALDWANI	2x100	200
2	KASHIPUR	2x315	630	6	PANTNAGAR	2x160	320
Aggregate Capacity: 400/220kV Transformers			<b>1185</b>	7	DEHRADUN (JHAJHRA)	2x160	320
<b>220/132kV</b>				8	MAHUAKHERAGANJ	2x100	200
1	RISHIKESH	2x160	320	9	PITHORAGARH	2x100	200
2	HARIDWAR	2x80	160	10	SITARGANJ	2x100	200
3	ROORKEE	2x160	320	Aggregate Capacity: 220/132kV Transformers			<b>2460</b>

## ANNEXURE – 5

**Table 55: Balance Position of Funds in R-APDRP Scheme (Part-B) (Rs. in Crores)**

S. No.	Name of Town	DPR Cost	Agreement amount	First Instalment of Loan	Expenditure up to 28.02.2015	Material Procured up to 16.02.2015	Balance Position of Funds (in Cr.)	% Progress
1	Tehri	4.86	5.60	1.46	1.57	2.75	0.13	49.16
2	Pauri	3.78	4.58	1.13	3.42	4.44	-2.09	97.00
3	Mussoorie	17.57	16.76	5.27	5.94	9.67	-0.66	57.70
4	Haridwar	86.72	65.87	26.02	6.84	14.93	19.18	22.66
5	Landhora	4.3	3.79	1.29	0.16	0.36	1.13	9.61
6	Manglore	14.03	11.65	4.21	0.35	0.78	3.86	6.67
7	Roorkee	33.2	33.01	9.96	1.43	3.18	8.53	9.62
8	Pithoragarh	8.73	7.05	2.62	4.16	6.38	-1.11	90.49
9	Srinagar	2.75	2.65	0.83	1.38	2.31	-0.42	87.31
10	Uttarkashi	6.46	7.53	1.94	1.70	2.49	0.24	33.05
11	Vikasnagar	3.93	4.98	1.18	2.13	3.82	-0.75	76.74
12	Rishikesh	14.35	13.74	4.31	4.46	7.87	-0.16	57.27
13	Ranikhet	3.59	4.28	1.08	3.23	4.09	-1.97	95.45
14	Kotdwar	7.47	9.1	2.24	2.72	4.23	-0.48	46.52
15	Bazpur	7.67	7.85	2.30	0.24	0.53	2.06	6.72
16	Gadarpur	3.83	3.88	1.15	0.59	1.30	0.56	33.51
17	Haldwani	26.31	23.59	7.89	3.14	6.97	4.76	29.56
18	Jaspur	11.24	9.89	3.37	1.15	2.39	2.22	24.19
19	Kashipur	49.37	40.35	14.81	1.90	3.94	12.91	9.77
20	Kathima	10	9.28	3.00	0.36	0.79	2.64	8.55
21	Kichha	4.88	4.34	1.46	0.92	2.03	0.55	46.86
22	Nainital	6.88	7.89	2.06	1.53	3.39	0.54	43.00
23	Ramnagar	11.65	12.24	3.50	1.76	3.42	1.74	27.92
24	Rudrapur	21.58	22.36	6.47	1.75	3.89	4.72	17.40
25	Sitarganj	4.24	3.86	1.27	0.82	1.82	0.45	47.16
26	Tanakpur	2.42	2.41	0.73	1.14	2.09	-0.30	86.88
27	Joshimath	2.78	3.38	0.83	1.28	1.70	-0.44	50.27
28	Almora	9.73	10.81	2.92	3.78	6.35	-0.86	58.72
29	Gopeshwar	2.22	3.01	0.67	0.72	1.60	-0.05	53.03
30	Laksar	6.09	5.21	1.83	0.67	1.49	1.16	28.56
31	Dehradun	191.46	240.9	57.44	8.84	16.48	48.60	6.84
<b>Total</b>		<b>584.09</b>	<b>601.83</b>	<b>175.23</b>	<b>70.03</b>	<b>127.94</b>	<b>106.70</b>	<b>21.26</b>

**Table 56: R-APDRP (Part-B) Current Progress<sup>6</sup>**

S. No.	Activity Detail	Total Work as per Approved BOQ	Progress	Remark
1	Replacement of Defective Meter	1φ 61469 Nos.	1φ 40533 Nos.	
		3φ 15930 Nos.	3φ 605 Nos.	
2	Shifting of Meter outside the premises	1φ 75212 Nos.	1φ 32912 Nos.	
		3φ 17625 Nos.	3φ 1 Nos.	
3	Replacement of LT Conductor with AB Cable	1409.434 Km.	916.229 Km.	
4	11 KV Line reconductoring	634.882 Km.	292.882 Km.	
5	11 KV New line	473.795 Km.	61.781 Km.	
6	Installation of New DT	2251 Nos.	810 Nos.	
7	Conversion of LT Line into HT Line HVDS	5154 Nos. New DT	297 Nos.	
		325.945 Km. LT to HT	9.3 Km.	
8	Construction of 33/11 KV S/s	10 Nos./158 MVA		In Rudrapur, Jaspur & Haldwani S/s Land is handed over & work under progress at site. Haridwar (4 Nos.)- Land of Sector-II S/s is acquired. Manglore (1 No.)- Land Handed over & work under progress. Roorkee (2 Nos.)- Land selected, proposal pending Jal Nigam for one S/S. For Ramnagar S/S work under Progress.
9	Additional Power T/f in 33/11 KV S/s	2 No./13 MVA	2 No./13 MVA	In Pithoragarh & Kotdwar town
10	Capacity enhancement of power T/f of 33/11 KV S/s	16 No./38 MVA	11 No./25 MVA	2 Nos. 3 to 5 MVA & 1 No. 8 to 10 MVA in Mussoorie, 1 No. 3 to 5 MVA in Pauri town, 1 No. 3 to 5 MVA in Srinagar town, 1 No. 8 to 10 MVA in Ramnagar town, 1 No. 5 to 8 MVA in Nainital & Kashipur town, 1 No. 3 to 5 MVA in Almora & Ranikhet town and 1 No. 5 to 8 MVA in Vikasnagar town.
11	Payment made till Date	61.24		
12	Payment under pipeline	Nil		

<sup>6</sup>As on 28<sup>th</sup> February 2015



Table 57: Work proposed Under DDUGVY scheme

Sl. No	Item	Unit	Qty.	Total Amount in Rs. Crores
<b>A.</b>	<b><u>Feeder Separation</u></b>			
A1	33 KV Feeder	Kms.	128.00	17.92
	<b>Sub-Total (A1)</b>			<b>17.92</b>
<b>A2</b>	<b>11 kV Feeder (Physical) Separation</b>		0.00	0.00
(i)	New 3 $\phi$ , 4 Wire 11 kV Line on PCC Poles	Kms.	2840.20	135.19
(i)	New 3 $\phi$ , 4 Wire 11 kV Line on ST Poles	Kms.	786.50	13.22
(ii)	Underground XLPE cable 3X120 sq. mm for separation of feeder	Kms.	0.50	0.00
(ii)	Augmentation of 3 $\phi$ , 4 Wire Existing 11 kV Line	Kms.	510.00	17.81
(iii)	11 kV Switchgear	Nos.	171.00	6.81
(iv)	New Transformers 25 kVA 3 $\phi$	Nos.	2815.00	66.46
(v)	Augmentation of Transformers	Nos.	0.00	0.00
	25 kVA to 63 kVA	Nos.	1281.00	20.44
	63 kVA to 100 kVA	Nos.	838.00	16.91
(vi)	LT Line on PCC Poles (Bare Conductor)	Kms.	398.00	8.29
(vii)	New 11 KV line on HT AB cable 3x120+1x95 sq. mm.	Kms.	112.00	3.09
(vii)	11 KV ABC on existing pole new ABC for PTW Fdr (1no fdr)	Kms.	409.00	35.64
(vii)	11 KV ABC on existing pole new ABC for STW Fdr for irrigation ( 3 no fdr)	Kms.	733.00	38.65
(vii)	Any other work, if any*		500.00	26.78
	<b>Sub-Total (A2)</b>			<b>389.30</b>
<b>A3</b>	<b>11 KV Feeder (Virtual) Separation</b>		0.00	0.00
(i)	New 3 $\phi$ , 4 Wire 11 kV Line on PCC Poles	Kms.	786.00	37.41
(ii)	Augmentation of 3 $\phi$ , 4 Wire Existing 11 kV Line	Kms.	47.00	0.78
(iii)	11 kV Switchgear	Nos.	15.00	0.60
(iv)	New Transformers 25 kVA 3 $\phi$	Nos.	1348.00	32.62
(v)	Augmentation of Transformers	Nos.	0.00	0.00
	25 kVA to 63 kVA	Nos.	21.00	0.19
	63 kVA to 100 kVA	Nos.	6.00	0.06
(vi)	LT Line on PCC Poles (Bare Conductor)	Kms.	27.00	0.54
(vii)	Any other work, if any*		0.00	0.00
	<b>Sub-Total (A3)</b>			<b>72.20</b>
	<b>Total (A)</b>			<b>479.43</b>
<b>B.</b>	<b><u>Strengthening of Sub-Transmission and Distribution Network</u></b>			
<b>B1</b>	<b>33 kV WORKS</b>		0.00	0.00
(i)	New 33/11 kV Sub-stations		0.00	0.00
	1X3 MVA	Nos.	23.00	39.10
	1X5 MVA	Nos.	58.00	111.07
	Any Other Capacity, if any required*	Nos.	12.00	5.34
(ii)	33kV bays	Nos.	43.00	8.60
(iii)	New 33kV Line	Kms.	1052.50	159.11
(iv)	Reorientation of 33kV Line	Kms.	191.15	25.64
(v)	Augmentation of Existing 33/11 kV S/s.		29.00	3.48
	1X1.5 to 1X3 MVA	Nos.	11.00	3.50
	1X1.5 to 1X5 MVA	Nos.	2.00	1.50
	1X1.5 to 1.5+3 MVA	Nos.	0.00	0.00
	1X3 to 1X5 MVA	Nos.	13.00	9.75
	1X3 to 2X3 MVA	Nos.	9.00	11.70
	1X5 to 5+3 MVA	Nos.	6.00	7.80
	2X3.15 to 2X5	Nos.	4.00	3.00
	1X5 to 2X5	Nos.	5.00	6.90

