24X7 POWER FOR ALL LAKSHADWEEP ISLANDS

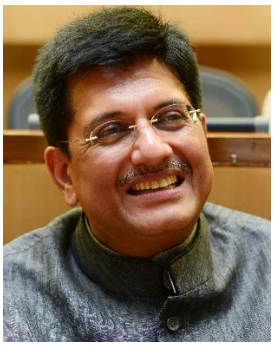
A Joint Initiative of Government of India and Administration of UT of Lakshadweep

सत्यमेव जयते

Government of India

Piyush Goyal

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



Foreword

Electricity consumption is one of the most important 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.

Union Territory of Lakshadweep is an important part of India situated in Arabian Sea and is having main source of power through diesel generation. UT is already providing round the clock power supply in all the inhabited islands but would have to increase the share of renewable energy in the Islands to increase the energy mix.

This joint initiative of Government of India and Administration of Lakshadweep aims to further enhance the satisfaction levels of the consumers and improve the quality of life of people through 24x7 power supply. This would lead to rapid economic development of the state in primary, secondary & tertiary sectors resulting in inclusive development.

I compliment the Administration of U.T. of Lakshadweep and wish them all the best for implementation of this programme and bringing uninterrupted quality power to each household, and other energy consuming establishments in the Lakshadweep Islands.

सत्यमेव जयते

Lakshadweep
Administration

Shri Vijay Kumar, IAS

Administrator, UT of Lakshadweep

Foreword

Power is the lifeline of any growing economy and the availability of reliable and uninterrupted power supply is a crucial determinant for economic growth. I would like to thank the Ministry of Power, Govt. of India for collaborating with the UT of Lakshadweep for implementing the scheme - "Power for All".

The Lakshadweep Power Department is already supplying power round the clock across all inhabited islands and is fully committed to undertake all measures for infrastructural upgradation and measures for efficiency improvements in Generation and Distribution system.

It is our vision to transform Lakshadweep into a model territory with an efficient power supply framework and best in industry standard efficiency parameters. Equally, we are committed to supplement our generating capacity through renewable energy sources including harnessing solar power.

Power for all programme provides us a blueprint and a management tool for undertaking comprehensive reforms in the power sector including the institutional arrangement and financial plan. I am confident that in the next few years, we shall be able to achieve the key objectives set out for us.

Government of India

UT of Lakshadweep Administration

Joint Statement

Lakshadweep is one of the Union Territory selected for "Power for ALL" (PFA) programme. This Programme will be implemented by Administration of Lakshadweep with active support of Government of India, Ministry of Power.

The objective of the programme is to supply 24x7 quality, reliable, uninterrupted and affordable power supply to all consumers within the territory. All unconnected households will be provided electricity as the goal of 100% electrification.

The Administration of UT of Lakshadweep is giving highest priority to power sector of the territory and has created adequate infrastructure to strengthen the power generation, transmission and distribution network of the territory.

The Administration of Lakshadweep would ensure that all the necessary steps outlined in the PFA document are taken up in terms of capacity addition, strengthening the required distribution network, encouraging renewables & energy efficiency measures, implementation of pre-paid metering, reduction of AT & C losses and following good governance practices in implementation of all Central and State Government schemes.

Government of India (GOI) would supplement the efforts of Union Territory through various interventions.

It is envisaged to cover entire territory under PFA programme in a phased manner and provide affordable, reliable and round the clock power supply to all consumers by FY 17 onwards.

The Central Government and Administration of UT of Lakshadweep 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
27/5

Joint Secretary
Ministry of Power (GoI)

Shri Vijay Kumar, IAS

Administrator,
UT of Lakshadweep

EXECUTIVE SUMMARY

24x7- Power for All (24x7 PFA) is a Joint Initiative of Government of India (GoI) and UT Administration with the objective to provide 24x7 power available to all households, industries, commercial businesses, public needs & any other electricity consuming entities and adequate power to agriculture farm holdings by FY 19. This roadmap document aims to meet the above objectives for the UT of Lakshadweep.

The power department of the UT is integrated utility having functions of generation, and distribution. As per department records, presently there are a total of 17,761 domestic consumers, which includes some of the households having multiple connections.

The UT has per capita annual consumption of 657 units in FY 15, which is expected to rise to 962 units in FY 19.

CONNECTING THE UNCONNECTED

As per available records, there are no un-electrified households in the UT at present.

FEEDER SEGREGATION

Keeping in view of the negligible sales in agriculture category, the UT does not have any feeder segregation and also has not estimated any expenditure on this account.

24 X 7 SUPPLY

The UT is already supplying 24 hours supply to all domestic households.

GROWTH IN DEMAND

Since growth in the demand in islands is dependent on various factors which are very different from the mainland, along with the fact that the islands are not physically and electrically connected, historical growth of individual islands have been considered to arrive at the demand of the Lakshadweep Islands as a whole.

For assessing the Island wise energy requirement, the daily household consumption for domestic consumers has been computed and increased with at reasonable CAGR to arrive at the daily household consumption up to FY 19 and accordingly, the energy requirement for domestic consumers are computed.

For other than domestic consumers, individual category-wise growth rate equivalent to the 5 year CAGR has been considered for estimating the energy requirement other than domestic sectors. However separate suitable growth rate has been assumed in categories where there has been abnormal growth due to various one-off reasons.

The maximum demand is projected to grow from present 8.24 MW in FY 15 to 10.85 MW in FY 19 and the average daily household consumption is projected to rise from 4.73 units in FY 16 to 5.50 units in FY 19.

SUPPLY ADEQUACY

The department has planned to install additional DG sets totaling up to 5.80 MW which will take the installed capacity of DG based generation to 26.82 MW and another 6.80 MW of Solar SPVs. With planned addition of DG sets and large scale installation of Solar SPVs, the department has adequate capacity available to meet the increasing demand.

ADEQUACY OF DISTRIBUTION NETWORK

Being an underground system, the overall T&D Losses are nominal i.e. 7.79% in FY 15 which are expected to reduce to 5.78% in FY 19. However, AT&C losses are high i.e. of the order of 21% in FY 15 which are primarily due to the lower collection efficiency. The collection efficiency is now targeted to be improved to a level of 99% in FY 19 thereby bringing them down the AT&C losses from 21.05% in FY 15 to 6.72% in FY 19.

The planned capacity addition in Distribution system (considering maximum loading of 80% and diversity factor of 1.1) is adequate to meet the requirement of 24x7 Power for All by FY 19 in all islands except Chetlat Island.

STRATERGIC INITIATIVES

A proposal of 2 MW Barge Mounted DG set, costing around Rs. 5-10 Crores is being considered for Lakshadweep Islands keeping in view the remoteness of islands and practical constraints of installing and maintaining individual spare capacity for each island.

Another proposal of having additional 50 kWp floating solar plant in Bitra is being considered which will make it 100% Green Island.

The idea of utilizing the biomass, especially coconut waste, which is available in plenty, for economical generation of power to meet a part of growing power demand of islands is also being actively pursued

Another key initiative being taken up by the department is construction of oil storage facilities and shifting of delivery point of Diesel from Cochin to the island, will result in net saving of Rs 1 per litre of HSD (BS III) and Rs 1.46 per litre of HSD (BS IV).

As the Electricity Department of Lakshadweep is primarily reliant on self-meter reading by its consumers (99% are LT Consumers), the utility has to plan for switching to prepaid metering which will help the department in reducing its AT&C losses and improve its realization and also save on manpower requirement.

FINANCIAL ADEQUACY

The UT has planned a capital expenditure of Rs. 19.60 Crores, Rs. 20.55 Crores and Rs. 16.08 Crores from FY 17 to FY 19. The average cost of power generation comes to around Rs 12-13/unit which makes up 73% of the total cost in the ARR. The ACoS in UT of Lakshadweep has ranged around Rs 17/Unit. This high cost of supply makes it very difficult to recover all the cost in ARR and the present average recovery is around Rs 3.5/unit which in turn means the recovery through tariff hovers around 20-22%. More than 99% sales in Lakshadweep is at LT level only, in which Domestic and Commercial Categories constitute more than 97% share, which makes it highly unforeseeable to recover the full cost through tariff hikes.

Therefore, UT is highly dependent on support from Government of India for Electricity Department to meet its cost at present and in future also.

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CHAPTER 1:INTRODUCTION

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

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

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

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

Towards this goal the 24x7 PFA initiative seeks to:

i. Ensure reliable 24x7 supply to consumers within a period of four years of commencement of the program. The hours of supply for agriculture consumers will be decided by the State Government as per requirement.

ii. Ensure that all unconnected households are provided access to electricity in a time bound manner in the next 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 to the expected growth in demand of existing as well as future consumers.

v. Assess the financial measures including optimizing investments and undertaking necessary balance sheet restructuring measures to ensure liquidity in the finances of the utility.

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

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

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

ix. To take measures for meeting the

performance standards as laid down by SERC.

This document is an action plan has been drawn to achieve the above aims and objectives. The plan will be executed by the Administration of Lakshadweep 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 to other consumer categories and determine financial implications on utilities for procuring additional energy and its implication on tariff.

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

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

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 LAKSHADWEEP

Key Facts	
Constituted on	21st January 1972
As per 2011 Census	
Total Area *- Rural* *- Urban*	30 Sq. Km *- 8.05* *- 21.95*
Density of Population	2013 people/Kms
Total islands *-Inhabited Islands*	36 *- 10*
Population *- Rural* *- Urban*	**64,473** *- 14,141* *- 50,332*

Lakshadweep is the tiniest union territory of India and is only coral island chain in the country. This archipelago consists of 36 islands including 12 atolls, 3 reefs and 5 submerged banks. The islands have a total area of 32 sq.km and the lagoons enclosed by the atolls cover an area of 4200 sq.km. Its territorial waters extend to 20,000 sq. km and Exclusive Economic Zone (EEZ) to 4,00,000 sq.km. Only 10 of these islands namely, Agatti, Amini, Andrott, Bitra, Chetlat, Kadmat, Kalpeni, Kavaratti, Kiltan and Minicoy are inhabited. Kavaratti is the administrative headquarters of the union territory. The islands are restricted area and permit from the Administration is required to visit the islands.

Electrification of Lakshadweep Islands was initiated during the Second Five Year Plan. Minicoy was the first island electrified in 1962 followed by Kavaratti Island in 1964, then Amini and Andrott in 1965 and 1966 respectively. Bitra was the last island electrified in 1982. Initially, power supply was limited to 6 - 12 hours till 1982-83 except in Kavaratti where 24 hours power supply was provided from 1964 itself. Round the clock power supply is provided in all the Islands since 1983.

Lakshadweep Electricity Department generates and distributes electricity to consumers round the clock in the entire Lakshadweep Islands and also performs following functions:

- Internal electrification of Govt. buildings
- Implementation of non-conventional energy source projects

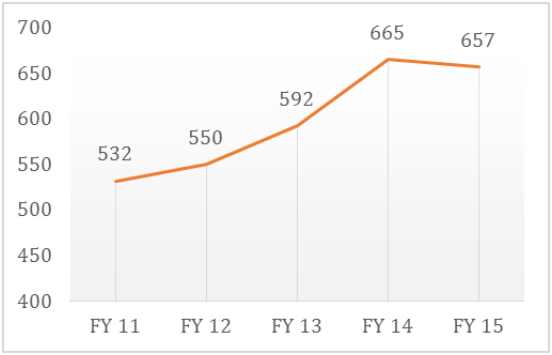
The power sector of state is regulated by Joint Electricity Regulatory Commission (JERC) for the State of Goa and Union Territories.

CHAPTER 3: CONSUMPTION PATTERN AND ELECTRIFICATION STATUS

ELECTRIFICATION STATUS AND PER-CAPITA CONSUMPTION

The population of Lakshadweep Islands has grown from 60,650 in 2001 to 64,473 in 2011 at a decadal CAGR of 0.61%. This growth rate has been considered for estimating the population beyond 2011. Based on the annual energy availability from FY 11 to FY 15, the per-capita consumption of electricity in the period has been as shown below:

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



STATUS OF ELECTRIFICATION AND PROJECTION OF HOUSEHOLDS FOR FY 14

District-wise electrification in urban and rural areas is detailed in Table 57 in Annexure-1.

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

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

Particulars	Electrified Households	Un-Electrified Households	Total Households
Total			
2001	9,213	27	9,240
in %	*99.71%*	*0.29%*	100.00%
2011	10,669	34	10,703
in %	*99.68%*	*0.32%*	100.00%
CAGR	1.48%	2.33%	1.48%
FY 15 (Projected Households)	**12,839**	**42**	**12,881**
Rural			
2001	5,337	14	5,351
in %	99.74%	0.26%	100.00%
2011	2,517	6	2,523
in %	99.76%	0.24%	100.00%
CAGR	-7.24%	-8.12%	-7.24%
FY 15 (Projected Households)	**1,863**	**4**	**1,868**
Urban			
2001	3,876	13	3,889
in %	*99.67%*	*0.33%*	100.00%
2011	8,152	28	8,180
in %	*99.66%*	*0.34%*	100.00%
CAGR	7.72%	7.97%	7.72%
FY 15 (Projected Households)	**10,975**	**38**	**11,013**

From above it is inferred that:

- ***%age of rural households has declined in past decade from 57.91% to 23.57% while the number of urban households has increased from 42.09% to 76.43% during this period.***
- ***There is almost 100% electrification in the Lakshadweep islands.***

The above projected figures, derived by extrapolating Census 2011 data, do not match with the records of the Electricity Department of UT of Lakshadweep for FY 15 which shows that presently there are a total of 17,761 domestic consumers.

This anomaly/discrepancy in figures was discussed with Electricity Department of UT of Lakshadweep wherein it was communicated that the some of the households have multiple connections.

Since growth in the demand in islands is dependent on various factors which are very different from the mainland, along with the fact that the islands are not electrically connected, historical growth of individual islands have been considered to arrive at the demand of the Lakshadweep Islands as a whole.

Accordingly, the demand projections for the state have been worked out in the next chapter.

CHAPTER 4: DEMAND AND SUPPLY SCENARIO

PRESENT POWER SUPPLY POSITION

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

Figure 2: Energy Requirement vs. Availability[1] (in MU)

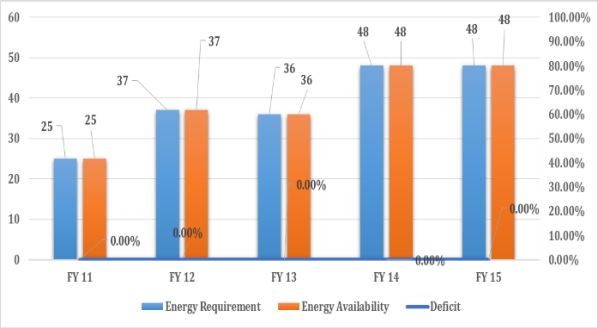
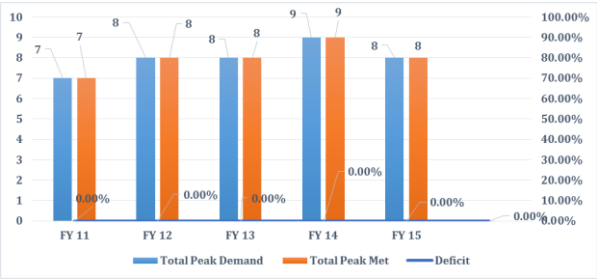


Figure 3: Peak Demand vs. Peak Met (in MW)



- *The demand is 100% met by the Electricity Department of UT of Lakshadweep.*

The demand has not increased substantially over the years owing to fact that there are no major industries and the demand is predominantly due to domestic and commercial consumers only.

As per the UT, in FY 15, the supply was generally of the order of around almost 24 hours only.

DEMAND PROJECTIONS

The present energy requirement of UT of Lakshadweep during FY 15 is 48 MU. With 24x7 supply to be provided across all the islands, the demand is likely to increase. The demand can be classified in two broad categories.

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

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

APPROACH FOR ASSESSMENT OF ADEQUACY

As the islands are not interconnected, island-wise estimation of demand and assessment of network adequacy has been done. The broad approach for assessment is highlighted below:

(1) The daily household consumption has been computed separately to arrive at the daily household consumption up to FY 19.

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

(3) Sales in categories other than household have been considered to increase at the respective CAGRs of past 5 years.

The island wise assessment of power supply scenario is summarized in subsequent chapters.

[1] *As per the data available in the CEA*

CHAPTER 5: POWER SUPPLY –AGATTI ISLAND

ABOUT AGATTI

The Agatti Island is at a distance of 459 km (248 nautical miles) from Kochi and is located the west of Kavaratti Island. It lies between 10°48' and 10°53' N latitude and 72°09' and 7°13' E longitude, having an area of 3.84 square km, with a maximum length of 10 km and width of 1 km. It has a north-east, south-west trend with a long tail on the south. The lagoon area of this island is 17.50 square km.

DEMAND PROJECTIONS

DETERMINATION OF CONSUMPTION OF DOMESTIC CONSUMERS

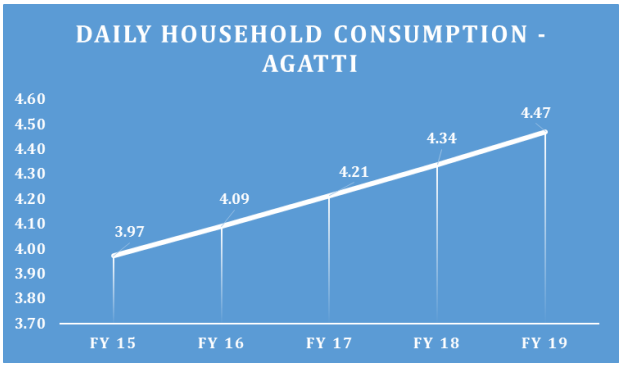
The present energy requirement of Agatti Islands during FY 15 was 5.51 MU. With 24x7 supply to be provided across the island, the demand is likely to increase.

The average daily household consumption of existing electrified households in FY 15 has been arrived at by dividing the actual sales by the actual number of electrified consumers in FY 15 respectively.

The actual daily household consumption of registered domestic consumers has increased from 2.82 kWh in FY 11 to 3.97 kWh in FY 15 at CAGR of 8.97%. However, considering the fact that average increase in daily household consumption is less than 1% last year, and considering the increased availability in past years along with other demographic factors, the daily household consumption has been escalated by 3% only.

The projected daily household consumption in Agatti Island is shown below:

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



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

The number of electrified households is expected to grow at the overall decadal CAGR of 1.48%.

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

Table 2: Projected Sales from Existing and Newly Electrified Households

Particulars	FY 15	FY 16	FY 17	FY 18	FY 19
Electrified Consumers (Existing + Projected Growth)					
Electrified Consumers (in Nos.)	2,342	2,377	2,412	2,448	2,484
Daily Household Consumption (in kWh)	3.97	4.09	4.21	4.34	4.47
Total Projected Domestic Consumption (In MU)	**3.39**	**3.55**	**3.71**	**3.88**	**4.05**

DETERMINATION OF CONSUMPTION OF OTHER CONSUMERS

For projection of sales for FY 16 to FY 19, the CAGR of previous 5 years has been considered for all categories.

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

Table 3: Projected Category-wise Sales (In MU)

Categories	CAGR Considered	Projections			
		FY 16	FY 17	FY 18	FY 19
Domestic		3.55	3.71	3.88	4.05
Commercial	18.36%	1.96	2.32	2.74	3.25
Industrial	3.00%	0.05	0.05	0.05	0.05
Public Lighting	1.08%	0.10	0.10	0.10	0.10
Temporary	10.72%	0.01	0.01	0.01	0.01
Grand Total		**5.66**	**6.18**	**6.78**	**7.46**

ENERGY AND DEMAND REQUIREMENT

MoP has not specified any loss trajectory for AT&C loss reduction for UT of Lakshadweep. Thus a reasonable reduction in line with JERC targets has been taken into account for preparing this roadmap document which is shown in Figure 5. A reduction of 0.1% every year in the T&D losses has been considered in Agatti Island.

Based on the loss reduction trajectory as above, the energy and demand requirement for the future years is tabulated in Table 4 below:

Figure 5: Projected Loss Reduction Trajectory- Agatti Island

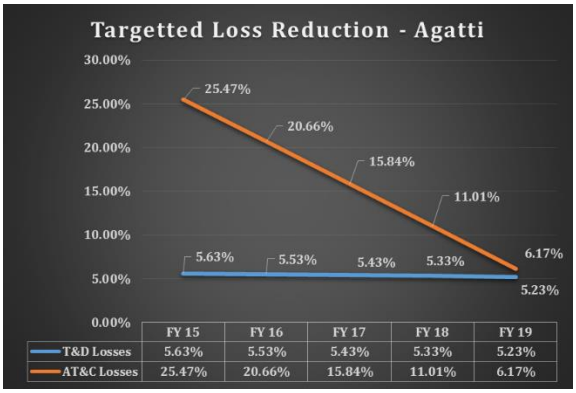


Table 4: Energy Requirement (In MU) and Peak Demand (in MW) – Agatti Island

Particulars	Energy and Demand Scenario			
	FY 16	FY 17	FY 18	FY 19
Sale within State	*5.66*	*6.18*	*6.78*	*7.46*
Distribution Losses	5.53%	5.43%	5.33%	5.23%
Total Energy Requirement within Island	**5.99**	**6.54**	**7.16**	**7.88**
Load Factor	*64.18%*	*64.18%*	*64.18%*	*64.18%*
Maximum Demand – Agatti Island	**1.07**	**1.16**	**1.27**	**1.40**

As seen from the above, the maximum demand requirement of the Agatti Islands is projected to increase from 0.98 MW in FY 15 to **1.40 MW in FY 19** assuming an unchanged annual load factor of 64.18% as per actual information for FY 15.

