

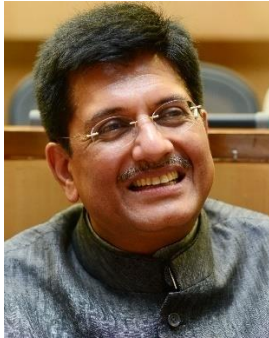


# 24X7 POWER FOR ALL TRIPURA

A JOINT INITIATIVE OF GOVERNMENT OF INDIA  
AND GOVERNMENT OF TRIPURA



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.

Tripura is one of the better performing North-Eastern state in Power Sector.

This joint initiative of Government of India and Government of Tripura 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 of the State.

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



সত্যমেব জয়তে  
ত্রিপুরা সরকার

Government of Tripura



**Manik Sarkar**

**Chief Minister of Tripura**

## Foreword

Government of Tripura always consider the power as the priority sector for improving the socio-economic development of the State. Therefore, we welcome the initiative of 24x7 “Power For All” programme. In Tripura, we offer subsidized tariff for almost all the categories of consumers and are meeting the demand of the state except during specific breakdown/outage as well as capacity limitation of transmission and distribution network. Providing reliable & quality power to all the citizen of Tripura irrespective of rural – urban divide at affordable price is our primary objective as far as power sector is concerned.

As a part of reforms, Government of Tripura has created Tripura State Electricity Corporation (TSECL) w. e. f. 2005 as a 100% state owned utility to take care of the state generation, transmission and distribution of power under a single utility.

Keeping in view the growing demand of electricity and sufficient natural gas reserve in the State, Government of Tripura has taken strong initiatives for increasing gas based generation capacity through establishment of Gas Based Thermal Power Stations by both state owned utility as well as NEEPCO & OTPC. TSECL is implementing different schemes (like World Bank Funded NER System Improvement scheme, NLCPR and SPA) for establishing required transmission & sub-transmission system capacity and (RGGVY, R-APDRP, DDUGJY & IPDS) for distribution system and rural electrification, commiserating with the growing demand of the state.

I look forward to successful implementation of the ‘24x7 Power for All’ in Tripura.



Government of India



সত্যমেব জয়তে  
ত্রিপুরা সরকার

Government of Tripura

## Joint Statement

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

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

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

central and state government schemes.

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

It is envisaged to cover the entire state under PFA programme for development of all the regions of the state for providing 24x7 power supply to all domestic, agriculture industrial and commercial consumers for all connected households from FY 2015-16 itself and to all un-connected households by FY 2018-19.

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

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

**Jyoti Arora, IAS**

Joint Secretary

Ministry of Power (GoI)

**Rakesh Sarwal, IAS**

Principal Resident Commissioner

Government of Tripura

## EXECUTIVE SUMMARY

24x7 Power for All (24x7 PFA) is a Joint Initiative of Government of India (GoI) and State Governments with the objective to make 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 Tripura.

Tripura is one of the few states in India which have adequate gas and hydro potential for power generation. As per GOI Census-2011, approximately 69% of domestic households (60% of Rural & 92% of Urban) have been electrified. As per CEA Annual report (FY 13-14), the per capita consumption in Tripura has shown a steady growth pattern from 179 kWh in FY 07 to 303 kWh in FY 15.

### CONNECTING THE UNCONNECTED

As on 31<sup>st</sup> March 2015, total 2,22,799 HH's are un-electrified within the state, out of which 2,13,710 HH's are from rural area and remaining 9,089 HH's are from urban area.

State has planned electrification of these un-connected HH's under several on-going and proposed electrification schemes of GOI for rural & urban area.

### 24 X 7 SUPPLY

Currently electricity supply is provided in the state for 24 hours per day across the consumer categories. However, many a times it reduces below 24 hours per day only due to the breakdowns of fragile

transmission & distribution network of the state.

However, it is expected that after the implementation of North Eastern Power System Improvement (NEPSI) project funded by World Bank, there will be sufficient capacity addition in the T&D Network to provide 24X7 power supply to all consumers in the state except agricultural consumers.

### 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 266 MW in FY 15 to 384 MW in FY 19 with corresponding increase in energy requirement from 1,125 MU in FY 15 to 1,568 MU in FY 19. Since from FY 12-13 onwards, state is able to meet its yearly peak demand, which is 266 MW in FY 14-15.

State caters about 79% of this electricity demand from gas based power stations and balance 21 % from hydro based power stations.

The future demand projections 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 consumption growth rate has been adopted based on certain realistic assumptions for other than domestic category.

The daily household consumption has been computed separately for rural and urban



households for FY 15 and escalated by 5% annually in rural areas (from 1.26 units to 1.53 units) and 8% in urban areas (from 3.99 units to 5.43 units) to arrive at the daily household consumption up to FY 19.

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#### SUPPLY ADEQUACY

Tripura has been allotted 243.76 MW of firm power excluding share from unallocated quota. The total installed capacity of the state's own generation plants is 89 MW. With the total state requirement in FY 15 being 266 MW, at first instance the state seems a power surplus state. But the generating sources based on hydel and gas, usually not available for the generation as per the projections. The insufficient flow of water due to irregular monsoon and undersupply of fuel gas- both are the main hurdles for harnessing the full capacity utilization of these plants in case of Tripura.

The state will also ensure optimum availability from their own existing stations that have either outlived their useful life, or are facing any other issues like fuel supply etc. by undertaking necessary remedial steps.

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#### ADEQUACY OF TRANSMISSION NETWORK

The existing ISTS Transmission line and transformation capacity is just adequate for meeting the present load requirements. But the fragile condition of intra-state transmission network lead to unwanted breakdowns and outages, due to which state is not able to provide quality & reliable 24X7 power supply across the consumer categories.

It is worth to mention that there is major intra-state transmission capacity addition and augmentation has been planned under

the North Eastern Region Power System Improvement Project (NERPSIP), funded by World Bank. After completion of this project, the overall intra-state transformation capacity at 132 kV level would be around 1600MVA, which shall be adequate to meet peak demand of state by 18-19.

Presently inter-state transmission network in Tripura consists of 822 ckm of 400 kV Transmission lines, 407 ckm of 132 kV Transmission lines and 2 no. of substations/switchyard with 255 MVA transformation capacity (Palatana 400/132 kV- 250 MVA, and Kumarghat 132/33 kV- 5MVA).

Further, R.C. Nagar generation project of 134 MW capacity (4X21 + 2X25) MW is present within the state of Tripura. This generation project along with above mentioned inter-state transmission lines and 2x125 MVA ICT at Palatana Switchyard are adequate to supply Tripura's share of CGS power.

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#### ADEQUACY OF DISTRIBUTION NETWORK

The existing distribution network with projected addition under NERPSIP as well as other planned works would be adequate under projected peak load conditions but for this, state has to take necessary steps to complete the planned works within scheduled time period.

State has envisaged a planned capacity addition of 450.55 MVA at 33/11 kV level, 162.21 MVA at DT level and creation of additional network of 1,400 CKM, 3,860 CKM and 3,777 CKM of 33 kV, 11 kV and LT lines respectively by FY 18-19.

State also intends to curb the AT&C losses of the state through this capacity addition

and investment in distribution infrastructure. Through the implementation of these planned investment works in transmission and distribution segment, state committed to achieve gradual improvement in year wise collection efficiency with 20% AT&C losses by FY 18-19. During FY 14-15, State has 34.34% AT&C losses with 94% collection efficiency.

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#### CLEAN ENERGY AND ENERGY EFFICIENCY

The state is in the process of adopting new and advanced technologies to save electricity. Several awareness programs and workshops are also being conducted among the users to promote energy efficiency measures. EESL has already conducted a load survey of state. A detailed report has already been submitted for state's review.

EESL has also been preparing a comprehensive action plan for the implementation of DSM measures in the state along with the launching of DELP scheme for the state.

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#### FINANCIAL TURNAROUND

The state is showing a net loss of Rs 60 Crores during FY 15. The accumulated financial losses will increase up to Rs. 1268 Crores in the FY 19 (without state government subsidy support) in normal circumstances in order to achieve the objective of 24X7 power supply in the state. However, for State Corporation to start earning operating profit by FY 19 it will require yearly average tariff increase of 19% in each financial year FY 17, FY 18 & FY 19.

On the other hand, if state opts for the investment funding for electrification under RGGVY, IPDS and DDUGJY through combination of State Government equity and loans from FI/Multilateral/Bilateral agencies in the ratio of debt-equity 70:30, in place of government grant under the scheme. Then a minimum tariff hike to the tune of 19% each in FY 17, FY 18 and FY 19 will be essential to be allowed by regulator in order to post positive profit in FY 19.

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 of 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 Tripura (GoT) 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 of 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 three 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 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 with methodology and steps required to be taken at every level of electricity 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.

**This document is an action plan drawn to achieve the above aims and objectives. The plan will be executed by the Government of Tripura 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:

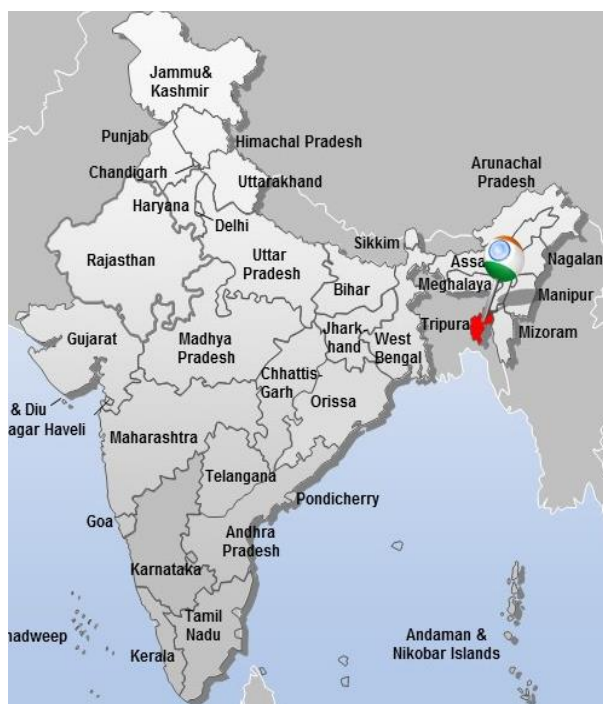
- (1) Bridging the gap between the demand and supply for the already identified/registered consumers and other consuming entities.
- (2) Connecting the unconnected households and unconnected farm holdings.

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 STATE TRIPURA



Key Facts <sup>1</sup>	
<b>Historical background of Tripura</b>	<ul style="list-style-type: none"> <li>Acceded to the Indian Union on 15 October, 1949 as a "C" category state.</li> <li>Became a Union Territory in November 1956.</li> <li>Attained full statehood on January 21, 1972.</li> </ul>
<b>Capital</b>	Agartala
<b>International Border</b>	856 Km.
<b>As per 2011 Census</b>	
<b>Total Area</b>	10,486 Sq. Km
<b>Administrative Districts</b>	04 No's
<b>Population</b>	36,73,917
<b>Population Density</b>	350 per Sq.-Km
<b>Literacy Rate</b>	87.8%

Tripura is a state in North-East India which borders Bangladesh, Mizoram and Assam. The length of its international border is 856 km (84 per cent of its total border). The state is connected with the rest of India by only one road (NH-44) that runs through the hills to the border of Karimganj District in Assam and then winds through the states of Meghalaya, Assam and North Bengal to Kolkata.

For administrative convenience and decentralization of power, Tripura which was once a single district only is now divided into altogether eight districts. As per the Memorandum of Understanding (MOU) between Ministry of Power (MoP), Government of India (GoI) and Government of Tripura (GoT) in August 2003, Government of Tripura (GoT) has introduced reforms and restructured the power sector in the state with the objectives of creating the conditions for sustainable development of the sector and improving the efficiency of services. Tripura was the second state in the NER to constitute a State Electricity Regulatory Commission.

Also, the Department of Power (DoP), GoT has been corporatized and Tripura State Electricity Corporation Limited (TSECL) formed, which started operation from 1st January 2005 onwards. Earlier TSECL was a deemed Licensee and was responsible for generation, transmission and distribution of power in Tripura. From June- 15 onwards, Tripura Power Generation Limited (TPGL) formed and soon will start its function of power generation in the state. The remained functions of electricity transmission and distribution will be vested with TSECL.

TSECL is mandated to get its tariff and annual revenue requirement (ARR) approved by TERC.

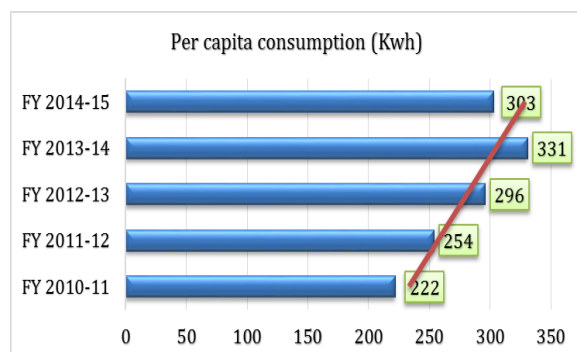
<sup>1</sup>Source: Official Website of Tripura [www.tripura.gov.in](http://www.tripura.gov.in)

## CHAPTER 3: CONSUMPTION PATTERN AND ELECTRIFICATION STATUS

### ELECTRIFICATION STATUS AND PER-CAPITA CONSUMPTION

The domestic household population of Tripura has grown from 6,62,023 in 2001 to 8,42,781 in 2011 at a CAGR of 2.44%. This growth rate has been considered for estimating the population beyond 2011. Considering the annual energy availability from FY 11 to FY 15, the per-capita consumption of electricity has grown as shown below:

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



- *The per-capita consumption has grown at a CAGR of 8.09%.*

### STATUS OF ELECTRIFICATION AND PROJECTION OF HOUSEHOLDS FOR FY 16

The summary of electrified and un-electrified households as per 2001 and 2011 census and projections for FY 15 based on CAGR for past 10 years is tabulated below:

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

Particulars	Electrified	Un-electrified	Total
<b>Total Domestic Households</b>			
<b>2001</b>	277,015	385,008	662,023
<b>in %</b>	41.84%	58.16%	100.00%
<b>2011</b>	576,787	265,994	842,781
<b>in %</b>	68.44%	31.56%	100.00%
<b>10 year CAGR</b>	<b>7.61%</b>	<b>-3.63%</b>	<b>2.44%</b>
<b>FY 15 (Projected)</b>	<b>773,492</b>	<b>168,993</b>	<b>942,485</b>
<b>Rural Households</b>			
<b>2001</b>	171,357	368,323	539,680
<b>in %</b>	31.75%	68.25%	81.52%
<b>2011</b>	361,573	246,206	607,779
<b>in %</b>	59.49%	40.51%	72.12%
<b>10 year CAGR</b>	<b>7.75%</b>	<b>-3.95%</b>	<b>1.20%</b>
<b>FY 15 (Projected)</b>	<b>487,432</b>	<b>149,935</b>	<b>637,367</b>
<b>Urban Households</b>			
<b>2001</b>	105,658	16,685	122,343
<b>in %</b>	86.36%	13.64%	18.48%
<b>2011</b>	215,214	19,788	235,002
<b>in %</b>	91.58%	8.42%	27.88%
<b>10 year CAGR</b>	<b>7.37%</b>	<b>1.72%</b>	<b>6.75%</b>
<b>FY 15 (Projected)</b>	<b>286,060</b>	<b>19,058</b>	<b>305,118</b>

The above projected figures do not coincide with the records of the state electricity corporation (TSECL) for FY 15. The following table shows the difference in projected figures of households based on Census 2011 and household figures as per TSECL records.

**Table 2: Census 2011 V/s. TSECL record for Households (Numbers)**

Particulars	Electrified	Un-electrified	Total
<b>Total Domestic Households</b>			
FY 14-15 (Projected)	7,73,492	1,68,993	9,42,485
FY 14-15 (TSECL record)	5,71,775	2,22,799	7,94,574
<b>Difference</b>	<b>2,01,717</b>	<b>-53,806</b>	<b>1,47,911</b>
<b>Rural Households</b>			
FY 14-15 (Projected)	4,87,432	1,49,935	6,37,367
FY 14-15 (TSECL record)	4,11,175	2,13,710	6,24,885
<b>Difference</b>	<b>76,257</b>	<b>-63,775</b>	<b>12,482</b>
<b>Urban Households</b>			
FY 14-15 (Projected)	2,86,060	19,058	3,05,118
FY 14-15 (TSECL record)	1,60,600	9,089	1,69,689
<b>Difference</b>	<b>1,25,460</b>	<b>9,969</b>	<b>1,35,429</b>

The above table representation shows that there is an overall difference of 1,47,911 households (rural-urban) between the census projections and the recorded households by TSECL.

One of the primer reason of such difference is due to the existing disputed or temporary disconnected service connections, which is quite dynamic in nature. As per the estimation of TSECL, there is approximately 28,476 disputed/ temporarily disconnected households in the state, as on 31<sup>st</sup> March, 2015. TSECL has been making every possible effort to rectify such cases in order to bring them in active consumption stream.

The other perspective reason of such difference is that the households, which are supplied from a common electricity connection / having sub meters within a given premises, has been recorded as one

household by the utilities but counted separately by the census. State has estimated approximately 52,553 rented households as on 31<sup>st</sup> March, 2015 on the basis of census 2011.

Apart of owned and rented household category in the state, there is also a group of population which resides temporarily in tents or shelters. They have to move and shift their shelter here & there to earn their livelihood. State has estimated approximately 22,810 such households, who neither have their own house nor lives on rent as on 31<sup>st</sup> March, 2015 on the basis of census 2011.

State has also identified at least 44,072 households, as on March, 2015 which still having un-authorized access of electricity though any means.

Hence, the over-all difference between census HH's projection and HH's reported by State reconciles as per below table:

**Table 3: Differential summary of census projected and state reported HH**

Particulars	No. of HH's
HH's having temporarily disconnection/ disputed service	28,476
Rented HH's	55,553
Other than rented/ owned HH's	22,810
Existing HH's having un-authorized electricity access	44,072
<b>Total difference of HH's with census</b>	<b>1,47,911</b>

Accordingly, State has planned electrification of 2,22,799 un-electrified HH's (2,13,710 Rural & 9,089 Urban) in order to achieve objective of 24X7 Power For All in the state by FY 18-19.

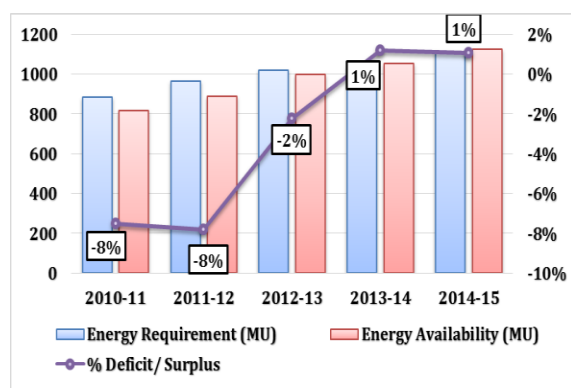


## CHAPTER 4: DEMAND AND SUPPLY SCENARIO

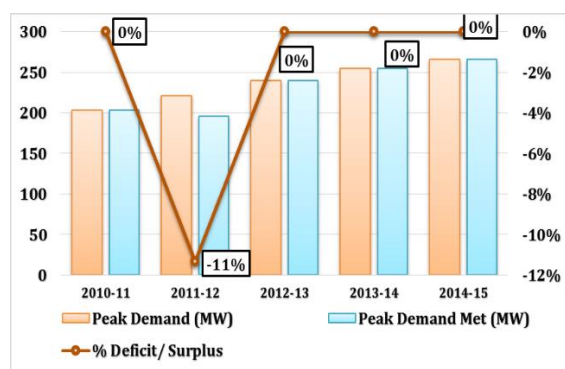
### PRESENT POWER SUPPLY POSITION

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

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



**Figure 3: Peak Demand vs. Peak Met<sup>3</sup> (in MW)**



It is evident from the above tabular representation that FY 12-13 onwards, there has not been any gap between state peak demand and peak demand met.

However, the energy shortage which was of the order of about 8% in FY 10-11 and FY 11-12, improved to 1% surplus in FY 14-15.

The factors responsible for the un-met gap in energy requirement and energy available for the state have been listed below:

- The power cut imposed or break-downs occurred due to insufficient capacity of transmission & distribution network.
- The state is not able to harness the full state owned installed generation capacity as well as allocated power share from CGS due to insufficient fuel gas supply/ un-availability of some generating units, on account of their age.
- Hydro power constitutes the major share of power available to the state which is adversely affected by insufficient or irregular rains.