Sl. No	Item	Unit	Qty.	Total Amount in Rs. Crores
	2X5 to 2x8	Nos.	3.00	1.74
	1X5 to 1x8	Nos.	2.00	1.16
	3+5 to 2X8	Nos.	5.00	2.89
	1x8 to 2x5	Nos.	1.00	1.30
	3X10 MVA TO 3X12.5 MVA	Nos.	3.00	2.70
	1X8 to 10 MVA	Nos.	3.00	2.15
	1X8 to 12.5 MVA	Nos.	25.00	22.50
	Any Other Capacity, if any required*	Nos.	96.00	57.33
(vi)	Renovation of Existing 33/11 kV Sub-stations	Kms.	91.00	10.92
(vii)	Upgradation of (Conductor) 33 kV Existing Line	Kms.	710.00	75.37
(viii)	Augmentation/Renovation of existing 33 kV line	Kms.	670.00	80.40
(ix)	Installation of Capacitors	Kms.	4680.00	167.53
(x)	Installation of Battery with Battery Charger	Kms.	150.00	1.05
	<b>Sub-Total (B1)</b>			<b>823.53</b>
B2	Brief Scope of R&M works in existing 33/11 KV or 66/11 KV substations (details of Substations & works to be provided in DPR)			
(i)	33 KV MOCB TO 33KV VCB	Kms.	16.00	0.58
(ii)	NEW 33KV VCB ON T/F AND LINE	Kms.	53.00	2.27
(iii)	11KV OCB to VCB	Kms.	54.00	0.81
(iv)	11 KV OLD VCB TO NEW VCB	Kms.	71.00	2.48
(vi)	OCB to VCB at Nuenisain- incoming-2 Nos. Outgoing-6 Nos.	Kms.	8.00	0.29
(vii)	OCB to VCB at Bagwang- incoming-1 Nos. Outgoing-4 Nos.	Kms.	5.00	0.18
(vii)	Battery Charger	Kms.	2.00	0.01
(vii)	Metering at 11 KV feeder Bagwan. - Incoming-1 Nos. Outgoing-4 Nos.	Kms.	5.00	0.75
(vii)	Metering at 11 KV feeder Nuenisain. - Incoming-2 Nos. Outgoing-6 Nos.	Kms.	8.00	1.20
(vii)	Earthing	Kms.	42.00	1.48
(viii)	3 MVA T/f	No.	3.00	0.09
(ix)	5 MVA T/f	No.	1.00	0.03
(ix)	33 KV Circuit breaker	No.	17.00	0.67
(ix)	33 KV Isolators	No.	19.00	0.11
(ix)	33 KV CT	No.	24.00	0.08
(ix)	33 KV PT	No.	14.00	0.04
(ix)	33 KV LA	No.	56.00	0.31
(ix)	33 KV Circuit breaker for T/f	No.	11.00	0.39
(ix)	Providing Chemical Earthing & 33 KV VCB With all accessories (Panel etc.)SF6	No.	37.00	1.27
	Replacement of Old 33 KV Isolators (8 Nos.)	Nos.	15.00	0.06
	Sub-station yard turfing	Nos.	5.90	0.19
	Repair of cable trenches	Nos.	5.80	0.34
	Renovation of S/S yard earth mat	Nos.	28.00	2.09
	Provision of 33 KV breaker for mehregaon circuit at 33/11 KV s/s Ranibagh and T/F breaker.	Nos.	3.00	0.11
	R& M works of 33 KV Breaker	Nos.	22.00	0.80
	R& M works of 33 KV CT	Nos.	9.00	0.03
	R& M works of 33 KV PT	Nos.	9.00	0.03
	R& M works of 33 KV L.A	Nos.	6.00	0.02
	R& M works of 33 KV FANCING	Nos.	1.00	0.02
	R& M works of 33 KV GUARDING	Nos.	18.00	0.36
(x)	Any Other Item	Set	978.17	10.45
	<b>Sub Total (B2)</b>			<b>27.55</b>
B3	<b>11 kV Transmission Works</b>			

Sl. No	Item	Unit	Qty.	Total Amount in Rs. Crores
(i)	New 3 $\phi$ , 4Wire 11 kV Line on ST Poles	Kms.	2094.36	157.07
(ii)	Reorientation of 3 $\phi$ , 4Wire 11 kV Line on ST Poles	Kms.	1018.50	73.18
(iii)	Augmentation of 1 $\phi$ , 2Wire to 3 $\phi$ , 4Wire 11 kV Line on ST Poles	Kms.	3094.70	83.74
(iv)	New 3 $\phi$ , 4Wire 11 kV Line on PCC Poles	Kms.	217.00	10.33
(v)	Augmentation of 3 $\phi$ , 4 Wire Existing 11 kV Line	Kms.	313.40	5.23
(v)	Reorientation of 3 $\phi$ , 4Wire 11 kV Line on PCC Poles	Kms.	409.00	19.47
(vi)	Augmentation of 1 $\phi$ , 2Wire to 3 $\phi$ , 4Wire 11 kV Line on PCC Poles	Kms.	141.00	3.36
(vi)	11 kV line conductor change to ABC Cable	Kms.	203.00	1.71
(vi)	11 kV line single disc to double disc	Kms.	779.00	2.62
(vi)	Replacement of Damage wooden poles	Nos.	3425.00	4.11
(vi)	Replacement of Damage STP poles	Nos.	1860.00	2.23
(vi)	Guarding of 11 K Line	Kms.	248.00	0.25
(vi)	11 KV Disk 1 No to 3 No	Nos.	200.00	0.01
	<b>Sub Total (B3)</b>			<b>363.31</b>
<b>B4</b>	<b>11 kV Transformation Works</b>			
(i)	Installation of New 3 $\phi$ , 11/0.4 kV Distribution T/fs			
	10 kVA (3ph)	Nos.	0.00	0.00
	16 kVA (3ph)	Nos.	0.00	0.00
	25 kVA (3ph)	Nos.	4225.00	91.55
	63 KVA (3ph)	Nos.	324.00	8.62
	100 KVA (3ph)	Nos.	728.00	22.57
	250 KVA (3ph)	Nos.	8.00	0.57
	400 KVA (3ph)	Nos.	5.00	0.42
	Any Other Capacity, if any required*	Nos.	0.00	0.00
(ii)	Augmentation of Distribution T/f		0.00	0.00
	10 kVA (1ph) to 10 kVA (3ph)	Nos.	24.00	0.18
	16 kVA (1ph) to 16 kVA (3ph)	Nos.	0.00	0.00
	16 kVA (1ph) to 25 KVA (3ph)	Nos.	4241.00	31.87
	25 kVA (3ph) to 63 KVA (3ph)	Nos.	1328.00	17.00
	63 kVA (3ph) to 100 KVA (3ph)	Nos.	382.00	6.49
	25 kVA (3ph) to 100 KVA (3ph)	Nos.	21.00	0.36
	100 kVA (3ph) to 250 KVA (3ph)	Nos.	622.00	43.65
	250 kVA (3ph) to 400 KVA (3ph)	Nos.	3.00	0.25
	Any Other Capacity, if any required*	Nos.	18.00	1.28
(iii)	Replacement of Brunt Distribution T/f	Nos.	0.00	0.00
	10 kVA (3ph)	Nos.	0.00	0.00
	16 kVA (3ph)	Nos.	587.00	2.76
	25 kVA (3ph)	Nos.	2201.00	14.99
	63 kVA (3ph)	Nos.	349.00	1.29
	100 kVA (3ph)	Nos.	813.00	4.43
	160 kVA (3ph)	Nos.	24.00	0.24
	250 kVA (3ph)	Nos.	140.00	2.42
	400 kVA (3ph)	Nos.	51.00	0.95
(iv)	Any Other Capacity, if any required*	Nos.	0.00	0.00
	<b>Sub Total (B4)</b>			<b>251.87</b>
<b>B5</b>	<b>Distribution Transformer-R&amp;M</b>			
(i)	16 kVA	Nos.	2400.00	1.92
(ii)	25 kVA	Nos.	13155.00	15.79
(iii)	63 kVA	Nos.	3599.00	7.32
(iv)	100 kVA	Nos.	1739.00	8.70
(v)	250 kVA	Nos.	710.00	7.10