Adoption of various energy efficiency measures like energy efficient lighting (use of LEDs) would also help in reducing the peak demand of the state.

GENERATION PLAN

The total installed capacity in Agatti Island as on 31st March 2015 is 2.55 MW which included 2.45 MW of DG Sets and 0.10 MW of SPV plant. Further 1.75 MW capacity addition (0.75 MW DG and 1 MW solar) has been planned to be added by FY 19.

However, the existing capacities of DG sets have derated over passage of time.

The total existing and upcoming generation up to FY 19 in Agatti Island is detailed in Table 5 below:

ADEQUACY OF GENERATION AND DISTRIBUTION SYSTEM

An assessment of the adequacy of generation and distribution infrastructure for meeting the projected annual energy demand of 7.88 MU and peak demand of around 1.40 MW is shown below:

Table 5: Capacity Availability from various Sources in Agatti Island (in MW)

Source	Commissioning	Installed Capacity (MW)	Derated Capacity Available (in MW)			
			FY 16	FY 17	FY 18	FY 19
DG Sets Existing						
New 1 X 500	*03-12-2008*	0.50	0.30	0.30	0.30	0.30
New 1 X 400	*06-12-2008*	0.40	0.30	0.30	0.30	0.30
New 1 X 400	*25-08-2011*	0.40	0.30	0.30	0.30	0.30
New 1 X 750	*10-01-2013*	0.75	0.65	0.65	0.65	0.65
Old 1 X 400	*09-03-1998*	0.40	0.18	0.18	0.18	0.18
DG Sets Upcoming						
New DG Set	*FY 18*	0.75			0.75	0.75
Solar Existing						
SPV Plants	*Commissioned*	0.10	0.10	0.10	0.10	0.10
Solar Upcoming						
New SPV Plants	*FY 19*	1.00				1.00
Total		**4.30**	**1.83**	**1.83**	**2.58**	**3.58**

Table 6: Assessment of adequacy of Generation and Distribution in Agatti Island

Particulars	FY 16	FY 17	FY 18	FY 19
Generation Adequacy				
Total Energy Requirement within Island	5.99	6.54	7.16	7.88
Maximum Energy Availability from Own Generation (In MU)	7.25	7.25	10.49	11.49
Adequacy of Generation	**Adequate**	**Adequate**	**Adequate**	**Adequate**
Additional Energy Generation Required (in MU)	0.00	0.00	0.00	0.00
Additional Capacity Required (40% PLF) on RTC Basis	**0.00**	**0.00**	**0.00**	**0.00**
Sub-Transmission (Step-up) Adequacy				
Existing Transformation Capacity (in MVA)	*2.00*	*2.00*	*2.00*	*2.00*
Planned Transformation Capacity (in MVA)	*0.00*	*1.00*	*1.00*	*1.00*
Total Transformation Capacity - Installed (in MVA)	**2.00**	**3.00**	**3.00**	**3.00**
Total Transformation Capacity - Required (in MVA)#	**1.33**	**1.45**	**1.59**	**1.75**
Adequacy of Sub-Transmission System	**Adequate**	**Adequate**	**Adequate**	**Adequate**
Additional Transformation Capacity Required (in MVA)	0.00	0.00	0.00	0.00
Distribution (Step-Down) Adequacy				
Existing Transformation Capacity (in MVA)	*1.60*	*1.60*	*1.60*	*1.60*
Planned Transformation Capacity (in MVA)	*0.00*	*0.50*	*0.50*	*1.00*
Total Transformation Capacity - Installed (in MVA)	**1.60**	**2.10**	**2.10**	**2.60**
Total Transformation Capacity - Required (in MVA)#	**1.47**	**1.60**	**1.75**	**1.93**
Adequacy of Distribution (Step-Down) System	**Adequate**	**Adequate**	**Adequate**	**Adequate**
Additional Transformation Capacity Required (in MVA)	0.00	0.00	0.00	0.00

 # Considering 10% Load catered directly through DG Sets

It is evident from above table that the planned capacity addition in Generation, Sub-Transmission (considering maximum loading of 80%) and Distribution (considering maximum loading of 80% and diversity factor of 1.1) is adequate to meet the requirement of 24x7 Power for All by FY 19 in Agatti Island.

CHAPTER 6:POWER SUPPLY –AMINI ISLAND

ABOUT AMINI

The Amini Island is at a distance of 407 km (220 nautical miles) from Kochi and located between Kavaratti Island in the south and Kadmat Island in the north. This island has an oval shape with a width of 1.20 km at the broadest point and a length of 2.70 km. It lies between 11° 06' and 11° 08' N latitude and 72° 42' and 72° 45' E longitude, having a land area of 2.60 square km and lagoon area of 1.50 square km.

DEMAND PROJECTIONS

DETERMINATION OF CONSUMPTION OF DOMESTIC CONSUMERS

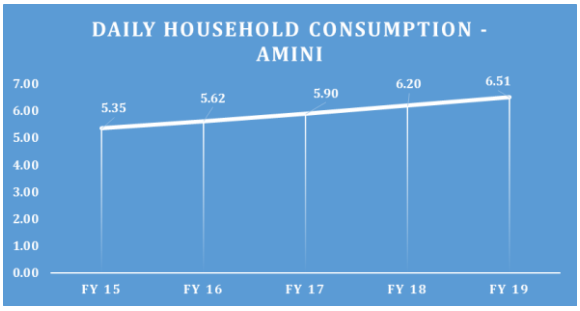
The present energy requirement of Amini Islands during FY 15 was 4.78 MU. With 24x7 supply to be provided across the island, the demand is likely to increase.

The average daily household consumption of existing electrified households in FY 15 has been arrived at by dividing the actual sales by the actual number of electrified consumers in FY 15 respectively.

The actual daily household consumption of registered domestic consumers has increased from 3.60 kWh in FY 11 to 5.35 kWh in FY 15 at CAGR of 10.43%. However, considering the fact that average increase in daily household consumption is also more than 10% last year, and considering the increased availability in past years along with other demographic factors, the daily household consumption has been escalated by 5%.

The projected daily household consumption in Amini Island is shown below:

Figure 6: Projected Daily Household Consumption Electricity (kWh per person) for future years



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

The number of electrified households is expected to grow at the overall decadal CAGR of 1.48%.

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

Table 7: Projected Sales from Existing and Newly Electrified Households

Particulars	FY 15	FY 16	FY 17	FY 18	FY 19
Electrified Consumers (Existing + Projected Growth)					
Electrified Consumers (in Nos.)	1,984	2,013	2,043	2,073	2,104
Daily Household Consumption (in kWh)	5.35	5.62	5.90	6.20	6.51
Total Projected Domestic Consumption (In MU)	**3.88**	**4.13**	**4.40**	**4.69**	**5.00**

DETERMINATION OF CONSUMPTION OF OTHER CONSUMERS

For projection of sales for FY 16 to FY 19, the

CAGR of previous 5 years has been considered for all categories.

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

Table 8: Projected Category-wise Sales (In MU)

Categories	CAGR Considered	Projections			
		FY 16	FY 17	FY 18	FY 19
Domestic		4.13	4.40	4.69	5.00
Commercial	13.65%	0.73	0.82	0.94	1.07
Industrial	9.77%	0.06	0.06	0.07	0.07
Public Lighting	10.98%	0.11	0.12	0.13	0.15
Temporary	16.70%	0.00	0.01	0.01	0.01
Grand Total		**5.03**	**5.41**	**5.83**	**6.29**

ENERGY AND DEMAND REQUIREMENT

MoP has not specified any loss trajectory for AT&C loss reduction. Thus a reasonable reduction in line with JERC targets has been taken into account for preparing this roadmap document which is shown in Figure 7. No Reduction in the T&D losses have been considered as the losses are already at a very nominal level.

Based on the loss reduction trajectory as above, the energy and demand requirement for the future years is tabulated in **Table 9** below:

Figure 7: Projected Loss Reduction Trajectory- Amini Island

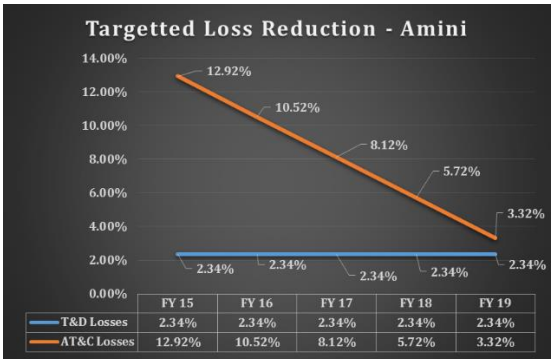


Table 9: Energy Requirement (In MU) and Peak Demand (in MW) – Amini Island

Particulars	Energy and Demand Scenario			
	FY 16	FY 17	FY 18	FY 19
Sale within State	*5.03*	*5.41*	*5.83*	*6.29*
Distribution Losses	2.34%	2.34%	2.34%	2.34%
Total Energy Requirement within Island	**5.15**	**5.54**	**5.97**	**6.44**
Load Factor	*68.21%*	*68.21%*	*68.21%*	*68.21%*
Maximum Demand – Amini Island	**0.86**	**0.93**	**1.00**	**1.08**

As seen from the above, the maximum demand requirement of the Amini Islands is projected to increase from 0.80 MW in FY 15 to **1.08 MW in FY 19** assuming an unchanged annual load factor of 68.21% as per actual information for FY 15.

Adoption of various energy efficiency measures like energy efficient lighting (use of LEDs) would also help in reducing the peak demand of the state.

GENERATION PLAN

The total installed capacity in Amini Island as on 31st March 2015 is 2.75 MW which included 2.65 MW of DG Sets and 0.10 MW of SPV plant. Further 1.75 MW capacity (0.75 DG +1 MW solar) has been planned to be added by FY 19. However, the existing capacities of DG sets have derated over passage of time.

The total existing and upcoming generation

up to FY 19 in Amini Island is detailed in Table 10 below:

ADEQUACY OF GENERATION AND DISTRIBUTION SYSTEM

An assessment of the adequacy of generation and distribution infrastructure for meeting the projected annual energy demand of 6.44 MU and peak demand of around 1.08 MW is shown below:

Table 10: Capacity Availability from various Sources in Amini Island (in MW)

Source	Commissioning	Installed Capacity (MW)	Derated Capacity Available in MW			
			FY 16	FY 17	FY 18	FY 19
DG Sets Existing						
New 1 X 750	*31-08-2008*	0.75	0.60	0.55	0.55	0.55
New 1 X 750	*04-04-2010*	0.75	0.60	0.55	0.55	0.55
New 1 X 750	*12-09-2013*	0.75	0.60	0.55	0.55	0.55
Old 1 X 400	*22-05-1998*	0.40	0.20	0.18	0.18	0.18
DG Sets Upcoming						
New DG Set	*FY 18*	0.75			0.75	0.75
Solar Existing						
SPV Plants	*Commissioned*	0.10	0.10	0.10	0.10	0.10
Solar Existing						
New SPV Plants	*FY 18*	1.00			1.00	1.00
Total		**4.50**	**2.10**	**1.93**	**3.68**	**3.68**

Table 11: Assessment of adequacy of Generation and Distribution in Amini Island

Particulars	FY 16	FY 17	FY 18	FY 19
Generation Adequacy				
Total Energy Requirement within Island	5.15	5.54	5.97	6.44
Maximum Energy Availability from Own Generation (In MU)	8.38	7.68	11.92	11.92
Adequacy of Generation	**Adequate**	**Adequate**	**Adequate**	**Adequate**
Additional Energy Generation Required (in MU)	0.00	0.00	0.00	0.00
Additional Capacity Required (40% PLF) on RTC Basis	**0.00**	**0.00**	**0.00**	**0.00**
Sub-Transmission (Step-up) Adequacy				
Existing Transformation Capacity (in MVA)	*1.00*	*1.00*	*1.00*	*1.00*
Planned Transformation Capacity (in MVA)	*0.00*	*0.00*	*1.00*	*1.00*
Total Transformation Capacity - Installed (in MVA)	**1.00**	**1.00**	**2.00**	**2.00**
Total Transformation Capacity - Required (in MVA)#	**1.08**	**1.16**	**1.25**	**1.35**
Adequacy of Sub-Transmission System	**Inadequate $**	**Inadequate $**	**Adequate**	**Adequate**
Additional Transformation Capacity Required (in MVA)	0.08	0.16	0.00	0.00
Distribution (Step-Down) Adequacy				
Existing Transformation Capacity (in MVA)	*1.30*	*1.30*	*1.30*	*1.30*
Planned Transformation Capacity (in MVA)	*0.00*	*0.00*	*0.75*	*0.75*
Total Transformation Capacity - Installed (in MVA)	**1.30**	**1.30**	**2.05**	**2.05**
Total Transformation Capacity - Required (in MVA)#	**1.18**	**1.28**	**1.37**	**1.48**
Adequacy of Distribution (Step-Down) System	**Adequate**	**Adequate**	**Adequate**	**Adequate**
Additional Transformation Capacity Required (in MVA)	0.00	0.00	0.00	0.00

 # Considering 10% Load catered directly through DG Sets

$ Transformers will be loaded to the extent of 95% to supply full load.

It is evident from above table that the planned capacity addition in Generation, Sub-Transmission (considering maximum loading of 80%) and Distribution (considering maximum loading of 80% and diversity factor of 1.1) is adequate to meet the requirement of 24x7 Power for All by FY 19 in Amini Island.

CHAPTER 7:POWER SUPPLY –ANDROTH ISLAND

ABOUT ANDROTH

The Androth Island is the largest island with an area of 4.90 sq km, length of 4.66 km and a maximum width of 1.43 km. It lies in the east-west direction, between 10° 48' and 10° 50' N latitude and 73° 38' and 73° 42' E longitude. It is 119 km (64 nautical miles) away from Kavaratti and 293 km (158 nautical miles) away from Kochi. It is the only island having a very small lagoon area.

DEMAND PROJECTIONS

DETERMINATION OF CONSUMPTION OF DOMESTIC CONSUMERS

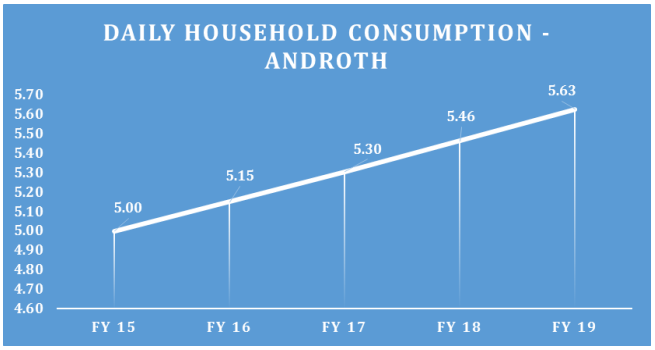
The present energy requirement of Androth Islands during FY 15 was 6.84 MU. With 24x7 supply to be provided across the island, the demand is likely to increase.

The average daily household consumption of existing electrified households in FY 15 has been arrived at by dividing the actual sales by the actual number of electrified consumers in FY 15 respectively.

The actual daily household consumption of registered domestic consumers has increased from 2.89 kWh in FY 11 to 5.00 kWh in FY 15 at CAGR of 14.69%. However, considering the fact that average increase in daily household consumption is less than 1% last year, and considering the increased availability in past years along with other demographic factors, the daily household consumption has been escalated by 3% only.

The projected daily household consumption in Androth Island is shown below:

Figure 8: Projected Daily Household Consumption Electricity (kWh per person) for future years



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

The number of electrified households is expected to grow at the overall decadal CAGR of 1.48%.

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

Table 12: Projected Sales from Existing and Newly Electrified Households

Particulars	FY 15	FY 16	FY 17	FY 18	FY 19
Electrified Consumers (Existing + Projected Growth)					
Electrified Consumers (in Nos.)	2,945	2,989	3,033	3,078	3,123
Daily Household Consumption (in kWh)	5.00	5.15	5.30	5.46	5.63
Total Projected Domestic Consumption (In MU)	**5.37**	**5.62**	**5.87**	**6.14**	**6.41**

DETERMINATION OF CONSUMPTION OF OTHER CONSUMERS

For projection of sales for FY 16 to FY 19, the CAGR of previous 5 years has been considered for all categories.

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

Table 13: Projected Category-wise Sales (In MU)

Categories	CAGR Considered	Projections			
		FY 16	FY 17	FY 18	FY 19
Domestic		5.62	5.87	6.14	6.41
Commercial	10.17%	1.05	1.16	1.28	1.41
Industrial	25.56%	0.17	0.21	0.26	0.33
Public	0.00%	0.06	0.06	0.06	0.06
Temporary	8.02%	0.01	0.01	0.02	0.02
Grand Total		**6.91**	**7.31**	**7.75**	**8.23**

ENERGY AND DEMAND REQUIREMENT

MoP has not specified any loss trajectory for AT&C loss reduction. Thus a reasonable reduction in line with JERC targets has been taken into account for preparing this roadmap document which is shown in Figure 7. No Reduction in the T&D losses have been considered as the losses are already at a very nominal level.

Based on the loss reduction trajectory as above, the energy and demand requirement for the future years is tabulated in **Table 9** below:

Figure 9: Projected Loss Reduction Trajectory- Androth Island

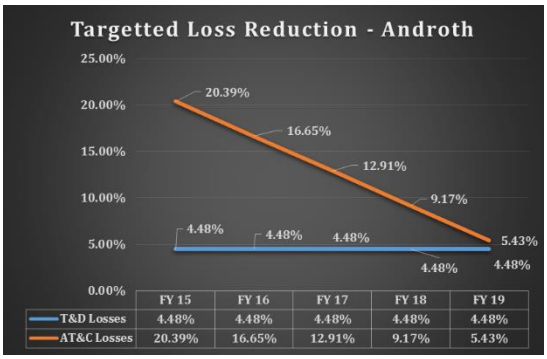


Table 14: Energy Requirement (In MU) and Peak Demand (in MW) – Androth Island

Particulars	Energy and Demand Scenario			
	FY 16	FY 17	FY 18	FY 19
Sale within State	*6.91*	*7.31*	*7.75*	*8.23*
Distribution Losses	4.48%	4.48%	4.48%	4.48%
Total Energy Requirement within Island	**7.23**	**7.66**	**8.12**	**8.61**
Load Factor	*66.34%*	*66.34%*	*66.34%*	*66.34%*
Maximum Demand – Androth Island	**1.24**	**1.32**	**1.40**	**1.48**

As seen from the above, the maximum demand requirement of the Androth Islands is projected to increase from 1.18 MW in FY 15 to **1.48 MW in FY 19** assuming an unchanged annual load factor of 66.34% as per actual information for FY 15.

Adoption of various energy efficiency measures like energy efficient lighting (use of LEDs) would also help in reducing the peak demand of the state.

GENERATION PLAN

The total installed capacity in Androth Island as on 31st March 2015 is 2.57 MW which included 2.25 MW of DG Sets and 0.32 MW of SPV plant. Further 1.00 MW capacity has been planned to be added by FY 19. However, the existing capacities of DG sets have derated over passage of time.

The total existing and upcoming generation

up to FY 19 in Androth Island is detailed in Table 15 below:

ADEQUACY OF GENERATION AND DISTRIBUTION SYSTEM

An assessment of the adequacy of generation and distribution infrastructure for meeting the projected annual energy demand of 6.44 MU and peak demand of around 1.08 MW is shown below:

Table 15: Capacity Availability from various Sources in Androth Island (in MW)

Source	Commissioning	Installed Capacity (MW)	Derated Capacity Available in MW			
			FY 16	FY 17	FY 18	FY 19
DG Sets Existing						
New 1 X 750	*13-07-2007*	0.75	0.60	0.55	0.55	0.55
New 1 X 750	*21-11-2007*	0.75	0.60	0.55	0.55	0.55
New 1 X 750	*30-01-2013*	0.75	0.60	0.55	0.55	0.55
DG Sets Upcoming						
New DG Set	*FY 17*	1.00		1.00	1.00	1.00
Solar Existing						
SPV Plants	*Commissioned*	0.32	0.32	0.32	0.32	0.32
Solar Upcoming						
New SPV Plants		0.00			0.00	0.00
Total		**3.57**	**2.12**	**2.97**	**2.97**	**2.97**

Table 16: Assessment of adequacy of Generation and Distribution in Androth Island

Particulars	FY 16	FY 17	FY 18	FY 19
Generation Adequacy				
Total Energy Requirement within Island	7.23	7.66	8.12	8.61
Maximum Energy Availability from Own Generation (In MU)	8.09	11.75	11.75	11.75
Adequacy of Generation	**Adequate**	**Adequate**	**Adequate**	**Adequate**
Additional Energy Generation Required (in MU)	0.00	0.00	0.00	0.00
Additional Capacity Required (40% PLF) on RTC Basis	**0.00**	**0.00**	**0.00**	**0.00**
Sub-Transmission (Step-up) Adequacy				
Existing Transformation Capacity (in MVA)	*4.50*	*4.50*	*4.50*	*4.50*
Planned Transformation Capacity (in MVA)	*0.00*	*0.00*	*0.00*	*0.00*
Total Transformation Capacity - Installed (in MVA)	**4.50**	**4.50**	**4.50**	**4.50**
Total Transformation Capacity - Required (in MVA)#	**1.56**	**1.65**	**1.75**	**1.85**
Adequacy of Sub-Transmission System	**Adequate**	**Adequate**	**Adequate**	**Adequate**
Additional Transformation Capacity Required (in MVA)	0.00	0.00	0.00	0.00
Distribution (Step-Down) Adequacy				
Existing Transformation Capacity (in MVA)	*2.56*	*2.56*	*2.56*	*2.56*
Planned Transformation Capacity (in MVA)	*0.00*	*0.25*	*0.50*	*1.00*
Total Transformation Capacity - Installed (in MVA)	**2.56**	**2.81**	**3.06**	**3.56**
Total Transformation Capacity - Required (in MVA)#	**1.71**	**1.81**	**1.92**	**2.04**
Adequacy of Distribution (Step-Down) System	**Adequate**	**Adequate**	**Adequate**	**Adequate**
Additional Transformation Capacity Required (in MVA)	0.00	0.00	0.00	0.00

 # Considering 10% Load catered directly through DG Sets

It is evident from above table that the planned capacity addition in Generation, Sub-Transmission (considering maximum loading of 80%) and Distribution (considering maximum loading of 80% and diversity factor of 1.1) is adequate to meet the requirement of 24x7 Power for All by FY 19 in Androth Island.