At first instance the generation capacity to the state – including state owned power plants and allocated share from CGS is sufficient for meeting the demand of state consumer. But due to irregular or abnormal monsoon, the hydel generated power (~21% in FY 14-15) causes un-adequate power generation for the state.

The state is in the process of implementing energy efficient street lighting systems and installing “Electronic Time Switches” for street lights. Also promotion of energy conservation initiatives by using CFL and LED bulbs for domestic consumers will contribute significantly for energy efficiency measures, through which the state would be able to control the growing power demand upto very much extent in upcoming years.

<sup>2</sup>As per the data available from TSECL

<sup>3</sup>As per the data available from TSECL



## DEMAND PROJECTIONS

The energy requirement of Tripura in FY 15 was 1124 MU. With 24x7 Power For All initiative, the state's demand will go up. The demand increase is owing to the following:

- Natural growth in demand of already electrified domestic households.
- Additional demand from electrification of un-electrified domestic households.
- Natural growth in demand of consumer categories other than domestic.
- Additional demand of all consumer categories due to availability of power 24x7 instead of restricted availability as at present.

### DETERMINATION OF DAILY HOUSEHOLD CONSUMPTION

The average urban household energy consumption has been obtained by dividing the total urban domestic billed energy by the number of electrified urban households as per census and the average rural household energy consumption has been derived likewise.

For determination of consumption of domestic households up to FY 19, as per TSECL records, total 4,11,175 rural households and 1,60,600 urban households has been considered as electrified (as on 31<sup>st</sup> March, 2015), as per the approach affirmed and described in Table-2 and Table-3.

The broad approach for computing daily household consumption is highlighted below:

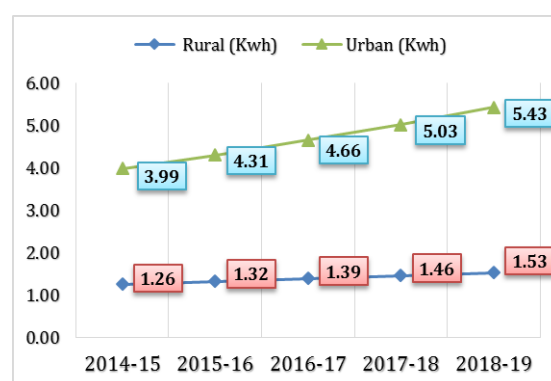
- The daily household consumption has been computed separately for rural and urban households for FY 15. Further, for the projection of future per day household consumption, the suitable escalation has been applied

considering consumption growth due to un-interrupted round the clock 24 hour power supply including nominal yearly growth of electrified households. Hence, yearly growth of 5% for rural and 8% for urban daily household consumption has been presumed for demand estimation up to FY 18-19.

- Certain realistic presumptions has been applied for sales estimation in categories other than domestic category.

Accordingly, 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**



### ELECTRIFICATION GROWTH PROJECTIONS

To achieve complete electrification of the state, the remaining un-electrified 2,13,710 rural households have been projected to be electrified through an yearly phasing of 10%, 25%, 50% and 15% respectively up to FY 19.

The electrification of estimated 9,089 urban households wouldn't require planning & installation of any huge electrical infrastructure, as electrical infrastructure is already within the reach of these households and they just needed to be connected with the network.

Hence, the electrification of remaining 9,089 urban un-electrified households has been considered to be completed within the FY 17 only.

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

**Table 4: Sales projection for Existing and Newly Electrified Households**

S.N.	Particulars	Units	FY 15	FY 16	FY 17	FY 18	FY 19
<b>A</b>	<b>Rural - Electrified Consumers (Existing + Projected Consumption Growth)</b>						
	Electrified Consumers	(Nos.)	4,11,175	4,16,090	4,21,064	4,26,098	4,31,192
	Actual Metered Sales	(MU)	189				
	Actual daily Rural Household Consumption	(kWh)	1.26				
	Yearly projected growth in per day per rural household consumption	(%)		5.00%	5.00%	5.00%	5.00%
	Projected daily Rural Household Consumption	(kWh)		1.32	1.39	1.46	1.53
	Projected Annual Rural Household Consumption	(MU)		201	214	227	241
<b>B</b>	<b>Rural - Electrification of Un-Electrified Consumes</b>						
	Targeted Annual Addition	(Nos.)	0	21,371	53,428	1,06,855	32,057
	Cumulative Annual Addition	(Nos.)	0	21,371	74,799	1,81,654	2,13,710
	Projected Annual Rural Household Consumption	(MU)		10	38	97	119
<b>C=A+B</b>	<b>Total Projected Annual Rural Consumption</b>	<b>(MU)</b>		211	251	324	361
<b>D</b>	<b>Urban - Electrified Consumers (Existing + Projected Consumption Growth)</b>						
	Electrified Consumers (in Nos.)	(Nos.)	1,60,600	1,71,433	1,82,997	1,95,341	2,08,518
	Actual Metered Sales (in MU)	(MU)	234				
	Actual Daily Household Consumption	(kWh)	3.99				
	Yearly projected growth in per day per urban household consumption	(%)		8.00%	8.00%	8.00%	8.00%
	Projected daily Urban Household Consumption	(kWh)		4.31	4.66	5.03	5.43
	Projected Annual Rural Household Consumption	(MU)		270	311	359	413
<b>E</b>	<b>Urban - Electrification of Un-Electrified Consumes</b>						
	Targeted Annual Addition	(Nos.)	0	0	9,089	0	0
	Cumulative Annual Addition	(Nos.)	0	0	9,089	9,089	9,089
	Projected Annual Urban Household Consumption	(MU)		0	15.4	16.7	18.0
<b>F=D+E</b>	<b>Total Projected Annual Urban Consumption</b>	<b>(MU)</b>		270	327	375	431
<b>G=C+F</b>	<b>Total Projected Domestic Consumption</b>	<b>(MU)</b>		481	578	699	792

#### DETERMINATION OF CONSUMPTION OF OTHER CONSUMERS

For sales projection of categories other than domestic consumer category for FY 16 to FY 19, CAGR of previous 5 years as well as certain realistic presumptions has been applied.

Accordingly the individual category wise sales projection has been tabulated as below:

**Table 5: Projected Category-wise Sales (In MU)**

Sl. No.	Consumer Category	Yearly growth assumption (%)	FY 2015-16	FY 2016-17	FY 2017-18	FY 2018-19
1.	Domestic	-	481	578	699	792
	<i>Domestic-Rural</i>	-	211	251	324	361
	<i>Domestic-Urban</i>	-	270	327	375	431
2.	Commercial	8%	78	84	91	98
3.	Industrial	3%	61	63	65	67
4.	Irrigation	3%	16.92	17.43	17.95	18.49
5.	Public Lighting	1%	28	28.63	28.92	29.21
6.	Public Water Works & Sewage disposal	11%	81	90	100	110
7.	Any other category (Tea, Coffee & Rubber Garden and Bulk)	8%	92	100	108	117
8.	Mobile Tower	3%	30.56	31.48	32.42	33.39
<b>Total:</b>			<b>869</b>	<b>992</b>	<b>1141</b>	<b>1265</b>

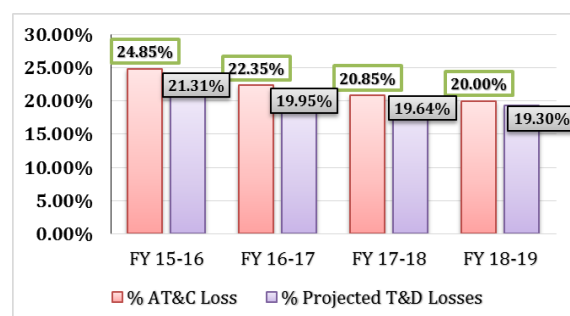
## FUTURE ENERGY AND DEMAND REQUIREMENT

The existing AT&C losses of State is 34.34% for FY 2014-15 and average AT&C losses of past 03 years is also in the tune of 35%.

TSECL has started making investments to reduce the high levels of AT&C losses and the results are expected to show up soon in near future.

To project the future loss trajectory, the proposed AT&C loss trajectory by Ministry Of Power for the state Tripura has been adopted as the baseline. Gradual improvement in collection efficiency has also been considered and it has been targeted to go up to 99.13% by FY 2018-19.

**Figure 5: Projected Loss Reduction Trajectory**



Based on the projected T&D loss reduction trajectory, the estimated energy and demand requirement for future years has been shown in the table below:

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

Particulars	FY 16	FY 17	FY 18	FY 19
<b>Sale within State (MU)</b>	869	992	1141	1265
<b>Projected T&amp;D Losses</b>	21.31%	19.95%	19.64%	19.30%
<b>Total Energy Requirement within State (MU)</b>	1,104	1,239	1,420	1,568
<b>Load Factor</b>	46.67%	46.67%	46.67%	46.67%
<b>Maximum Demand Requirement within State (MW)</b>	270	303	347	384

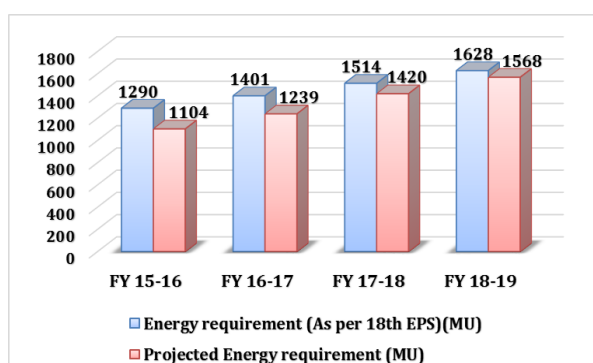
As per the actual power supply position of the state (up to March 15), the actual requirement for FY 15 was 1125 MU, with 786 MU actual energy sales and 30.15% T&D Losses.

Load factor projected for future year is based on the average of past 05 year load factor for estimating peak demand of state.

Adoption of various energy efficiency measures like 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 in upcoming years.

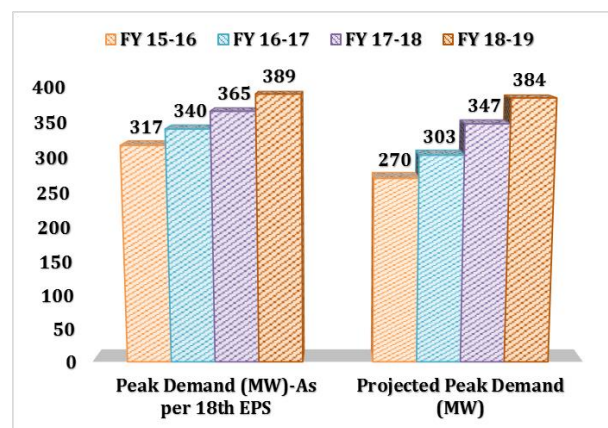
A graphical comparison of projected energy requirement (MU) with the 18<sup>th</sup> EPS projections has been provided as below:

**Table 7: Energy requirement (Projected V/s 18<sup>th</sup> EPS Projection) (MU)**



A similar graphical comparison between the projected peak demand and the peak demand projected in the 18<sup>th</sup> EPS is shown in the table below.

**Table 8: Peak Demand (Projected V/s 18<sup>th</sup> EPS Projection) (MW)**



The projected energy requirement and peak demand are slightly lower than 18<sup>th</sup> EPS projections due to considered stringent AT&C loss trajectory (as per Figure-5). An assessment for the adequacy of generation, transmission and distribution infrastructure for meeting the future projected energy demand of the state i.e. near about 384 MW has been covered in the chapters that follow.

## CHAPTER 5: GENERATION PLAN

### AVAILABLE GENERATION SOURCES

Following are the power generation sources available to the state:

- State's own generating stations.
- OTPC (Palatana).
- Bongaigaon Thermal Project.
- NEEPCO Generating units.
- NHPC generating units.

**Rokhia Gas based Power Station (6X8 MW + 3X21 MW)** capacity was installed in different phases from year 1990 to last 21 MW unit in August-2013. At present, Rokhia gas based thermal power plant owned by the state has 3x21 MW effective operative capacity. Other units of each 8 MW capacity were aged old, outdated & were operated at high fuel consumption. Hence decided to get them retired. The total effective output from Rokhia power station is 63 MW at present based on available fuel linkage.

**Baramura Power Station (2X21 MW)** is also a state owned plant with 50% generated power shared by Manipur & Mizoram, being NEC aided project.

**Gumti Hydroelectric Project** is the oldest power station of the state with 3x5 MW capacity small hydro units. Though there are 3 units, one unit remains as stand by rotationally as the water content allows running only two units at a time with an operational available capacity of 8 MW.

**ONGC Tripura Power Company (OTPC)** developed a (2X363.6) MW combined cycle gas turbine (CCGT) thermal power plant in the state of Tripura to supply power to the deficit areas of north eastern states of India.

Although, Tripura has 196 MW allocated share from OTPC, it received only 80 MW and 148 MW share from OTPC during FY 14 & FY 15. The only reason behind this short supply from OTPC is that out of total 726 MW, presently OTPC is capable of generating only 526 MW due to less availability of fuel gas.

### FUTURE IMPENDING GENERATION SOURCES

**35 MW capacity addition at Rokhia and 25 MW at Baramura** through combined cycle power generation has been planned by TSECL. NEEPCO is already working on preparing the feasibility report and detailed project reports. At present detailed surveying work is in progress for rain water harvesting and storing for combined cycle generation. Both the plants are expected to be operational from FY 2018-19 onwards.

**NEEPCO's 101 MW combined cycle plant at Monarchak** (West Tripura) is under execution. The project will generate 61.3 MW power from gas turbine unit and remaining 39.7 MW from steam turbine unit. Tripura has 100% power allocation from this project. The plant is now under trial run and is expected to be operational fully in FY 16-17.

NEEPCO has also made operationalized 46 MW combined cycle based generating units at Ramchandra Nagar (Agartala), and supplying electricity to the state from FY 15-16 onwards. Tripura has 18.6% power allocation from this plant.

The additional planned capacity addition & future energy availability from proposed grid connected solar power projects has

been detailed in the chapter on renewable energy.

## CUMULATIVE GENERATION AVAILABILITY

The total available generation capacity to Tripura including firm allocated share from CGS as on 31<sup>st</sup> March 2015 is 332.76 MW as detailed in the table below.

**Table 9: Generation Availability Mix for FY 15 (MW)**

Source	Latest Firm Entitlement (in MW)	%age of Total Availability
<b>Own Generating Stations (OGS)</b>		
Hydro	5.00	5.62%
Gas Based	84.00	94.38%
<b>Subtotal – OGS</b>	<b>89.00</b>	<b>26.75%</b>
<b>Central Generating Stations (CGS)</b>		
Hydro	65.89	27.03%
Gas Based	177.87	72.97%
<b>Subtotal-CGS</b>	<b>243.76</b>	<b>73.25%</b>
<b>Grand Total</b>	<b>332.76</b>	<b>100%</b>
<b>Total Hydro</b>	<b>70.89</b>	<b>21.30%</b>
<b>Total Gas Based</b>	<b>261.87</b>	<b>78.70%</b>

Gas based generation capacity constitutes about 78.70% of the total generation capacity with hydro generation capacity for the balance 21.30%.

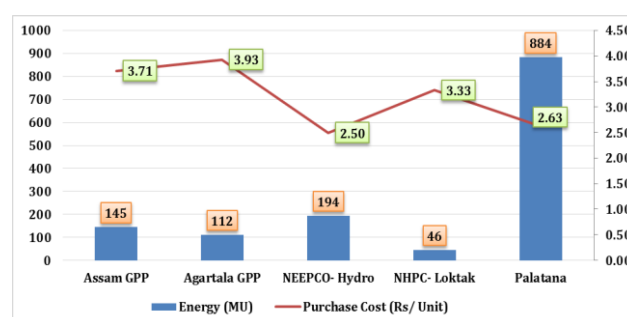
Tripura met a max demand of about 266 MW in FY 15 and the energy requirement of the state is of the order of 1125 MU for FY 15.

Considering baseline AT&C loss trajectory of Tripura given by MoP, the maximum

demand is expected to grow up to to 384 MW in FY 19 and the energy requirement would be of the order of 1568 MU for providing 24x7 power supply to the State.

The source wise actual energy availability with per unit cost from respective source has been summarized below:

**Figure 6: Availability Mix from Various Sources in FY 15**



- *It is evident from the above representation that TSECL has been procuring cost-effective hydro power (Rs. 2.50 per Unit) from NEEPCO- hydro plants.*
- *Per unit power procurement from Palatana Gas Station is the lowest (Rs. 2.63 per Unit) among gas power plants.*

The combined cycle based Rokhia and Baramura Power Projects has been envisaged to be operationalized by FY 2018-19.

The Renovation and Modernization/ life extension project of 3X5 MW GHEP has also been proposed. Since pre-project activities and fund tie up is not completed yet, hence, expected generation from this project has not been considered in this document.



**Table 10: Projected Allocations from Various Power Generating Sources (in MW)**

Particulars		Nature	Projected Available Generation (MW)			
			FY 15-16	FY 16-17	FY 17-18	FY 18-19
A	State Own Generating Stations					
1	Gumti Hydroelectric Project (GHEP)	Hydro	5	5	5	5
2	Rokhia Gas Thermal Power Plant (RGTPP)- Existing Unit	Gas	63	63	63	63
3	Rokhia Combined Cycle power plant – New CCGT	Gas (CCGT)	0	0	0	35
4	Baramura gas thermal power plant (BGTPP)	Gas	21	21	21	21
5	Baramura Combined Cycle power plant – New CCGT	Gas (CCGT)	0	0	0	25
	Available State own Generation (MW)		89	89	89	149
B	CGS Allocation					
1	OTPC Palatana/ Tripura CCGT	Gas	142.02	142.02	142.02	142.02
2	NEEPCO					
	Khandong HPS	Hydro	2.88	2.88	2.88	2.88
	Kopili +Kopili Extn .HPS	Hydro	12.16	12.16	12.16	12.16
	Kopili HEP Stg. – II	Hydro	2.38	2.38	2.38	2.38
	Kathalguri GPS/ AGBPP	Gas	20.22	20.22	20.22	20.22
	Agartala GPS	Gas	15.62	15.62	15.62	15.62
	Doyang HPS	Hydro	5.30	5.30	5.30	5.30
	Ranganadi HPS	Hydro	30.66	30.66	30.66	30.66
	R.C. Nagar CCGT	Gas	8.56	8.56	8.56	8.56
	Monarchak CCGT	Gas	0	101.00	101.00	101.00
3	NHPC - Loktak HPS	Hydro	12.52	12.52	12.52	12.52
Available CGS Generation (Sub-Total) (MW)			252.32	353.32	353.32	353.32
Available Generation (Grand Total) (MW)			341.32	442.32	442.32	502.32

As seen from the above, there is a substantial capacity addition planned by the state by FY 19.

The year wise expected generation from state owned generating stations has been projected in line with the available generating capacity during FY 2015-16 to FY 18-19.

The generation from central generating sources has also been projected on the basis of available generating capacity during FY 15-16 to FY 18-19 with due consideration of capacity addition in the near future.

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

**Table 11: Projected Energy Availability from Various Sources (in MU)**

Particulars		Nature	Projected Available Generation (MU)			
			FY 15-16	FY 16-17	FY 17-18	FY 18-19
A	State Own Generating Stations					
1	Gumti Hydroelectric Project (GHEP)	Hydro	17.83	17.83	17.83	17.83
2	Rokhia Gas Thermal Power Plant (RGTPP)- Existing Unit	Gas	395.76	395.76	395.76	395.76
3	Rokhia Combined Cycle power plant – New CCGT	Gas (CCGT)	0	0	0	235.47
4	Baramura gas thermal power plant (BGTPP)	Gas	151.56	151.56	151.56	151.56
5	Baramura Combined Cycle power plant – New CCGT	Gas (CCGT)	0	0	0	173.45
	Available State own Generation (MU)		565.16	565.16	565.16	974.07
B	CGS Allocation					
1	OTPC Palatana/ Tripura CCGT	Gas	883.81	883.81	883.81	883.81
2	NEEPCO					
	Khandong HPS	Hydro	10.47	10.47	10.47	10.47
	Kopili +Kopili Extn .HPS	Hydro	44.29	44.29	44.29	44.29
	Kopili HEP Stg. – II	Hydro	8.68	8.68	8.68	8.68
	Kathalguri GPS/ AGBPP	Gas	144.57	144.57	144.57	144.57
	Agartala GPS	Gas	111.68	111.68	111.68	111.68
	Doyang HPS	Hydro	19.31	19.31	19.31	19.31
	Ranganadi HPS	Hydro	111.67	111.67	111.67	111.67
	R.C. Nagar CCGT	Gas	42.47	61.16	61.16	61.16
	Monarchak CCGT	Gas	0	721.96	721.96	721.96
3	NHPC - Loktak HPS	Hydro	45.59	45.59	45.59	45.59
Available CGS Generation (Sub-Total) (MU)			1422.54	2163.19	2163.19	2163.19
Available Generation (Grand Total) (MU)			1987.70	2728.35	2728.35	3137.27

**Table 12: Adequacy of Projected Energy Availability from Firm Share/Long Term Tie-Ups (in MU)**

Particulars	FY 15-16	FY 16-17	FY 17-18	FY 18-19
Total Energy Requirement within State (MU)	1104	1239	1420	1568
Total Energy Availability (MU)	<b>1988</b>	<b>2728</b>	<b>2728</b>	<b>3137</b>
Surplus / (Deficit) ((MU)	884	1489	1308	1569
<b>Adequacy of Power Supply</b>	<b>Adequate</b>	<b>Adequate</b>	<b>Adequate</b>	<b>Adequate</b>

It is evident from the above table that there is surplus power available in the state taking into account the state's own generating plants and allocation from central generating stations after fulfilling its obligation to supply 20 MW firm share to Mizoram and Manipur from the state owned Baramura gas based thermal power plant.