Sl. No	Item	Unit	Qty.	Total Amount in Rs. Crores
(vi)	400 kVA	Nos.	422.00	5.04
(iv)	500 kVA	Nos.	58.00	0.76
(iv)	630 kVA	Nos.	5.00	0.09
	11 kV Switchgear	Nos.	85.00	3.36
	<b>Sub Total (B5)</b>			<b>50.07</b>
<b>B6</b>	<b>LT Distribution Works</b>			
(i)	3Ph, 4W LT Line with Aerial Bunched Cable (ABC) on ST Poles	Kms.	4046.50	251.38
(ii)	1Ph, 2W LT Line with Aerial Bunched Cable (ABC) on ST Poles	Kms.	2080.50	74.83
(iii)	Conversion of 3Ph LT Line to 3Ph Aerial Bunched Cable (ABC)	Kms.	11434.00	139.11
(iv)	3Ph, 4W LT Line with Aerial Bunched Cable (ABC) on PCC Poles	Kms.	2295.90	58.67
(v)	1Ph, 2W LT Line with Aerial Bunched Cable (ABC) On PCC Poles	Kms.	942.00	14.82
(vi)	Conversion of 1Ph LT Line to 1Ph Aerial Bunched Cable (ABC)	Kms.	5577.00	50.94
	LT Line on ST Poles (Bare Conductor)	Kms.	155.00	3.01
	Replacement of GI wire with weasel conductor	Kms.	1930.00	7.93
	Providing of poles on long span (SP-23)	Nos.	1770.00	1.99
	replacement of damaged/rusted pole	Nos.	6894.00	7.39
	10 kVA (3ph)	Nos.	0.00	0.00
	Conversion of 1Ph LT Line bare/ABC to 3Ph Aerial Bunched Cable (ABC)	Kms.	2914.00	22.73
	<b>Sub Total (B6)</b>			<b>632.79</b>
<b>B7</b>	Capacitor Bank	MVAR	1757.45	63.51
	<b>Sub Total (B7)</b>			<b>63.51</b>
<b>B8</b>	<b>Service Connections Works</b>			
(i)	Domestic (All)	Nos.	0.00	0.00
(ii)	Domestic (BPL)	Nos.	0.00	0.00
	<b>Sub Total (B8)</b>			<b>0.00</b>
	<b>Total (B)</b>			<b>2212.64</b>
<b>C.</b>	<b>Metering</b>			
C1	Feeder		0.00	0.00
(i)	Installation of Meter at 11 kV Feeders (Feeder Metering) using		0.00	0.00
	100/5A CT Ratio & PT	Nos.	47.00	0.13
	150/5A CT Ratio & PT	Nos.	47.00	0.14
	200/5A CT Ratio & PT	Nos.	209.00	0.62
	400/5A CT Ratio & PT	Nos.	120.00	0.36
	600/5A CT Ratio & PT	Nos.	5.00	0.02
	Any Other Capacity, if any required*		0.00	0.00
	<b>Sub-Total (C1)</b>			<b>1.27</b>
C2	<b>Distribution Transformer</b>			
(i)	Installation of Meter at Distribution T/fs (DTR Metering)		0.00	0.00
	10 kVA (3ph)	Nos.	71.00	0.21
	16 kVA (3ph)	Nos.	3362.00	9.75
	25 kVA (3ph)	Nos.	19013.00	55.14
	63 kVA (3ph)	Nos.	2900.00	8.41
	100 kVA (3ph)	Nos.	2365.00	6.86
	160 kVA (3ph)	Nos.	248.00	0.72
	250 kVA (3ph)	Nos.	486.00	1.41
	400 kVA (3ph)	Nos.	96.00	0.28
	500 kVA (3ph)	Nos.	2.00	0.01
	Any Other Capacity, if any required*	Nos.	1707.00	4.95
	<b>Sub-Total (C2)</b>			<b>87.73</b>
C3	<b>Consumer</b>	Nos.		

Sl. No	Item	Unit	Qty.	Total Amount in Rs. Crores
(i)	Installation of Meter Pillar Box for 1Ph Connections	Nos.	190650.00	19.07
(i)	Installation of Meter Pillar Box for 3Ph Connections	Nos.	16442.00	6.27
(ii)	Replacement 1Ph Defective Meters	Nos.	136129.00	16.22
(iii)	Replacement 3 Ph. Defective Meters	Nos.	10317.00	5.08
(iv)	Metering of 1Ph Un-metered Connections	Nos.	6723.00	2.61
(v)	Metering of 3Ph Un-metered Connections	Nos.	1024.00	0.40
(vi)	Replacement of 1Ph Electro-mechanical to Electronic Meters	Nos.	123542.00	12.35
(iv)	Replacement of 3Ph Electro-mechanical to Electronic Meters	Nos.	16250.00	6.34
	<b>Sub-Total (C3)</b>			<b>68.33</b>
	<b>Total (C)</b>			<b>157.33</b>
	<b>Providing access to all rural households.</b>			
<b>D1</b>	<b>11 kV Transmission Works</b>		0.00	0.00
	New 3 $\phi$ , 4Wire 11 kV Line on ST Poles	Kms.	5211.27	390.71
	New 3 $\phi$ , 4Wire 11 kV Line on PCC Poles	Kms.	0.00	0.00
	<b>Sub Total (D1)</b>			<b>390.71</b>
<b>D2</b>	<b>11 kV Transformation Works</b>			0.00
	Installation of New 25 kVA (3ph) 3 $\phi$ , 11/0.4 kV Distribution T/fs	Nos.	2955.00	63.91
	<b>Sub Total (D2)</b>			<b>63.91</b>
<b>D3</b>	<b>LT Distribution Works</b>			0.00
(i)	3Ph, 4W LT Line with Arial Bunched Cable (ABC) on ST Poles	Kms.	1408.99	68.28
(ii)	1Ph, 2W LT Line with Arial Bunched Cable (ABC) on ST Poles	Kms.	1549.35	50.33
(iii)	3Ph, 4W LT Line with Arial Bunched Cable (ABC) on PCC Poles	Kms.	5.13	0.13
(iv)	1Ph, 2W LT Line with Arial Bunched Cable (ABC) On PCC Poles	Kms.	1.81	0.04
	<b>Sub Total (D3)</b>			<b>118.79</b>
<b>D4</b>	<b>Service Connections Works</b>			
	Domestic (APL)	Nos.	965.00	0.29
	Domestic (BPL)	Nos.	33721.00	10.11
	<b>Sub Total (D4)</b>			<b>10.40</b>
	<b>Total (D)</b>			<b>583.81</b>
	<b>Grand Total</b>			<b>3433.20</b>