CHAPTER 8: POWER SUPPLY –BITRA ISLAND

ABOUT BITRA

The Bitra Island is the smallest inhabited island in the territory having a land area of 0.105 square km. It has a length of 0.57 km and a width of 0.28 km at the broadest point. This is at a distance of 483 km (261 nautical miles) from Kochi. The island is located at 11° 36' N I and 72° 11' E longitude. Though the land area is small, its lagoon area is 45.61 square km.

DEMAND PROJECTIONS

DETERMINATION OF CONSUMPTION OF DOMESTIC CONSUMERS

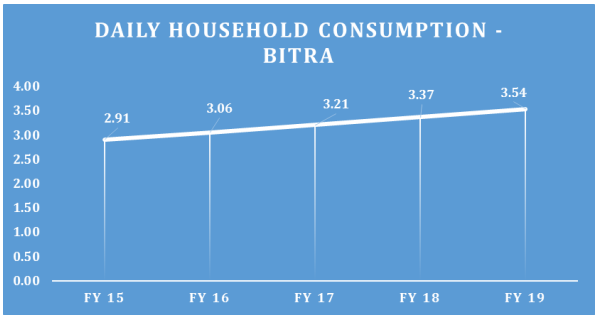
The present energy requirement of Bitra Islands during FY 15 was 0.22 MU. With 24x7 supply to be provided across the island, the demand is likely to increase.

The average daily household consumption of existing electrified households in FY 15 has been arrived at by dividing the actual sales by the actual number of electrified consumers in FY 15 respectively.

The actual daily household consumption of registered domestic consumers has increased from 2.01 kWh in FY 11 to 2.91 kWh in FY 15 at CAGR of 9.70%. However, considering the fact that average increase in daily household consumption is more than 10% last year, and considering the increased availability in past years along with other demographic factors, the daily household consumption has been escalated by 5%.

The projected daily household consumption in Bitra Island is shown below:

Figure 10: Projected Daily Household Consumption Electricity (kWh per person) for future years



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

The number of electrified households is expected to grow at the overall decadal CAGR of 1.48%.

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

Table 17: Projected Sales from Existing and Newly Electrified Households

Particulars	FY 15	FY 16	FY 17	FY 18	FY 19
Electrified Consumers (Existing + Projected Growth)					
Electrified Consumers (in Nos.)	128	130	132	134	136
Daily Household Consumption (in kWh)	2.91	3.06	3.21	3.37	3.54
Total Projected Domestic Consumption (In MU)	**0.14**	**0.14**	**0.15**	**0.16**	**0.18**

DETERMINATION OF CONSUMPTION OF OTHER CONSUMERS

For projection of sales for FY 16 to FY 19, the CAGR of previous 5 years has been considered for all categories.

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

Table 18: Projected Category-wise Sales (In MU)

Categories	CAGR Considered	Projections			
		FY 16	FY 17	FY 18	FY 19
Domestic		0.14	0.15	0.16	0.18
Commercial	0.00%	0.08	0.08	0.08	0.08
Industrial	0.00%	0.00	0.00	0.00	0.00
Public Lighting	0.00%	0.00	0.00	0.00	0.00
Temporary	0.00%	0.00	0.00	0.00	0.00
Grand Total		**0.23**	**0.24**	**0.25**	**0.26**

ENERGY AND DEMAND REQUIREMENT

MoP has not specified any loss trajectory for AT&C loss reduction. Thus a reasonable reduction in line with JERC targets has been taken into account for preparing this roadmap document which is shown in Figure 11. No Reduction in the T&D losses have been considered as the losses are already at a very nominal level.

Based on the loss reduction trajectory as above, the energy and demand requirement for the future years is tabulated in Table 19 below:

Figure 11: Projected Loss Reduction Trajectory- Bitra Island

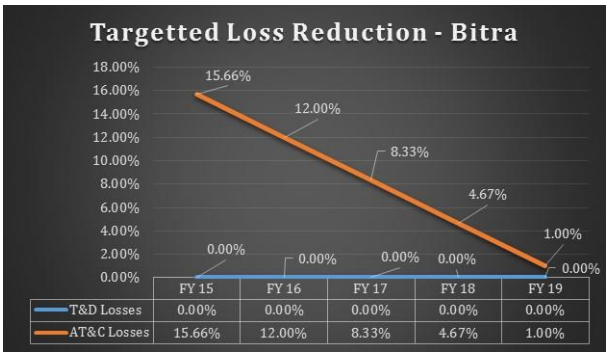


Table 19: Energy Requirement (In MU) and Peak Demand (in MW) – Bitra Island

Particulars	Energy and Demand Scenario			
	FY 16	FY 17	FY 18	FY 19
Sale within State	*0.23*	*0.24*	*0.25*	*0.26*
Distribution Losses	0.00%	0.00%	0.00%	0.00%
Total Energy Requirement within Island	**0.23**	**0.24**	**0.25**	**0.26**
Load Factor	*50.65%*	*50.65%*	*50.65%*	*50.65%*
Maximum Demand – Bitra Island	**0.05**	**0.05**	**0.06**	**0.06**

As seen from the above, the maximum demand requirement of the Bitra Islands is projected to increase from 0.05 MW in FY 15 to **0.06 MW in FY 19** assuming an unchanged annual load factor of 50.65% as per actual information for FY 15.

Adoption of various energy efficiency measures like energy efficient lighting (use of LEDs) would also help in reducing the peak demand of the state.

GENERATION PLAN

The total installed capacity in Bitra Island as on 31st March 2015 is 2.57 MW which included 2.25 MW of DG Sets and 0.32 MW of SPV plant. Further Nil capacity has been planned to be added by FY 19. However, the existing capacities of DG sets have derated over passage of time.

The total existing and upcoming generation

up to FY 19 in Bitra Island is detailed in Table 20 below:

ADEQUACY OF GENERATION AND DISTRIBUTION SYSTEM

An assessment of the adequacy of generation and distribution infrastructure for meeting the projected annual energy demand of 0.26 MU and peak demand of around 0.06 MW is shown below:

Table 20: Capacity Availability from various Sources in Bitra Island (in MW)

Source	Commissioning	Installed Capacity (MW)	Derated Capacity Available in MW			
			FY 16	FY 17	FY 18	FY 19
DG Sets Existing						
New 1 X 100	*28-02-2013*	0.10	0.08	0.08	0.08	0.08
Old 1 X 50	*31-08-2003*	0.05	0.03	0.03	0.03	0.03
Old 1 X 50	*30-08-2003*	0.05	0.03	0.03	0.03	0.03
Old 1 X 320	*30-12-2012*	0.32	0.25	0.25	0.25	0.25
DG Sets Upcoming						
New DG Set		0.00			0.00	0.00
Solar Existing						
SPV Plants	*Commissioned*	0.10	0.10	0.10	0.10	0.10
Solar Upcoming						
New SPV Plants		0.00			0.00	0.00
Total		**0.62**	**0.48**	**0.48**	**0.48**	**0.48**

Table 21: Assessment of adequacy of Generation and Distribution in Bitra Island

Particulars	FY 16	FY 17	FY 18	FY 19
Generation Adequacy				
Total Energy Requirement within Island	0.23	0.24	0.25	0.26
Maximum Energy Availability from Own Generation (In MU)	1.22	1.22	1.22	1.22
Adequacy of Generation	**Adequate**	**Adequate**	**Adequate**	**Adequate**
Additional Energy Generation Required (in MU)	0.00	0.00	0.00	0.00
Additional Capacity Required (40% PLF) on RTC Basis	**0.00**	**0.00**	**0.00**	**0.00**
Sub-Transmission (Step-up) Adequacy				
Existing Transformation Capacity (in MVA)	Not Required as supply is directly done from generator to the Consumers owing to very less connected load			
Planned Transformation Capacity (in MVA)				
Total Transformation Capacity - Installed (in MVA)				
Total Transformation Capacity - Required (in MVA)				
Adequacy of Sub-Transmission System				
Additional Transformation Capacity Required (in MVA)				
Distribution (Step-Down) Adequacy				
Existing Transformation Capacity (in MVA)	Not Required as supply is directly done from generator to the Consumers owing to very less connected load			
Planned Transformation Capacity (in MVA)				
Total Transformation Capacity - Installed (in MVA)				
Total Transformation Capacity - Required (in MVA)				
Adequacy of Distribution (Step-Down) System				
Additional Transformation Capacity Required (in MVA)				

It is evident from above table that the planned capacity addition in Generation, Sub-Transmission (considering maximum loading of 80%) and Distribution (considering maximum loading of 80% and diversity factor of 1.1) is adequate to meet the requirement of 24x7 Power for All by FY 19 in Bitra Island.

CHAPTER 9: POWER SUPPLY –CHETLAT ISLAND

ABOUT CHETLAT

The Chetlat Island is 56 km on the north of the Amini and 432 km (233 nautical miles) away from Kochi. It lies between 11° 41' and 11° 43' N latitude and 72° 41' and 72° 43' E longitude having an area of 1.40 square km. Along the eastern side of the island, there is a wide belt of coral delta formed by storms, which broadens at the north and covers the whole southern end of the island.

DEMAND PROJECTIONS

DETERMINATION OF CONSUMPTION OF DOMESTIC CONSUMERS

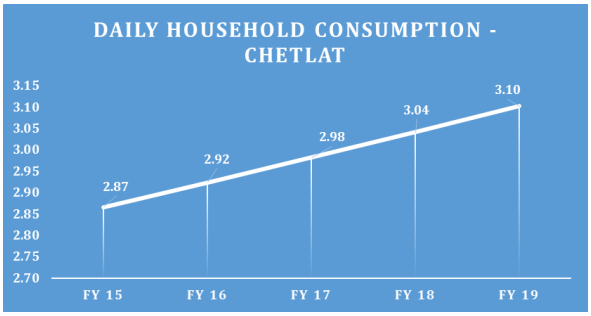
The present energy requirement of Chetlat Islands during FY 15 was 1.47 MU. With 24x7 supply to be provided across the island, the demand is likely to increase.

The average daily household consumption of existing electrified households in FY 15 has been arrived at by dividing the actual sales by the actual number of electrified consumers in FY 15 respectively.

The actual daily household consumption of registered domestic consumers has increased from 1.81 kWh in FY 11 to 2.87 kWh in FY 15 at CAGR of 12.21%. However, considering the fact that average increase in daily household consumption is less than 1% last year, and considering the increased availability in past years along with other demographic factors, the daily household consumption has been escalated by 2% only.

The projected daily household consumption in Chetlat Island is shown below:

Figure 12: Projected Daily Household Consumption Electricity (kWh per person) for future years



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

The number of electrified households is expected to grow at the overall decadal CAGR of 1.48%.

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

Table 22: Projected Sales from Existing and Newly Electrified Households

Particulars	FY 15	FY 16	FY 17	FY 18	FY 19
Electrified Consumers (Existing + Projected Growth)					
Electrified Consumers (in Nos.)	1,002	1,017	1,032	1,047	1,063
Daily Household Consumption (in kWh)	2.87	2.92	2.98	3.04	3.10
Total Projected Domestic Consumption (In MU)	**1.05**	**1.08**	**1.12**	**1.16**	**1.20**

DETERMINATION OF CONSUMPTION OF OTHER CONSUMERS

For projection of sales for FY 16 to FY 19, the CAGR of previous 5 years has been considered for all categories.

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

Table 23: Projected Category-wise Sales (In MU)

Categories	CAGR Considered	Projections			
		FY 16	FY 17	FY 18	FY 19
Domestic		1.08	1.12	1.16	1.20
Commercial	9.86%	0.29	0.32	0.35	0.39
Industrial	8.79%	0.01	0.01	0.01	0.01
Public Lighting	0.00%	0.02	0.02	0.02	0.02
Temporary	37.62%	0.00	0.00	0.01	0.01
Grand Total		**1.41**	**1.48**	**1.55**	**1.63**

ENERGY AND DEMAND REQUIREMENT

MoP has not specified any loss trajectory for AT&C loss reduction. Thus a reasonable reduction in line with JERC targets has been taken into account for preparing this roadmap document which is shown in Figure 13. A reduction of 0.25% in the T&D losses have been considered as the losses are already at a very nominal level.

Based on the loss reduction trajectory approved as above, the energy and demand requirement for the future years is tabulated in Table 24 below:

Figure 13: Projected Loss Reduction Trajectory- Chetlat Island

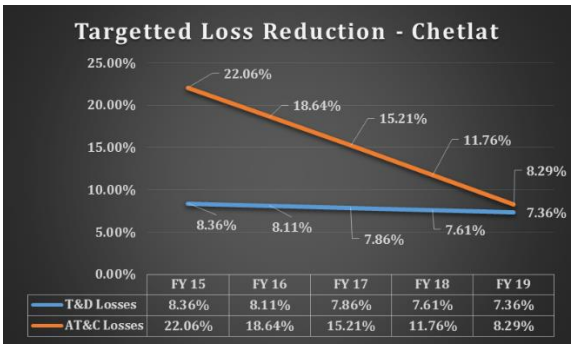


Table 24: Energy Requirement (In MU) and Peak Demand (in MW) – Chetlat Island

Particulars	Energy and Demand Scenario			
	FY 16	FY 17	FY 18	FY 19
Sale within State	*1.41*	*1.48*	*1.55*	*1.63*
Distribution Losses	8.11%	7.86%	7.61%	7.36%
Total Energy Requirement within Island	**1.54**	**1.61**	**1.68**	**1.76**
Load Factor	*45.85%*	*45.85%*	*45.85%*	*45.85%*
Maximum Demand – Chetlat Island	**0.38**	**0.40**	**0.42**	**0.44**

As seen from the above, the maximum demand requirement of the Chetlat Islands is projected to increase from 0.37 MW in FY 15 to **0.44 MW in FY 19** assuming an unchanged annual load factor of 45.85% as per actual information for FY 15.

Adoption of various energy efficiency measures like energy efficient lighting (use of LEDs) would also help in reducing the peak demand of the state.

GENERATION PLAN

The total installed capacity in Chetlat Island as on 31st March 2015 is 1.10 MW which included 1.00 MW of DG Sets and 0.10 MW of SPV plant. Further Nil capacity has been planned to be added by FY 19. However, the existing capacities of DG sets have derated over passage of time.

The total existing and upcoming generation

up to FY 19 in Chetlat Island is detailed in Table 15 below:

ADEQUACY OF GENERATION AND DISTRIBUTION SYSTEM

An assessment of the adequacy of generation and distribution infrastructure for meeting the projected annual energy demand of 1.76 MU and peak demand of around 0.44 MW is shown below:

Table 25: Capacity Availability from various Sources in Chetlat Island (in MW)

Source	Commissioning	Capacity (MW)	Derated Capacity Available in MW			
			FY 16	FY 17	FY 18	FY 19
DG Sets Existing						
New 1 X 250	*10-02-2012*	0.25	0.18	0.18	0.16	0.16
New 1 X 250	*11-02-2012*	0.25	0.18	0.18	0.16	0.16
New 1 X 500	*12-02-2013*	0.50	0.40	0.40	0.35	0.35
DG Sets Upcoming						
New DG Set		0.00		0.00	0.00	0.00
Solar Existing						
SPV Plants	*Commissioned*	0.10	0.10	0.10	0.10	0.10
Solar Upcoming						
New SPV Plants		0.00		0.00	0.00	0.00
Total		**1.10**	**0.85**	**0.85**	**0.77**	**0.77**

Table 26: Assessment of adequacy of Generation and Distribution in Chetlat Island

Particulars	FY 16	FY 17	FY 18	FY 19
Generation Adequacy				
Total Energy Requirement within Island	1.54	1.61	1.68	1.76
Maximum Energy Availability from Own Generation (In MU)	3.34	3.34	2.99	2.99
Adequacy of Generation	**Adequate**	**Adequate**	**Adequate**	**Adequate**
Additional Energy Generation Required (in MU)	0.00	0.00	0.00	0.00
Additional Capacity Required (40% PLF) on RTC Basis	**0.00**	**0.00**	**0.00**	**0.00**
Sub-Transmission (Step-up) Adequacy				
Existing Transformation Capacity (in MVA)	*0.50*	*0.50*	*0.50*	*0.50*
Planned Transformation Capacity (in MVA)	*0.00*	*0.00*	*0.00*	*0.00*
Total Transformation Capacity - Installed (in MVA)	**0.50**	**0.50**	**0.50**	**0.50**
Total Transformation Capacity - Required (in MVA)#	**0.48**	**0.50**	**0.52**	**0.55**
Adequacy of Sub-Transmission System	**Adequate**	**Inadequate**	**Inadequate**	**Inadequate**
Additional Transformation Capacity Required (in MVA)	0.00	0.00	0.02	0.05
Distribution (Step-Down) Adequacy				
Existing Transformation Capacity (in MVA)	*0.30*	*0.30*	*0.30*	*0.30*
Planned Transformation Capacity (in MVA)	*0.00*	*0.00*	*0.00*	*0.00*
Total Transformation Capacity - Installed (in MVA)	**0.30**	**0.30**	**0.30**	**0.30**
Total Transformation Capacity - Required (in MVA)#	**0.53**	**0.55**	**0.58**	**0.60**
Adequacy of Distribution (Step-Down) System	**Inadequate**	**Inadequate**	**Inadequate**	**Inadequate**
Additional Transformation Capacity Required (in MVA)	0.23	0.25	0.28	0.30

 # Considering 10% Load catered directly through DG Sets

It is evident from above table that while the planned capacity addition in Generation is adequate, additional capacity of 0.05 MVA is required in Sub-Transmission (considering maximum loading of 80%) and additional capacity of 0.30 MVA in Distribution (considering maximum loading of 80% and diversity factor of 1.1) to meet the requirement of 24x7 Power for All by FY 19 in Chetlat Island.

CHAPTER 10: POWER SUPPLY –KADMAT ISLAND

ABOUT KADMAT

The Kadmat Island is long and narrow. It is only 0.57 km wide at the broadest point having maximum length of 11 km. It lies between 11° 10' and 11° 16' N latitude and 72° 45' and 72° 48' E longitude, having an area of 3.20 square km. This island is at a distance of 407 km (220 nautical mil from Kochi and located between Amini Island in the south and Chetlat Island in the north.

DEMAND PROJECTIONS

DETERMINATION OF CONSUMPTION OF DOMESTIC CONSUMERS

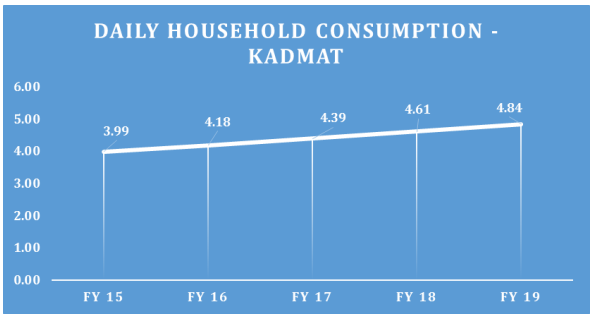
The present energy requirement of Kadmat Islands during FY 15 was 4.31 MU. With 24x7 supply to be provided across the island, the demand is likely to increase.

The average daily household consumption of existing electrified households in FY 15 has been arrived at by dividing the actual sales by the actual number of electrified consumers in FY 15 respectively.

The actual daily household consumption of registered domestic consumers has increased from 2.09 kWh in FY 11 to 3.71 kWh in FY 15 at CAGR of 17.55%. However, considering the fact that average increase in daily household consumption is more than 7% last year, and considering the increased availability in past years along with other demographic factors, the daily household consumption has been escalated by 5% only.

The projected daily household consumption in Kadmat Island is shown below:

Figure 14: Projected Daily Household Consumption Electricity (kWh per person) for future years



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

The number of electrified households is expected to grow at the overall decadal CAGR of 1.48%.