However, there also be a different scenario of power generation, may evolve in near future for Tripura, which will be either due

to non-availability or less availability of existing hydel generating stations due to less or abnormal monsoon.

Similarly, the generation availability of gas based generating station is totally depends upon the fuel gas supply as per requirement.

At present, all the gas based generating stations of north eastern region is under-performing due to irregular fuel gas supply as per requirement.

Hence, the state of power generation adequacy (as shown in Table 12), may differ as per the situation evolved in near future in the state.

## FUND REQUIREMENT

The fund requirement for state power generating sector is summarized as per below table:

**Table 13: Fund Requirement for State Power Generating Projects (in Rs Crores)**

Sr.	Work	FY 15-16	FY 16-17	FY 17-18	FY 18-19	Total
1	35 MW Rokhia Combine cycle project	0	0	63	188	250.80
2	25 MW Baramura Combine cycle project	0	0	48	144	192.20
3	Life extension of 3X5 MW GHEP	0	0	27	82	109.60
	<b>Total Fund Requirement</b>	<b>0</b>	<b>0</b>	<b>138</b>	<b>414</b>	<b>552.60</b>

The financial closure of combine cycle projects of Rokhia and Baramura is expected to be achieved within FY 16-17 and accordingly the project is expected to be operationalized by FY 18-19. However, the pre-project activities and assessment is in process for life extension project of Gumti (3X5 MW) HEP.

State has planned external aided funding mode to execute proposed power generating projects of Tripura.

## **ACTION POINTS FOR THE STATE**

### **POWER PURCHASE PLANNING**

Since, the state is a marginally surplus power state, there is an imperative need to establish a Power Purchase Planning and Procurement cell manned by skilled and efficient professionals for effective management of power procurement. The cell should be responsible for monitoring all the power sell/purchase activities under different modes of contracting (long term/medium term/ short term & day ahead etc.) keeping in view the merit order of the source.

This cell should also be responsible for assessing the monthly power availability from already tied-up sources (on the basis of declared schedules provided by generating sources) and accordingly tie up the surplus power on the basis of optimum available contracts keeping in consideration the huge seasonal variation in energy availability from renewable and hydro sources across the year.

TSECL is already attaining a substantial revenue by selling its surplus power. However, it is anticipated that better gains can be achieved by managing power procurement operations more effectively.

### **COMBINE CYCLE CONVERSION AND RM&U OF EXISTING STATIONS**

TSECL has already taken up concrete steps to execute the combine cycle conversion of Rokhia and Baramura generating plants along with life extension project of 3X5 MW Gumti HEP. State has proposed to achieve this generating capacity addition through the support of External Aided Funding. State is also making every possible effort in order to achieve financial closure of these power generation projects of the state.

## **GOVERNMENT OF INDIA** **INTERVENTION**

The state is facing hurdles in fully harnessing its own installed generation capacity as well as receiving less than its allocated share of power from some central generation plants. The issues highlighted by the state for intervention of Government of India are detailed as follows:

### **IN-ADEQUATE FUEL GAS SUPPLY TO STATE TIED UP GENERATING PLANTS**

The state is unable to get the entitled quantum of power from its own as well as from some firm power allocations of CGS, the only constraints being the inadequate fuel gas supply to all these generating stations.

Nearly 4.88 MMSCMD natural gas is required for gas based power plants tied up with Tripura. However, ONGC, the sole gas supplier for the state power generation sector is finding great operational difficulties in supplying the fuel gas as per the requirement.

OTPC's project at Palatana with 726 MW generation capacity, which is the largest power project of the region, is not generating to its full capacity. The gas supply to the station is not yet so adequate to harness its optimum generation.

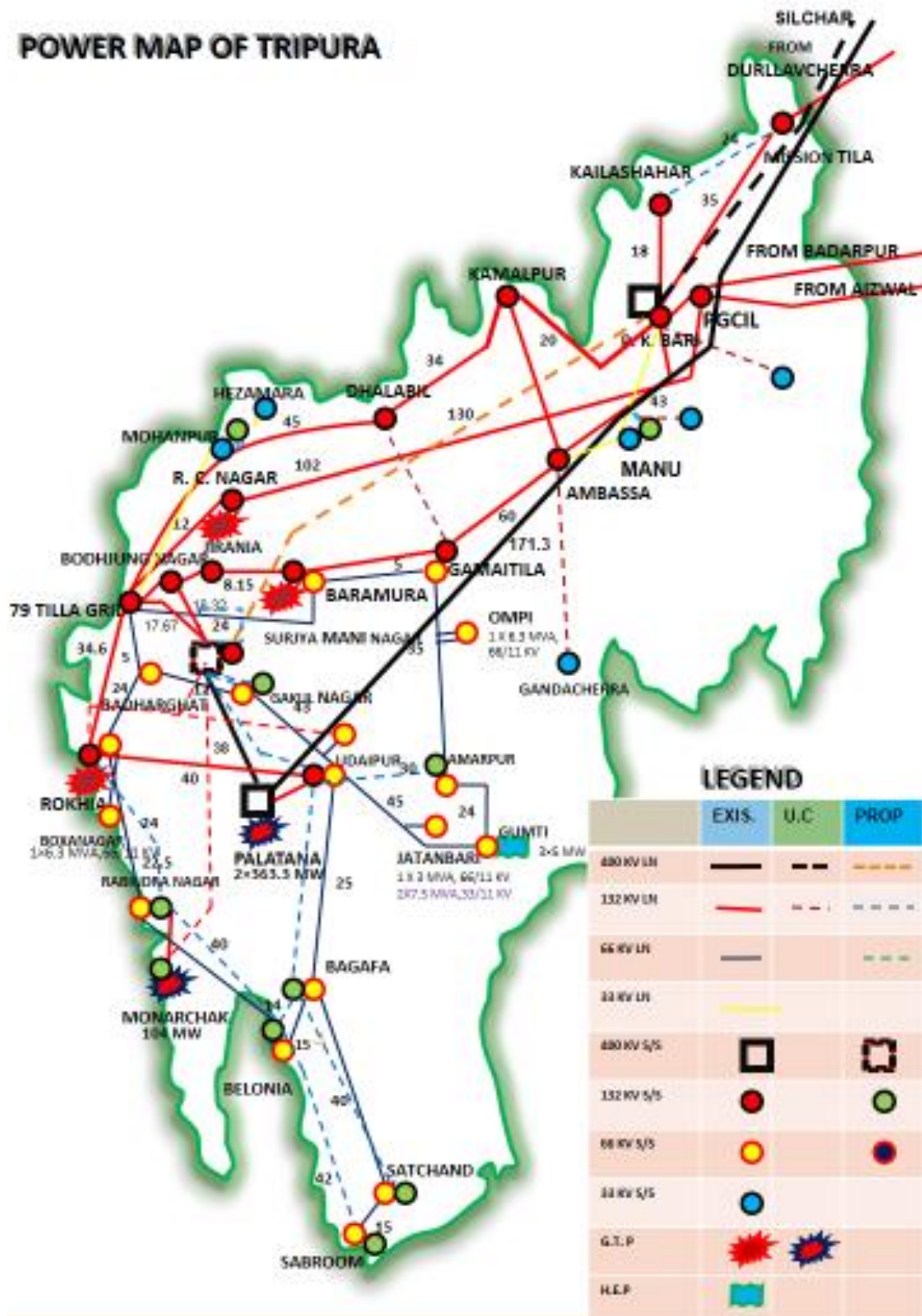
Similar is the situation with NEEPCO's 101 MW Monarchak project. Baramura Gas based Power Plant of the State is also suffering from under-rated power Generation due to in-adequate gas supply.

### **FUND TIE-UP FOR COMBINE CYCLE CONVERSION AND RM&U OF EXISTING STATIONS**

State has proposed to achieve generating capacity addition through the support of External Aided Funding. State is also making every possible effort in order to achieve financial closure of these power generation projects of the state. However, state seeks Government of India intervention on board in order to expedite the allotment of external aided funds for required capacity addition in state power generating stations.

## CHAPTER 6: TRANSMISSION PLAN

Figure 7: Power Transmission Map of Tripura





The total energy requirement projected for Tripura during the FY 2018-19 is 1,568 MU and the maximum demand comes out to 384 MW. To meet this future demand, the assessment of transmission network availability and adequacy has been undertaken in this chapter.

### EXISTING POWER EVACUATION & INTRA STATE TRANSMISSION SYSTEM

TSECL owns 564.16 Ckt. km of 132 KV and 408.38 Ckt. km of 66 KV network as on 31<sup>st</sup> March, 2015.

The transmission infrastructure growth trend has been tabulated as below:

**Table 14: Intra-state transmission infra. Growth (Ckt-Km.)**

Particulars	FY 13	FY 14	FY 15
<b>132 kV Line</b>	460.35	496.33	564.16
<b>66 kV Line</b>	384.10	384.10	408.38

As can be seen in the table above, while the 132 kV network has a rapid growth in comparison to the 66 kV voltage network. This is explained by the fact that 132 kV is better suited as transmission voltage keeping in view the loads and distances involved.

**Table 15: Intra-state transmission infra. Details (FY 14-15)**

Cumulative sub-station capacity (MVA)	
<b>132/66 kV</b>	<b>90 MVA</b>
132/33 kV	325 MVA
66/33 kV	94.30 MVA
<b>Total at X/33 kV</b>	<b>419.30 MVA</b>
132/11 kV	135 MVA
66/11 kV	125.80 MVA
33/11 kV	284.20 MVA
<b>Total at X/11 kV</b>	<b>545 MVA</b>

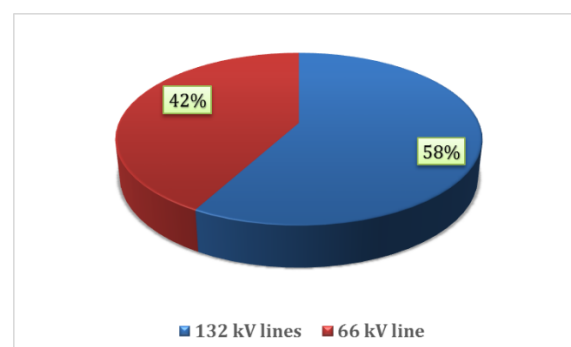
Cumulative sub-station capacity (MVA)	
Cumulative Line capacity (Ckt-KM)	
<b>132 kV Lines</b>	564.16 Ckt-KM
<b>66 kV Lines</b>	408.38 Ckt-KM

As tabulated above, the installed intra-state transformation capacity is adequate to cater the existing peak demand of state. However, due to the fragile & poor conditioning of state transmission and distribution network, sometimes supply interruptions happens.

The detailed existing intra-state transmission infrastructure details has been provided in the Annexure- 4.

The power evacuation system of GHEP comprises of 66 kV lines emanating to Agartala via Amarpur & Teliamura via Udaipur. Generation from RGTPP & BGTPP is evacuated to the load centres of Agartala, Badharghat, Udaipur, and Teliamura, Ambassa etc. by transmission system constituted of both 66 kV and 132 kV lines.

**Figure 8: Voltage wise Existing Intra-state Transmission Line (CKM) (FY 14)**



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

The state is connected to other states of North Eastern Region through 132 kV Kumarghat- Badarpur single circuit line, 132 kV Dharmanagar – Dullavcherra single circuit line, 132 kV Kumarghat- Aizwal single circuit line, 400 kV Silchar- P. K. Bari Double circuit line (operated at 132 kV) and



400 kV Palatana- Silchar double circuit lines.

**Table 16: Inter-state transmission infra. Details (FY 14-15)**

Cumulative sub-station capacity (MVA)	
400/132 kV**	250 MVA
** At present charged at 132 kV	
132/33 kV	5 MVA
Cumulative Line Capacity (Ckt- KM)	
400 kV Lines	822 Ckt-KM
132 kV Lines	407 Ckt-KM

Presently ISTS in Tripura consists of 822 ckm of 400 kV Transmission lines, 407 ckm of 132 kV Transmission lines and 2 no. of substations/switchyard with 255 MVA transformation capacity (Palatana 400/132 kV-2X125 MVA, and Kumarghat 132/33 kV-5MVA).

Further, R.C. Nagar generation project of 134 MW capacity (4X21 + 2X25) MW is present within the state of Tripura. This generation project along with above mentioned inter-state transmission lines and 2x125MVA ICT at Palatana Switchyard are adequate to supply Tripura's share of CGS power.

The details of existing inter-state transmission system has been provided in the Annexure- 3.

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

**Table 18: State planned Intra-State Transmission infrastructure**

Sr.	Particulars	Measurement	Cost (Rs. Cr.)	CO D
<b>Lines</b>				
1	132 kV D/C Suryamaninagar - Rokhia	42.9 CKM	12.61	May -16
2	132 kV D/C Suryamaninagar - Monarchak : Section: Suryamaninagar - Melaghar section	81.1 CKM	28.03	Aug -16

**Table 17: Intra-State Transmission System development (NERPSIP Scheme)**

Transmission & Sub-transmission System (132 KV & above)	
Line (CKM)	461
New S/s (No)	09
MVA(New & augmentation at 132/33 kV )	1084.50

At present, under the North Eastern Power System Improvement Project (NERPSIP) to strengthen the intra-state transmission & distribution systems (up to 33 kV and above), PGCIL has been developing approximately 200 CKM transmission line capacity at 132 kV voltage level with double circuit transmission line and the remaining 261 CKM transmission line at 132 kV voltage level with single circuit line arrangement. Total 9 no's of 132/ 33 kV sub-stations (752 MVA) are also being added. Besides, 05 no. 132/33 kV sub-stations are being augmented by adding 332.5 MVA to their capacity. The proposed works under the scheme have been envisaged to be completed by the end of FY 18-19. The details of transmission & distribution infrastructure development under NERPSIP scheme has been provided in Annexure- 3.

The transmission infrastructure capacity addition has also been planned under NEC & Special Plan Assistance (SPA) schemes for the state. The details of these works has been provided as per table below:

Sr.	Particulars	Measurement	Cost (Rs. Cr.)	CO D
3	132 kV D/C Suryamaninagar (TSECL) - Suryamaninagar (TBCB)	0.5 CKM	Yet to estimate	FY 18-19
4	132 kV D/C P. K. Bari (TSECL) - P. K. Bari (TBCB)	Yet to estimate	Yet to estimate	FY 18-19
<b>Sub-station</b>				
1	132/33 & 33/11 kV Bishramganj Sub-Stn. 132 KV Extension	20 MVA	8	FY 18-19

The connecting lines between Surjyamaninagar (TSECL)-Surjyamaninagar (TBCB) and P. K. Bari (TSECL) - P. K. Bari (TBCB) has already been approved by CEA in 5<sup>th</sup> Standing Committee meeting for NER Power System Planning and these lines will be executed by state at own. At present, the land has been identified and finalized for Surjyamaninagar (TSECL)-Surjyamaninagar (TBCB) connecting link. However, land finalization is in the process for P.K. Bari (TSECL)-P. K. Bari (TBCB) link.

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

430 Ckm. double circuit inter-state transmission lines from Surjyamaninagar to PK Bari and Agartala GBPP to PK Bari have been approved to be added under Tariff based competitive bidding (TBCB) route. The existing inter-state transformation capacity at 400/ 132 kV will be enhanced by 1260 MVA after commissioning of planned 400/132 kV sub-stations at P. K. Bari and Surjyamaninagar, under Tariff based competitive bidding (TBCB) route.

Apparently, the work of inter-state transmission capacity addition is yet to start and as per scheduled milestones of the projects, these transmission assets are expected to be commissioned by FY 18-19.

However, the exact COD of these works may only be assured only after award of these works to the respective executing agency.

These 400/132kV sub-stations have been planned as an alternate evacuation path for

Palatana GBPP and would be required for charging of Pallatana-Surajmaninagar and Silchar – P.K. Bari 400 kV D/c lines (presently charged at 132kV) to their rated voltage (400kV).

However, existing inter-state transmission lines along with 2x125 MVA ICT at Palatana and R. C. Nagar generation project of 134 MW capacity (4x21 + 2x25) within the state of Tripura adequate to draw Tripura's share of CGS power up to FY 18-19 time-frame.

Under North Eastern Power System Improvement Project (NERPSIP), addition of 1084 MVA transformation capacity at 132 kV level has been approved to be added in Tripura, so overall transformation capacity at 132 kV level would be around 1600 MVA, which shall be adequate to meet peak demand of state by FY 18-19.

The details of proposed inter-state transmission lines and sub-station to be added has been provided in the Annexure-3.

#### FUND REQUIREMENT

The fund is already tied up with World Bank for NERPSIP works. However, the work proposed under state plan will be funded through either grant from state government or will be tied up through external aided funding agency.

The fund requirement for state transmission projects in upcoming years is summarized as per below table.

**Table 19: Fund Requirement for State Transmission Projects (in Rs Crores)**

Sl.	Category	Fund Requirement (in Rs Crores)				
		FY 16	FY 17	FY 18	FY 19	Total
1	132 kV Transmission Lines (NERPSIP scheme)	17.88	71.54	62.59	26.83	178.84
2	132 kV Transmission Lines (State plan)	4.06	16.26	14.22	6.10	40.64
3	New 132 / 33 KV Sub-Substations (NERPSIP scheme)	35.65	142.58	124.76	53.47	356.46
4	S/S Augmentation & transformer replacement					
4.1	132/33 KV Sub-station (NERPSIP scheme)	7.53	30.10	26.34	11.29	75.26
4.2	<i>Augmentation of 66/33 KV Sub-Station- under state plan</i>	1.60	6.40	5.60	2.40	16.00
<b>Total Fund Requirement</b>		<b>66.72</b>	<b>266.88</b>	<b>233.52</b>	<b>100.08</b>	<b>667.20</b>

### **ACTION POINTS FOR THE STATE**

- State will implement the projects on time to ensure availability of transmission system for 24 x 7 supply.
- TSECL 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.
- TSECL has to take measures for reconductoring of lines with high capacity conductor or plan alternative network to avoid anticipated overloading of lines.
- The state will procure and deploy one Emergency Restoration System (ERS) to effectively restore transmission lines in case of emergency.
- Advanced techniques like Infrared Camera to be used to detect of hot spots

and weak joints so that preventive maintenance can be carried out at the earliest in order to avoid any un-wanted transmission line break-downs.

- Although, the state is in the process of constructing new inter-state transmission lines & sub-stations at 400/ 132 kV voltage level through tariff based competitive bidding (TBCB) route but the project is yet to be awarded to any project executing agency. To achieve the time bound object of 24X7 PFA, state has to quicken the process of project award and execution thereon.

### **GOVERNMENT OF INDIA INTERVENTION**

The proposed works for 400 kV inter-state transmission lines (Surjyamaninagar to P.K. Bari and AGBPP to P.K. Bari) and 400/ 132 kV sub-stations (at P.K. Bari & Surjyamaninagar) under TBCB route needs to be expedite with the help of central team.

## CHAPTER 7: DISTRIBUTION PLAN

### CONNECTING THE UNCONNECTED HOUSEHOLDS

The following actions are initiated to electrify all the remaining villages and households in the State:

#### Out of 2,22,799 Un-electrified Rural Households,

- ✓ Electrification of 75,828 Rural Households has already sanctioned under RGGVY XII plan.
- ✓ Electrification of remaining 1,37,882 Rural Households is yet to be covered under any plan.
- ✓ Electrification of 9,089 urban households doesn't require any huge investment since electrical network and facilities are within their reach. They just needed to be connected with the system.

### EXISTING DISTRIBUTION SYSTEM

TSECL is the only distribution licensee in the state of Tripura. It is serving 6.42 lakh consumers of the state and at present providing 24 hours supply to all its consumers.