## ANNEXURE – 6

**Table 58: Remote Village Electrification through off-grid Mini/Micro Hydro Power Projects**

S.N.	District	Name of Project	Capacity (KW)	Block	Electrified Year	House hold
1	Bageshwar	Kanolgad	100	Kapkot	FY 05	235
2	Bageshwar	Ratmoli	50	Bageshwar	FY 05	102
3	Bageshwar	Dokhtigaun	20	Kapkot	FY 05	134
4	Bageshwar	Karmi-II	50	Kapkot	FY 05	28
5	Bageshwar	Kunwari	50	Kapkot	FY 09	53
6	Bageshwar	Jagthana	100	Kapkot	FY 09	148
7	Bageshwar	Liti-II	50	Kapkot	FY 09	73
8	Bageshwar	Borbalda	25	Kapkot	FY 12	49
9	Bageshwar	Lamabagar	200	Kapkot	FY 13	370
10	Bageshwar	Gogani-II	50	Kapkot	FY 13	242
11	Bageshwar	Lumchula	50	Garud	FY 13	123
12	Bageshwar	Gogina	100	Kapkot	FY 02	480
13	Bageshwar	Badiyakot	100	Kapkot		284
14	Bageshwar	Baicham	100	Kapkot		659
15	Bageshwar	Karmi-I	50	Kapkot		453
16	Bageshwar	Sorag	50	Kapkot		167
17	Bageshwar	Bagar	50	Kapkot		150
18	Bageshwar	Liti	50	Kapkot		152
19	Bageshwar	Toli	100	Kapkot		275
20	Bageshwar	Lathi	100	Kapkot	FY 03	321
21	Bageshwar	Karmi-III	50	Kapkot		75
22	Chamoli	Bank	100	Dawal	FY 13	160
23	Chamoli	Gulari	200	Ghat	FY 02	458
24	Chamoli	Gamsali-Bampa	50	Joshimath	FY 11	124
25	Chamoli	Ghagariya	100	Joshimath	up to FY 02	16
26	Chamoli	Niti	25	Joshimath	FY 08	54
27	Chamoli	Wan	50	Dewal	FY 09	75
28	Chamoli	Ghes	100	Dewal	FY 09	310
29	Chamoli	Choting	100	Dewal	FY 10	295
30	Chamoli	Sarma	100	Ghat	FY 11	92
31	Chamoli	Milkhet	100	Dewal	FY 02	285
32	Chamoli	Bursol	200	Tharali	FY 04	521
33	Tehri	Jakhana	100	Bhilangana	FY 13	195
34	Almora	Tarula	100	Dhauladevi	FY 13	110
35	Pirhrogarh	Satteshwar	50	Berinag	FY 05	158
36	Pirhrogarh	Rotan	50	Berinag	FY 13	168
37	Pithoragarh	Bhikuriyagad	500	Munsyari	FY 05	554
38	Uttarkashi	Taluka	20	Mori	FY 11	25
39	Uttarkashi	Jankichatti	200	Naugaon	up to FY 02	218
40	Uttarkashi	Istergad	200	Mori	up to FY 02	303
41	Uttarkashi	Gangotri 1 <sup>st</sup>	150	Bhatwari	FY 06	225
		Gangotri 2 <sup>nd</sup>	20			
42	Nainital	Ramgad	100	Betalghat	FY 02	310
43	Pauri	Bilkot	50	Nainidanda	up to FY 02	167
44	Pauri	Diyor	100	Rikhanikhal		252
45	Rudraprayag	Kedarnath-1 <sup>st</sup>	100	Ukchimath	up to FY 02	30
<b>Total (Households)</b>						<b>9678</b>



## ANNEXURE – 7

### 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 NCEF
- A 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

		Lighting Savings/annum		Investment/Payback	
S.N	Name	kWh	Rs.Lakhs/yr	Investment Rs. Crores	Payback
NAGAR NIGAM					
1	Dehradun Nagar Nigam	10.356	4.25	23.78	5.6
2	Haridwar Nagar Nigam	4.109	1.68	6.91	4.103
3	Haldwani Nagar Nigam	1.416	0.58	2.68	4.621
4	Rudrapur Nagar Nigam	0.955	0.39	2.22	5.678
5	Kashipur Nagar Nigam	0.865	0.35	1.79	5.032
6	Roorkee Nagar Nigam	0.952	0.39	1.66	4.238
	Sub Total	18.653	7.65	39.04	5.104
NAGAR PALIKA / PARISHAD					
1	Kotdwara Nagar Palika Parishad	0.133	0.05	0.24	4.488
2	Nainital Nagar Palika Parishad	0.488	0.20	0.83	4.147
3	Almora Nagar Palika Parishad	1.388	0.57	2.11	3.701
4	Pithoragarh Nagar Palika Parishad	2.635	1.08	3.43	3.176
5	Tanakpur Nagar Palika Parishad	0.027	0.01	0.05	4.057
6	Champawat Nagar Palika Parishad	0.082	0.03	0.19	5.809
7	Bageshwar Nagar Palika Parishad	0.100	0.04	0.06	1.471
8	Sitarganj Nagar Palika Parishad	0.251	0.10	0.49	4.715
9	Khatima Nagar Palika Parishad	0.301	0.12	0.37	3.006
10	Kichcha Nagar Palika Parishad	0.454	0.19	0.71	3.819
11	Bazpur Nagar Palika Parishad	0.045	0.02	0.06	3.288
12	Gadarpur Nagar Palika Parishad	0.030	0.01	0.06	4.87
13	Joshimat Nagar Palika Parishad	0.094	0.04	0.15	3.807
14	Mangulur Nagar Palika Parishad	0.296	0.12	0.45	3.677
15	Mussorie Nagar Palika Parishad	0.869	0.36	1.46	4.1
16	Pauri Nagar Palika Parishad	3.662	1.50	4.60	3.063
17	Rudraprayaga Nagar Palika Parishad	0.056	0.02	0.07	3.076
18	Srinagar Nagar Palika Parishad	0.082	0.03	0.10	3.068
19	Rishikesh Nagar Palika Parishad	2.287	0.94	1.82	1.942
20	Vikas Nagar Nagar Palika Perished	0.382	0.16	0.72	4.596
21	Uttarkashi Nagar Palika Perished	0.344	0.14	0.53	3.784
22	Ramnagar Nagar Palika Perished	0.940	0.39	1.44	3.737
23	Tehri Nagar Palika Perished	0.530	0.22	0.87	3.983
24	Jaspur Nagar Palika Perished	1.022	0.42	1.48	3.533
	Sub Total	16.498	6.76	22.29	3.295
NAGAR PANCHAYAT					
1	Sultanpura Nagar Panchayat	0.024	0.01	0.03	3.48
2	Lalkaun Nagar Panchayat	0.015	0.01	0.02	3.409
3	Chamba Nagar Panchayat	0.022	0.01	0.02	1.979
4	Bimtal Nagar Panchayat	0.081	0.03	0.10	2.956
5	Lohagwat Nagar Panchayat	0.097	0.04	0.09	2.173
6	Mahuakherganj Nagar Panchayat	0.020	0.01	0.04	4.671
7	Dineshpur Nagar Panchayat	0.053	0.02	0.08	3.474
8	Doiwala Nagar Panchayat	0.030	0.01	0.03	2.412
9	Gachar Chamoli Nagar Panchayat	0.271	0.11	0.42	3.76
10	Herbertpur Nagar Panchayat	0.284	0.12	0.57	4.903
11	Jhabrera Nagar Panchayat	0.212	0.09	0.35	3.99
12	Kaladungi Nagar Panchayat	0.021	0.01	0.04	4.787
13	karnprayag Nagar Panchayat	0.266	0.11	0.30	2.701
14	Laksar Nagar Panchayat	0.357	0.15	0.50	3.417
15	Landhora Nagar Panchayat	0.034	0.01	0.04	2.97
16	Kelakhera Nagar Palika Parishad	0.017	0.01	0.03	4.397
	Sub Total	1.802	0.74	2.64	3.58
	Grand Total	36.953	15.15	63.96	4.08

## ANNEXURE – 8

Table 59: Firm entitlement in FY 15 (in MW)

Source	Latest Firm Entitlement
Availability Within State	
Own Generating Stations	
<i>Hydro</i>	
<i>Chibro</i>	180.00
<i>Khodri</i>	90.00
<i>Dhakrani</i>	25.31
<i>Dhalipur</i>	38.25
<i>Kulhal</i>	24.00
<i>Tiloth</i>	90.00
<i>Dharasu</i>	304.00
<i>Chilla</i>	144.00
<i>Ramganga</i>	198.00
<i>Khatima</i>	41.40
<b>Subtotal</b>	<b>1134.96</b>
<i>Small Hydro</i>	
<i>Pathri</i>	20.40
<i>Mohd.Pur</i>	9.30
<i>Galogi</i>	3.00
<i>Small Hydro</i>	<b>32.70</b>
<b>Own Generating Stations</b>	<b>1167.66</b>
<b>Private Generating Stations</b>	
<i>Non-Solar</i>	213.30
<i>Solar</i>	6.60
<i>Vishnugarh (J.P.)</i>	48.00
<b>Private Generating Stations</b>	<b>267.90</b>
<b>Central Generating Stations</b>	
<i>Coal Based</i>	
<i>Kahalgaoon-I</i>	28.05
<i>Singrauli</i>	96.40
<i>Rihand-I</i>	39.30
<i>Rihand-II</i>	34.00
<i>Unchahar-I</i>	35.99