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

Table 27: Projected Sales from Existing and Newly Electrified Households

Particulars	FY 15	FY 16	FY 17	FY 18	FY 19
Electrified Consumers (Existing + Projected Growth)					
Electrified Consumers (in Nos.)	1,728	1,754	1,780	1,806	1,833
Daily Household Consumption (in kWh)	3.99	4.18	4.39	4.61	4.84
Total Projected Domestic Consumption (In MU)	**2.51**	**2.68**	**2.85**	**3.04**	**3.24**

DETERMINATION OF CONSUMPTION OF OTHER CONSUMERS

For projection of sales for FY 16 to FY 19, the CAGR of previous 5 years has been considered for all categories.

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

Table 28: Projected Category-wise Sales (In MU)

Categories	CAGR Considered	Projections			
		FY 16	FY 17	FY 18	FY 19
Domestic		2.68	2.85	3.04	3.24
Commercial	10.56%	0.57	0.63	0.70	0.77
Industrial	4.57%	0.03	0.03	0.03	0.03
Public Lighting	13.05%	0.23	0.26	0.29	0.33
Temporary	52.04%	0.01	0.01	0.02	0.03
Grand Total		**3.51**	**3.78**	**4.08**	**4.40**

ENERGY AND DEMAND REQUIREMENT

MoP has not specified any loss trajectory for AT&C loss reduction. Thus a reasonable reduction in line with JERC targets has been taken into account for preparing this roadmap document which is shown in Figure 15. A reduction of 4% in the T&D losses have been considered as the losses are at very high level.

Based on the loss reduction trajectory as above, the energy and demand requirement for the future years is tabulated in Table 29 below:

Figure 15: Projected Loss Reduction Trajectory- Kadmat Island

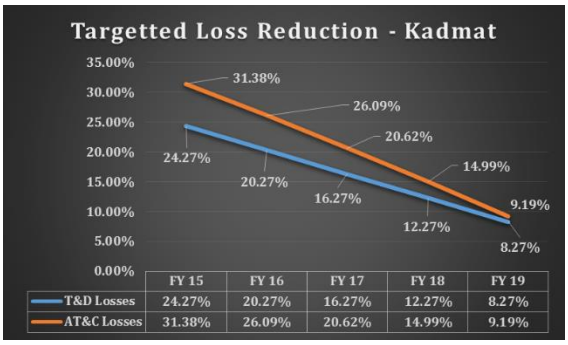


Table 29: Energy Requirement (In MU) and Peak Demand (in MW) – Kadmat Island

Particulars	Energy and Demand Scenario			
	FY 16	FY 17	FY 18	FY 19
Sale within State	*3.51*	*3.78*	*4.08*	*4.40*
Distribution Losses	20.27%	16.27%	12.27%	8.27%
Total Energy Requirement within Island	**4.41**	**4.52**	**4.65**	**4.80**
Load Factor	*61.50%*	*61.50%*	*61.50%*	*61.50%*
Maximum Demand – Kadmat Island	**0.82**	**0.84**	**0.86**	**0.89**

As seen from the above, the maximum demand requirement of the Kadmat Islands is projected to increase from 1.18 MW in FY 15 to **1.48 MW in FY 19** assuming an unchanged annual load factor of 66.34% as per actual information for FY 15.

Adoption of various energy efficiency measures like energy efficient lighting (use of LEDs) would also help in reducing the peak demand of the state.

GENERATION PLAN

The total installed capacity in Kadmat Island as on 31st March 2015 is 2.45 MW which included 2.30 MW of DG Sets and 0.15 MW of SPV plant. Further 1.75 MW capacity (0.75 MW DG + 1 MW Solar) has been planned to be added by FY 19. However, the existing capacities of DG sets have derated over passage of time.

The total existing and upcoming generation up to FY 19 in Kadmat Island is detailed in Table 30 below:

ADEQUACY OF GENERATION AND DISTRIBUTION SYSTEM

An assessment of the adequacy of generation and distribution infrastructure for meeting the projected annual energy demand of 8.61 MU and peak demand of around 1.48 MW is shown below:

Table 30: Capacity Availability from various Sources in Kadmat Island (in MW)

Source	Commissioning	Installed Capacity (MW)	Derated Capacity Available in MW			
			FY 16	FY 17	FY 18	FY 19
DG Sets Existing						
New 1 X 400	*24-01-2009*	0.40	0.30	0.30	0.30	0.30
New 1 X 400	*08-05-2011*	0.40	0.30	0.30	0.30	0.30
New 1 X 750	*03-02-2013*	0.75	0.65	0.65	0.65	0.65
Old 1 X 250	*13-06-2013*	0.25	0.08	0.08	0.08	0.08
Old 1 X 250	*06-09-2013*	0.25	0.08	0.08	0.08	0.08
Old 1 X 250	*09-02-2014*	0.25	0.08	0.08	0.08	0.08
DG Sets Upcoming						
New DG Set	*FY 18*	0.75			0.75	0.75
Solar Existing						
SPV Plants	*Commissioned*	0.15	0.15	0.15	0.15	0.15
Solar Upcoming						
New SPV Plants	*FY 18*	1.00			1.00	1.00
Total		**4.20**	**1.64**	**1.64**	**3.39**	**3.39**

Table 31: Assessment of adequacy of Generation and Distribution in Kadmat Island

Particulars	FY 16	FY 17	FY 18	FY 19
Generation Adequacy				
Total Energy Requirement within Island	4.41	4.52	4.65	4.80
Maximum Energy Availability from Own Generation (In MU)	6.16	6.16	10.40	10.40
Adequacy of Generation	**Adequate**	**Adequate**	**Adequate**	**Adequate**
Additional Energy Generation Required (in MU)	0.00	0.00	0.00	0.00
Additional Capacity Required (40% PLF) on RTC Basis	**0.00**	**0.00**	**0.00**	**0.00**
Sub-Transmission (Step-up) Adequacy				
Existing Transformation Capacity (in MVA)	*1.50*	*1.50*	*1.50*	*1.50*
Planned Transformation Capacity (in MVA)	*0.00*	*0.00*	*1.00*	*1.00*
Total Transformation Capacity - Installed (in MVA)	**1.50**	**1.50**	**2.50**	**2.50**
Total Transformation Capacity - Required (in MVA)#	**1.02**	**1.05**	**1.08**	**1.11**
Adequacy of Sub-Transmission System	**Adequate**	**Adequate**	**Adequate**	**Adequate**
Additional Transformation Capacity Required (in MVA)	0.00	0.00	0.00	0.00
Distribution (Step-Down) Adequacy				
Existing Transformation Capacity (in MVA)	*1.00*	*1.00*	*1.00*	*1.00*
Planned Transformation Capacity (in MVA)	*0.00*	*0.00*	*0.75*	*0.75*
Total Transformation Capacity - Installed (in MVA)	**1.00**	**1.00**	**1.75**	**1.75**
Total Transformation Capacity - Required (in MVA)#	**1.12**	**1.15**	**1.19**	**1.22**
Adequacy of Distribution (Step-Down) System	**Inadequate$**	**Inadequate$**	**Adequate**	**Adequate**
Additional Transformation Capacity Required (in MVA)	0.12	0.15	0.00	0.00

 # Considering 10% Load catered directly through DG Sets

$ Transformers will be loaded to the extent of 95% to supply full load.

It is evident from above table that the planned capacity addition in Generation, Sub-Transmission (considering maximum loading of 80%) and Distribution (considering maximum loading of 80% and diversity factor of 1.1) is adequate to meet the requirement of 24x7 Power for All by FY 19 in Kadmat Island.

CHAPTER 11: POWER SUPPLY –KALPENI ISLAND

ABOUT KALPENI

The Kalpeni Island lies between 10° 03' and 10° 07' N latitude and 73° 37' and 73° 39'E longitude, having on area of 2.79 square km. The Island is located at a distance of 287 km (155 nautical miles) from Kochi and located south-east of Kavaratti Island and midway between Andrott and Minicoy. It has a very large lagoon measuring about 2.8 km at the point of maximum width. The Island is aligned in the north-south direction.

DEMAND PROJECTIONS

DETERMINATION OF CONSUMPTION OF DOMESTIC CONSUMERS

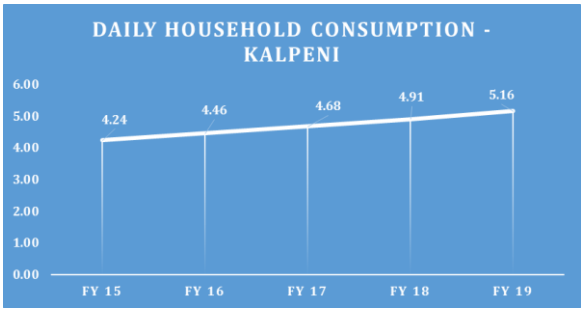
The present energy requirement of Kalpeni Islands during FY 15 was 3.39 MU. With 24x7 supply to be provided across the island, the demand is likely to increase.

The average daily household consumption of existing electrified households in FY 15 has been arrived at by dividing the actual sales by the actual number of electrified consumers in FY 15 respectively.

The actual daily household consumption of registered domestic consumers has increased from 2.71 kWh in FY 11 to 4.24 kWh in FY 15 at CAGR of 11.82%. However, considering the fact that average increase in daily household consumption is more than 10% last year, and considering the increased availability in past years along with other demographic factors, the daily household consumption has been escalated by 5% only.

The projected daily household consumption in Kalpeni Island is shown below:

Figure 16: Projected Daily Household Consumption Electricity (kWh per person) for future years



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

The number of electrified households is expected to grow at the overall decadal CAGR of 1.48%.

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

Table 32: Projected Sales from Existing and Newly Electrified Households

Particulars	FY 15	FY 16	FY 17	FY 18	FY 19
Electrified Consumers (Existing + Projected Growth)					
Electrified Consumers (in Nos.)	1,706	1,731	1,757	1,783	1,809
Daily Household Consumption (in kWh)	4.24	4.46	4.68	4.91	5.16
Total Projected Domestic Consumption (In MU)	**2.64**	**2.82**	**3.00**	**3.20**	**3.41**

DETERMINATION OF CONSUMPTION OF OTHER CONSUMERS

For projection of sales for FY 16 to FY 19, the CAGR of previous 5 years has been considered for all categories.

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

Table 33: Projected Category-wise Sales (In MU)

Categories	CAGR Considered	Projections			
		FY 16	FY 17	FY 18	FY 19
Domestic		2.82	3.00	3.20	3.41
Commercial	8.22%	0.48	0.51	0.56	0.60
Industrial	17.79%	0.05	0.05	0.06	0.07
Public Lighting	0.00%	0.06	0.06	0.06	0.06
Temporary	54.38%	0.01	0.02	0.03	0.05
Grand Total		**3.41**	**3.65**	**3.91**	**4.19**

ENERGY AND DEMAND REQUIREMENT

MoP has not specified any loss trajectory for AT&C loss reduction. Thus a reasonable reduction in line with JERC targets has been taken into account for preparing this roadmap document which is shown in Figure 17. A reduction of 0.10% in the T&D losses have been considered as the losses are at very nominal level.

Based on the loss reduction trajectory as above, the energy and demand requirement for the future years is tabulated in Table 34 below:

Figure 17: Projected Loss Reduction Trajectory- Kalpeni Island

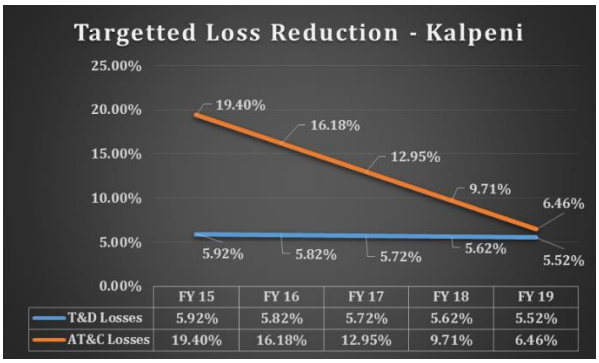


Table 34: Energy Requirement (In MU) and Peak Demand (in MW) – Kalpeni Island

Particulars	Energy and Demand Scenario			
	FY 16	FY 17	FY 18	FY 19
Sale within State	*3.41*	*3.65*	*3.91*	*4.19*
Distribution Losses	5.82%	5.72%	5.62%	5.52%
Total Energy Requirement within Island	**3.62**	**3.87**	**4.14**	**4.44**
Load Factor	*56.91%*	*56.91%*	*56.91%*	*56.91%*
Maximum Demand – Kalpeni Island	**0.73**	**0.78**	**0.83**	**0.89**

As seen from the above, the maximum demand requirement of the Kalpeni Islands is projected to increase from 0.68 MW in FY 15 to **0.89 MW in FY 19** assuming an unchanged annual load factor of 56.91% as per actual information for FY 15.

Adoption of various energy efficiency measures like energy efficient lighting (use of LEDs) would also help in reducing the peak demand of the state.

GENERATION PLAN

The total installed capacity in Kalpeni Island as on 31st March 2015 is 1.35 MW which included 1.25 MW of DG Sets and 0.10 MW of SPV plant. However, 0.25 MW old DG set has been replaced by 0.75 MW DG set on 16/02/2016. Further 1.3 MW capacity (0.50 DG + 0.80 MW Solar) has been planned to be added by FY 19. However, the existing

capacities of DG sets have derated over passage of time. The total existing and upcoming generation up to FY 19 in Kalpeni Island is detailed in Table 35 below:

ADEQUACY OF GENERATION DISTRIBUTION SYSTEM

An assessment of the adequacy of generation and distribution infrastructure for meeting the projected annual energy demand of 4.44 MU and peak demand of around 0.89 MW is shown below:

Table 35: Capacity Availability from various Sources in Kalpeni Island (in MW)

Source	Commissioning	Installed Capacity (MW)	Derated Capacity Available in MW			
			FY 16	FY 17	FY 18	FY 19
DG Sets Existing						
New 1 X 250	*25-05-2009*	0.25	0.16	0.16	0.16	0.16
New 1 X 250	*25-05-2009*	0.25	0.16	0.16	0.16	0.16
New 1 X 750	*16-02-2016*	0.75	0.75	0.75	0.75	0.75
Old 1 X 250	*15-08-1995*	0.25	0.10	0.10	0.10	0.10
Old 1 X 250	*01-01-1998*	0.25	0.10	0.10	0.10	0.10
DG Sets Upcoming						
New DG Set	*FY 18*	0.50			0.50	0.50
Solar Existing						
SPV Plants	*Commissioned*	0.10	0.10	0.10	0.10	0.10
Solar Upcoming						
New SPV Plants	*FY 19*	0.80				0.80
Total		**2.65**	**1.37**	**1.37**	**1.87**	**2.67**

Table 36: Assessment of adequacy of Generation and Distribution in Kalpeni Island

Particulars	FY 16	FY 17	FY 18	FY 19
Generation Adequacy				
Total Energy Requirement within Island	3.62	3.87	4.14	4.44
Maximum Energy Availability from Own Generation (In MU)	3.94	3.94	6.10	6.90
Adequacy of Generation	**Adequate**	**Adequate**	**Adequate**	**Adequate**
Additional Energy Generation Required (in MU)	0.00	0.00	0.00	0.00
Additional Capacity Required (40% PLF) on RTC Basis	**0.00**	**0.00**	**0.00**	**0.00**
Sub-Transmission (Step-up) Adequacy				
Existing Transformation Capacity (in MVA)	*1.00*	*1.00*	*1.00*	*1.00*
Planned Transformation Capacity (in MVA)	*0.00*	*0.00*	*1.00*	*1.00*
Total Transformation Capacity - Installed (in MVA)	**1.00**	**1.00**	**2.00**	**2.00**
Total Transformation Capacity - Required (in MVA)#	**0.91**	**0.97**	**1.04**	**1.11**
Adequacy of Sub-Transmission System	**Adequate**	**Adequate**	**Adequate**	**Adequate**
Additional Transformation Capacity Required (in MVA)	0.00	0.00	0.00	0.00
Distribution (Step-Down) Adequacy				
Existing Transformation Capacity (in MVA)	*1.15*	*1.15*	*1.15*	*1.15*
Planned Transformation Capacity (in MVA)	*0.00*	*0.00*	*0.75*	*0.75*
Total Transformation Capacity - Installed (in MVA)	**1.15**	**1.15**	**1.90**	**1.90**
Total Transformation Capacity - Required (in MVA)#	**1.00**	**1.07**	**1.14**	**1.22**
Adequacy of Distribution (Step-Down) System	**Adequate**	**Adequate**	**Adequate**	**Adequate**
Additional Transformation Capacity Required (in MVA)	0.00	0.00	0.00	0.00

 # Considering 10% Load catered directly through DG Sets

It is evident from above table that the planned capacity addition in Generation, Sub-Transmission (considering maximum loading of 80%) and Distribution (considering maximum loading of 80% and diversity factor of 1.1) is adequate to meet the requirement of 24x7 Power for All by FY 19 in Kalpeni Island.

CHAPTER 12: POWER SUPPLY –KAVARATTI

ABOUT KAVARATTI

The Kavaratti Island is the headquarters of the Union Territory of Lakshadweep. This island is at a distance of 404 km (218 nautical miles) from Kochi and is located between Agatti Island on the west and Androtт Island on the east. It lies between 10° 32' and 10° 35' N latitude and 72° 35' and 72° 40' E longitude, having an area of 4.22 square km. Maximum length of the island is 5.8 km and width is 1.6 km with a lagoon having a length of about 6 km.

DEMAND PROJECTIONS

DETERMINATION OF CONSUMPTION OF DOMESTIC CONSUMERS

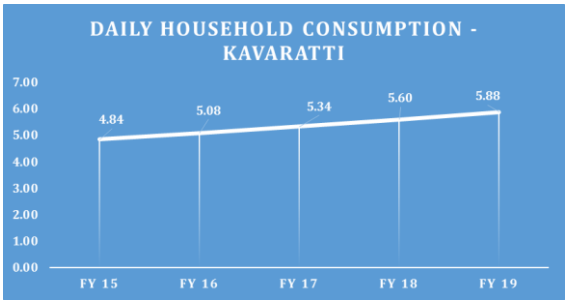
The present energy requirement of Kavaratti Islands during FY 15 was 10.90 MU. With 24x7 supply to be provided across the island, the demand is likely to increase.

The average daily household consumption of existing electrified households in FY 15 has been arrived at by dividing the actual sales by the actual number of electrified consumers in FY 15 respectively.

The actual daily household consumption of registered domestic consumers has increased from 2.64 kWh in FY 11 to 4.84 kWh in FY 15 at CAGR of 16.39%. However, considering the fact that average increase in daily household consumption is more than 7% last year, and considering the increased availability in past years along with other demographic factors, the daily household consumption has been escalated by 5% only.

The projected daily household consumption in Kavaratti Island is shown below:

Figure 18: Projected Daily Household Consumption Electricity (kWh per person) for future years



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

The number of electrified households is expected to grow at the overall decadal CAGR of 1.48%.

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

Table 37: Projected Sales from Existing and Newly Electrified Households

Particulars	FY 15	FY 16	FY 17	FY 18	FY 19
Electrified Consumers (Existing + Projected Growth)					
Electrified Consumers (in Nos.)	3,475	3,526	3,579	3,632	3,685
Daily Household Consumption (in kWh)	4.84	5.08	5.34	5.60	5.88
Total Projected Domestic Consumption (In MU)	**6.14**	**6.54**	**6.97**	**7.43**	**7.92**

DETERMINATION OF CONSUMPTION OF OTHER CONSUMERS

For projection of sales for FY 16 to FY 19, the CAGR of previous 5 years has been considered for all categories.

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

Table 38: Projected Category-wise Sales (In MU)

Categories	CAGR Considered	Projections			
		FY 16	FY 17	FY 18	FY 19
Domestic		6.54	6.97	7.43	7.92
Commercial	10.33%	3.85	4.24	4.68	5.17
Industrial	3.48%	0.09	0.09	0.09	0.10
Public Lighting	0.00%	0.11	0.11	0.11	0.11
Temporary	82.95%	0.10	0.19	0.35	0.64
Grand Total		**10.69**	**11.60**	**12.66**	**13.92**

ENERGY AND DEMAND REQUIREMENT

MoP has not specified any loss trajectory for AT&C loss reduction. Thus a reasonable reduction in line with JERC targets has been taken into account for preparing this roadmap document which is shown in Figure 19. A reduction of 0.25% in the T&D losses have been considered as the losses are at very nominal level.

Based on the loss reduction trajectory as above, the energy and demand requirement for the future years is tabulated in Table 39 below:

Figure 19: Projected Loss Reduction Trajectory- Kavaratti Island

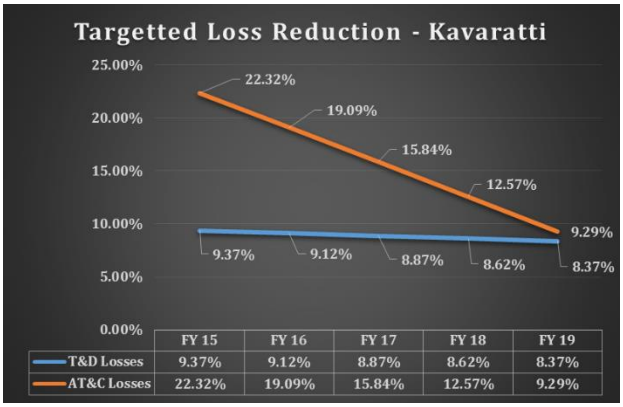


Table 39: Energy Requirement (In MU) and Peak Demand (in MW) – Kavaratti Island

Particulars	Energy and Demand Scenario			
	FY 16	FY 17	FY 18	FY 19
Sale within State	*10.69*	*11.60*	*12.66*	*13.92*
Distribution Losses	9.12%	8.87%	8.62%	8.37%
Total Energy Requirement within Island	**11.76**	**12.73**	**13.86**	**15.20**
Load Factor	*70.68%*	*70.68%*	*70.68%*	*70.68%*
Maximum Demand – Kavaratti Island	**1.90**	**2.06**	**2.24**	**2.45**

As seen from the above, the maximum demand requirement of the Kavaratti Islands is projected to increase from 1.76 MW in FY 15 to **2.45 MW in FY 19** assuming an unchanged annual load factor of 66.34% as per actual information for FY 15.