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

**Table 20: Existing Distribution System of Tripura (As on March-2015)**

Particulars	Qty.
Electricity Consumers	6.42 Lacs
33/11 KV Sub-stations	43 No.
Capacity at 132/11 KV	135 MVA
Capacity at 66/11 KV	125.80 MVA
Capacity at 33/11 KV	284.20MVA
33 KV Line	805.29 CKM
11 KV Line	10936 CKM

Particulars	Qty.
LT Line	22,937 CKM
11/0.4 KV DTR (No.)	12,673
Capacity of 11/0.4 KV DTR	993 MVA

### PERFORMANCE OF TSECL

#### NETWORK RELIABILITY

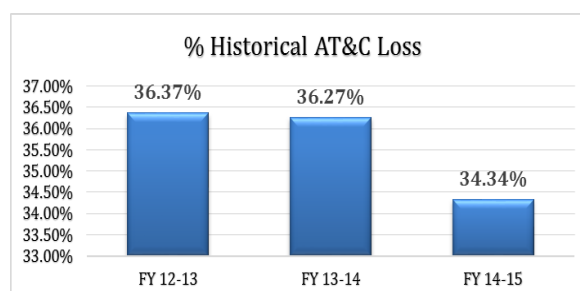
The average system availability index of State Network is shown below.

**Table 21: %Availability of State T&D System**

Particular	FY 12-13	FY 13-14	FY 14-15
132 kV S/s	98.75	99.18	99.20
66 kV S/s	98.75	98.88	98.90
11 kV S/s (DT)	88.65	87.95	88.00
Power Transformer	99.20	99.50	99.50
132 kV line	98.06	98.45	98.50
66 kV line	98.06	98.25	98.30

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

**Figure 9: Historical AT&C losses of State**



As per above graphical representation, State has historical trend of near about 35% yearly AT&C losses. However, State has planned to reduce gradually its AT&C losses from 34.34% in FY 2015 to 20% by the end of FY 18-19.

**Table 22: Projected AT&C Targets**

FY 16	FY 17	FY 18	FY 19
24.85%	22.35%	20.85%	20.00%

Therefore, to achieve 100% rural household electrification and to meet the AT&C losses targets, the state has planned following investments.

## INVESTMENTS PROPOSED

### System Strengthening

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

- I. System strengthening works like establishment of 33 kV sub-stations, re-conductoring of HT/LT Lines, enhancement of existing transformer capacity, and bifurcation of load by providing new feeders/Distribution transformers etc.
- II. System improvement works like providing UG Cables/ Aerial Bunched Cables, replacement of deteriorated Poles, Conductors etc.
- III. Creation of infrastructure for providing new service connections.
- IV. Metering of installations and distribution transformers for energy accountability and auditing.
- V. Replacement of electro-mechanical meters to static meters.

- VI. Projects/Schemes which help in reduction of Technical and Commercial Losses.

### Rural Electrification:

The GoI has proposed to assist the state governments to connect the un-connected households in every village in the country. The aim of providing power to each household is very important and Government of Tripura has planned to achieve the same under DDUGJY and RGGVY schemes.

## SYSTEM STRENGTHENING

### DISTRIBUTION WORKS UNDER NERPSIP SCHEME

At present, under the North Eastern Power System Improvement Project (NERPSIP), to strengthen the intra-state transmission & distribution systems (up to 33 kV and above), PGCIL has been developing approximately 1096 ckm transmission line capacity at 33 kV voltage level with single circuit arrangement and 34 no's of 33 kV sub-stations (752 MVA) in the same scheme.

The state has planned to invest Rs. 660 crores towards system strengthening which is currently undertaken with the help of World Bank for distribution network and system strengthening.

**Table 23: 33 kV System development (NERPSIP Scheme)**

Distribution System (up to 33 kV)	
Line (CKM)	1096
New S/s (No.)	34
MVA(New & augmentation)	450.55

The details of distribution infrastructure development under NERPSIP scheme has been provided in Annexure- 4.

The anticipated benefits from this project are as below:

- Transformation Capacity addition with stand by arrangements to cater future load.
- Development of 33 KV system.
- Targeted reduction in line loss.

## RURAL INFRASTRUCTURE

### INTEGRATED POWER DEVELOPMENT SCHEME (IPDS)

The Central Government has sanctioned “Integrated Power Development Scheme” (IPDS) on 3<sup>rd</sup> December, 2014 for urban areas 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 of 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 CEA 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.

Tripura received Rs. 35.19 Cr. for R-APDRP Part-A and Rs. 165.10 Cr. for Part-B sanction for 16 No. of towns. The progress achieved till now is as below:

- ✓ 100 % System metering (boundary, feeder and DT metering) achieved in all 16 project areas.
- ✓ 100% GIS Assets and Consumer indexing has been completed in all 16 project areas.
- ✓ Applications like- metering-billing-collection, Meter Data Acquisition System (M-DAS) and Energy Audit are operational.
- ✓ As per the guidelines, Part-A, IT System is operational in 15 nos. towns and 8 nos. towns have been declared “Go Live”.
- ✓ Facilities like on line payment, bill information through sms has already been extended to all the consumers of R-APDRP Project Areas, except Gandhigram Town, which is pending due to un-availability of 2 mbps MPLS Link from BSNL, Tripura.
- ✓ For implementation of Part-B, the supply of requisite material is almost complete and erection/ implementation work has already been started in all project areas.
- ✓ A Common Data Centre has been operationalized at Guwahati with an establishment of Common Disaster Recovery Centre at Agartala, which is in progress.



- ✓ Installation of 2,759 no. of DT meters of 63 kVA DT has been done under 11<sup>th</sup> Plan R-APDRP.
- ✓ 299 no's DT & MS feeder have been metered under R-APDRP for establishing base line AT&C losses of 16 no. of Project Areas.

Further, under new IPDS scheme, the state has proposed to invest **Rs. 510.42 crores** by the end of FY 2019. The DPR has been prepared for 20 Towns, namely Agartala, Sonamura, Khowai, Teliamura, Amarpur, Udaipur, Belonia, Ranirbazar, Kumarghat, Kailashahar, Dharamnagar, Bishalgarh, , Santirbazar, Melagarh, Jirania, Mohanpur, Panisagar, Ambassa, Kamalpur and Sabroom, which were not covered earlier under R-APDRP project areas. The new IPDS Scheme aims to cover works like feeder separation, strengthening of sub-transmission and distribution system, laying of underground cable - A.B. cables for smooth power supply and proper metering along with targeted works for reducing AT &C loss and enabling 24x7 hrs. Quality power supply up to the consumer end.

**Table 24: Work proposed Under IPDS scheme**

S. N.	Item	Unit	Quantity	Rs Cr.
1	33/11 kV new S/s	No.	09	45
2	33 kV new feeders / bi-furcation of feeders	KM	95	25.70
3	11 kV Line / bi-furcation of feeders	KM	189	14.25
4	11 kV line augmentation/ reconductoring	KM	488	17.55
5	AB cable	KM	260	25.65
6	UG cable	KM	382	91.95
7	DT installation	No.	847	41.67
8	LT s/s capacity enhancement	No	39	1.47
9	LT Line : New feeder/ feeder bi-furcation	KM	160	16.70
10	LT Line : Augmentation/ Reconductoring	KM	592	45.70

S. N.	Item	Unit	Quantity	Rs Cr.
11	HVDS	No.	205	11.28
12	Metering	No.	3,50,749	173.27
13	Provisioning of Solar Panel	Lot.	31	0.22
<b>Grand Total</b>				<b>510.42</b>

However, out of Rs 510.42 crores, state received only a sanction of Rs 73.14 crores towards works proposed under IPDS scheme which leaves 437.27 crores as uncovered gap.

Such investment in IPDS scheme would lead to following benefits in the state power sector:

- ✓ Accurate & reliable energy accounting on sustainable basis.
- ✓ Better accountability at all levels.
- ✓ Improve the reliability of power supply.
- ✓ 24x7 power supply in urban areas.
- ✓ Would lead to achieve the time-bound defined AT&C loss trajectory.
- ✓ Better network planning will provide effective and prompt solutions of consumer grievances.

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

Government of India launched "Deendayal Upadhyaya Gram Jyoti Yojana" (DDUGJY) on 3<sup>rd</sup> December, 2014 for:

- (a) Separation of agriculture and non-agriculture feeders facilitating judicious restoring of supply to agricultural & non-agriculture consumers in the rural areas; and
- (b) Strengthening and augmentation of sub-transmission and distribution infrastructure in rural areas, including

metering of distribution transformers/feeders/consumers.

- (c) 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.

In Tripura, almost all the four RGGVY works have been completed with electrification of 144 no. of un-electrified villages, 652 no. of partially electrified villages and 1,06,329 BPL Households. Under the same scheme, 871.92 KM HT lines, 1879.54 KM LT lines and 1825 no. of distribution transformers have been installed in the state. Apart from this 02 no.'s of 66/11 kV sub-stations & 06 no.'s of 33/11 kV sub-stations have been commissioned with laying of 102.50 km 33 kV line. The total expenditure of Rs. 168.27 crore has been incurred so far against a sanctioned cost of Rs. 197.28 Cr. under four RGGVY Projects of Tripura.

However, under ongoing RGGVY XII Plan, under which the state has received a sanction of Rs. 316.23 crores, following

asset addition has been proposed in order to electrify 75,828 rural households

**Table 25: Infrastructure-S/S & DT addition for Electrification under RGGVY XII Plan**

District	33/11 kV S/s Capacity (MVA)	DT (No's)
North Tripura	26.3	487
Unokoti	6.3	289
Dhalai	16.6	659
Gomati	6.3	382
Khowai	12.6	413
West Tripura	22.60	271
<b>Total</b>	<b>90.7</b>	<b>2501</b>

Under DDUGJY scheme, State has planned to cover 1,37,882 rural households with an expected outlay of Rs 903.01 crores which shall cover the following aspects:

- Conversion of LT lines into AB cables, including re-conductoring of LT overhead line
- Strengthening and augmentation of sub-transmission & distribution infrastructure in rural areas, including metering of distribution transformers /feeders/consumers.

The proposed works under DDUGJY scheme has been listed as below:

**Table 26: Work proposed Under DDUGJY scheme**

S. N.	Particular	Quantity
<b>Coverage</b>		
1	Villages (No.)	26
2	Habitations/ Hamlet (No.)	669
3	Rural Households (No.)	1,37,882
<b>Strengthening of Sub-Transmission and Distribution Network</b>		
<b>Sr.</b>	<b>Project Item</b>	<b>Cost (Rs. Cr.)</b>
1	HT (11 KV) Line	108.62
2	LT AB Cable	70.57
3	LT Over Head Line	65.45
4	Distribution Transformer	43.72
5	BPL Service Connection	11.05

S. N.	Particular	Quantity
6	Capacity Augmentation of DTR	107.68
7	LT Line Augmentation by AB Cable	178.39
8	LT Line Augmentation by Over Head Line	79.55
9	11 KV Line Augmentation	109.00
10	33 KV Line Augmentation	13.59
11	Renovation of DTR S/Stn. Earthing	2.51
12	New 33/11 KV Sub-stn.	33.27
13	New 33 KV Line	11.78
14	Existing 33/11 KV Sub-Stn. Augmentation	8.85
15	33 KV Bay	5.45
16	11 KV Bay	0.52
17	New 11 KV Feeder	16.43
18	DTR Metering	8.18
19	LT Metering	28.41
	<b>GRAND TOTAL OF DDUGJY</b>	<b>903.02</b>

However, out of Rs 903.01 crores the state has received only sanction of Rs 74.12 crores towards system strengthening under DDUGJY scheme which leaves 828.89 crores as uncovered gap.

### ASSESSMENT OF ADEQUACY OF DISTRIBUTION SYSTEM

#### AT 33/11 LEVEL

The total transformation capacity available to meet the existing demand at 11 kV and LT level is 545 MVA (=135 MVA by 132/11kV +125.8 MVA by 66/11kV + 284 MVA by 33/11kV step-down transformers), which is adequate to meet the existing demand.

Though, computation affirms the adequacy of existing distribution network in the state. But in actual, distribution network is not enough adequate to provide reliable & quality supply. It is serving only the purpose of connectivity. Some of the 11 kV line feeder has distances more than 150 Km in place of standard line length about 25 Km. Also the condition of electrical network in the state is very poor and not up to mark

in order to provide quality & reliable power supply.

The transformation capacity at 33/11 kV level is projected to grow from 284.20 MVA in FY 2015 to ~925 MVA by FY 18-19. Similarly, DT capacity is projected to grow from 993 MVA in FY 14-15 up to order of 1,200 MVA by FY 18-19.

This network in-adequacy has been trying to be addressed by the implementation of major cap-ex works e.g. NERPSIP and Rural & Urban area distribution infra. Development works.

Through these works, the state has planned to add approx. 162 MVA capacity of distribution transformers to meet the demand at DT level. This will be adequate to meet the projected peak demand of 384 MW in FY 2018-19, considering power factor of 0.9 and diversity factor of 1.2.

### IT INITIATIVES TAKEN BY TSECL

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

- TSECL has implemented 98% computerized billing of its consumers.
- Centralized IT enabled MBC (metering, billing & collection), Online Payment Facility & Consumer Grievance Redressal Management established in 24 Electrical Sub-division under R-APDRP.
- To enable IT based MBC in remaining 55 Electrical sub-divisions.
- Introduction of Smart Energy meters in the State to reduce commercial & administrative losses.
- ERP Implementation.

- (f) SCADA/ DMS project in West Tripura District has been implemented under R-APDRP 10<sup>th</sup> Plan.
- (g) MoP has selected Electrical division No. 1 of Agartala Town to implement pilot Smart Grid Project, having 46,071 consumers. The project area is already covered under R-APDRP scheme for IT implementation & system strengthening. Peak load management of residential & industrial consumers has been proposed through automated metering infrastructure under this pilot project.

#### OTHER INITIATIVES

In Tripura, following initiatives has been planned in order to improve service quality standards:

- ✓ Conversion of existing overhead lines (11 kV & LT) in to underground line by XLPE insulated power cables within “all District HQ, Block HQ and all Urban areas” in order to ensure quality and reliable power supply
- ✓ Renovation & augmentation of distribution network in Rural & Urban Area.

#### **DISTRIBUTION PROJECTS** **FUND REQUIREMENT**

At present, in state Tripura, there is a requirement of massive capital expenditure in order to roll out the 24X7 quality and reliable power supply, which needs implementation of specific and additional

works like conversion of existing overhead lines (11 kV & LT) in to underground line by XLPE insulated power cables and Smart Energy meters.

For implementation of these two works, state has proposed to fund these projects through the external aided funding mode.

Implementation of UG cable & smart metering scheme through external aided funding mode will itself curtail the expenditure of IPDS and DDUGJY up to some extent, since some of the prevalent works of DDUGJY and IPDS will already be covered under UG cable & smart metering scheme.

A brief comparison of initial estimation of IPDS and DDUGJY and cost reduction after implementation of UG cable & smart metering scheme has been given as per below table 27:

**Table 27: Electrification scheme comparative Fund statement (in Rs Crores)**

Scheme	Initial Estimated Cost	Revised Fund Requirement after implementation of Smart Metering & UG Cable Scheme
IPDS	510.42	125.34
DDUGJY	903.02	866.43
12th Plan RGGVY	316.22	316.22
<b>Total</b>	<b>1729.66</b>	<b>1307.99</b>

From above table, it is evident that Rs. 421.67 Crores worth works pertains to IPDS/ DDUGJY will be covered through the implementation of UG cable & smart metering scheme, which is already proposed through external aided funding.

**Table 28: Fund Requirement for Distribution Projects (in Rs Crores)**

Sl.	Name of work	Fund Requirement (in Rs Crores)				
		FY 16	FY 17	FY 18	FY 19	Total
	<b>Distribution</b>					
<b>i)</b>	<b>PROPOSED UNDER WORLD BANK FUNDING</b>	<b>56.45</b>	<b>225.82</b>	<b>197.59</b>	<b>84.68</b>	<b>564.55</b>
<b>a</b>	<i>33 KV New Line (770 CKM)</i>	<i>20.88</i>	<i>83.53</i>	<i>73.09</i>	<i>31.33</i>	<i>208.83</i>
<b>b</b>	<i>33 KV Line Re-conductoring (326 CKM)</i>	<i>4.50</i>	<i>17.98</i>	<i>15.74</i>	<i>6.74</i>	<i>44.96</i>
<b>c</b>	<i>33 KV New Line Bays (27 No.)</i>	<i>1.32</i>	<i>5.28</i>	<i>4.62</i>	<i>1.98</i>	<i>13.21</i>
<b>d</b>	<i>34 No. 33 KV New sub-station (360 MVA)</i>	<i>20.70</i>	<i>82.80</i>	<i>72.45</i>	<i>31.05</i>	<i>207.00</i>
<b>e</b>	<i>13 No. 33 KV sub-station augmentation (360 MVA)</i>	<i>9.06</i>	<i>36.22</i>	<i>31.69</i>	<i>13.58</i>	<i>90.55</i>
<b>ii)</b>	Conversion of existing overhead lines (11 KV & LT) in to underground line by XLPE insulated power cables within all district HQ, Sub-division and block HQ, all urban/semi urban areas in order to ensure quality and reliable power supply. <b>[Proposal under External Aided Funding]</b>	-	214.54	343.27	300.36	858.17
<b>iii)</b>	Introduction of Smart Energy Metering System in the state of Tripura. <b>[Proposal under External Aided Funding]</b>	-	211.00	233.00	192.76	636.76
<b>iv)</b>	Augmentation of administrative Infrastructure of TSECL	-	0.00	25.00	25.00	50.00
<b>v)</b>	ERP implementation	-	0.00	5.00	10.00	15.00
<b>vi)</b>	IT enabling MBC & MDAS for balance consumers other than R-APDRP Town & Sub-station protection system renovation & upgradation (sanctioned)	3.11	15.53	17.42	20.00	56.05
<b>viii)</b>	<b>RURAL &amp; Urban Area Distribution infra. Development (IPDS+ DDUGJY)</b>	<b>46.42</b>	<b>232.11</b>	<b>185.69</b>	<b>0.00</b>	<b>464.21</b>
<b>a)</b>	<i>IPDS (originally estimated: Rs. 510.42 Cr.)</i>	<i>7.39</i>	<i>36.94</i>	<i>29.55</i>	<i>0.00</i>	<i>73.87</i>
<b>b)</b>	<i>DDUGJY (originally estimated: Rs. 903.02 Cr.)</i>	<i>7.41</i>	<i>37.06</i>	<i>29.65</i>	<i>0.00</i>	<i>74.12</i>
<b>c)</b>	<i>12th Plan RGGVY (RE DDUGJY) (originally estimated: Rs. 316.22 Cr.)</i>	<i>31.62</i>	<i>158.11</i>	<i>126.49</i>	<i>0.00</i>	<i>316.22</i>
<b>x)</b>	<b>Additional funding required for tie up</b>	<b>84.38</b>	<b>421.89</b>	<b>337.51</b>	<b>0.00</b>	<b>843.78</b>
	<b>Total Distribution sector Fund requirement (Rs. Crores.)</b>	<b>190.36</b>	<b>1320.88</b>	<b>1344.48</b>	<b>632.80</b>	<b>3488.52</b>

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

- ✓ State will ensure the timely and phase wise execution and implementation of distribution infrastructure as per submitted plan.

### **GOVERNMENT OF INDIA INTERVENTION**

- ✓ State requires funding support to implement full-fledged electrification works as per the proposed work submission in the respective DPR's of IPDS and DDUGJY. However, a part of fund has already been sanctioned by Central Government against these electrification schemes. Still state is facing a fund crunch to execute these electrification schemes and needs remaining un-sanctioned financial support from GoI to achieve objective of 24X7 power supply in the state.
- ✓ Support for fund sanction through External aided funding for implementation of smart metering project and conversion of overhead to UG cabling.
- ✓ Required Funding support for implementing ERP and IT enabled MBC works.