Source	Latest Firm Entitlement
<i>Unchahar-II</i>	15.12
<i>Unchahar-III</i>	13.00
<i>Rihand-III</i>	39.24
<i>Sasan UMPP</i>	99.00
<b>Subtotal</b>	<b>400.10</b>
<b>Gas Based</b>	
<i>Anta</i>	15.88
<i>Auriya</i>	25.46
<i>Dadri</i>	28.30
<i>Subtotal</i>	<b>69.64</b>
<b>Subtotal-Thermal</b>	<b>469.75</b>
<b>Nuclear</b>	
<i>NAPS</i>	16.28
<i>RAPS-C # 5 &amp; 6</i>	14.96
<b>Subtotal</b>	<b>31.24</b>
<b>Hydro Based</b>	
<i>Tanakpur</i>	14.40
<i>Dhuliganga</i>	45.00
<i>Koteswar</i>	70.68
<i>Tehri-I</i>	147.00
<i>Salal</i>	8.35
<i>Rampur HEP</i>	43.59
<i>Dhulasti</i>	16.03
<i>Chamera-I</i>	19.06
<i>Parbati -III</i>	21.37
<i>Sewa-II</i>	5.00
<i>URI-I</i>	16.70
<i>URI-II</i>	10.44
<i>Chamera-III</i>	9.50
<i>Subtotal</i>	<b>427.13</b>
<b>Central Generating Stations</b>	<b>928.12</b>
<b>Grand Total</b>	<b>2363.68</b>

**Table 60: Year-wise Projection of Power Purchase/Availability (in MU)**

Sr. No.	Source	Avg Per Units Charge s (Rs/k Wh)	Energy Availability in MU					Power Purchase Cost (in Rs Crores)				
			FY 15	FY 16	FY 17	FY 18	FY 19	FY 15	FY 16	FY 17	FY 18	FY 19
Availability Within State												
A	Own Generating Stations											
	Chibro	0.46	910	910	910	910	910	42	42	42	42	42
	Khodri	0.57	465	465	465	465	465	27	27	27	27	27
	Dhakrani	0.53	126	126	126	126	126	7	7	7	7	7
	Dhalipur	0.66	188	188	188	188	188	12	12	12	12	12
	Kulhal	0.53	141	141	141	141	141	7	7	7	7	7
	Tiloth	1.28	376	376	376	376	376	48	48	48	48	48
	Dharasu	1.50	821	821	821	821	821	123	123	123	123	123
	Chilla	0.70	773	773	773	773	773	54	54	54	54	54
	Ramganga	0.89	230	230	230	230	230	20	20	20	20	20
	Khatima	0.67	113	113	113	113	113	8	8	8	8	8
	Pathri	1.05	25	25	25	25	25	3	3	3	3	3
	Mohd.Pur	1.20	41	41	41	41	41	5	5	5	5	5
	Galogi	1.20	5	5	5	5	5	1	1	1	1	1
Own Generating Stations			4215	4215	4215	4215	4215	356	356	356	356	356
B	New Stations-Own & Private											
	Vyasi	5.00	0	0	0	0	777	0	0	0	0	388
	Dunao	3.92	0	0	6	6	6	0	0	2	2	2
	Suwarigad	3.92	0	0	8	8	8	0	0	3	3	3
	Limchagad	3.92	0	0	14	14	14	0	0	5	5	5
	Asiganga-I	3.92	0	0	0	17	17	0	0	0	7	7
	Asiganga-II	3.92	0	0	0	17	17	0	0	0	7	7
	Suringad-II	3.92	0	0	0	19	19	0	0	0	8	8
	Kaliganga-I	3.92	0	0	0	0	16	0	0	0	0	6
New Stations-Own & Private			0	0	27	82	874	0	0	11	32	426
C	Private RE Generating Stations Existing											
	Small Hydro	3.74	628	628	628	628	628	235	235	235	235	235
	Solar	5.67	11	11	11	11	11	6	6	6	6	6
	Cogeneration	2.10	189	189	189	189	189	40	40	40	40	40
Private RE Generating Stations Existing			828	828	828	828	828	281	281	281	281	281
D	IPPs											
	Vishnugarh (J.P.)	1.71	269	269	269	269	269	46	46	46	46	46
IPPs			269	269	269	269	269	46	46	46	46	46
E	Renewable Energy Sources -Upcoming											
	Mini Hydel	3.92	1	2	19	39	59	0	1	8	15	23
	Solar	5.67	7	52	75	142	292	4	29	42	81	166
	Cogeneration	2.7	0	0	19	43	67	0	0	5	12	18
	Biomass	2.1	0	10	33	67	134	0	2	7	14	28
	W2E	3.5	0	0	7	14	21	0	0	3	5	8
	Others	4	0	0	2	5	10	0	0	1	2	4
Renewable Energy Sources - Upcoming			8	64	156	311	584	4	32	66	129	247
F	Central Generating Stations											
	Tanakpur	1.93	64	64	64	64	64	12	12	12	12	12

Sr. No.	Source	Avg Per Units Charge s (Rs/k Wh)	Energy Availability in MU					Power Purchase Cost (in Rs Crores)				
			FY 15	FY 16	FY 17	FY 18	FY 19	FY 15	FY 16	FY 17	FY 18	FY 19
	Dhuliganga	1.96	170	170	170	170	170	33	33	33	33	33
	Koteshwar	2.32	201	201	201	201	201	47	47	47	47	47
	Tehri-I	2.15	405	405	405	405	405	87	87	87	87	87
Central Generating Stations			840	840	840	840	840	179	179	179	179	179
G	New Stations-CGS											
	Tapovan Vishnugad	2.61	0	0	0	559	559	0	0	0	146	146
	Lata Tapovan	2.64	0	0	0	0	186	0	0	0	0	49
	Vishugarh Pipalkoti	2.34	0	0	0	0	428	0	0	0	0	100
	Tehri Pump Storage	2.86	0	0	0	0	687	0	0	0	0	197
New Stations-CGS			0	0	0	559	1860	0	0	0	146	492
Availability Within State			6160	6216	6335	7104	9470	867	895	939	1169	2027
Availability Outside State												
H	Central Generating Stations											
	Kahalgau-I	3.89	162	162	162	162	162	63	63	63	63	63
	Singrauli	2.04	630	630	630	630	630	129	129	129	129	129
	Rihand-I	2.86	249	249	249	249	249	71	71	71	71	71
	Rihand-II	3.04	232	232	232	232	232	71	71	71	71	71
	Unchahar-I	3.87	252	252	252	252	252	97	97	97	97	97
	Unchahar-II	3.96	103	103	103	103	103	41	41	41	41	41
	Unchahar-III	4.32	94	94	94	94	94	41	41	41	41	41
	Anta	4.56	63	63	63	63	63	29	29	29	29	29
	Auriya	5.86	60	60	60	60	60	35	35	35	35	35
	Dadri	5.41	83	83	83	83	83	45	45	45	45	45
	NAPS	2.63	102	102	102	102	102	27	27	27	27	27
	RAPS-C # 5 & 6	3.67	93	93	93	93	93	34	34	34	34	34
	Salal	1.96	36	36	36	36	36	7	7	7	7	7
	Rampur HEP	3.59	131	131	131	131	131	47	47	47	47	47
	Dhulasti	6.36	84	84	84	84	84	53	53	53	53	53
	Chamera-I	1.80	74	74	74	74	74	13	13	13	13	13
	Parbati -III	5.01	72	72	72	72	72	36	36	36	36	36
	Sewa-II	5.26	19	19	19	19	19	10	10	10	10	10
	URI-I	2.12	86	86	86	86	86	18	18	18	18	18
	URI-II	4.48	44	44	44	44	44	20	20	20	20	20
	Rihand-III	2.62	242	242	242	242	242	63	63	63	63	63
	Chamera-III	4.44	40	40	40	40	40	18	18	18	18	18
	Sasan UMPP	1.37	663	663	663	663	663	91	91	91	91	91
Central Generating Stations			3615	3615	3615	3615	3615	1059	1059	1059	1059	1059
I	CGS - New											
	RAPP U-7&8	4.00	0	211	211	211	211	0	84	84	84	84
	Koldam	5.00	0	227	227	227	227	0	114	114	114	114
	Meja-I	4.50	0	0	73	147	147	0	0	33	66	66
	Parbati-II	5.00	0	0	0	0	145	0	0	0	0	73
	Kishanganga	5.00	0	0	93	93	93	0	0	47	47	47
CGS - New			0	438	605	678	824	0	198	278	311	383
Availability Outside State			3615	4053	4220	4293	4439	1059	1257	1337	1370	1443