Adoption of various energy efficiency measures like energy efficient lighting (use of LEDs) would also help in reducing the peak demand of the state.

GENERATION PLAN

The total installed capacity in Kavaratti Island as on 31st March 2015 is 3.96 MW which included 3.20 MW of DG Sets and 0.76 MW of SPV plant. Further 2 MW capacity (1 MW DG + 1 MW Solar) has been planned to be added by FY 19. However, the existing capacities of DG sets have derated over passage of time.

The total existing and upcoming generation up to FY 19 in Kavaratti Island is detailed in Table 40 below:

ADEQUACY OF GENERATION AND DISTRIBUTION SYSTEM

An assessment of the adequacy of generation and distribution infrastructure for meeting the projected annual energy demand of 15.20 MU and peak demand of around 2.45 MW is shown below:

Table 40: Capacity Availability from various Sources in Kavaratti Island (in MW)

Source	Commissioning	Installed Capacity (MW)	Derated Capacity Available in MW			
			FY 16	FY 17	FY 18	FY 19
DG Sets Existing						
New 1 X 1000	*11-11-2010*	1.00	0.80	0.75	0.75	0.75
New 1 X 1000	*13-10-2010*	1.00	0.80	0.75	0.75	0.75
New 1 X 600	*09-10-2009*	0.60	0.40	0.35	0.35	0.35
New 1 X 600	*15-10-2009*	0.60	0.40	0.35	0.35	0.35
DG Sets Upcoming						
New DG Set	*FY 17*	1.00		1.00	1.00	1.00
Solar Existing						
SPV Plants	*Commissioned*	0.76	0.76	0.76	0.76	0.76
Solar Upcoming						
New SPV Plants	*FY 17*	1.00		1.00	1.00	1.00
Total		**5.96**	**3.16**	**4.96**	**4.96**	**4.96**

Table 41: Assessment of adequacy of Generation and Distribution in Kavaratti Island

Particulars	FY 16	FY 17	FY 18	FY 19
Generation Adequacy				
Total Energy Requirement within Island	11.76	12.73	13.86	15.20
Maximum Energy Availability from Own Generation (In MU)	11.11	15.57	15.57	15.57
Adequacy of Generation	**Inadequate**	**Adequate**	**Adequate**	**Adequate**
Additional Energy Generation Required (in MU)	0.65	0.00	0.00	0.00
Additional Capacity Required (40% PLF) on RTC Basis	**0.18**	**0.00**	**0.00**	**0.00**
Sub-Transmission (Step-up) Adequacy				
Existing Transformation Capacity (in MVA)	*6.00*	*6.00*	*6.00*	*6.00*
Planned Transformation Capacity (in MVA)	*0.00*	*0.00*	*1.00*	*1.00*
Total Transformation Capacity - Installed (in MVA)	**6.00**	**6.00**	**7.00**	**7.00**
Total Transformation Capacity - Required (in MVA)#	**2.37**	**2.57**	**2.80**	**3.07**
Adequacy of Sub-Transmission System	**Adequate**	**Adequate**	**Adequate**	**Adequate**
Additional Transformation Capacity Required (in MVA)	0.00	0.00	0.00	0.00
Distribution (Step-Down) Adequacy				
Existing Transformation Capacity (in MVA)	*4.53*	*4.53*	*4.53*	*4.53*
Planned Transformation Capacity (in MVA)	*0.00*	*0.00*	*0.50*	*0.50*
Total Transformation Capacity - Installed (in MVA)	**4.53**	**4.53**	**5.03**	**5.03**
Total Transformation Capacity - Required (in MVA)#	**2.61**	**2.83**	**3.08**	**3.37**
Adequacy of Distribution (Step-Down) System	**Adequate**	**Adequate**	**Adequate**	**Adequate**
Additional Transformation Capacity Required (in MVA)	0.00	0.00	0.00	0.00

 # Considering 10% Load catered directly through DG Sets

It is evident from above table that the planned capacity addition in Generation, Sub-Transmission (considering maximum loading of 80%) and Distribution (considering maximum loading of 80% and diversity factor of 1.1) is adequate to meet the requirement of 24x7 Power for All by FY 19 in Kavaratti Island.

CHAPTER 13: POWER SUPPLY –KILTAN ISLAND

ABOUT KILTAN

The Kiltan Island lies 51 km north-east of Amini Island, between 11° 28' and 11° 30' N latitude and 72° 59' and 73° 01' E longitude, and has an area of 2.20 square km. It has 3.4 km length and 0.6 km width at the broadest point. On the northern and southern ends of the island, there are high storm beaches. This island is 394 km (213 nautical miles) away from Kochi. Its lagoon area is 1.76 square km.

DEMAND PROJECTIONS

DETERMINATION OF CONSUMPTION OF DOMESTIC CONSUMERS

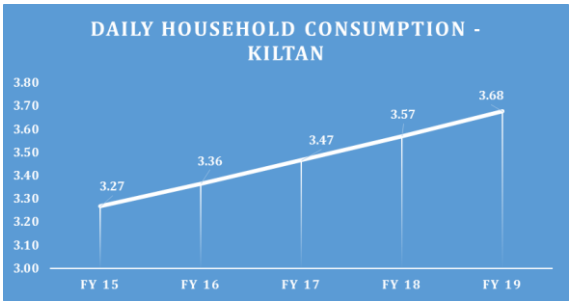
The present energy requirement of Kiltan Islands during FY 15 was 2.58 MU. With 24x7 supply to be provided across the island, the demand is likely to increase.

The average daily household consumption of existing electrified households in FY 15 has been arrived at by dividing the actual sales by the actual number of electrified consumers in FY 15 respectively.

The actual daily household consumption of registered domestic consumers has increased from 2.07 kWh in FY 11 to 3.27 kWh in FY 15 at CAGR of 12.04%. However, considering the fact that average increase in daily household consumption is less than 4% last year, and considering the increased availability in past years along with other demographic factors, the daily household consumption has been escalated by 3% only.

The projected daily household consumption in Kiltan Island is shown below:

Figure 20: Projected Daily Household Consumption Electricity (kWh per person) for future years



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

The number of electrified households is expected to grow at the overall decadal CAGR of 1.48%.

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

Table 42: Projected Sales from Existing and Newly Electrified Households

Particulars	FY 15	FY 16	FY 17	FY 18	FY 19
Electrified Consumers (Existing + Projected Growth)					
Electrified Consumers (in Nos.)	1,500	1,522	1,545	1,568	1,591
Daily Household Consumption (in kWh)	3.27	3.36	3.47	3.57	3.68
Total Projected Domestic Consumption (In MU)	**1.79**	**1.87**	**1.95**	**2.04**	**2.14**

DETERMINATION OF CONSUMPTION OF OTHER CONSUMERS

For projection of sales for FY 16 to FY 19, the CAGR of previous 5 years has been considered for all categories.

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

Table 43: Projected Category-wise Sales (In MU)

Categories	CAGR Considered	Projections			
		FY 16	FY 17	FY 18	FY 19
Domestic		1.87	1.95	2.04	2.14
Commercial	9.39%	0.41	0.45	0.49	0.53
Industrial	0.00%	0.01	0.01	0.01	0.01
Public Lighting	57.42%	0.14	0.22	0.35	0.55
Temporary	0.00%	0.00	0.00	0.00	0.00
Grand Total		**2.43**	**2.64**	**2.89**	**3.23**

ENERGY AND DEMAND REQUIREMENT

MoP has not specified any loss trajectory for AT&C loss reduction. Thus a reasonable reduction in line with JERC targets has been taken into account for preparing this roadmap document which is shown in Figure 21. A reduction of 1.00% in the T&D losses have been considered as the losses are at very high level.

Based on the loss reduction trajectory as above, the energy and demand requirement for the future years is tabulated in Table 44 below:

Figure 21: Projected Loss Reduction Trajectory- Kiltan Island

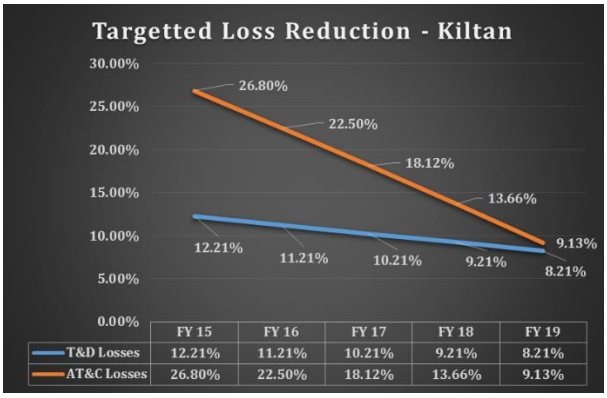


Table 44: Energy Requirement (In MU) and Peak Demand (in MW) – Kiltan Island

Particulars	Energy and Demand Scenario			
	FY 16	FY 17	FY 18	FY 19
Sale within State	*2.43*	*2.64*	*2.89*	*3.23*
Distribution Losses	11.21%	10.21%	9.21%	8.21%
Total Energy Requirement within Island	**2.74**	**2.94**	**3.19**	**3.52**
Load Factor	*77.51%*	*77.51%*	*77.51%*	*77.51%*
Maximum Demand – Kiltan Island	**0.40**	**0.43**	**0.47**	**0.52**

As seen from the above, the maximum demand requirement of the Kiltan Islands is projected to increase from 0.38 MW in FY 15 to **0.52 MW in FY 19** assuming an unchanged annual load factor of 77.51% as per actual information for FY 15.

Adoption of various energy efficiency measures like energy efficient lighting (use of LEDs) would also help in reducing the peak demand of the state.

GENERATION PLAN

The total installed capacity in Kiltan Island as on 31st March 2015 is 1.10 MW which included 1.00 MW of DG Sets and 0.10 MW of SPV plant. Also, 0.5 MW DG set has been commissioned on 22/02/2016. Further 0.65 MW DG based capacity has been planned to be added by FY 19. However, the existing capacities of DG sets have derated over

passage of time.

The total existing and upcoming generation up to FY 19 in Kiltan Island is detailed in Table 40 below:

ADEQUACY OF GENERATION AND DISTRIBUTION SYSTEM

An assessment of the adequacy of generation and distribution infrastructure for meeting the projected annual energy demand of 3.52 MU and peak demand of around 0.52 MW is shown below:

Table 45: Capacity Availability from various Sources in Kiltan Island (in MW)

Source	Commissioning	Installed Capacity (MW)	Derated Capacity Available in MW			
			FY 16	FY 17	FY 18	FY 19
DG Sets Existing						
New 1 X 500	*22-02-2016*	0.50	0.50	0.50	0.50	0.50
New 1 X 400	*13-08-2008*	0.40	0.32	0.30	0.30	0.30
New 1 X 400	*14-08-2008*	0.40	0.32	0.30	0.30	0.30
Old 1 X 200	*22-05-1996*	0.20	0.08	0.07	0.07	0.07
DG Sets Upcoming						
New DG Set	*FY 17*	0.65		0.65	0.65	0.65
Solar Existing						
SPV Plants	*Commissioned*	0.10	0.10	0.10	0.10	0.10
Solar Upcoming						
New SPV Plants		0.00		0.00	0.00	0.00
Total		**2.25**	**1.32**	**1.92**	**1.92**	**1.92**

Table 46: Assessment of adequacy of Generation and Distribution in Kiltan Island

Particulars	FY 16	FY 17	FY 18	FY 19
Generation Adequacy				
Total Energy Requirement within Island	2.74	2.94	3.19	3.52
Maximum Energy Availability from Own Generation (In MU)	5.23	7.83	7.83	7.83
Adequacy of Generation	**Adequate**	**Adequate**	**Adequate**	**Adequate**
Additional Energy Generation Required (in MU)	0.00	0.00	0.00	0.00
Additional Capacity Required (40% PLF) on RTC Basis	**0.00**	**0.00**	**0.00**	**0.00**
Sub-Transmission (Step-up) Adequacy				
Existing Transformation Capacity (in MVA)	*1.10*	*1.10*	*1.10*	*1.10*
Planned Transformation Capacity (in MVA)	*0.00*	*0.00*	*1.00*	*1.00*
Total Transformation Capacity - Installed (in MVA)	**1.10**	**1.10**	**2.10**	**2.10**
Total Transformation Capacity - Required (in MVA)#	**0.50**	**0.54**	**0.59**	**0.65**
Adequacy of Sub-Transmission System	**Adequate**	**Adequate**	**Adequate**	**Adequate**
Additional Transformation Capacity Required (in MVA)	0.00	0.00	0.00	0.00
Distribution (Step-Down) Adequacy				
Existing Transformation Capacity (in MVA)	*0.70*	*0.70*	*0.70*	*0.70*
Planned Transformation Capacity (in MVA)	*0.00*	*0.00*	*0.25*	*0.25*
Total Transformation Capacity - Installed (in MVA)	**0.70**	**0.70**	**0.95**	**0.95**
Total Transformation Capacity - Required (in MVA)#	**0.55**	**0.59**	**0.65**	**0.71**
Adequacy of Distribution (Step-Down) System	**Adequate**	**Adequate**	**Adequate**	**Adequate**
Additional Transformation Capacity Required (in MVA)	0.00	0.00	0.00	0.00

 # Considering 10% Load catered directly through DG Sets

It is evident from above table that the planned capacity addition in Generation, Sub-Transmission (considering maximum loading of 80%) and Distribution (considering maximum loading of 80% and diversity factor of 1.1) is adequate to meet the requirement of 24x7 Power for All by FY 19 in Kiltan Island.

CHAPTER 14: POWER SUPPLY –MINICOY ISLAND

ABOUT MINICOY

The Minicoy Island is the southern-most island of Lakshadweep, situated at a distance of 398 km (215 nautical miles) south-west of Kochi between 8° 15' and 8° 20' N latitude and 73° 01' and 73° OS' E longitude, having an area of 4.80 square km. This island lies near the 9 0 Channel, which is one of the busiest shipping routes and is about 130 km from the northern-most island of Maldives.

DEMAND PROJECTIONS

DETERMINATION OF CONSUMPTION OF DOMESTIC CONSUMERS

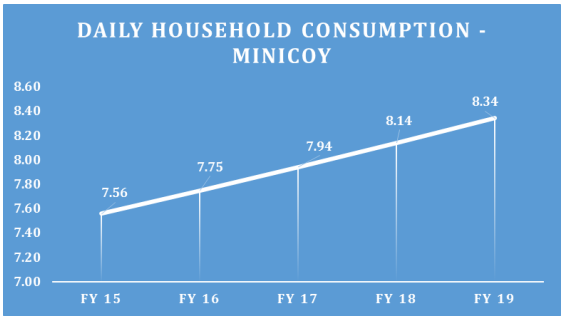
The present energy requirement of Minicoy Islands during FY 15 was 7.49 MU. With 24x7 supply to be provided across the island, the demand is likely to increase.

The average daily household consumption of existing electrified households in FY 15 has been arrived at by dividing the actual sales by the actual number of electrified consumers in FY 15 respectively.

The actual daily household consumption of registered domestic consumers has increased from 5.66 kWh in FY 11 to 7.56 kWh in FY 15 at CAGR of 7.52%. However, considering the fact that average increase in daily household consumption is less than 1% last year, and considering the increased availability in past years along with other demographic factors, the daily household consumption has been escalated by 2.5% only.

The projected daily household consumption in Minicoy Island is shown below:

Figure 22: Projected Daily Household Consumption Electricity (kWh per person) for future years



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

The number of electrified households is expected to grow at the overall decadal CAGR of 1.48%.

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

Table 47: Projected Sales from Existing and Newly Electrified Households

Particulars	FY 15	FY 16	FY 17	FY 18	FY 19
Electrified Consumers (Existing + Projected Growth)					
Electrified Consumers (in Nos.)	2,015	2,045	2,075	2,106	2,137
Daily Household Consumption (in kWh)	7.56	7.75	7.94	8.14	8.34
Total Projected Domestic Consumption (In MU)	**5.56**	**5.78**	**6.01**	**6.26**	**6.51**

DETERMINATION OF CONSUMPTION OF OTHER CONSUMERS

For projection of sales for FY 16 to FY 19, the CAGR of previous 5 years has been considered for all categories.

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

Table 48: Projected Category-wise Sales (In MU)

Categories	CAGR Considered	Projections			
		FY 16	FY 17	FY 18	FY 19
Domestic		5.78	6.01	6.26	6.51
Commercial	16.45%	1.76	2.05	2.39	2.78
Industrial	8.98%	0.08	0.09	0.09	0.10
Public Lighting	0.00%	0.07	0.07	0.07	0.07
Temporary	1.92%	0.01	0.01	0.01	0.01
Grand Total		**7.71**	**8.24**	**8.82**	**9.47**

ENERGY AND DEMAND REQUIREMENT

MoP has not specified any loss trajectory for AT&C loss reduction. Thus a reasonable reduction in line with JERC targets has been taken into account for preparing this roadmap document which is shown in Figure 23. No reduction in the T&D losses have been considered as the losses are at already at a very low level.

Based on the loss reduction trajectory as above, the energy and demand requirement for the future years is tabulated in Table 49 below:

Figure 23: Projected Loss Reduction Trajectory- Minicoy Island

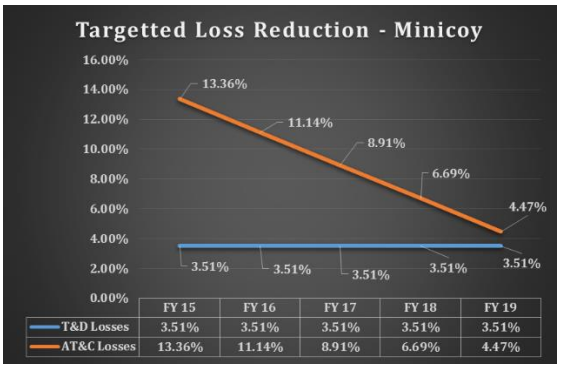


Table 49: Energy Requirement (In MU) and Peak Demand (in MW) – Minicoy Island

Particulars	Energy and Demand Scenario			
	FY 16	FY 17	FY 18	FY 19
Sale within State	*7.71*	*8.24*	*8.82*	*9.47*
Distribution Losses	3.51%	3.51%	3.51%	3.51%
Total Energy Requirement within Island	**7.99**	**8.53**	**9.14**	**9.82**
Load Factor	*68.40%*	*68.40%*	*68.40%*	*68.40%*
Maximum Demand – Minicoy Island	**1.33**	**1.42**	**1.53**	**1.64**

As seen from the above, the maximum demand requirement of the Minicoy Islands is projected to increase from 1.25 MW in FY 15 to **1.64 MW in FY 19** assuming an unchanged annual load factor of 68.40% as per actual information for FY 15.

Adoption of various energy efficiency measures like energy efficient lighting (use of LEDs) would also help in reducing the peak demand of the state.

GENERATION PLAN

The total installed capacity in Minicoy Island as on 31st March 2015 is 4.72 MW which included 4.40 MW of DG Sets and 0.32 MW of SPV plant. Further 1.90 MW capacity has been planned to be added by FY 19. However, the existing capacities of DG sets have derated over passage of time.