## CHAPTER 8: RENEWABLE ENERGY INITIATIVES

### RPO STATUS IN TRIPURA STATE

#### RENEWABLE PURCHASE OBLIGATION – CURRENT STATUS

The RPO Compliance of Tripura has been reviewed as per recently notified TERC Renewable Energy Regulations (Multi Year Tariff), 2015. The RPO Compliance Status up to FY 18-19 has been presented as below:

**Table 29: Existing and projected status of state RPO**

Particulars	FY 15	FY 16	FY 17	FY 18	FY 19
Yearly Consumption (MU)	786	869	992	1,141	1,265
Yearly RPO mandate (%)	2.0%	11.0%	12.0%	13.0%	14.0%
Yearly Solar RPO mandate (%)	0.1%	5.0%	6.0%	7.0%	8.0%
Corresponding Total RPO (Solar+ Non-Solar) quantum (MU)	16	96	119	148	177
Corresponding Solar RPO quantum (MU)	0.02	4.78	7.14	10.39	14.17
Non-solar RPO quantum (MU)	15.71	90.76	111.87	137.98	162.99
<b>Actual yearly Renewable purchase (MU)</b>	<b>36.98</b>	<b>36.98</b>	<b>36.98</b>	<b>36.98</b>	<b>36.98</b>
<i>Solar</i>	<i>0.000</i>	<i>0.000</i>	<i>0.000</i>	<i>0.000</i>	<i>0.000</i>
<i>Non-Solar</i>	<i>36.982</i>	<i>36.98</i>	<i>36.98</i>	<i>36.98</i>	<i>36.98</i>
<b>(Shortfall)/ surplus RPO (MU)</b>					
<i>Solar : (shortfall)</i>	<i>(0.02)</i>	<i>(4.78)</i>	<i>(7.14)</i>	<i>(10.39)</i>	<i>(14.17)</i>
<i>Non-Solar : (Shortfall)/surplus</i>	<i>21.27</i>	<i>(53.78)</i>	<i>(74.89)</i>	<i>(101.00)</i>	<i>(126.00)</i>
Cumulative Solar RPO remained unmet (MU)	0.055	4.83	11.97	22.36	36.53
<b>Required MW capacity of Solar @15% CUF</b>	<b>0.042</b>	<b>3.68</b>	<b>9.11</b>	<b>17.02</b>	<b>27.80</b>

As per above table, state has planned to install 28 MW solar (grid/ off-grid) power Generating projects within the state in order to achieve its renewable power obligation up to FY 18-19 with the projected capacity addition as per below table:

**Table 30: Year wise solar capacity addition (in MW)**

Particulars	FY 16	FY 17	FY 18	FY 19	Total Capacity
Proposed Solar capacity addition (MW)	0	4	12	12	28

#### SOLAR ROOFTOP TARGET FOR STATE

As per D.O. No. 03/132015-16/GCRT of MNRE, the Government of India has set the year wise targets for installation of Grid Connected Solar Roof Top System for each State as part of installing 40 GW Grid Connected Solar Roof Top system in the country by 2022. In same continuation, Tripura needs to install 21 MW of grid connected Solar Roof Top capacity by the end of FY 2018-19. The year wise mandated targets has been tabulated below:



**Table 31: Solar Roof Top Installation Targets<sup>4</sup> for Tripura (in MW)**

Particulars	FY 16	FY 17	FY 18	FY 19	Total Capacity
Solar Roof Top installation targets (MW)	1	6	6	8	21

Apart of this approximately 10% of IPDS sanctioned fund will be utilized for installation of solar rooftop project.

#### FUND REQUIREMENT

For the installation of proposed 28 MW solar capacity addition by the end of FY 18-19, TSECL requires fund requirement as per below table:

**Table 32: Year wise fund requirement for solar capacity addition (in Rs. Crores)**

Particulars	FY 16	FY 17	FY 18	FY 19	Total
Proposed fund requirement (Rs. Cr.)	0	20	60	60	140

State is in the process of identifying land as well as financial closure is yet to be achieved for the installation of these proposed solar power projects. Hence, fund requirement may be changed later wards.

#### ACTION PLAN FOR STATE

State needs to identify and acquire timely land and achieve financial closure in order to implement proposed solar power projects in the state.

However, the newly formed Tripura Power Generation Company (TPGL) has been making every possible effort to expedite these projects.

#### GOVERNMENT OF INDIA INTERVENTION

Since, the funding is yet to tie up for executing these solar projects, hence state requires the funding assistance from Government of India in order to add the solar based generation capacity in the state. Besides that the technical assistance from state and centre renewable energy departments is also desired in order to execute these capital intensive projects and timely successfully.

State also look forward assistance from central government in order to get External Aid Funding for implementing renewable (solar) projects in the state.

Since TERC is in the process of notification of net metering regulations and state solar policy. Notification of these will promote investment in grid interactive solar roof top projects. Hence, intervention of state Regulator is envisaged in order to provide renewable policy level support.

<sup>4</sup>Source: MNRE

## CHAPTER 9: ENERGY CONSERVATION AND ENERGY EFFICIENCY PROGRAM

### ACHIEVEMENTS IN ENERGY EFFICIENCY MEASURES

TSECL has been implementing the energy efficiency measures in various formats. The prompt activities has been listed as below:

- 1) **Demonstration Projects:** TSECL has successfully completed the following demonstration projects under the umbrella of BEE.
  - ✓ DPR preparation for Energy Efficient LED Street Lighting Project in 18 Nagar Panchayat Area has already been taken up. Further steps are being taken for coverage of all municipal councils & Nagar Panchayat Areas for total LED Street Lighting on revolving fund basis.
  - ✓ Energy Audit in 6 nos. of Government Buildings.-
    - (a) TSECL Corporate Office Building.
    - (b) TERC Office Building
    - (c) IG, BSF H.Q. Building
    - (d) DIG, CRPF Building
    - (e) Police H.Q. CID Building
    - (f) NIT, Agartala Building
  - ✓ Demo Street Lighting (CFL) at Engineering College Chowmohani, Jirania
  - ✓ Installation of 120 watt LED Street Lights in 4 nos. of NPs/ MCs area namely Jirania, Mohanpur, Panisagar & Melaghar on Pilot basis under supervision of TSECL (SDA Tripura). At present, except Melaghar, all installation of LED Street Lights has achieved.

- ✓ 120 Watt Street Light for remaining 16 nos. of NPs / MCs as Demonstration Project. The work of the project has initiated and material supply is in process.
- 2) **LED village campaign:** 2500 nos. of 7 watt LED Bulbs & 120 nos. of 18 watt LED Street Lights are going to be distributed in 8 villages in Tripura suggested by concerned District Magistrate.
  - 3) **Workshop/ Training Programme:** In the State, workshops as well as seminars on Energy Conservation has been conducted to create awareness through Indian Building Congress, Agartala.
  - 4) **Impact assessment study of Energy Conservation Activities:** The proper Energy Conservation impact analysis in various consumer categories has been planned.
  - 5) **Awareness of Energy Conservation:** The different ways of awareness has been adopted like, through leaflet distribution as well as awareness through hoarding installation.
  - 6) **Through student capacity building Programme:** Capacity building programs has been organised time to time to teach energy efficiency and awareness to school children.

As per the MoU signed between EESL & Agartala Municipal Corporation, total 34200 CFL/ LED fixtures has been installed successfully in the Agartala Municipal Area, which ultimately results an yearly savings of 3.220 MU as well as ~Rs. 1.90 Cr.

In near future, the LED street lighting project is further to be planned in Udaipur,

Belonia, Khowai, and Dharmanagar Municipal Corporations in co-operation of EESL.

The list of LED DEMO Projects undertaken by SDA Tripura / TSECL in the State has been provided with their work status has been provided in Annexure- 5.

#### DSM ACTION PLAN

To implement the DSM Program successfully in the state, BEE has completed the load research and consumer survey and detail report has already been submitted to the State.

Further a complete DSM Action Plan is being prepared by EESL with required training programs for utility Officers. Already training sessions has been conducted in Agartala, while next phase of training is planned to begin from April-2016 onwards.

The state is also in the process of implementation of DELP scheme, as part of DSM initiative as EESL is preparing the DSM Action Plan for the state.

## CHAPTER 10: FINANCIAL VIABILITY OF DISTRIBUTION COMPANY

### FINANCIAL POSITION OF DISTRIBUTION UTILITIES

The state is showing net loss of Rs 60 crore as per provisional financial accounts of FY 2014-15, which is ~8% of their revenue booked for the FY 2014-15. The following table shows key items under P&L account for FY 2014-15:

**Table 33: Profit and loss Statement for FY 2014-15 (Rs Crores)**

Particulars	FY 2014-15
<b>Sales Turnover</b>	706
<b>Other Income</b>	28
<b>Total Income</b>	<b>734</b>
<b>Expenditure</b>	
<b>Fuel cost</b>	217
<b>Power and transmission charges</b>	344
<b>Employee Cost</b>	112
<b>R&amp;M cost</b>	21
<b>A&amp;G</b>	13
<b>Total Expenses</b>	<b>745</b>
<b>PBDIT</b>	-11
<b>Finance costs</b>	0.07
<b>PBDT</b>	-11
<b>Depreciation</b>	49
<b>Profit Before Tax</b>	<b>-60</b>

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

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

The following scenarios have been detailed in subsequent sections:

- At targeted growth rate as per “24x7 Power for All” Road Map (Base case).
- At targeted growth rate as per “24x7 Power for All” along with Financial Turnaround by FY 19.
- At targeted growth rate as per “24x7 Power for All” Road Map with funding of proposed investments in distribution cap-ex through State funds and financial institutions in debt-equity ratio of 70:30.
- Financial performance at higher AT&C losses

### COMMON ASSUMPTIONS

- ✓ Any change in the power purchase cost will be taken care by the Fuel and Power Purchase Cost Adjustment mechanism.
- ✓ Rate of sale of surplus power considered at the average rate of power purchase.
- ✓ Escalation towards employee cost has been considered at 10% based on increase observed in CPI for FY 2014-15 and for A&G expenses 6% has been considered based on WPI inflation index for the FY 2014-15. In the FY 2016-17 escalation in employee expense has been considered at 18% to factor in the impact of 7<sup>th</sup> pay commission.
- ✓ R&M cost has been computed in proportion to the available yearly net GFA.
- ✓ Asset Additions has been considered as 50% in same year of capital expenditure and balance in the next year. Interest is

calculated on assets capitalized only and no IDC has been considered.

- ✓ Interest computations has been done as per the existing loan profile at 2.44% and addition of new loans at 12%.
- ✓ Interest on working capital and cash deficit loan at 14%.
- ✓ Category-wise average billing rate (without subsidy) for computation of revenue for FY 2015-16 and onwards has been taken as per the tariff hike provided.
- ✓ Nil yearly revenue subsidy from state government has been considered.
- ✓ Transmission charges has been escalated in proportion to the increase in power purchase quantum and allocation.
- ✓ Depreciation has been computed at the actual average depreciation rate 3% of FY 2014-15 for existing assets and 5.28% for new assets.
- ✓ Non-tariff Income has been projected to increase at 5% annually.
- ✓ The average cost of supply has been computed after deducting non-tariff income from the expenses.
- ✓ Grant, Loan and equity ratio has been considered based on the guidelines of centrally sponsored schemes (**except scenario 4 where no grant has been considered against IPDS and DDUGJY**). Further, additional grant of 5% has been considered as per the terms and conditions in IPDS and DDUGJY.
- ✓ The capital expenditure pertaining to energy efficiency measures has not been considered as either these schemes are primarily funded through grant or have short payback period, thus having negligible impact on the financials of the distribution company.
- ✓ The Average Cost of Supply (ACS) has been computed by dividing the total expenditure (including purchase of surplus power) by total sale of power within the State.
- ✓ Similarly, O&M cost per unit and interest cost per unit has been calculated by dividing their respective cost by sale of power within the State.
- ✓ Sale of surplus power has been considered at the average rate of purchase of power including fuel cost.
- ✓ Funding shortfall under DDUGJY & IPDS has been considered to be funded through debt equity in ratio of 70:30.

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

### ASSUMPTIONS

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

Table 34: Assumptions for Scenario A

Particulars	Units	31-Mar-16	31-Mar-17	31-Mar-18	31-Mar-19
Energy Demand	MU	1,104	1,239	1,420	1,568
Sales	MU	869	992	1,141	1,265
Power Available	MU	1,988	2,728	2,728	3,137
Surplus power	MU	884	1,489	1,308	1,569
Power purchase rate (including fuel cost)	Rs/kWh	2.89	3.17	3.17	2.86
AT&C losses	%	24.85%	22.35%	20.85%	20.00%
T&D Losses	%	21.31%	19.95%	19.64%	19.30%
Collection Efficiency	%	95.50%	97.00%	98.50%	99.13%

Table 35: Key Parameters under Scenario A

Key Parameters	Units	31-Mar-16	31-Mar-17	31-Mar-18	31-Mar-19
Revenue excluding subsidy	Rs Crores	716	995	1,011	1,106
Total Expense excluding other income	Rs Crores	878	1,257	1,374	1,653
PBT	Rs Crores	-133	-231	-331	-513
ABR	Rs/ kWh	4.09	4.01	4.13	3.90
Rate of sale of surplus power	Rs/ kWh	2.89	3.17	3.17	2.86
ACS	Rs/ kWh	5.01	5.07	5.61	5.83
Interest Cost	Rs Crores	24	68	134	215
O&M cost per unit	Rs/ kWh	1.82	1.90	1.89	1.87
R&M cost per unit	Rs/ kWh	0.25	0.30	0.36	0.36
Employee cost per unit	Rs/ kWh	1.41	1.46	1.40	1.39
A&G cost per unit	Rs/ kWh	0.15	0.14	0.13	0.13
Interest cost per unit	Rs/ kWh	0.28	0.68	1.18	1.70

Table 36: Profit and loss Statement under Scenario A (Rs Crores)

P&L	31-Mar-16	31-Mar-17	31-Mar-18	31-Mar-19
<b>Sales Turnover</b>	<b>461</b>	<b>522</b>	<b>596</b>	<b>658</b>
Net Sales	461	522	596	658
Other Income	29	31	32	34
Revenue from surplus power	256	473	415	448
<b>Total Income</b>	<b>746</b>	<b>1,025</b>	<b>1,043</b>	<b>1,140</b>
<b>Expenditure</b>				
Transmission Charges	38	42	49	54
Fuel Cost	217	217	217	373
Power Cost	410	702	702	702
Employee Cost	123	145	159	175
R&M cost	21	29	41	45
A&G Cost	13	14	15	16
Provision for bad debt	0	0	0	0



P&L	31-Mar-16	31-Mar-17	31-Mar-18	31-Mar-19
<b>Total Expenses</b>	<b>823</b>	<b>1,149</b>	<b>1,183</b>	<b>1,365</b>
<i>PBDIT</i>	<i>-77</i>	<i>-124</i>	<i>-139</i>	<i>-225</i>
<b>Finance costs</b>	<b>24</b>	<b>68</b>	<b>134</b>	<b>215</b>
<i>PBDT</i>	<i>-101</i>	<i>-192</i>	<i>-274</i>	<i>-440</i>
Depreciation	31	40	58	73
<b>Profit Before Tax</b>	<b>-133</b>	<b>-231</b>	<b>-331</b>	<b>-513</b>
<b>Accumulated losses by end of the year</b>	<b>-192</b>	<b>-424</b>	<b>-755</b>	<b>-1,268</b>

Table 37: Cash flow Statement (Rs Crores)

Cash Flow	31-Mar-16	31-Mar-17	31-Mar-18	31-Mar-19
<b>Cash flow arising from Operating Activities</b>	<b>-108</b>	<b>-163</b>	<b>-197</b>	<b>-297</b>
Depreciation and Amortisation expenses	31	40	58	73
<b>Operating profit</b>	<b>-77</b>	<b>-124</b>	<b>-139</b>	<b>-225</b>
<b>Subsidy</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
Increase / (Decrease) in current liability	76	49	5	18
(Increase) in current Asset	-42	-21	-16	-9
<b>Cash Flow from Operation</b>	<b>-43</b>	<b>-96</b>	<b>-150</b>	<b>-216</b>
<b>Cash from Investment Activities</b>				
<b>Capex</b>	<b>-257</b>	<b>-1608</b>	<b>-1776</b>	<b>-1207</b>
<b>Net Cash from Investment Activities</b>	<b>-257</b>	<b>-1608</b>	<b>-1776</b>	<b>-1207</b>
<b>Cash from Financing Activities</b>				
Equity Investments	26	130	104	0
Debt Drawn	64	319	255	0
Loan Repayment	-18	-19	-36	-61
WC loan	-76	-49	-5	-18
Interest cost	-24	-68	-134	-215
Grant	167	1159	1417	1207
<b>Net Cash from Financing Activities</b>	<b>139</b>	<b>1472</b>	<b>1601</b>	<b>913</b>
<b>Net Cash Balances</b>				
Cash BF	51	-110	-341	-667
Cash Flow during the year	-161	-231	-326	-510
Cash	-110	-341	-667	-1177
Cash CF to balance sheet - post deficit loan	0	0	0	0
<b>Cash deficit Loan</b>				
Opening loan	0	110	341	667
Additions	110	341	667	1177
Repayment	0	110	341	667
<b>Closing</b>	<b>110</b>	<b>341</b>	<b>667</b>	<b>1177</b>
Interest in cash deficit loan	8	32	71	129

Based on the above assumptions, it is evident that if TSECL adheres to the PFA Roadmap target and reduction of AT&C losses, the operating losses will increase up to Rs. 513 crore in the FY 19 from Rs 60 Crores in FY 15.

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

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

### ASSUMPTIONS

- ✓ Yearly suitable tariff hike
- ✓ AT&C losses as per targeted trajectory.
- ✓ Cash deficit loan in case of short fall.

Table 38: Assumptions for Scenario B

Particulars	Units	31-Mar-16	31-Mar-17	31-Mar-18	31-Mar-19
Energy Demand	MU	1,104	1,239	1,420	1,568
Sales	MU	869	992	1,141	1,265
Power Available	MU	1,988	2,728	2,728	3,137
Surplus power	MU	884	1,489	1,308	1,569
Power purchase rate (including fuel cost)	Rs/kWh	2.89	3.17	3.17	2.86
AT&C losses	%	24.85%	22.35%	20.85%	20.00%
T&D Losses	%	21.31%	19.95%	19.64%	19.30%
Collection Efficiency	%	95.50%	97.00%	98.50%	99.13%

Table 39: Key Parameters under Scenario B

Key Parameters	Units	31-Mar-16	31-Mar-17	31-Mar-18	31-Mar-19
Revenue excluding subsidy	Rs Crores	716	1,094	1,259	1,557
Total Expense excluding other income	Rs Crores	878	1,252	1,347	1,574
PBT	Rs Crores	-133	-127	-55	17
ABR	Rs/ kWh	4.09	4.41	5.14	5.49
Rate of sale of surplus power	Rs /kWh	2.89	3.17	3.17	2.86
ACS	Rs/ kWh	5.01	5.05	5.50	5.55
Interest Cost	Rs Crores	24	63	106	136
O&M cost per unit	Rs/ kWh	1.82	1.90	1.89	1.87
R&M cost per unit	Rs/ kWh	0.25	0.30	0.36	0.36
Employee cost per unit	Rs/ kWh	1.41	1.46	1.40	1.39
A&G cost per unit	Rs/ kWh	0.15	0.14	0.13	0.13
Interest cost per unit	Rs/ kWh	0.28	0.63	0.93	1.08

Table 40: Profit and loss Statement under Scenario B (Rs Crores)

P&L	31-Mar-16	31-Mar-17	31-Mar-18	31-Mar-19
<b>Sales Turnover</b>	<b>461</b>	<b>621</b>	<b>844</b>	<b>1,109</b>
Net Sales	461	621	844	1,109
Other Income	29	31	32	34
Revenue from surplus power	256	473	415	448
<b>Total Income</b>	<b>746</b>	<b>1,125</b>	<b>1,291</b>	<b>1,591</b>
<b>Expenditure</b>				
Transmission Charges	38	42	49	54
Fuel Cost	217	217	217	373
Power Cost	410	702	702	702
Employee Cost	123	145	159	175
R&M cost	21	29	41	45
A&G Cost	13	14	15	16
Provision for bad debt	0	0	0	0

P&L	31-Mar-16	31-Mar-17	31-Mar-18	31-Mar-19
<b>Total Expenses</b>	<b>823</b>	<b>1,149</b>	<b>1,183</b>	<b>1,365</b>
<i>PBDIT</i>	-77	-24	109	226
<b>Finance costs</b>	24	63	106	136
<i>PBDT</i>	-101	-87	2	90
Depreciation	31	40	58	73
<b>Profit Before Tax</b>	<b>-133</b>	<b>-127</b>	<b>-55</b>	<b>17</b>
<b>Accumulated losses by end of the year</b>	<b>-192</b>	<b>-320</b>	<b>-375</b>	<b>-358</b>

Table 41: Cash flow Statement (Rs Crores)

Cash Flow	31-Mar-16	31-Mar-17	31-Mar-18	31-Mar-19
<b>Cash flow arising from Operating Activities</b>	<b>-108</b>	<b>-64</b>	<b>51</b>	<b>153</b>
Depreciation and Amortisation expenses	31	40	58	73
<b>Operating profit</b>	<b>-77</b>	<b>-24</b>	<b>109</b>	<b>226</b>
<b>Subsidy</b>	0	0	0	0
Increase / (Decrease) in current liability	76	65	30	51
(Increase) in current Asset	-42	-21	-19	-13
<b>Cash Flow from Operation</b>	<b>-43</b>	<b>20</b>	<b>120</b>	<b>265</b>
<b>Cash from Investment Activities</b>				
<b>Capex</b>	<b>-257</b>	<b>-1608</b>	<b>-1776</b>	<b>-1207</b>
<b>Net Cash from Investment Activities</b>	<b>-257</b>	<b>-1608</b>	<b>-1776</b>	<b>-1207</b>
<b>Cash from Financing Activities</b>				
Equity Investments	26	130	104	0
Debt Drawn	64	319	255	0
Loan Repayment	-18	-19	-36	-61
WC loan	-76	-65	-30	-51
Interest cost	-24	-63	-106	-136
Grant	167	1159	1417	1207
<b>Net Cash from Financing Activities</b>	<b>139</b>	<b>1461</b>	<b>1604</b>	<b>959</b>
<b>Net Cash Balances</b>				
Cash BF	51	-110	-237	-290
Cash Flow during the year	-161	-127	-53	16
Cash	-110	-237	-290	-274
Cash CF to balance sheet - post deficit loan	0	0	0	0
<b>Cash deficit Loan</b>				
Opening loan	0	110	237	290
Additions	110	237	290	274
Repayment	0	110	237	290
<b>Closing</b>	<b>110</b>	<b>237</b>	<b>290</b>	<b>274</b>
Interest in cash deficit loan	8	24	37	39

Based on the above assumptions, it is evident that even if Discoms adheres to the target electrification and reduction of losses, average tariff increase of 19% is required in FY 17, FY 18 & FY 19 to progressively reduce the accumulated losses from FY 19 onwards.