Sr. No.	Source	Avg Per Units Charge s (Rs/k Wh)	Energy Availability in MU					Power Purchase Cost (in Rs Crores)				
			FY 15	FY 16	FY 17	FY 18	FY 19	FY 15	FY 16	FY 17	FY 18	FY 19
Grand Total - Firm Power			9775	10270	10555	11397	13909	1926	2152	2276	2539	3470
Additional Power Purchase		4.00	2619	3551	4514	5041	4153	1047	1420	1806	2016	1661
Total Power Purchase			12394	13820	15070	16438	18062	2974	3572	4081	4555	5131

**Table 61: Year-wise Projection of Category-wise Revenue (In Rs Crores) – Base Case**

Categories	ABR		Projections				
	FY 15	FY 16 <sup>7</sup>	FY 15	FY 16	FY 17	FY 18	FY 19
Domestic - Rural	3.06	3.31	328	388	431	482	532
Domestic - Urban	3.06	3.31	383	462	516	575	642
Non Domestic	4.80	5.12	517	598	648	703	762
Industrial(LT)	4.57	4.85	143	164	178	192	208
Industrial(HT)	4.54	4.83	2432	2885	3217	3587	4000
Mixed Load (HT)	3.94	4.34	79	97	109	123	138
Industrial (Deemed Additional Sale due to Load Shedding)	3.94	4.34	0	161	161	161	161
Public Lighting	4.17	4.50	19	20	21	21	21
Traction	4.63	5.04	5	6	6	6	6
Agriculture							
Private Tube-wells	1.19	1.62	28	40	42	45	47
Govt. Irrigation	4.20	4.56	44	49	50	51	52
Public Water Works & Sewage Pumping	4.15	4.48	130	151	161	173	185
<b>Grand Total</b>			<b>4108</b>	<b>5022</b>	<b>5540</b>	<b>6118</b>	<b>6753</b>

<sup>7</sup> In absence of tariff hike, the ABR approved in tariff order for FY 16 is assumed to continue up to FY 19.

## ANNEXURE – 9

### Distribution

The Roll-Out Plan for Distribution for Supply Hours and Connection to Un-Electrified Households in urban areas is summarized below:

**Table 62: Roll Out Plan Distribution (Supply Hours and Electrification of the Un-Electrified Households) - Urban**

District Name	Area	Current Status		Target	
		Un Electrified Households	Supply Hours	Electrification of Un-Electrified Households	Target 24 Hours Supply Hours
Uttarkashi	27.02	NIL	23.47	To maintain 100% electrification in FY 16 and beyond	FY 16 and beyond
Chamoli	39.53	NIL	23.47		
Rudraprayag	12.75	NIL	23.47		
Tehri Garhwal	66.11	NIL	23.47		
Dehradun	272.3	NIL	24.00		
Garhwal	72.16	NIL	23.47		
Pithoragarh	16.5	NIL	23.47		
Bageshwar	5.5	NIL	23.47		
Almora	35.68	NIL	23.47		
Champawat	13.04	NIL	23.47		
Nainital	97.88	NIL	24.00		
Udham Singh Nagar	122.21	NIL	23.45		
Haridwar	121.24	NIL	23.30		

As seen from the above, the Uttarakhand is already providing power supply to urban areas for more than 23.30 Hours. Hence it should endeavor to provide 24 hours uninterrupted power supply to all urban domestic areas from FY 16 onwards.

The roll out plan for Distribution for extending supply hours and connection to un-electrified households in rural areas is shown below:

**Table 63: Roll Out Plan Distribution (Supply Hours and Electrification of the Un-Electrified Households) - Rural**

District Name	Area	Current Status		Target Electrification of Un-Electrified Households			Target 24 Hours Supply Hours
		Un Electrified Households	Supply Hours	FY 16	FY 17	FY 18	
Uttarkashi	7989.0	5,832	23.47	1166	2041	2625	FY 16 and beyond on continuous basis
Chamoli	7990.5	5,884	23.47	1177	2059	2648	
Rudraprayag	1971.3	1,801	23.47	360	630	810	
Tehri Garhwal	3575.9	6,746	23.47	1349	2361	3036	
Dehradun	2815.7	3,199	24.00	640	1120	1439	
Garhwal	5256.8	7,284	23.36	1457	2550	3278	
Pithoragarh	7073.5	6,717	23.47	1343	2351	3023	
Bageshwar	2235.5	4,460	23.47	892	1561	2007	
Almora	3108.3	12,289	23.47	2458	4301	5530	
Champawat	1753.0	5,926	23.47	1185	2074	2667	
Nainital	4153.1	6,715	23.47	1343	2350	3022	
Udham Singh Nagar	2419.8	16,041	22.26	3208	5614	7218	
Haridwar	2238.8	17,512	22.07	3502	6129	7880	
<b>Total</b>		<b>1,00,407</b>		<b>20081</b>	<b>35143</b>	<b>45183</b>	

As the state is yet to identify 44,163 households by survey, the state will undertake following actions on priority:

Activity	Timeframe
Issuance of RfP/RfQ documents for survey work	Within 1 month
Award of survey work	Within 2 months of issuance of tender documents
Completion of survey of 22,000 households	Within 3 months of award
Preparation and submission of DPR for approval	Within 6-8 weeks of completion of survey
Completion of survey of remaining households	Within 6 months of award
Preparation and submission of DPR for approval	Within 6-8 weeks of completion of survey

Barring operational constraints, the state should endeavor to put its best foot forward to connect un-electrified households as per the plan detailed above and simultaneously ensure 24 hours uninterrupted supply to all the rural consumers of the state.

Further, given the adequacy of the planned capacity addition in generation, transmission and distribution, the state should also ensure 24 hours supply to all other consumers of the state.

The year-wise operational efficiency improvement targets for all electrical divisions (on the basis of actual information of FY 14) are detailed below:

**Table 64: Roll Out Plan Distribution (Efficiency Improvement Targets) – T&D Losses**

S. No.	Name of Divisions / Circles / Zones	T&D Losses					
		Actuals	Targeted Trajectory				
		FY 14	FY 15	FY 16	FY 17	FY 18	FY 19
1	EDD (R), Dehradun	17.77%	16.77%	15.00%	14.00%	12.50%	12.40%
2	EDD Vikasnagar	39.08%	36.08%	31.00%	28.00%	24.00%	23.75%
3	EDD, Rishikesh	18.17%	17.17%	15.50%	14.50%	13.00%	12.90%
4	EDD, Uttarkashi	35.42%	32.42%	26.50%	25.00%	22.50%	22.00%
<b>EDC, Dehradun</b>		<b>23.11%</b>	<b>21.47%</b>	<b>18.65%</b>	<b>17.24%</b>	<b>15.20%</b>	<b>15.04%</b>
5	UEDDN, Dehradun	13.52%	12.52%	12.00%	11.50%	11.00%	10.90%
6	UEDDS, Dehradun	16.35%	15.35%	14.00%	13.00%	12.00%	11.90%
7	UEDDC, Dehradun	18.31%	17.31%	16.00%	15.00%	14.00%	13.80%
<b>UEDC, Dehradun</b>		<b>16.23%</b>	<b>15.23%</b>	<b>14.10%</b>	<b>13.23%</b>	<b>12.37%</b>	<b>12.23%</b>
8	EDD, Srinagar	14.73%	14.00%	13.00%	12.00%	11.50%	11.40%
9	EDD, Pauri	30.88%	27.88%	25.00%	23.50%	22.00%	21.00%
10	EDD, Tehri	35.79%	32.79%	27.50%	26.00%	24.00%	23.00%
11	EDD, Gopeshwar	39.69%	36.69%	30.00%	28.50%	27.00%	25.00%
12	EDD, Kotdwar	16.47%	15.47%	14.50%	13.50%	12.50%	12.40%
13	EDD, Rudraprayag	38.69%	35.69%	29.50%	28.00%	24.50%	23.00%
<b>EDC, Srinagar</b>		<b>26.41%</b>	<b>24.26%</b>	<b>20.83%</b>	<b>19.56%</b>	<b>18.11%</b>	<b>17.39%</b>
14	EDD, Roorkee (U)	28.27%	26.77%	23.75%	22.25%	20.75%	20.40%
15	EDD, Roorkee (R)	28.36%	26.86%	23.75%	22.25%	20.75%	20.25%
<b>EDC, Roorkee</b>		<b>28.33%</b>	<b>26.83%</b>	<b>23.75%</b>	<b>22.25%</b>	<b>20.75%</b>	<b>20.30%</b>
16	EDD, Hardwar (U)	14.55%	13.55%	12.50%	11.50%	11.00%	10.80%
17	EDD, Hardwar (R)	13.17%	12.16%	11.00%	10.75%	9.50%	9.45%
<b>EDC, Hardwar</b>		<b>13.54%</b>	<b>12.53%</b>	<b>11.40%</b>	<b>10.95%</b>	<b>9.90%</b>	<b>9.81%</b>
<b>Garhwal Zone</b>		<b>21.13%</b>	<b>19.70%</b>	<b>17.40%</b>	<b>16.33%</b>	<b>14.97%</b>	<b>14.67%</b>
18	EDD, Haldwani (U)	26.53%	25.03%	22.00%	20.50%	19.00%	18.50%
19	EDD, Nainital	19.28%	18.28%	17.00%	16.00%	15.00%	14.50%
20	EDD, Ramnagar	23.39%	21.89%	19.00%	18.00%	17.00%	16.50%
21	EDD, Haldwani (R)	15.25%	14.25%	13.00%	12.00%	11.50%	11.00%
<b>EDC, Haldwani</b>		<b>20.41%</b>	<b>19.17%</b>	<b>17.10%</b>	<b>15.96%</b>	<b>15.02%</b>	<b>14.52%</b>
22	EDD, Kashipur	16.00%	15.10%	13.30%	12.30%	11.80%	11.70%
23	EDD, Bajpur	22.72%	21.21%	18.00%	17.00%	16.00%	15.00%
<b>EDC, Kashipur</b>		<b>17.60%</b>	<b>16.55%</b>	<b>14.40%</b>	<b>13.40%</b>	<b>12.77%</b>	<b>12.46%</b>
24	EDD, Rudrapur	9.31%	9.30%	9.20%	9.10%	9.00%	8.90%
25	EDD, Sitarganj	19.81%	19.00%	18.00%	17.00%	16.00%	15.50%
<b>EDC, Rudrapur</b>		<b>12.37%</b>	<b>12.11%</b>	<b>11.73%</b>	<b>11.35%</b>	<b>10.98%</b>	<b>10.76%</b>
26	EDD, Almora	21.06%	19.56%	18.00%	17.00%	16.00%	14.50%
27	EDD, Bageshwar	30.56%	27.56%	24.00%	22.50%	20.00%	18.00%
28	EDD, Ranikhet	20.22%	18.71%	17.00%	16.00%	15.00%	14.75%
29	EDD, Pithoragarh	29.49%	27.98%	24.00%	22.50%	21.00%	19.50%
30	EDD, Champawat	29.52%	28.02%	26.00%	24.50%	23.00%	21.00%
<b>EDC, Ranikhet</b>		<b>26.28%</b>	<b>24.56%</b>	<b>21.81%</b>	<b>20.49%</b>	<b>19.04%</b>	<b>17.63%</b>
<b>Kumaon Zone</b>		<b>16.61%</b>	<b>15.77%</b>	<b>14.30%</b>	<b>13.51%</b>	<b>12.87%</b>	<b>12.47%</b>
<b>Total Uttarakhand</b>		<b>19.18%</b>	<b>18.00%</b>	<b>16.05%</b>	<b>15.10%</b>	<b>14.05%</b>	<b>13.70%</b>