The total existing and upcoming generation up to FY 19 in Minicoy Island is detailed in

Table 50 below:

ADEQUACY OF GENERATION AND DISTRIBUTION SYSTEM

An assessment of the adequacy of generation and distribution infrastructure for meeting the projected annual energy demand of 9.82 MU and peak demand of around 1.64 MW is shown below:

Table 50: Capacity Availability from various Sources in Minicoy Island (in MW)

Source	Commissioning	Installed Capacity (MW)	Derated Capacity Available in MW			
			FY 16	FY 17	FY 18	FY 19
DG Sets Existing						
New 1 X 1600	*13-04-2013*	1.60	1.12	1.12	1.12	0.98
New 1 x 1000	*13-04-2009*	1.00	0.90	0.85	0.85	0.85
New 1 x 1000*	*05-08-2009*	1.00	0.70	0.65	0.65	0.65
Old 1 X 400	*03-12-2012*	0.40	0.20	0.18	0.18	0.18
Old 1 X 400	*22-04-1995*	0.40	0.20	0.18	0.18	0.18
DG Sets Upcoming						
New DG Set	*FY 18*	0.40			0.40	0.40
Solar Existing						
SPV Plants	*Commissioned*	0.32	0.32	0.32	0.32	0.32
Solar Upcoming						
New SPV Plants	*FY 17*	1.50		1.50	1.50	1.50
Total		**6.62**	**3.44**	**4.80**	**5.20**	**5.06**

** To be replaced by new DG set in FY 17.*

Table 51: Assessment of adequacy of Generation and Distribution in Minicoy Island

Particulars	FY 16	FY 17	FY 18	FY 19
Generation Adequacy				
Total Energy Requirement within Island	7.99	8.53	9.14	9.82
Maximum Energy Availability from Own Generation (In MU)	13.09	14.06	15.78	15.18
Adequacy of Generation	**Adequate**	**Adequate**	**Adequate**	**Adequate**
Additional Energy Generation Required (in MU)	0.00	0.00	0.00	0.00
Additional Capacity Required (40% PLF) on RTC Basis	**0.00**	**0.00**	**0.00**	**0.00**
Sub-Transmission (Step-up) Adequacy				
Existing Transformation Capacity (in MVA)	*6.00*	*6.00*	*6.00*	*6.00*
Planned Transformation Capacity (in MVA)	*0.00*	*0.00*	*0.00*	*0.00*
Total Transformation Capacity - Installed (in MVA)	**6.00**	**6.00**	**6.00**	**6.00**
Total Transformation Capacity - Required (in MVA)#	**1.67**	**1.78**	**1.91**	**2.05**
Adequacy of Sub-Transmission System	**Adequate**	**Adequate**	**Adequate**	**Adequate**
Additional Transformation Capacity Required (in MVA)	0.00	0.00	0.00	0.00
Distribution (Step-Down) Adequacy				
Existing Transformation Capacity (in MVA)	*2.90*	*2.90*	*2.90*	*2.90*
Planned Transformation Capacity (in MVA)	*0.00*	*0.00*	*0.25*	*0.25*
Total Transformation Capacity - Installed (in MVA)	**2.90**	**2.90**	**3.15**	**3.15**
Total Transformation Capacity - Required (in MVA)#	**1.83**	**1.96**	**2.10**	**2.25**
Adequacy of Distribution (Step-Down) System	**Adequate**	**Adequate**	**Adequate**	**Adequate**
Additional Transformation Capacity Required (in MVA)	0.00	0.00	0.00	0.00

 # Considering 10% Load catered directly through DG Sets

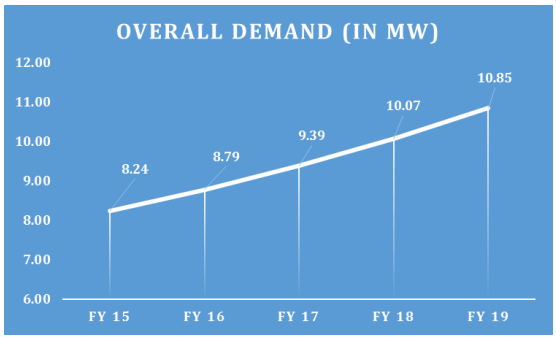
It is evident from above table that the planned capacity addition in Generation, Sub-Transmission (considering maximum loading of 80%) and Distribution (considering maximum loading of 80% and diversity factor of 1.1) is adequate to meet the requirement of 24x7 Power for All by FY 19 in Minicoy Island.

CHAPTER 15: OVERALL SCENARIO

AGGREGATE DEMAND

On the basis of island-wise demand assessment discussed in previous chapters, the overall demand projections of Lakshadweep Islands is shown in figure below:

Figure 24: Projected Maximum Demand for Lakshadweep Islands (in MW)

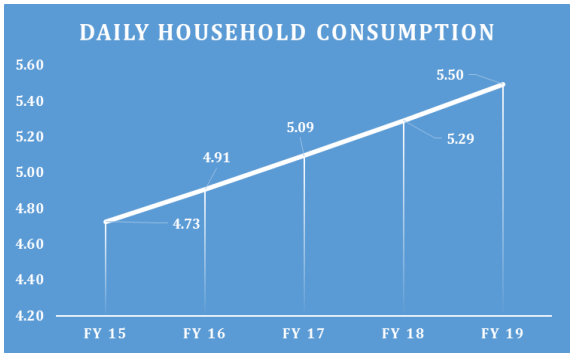


The maximum demand is projected to grow from present 8.24 MW in FY 15 to 10.85 MW in FY 19 (Refer table 79 in Annexure 3).

OVERALL DAILY HOUSEHOLD CONSUMPTION

On the basis of island-wise domestic consumers and sales in domestic category discussed in previous chapters, the overall Daily Household Consumption for Lakshadweep Islands is shown in figure below (Refer table 78 in Annexure 2):

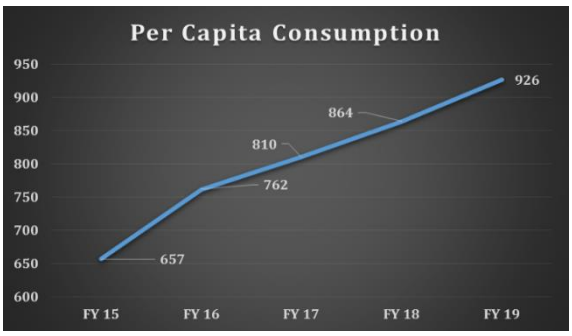
Figure 25: Projected Daily Household Consumption - Lakshadweep Islands



OVERALL PER-CAPITA CONSUMPTION

On the basis of island-wise population and overall sales in domestic category discussed in previous chapters, the overall Per Capita Consumption for Lakshadweep Islands is shown in figure below:

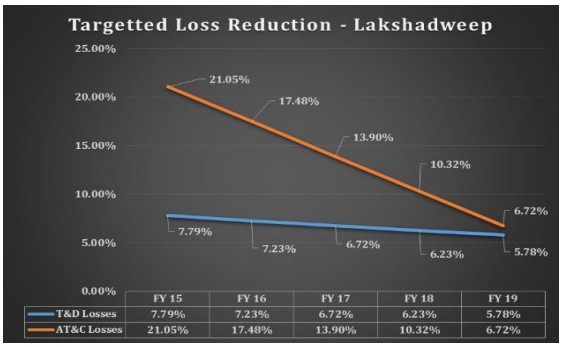
Figure 26: Projected Per-Capita Consumption - Lakshadweep Islands



OVERALL LOSS TRAJECTORY

On the basis of island-wise demand assessment discussed in previous chapters, the overall trajectory for AT&C and T&D Losses for Lakshadweep Islands is shown in figure below:

Figure 27: Projected Loss Reduction Trajectory- Lakshadweep Islands



Being an underground system, the overall T&D Losses are very nominal. The high AT&C losses is primarily due to the lower collection efficiency, which is now targeted to be improved to a level of 99% in FY 19.

CHAPTER 16: GREEN ISLAND INITIATIVES

GREEN ISLAND INITIATIVE

Government of India has taken a strategic decision for conversion of Lakshadweep Islands into 100% Green Islands.

Ministry of New and Renewable Energy has fixed a target of 10 MW rooftop solar plants to be achieved by the year 2022. As a preliminary requirement for executing the project, power department has assessed the available roof area of Government buildings throughout the inhabited islands of this Union Territory.

Since the allowable height of the buildings is nine meters i.e. ground+2, initial preference will be given to three storied buildings so that shadow free are can be ensured and there will not be further extension of the buildings. Moreover, as the 11 kV Grid is available adjacent to these buildings, feeding the power to grid will also not an issue.

As the rooftop solar plants are of grid interactive one without battery backup, the generation from the plant will be available during day time only. Hence such plants could be used for peak shaving at day time and can take away a major portion of the day time demand from Diesel Generating sets.

To achieve the target allocated by the Ministry a road map has already been prepared to achieve the target by the year 2022.

The capacity addition proposed for each island is as follows:

Table 52: Year-wise planned Capacity Addition in Rooftop Solar (in MW)

Island	FY 16	FY 17	FY 18	FY 19	FY 20	FY 21	FY 22
Agatti	0.10			1			
Amini	0.10		1				
Androth	0.32					1.5	
Bitra	0.10						
Chetlat	0.10				0.6		
Kadmat	0.15		1				
Kalpeni	0.10			0.8			
Kavaratti	0.76	1					1
Kiltan	0.10				0.6		
Minicoy	0.32	1.5					
Capacity Addition During the Year		**2.50**	**2.00**	**1.80**	**1.20**	**1.50**	**1.00**
Aggregate Capacity	**2.15**	**4.65**	**6.65**	**8.45**	**9.65**	**11.15**	**12.15**

LEDA (Lakshadweep Energy Development Agency), with the assistance of PWD, has made an initial assessment that the RCC Roof area is sufficient to install 1 MW roof top solar plant in the capital island. Possibility is being explored with the help of SECI to get a third party installing the plant and dept. having a Power Purchase agreement with them at the tariff rate fixed by JERC. Geographical separation of these islands could be a hurdle in this aspect, in that case dept. has to get fund either through budget allocation or other possibilities including availing loan from nationalized banks could be explored.

PRESENT STATUS OF EXISTING SPV POWER PLANTS

i. **760 kWp Grid Interactive SPV plant at Kavaratti**: Three power conditioning units are defective at this plant, 2 Nos 110 kVA and 1 No. 50 kVA, i.e. 270 kVA capacity is kept idle.

ii. **320 kWp SPV power plant at Androtti**: 100 kWp unit is kept idle and 220 kWp new addition is functioning smoothly. Decommissioning and erection works of old plants are to be carried out.

iii. **220 kWp plant at Minicoy:** The plant is kept idle due to defective PCUs, 3 Nos PCUs are defective.

iv. **100 kWp at Agatti:** The plant is generating at full capacity, but one of the 50 kVA PCUs are developed a snag, tripping in between, which is to be attended for smooth functioning of the plant.

v. **100 kWP plant at Kiltan:** Both the 50 kVA PCUs are defective and plant kept idle. New RCC control is constructed and it is to be occupied by shifting control units from old bunk house. A 100 kWp indoor transformer is to be purchased for this plant.

vi. **100 kWp plant at Kalpeni:** Both the 50 kVA PCUs are defective and hence the plant is kept idle. Renovation by changing old modules is to be carried out.

vii. **260 kWp plant at Kadmath:** 110 kWp new addition is working smoothly but old 150 kWp unit is kept idle due to defective PCUs and want of battery bank.

viii. **50 kWp standalone SPV power plant at Bitra:** Erection works are completed at this plant only commissioning is pending**.**

ix. **50 kWp plant at Bangaram:** Plant is kept idle due to defective PCUs. The battery bank shifted from Kadmath is to be commissioned.

GOI INTERVENTIONS REQUESTED

ISSUES WITH BHEL

Out of a total installed capacity of 1960 kWp, only 920 kWp only is generating (490 kWp at Kavaratti, 220 kWp at Androtti, 100 kWp at Agatti and 110 kWp at Kadmath) and 1040 kWp is kept idle.

The work is held up due to pending payments to M/s BHEL. The firm has stopped attending the operation & maintenance of the plant. Around 4.5 crore is pending to be released to the firm for want fund from MNRE. Ministry has released Rs. 3 crore during Aug. 2015 which is being released to BHEL.

Ministry of Power is required to intervene and take up the matter with MNRE /BHEL for prompt resolution of this issue.

ADVISORY TO SECI

SECI may be advised to take up the field survey so that the capacity of solar plants that can be installed in the available roof tops in each of the islands can be finalized and implementation process could be commenced at the earliest.

CHAPTER 17: ENERGY EFFICIENCY PROGRAM

LED STREET LIGHTING

The Power Department has already replaced 2980 numbers of ordinary street lights with energy efficient LED sets. Another 500 numbers are under supply which will replace the remaining ordinary street lights at Chetlat and Kiltan Island. With this Chetlat island will be without ordinary street lights along with Bitra which is already an LED island. Distribution of street lights both LED and ordinary at each island is as follows.

Island	No of Street Lights	LED Street Lights	Balance
Agatti	541	305	236
Amini	664	435	229
Andrott	833	385	448
Bangaram	50	0	50
Bitra	80	80	0
Chetlat	380	380	0
Kadmat	664	310	354
Kalpeni	527	285	242
Kavaratti	1163	465	698
Kiltan	423	400	23
Minicoy	730	435	295
Total	**6055**	**3480**	**2575**

Estimated cost is Rs. 1 Crores (Rs. 3950/- per set X 2575).

DOMESTIC EFFICIENT LIGHTING PROGRAMME (DELP)

- As per the industry statistics, a large numbers of incandescent lamps are still used in households to serve the lighting needs. Incandescent lamps are highly inefficient and 95% of electricity used by them is converted to heat. They can be replaced by LED lamps, which are 90% more energy efficient.
- Penetration of efficient lights in households is constrained by the first high cost barrier. The incandescent lamps are available at Rs. 10-15 while LED sell at Rs, 400-500 as a result the penetration of LEDs in household sector is less than 1%.
- EESL has developed and implemented a scheme called Domestic Efficient Lighting Scheme (DELP) to provide energy efficient LED lighting to grid-connected consumers in the domestic sector across Indian cities and states where high quality LED bulbs are given to households at an affordable price to encourage them to invest in energy efficiency. The large-scale replacement of incandescent lamps and CFL's with LEDs leads to savings in peak power for DISCOMs and lower power consumption of households.
- An independent mechanism for monitoring and verification of savings shall be established.
- Under the programme LEDA will purchase the required LED bulbs of 9W and tubes of 18W. Two LED bulbs and one LED tube will be provide to all domestic consumers.
- The LEDs will be given at an upfront cost of Rs. 10/- each. The balance cost towards actual price of the LED bulbs and tubes as discovered through competitive bidding will be recovered from consumer's electricity bill over a period of 10-15 months. Subjected to a maximum of Rs. 20/- for each LED bulb & tube every month.

- Tentative cost of LED bulbs 9W and tubes 18 W may be Rs. 80-90/- and Rs. 250-350/- respectively.
- A 9 W LED could replace a 60 W incandescent lamp and a 14 W CFL and 18W led tube will replace 40W conventional tube. Through distribution of two LED's and 1 tube under DELP in the domestic sector of Lakshadweep, considering all domestic consumers avail the scheme, the estimated overall reduction of demand shall be 13.74 MW and the annual total energy savings shall be 17.55 Million kWH. The scheme shall result into an estimated annual power procurement cost savings of INR 3.79 Crores.

A plan to cover all the inhabited islands is being prepared by the department. The estimated annual energy savings and estimated annual savings in power procurement cost are indicated below:

S.N.	Particulars	Costs/ Savings
1	No. of Domestic Households (Nos.)	11,013
2	No. of LED bulbs to be distributed (@2Nos. to each)	22,026
3	Wattage of 1 ICL (60 W) and 1 CFL (14W) to be replaced (Watt)	37
4	Wattage of LEDs (Watt)	9
5	Reduction of power consumption per bulb (Watt)	28
6	**Total annual energy consumption reduction in UT 3.5 Hours/day for 365 days (MU)**	**0.79**
7	Total monetary savings @ Rs. 20/unit (Rs.)	1.58

S.N.	Particulars	Costs/ Savings
1	No. of Domestic households (Nos.)	11,013
2	No. of LED Tubes to be distributed (@1Nos. to each)	11,013
3	Wattage of 1 tube (40 W) to be replaced (Watt)	40
4	Wattage of LEDs Tube (Watt)	18
5	Reduction of power consumption per bulb (Watt)	22
6	**Total annual energy consumption reduction in UT 3.5 Hours/day for 365 days (MU)**	**0.31**
7	Total monetary savings @ Rs. 20/unit (Rs.)	0.62

GOVT. BUILDINGS – LED CONVERSION

Govt. offices and institutions are the major consumers during day time. Load at these buildings are lights, fans and air conditioners. The offices are electrified with fluorescent tubes of 36/40 W, Compact Fluorescent Lamps of 15 to 20 W. These FTs can be replaced with 18 W or less LED tubes and CFLs with LED bulbs of 7/9W which will give as much lumen as their higher rated counter parts. Hence by opting LED lighting, the load at Govt. Offices can be reduced by half. For electrification of new Govt. buildings LED bulbs & tubes and star rated (5 star or 3 star) energy efficient fans and air conditioners will be made mandatory. While replacing the defective fans the star rated one should be used so that old fans will be eliminated completely gradually.

The department is preparing proposal for same and will submit same for approval of competent authority by September 2016. The UT will implement this scheme completely by end of FY 17.

CHAPTER 18: STRATERGIC INTIATIVES

It has been discussed in previous chapters that the Lakshadweep Islands are already supplying 24X7 power to all its consumers and would continue to do so till FY 19.

However, it is observed that all the Islands are standalone grid among themselves and are not connected either within themselves or with the National Grid. In the absence of DG failures, there is no alternate supply arrangement. The Power Department of Lakshadweep had thus considered following proposals for further review and consideration of Administration of Lakshadweep and Government of India. Detailed proposals will be submitted in due course of time.

2 MW BARGE MOUNTED DG SET

Unmortised powerships, known as **power barges**, are power plants installed on a deck barge. These are sometimes called "floating power plants" or "barge mounted power plants".

Some of the advantages of the Power Barge are as follows:

- Constructed in shipyards under controlled conditions
- Relatively fast Construction dependent upon equipment availability
- Can utilize any electrical generating technologies
- Transportable power; large capacity can be moved to areas of need quickly
- Fuels can be supplied by ocean transport and stored in adjacent barges
- Financially viable asset for installation in developing countries

FPP operations are carried out very much the same as land based facilities, with the plant being dispatched in accordance with grid demand. Irrespective of the generating technology installed, the FFP is fitted with an onboard control room complete with data acquisition and all machinery and equipment controls. Switchgear, motor controllers, main breakers and station and step up transformers are all installed on the barge.

The scheme is expected to cost around Rs 5-10 Crores.

FLOATING SOLAR AT BITRA ISLAND

At present existing 50 kWp standalone power plant (which is under renovation) has been able to meet the load demand of the island during day time which is at 30-40 kW. The peak demand during night is around 40-50 kW only. Addition of another 50 kWp solar plant should make Bitra entirely a green powered island, the Diesel Generating sets will be in standby. The capacity of the existing battery bank will also be properly augmented to feed the night load.

The consultant is expected to visit the island soon for field study. After receiving the report, necessary environmental clearance is to be taken from concerned, if required. The plant may be got installed through the SECI or through open tender.

BIOMASS BASED POWER PLANTS

Department have earlier explored the possibility of utilizing the biomass, especially coconut waste, which is available in plenty, for economical generation of power with the technical assistance of Indian Institute of Science, Bangalore. The technology adapted was gasification of biomass. A 250 kW biomass gasifier plant

was installed where Diesel generating set run on dual fuel mode i.e. 80% gas and 20% diesel. The project could not succeed due to various reasons.

However, determined to utilize the biomass waste to meet a part of growing power demand of these islands, the power department decided to install biomass combustion route, which is a proven technology, based power plants at three island viz. at Androtт (2 MW), Kavaratti (2 MW) and Kadmath (1 MW). The DPR and bid documents for the proposed project got prepared which was further vetted by the Ministry of New & Renewable Energy. Ministry will fund the project at the rate of Rs. 2 core/MW. The CFA will be released directly to the firm. Power Department will provide the land and logistical support. Supplier will provide a guaranteed quantity of electricity every year for which the power department will make payment at the rate quoted by the firm. After 10 – 15 years the plant will be handed over to the dept.

The tender floated during 06/14. Even though two firms participated neither of them were technically qualified. Again after rectification of flaws in the tender document it was retendered during 06/15 but failed attract any of the interested parties.

Meanwhile during 09/15, Engineers from M/s Arya Energy, Raipur, who is operating such plants in Chhattisgarh, visited Kavaratti and had detailed discussion with the department of Electricity and Secretary (Power). They expressed their interest towards executing the project. They explained the possible hurdles such as availability of required quantity of biomass, ash disposal etc.

Hence they suggested to take one plant at a time i.e. install one plant of 2 MW capacity either at Kavaratti or Androtт operate it successfully for a year or two understand the logistical difficulty and then other plants could be installed.

They also suggested some modifications to the bid document, which are being scrutinized and will be submitted to the Ministry for final approval. On receiving the vetted document it will be tendered by the power department.

OIL STORAGE FACILITES AND DELIVERY POINT IN THE ISLAND

GOI, Min. of Petroleum & Natural Gas conveyed the approval to install Bulk Oil Storage Facilities at Kavaratti and Minicoy Islands in the sites selected by the High Power Committees as a deposit work by IOC vide their letter dated 19/02/2004. The works at Kavaratti and Minicoy were started on the basis of the initial approval of CCE, Nagpur and on the basis of advice of Deputy Conservator of Forests in the Administration.

One Writ Petition (WPI 3334/06) challenging the installation of Bulk Oil Storage Facilities at Kavaratti, filed before Hon'ble High Court of Kerala. Which ultimately led to stopping the construction activities when all the works except laying of pipe lines were completed at Kavaratti.

Expert Appraisal Committee on CRZ in their 115th Meeting suggested the Ministry to refer back the proposal to State Coastal Zone Management Authority for necessary action as the activity falls within the purview of SCZMA. Lakshadweep Administration decided to deposit balance amount for the completion of works to IOC after the visit of IOC officials. IOC restarted the works and completed the work at Kavaratti and obtained PESO licensee. Commissioning the

facility is pending due to non-availability of Oil barge. IOC stopped the work at Minicoy due non-payment of revised estimate cost. The shifting of delivery point will result in net saving of Rs 1 per litre of HSD (BS III) and Rs 1.46 per litre of HSD (BS IV).