**SCENARIO C: AT TARGETED GROWTH RATE AS PER “24X7 POWER FOR ALL” ROAD MAP PLUS FINANCIAL TURNAROUND WITH PROPOSED INVESTMENTS FUNDED THROUGH 70:30 DEBT-EQUITY**

**ASSUMPTIONS**

- ✓ AT&C losses as per the target.
- ✓ Funding of schemes like RGGVY, IPDS, and DDUGJY through loan and equity in 70:30 ratio (except works under external aided funding, state plan and World Bank funding) with no grant from Government of India.
- ✓ Cash deficit loan in case of short fall.

**Table 42: Assumptions for Scenario C**

Particulars	Units	31-Mar-16	31-Mar-17	31-Mar-18	31-Mar-19
Energy Demand	MU	1,119	1,255	1,438	1,588
Sales	MU	869	992	1,141	1,265
Power Available	MU	1,988	2,728	2,728	3,137
Surplus power	MU	869	1,473	1,290	1,549
Power purchase rate (including fuel cost)	Rs/kWh	2.89	3.17	3.17	2.86
AT&C losses	%	25.85%	23.35%	21.85%	21.00%
T&D Losses	%	22.36%	20.98%	20.66%	20.31%
Collection Efficiency	%	95.50%	97.00%	98.50%	99.13%

**Table 43: Key Parameters under Scenario C**

Key Parameters	Units	31-Mar-16	31-Mar-17	31-Mar-18	31-Mar-19
Revenue excluding subsidy	Rs Crores	712	1,089	1,253	1,551
Total Expense excluding other income	Rs Crores	879	1,254	1,350	1,580
PBT	Rs Crores	-138	-134	-65	6
ABR	Rs/ kWh	4.10	4.42	5.15	5.51
Rate of sale of surplus power	Rs /kWh	2.89	3.17	3.17	2.86
ACS	Rs/ kWh	5.06	5.09	5.55	5.61
Interest Cost	Rs Crores	25	64	109	141
O&M cost per unit	Rs/ kWh	1.82	1.90	1.89	1.87
R&M cost per unit	Rs/ kWh	0.25	0.30	0.36	0.36
Employee cost per unit	Rs/ kWh	1.41	1.46	1.40	1.39
A&G cost per unit	Rs/ kWh	0.15	0.14	0.13	0.13
Interest cost per unit	Rs/ kWh	0.28	0.65	0.96	1.11

**Table 44: Profit and loss Statement under Scenario C (Rs Crores)**

P&L	31-Mar-16	31-Mar-17	31-Mar-18	31-Mar-19
<b>Sales Turnover</b>	<b>461</b>	<b>621</b>	<b>844</b>	<b>1,109</b>
Net Sales	461	621	844	1,109
Other Income	29	31	32	34
Revenue from surplus power	251	467	409	442
<b>Total Income</b>	<b>741</b>	<b>1,120</b>	<b>1,285</b>	<b>1,585</b>
<b>Expenditure</b>				
Transmission Charges	38	43	49	54
Fuel Cost	217	217	217	373
Power Cost	410	702	702	702
Employee Cost	123	145	159	175
R&M cost	21	29	42	45
A&G Cost	13	14	15	16

P&L	31-Mar-16	31-Mar-17	31-Mar-18	31-Mar-19
Provision for bad debt	0	0	0	0
<b>Total Expenses</b>	<b>823</b>	<b>1,150</b>	<b>1,183</b>	<b>1,366</b>
<i>PBDIT</i>	<i>-82</i>	<i>-30</i>	<i>102</i>	<i>220</i>
<b>Finance costs</b>	<b>25</b>	<b>64</b>	<b>109</b>	<b>141</b>
<i>PBDT</i>	<i>-106</i>	<i>-94</i>	<i>-7</i>	<i>79</i>
Depreciation	32	40	58	73
<b>Profit Before Tax</b>	<b>-138</b>	<b>-134</b>	<b>-65</b>	<b>6</b>
<b>Accumulated losses by end of the year</b>	<b>-198</b>	<b>-332</b>	<b>-397</b>	<b>-391</b>

Table 45: Cash flow Statement (Rs Crores)

Cash Flow	31-Mar-16	31-Mar-17	31-Mar-18	31-Mar-19
<b>Cash flow arising from Operating Activities</b>	<b>-113</b>	<b>-70</b>	<b>44</b>	<b>147</b>
Depreciation and Amortisation expenses	32	40	58	73
<b>Operating profit</b>	<b>-82</b>	<b>-30</b>	<b>102</b>	<b>220</b>
<b>Subsidy</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
Increase / (Decrease) in current liability	76	65	29	51
(Increase) in current Asset	-42	-21	-19	-13
<b>Cash Flow from Operation</b>	<b>-48</b>	<b>14</b>	<b>113</b>	<b>258</b>
<b>Cash from Investment Activities</b>				
<b>Capex</b>	<b>-257</b>	<b>-1608</b>	<b>-1776</b>	<b>-1207</b>
<b>Net Cash from Investment Activities</b>	<b>-257</b>	<b>-1608</b>	<b>-1776</b>	<b>-1207</b>
<b>Cash from Financing Activities</b>				
Equity Investments	26	130	104	0
Debt Drawn	64	322	258	0
Loan Repayment	-18	-19	-37	-62
WC loan	-76	-65	-29	-51
Interest cost	-25	-64	-109	-141
Grant	167	1155	1414	1207
<b>Net Cash from Financing Activities</b>	<b>139</b>	<b>1459</b>	<b>1601</b>	<b>953</b>
<b>Net Cash Balances</b>				
Cash BF	51	-115	-249	-312
Cash Flow during the year	-166	-134	-62	5
Cash	-115	-249	-312	-307
Cash CF to balance sheet - post deficit loan	0	0	0	0
<b>Cash deficit Loan</b>				
Opening loan	0	115	249	312
Additions	115	249	312	307
Repayment	0	115	249	312
<b>Closing</b>	<b>115</b>	<b>249</b>	<b>312</b>	<b>307</b>
Interest in cash deficit loan	8	26	39	43

Based on the above assumptions, it is evident that if state adheres to the target electrification and reduction of losses, and funds the proposed capital expenditure for electrification under RGGVY, IPDS and DDUGJY through combination of State Government equity and loans from FI/Multilateral/Bilateral agencies in the ratio of debt-equity 70:30, it has to still depended on the tariff hike to the tune of 19% each in FY 17, FY 18, and FY 19 in order to post positive profit in FY 19.

## SCENARIO D: NON ADHERENCE TO PROJECTED STRINGENT LOSS REDUCTION TRAJECTORY AND SUBSEQUENT DEPENDENCE ON HIGHER TARIFF HIKE

### ASSUMPTIONS

- ✓ 1% higher AT&C Loss than the targeted loss trajectory.
- ✓ Normal proposed funding pattern.
- ✓ Cash deficit loan in case of short fall.
- ✓ Yearly suitable tariff hike.

Table 46: Assumptions for Scenario D

Particulars	Units	31-Mar-16	31-Mar-17	31-Mar-18	31-Mar-19
Energy Demand	MU	1,104	1,239	1,420	1,568
Sales	MU	869	992	1,141	1,265
Power Available	MU	1,988	2,728	2,728	3,137
Surplus power	MU	884	1,489	1,308	1,569
Power purchase rate (including fuel cost)	Rs/kWh	2.89	3.17	3.17	2.86
AT&C losses	%	24.85%	22.35%	20.85%	20.00%
T&D Losses	%	21.31%	19.95%	19.64%	19.30%
Collection Efficiency	%	95.50%	97.00%	98.50%	99.13%

Table 47: Key Parameters under Scenario D

Key Parameters	Units	31-Mar-16	31-Mar-17	31-Mar-18	31-Mar-19
Revenue excluding subsidy	Rs Crores	716	1,104	1,287	1,614
Total Expense excluding other income	Rs Crores	881	1,268	1,391	1,638
PBT	Rs Crores	-135	-133	-71	10
ABR	Rs/ kWh	4.09	4.45	5.26	5.69
Rate of sale of surplus power	Rs /kWh	2.89	3.17	3.17	2.86
ACS	Rs/ kWh	5.02	5.11	5.68	5.78
Interest Cost	Rs Crores	25	70	127	168
O&M cost per unit	Rs/ kWh	1.82	1.95	1.99	1.97
R&M cost per unit	Rs/ kWh	0.26	0.35	0.46	0.46
Employee cost per unit	Rs/ kWh	1.41	1.46	1.40	1.39
A&G cost per unit	Rs/ kWh	0.15	0.14	0.13	0.13
Interest cost per unit	Rs/ kWh	0.29	0.71	1.11	1.33

A2:

Table 48: Profit and loss Statement under Scenario D (Rs Crores)

P&L	31-Mar-16	31-Mar-17	31-Mar-18	31-Mar-19
<b>Sales Turnover</b>	<b>461</b>	<b>632</b>	<b>872</b>	<b>1,166</b>
Net Sales	461	632	872	1,166
Other Income	29	31	32	34
Revenue from surplus power	256	473	415	448
<b>Total Income</b>	<b>746</b>	<b>1,135</b>	<b>1,320</b>	<b>1,648</b>
<b>Expenditure</b>				
Transmission Charges	38	42	49	54
Fuel Cost	217	217	217	373
Power Cost	410	702	702	702
Employee Cost	123	145	159	175



P&L	31-Mar-16	31-Mar-17	31-Mar-18	31-Mar-19
R&M cost	22	34	52	58
A&G Cost	13	14	15	16
Provision for bad debt	0	0	0	0
<b>Total Expenses</b>	<b>823</b>	<b>1,154</b>	<b>1,193</b>	<b>1,378</b>
PBDIT	-78	-19	126	270
<b>Finance costs</b>	<b>25</b>	<b>70</b>	<b>127</b>	<b>168</b>
PBDT	-103	-89	-1	102
Depreciation	32	44	70	92
<b>Profit Before Tax</b>	<b>-135</b>	<b>-133</b>	<b>-71</b>	<b>10</b>
<b>Accumulated losses by end of the year</b>	<b>-195</b>	<b>-328</b>	<b>-399</b>	<b>-389</b>

Table 49: Cash flow Statement (Rs Crores)

Cash Flow	31-Mar-16	31-Mar-17	31-Mar-18	31-Mar-19
<b>Cash flow arising from Operating Activities</b>	<b>-110</b>	<b>-63</b>	<b>56</b>	<b>178</b>
Depreciation and Amortisation expenses	32	44	70	92
<b>Operating profit</b>	<b>-78</b>	<b>-19</b>	<b>126</b>	<b>270</b>
<b>Subsidy</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
Increase / (Decrease) in current liability	76	67	33	56
(Increase) in current Asset	-42	-21	-19	-13
<b>Cash Flow from Operation</b>	<b>-44</b>	<b>28</b>	<b>140</b>	<b>313</b>
<b>Cash from Investment Activities</b>				
<b>Capex</b>	<b>-257</b>	<b>-1608</b>	<b>-1776</b>	<b>-1207</b>
<b>Net Cash from Investment Activities</b>	<b>-257</b>	<b>-1608</b>	<b>-1776</b>	<b>-1207</b>
<b>Cash from Financing Activities</b>				
Equity Investments	39	196	157	0
Debt Drawn	92	458	366	0
Loan Repayment	-18	-21	-46	-82
WC loan	-76	-67	-33	-56
Interest cost	-25	-70	-127	-168
Grant	126	954	1253	1207
<b>Net Cash from Financing Activities</b>	<b>138</b>	<b>1450</b>	<b>1570</b>	<b>900</b>
<b>Net Cash Balances</b>				
Cash BF	51	-112	-242	-308
Cash Flow during the year	-163	-130	-66	6
Cash	-112	-242	-308	-301
Cash CF to balance sheet - post deficit loan	0	0	0	0
<b>Cash deficit Loan</b>				
Opening loan	0	112	242	308
Additions	112	242	308	301
Repayment	0	112	242	308
<b>Closing</b>	<b>112</b>	<b>242</b>	<b>308</b>	<b>301</b>
Interest in cash deficit loan	8	25	38	43

Based on the above assumptions, it is evident that if TSECL adheres to the target electrification and but fails to adhere to loss reduction trajectory (yearly 1% increase in AT&C Losses from targeted), TSECL has to depend on at least 21% higher yearly tariff hike in each FY 17, FY 18 and in FY 19 in order to achieve nil profit/loss in FY 19.

## 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 headquarter of the TSECL for looking at activities of overall communication strategy.

The financial situation in Tripura 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 Tripura will also be required:

**Table 50: 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 Related Issues</i>	Director, TPGL	Quarterly

Communication Objective	Responsibility	Frequency
Inter-State Transmission Projects <i>Physical Progress, Achievements and Other Related Issues</i>	Director (Projects), PGCIL	Monthly
Intra-State Transmission Projects <i>Physical Progress, Achievements and Other Related Issues</i>	Managing Director, TSECL	Monthly
Distribution <i>Progress, Achievements, Losses, Consumer Initiatives etc.</i>	Managing Director, TSECL	Monthly
Renewable Power	TREDA	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 TSECL 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 24 x 7 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 for goal. The training for the class C & D employees is also being provided under RAPDRP Part C scheme.

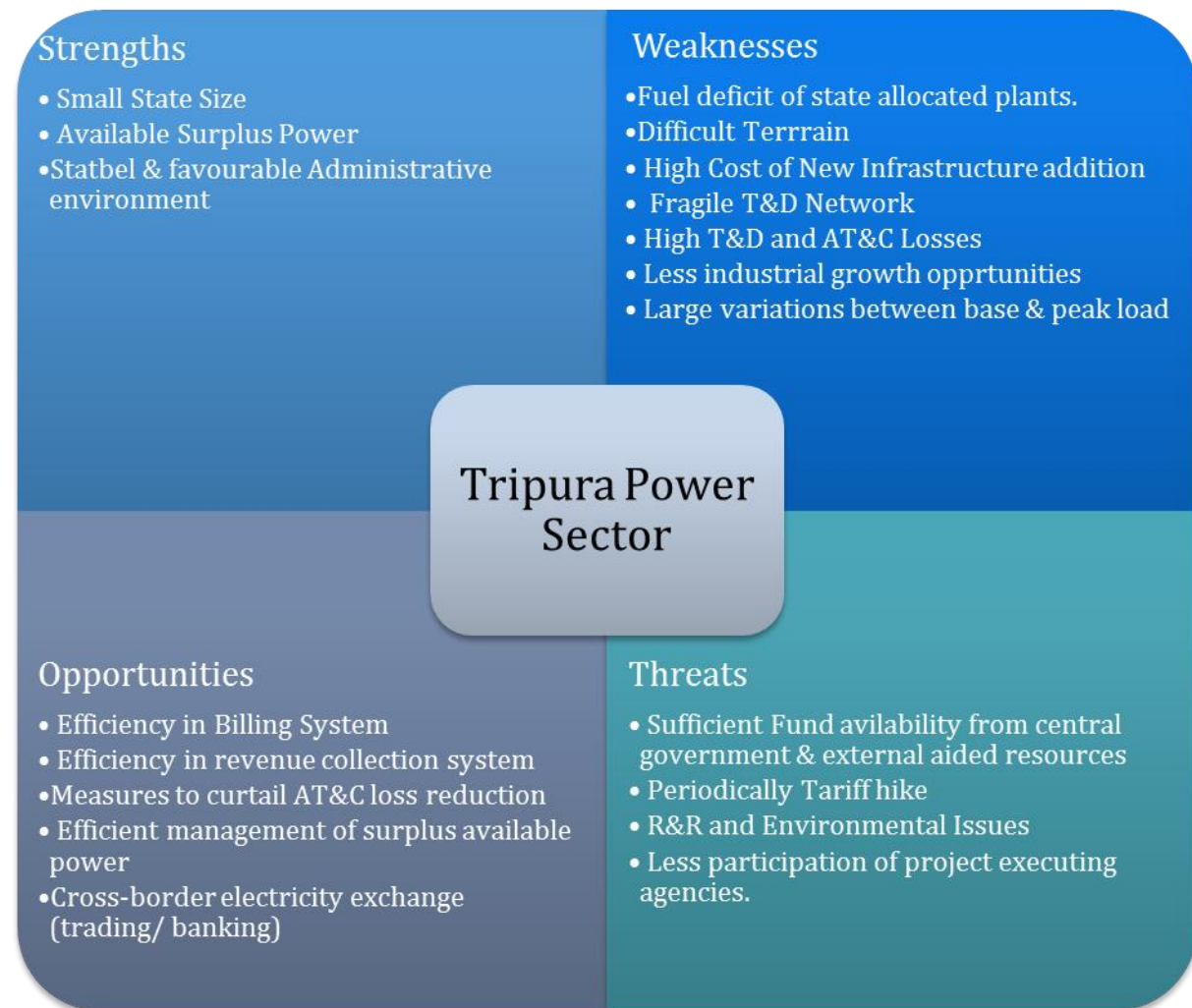
A state level officers training institute may be required to be opened in the state to fulfil the ongoing training requirement for employees. This also helps in training of subordinate technical staff. Following training programmes are proposed to be implemented for the utility:

- ✓ 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 State Tripura in achieving the set goal. Before structuring the above targets, SWOT analysis of existing power sector in Tripura has been discussed. The exercise has been done to bring out some of the key risk indicators which affect the overall market in Tripura 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 state to mitigate them as soon as possible. Further, from the weaknesses tabulated it is seen that, with some strong and bold measures state would be able to attain the target.