**Table 65: Roll Out Plan Distribution (Efficiency Improvement Targets) – Collection Efficiency**

S. No.	Name of Divisions / Circles / Zones	Collection Efficiency					
		Actuals	Targeted Trajectory				
			FY 14	FY 15	FY 16	FY 17	FY 18
1	EDD (R), Dehradun	105.82%	99.00%	99.00%	99.00%	99.00%	99.65%
2	EDD Vikasnagar	91.46%	93.00%	94.50%	96.00%	97.50%	99.65%
3	EDD, Rishikesh	97.44%	98.00%	99.00%	99.00%	99.00%	99.65%
4	EDD, Uttarkashi	80.06%	84.00%	88.00%	92.00%	96.00%	99.65%
5	UEDDN, Dehradun	103.08%	99.00%	99.00%	99.00%	99.00%	99.65%
6	UEDDS, Dehradun	102.60%	99.00%	99.00%	99.00%	99.00%	99.65%
7	UEDDC, Dehradun	109.10%	99.00%	99.00%	99.00%	99.00%	99.65%
8	EDD, Srinagar	106.16%	99.00%	99.00%	99.00%	99.00%	99.65%
9	EDD, Pauri	94.86%	96.00%	97.00%	98.00%	99.00%	99.65%
10	EDD, Tehri	111.43%	99.00%	99.00%	99.00%	99.00%	99.65%
11	EDD, Gopeshwar	86.09%	90.00%	93.00%	96.00%	97.00%	99.65%
12	EDD, Kotdwar	104.55%	99.00%	99.00%	99.00%	99.00%	99.65%
13	EDD, Rudraprayag	88.54%	90.00%	93.00%	96.00%	97.00%	99.65%
14	EDD, Roorkee (U)	85.14%	90.00%	93.00%	96.00%	97.00%	99.65%
15	EDD, Roorkee (R)	98.68%	99.00%	99.00%	99.00%	99.00%	99.65%
16	EDD, Hardwar (U)	98.15%	99.00%	99.00%	99.00%	99.00%	99.65%
17	EDD, Hardwar (R)	96.93%	98.00%	99.00%	99.00%	99.00%	99.65%
18	EDD, Haldwani (U)	95.72%	96.00%	97.00%	98.00%	99.00%	99.65%
19	EDD, Nainital	101.14%	99.00%	99.00%	99.00%	99.00%	99.65%
20	EDD, Ramnagar	97.28%	98.00%	99.00%	99.00%	99.00%	99.65%
21	EDD, Haldwani (R)	104.15%	99.00%	99.00%	99.00%	99.00%	99.65%
22	EDD, Kashipur	92.89%	94.00%	95.50%	97.00%	98.00%	99.65%
23	EDD, Bajpur	97.57%	98.00%	99.00%	99.00%	99.00%	99.65%
24	EDD, Rudrapur	101.01%	99.00%	99.00%	99.00%	99.00%	99.65%
25	EDD, Sitarganj	98.50%	99.00%	99.00%	99.00%	99.00%	99.65%
26	EDD, Almora	105.91%	99.00%	99.00%	99.00%	99.00%	99.65%
27	EDD, Bageshwar	102.49%	99.00%	99.00%	99.00%	99.00%	99.65%
28	EDD, Ranikhet	98.13%	99.00%	99.00%	99.00%	99.00%	99.65%
29	EDD, Pithoragarh	104.61%	99.00%	99.00%	99.00%	99.00%	99.65%
30	EDD, Champawat	94.40%	96.00%	97.00%	98.00%	99.00%	99.65%

The targets for individual divisions will suitably be revisited in case of split of existing divisions into new divisions in future.

The Roll-Out Plan for Capacity addition/ augmentation is summarized below:

**Table 66: Roll Out Plan Distribution (Capacity Augmentation) – 33 kV Substations (in MVA)**

Sl. No.	Name of Division	Total Capacity	Rollout Target for Capacity Addition					Total Expected Capacity by March 19
			FY 16	FY 17	FY 18	FY 19	Total	
1	EDD, Doiwala	43	-	3	3	4	10	53
2	EDD(Rural), Ddun.	146	30	14	14	19	78	224
3	EDD, Vikasnagar	71	-	14	14	18	45	116
4	EDD, Rishikesh	64	-	6	6	8	20	84
5	EDD, Uttarkashi	43	9	3	3	4	20	63
6	EDD,North Ddun.	87	10	6	6	8	30	117
7	EDD, South Ddun.	117	44	6	6	8	65	182
8	EDD, Central Ddun.	92	20	6	6	8	40	132
9	EDD, Srinagar	41	6	5	5	6	22	63
10	EDD, Pauri	54	-	3	3	4	9	63
11	EDD, Tehri	104	6	5	5	6	21	125
12	EDD, Gopeshwar	55	5	3	3	4	15	70
13	EDD, Kotdwar	116	-	7	7	9	23	139
14	EDD, Rudraprayag	28	5	2	2	2	11	39
15	EDD, Roorkee	140	-	13	13	17	42	182
16	EDD(Rural), Roorkee	221	10	41	41	54	145	366
17	EDD, Haridwar	186	10	19	19	26	74	260
18	EDD(Rural), Haridwar	284	10	26	26	34	95	379
19	EDD, Laksar	53	-	24	24	32	80	133
20	EDD, Haldwani(Urban)	63	-	17	17	22	56	119
21	EDD, Nainital	61	3	0	0	0	3	64
22	EDD, Ramnagar	57	-	3	3	4	10	67
23	EDD, Haldwani(Rural)	95	-	0	0	0	0	95
24	EDD, Kashipur	176	10	38	38	50	136	312
25	EDD, Bazpur	70	-	6	6	8	20	90
26	EDD, Rudrapur	290	16	11	11	15	54	344
27	EDD, Sitarganj	155	5	6	6	8	25	180
28	EDD, Almora	46	6	1	1	1	9	55
29	EDD, Bageshwar	32	6	1	1	1	9	41
30	EDD, Ranikhet	64	-	0	0	0	0	64
31	EDD, Pithoragarh	78	3	5	5	7	21	99
32	EDD, Dharchula	28	3	2	2	2	9	37
33	EDD, Champawat	45	-	1	1	1	3	48
<b>Total</b>		<b>3203</b>	<b>217</b>	<b>295</b>	<b>295</b>	<b>393</b>	<b>1200</b>	<b>4403</b>