PREPAID METERING PLAN

As the Electricity Department of Lakshadweep is primarily reliant on self-meter reading by its consumers which are 99% LT Consumers, the utility has to plan for switching to prepaid metering.

Installation of prepaid metering will help the department in reducing its AT&C losses and improve its realization. Some of the improvements which the department envisages post implementation of prepaid metering are:

I. Multi fold increase in revenue collection
II. 100% consumers satisfaction service delivery achieved
III. 100% collection efficiency and billing efficiency for prepaid consumers
IV. Reduction in pilferage.

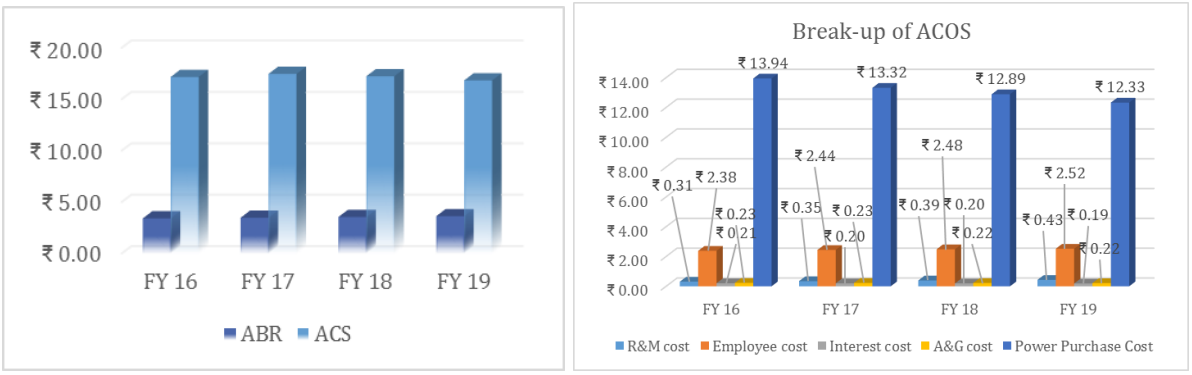
Accordingly, the department will prepare a plan for 100% prepaid metering for approval of competent authority by July 2016 and target the conversion of all connections within one year of approval of the plan by the competent authority and not later than end of FY 18. The overall cost of the scheme will be in range of Rs 6-8 Crores.

CHAPTER 19: FINANCIAL VIABILITY OF THE POWER DEPARTMENT

The main source of power is Union Territory of Lakshadweep is HSD (High Speed Diesel) based power generators and solar based SPV's. Since, specific fuel consumption is very high in case of HSD, the overall cost of generation is one of the highest. The average cost of power generation comes to around Rs 12-13/unit which makes up 73% of the total cost in the ARR. The ACoS in UT of Lakshadweep has ranged around Rs 17/Unit. This high cost of supply makes it very difficult to recover all the costs in ARR and the present average recovery is around Rs 3.5/unit which in turn means the recovery through tariff hovers around 20-22% only. More than 99% sales in Lakshadweep is at LT level only, in which Domestic and Commercial Categories constitute more than 97% share, which makes it highly unforeseeable to recover the full cost through tariff hikes.

Therefore, UT is highly dependent on support from Government of India for Electricity Department to meet its cost at present and in future also.

Figure 28: ACoS Vs ABR and Break-up of ACOS



However, UT of Lakshadweep has planned to increase the capacity of solar based SPVs in the islands which will help in reduction on dependence on diesel based generating stations which in turn will help in reducing the cost of power and overall cost of supply. Further, Electricity Department has planned to improve upon its collection efficiency by implementing prepaid metering in the Islands.

CHAPTER 20: OTHER INITIATIVES

COMMUNICATION

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

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

The financial situation in Electricity Department of Lakshadweep 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 Administration of Lakshadweep will also be required:

Table 53: Proposed Communication Responsibilities

Communication Objective	Responsibility	Frequency
"Power for All" – Roll Out Plan	Secretary, Energy	Quarterly
Status update on Deliverables	Secretary, Energy	Quarterly
Generation Projects *Physical Progress, Achievements and Other Relates Issues*	Executive Engineer	Quarterly
Distribution *Progress, Achievements, Losses, Consumer Initiatives etc.*	Executive Engineer	Monthly
Renewable Power	LEDA	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.

- ✓ 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.

- ✓ 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 Island wise Distribution Control Centers (RDCC) within the State will be identified in view of upcoming projected load. 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 Electricity Department 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.

The present computerization status of Electricity Department is shown below:

- ✓ *The cash collection counters since 1995.*
- ✓ *Store Inventory Management.*
- ✓ *Payroll of Employees.*
- ✓ *Various kind of bills of employees.*
- ✓ *Setup Local Area Networks in all the offices under the Department.*
- ✓ *Provided internet connection to all the office through SWAN*
- ✓ *Introduced various online applications including Electricity Consumer Management System & Inventory Management System*
- ✓ *Online Tapal Monitoring System has been introduced and functions at Electricity Division office*
- ✓ *Online software for Power Generation monitoring has been put on trial run since 27th October, 2012*
- ✓ *Introduced online payment and online application for new connection.*

In future, the department plans to cover the following

- ✓ *Computerization of entire activity of the Department*
- ✓ *Remote monitoring & Control of Power Generation & Distribution system*

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.

- **Administration Level Committee:** It is proposed that a Administration 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.

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

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

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.

ORGANIZATIONAL STRUCTURE

The present sanctioned strength viz-a-viz the vacancies is summarized below:

S. No.	Post	Present	Vacancy
1	Executive Engineer	1	
2	Assistant Executive Engineer	1	
3	Assistant Engineer	8	
4	Junior Engineer	33	5
5	Tracer	5	
6	Chargeman / Electrician/Mechanic	36	5
7	Operator/Meter Reader	24	
8	Helper for Lineman / Engine Driver/Oil man/Line man	174	19
Total		282	29

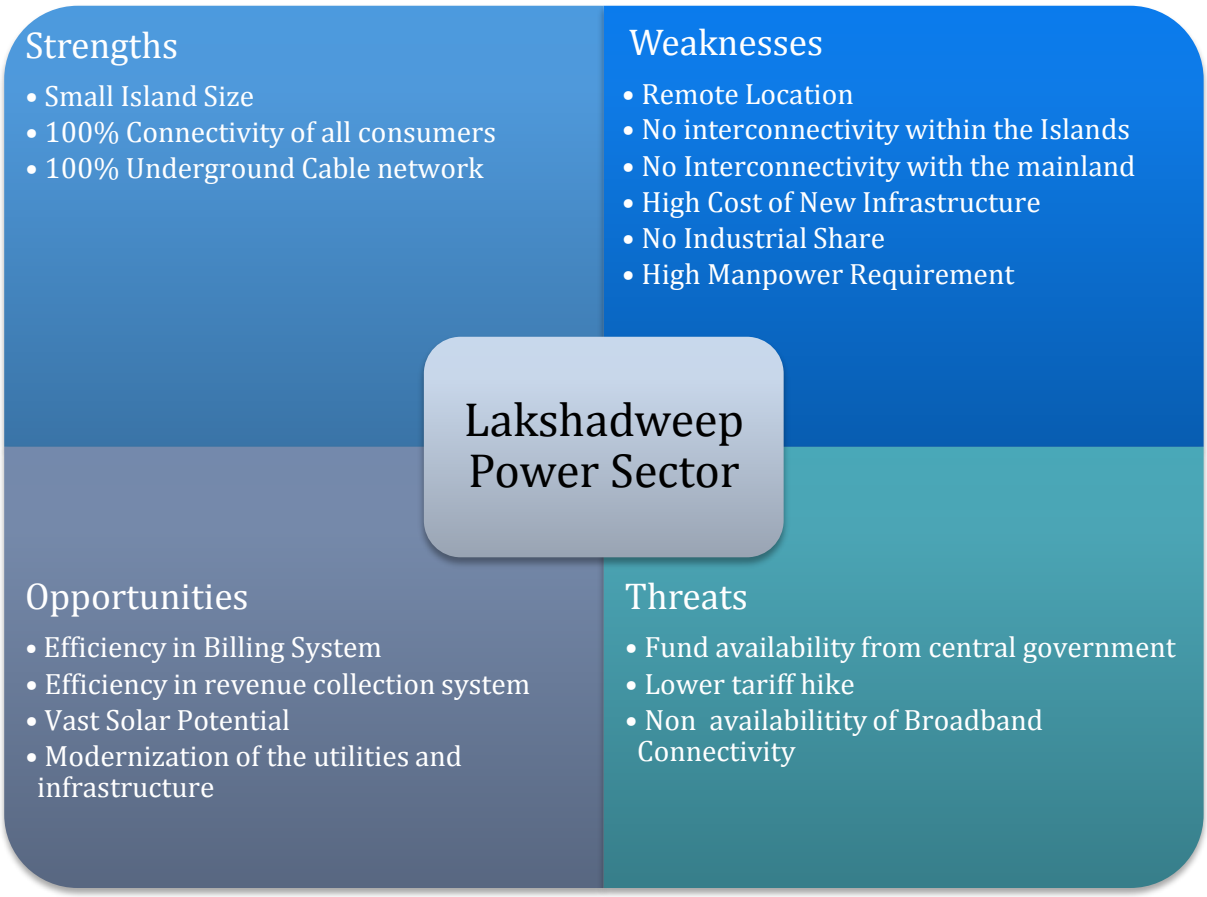
However, there is need to revisit the organizational requirement considering the increased load growth as well as new technologies already/being adopted by the power department.

The present organizational structure of the Electricity Department is shown below:

CHAPTER 21: 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 Lakshadweep in achieving the set goal. Before structuring the above targets, SWOT analysis of existing power sector in Lakshadweep has been discussed. The exercise has been done to bring out some of the key risk indicators which affect the overall market in Lakshadweep along with advantages present.



From the above analysis it is quite evident that most of the threats and weaknesses are external factors which would need continuous efforts from both Administration of Lakshadweep as well as Government of India to mitigate them as soon as possible.

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

BEST PRACTICES

Some of the best practices followed by the power department of UT of Lakshadweep is summarized below:

- ✓ Round the clock power supply in all the inhabited Islands
- ✓ Electrified 100% households
- ✓ Connection available on demand
- ✓ Self-meter reading by consumers from 1988 onwards.
- ✓ Charges are paid directly at the computerized Billing counters in the Islands
- ✓ Consumers have the option to temporarily generate bills online before making payment at the Billing counters.
- ✓ 100% underground cabling
- ✓ 100% computerized billing
- ✓ Inter linked all sub-divisions and sections through virtual connectivity
- ✓ Bitra Island to become first LED village of Lakshadweep
- ✓ Electronic Energy meters being installed now are having optical port to download data directly to CMRI and then into computer for further processing.
- ✓ Periodic surprise checking of energy meters are being carried out by the Department.

Table 54: Roll Out Plan

Sl. No.	Category	Base year scenario (FY 16)	FY 17	FY 18	FY 19	Total	Total expected capacity FY 19
GENERATION							
A	**Availability (MW):**						
	Own Generation						
1	DG Sets	22.02	2.65	3.15	0.00	**5.80**	27.82
2	Solar	2.15	2.50	2.00	1.80	**6.30**	8.45
Total Availability (MW)		**24.17**	**5.15**	**5.15**	**1.80**	**12.10**	**36.27**
B	**Peak Demand (MW):**						
1	Peak Demand (MW) (8.24 MW in FY 15)	**8.79**	**9.39**	**10.07**	**10.85**		**10.85**
2	Per Capita Consumption	**762**	**810**	**864**	**926**		**926**
TRANSMISSION AND DISTRIBUTION							
C	**Efficiency Improvement**						
1	T&D Losses (7.79% in FY 15)	7.23%	6.72%	6.23%	5.78%		5.78%
2	AT&C Losses (21.05% in FY 15)	17.48%	13.90%	10.32%	6.72%		6.72%
3	DELP (Number of consumers Covered)		11013				11013
D	**Capacity Addition/Augmentation**						
1	Step-Up Transformers (in MVA)	23.6	1	5	0	**6**	29.6
2	Step-Down Transformers (in MVA)	15.897	0.75	3.5	1	**5.25**	21.147
3	HT Lines (CKT Km.)	104.564	8.75	7.75	0	**16.5**	121.064
4	LT Lines (CKT Km.)	268.213	15	20	1.5	**36.5**	304.713
5	Street lights	5334	737	65	42	**844**	6178
6	Street lights (Solar)	1994	479	40	0	**519**	2513

The island-wise actionable roll-out plan has been detailed in Annexure – 3.

CHAPTER 22: 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 55: Fund Requirement

S. No.	Particulars	FY 17	FY 18	FY 19
1	Augmentation of DG set (Old)	4.55	4.55	4.55
2	Augmentation of DG Generating Capacity (New)	3.10	4.35	
3	Augmentation of Solar Generating Capacity (New)	1.50	1.20	1.08
4	Setting up of Installation of transformers	0.70	0.70	0.70
5	Construction of HT Lines / RMU	1.10	1.10	1.10
6	Service connections /LT Line	0.30	0.30	0.30
7	Street Lights	0.30	0.30	0.30
8	Distribution Box	0.30	0.30	0.30
9	Energy Meter	0.75	0.75	0.75
10	Underground cable for consumers	0.20	0.20	0.20
11	Energy Conservation	0.05	0.05	0.05
12	e-Governance	0.15	0.15	0.15
13	Special Tools and Plants	0.20	0.20	0.20
14	Administrative set up	0.30	0.30	0.30
15	Oil Storage facilities	2.95	2.95	2.95
16	Civil works	2.75	2.75	2.75
17	Skill up gradation	0.40	0.40	0.40
Total		**19.60**	**20.55**	**16.08**

The entire capital expenditure incurred by Electricity Department of Lakshadweep will be funded by GOI through budgetary support without any external borrowings for the capital expenditure.

ANNEXURES

ANNEXURE – 1

Table 56: Population Details as per 2011 Census (In Nos.) [2]

S. No.	District Name	Total	Rural		Urban	
		(in No.s)	In No.s	In %age	In No.s	In %age
1	Amini	7,661	0	0.00%	7661	100.00%
2	Bitra	271	271	100.00%	0	0.00%
3	Chetlat	2,347	2,347	100.00%	0	0.00%
4	Kiltan	3,946	3,946	100.00%	0	0.00%
5	Kadmat	5,404	0	0.00%	5404	100.00%
6	Kavaratti	11,221	11	0.10%	11210	99.90%
7	Agatti	7,566	7,566	100.00%	0	0.00%
8	Andrott	11,191	0	0.00%	11191	100.00%
9	Kalpeni	4,419	0	0.00%	4419	100.00%
10	Minicoy	10,447	0	0.00%	10447	100.00%
Overall		**64,473**	**14,141**	**21.93%**	**50,332**	**78.07%**

Table 57: Households and their Electrification Status (in %age) [3]

S. No.	District Name	Households		Electrification Status - Rural		Electrification Status - Urban	
		Rural	Urban	Electrified	Un-Electrified	Electrified	Un-Electrified
1	Amini	0.00%	100.00%	0.00%	0.00%	99.62%	0.38%
2	Bitra	100.00%	0.00%	100.00%	0.00%	0.00%	0.00%
3	Chetlat	100.00%	0.00%	99.80%	0.20%	0.00%	0.00%
4	Kiltan	100.00%	0.00%	99.73%	0.27%	0.00%	0.00%
5	Kadmat	0.00%	100.00%	0.00%	0.00%	99.90%	0.10%
6	Kavaratti	0.00%	100.00%	0.00%	0.00%	99.55%	0.45%
7	Agatti	100.00%	0.00%	99.75%	0.25%	0.00%	0.00%
8	Andrott	0.00%	100.00%	0.00%	0.00%	99.61%	0.39%
9	Kalpeni	0.00%	100.00%	0.00%	0.00%	99.88%	0.12%
10	Minicoy	0.00%	100.00%	0.00%	0.00%	99.60%	0.40%
Overall		**23.57%**	**76.43%**	**99.76%**	**0.24%**	**99.66%**	**0.34%**

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

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

ANNEXURE – 2

Table 58: Year-wise Projection of Power Generation/Availability (in MU) – Agatti Island

Particulars	FY 16	FY 17	FY 18	FY 19
Power Purchase Quantum and Cost				
Total Energy Requirement within Island (MU)	*5.99*	*6.54*	*7.16*	*7.88*
Energy Generated from Solar (MU)	*0.10*	*0.10*	*0.10*	*1.10*
Required Generation from DG Sets corresponding to Max Requirement (MU)	*5.89*	*6.44*	*7.06*	*6.78*
Cost of Energy Generation from Solar (Included in O&M Contract) (Rs Crores)	**0.00**	**0.00**	**0.00**	**0.00**
Specific Oil Consumption per kWH (ml) for Island	*265.74*	*265.74*	*265.74*	*265.74*
Estimated HSD Consumption (in Kl)	*1565.65*	*1711.03*	*1876.72*	*1800.40*
Cost of HSD Oil (Rs. Crores) @ Rs 46.21/L	**7.23**	**7.91**	**8.67**	**8.32**
Weighted Average lube oil consumption per kWh (ml)	*0.87*	*0.87*	*0.87*	*0.87*
Lube Oil Consumption (Litres)	*5125.74*	*5601.71*	*6144.16*	*5894.30*
Cost of Lube Oil (Rs Crores) @ Rs 215.62/L	**0.11**	**0.12**	**0.13**	**0.13**
Total Cost of Fuel (In Rs Crores)	**7.35**	**8.03**	**8.80**	**8.45**

Table 59: Year-wise Projection of Power Generation /Availability (in MU) – Amini Island

Particulars	FY 16	FY 17	FY 18	FY 19
Power Purchase Quantum and Cost				
Total Energy Requirement within Island (MU)	*5.15*	*5.54*	*5.97*	*6.44*
Energy Generated from Solar (MU)	*0.10*	*0.10*	*1.10*	*1.10*
Required Generation from DG Sets corresponding to Max Requirement (MU)	*5.05*	*5.44*	*4.87*	*5.34*
Cost of Energy Generation from Solar (Included in O&M Contract) (Rs Crores)	**0.00**	**0.00**	**0.00**	**0.00**
Specific Oil Consumption per kWH (ml) for Island	*259.99*	*259.99*	*259.99*	*259.99*
Estimated HSD Consumption (in Kl)	*1311.98*	*1415.28*	*1267.44*	*1389.31*
Cost of HSD Oil (Rs. Crores) @ Rs 46.21/L	**6.06**	**6.54**	**5.86**	**6.42**
Weighted Average lube oil consumption per kWh (ml)	*0.87*	*0.87*	*0.87*	*0.87*
Lube Oil Consumption (Litres)	*4390.25*	*4735.93*	*4241.22*	*4649.01*
Cost of Lube Oil (Rs Crores) @ Rs 215.62/L	**0.09**	**0.10**	**0.09**	**0.10**
Total Cost of Fuel (In Rs Crores)	**6.16**	**6.64**	**5.95**	**6.52**

Table 60: Year-wise Projection of Power Generation /Availability (in MU) – Androth Island

Particulars	FY 16	FY 17	FY 18	FY 19
Power Purchase Quantum and Cost				
Total Energy Requirement within Island (MU)	*7.23*	*7.66*	*8.12*	*8.61*
Energy Generated from Solar (MU)	*0.32*	*0.32*	*0.32*	*0.32*
Required Generation from DG Sets corresponding to Max Requirement (MU)	*6.91*	*7.34*	*7.80*	*8.29*
Cost of Energy Generation from Solar (Included in O&M Contract) (Rs Crores)	**0.00**	**0.00**	**0.00**	**0.00**
Specific Oil Consumption per kWH (ml) for Island	*274.46*	*274.46*	*274.46*	*274.46*
Estimated HSD Consumption (in Kl)	*1897.33*	*2013.72*	*2139.70*	*2276.57*
Cost of HSD Oil (Rs. Crores) @ Rs 46.21/L	**8.77**	**9.31**	**9.89**	**10.52**
Weighted Average lube oil consumption per kWh (ml)	*0.87*	*0.87*	*0.87*	*0.87*
Lube Oil Consumption (Litres)	*6014.28*	*6383.20*	*6782.57*	*7216.41*
Cost of Lube Oil (Rs Crores) @ Rs 215.62/L	**0.13**	**0.14**	**0.15**	**0.16**
Total Cost of Fuel (In Rs Crores)	**8.90**	**9.44**	**10.03**	**10.68**

Table 61: Year-wise Projection of Power Generation /Availability (in MU) – Bitra Island

Particulars	FY 16	FY 17	FY 18	FY 19
Power Purchase Quantum and Cost				
Total Energy Requirement within Island (MU)	*0.23*	*0.24*	*0.25*	*0.26*
Energy Generated from Solar (MU)	*0.10*	*0.10*	*0.10*	*0.10*
Required Generation from DG Sets corresponding to Max Requirement (MU)	*0.13*	*0.14*	*0.15*	*0.16*
Cost of Energy Generation from Solar (Included in O&M Contract) (Rs Crores)	**0.00**	**0.00**	**0.00**	**0.00**
Specific Oil Consumption per kWH (ml) for Island	*390.74*	*390.74*	*390.74*	*390.74*
Estimated HSD Consumption (in Kl)	*51.09*	*54.80*	*58.76*	*62.97*
Cost of HSD Oil (Rs. Crores) @ Rs 46.21/L	**0.24**	**0.25**	**0.27**	**0.29**
Weighted Average lube oil consumption per kWh (ml)	*0.87*	*0.87*	*0.87*	*0.87*
Lube Oil Consumption (Litres)	*113.76*	*122.02*	*130.82*	*140.20*
Cost of Lube Oil (Rs Crores) @ Rs 215.62/L	**0.00**	**0.00**	**0.00**	**0.00**
Total Cost of Fuel (In Rs Crores)	**0.24**	**0.26**	**0.27**	**0.29**