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



## ROAD MAP FOR POWER FOR ALL

Table 51: Roll Out Plan

Sl. No.	Category	Base year scenario (FY 15)	FY 16	FY 17	FY 18	FY 19	Total	Total expected capacity FY 19
GENERATION								
A	Availability (MW):							
	State Sector							
1	Existing State Generating Stations (Gas and combine cycle)	89	0	0	65	0	65	154
2	Solar	0	0	4	12	12	28	28
	Central Sector							
3	Central generating stations	244	8.56	101	0	0	109.56	353
	Total Availability (MW)	332.76	8.56	105	12	72	198	530
B	Peak Demand (MW):							
	Peak Demand (MW)	266	270	303	347	384		384
TRANSMISSION								
C	Transmission Lines (CKM):							
1	Inter state	1,229	0	0	0	0	0	1,229
2	Intra state	1,047	124	0	0	473	597	1,643
Total Transmission Line (KM)		2,276	124	0	0	473	597	2,872
D	Transformation Capacity (MVA):							
	Interstate (400 kV and 132 kV)	255	0	0	0	0	0	255
	Intra state (132 kV & 66 kV)	770.10	0	0	0	1105	1105	1875
Total Transformation Capacity		1025	0	0	0	1105	1105	2129.60
DISTRIBUTION								
E	Connecting the Unconnected							
1	Village Electrification	875	9	17	0	0	26	901
2	Hamlet Electrification	8,411	113	556	0	0	669	9,080
3	Target Electrification – Rural HH	4,11,175	21,371	53,428	1,06,855	32,057	2,13,710	6,24,885
4	Target Electrification – Urban HH	1,60,600	0	9,089	0	0	9,089	1,69,689
F	Efficiency Improvement							
1	T&D Losses (30.08% - FY15)	30.08%	21.31%	19.95%	19.64%	19.30%		19.30%
2	AT&C Losses (34.34% - FY 15)	34.34%	24.85%	22.35%	20.85%	20.00%		20%
G	Capacity Addition/Augmentation							
1	33 kV Substation (MVA Capacity) (new+ augmentation + bay extension)	284.2	63	63	63	450.55	641	925
2	33 kV Lines (CKT Km.)	805.29	101	101	101	1,096	1,400	2,205

Sl. No.	Category	Base year scenario (FY 15)	Rollout Plan					Total expected capacity FY 19
			FY 16	FY 17	FY 18	FY 19	Total	
3	11 kV Lines (CKT Km.) (new+ re-conductoring/ augmentation)	10,936	965	965	965	965	3,860	14,796
4	LT Lines (CKT Km.) (new+ re-conductoring/ augmentation)	22,937	944	944	944	944	3,777	26,714
5	No. of DT installation (new+ augmentation)	12,673	987	987	987	987	3,947	16,620
6	DT capacity (MVA)	993	0	54	54	54	162	1155
7	HVDS (MVA)	-	0.00	1.09	1.09	1.09	3.28	3.28
H	Metering							
1	DT metering (No.)	1,099	0.00	2,174.00	2,174.00	2,174.00	6,522	7,621

## 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 52: TSECL Fund Requirement

Sl. No.	Category	Fund Requirement (in Rs Crores)				
		FY 16	FY 17	FY 18	FY 19	Total
A	<b>Generation</b>					
1	35 MW Rokhia Combine cycle project	0	0	63	188	250.80
2	25 MW Baramura Combine cycle project	0	0	48	144	192.20
3	Life extension of 3X5 MW GHEP	0	0	27	82	109.60
4	28 MW Solar (Grid and Off-Grid) projects	0	20	60	60	140
	<b>Total Fund Requirement (Generation)</b>	<b>0</b>	<b>20</b>	<b>198</b>	<b>474</b>	<b>693</b>
B	<b>Transmission</b>					
1	132 KV Transmission Line -under world bank funding	17.88	71.54	62.59	26.83	178.84
2	132 KV Transmission Line -under state plan	4.06	16.26	14.22	6.10	40.64
3	New 132/33 KV Sub-Station-under world bank funding	35.65	142.58	124.76	53.47	356.46
4	<b>Sub-Station &amp; transformer replacement</b>					
a	132/33 KV Sub-station-under world bank funding	7.53	30.10	26.34	11.29	75.26
b	Augmentation of 66/33 KV Sub-Station- under state plan	1.60	6.40	5.60	2.40	16.00
	<b>Total Fund Requirement (Transmission)</b>	<b>66.72</b>	<b>266.88</b>	<b>233.52</b>	<b>100.08</b>	<b>667.20</b>
C	<b>Distribution</b>					
i)	<b>Proposed works under World Bank Funding</b>	<b>56.45</b>	<b>225.82</b>	<b>197.59</b>	<b>84.68</b>	<b>564.55</b>
a	33 KV New Line (770 CKM)	20.88	83.53	73.09	31.33	208.83
b	33 KV Line Re-conductoring (326 CKM)	4.50	17.98	15.74	6.74	44.96
c	33 KV New Line Bays (27 No.)	1.32	5.28	4.62	1.98	13.21
d	34 No. 33 KV New sub-station (360 MVA)	20.70	82.80	72.45	31.05	207.00
e	13 No. 33 KV sub-station augmentation (360 MVA)	9.06	36.22	31.69	13.58	90.55
ii)	Conversion of existing overhead lines (11 KV & LT) in to underground line by XLPE insulated power cables within all district HQ, Sub-division and block HQ, all urban/semi urban areas in order to ensure quality and reliable power supply. <b>[Proposal under External Aided Funding]</b>	-	214.54	343.27	300.36	858.17
iii)	Smart Energy Metering System. <b>[Proposal under External Aided Funding]</b>	0.00	211.00	233.00	192.76	636.76
iv)	Augmentation of administrative Infrastructure of TSECL	-	0.00	25.00	25.00	50.00
v)	ERP implementation	-	0.00	5.00	10.00	15.00

Sl. No.	Category	Fund Requirement (in Rs Crores)				
		FY 16	FY 17	FY 18	FY 19	Total
vi)	IT enabling MBC & MDAS for balance consumers other than R-APDRP Town & Sub-station protection system renovation & upgradation (sanctioned)	3.11	15.53	17.42	20.00	56.05
vii)	<b><u>RURAL &amp; Urban Area Distribution infra. Development (IPDS+ DDUGJY)</u></b>	<b>46.42</b>	<b>232.11</b>	<b>185.69</b>	<b>0.00</b>	<b>464.21</b>
a)	<i>IPDS (originally estimated: Rs. 510.42 Cr.)</i>	<i>7.39</i>	<i>36.94</i>	<i>29.55</i>	<i>0.00</i>	<i>73.87</i>
b)	<i>DDUGJY (originally estimated: Rs. 903.02 Cr.)</i>	<i>7.41</i>	<i>37.06</i>	<i>29.65</i>	<i>0.00</i>	<i>74.12</i>
c)	<i>12th Plan RGGVY (RE DDUGJY) (originally estimated: Rs. 316.22 Cr.)</i>	<i>31.62</i>	<i>158.11</i>	<i>126.49</i>	<i>0.00</i>	<i>316.22</i>
viii)	<b>Additional funding required for tie up</b>	84.38	421.89	337.51	0.00	<b>843.78</b>
	<b>Total Distribution sector Fund requirement (Rs. Crores.)</b>	<b>190.36</b>	<b>1320.88</b>	<b>1344.48</b>	<b>632.80</b>	<b>3488.52</b>

## ANNEXURES

### ANNEXURE – 1

Table 53: Area Details as per 2011 Census (in Sq. Km.)

S. No.	District Name	Total	Rural		Urban	
		(in Sq. Km)	In Sq. Km	In %age	In Sq. Km	In %age
1	Dhalai	2,400	2,364	98.51%	35.71	1.49%
2	North Tripura	2,036	1972.28	96.87%	63.72	3.13%
3	South Tripura	3,057	2,978	97.43%	78.63	2.57%
4	West Tripura	2,993	2,779	92.86%	213.82	7.14%
<b>Overall</b>		<b>10,486</b>	<b>10,094</b>	<b>96.26%</b>	<b>392</b>	<b>3.74%</b>

Table 54: Population Details as per 2011 Census (In Nos.)

S. No.	District Name	Total	Rural		Urban	
		(in Nos.)	In Nos.	In %age	In Nos.	In %age
1	Dhalai	3,78,230	3,37,731	89.29%	40,499	10.71%
2	North Tripura	6,93,947	5,73,662	82.67%	1,20,285	17.33%
3	South Tripura	8,76,001	7,52,970	85.96%	1,23,031	14.04%
4	West Tripura	17,25,739	10,48,101	60.73%	6,77,638	39.27%
<b>Overall</b>		<b>36,73,917</b>	<b>27,12,464</b>	<b>73.83%</b>	<b>9,61,453</b>	<b>26.17%</b>

### ANNEXURE – 2

Table 55: District wise Households and their Electrification Status (as per census 2011)

Sr.	District	Rural HH's	% Electrified Rural HH's	Urban HH's	% Electrified Urban HH's	Total HH's	% Total Electrified HH's
1	Dhalai	37,846	51.73%	9,029	90.86%	46,875	56%
2	North Tripura	57,030	46.48%	24,571	87.01%	81,601	54%
3	South Tripura	1,04,977	60.45%	28,767	90.98%	1,33,744	65%
4	West Tripura	1,61,720	67.88%	1,52,847	92.52%	3,14,567	78%
<b>Overall</b>		<b>3,61,573</b>	<b>59.49%</b>	<b>2,15,214</b>	<b>91.58%</b>	<b>5,76,787</b>	<b>100%</b>

## ANNEXURE – 3

**Table 56: Existing Intra-state Transmission Lines (CKM)**

Sr.	Project	Ckts. (SC/ DC)	Conductor	Total CKM
<b>132 kV</b>				
1	79 Tilla Grid - Dhalabil	S/C	AASC Panther	35
2	Dhalabil - Kamalpur	S/C	AASC Panther	36
3	Kamalpur - P.K. Bari	S/C	ACSR Panther	31
4	P.K. Bari - Missiontilla	S/C	AASC Panther	36.5
5	Missiontilla - Churaibari	S/C	AASC Panther	11.5
6	P.K. Bari - Kailasahar	S/C	ACSR Panther	18
7	P.K. Bari - PGCIL	S/C	ACSR Panther	2
8	79 Tilla Grid - Bodhjungnagar	S/C	ACSR Panther	10
9	Bodhjungnagar - Jirania	S/C	ACSR Panther	13.5
10	Jirania - Baramura	S/C	ACSR Panther	12.6
11	Bodhjungnagar LILO	D/C	AASC Panther	9
12	Jirania LILO	D/C	AASC Panther	1.5
13	Baramura - Ambassa	S/C	AASC Panther	39
14	Baramura LILO	D/C	AASC Panther	1
15	Gamaitilla LILO	D/C	AASC Panther	1.5
16	Amdassa - P.K. Bari	S/C	AASC Panther	45
17	Ambassa - Kamalpur	S/C	ACSR Panther	31
18	79 Tilla Grid - Rokhia L1 & L2	D/C	ACSR Panther	70
19	Rokhia - Udaipur	S/C	ACSR Panther	47
20	Udaipura - Palatana	S/C	AASC Panther	11.12
21	Suryamaninagar- Bodhjungnagar	D/C	AASC Panther	36.65
22	Monarchak - Rabindranagar	D/C	AASC Panther	5.266
23	Suryamaninagar - 79 Tilla	D/C	AASC Panther	35.312
24	Suryamaninagar - Monarchak / Section : Monarchak - Melaghar	D/C	AASC Panther	24.72
	<b>Sub-total</b>			<b>564.168</b>
<b>66 kV</b>				
1	79 Tilla Grid - Badharghat	S/C	ACSR DOG	10
2	Bagharghat - Gakulnagar	S/C	ACSR DOG	12
3	Gakulnagar - Udaipur	S/C	ACSR DOG	40
4	Udaipura - Gumti	S/C	ACSR DOG	60
5	79 Tilla Grid - Baramura	S/C	ACSR DOG	25
6	Baramura - Gamaitilla	S/C	ACSR DOG	12
7	Gamaitilla - Amarpur	S/C	ACSR DOG	43
8	Amarpur - Gumti	S/C	ACSR DOG	30
9	Badharghat - Rokhia	S/C	ACSR DOG	24
10	Rokhia - Rabindranagar	S/C	ACSR DOG	23
11	Rabindranagar - Belonia	S/C	ACSR DOG	37
12	Belonia - Bagafa	S/C	ACSR DOG	15
13	Udaipura - Bagafa	S/C	ACSR DOG	25
14	Bagafa - Satchand	S/C	ACSR DOG	32
15	Satchand - Sabroom	S/C	ACSR DOG	15
16	Rokhia - Baxanagar	S/C	ACSR DOG	3.48
17	Ompi LILO	D/C	ACSR DOG	0.42
18	Jatanbari LILO	D/C	ACSR DOG	1.255
19	Bishramganj LILO	D/C	ACSR DOG	0.228
	<b>Sub-total</b>			<b>408.383</b>
	<b>Grand Total (CKM)</b>			<b>1046.551</b>



**Table 57: Existing Intra-state Substation details**

Sr.	Sub-station	Voltage level (KV)	No.X Rating in MVA	Sub-Station Transformation capacity (MVA)
<b>132 kV Sub-stations</b>				
1	Mission Tilla, Dharmanagar	132/33/11	3x(7.5/2.5/5)	22.5
		132/33	1x25	25
2	Gour Nagar	132/33/11	2x(7.5/2.5/5)	15
		132/33		7.5
3	P.K. Bari	132/33 & 132/11	1X15 and 1X10	25
4	Garad Tilla	132/11	2X10	20
5	Kamalpur	132/11	1X10	10
6	Dhalabil	132/33	1X7.5	7.5
		132/11	1X15	15
7	Ambassa	132/33/11	1x(7.5/2.5/5)	7.5
		132/33	1x25	25
8	Teliamura/ Gamaitila	132/11	1x15	15
9	Jirania	132/33	1x10	10
		132/11	1x15	15
10	Bodhjunga Nagar	132/33	1x25	25
11	Agartala Grid	132/66	1x15	
		132/33	2x25 , 3X15	95
		132/11	1x15	15
12	S.M. Nagar	132/33	2x50	100
13	Bandoar, Udaipur	132/66	2x15	30
14	Rabindranagar	132/33	1x15	15
<b>Total 132 KV S/S MVA capacity</b>				<b>550</b>
<b>66 kV Sub-stations</b>				
1	Badharghat	66/33	2x15	30
		66/11	2x10	20
2	Rokhia	66/11	1x5	5
3	Bishramganj	66/11	1x5	5
4	Gokul Nagar	66/11	1x15	15
5	Boxa Nagar,	66/11	1x6.3	6.3
6	Rabindranagar	66/11	1x15	15
		66/33	2x5	10
7	Belonia	66/33	1x10	10
		66/11	1x6.3	6.3
8	Bagafa	66/33	1x10	10
		66/11	1x10	10
9	Satchand	66/11	1x6.3	6.3
10	Sabroom	66/11	1x10	10
11	Jatanbari	66/11 & 66/33	1x3 + 1X4	7
12	Amarpur	66/11	2x6.3	12.6
13	Udaipur	66/33	1x10	10
14	Ompi	66/11	1x6.3	6.3
15	Baramura	66/11	1X5	5
16	Gumti Hydro	66/33/11	1X4	4
17	Gamaitilla	66/33	1x6.3 1X10	16.3
<b>Total 66 kV Sub-Station MVA Capacity</b>				<b>220.10</b>

**Table 58: Existing Inter-state Transmission Lines (CKM)**

Sr.	Project	Ckts. (SC/ DC)	Conductor	Total CKM
<b>400 kV</b>				
1	Pallatana - Surajmaninagar I,II (Charged at 132 kV)	D/C	Twin moose	74
2	Silchar- Purbi Kanchan Bari, I, II (Charged at 132 kV)	DC	Twin moose	254
3	Pallatana - Silchar, I, II	DC	Twin moose	494
	<b>Sub-total</b>			<b>822</b>
<b>132 kV</b>				
1	Badarpur - Kumarghat	SC	Panther	119
2	Agartala- Agartala I (GBPP)	SC	Panther	8
3	Agartala- Agartala II (GBPP)	SC	Panther	8
4	Kumargaht- RC Nagar	SC	Panther	104
5	Aizwal - Kumarghat	SC	Panther	131
6	Dharamnagar- Dhullavcheera	SC	Panther	37
	<b>Sub-total (CKM)</b>			<b>407</b>
	<b>Total inter-state (CKM)</b>			<b>1229</b>

**Table 59: Existing Inter-state Substation details**

Sr.	Sub-station	Voltage level (KV)	No. X Rating in MVA	Sub-Station T?F capacity (MVA)
<b>400/132 kV Sub-stations</b>				
1	Pallatana switchyard (at present charged at 132 kV)	400/132	2X125	250
<b>132/33 kV Sub-stations</b>				
1	Kumarghat	132/33	1X5	5
	<b>Total inter-state S/s capacity</b>			<b>255</b>

**Table 60: Intra-State Planned Transmission Lines (NERPSIP scheme)**

Sr.	Lines	Voltage (kV)	Ckts. (SC/ DC)	Total CKM	Rs. Cr.	Commissioning Schedule
1	Rabindra Nagar – Rokhia	132	DC	48	17.75	FY 18-19
2	LILo of one circuit of Surajmaninagar- Rokhia 132 kV D/c line at Gokulnagar	132	DC	10	4.9	FY 18-19
3	LILo of Ambassa – P. K. Bari at Manu.	132	SC	4	4.33	FY 18-19
4	Kailasahar – Dharmanagar	132	DC	48	18.28	FY 18-19
5	Rabindra Nagar – Belonia	132	DC	80	25.88	FY 18-19
6	Udaipur - Bagafa	132	DC	64	21.27	FY 18-19
7	Bagafa – Belonia	132	DC	30	11.47	FY 18-19
8	Belonia – Sabroom	132	DC	84	25.7	FY 18-19
9	LILo of Agartala (79 Tilla) - Dhalabil (Khowai) at Mohanpur	132	SC	4	1.75	FY 18-19
10	Bagafa – Satchand 132 kV S/c on D/c line (utilizing the corridor of existing Bagafa – Satchand 66 kV line)	132	SC	40	25.7	FY 18-19
11	Udaipur - Amarpur	132	DC	60	21.81	FY 18-19
<b>Total</b>				<b>472</b>	<b>178.84</b>	

**Table 61: Intra-State Planned Transmission Sub-stations (NERPSIP scheme)**

Sr.	Sub-stations	Voltage (kV)	No. X Ratings (MVA)	Total MVA	Rs. Cr.	Commissioning Schedule
<b>Sub-station Addition</b>						
1	Rabindranagar	132/33	2X50	100	42.42	FY 18-19
2	Gokulnagar	132/33	2X50	100	37.41	FY 18-19
3	Manu	132/33	2X50	100	37.84	FY 18-19
4	Belonnia	132/33	2X50	100	43.73	FY 18-19
5	Bagafa	132/33	2X50	100	41.26	FY 18-19
6	Sabroom	132/33	2X31.5	63	39.04	FY 18-19
7	Mohonpur	132/33	2X31.5	63	36.32	FY 18-19
8	Satchand	132/33	2X31.5	63	36.48	FY 18-19
9	Amarpur	132/33	2X31.5	63	36.32	FY 18-19
10	Rokhia Sub-Stn. 132 KV bay Extension only	132			2.98	FY 18-19
11	Mission Tilla (Dharmanagar) bay extension only	132			2.67	FY 18-19
<b>Sub-Total</b>				<b>752.00</b>	<b>356.46</b>	
<b>Augmentation works</b>						
1	Kailashahar	132/33	2X50	85	17.21	FY 18-19
2	Augmentation of Ambassa S/s	132/33	1X31.5	31.5	10.35	FY 18-19
3	Augmentation of Dhalabill (Khowai) S/S	132/33	2X31.5	63	15.01	FY 18-19
4	Augmentation of Jirania S/S	132/33	2X31.5	53	13.24	FY 18-19
5	Udaipur Sub-Stn. 132 KV Extension	132/33	2X50	100	19.45	FY 18-19
<b>Sub-total</b>				<b>332.5</b>	<b>75.26</b>	
<b>Total NERPSIP (Tranche-I)</b>				<b>1084.50</b>	<b>431.72</b>	

**Table 62: Inter-State Planned Transmission Lines (NERSS scheme through TBCB route)**

Sr.	Lines	Voltage (kV)	Ckts. (SC/ DC)	Total CKM	Rs. Cr.	Commissioning Schedule
1	Surjyamaninagar to PK Bari	400	DC	130	200	Estimated by FY 19-20, work yet to be awarded
2	Agartala GBPP to PK Bari	132	DC	300	10	Estimated by FY 19-20, work yet to be awarded

**Table 63: Inter-State Planned Transmission Sub-stations (NERSS scheme through TBCB route)**

Sr.	Sub-stations	Voltage (kV)	No. X Ratings (MVA)	Total MVA	Rs. Cr.	Commissioning Schedule
<b>Sub-station Addition</b>						
1	PK Bari	400/132	2X315	630	100.00	Estimated by FY 19-20, work yet to be awarded
2	Surjyamani Nagar	400/132	2X315	630	100.00	Estimated by FY 19-20, work yet to be awarded