**Table 67: Roll Out Plan Distribution (Capacity Augmentation) – 33 kV Lines (in Ckt. Km)**

Sl. No.	Name of Division	Total Length	Rollout Target for Capacity Addition					Total Expected Capacity by March 19
			FY 16	FY 17	FY 18	FY 19	Total	
1	EDD(Rural), Ddun.	367	7	15	22	30	74	441
2	EDD, Uttarkashi	248	7	14	21	28	70	318
3	EDD, Rishikesh	96	1	1	2	2	6	123
4	EDD, Doiwala		2	4	6	8	21	
5	EDD, Vikasnagar	166	26	53	79	105	263	429
6	EDD,North Ddun.	99	3	7	10	14	34	133
7	EDD, South Ddun.	74	8	16	24	32	81	155
8	EDD, Central Ddun.	33	2	5	7	10	24	57
9	EDD, Srinagar	89	7	13	20	27	67	156
10	EDD, Kotdwar	325	1	2	3	5	12	336
11	EDD, Tehri	364	24	47	71	94	236	600
12	EDD, Rudraprayag	134	2	3	5	6	15	149
13	EDD, Gopeshwar	173	8	16	24	31	79	251
14	EDD, Pauri	190	0	0	0	0	0	190
15	EDD, Roorkee	84	5	11	16	22	54	138
16	EDD(Rural), Roorkee	114	9	18	27	36	90	204
17	EDD, Haridwar	49	6	11	17	22	55	104
18	EDD(SIDCUL & Rural), Haridwar	169	9	18	28	37	92	316
19	EDD, Laksar		6	11	17	22	55	
20	EDD, Nainital	134	7	13	20	26	65	199
21	EDD, Ramnagar	85	4	8	12	16	40	125
22	EDD, Haldwani(Urban)	30	1	2	3	3	9	38
23	EDD, Haldwani(Rural)	80	1	1	2	3	7	87
24	EDD, Kashipur	183	5	9	14	18	45	228
25	EDD, Bazpur	67	7	13	20	27	67	134
26	EDD, Rudrapur	131	3	5	8	10	26	156
27	EDD, Sitarganj	122	1	3	4	6	15	136
28	EDD, Almora	211	6	11	17	22	56	267
29	EDD, Bageshwar	143	4	9	13	17	43	186
30	EDD, Ranikhet	136	9	17	26	34	85	221
31	EDD, Pithoragarh	229	9	17	26	34	85	377
32	EDD, Dharchula		6	13	19	25	63	
33	EDD, Champawat	166	6	11	17	23	57	223
<b>Total</b>		<b>4488</b>	<b>199</b>	<b>397</b>	<b>596</b>	<b>795</b>	<b>1987</b>	<b>6475</b>

**Table 68: Roll Out Plan Distribution (Capacity Augmentation) –11 kV Lines (in Ckt. Km)**

Sl. No.	Name of Division	Total Length	Rollout Target for Capacity Addition					Total Expected Capacity by March 19
			FY 16	FY 17	FY 18	FY 19	Total	
1	EDD(Rural), Ddun.	2577	9	19	28	38	94	2671
2	EDD, Uttarkashi	1525	10	19	29	38	96	1622
3	EDD, Rishikesh	798	2	4	6	8	20	818
4	EDD, Doiwala		1	1	2	3	7	
5	EDD, Vikasnagar	1190	2	4	6	7	19	1209
6	EDD,North Ddun.	198	9	18	27	35	89	287
7	EDD, South Ddun.	357	15	29	44	59	146	503
8	EDD, Central Ddun.	127	7	14	21	28	71	198
9	EDD, Srinagar	1297	7	14	21	28	71	1368
10	EDD, Kotdwar	2640	5	11	16	22	54	2694
11	EDD, Tehri	3786	16	32	48	64	160	3946
12	EDD, Rudraprayag	1217	5	10	15	20	51	1268
13	EDD, Gopeshwar	1957	7	13	20	26	66	2022
14	EDD, Pauri	1110	1	2	2	3	8	1118
15	EDD, Roorkee	533	4	7	11	14	36	569
16	EDD(Rural), Roorkee	1246	14	29	43	58	145	1390
17	EDD, Haridwar	632	30	60	89	119	298	930
18	EDD(SIDCUL & Rural), Haridwar	838	18	35	53	70	175	1013
19	EDD, Laksar		16	32	49	65	162	
20	EDD, Nainital	1614	5	11	16	21	53	1667
21	EDD, Ramnagar	587	6	12	19	25	62	650
22	EDD, Haldwani(Urban)	152	9	17	26	35	87	239
23	EDD, Haldwani(Rural)	325	3	6	8	11	28	353
24	EDD, Kashipur	903	8	15	23	30	76	978
25	EDD, Bazpur	535	5	11	16	22	54	589
26	EDD, Rudrapur	1144	19	37	56	74	186	1330
27	EDD, Sitarganj	962	6	12	18	24	61	1022
28	EDD, Almora	1581	23	47	70	93	233	1814
29	EDD, Bageshwar	1444	13	26	39	52	131	1575
30	EDD, Ranikhet	1562	16	32	47	63	158	1720
31	EDD, Pithoragarh	2796	17	34	51	68	169	2965
32	EDD, Dharchula		19	38	57	76	190	
33	EDD, Champawat	1647	209	418	627	836	2091	3738
<b>Total</b>		<b>37278</b>	<b>534</b>	<b>1069</b>	<b>1603</b>	<b>2138</b>	<b>5345</b>	<b>42623</b>

**Table 69: Roll Out Plan Distribution (Capacity Augmentation) – LT Lines (in Ckt. Km)**

Sl. No.	Name of Division	Total Length	Rollout Target for Capacity Addition					Total Expected Capacity by March 19
			FY 16	FY 17	FY 18	FY 19	Total	
1	EDD (Rural), Ddun.	4413	61	122	184	245	612	5025
2	EDD, Uttarkashi	2127	13	26	38	51	128	2255
3	EDD, Rishikesh	1240	1	2	2	3	8	1248
4	EDD, Doiwala		0	0	0	0	1	
5	EDD, Vikasnagar	1513	75	150	225	300	750	2263
6	EDD, North Ddun.	1021	1	2	4	5	12	1033
7	EDD, South Ddun.	1860	1	2	3	5	11	1871
8	EDD, Central Ddun.	425	3	6	10	13	32	457
9	EDD, Srinagar	1443	4	7	11	14	36	1478
10	EDD, Kotdwar	3990	44	87	131	174	435	4425
11	EDD, Tehri	3953	9	18	28	37	92	4045
12	EDD, Rudraprayag	1720	7	15	22	29	73	1793
13	EDD, Gopeshwar	2775	3	6	9	12	30	2805
14	EDD, Pauri	1736	0	0	0	0	0	1736
15	EDD, Roorkee	872	10	20	30	40	99	972
16	EDD(Rural), Roorkee	1437	57	114	171	228	569	2006
17	EDD, Haridwar	917	8	16	25	33	82	999
18	EDD(SIDCUL & Rural), Haridwar	960	94	188	282	376	940	1900
19	EDD, Laksar		19	38	57	76	190	
20	EDD, Nainital	2437	9	19	28	37	94	2530
21	EDD, Ramnagar	907	22	44	66	88	221	1128
22	EDD, Haldwani(Urban)	244	5	10	15	20	50	294
23	EDD, Haldwani(Rural)	728	6	13	19	25	63	791
24	EDD, Kashipur	1138	11	21	32	42	105	1243
25	EDD, Bazpur	568	5	10	16	21	52	620
26	EDD, Rudrapur	1290	23	46	69	93	232	1522
27	EDD, Sitarganj	1255	0	0	0	0	0	1255
28	EDD, Almora	2443	122	244	365	487	1218	3660
29	EDD, Bageshwar	2132	11	22	34	45	112	2244
30	EDD, Ranikhet	2190	11	22	34	45	112	2302
31	EDD, Pithoragarh	3336	94	187	281	375	937	4273
32	EDD, Dharchula		17	35	52	69	173	
33	EDD, Champawat	2136	26	52	78	104	261	2396
<b>Total</b>		<b>53203</b>	<b>773</b>	<b>1546</b>	<b>2319</b>	<b>3091</b>	<b>7728</b>	<b>60932</b>

The concerned officials of the Electrical Divisions 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.