## ANNEXURE – 4

**Table 64: Planned 33 kV Distribution Lines (under NERPSIP scheme)**

Sr.	Lines	Voltage (kV)	Ckts. (SC/ DC)	Total CKM	Rs. Cr.	COD	Conductor	Package
<b>New Lines</b>								
1	LILO of existing Tirthmukh - Silachari and Karbook Line	33	SC	6	1.62	FY 18-19	ACSR Wolf	P-1
2	LILO of existing Jolaibari - Bagafa and Muhuripur Line	33	SC	16	4.31	FY 18-19	ACSR Wolf	P-1
3	Amarpur - Dalak (Chelagang) line	33	SC	15	4.04	FY 18-19	ACSR Wolf	P-1
4	Jantabari - Dalak (Chelagang) line	33	SC	12	3.24	FY 18-19	ACSR Wolf	P-1
5	Belonia - Chittamara line	33	SC	8	2.16	FY 18-19	ACSR Wolf	P-1
6	Garjee - Chittamara line	33	SC	20	5.39	FY 18-19	ACSR Wolf	P-1
7	Udaipur- Maharani Line	33	SC	8	2.16	FY 18-19	ACSR Wolf	P-1
8	Garjee- Maharani Line	33	SC	20	5.39	FY 18-19	ACSR Wolf	P-1
9	Amarpur- Chechua Line	33	SC	16	4.31	FY 18-19	ACSR Wolf	P-1
10	Sabroom- Manughat Line	33	SC	10	3.94	FY 18-19	ACSR Wolf	P-2
11	Manughat- Srinagar Line	33	SC	20	5.39	FY 18-19	ACSR Wolf	P-2
12	Satchand- Srinagar Line	33	SC	22	5.93	FY 18-19	ACSR Wolf	P-2
13	Tapping point on existing Belonia- Hrishyamukh 33 kV line and Srinagar line	33	SC	25	6.74	FY 18-19	ACSR Wolf	P-2
14	Satchand - Rupaichari	33	SC	10	2.70	FY 18-19	ACSR Wolf	P-2
15	Rajnagar - Ekinpur	33	SC	20	5.39	FY 18-19	ACSR Wolf	P-2
16	LILO of existing Belonia- Rajnagar & Barpathari Line	33	SC	10	2.70	FY 18-19	ACSR Wolf	P-2
17	Jolaibari - Silachari	33	SC	30	8.09	FY 18-19	ACSR Wolf	P-2
18	Jolaibari - Satchand	33	SC	18	4.85	FY 18-19	ACSR Wolf	P-2
19	Rupaichari- Sabroom	33	SC	12	3.24	FY 18-19	ACSR Wolf	P-2
20	LILO of existing Surjyamani Nagar- Takarjala & Gabardi Line	33	SC	4	1.08	FY 18-19	ACSR Wolf	P-2
21	LILO of existing Badarghat- Jangalia & Sekerkote Line	33	SC	10	2.70	FY 18-19	ACSR Wolf	P-3
22	Gokulnagar- Golaghati	33	SC	15	4.04	FY 18-19	ACSR Wolf	P-3
23	Takarjala- Golaghati	33	SC	15	4.04	FY 18-19	ACSR Wolf	P-3
24	Gokulnagar- Durganagar	33	SC	15	4.04	FY 18-19	ACSR Wolf	P-3
25	Madhupur- Durganagar	33	SC	14	3.77	FY 18-19	ACSR Wolf	P-3
26	Kathaliya- Nidaya	33	SC	12	3.24	FY 18-19	ACSR Wolf	P-3
27	Melagarh - Nalchar	33	SC	10	2.70	FY 18-19	ACSR Wolf	P-3
28	Bishramganj - Nalchar	33	SC	10	2.70	FY 18-19	ACSR Wolf	P-3
29	Madhupur- Jangalia line tapping to Gokulnagar Sub-station	33	SC	1	0.27	FY 18-19	ACSR Wolf	P-3
30	Bishramganj - Jangalia	33	SC	15	4.04	FY 18-19	ACSR Wolf	P-3
26	Kathaliya- Nidaya	33	SC	12	3.24	FY 18-19	ACSR Wolf	P-3
31	Rajnagar- Nidaya	33	SC	20	5.39	FY 18-19	ACSR Wolf	P-3
32	Dhalabil- Khowai	33	SC	8	2.16	FY 18-19	ACSR Wolf	P-4

Sr.	Lines	Voltage (kV)	Ckts. (SC/ DC)	Total CKM	Rs. Cr.	COD	Conductor	Package
33	Ampura- Khowai (Under RGGVY)	33	SC	16	4.31	FY 18-19	ACSR Wolf	P-4
34	Hemzara- Simna	33	SC	22	5.93	FY 18-19	ACSR Wolf	P-4
35	Tapping point on existing Mohanpur- Hemzara 33 kV Feeder to Simna	33	SC	16	4.31	FY 18-19	ACSR Wolf	P-4
36	Hemzara- Barkthal	33	SC	12	3.24	FY 18-19	ACSR Wolf	P-4
37	Mohanpur- Barkathal	33	SC	14	3.77	FY 18-19	ACSR Wolf	P-4
38	Durjoynagar - Bamutia	33	SC	14	3.77	FY 18-19	ACSR Wolf	P-4
39	Lembucherra - Bamutia	33	SC	6	1.62	FY 18-19	ACSR Wolf	P-4
40	LILO of existing Agartala- Mohanpur & Lembucherra Line	33	SC	4	1.08	FY 18-19	ACSR Wolf	P-4
41	Jirania- Champaknagar	33	SC	8	2.16	FY 18-19	ACSR Wolf	P-4
42	LILO of existing Khayerpur- Jirania & Ranirbazar Line	33	SC	8	2.16	FY 18-19	ACSR Wolf	P-4
43	Jirania- ADC Head Qtr.	33	SC	5	1.35	FY 18-19	ACSR Wolf	P-4
44	Champaknagar- ADC Head Qtr.	33	SC	9	2.43	FY 18-19	ACSR Wolf	P-4
45	Hemzara- Dhalabil	33	SC	22	5.93	FY 18-19	ACSR Wolf	P-4
46	LILO of Ambassa- Telimura & Mungiakami Line	33	SC	2	0.54	FY 18-19	ACSR Wolf	P-4
47	Teliamura- Taidu	33	SC	12	3.24	FY 18-19	ACSR Wolf	P-4
48	Chechua- Taidu	33	SC	20	5.39	FY 18-19	ACSR Wolf	P-4
49	Ambassa- Jawahar Nagar	33	SC	13	3.50	FY 18-19	ACSR Wolf	P-5
50	LILO of existing Chamanu- Manu & Chailengta Line	33	SC	8	2.16	FY 18-19	ACSR Wolf	P-5
51	Jawahar Nagar- Dhumcherra	33	SC	20	5.39	FY 18-19	ACSR Wolf	P-5
52	Manu- Dhumcherra	33	SC	25	6.74	FY 18-19	ACSR Wolf	P-5
53	Manu- 82 mile	33	SC	21	5.66	FY 18-19	ACSR Wolf	P-5
54	PK Bari - 82 mile	33	SC	13	3.50	FY 18-19	ACSR Wolf	P-5
55	Kailashahar - Tilla Bazar	33	SC	14	3.77	FY 18-19	ACSR Wolf	P-5
56	Tapping at Chowmanu- manu to Manu s/s	33	SC	5	1.35	FY 18-19	ACSR Wolf	P-5
57	LILO of existing salema- kamalpur to Durga Chowmohani line	33	SC	14	3.77	FY 18-19	ACSR Wolf	P-5
<b>New Lines Sub-total</b>				<b>770</b>	<b>208.83</b>			
<b>Re-conductoring (From Dog to Wolf)</b>								
1	Jolaibari- Bagafa	33	SC	20	2.76	FY 18-19	ACSR Wolf	P-1
2	Silachari- Tirthamukh	33	SC	40	5.52	FY 18-19	ACSR Wolf	P-1
3	Belonia- Hrishyamukh	33	SC	20	2.76	FY 18-19	ACSR Wolf	P-2
4	Belonia- Rajnagar	33	SC	25	3.45	FY 18-19	ACSR Wolf	P-2
5	Badarghat - Jangalia	33	SC	20	2.76	FY 18-19	ACSR Wolf	P-3
6	Rabindranagar 132/33 kV S/s - Kathalia	33	SC	20	2.76	FY 18-19	ACSR Wolf	P-3
7	Rabindranagar 132/33 kV S/s - Melaghar	33	SC	26	3.59	FY 18-19	ACSR Wolf	P-3
8	Badarghat - SM Nagar	33	SC	14	1.93	FY 18-19	ACSR Wolf	P-3
9	SM Nagar - Takarjala	33	SC	27	3.72	FY 18-19	ACSR Wolf	P-3
10	Teliamura - Kalyanpur	33	SC	15	2.07	FY 18-19	ACSR Wolf	P-4

Sr.	Lines	Voltage (kV)	Ckts. (SC/ DC)	Total CKM	Rs. Cr.	COD	Conductor	Package
11	Dhalabil - Kalyanpur	33	SC	18	2.48	FY 18-19	ACSR Wolf	P-4
12	Mohanpur - Hemzara	33	SC	12	1.65	FY 18-19	ACSR Wolf	P-4
13	Mohanpur - Agartala	33	SC	20	2.76	FY 18-19	ACSR Wolf	P-4
14	Khayerpur - Jirania	33	SC	14	1.93	FY 18-19	ACSR Wolf	P-4
15	Ambassa - Teliamura	33	SC	35	4.83	FY 18-19	ACSR Wolf	P-5
	<b>Re-conductoring Sub-Total</b>			<b>326</b>	<b>44.96</b>			
	<b>Total (New lines+ Re-conductoring)</b>			<b>1096</b>	<b>253.79</b>			

**Table 65: Planned Distribution Sub-stations (Under NERPSIP scheme)**

Sr.	Sub-stations	Voltage (kV)	No. X Ratings (MVA)	Total MVA	Rs. Cr.	COD	Package
<b>Sub-station Addition</b>							
1	Karbook	33/11	2X5	10	6.04	FY 18-19	P-1
2	Muhuripur	33/11	2X5	10	6.04	FY 18-19	P-1
3	Dalak (Chelagang)	33/11	2X5	10	6.04	FY 18-19	P-1
4	Garjee	33/11	2X5	10	6.04	FY 18-19	P-1
5	Chittamara	33/11	2X5	10	6.04	FY 18-19	P-1
6	Maharani	33/11	2X5	10	6.04	FY 18-19	P-1
7	Chechua	33/11	2X5	10	6.04	FY 18-19	P-2
8	Ekinpur	33/11	2X5	10	6.04	FY 18-19	P-2
9	Manughat	33/11	2X5	10	6.04	FY 18-19	P-2
10	Rupaichari	33/11	2X5	10	6.04	FY 18-19	P-2
11	Barpathari	33/11	2X5	10	6.04	FY 18-19	P-2
12	Gabardi	33/11	2X5	10	6.04	FY 18-19	P-2
13	Srinagar	33/11	2X5	10	6.39	FY 18-19	P-2
14	Sekerkote	33/11	2X5	10	6.04	FY 18-19	P-3
15	Golaghati	33/11	2X5	10	6.04	FY 18-19	P-3
16	Durganagar	33/11	2X5	10	5.54	FY 18-19	P-3
17	Nidaya	33/11	2X5	10	6.04	FY 18-19	P-3
18	Nalchar	33/11	2X7.5	15	6.07	FY 18-19	P-3
19	Simna	33/11	2X5	10	6.04	FY 18-19	P-4
20	Barkathal	33/11	2X5	10	6.04	FY 18-19	P-4
21	Bamutia	33/11	2X5	10	6.04	FY 18-19	P-4
22	Champaknagar	33/11	2X5	10	6.04	FY 18-19	P-4
23	Mungiakami	33/11	2X5	10	6.04	FY 18-19	P-4
24	Taidu	33/11	2X5	10	6.04	FY 18-19	P-4
25	Lembucherra	33/11	2X5	10	6.39	FY 18-19	P-4
26	Khowai	33/11	2X7.5	15	6.57	FY 18-19	P-4
27	ADC Head Qtr.	33/11	2X7.5	15	6.57	FY 18-19	P-4
28	Ranir Bazar	33/11	2X7.5	15	6.57	FY 18-19	P-5
29	Tilla Bazaar	33/11	2X5	10	5.78	FY 18-19	P-5
30	Jawahar Nagar	33/11	2X5	10	6.04	FY 18-19	P-5
31	Chailengta	33/11	2X5	10	6.04	FY 18-19	P-5
32	Dhumachhera	33/11	2X5	10	6.04	FY 18-19	P-5
33	82 mile	33/11	2X5	10	6.04	FY 18-19	P-5
34	Durga Chowmohani	33/11	2X5	10	6.04	FY 18-19	P-5



Sr.	Sub-stations	Voltage (kV)	No. X Ratings (MVA)	Total MVA	Rs. Cr.	COD	Package
	<b>New-substations -Sub-total</b>			<b>360</b>	<b>206.99</b>		
<b>Augmentation</b>							
1	Rani existing	33/11	2X5	6.85	3.66	FY 18-19	P-1
2	Jolaibari existing	33/11	2X7.5	11.85	4.03	FY 18-19	P-1
3	Hrishyamukh existing	33/11	2X5	6.85	3.66	FY 18-19	P-2
4	Rajnagar existing	33/11	2X5	6.85	3.66	FY 18-19	P-2
5	Madhupur existing	33/11	2X5	5	1.89	FY 18-19	P-3
6	Melaghar existing	33/11	2X7.5	7.5	2.15	FY 18-19	P-3
7	Kathalia existing	33/11	2X7.5	7.5	2.15	FY 18-19	P-3
8	Takarjala existing	33/11	2X5	6.8	2.65	FY 18-19	P-3
9	Hezmara existing	33/11	2X5	6.85	3.66	FY 18-19	P-4
10	Khayerpur existing	33/11	2X7.5	7.5	2.15	FY 18-19	P-4
11	Gandacherra existing	33/11	2X5	5	1.89	FY 18-19	P-5
12	Salema existing	33/11	2X5	5	1.89	FY 18-19	P-5
13	Rangrung existing	33/11	2X5	7	3.67	FY 18-19	P-5
	<b>Augmentations-Sub-total</b>			<b>90.55</b>	<b>37.14</b>		
	<b>(New S/s + Augmentations+ new bays) Grand-total</b>			<b>450.55</b>	<b>257.35</b>		
	<b>Augmentations-Sub-total</b>			<b>90.55</b>	<b>37.14</b>		
<b>Existing Sub-station R&amp;M</b>							
1	Jolaibari existing	33/11				FY 18-19	P-1
2	Hrishyamukh existing	33/11				FY 18-19	P-2
3	Rajnagar existing	33/11				FY 18-19	P-2
4	Takarjala existing	33/11				FY 18-19	P-3
5	Madhupur existing	33/11				FY 18-19	P-3
6	Jangalia existing	33/11				FY 18-19	P-3
7	Melaghar existing	33/11				FY 18-19	P-3
8	Kathalia existing	33/11				FY 18-19	P-3
9	Hezmara existing	33/11				FY 18-19	P-4
10	Khayerpur existing	33/11				FY 18-19	P-4
11	Gandacherra existing	33/11				FY 18-19	P-5
12	Chowmanu existing	33/11				FY 18-19	P-5
13	Rangrung existing	33/11				FY 18-19	P-5

**Table 66: Planned Distribution Line Bays (Under NERPSIP scheme)**

Sr.	Sub-stations	Voltage (kV)	No. of Bays	Rs. Cr.	COD	Package
<b>New 33 kV line bays</b>						
1	1 No. of bay at existing Jantabari 33/11 kV S/s	33	1	0.51	FY 18-19	P-1
2	1 No. of bay at existing Udaipur 132/33 kV S/s	33	1	0.51	FY 18-19	P-1
3	1 No. of bay at existing Belonia 33/11 kV S/s	33	1	0.51	FY 18-19	P-1
4	1 No. of bay at existing Silachari 33/11 kV S/s	33	1	0.51	FY 18-19	P-2
5	2 No. of bay at existing Rajnagar 33/11 kV S/s	33	2	0.92	FY 18-19	P-2
6	2 No. of bay at existing Jolaibari 33/11 kV S/s	33	2	0.92	FY 18-19	P-2

Sr.	Sub-stations	Voltage (kV)	No. of Bays	Rs. Cr.	COD	Package
7	1 No. of bay at Bishramganj	33	1	0.51	FY 18-19	P-3
8	1 No. of bay at Jangalia	33	1	0.51	FY 18-19	P-3
9	1 No. of bay at existing Takarjala 33/11 kV S/s	33	1	0.51	FY 18-19	P-3
10	1 No. of bay at existing Madhupur 33/11 kV S/s	33	1	0.51	FY 18-19	P-3
11	1 No. of bay at existing Kathalia 33/11 kV S/s	33	1	0.51	FY 18-19	P-3
12	1 No. of bay at existing Melagarh 33/11 kV S/s	33	1	0.51	FY 18-19	P-3
13	1 No. of bay at existing Bishramganj 33/11 kV S/s	33	1	0.51	FY 18-19	P-3
14	1 No. of bay at existing Durjoynagar 33/11 kV S/s	33	1	0.51	FY 18-19	P-4
15	1 No. of bay at Ampura (under RGGVY)	33	1	0.51	FY 18-19	P-4
16	1 No. of bay at existing 132/33 kV Telimaure S/s	33	1	0.51	FY 18-19	P-4
17	2 No. of bays at existing 132/33 kV Dhalabil S/s	33	2	0.92	FY 18-19	P-4
18	2 No. of bays at existing 132/33 kV Jirania S/s	33	2	0.92	FY 18-19	P-4
19	3 No. of bays at existing 132/33 kV Hemzara S/s	33	3	1.43	FY 18-19	P-4
20	1 No. of bay at existing 132/33 kV PK Bari S/s	33	1	0.51	FY 18-19	P-5
21	1 No. of bay at existing 132/33 kV Kailashahar S/s	33	1	0.51	FY 18-19	P-5
	<b>New Bays -Sub-Total</b>		<b>27</b>	<b>13.21</b>		

## ANNEXURE – 5

**Table 67: List of LED Demo Projects undertaken by SDA Tripura/ TSECL**

Sr.	Project	Location	Project Nature	No. of LED installed/ distributed	Project Status
1	LED Street Light Campaign	Mohanpur	Demonstration Project funded and guided by BEE	LED Street Light (120 Watt) – 74	Completed
2	LED Street Light Campaign	Jirania	Demonstration Project funded and guided by BEE	LED Street Light (120 Watt) – 70	Completed
3	LED Street Light Campaign	Panisagar	Demonstration Project funded and guided by BEE	LED Street Light (120 Watt) – 95	Completed
4	LED Street Light Campaign	Melaghar	Demonstration Project funded and guided by BEE	LED Street Light (120 Watt) – 55	Completed
5	LED Street Light Campaign	Sabroom	Demonstration Project funded and guided by BEE	LED Street Light (120 Watt) – 40	Completed
6	LED Street Light Campaign	Ranirbazar	Demonstration Project funded and guided by BEE	LED Street Light (120 Watt) – 30	Completed
7	LED Street Light Campaign	Khowai	Demonstration Project funded and guided by BEE	LED Street Light (120 Watt) – 30	Completed
8	LED Street Light Campaign	Belonia	Demonstration Project funded and guided by BEE	LED Street Light (120 Watt) – 55	Completed
9	LED Street Light Campaign	Bishalgarh	Demonstration Project funded and guided by BEE	LED Street Light (120 Watt) – 30	Completed
10	LED Street Light Campaign	Ambassa	Demonstration Project funded and guided by BEE	LED Street Light (120 Watt) – 30	Completed
11	LED Street Light Campaign	Kailasahar	Demonstration Project funded and guided by BEE	LED Street Light (120 Watt) – 30	Completed
12	LED Village Campaign	Kathalia	Demonstration Project funded and guided by BEE	LED Street Light (18 Watt) – 15	Completed

Sr.	Project	Location	Project Nature	No. of LED installed/ distributed	Project Status
				LED Bulb (7 Watt) – 300	
13	LED Village Campaign	Mohanbhog	Demonstration Project funded and guided by BEE	LED Street Light (18 Watt) – 15 LED Bulb (7 Watt) – 300	Completed
14	LED Village Campaign	Harbang	Demonstration Project funded and guided by BEE	LED Street Light (18 Watt) – 15 LED Bulb (7 Watt) – 243	Completed
15	LED Village Campaign	Khirodenagar, Khowai	Demonstration Project funded and guided by BEE	LED Street Light (18 Watt) – 15 LED Bulb (7 Watt) – 300	Completed
16	LED Village Campaign	Jubarajnagar	Demonstration Project funded and guided by BEE	LED Street Light (18 Watt) – 15 LED Bulb (7 Watt) – 300	Work in progress
17	LED Village Campaign	Demcherra	Demonstration Project funded and guided by BEE	LED Street Light (18 Watt) – 15 LED Bulb (7 Watt) – 300	Work in progress
18	LED Village Campaign	East Kalaberia	Demonstration Project funded and guided by BEE	LED Street Light (18 Watt) – 15 LED Bulb (7 Watt) – 300	Work in progress