Table 62: Year-wise Projection of Power Generation /Availability (in MU) – Chetlat Island

Particulars	FY 16	FY 17	FY 18	FY 19
Power Purchase Quantum and Cost				
Total Energy Requirement within Island (MU)	*1.54*	*1.61*	*1.68*	*1.76*
Energy Generated from Solar (MU)	*0.10*	*0.10*	*0.10*	*0.10*
Required Generation from DG Sets corresponding to Max Requirement (MU)	*1.44*	*1.51*	*1.58*	*1.66*
Cost of Energy Generation from Solar (Included in O&M Contract) (Rs Crores)	**0.00**	**0.00**	**0.00**	**0.00**
Specific Oil Consumption per kWH (ml) for Island	*305.25*	*305.25*	*305.25*	*305.25*
Estimated HSD Consumption (in Kl)	*438.41*	*459.91*	*482.83*	*507.31*
Cost of HSD Oil (Rs. Crores) @ Rs 46.21/L	**2.03**	**2.13**	**2.23**	**2.34**
Weighted Average lube oil consumption per kWh (ml)	*0.87*	*0.87*	*0.87*	*0.87*
Lube Oil Consumption (Litres)	*1249.52*	*1310.81*	*1376.14*	*1445.91*
Cost of Lube Oil (Rs Crores) @ Rs 215.62/L	**0.03**	**0.03**	**0.03**	**0.03**
Total Cost of Fuel (In Rs Crores)	**2.05**	**2.15**	**2.26**	**2.38**

Table 63: Year-wise Projection of Power Generation /Availability (in MU) – Kadmat Island

Particulars	FY 16	FY 17	FY 18	FY 19
Power Purchase Quantum and Cost				
Total Energy Requirement within Island (MU)	*4.41*	*4.52*	*4.65*	*4.80*
Energy Generated from Solar (MU)	*0.15*	*0.15*	*1.15*	*1.15*
Required Generation from DG Sets corresponding to Max Requirement (MU)	*4.26*	*4.37*	*3.50*	*3.65*
Cost of Energy Generation from Solar (Included in O&M Contract) (Rs Crores)	**0.00**	**0.00**	**0.00**	**0.00**
Specific Oil Consumption per kWH (ml) for Island	*251.00*	*251.00*	*251.00*	*251.00*
Estimated HSD Consumption (in Kl)	*1068.34*	*1096.61*	*878.08*	*915.03*
Cost of HSD Oil (Rs. Crores) @ Rs 46.21/L	**4.94**	**5.07**	**4.06**	**4.23**
Weighted Average lube oil consumption per kWh (ml)	*0.87*	*0.87*	*0.87*	*0.87*
Lube Oil Consumption (Litres)	*3703.03*	*3800.99*	*3043.55*	*3171.61*
Cost of Lube Oil (Rs Crores) @ Rs 215.62/L	**0.08**	**0.08**	**0.07**	**0.07**
Total Cost of Fuel (In Rs Crores)	**5.02**	**5.15**	**4.12**	**4.30**

Table 64: Year-wise Projection of Power Generation /Availability (in MU) – Kalpeni Island

Particulars	FY 16	FY 17	FY 18	FY 19
Power Purchase Quantum and Cost				
Total Energy Requirement within Island (MU)	*3.62*	*3.87*	*4.14*	*4.44*
Energy Generated from Solar (MU)	*0.10*	*0.10*	*0.10*	*0.90*
Required Generation from DG Sets corresponding to Max Requirement (MU)	*3.52*	*3.77*	*4.04*	*3.54*
Cost of Energy Generation from Solar (Included in O&M Contract) (Rs Crores)	**0.00**	**0.00**	**0.00**	**0.00**
Specific Oil Consumption per kWH (ml) for Island	*616.02*	*616.02*	*616.02*	*616.02*
Estimated HSD Consumption (in Kl)	*2169.00*	*2322.84*	*2489.87*	*2179.52*
Cost of HSD Oil (Rs. Crores) @ Rs 46.21/L	**10.02**	**10.73**	**11.51**	**10.07**
Weighted Average lube oil consumption per kWh (ml)	*0.87*	*0.87*	*0.87*	*0.87*
Lube Oil Consumption (Litres)	*3063.26*	*3280.52*	*3516.43*	*3078.12*
Cost of Lube Oil (Rs Crores) @ Rs 215.62/L	**0.07**	**0.07**	**0.08**	**0.07**
Total Cost of Fuel (In Rs Crores)	**10.09**	**10.80**	**11.58**	**10.14**

Table 65: Year-wise Projection of Power Generation /Availability (in MU) – Kavaratti Island

Particulars	FY 16	FY 17	FY 18	FY 19
Power Purchase Quantum and Cost				
Total Energy Requirement within Island (MU)	*11.76*	*12.73*	*13.86*	*15.20*
Energy Generated from Solar (MU)	*0.76*	*1.76*	*1.76*	*1.76*
Required Generation from DG Sets corresponding to Max Requirement (MU)	*11.00*	*10.97*	*12.10*	*13.44*
Cost of Energy Generation from Solar (Included in O&M Contract) (Rs Crores)	**0.00**	**0.00**	**0.00**	**0.00**
Specific Oil Consumption per kWH (ml) for Island	*258.88*	*258.88*	*258.88*	*258.88*
Estimated HSD Consumption (in Kl)	*2847.96*	*2840.87*	*3131.20*	*3478.26*
Cost of HSD Oil (Rs. Crores) @ Rs 46.21/L	**13.16**	**13.13**	**14.47**	**16.07**
Weighted Average lube oil consumption per kWh (ml)	*0.87*	*0.87*	*0.87*	*0.87*
Lube Oil Consumption (Litres)	*9570.95*	*9547.11*	*10522.79*	*11689.14*
Cost of Lube Oil (Rs Crores) @ Rs 215.62/L	**0.21**	**0.21**	**0.23**	**0.25**
Total Cost of Fuel (In Rs Crores)	**13.37**	**13.33**	**14.70**	**16.33**

Table 66: Year-wise Projection of Power Generation /Availability (in MU) – Kiltan Island

Particulars	FY 16	FY 17	FY 18	FY 19
Power Purchase Quantum and Cost				
Total Energy Requirement within Island (MU)	*2.74*	*2.94*	*3.19*	*3.52*
Energy Generated from Solar (MU)	*0.10*	*0.10*	*0.10*	*0.10*
Required Generation from DG Sets corresponding to Max Requirement (MU)	*2.64*	*2.84*	*3.09*	*3.42*
Cost of Energy Generation from Solar (Included in O&M Contract) (Rs Crores)	**0.00**	**0.00**	**0.00**	**0.00**
Specific Oil Consumption per kWH (ml) for Island	*280.51*	*280.51*	*280.51*	*280.51*
Estimated HSD Consumption (in Kl)	*740.36*	*795.45*	*865.96*	*959.72*
Cost of HSD Oil (Rs. Crores) @ Rs 46.21/L	**3.42**	**3.68**	**4.00**	**4.43**
Weighted Average lube oil consumption per kWh (ml)	*0.87*	*0.87*	*0.87*	*0.87*
Lube Oil Consumption (Litres)	*2296.22*	*2467.07*	*2685.78*	*2976.56*
Cost of Lube Oil (Rs Crores) @ Rs 215.62/L	**0.05**	**0.05**	**0.06**	**0.06**
Total Cost of Fuel (In Rs Crores)	**3.47**	**3.73**	**4.06**	**4.50**

Table 67: Year-wise Projection of Power Generation /Availability (in MU) – Minicoy Island

Particulars	FY 16	FY 17	FY 18	FY 19
Power Purchase Quantum and Cost				
Total Energy Requirement within Island (MU)	*7.99*	*8.53*	*9.14*	*9.82*
Energy Generated from Solar (MU)	*0.32*	*1.82*	*1.82*	*1.82*
Required Generation from DG Sets corresponding to Max Requirement (MU)	*7.67*	*6.71*	*7.32*	*8.00*
Cost of Energy Generation from Solar (Included in O&M Contract) (Rs Crores)	**0.00**	**0.00**	**0.00**	**0.00**
Specific Oil Consumption per kWH (ml) for Island	*246.81*	*246.81*	*246.81*	*246.81*
Estimated HSD Consumption (in Kl)	*1892.08*	*1657.22*	*1807.31*	*1974.25*
Cost of HSD Oil (Rs. Crores) @ Rs 46.21/L	**8.74**	**7.66**	**8.35**	**9.12**
Weighted Average lube oil consumption per kWh (ml)	*0.87*	*0.87*	*0.87*	*0.87*
Lube Oil Consumption (Litres)	*6669.53*	*5841.67*	*6370.74*	*6959.20*
Cost of Lube Oil (Rs Crores) @ Rs 215.62/L	**0.14**	**0.13**	**0.14**	**0.15**
Total Cost of Fuel (In Rs Crores)	**8.89**	**7.78**	**8.49**	**9.27**

Table 68: Year-wise Projection of Category-wise Revenue (In Rs Crores) – Base Case (Agatti)

Categories	ABR	Projections			
	FY 16	FY 16	FY 17	FY 18	FY 19
Domestic	2.30	0.81	0.99	1.20	1.45
Commercial	6.43	1.26	1.73	2.37	3.26
Industrial	8.30	0.04	0.05	0.06	0.07
Public	4.40	0.04	0.05	0.06	0.07
Temporary	7.70	0.01	0.01	0.01	0.01
Grand Total		**2.16**	**2.82**	**3.70**	**4.86**

Table 69: Year-wise Projection of Category-wise Revenue (In Rs Crores) – Base Case (Amini)

Categories	ABR	Projections			
	FY 16	FY 16	FY 17	FY 18	FY 19
Domestic	2.30	0.95	1.17	1.45	1.79
Commercial	6.43	0.47	0.62	0.81	1.07
Industrial	8.30	0.05	0.06	0.08	0.10
Public	4.40	0.05	0.06	0.08	0.10
Temporary	7.70	0.00	0.00	0.01	0.01
Grand Total		**1.51**	**1.91**	**2.42**	**3.07**

Table 70: Year-wise Projection of Category-wise Revenue (In Rs Crores) – Base Case (Androth)

Categories	ABR	Projections			
	FY 16	FY 16	FY 17	FY 18	FY 19
Domestic	2.30	1.29	1.56	1.90	2.30
Commercial	6.43	0.68	0.86	1.10	1.41
Industrial	8.30	0.14	0.20	0.30	0.43
Public	4.40	0.03	0.03	0.04	0.04
Temporary	7.70	0.01	0.01	0.02	0.02
Grand Total		**2.14**	**2.67**	**3.35**	**4.20**

Table 71: Year-wise Projection of Category-wise Revenue (In Rs Crores) – Base Case (Bitra)

Categories	ABR	Projections			
	FY 16	FY 16	FY 17	FY 18	FY 19
Domestic	2.30	0.03	0.04	0.05	0.06
Commercial	6.43	0.05	0.06	0.07	0.08
Industrial	8.30	0.00	0.00	0.00	0.00
Public	4.40	0.00	0.00	0.00	0.00
Temporary	7.70	0.00	0.00	0.00	0.00
Grand Total		**0.09**	**0.10**	**0.12**	**0.15**

Table 72: Year-wise Projection of Category-wise Revenue (In Rs Crores) – Base Case (Chetlat)

Categories	ABR	Projections			
	FY 16	FY 16	FY 17	FY 18	FY 19
Domestic	2.30	0.25	0.30	0.36	0.43
Commercial	6.43	0.19	0.24	0.31	0.39
Industrial	8.30	0.01	0.01	0.01	0.01
Public	4.40	0.01	0.01	0.01	0.02
Temporary	7.70	0.00	0.00	0.01	0.01
Grand Total		**0.46**	**0.56**	**0.69**	**0.86**

Table 73: Year-wise Projection of Category-wise Revenue (In Rs Crores) – Base Case (Kadmat)

Categories	ABR	Projections			
	FY 16	FY 16	FY 17	FY 18	FY 19
Domestic	2.30	0.61	0.76	0.94	1.16
Commercial	6.43	0.37	0.47	0.60	0.77
Industrial	8.30	0.03	0.03	0.04	0.05
Public	4.40	0.10	0.13	0.17	0.23
Temporary	7.70	0.01	0.01	0.02	0.03
Grand Total		**1.11**	**1.40**	**1.77**	**2.23**

Table 74: Year-wise Projection of Category-wise Revenue (In Rs Crores) – Base Case (Kalpeni)

Categories	ABR	Projections			
	FY 16	FY 16	FY 17	FY 18	FY 19
Domestic	2.30	0.65	0.80	0.99	1.22
Commercial	6.43	0.31	0.38	0.48	0.60
Industrial	8.30	0.04	0.05	0.07	0.10
Public	4.40	0.03	0.03	0.04	0.04
Temporary	7.70	0.01	0.02	0.03	0.06
Grand Total		**1.03**	**1.28**	**1.61**	**2.02**

Table 75: Year-wise Projection of Category-wise Revenue (In Rs Crores) – Base Case (Kavaratti)

Categories	ABR	Projections			
	FY 16	FY 16	FY 17	FY 18	FY 19
Domestic	2.30	1.50	1.86	2.29	2.84
Commercial	6.43	2.47	3.16	4.05	5.18
Industrial	8.30	0.07	0.09	0.11	0.13
Public	4.40	0.05	0.05	0.06	0.07
Temporary	7.70	0.08	0.17	0.36	0.77
Grand Total		**4.17**	**5.33**	**6.87**	**8.98**

Table 76: Year-wise Projection of Category-wise Revenue (In Rs Crores) – Base Case (Kiltan)

Categories	ABR	Projections			
	FY 16	FY 16	FY 17	FY 18	FY 19
Domestic	2.30	0.43	0.52	0.63	0.77
Commercial	6.43	0.26	0.33	0.42	0.53
Industrial	8.30	0.01	0.01	0.02	0.02
Public	4.40	0.06	0.11	0.21	0.38
Temporary	7.70	0.00	0.00	0.00	0.00
Grand Total		**0.76**	**0.98**	**1.28**	**1.70**

Table 77: Year-wise Projection of Category-wise Revenue (In Rs Crores) – Base Case (Minicoy)

Categories	ABR	Projections			
	FY 16	FY 16	FY 17	FY 18	FY 19
Domestic	2.30	1.33	1.60	1.93	2.33
Commercial	6.43	1.13	1.53	2.06	2.79
Industrial	8.30	0.07	0.08	0.10	0.13
Public	4.40	0.03	0.04	0.04	0.05
Temporary	7.70	0.01	0.01	0.01	0.02
Grand Total		**2.57**	**3.26**	**4.16**	**5.32**

Table 78: Year-wise Projection of Daily Household Consumption

Particulars	FY 15	FY 16	FY 17	FY 18	FY 19
Total Domestic Sales	32.47	34.21	36.05	37.99	40.04
Total Domestic Consumers	18,825	19,104	19,387	19,674	19,965
Daily Household Consumption	**4.73**	**4.91**	**5.09**	**5.29**	**5.50**

ANNEXURE – 3

The Roll-Out Plan for Island –wise capacity addition in Generation is summarized below:

Table 79: Year-wise Projection of Maximum Demand (in MW)

Maximum Demand	FY 16	FY 17	FY 18	FY 19
Agatti	1.07	1.16	1.27	1.40
Amini	0.86	0.93	1.00	1.08
Androth	1.24	1.32	1.40	1.48
Bitra	0.05	0.05	0.06	0.06
Chetlat	0.38	0.40	0.42	0.44
Kadmat	0.82	0.84	0.86	0.89
Kalpeni	0.73	0.78	0.83	0.89
Kavaratti	1.90	2.06	2.24	2.45
Kiltan	0.40	0.43	0.47	0.52
Minicoy	1.33	1.42	1.53	1.64
Total	**8.79**	**9.39**	**10.07**	**10.85**

Table 80: Island-wise Capacity Addition (DG Sets)

Sl. No.	Island	Base year scenario (FY 16)	Capacity Addition (in MW)				Total expected capacity FY 19
			FY 17	FY 18	FY 19	Total	
1	Agatti	2.45	0.00	0.75	0.00	**0.75**	3.20
2	Amini	2.65	0.00	0.75	0.00	**0.75**	3.40
3	Androth	2.25	1.00	0.00	0.00	**1.00**	3.25
4	Bitra	0.52	0.00	0.00	0.00	**0.00**	0.52
5	Chetlat	1.00	0.00	0.00	0.00	**0.00**	1.00
6	Kadmat	2.30	0.00	0.75	0.00	**0.75**	3.05
7	Kalpeni	1.75	0.00	0.50	0.00	**0.50**	2.25
8	Kavaratti	3.20	1.00	0.00	0.00	**1.00**	4.20
9	Kiltan	1.50	0.65	0.00	0.00	**0.65**	2.15
10	Minicoy	4.40	0.00	0.40	0.00	**0.40**	4.80
	Total	**22.02**	**2.65**	**3.15**	**0.00**	**5.80**	**27.82**

Table 81: Island-wise Capacity Addition (Solar)

Sl. No.	Island	Base year scenario (FY 16)	Capacity Addition (in MW)				Total expected capacity FY 19
			FY 17	FY 18	FY 19	Total	
1	Agatti	0.10	0.00	0.00	1.00	**1.00**	1.10
2	Amini	0.10	0.00	1.00	0.00	**1.00**	1.10
3	Androth	0.32	0.00	0.00	0.00	**0.00**	0.32
4	Bitra	0.10	0.00	0.00	0.00	**0.00**	0.10
5	Chetlat	0.10	0.00	0.00	0.00	**0.00**	0.10
6	Kadmat	0.15	0.00	1.00	0.00	**1.00**	1.15
7	Kalpeni	0.10	0.00	0.00	0.80	**0.80**	0.90
8	Kavaratti	0.76	1.00	0.00	0.00	**1.00**	1.76
9	Kiltan	0.10	0.00	0.00	0.00	**0.00**	0.10
10	Minicoy	0.32	1.50	0.00	0.00	**1.50**	1.82
	Total	**2.15**	**2.50**	**2.00**	**1.80**	**6.30**	**8.45**

Barring operational constraints, the UT should endeavor to put its best foot forward to ensure 24 hours uninterrupted supply to all the consumers of the Islands.

The year-wise operational efficiency improvement targets for all Islands (on the basis of actual information of FY 15) are detailed below:

Table 82: Roll Out Plan (Efficiency Improvement Targets) – T&D Losses

Sl. No.	Island	Base year scenario (FY 15)	T&D Loss Trajectory (in %)			
			FY 16	FY 17	FY 18	FY 19
1	Agatti	5.63%	5.53%	5.43%	5.33%	5.23%
2	Amini	2.34%	2.34%	2.34%	2.34%	2.34%
3	Androth	4.48%	4.48%	4.48%	4.48%	4.48%
4	Bitra	0.00%	0.00%	0.00%	0.00%	0.00%
5	Chetlat	8.36%	8.11%	7.86%	7.61%	7.36%
6	Kadmat	24.27%	20.27%	16.27%	12.27%	8.27%
7	Kalpeni	5.92%	5.82%	5.72%	5.62%	5.52%
8	Kavaratti	9.37%	9.12%	8.87%	8.62%	8.37%
9	Kiltan	12.21%	11.21%	10.21%	9.21%	8.21%
10	Minicoy	3.51%	3.51%	3.51%	3.51%	3.51%
	Total	**7.79%**	**7.23%**	**6.72%**	**6.23%**	**5.78%**

Table 83: Roll Out Plan (Efficiency Improvement Targets) – Collection Efficiency

Sl. No.	Island	Base year scenario (FY 15)	Collection Efficiency Trajectory (in %)			
			FY 16	FY 17	FY 18	FY 19
1	Agatti	78.98%	83.98%	88.99%	93.99%	99.00%
2	Amini	89.17%	91.63%	94.09%	96.54%	99.00%
3	Androth	83.34%	87.26%	91.17%	95.09%	99.00%
4	Bitra	84.34%	88.00%	91.67%	95.33%	99.00%
5	Chetlat	85.05%	88.54%	92.02%	95.51%	99.00%
6	Kadmat	90.61%	92.70%	94.80%	96.90%	99.00%
7	Kalpeni	85.67%	89.00%	92.33%	95.67%	99.00%
8	Kavaratti	85.71%	89.03%	92.36%	95.68%	99.00%
9	Kiltan	83.39%	87.29%	91.19%	95.10%	99.00%
10	Minicoy	89.79%	92.09%	94.40%	96.70%	99.00%
	Total	**85.62%**	**88.96%**	**92.30%**	**95.64%**	**99.00%**

Table 84: Roll Out Plan (Efficiency Improvement Targets) – AT&C Losses

Sl. No.	Island	Base year scenario (FY 15)	AT&C Loss Trajectory (in %)			
			FY 16	FY 17	FY 18	FY 19
1	Agatti	25.47%	20.66%	15.84%	11.01%	6.17%
2	Amini	12.92%	10.52%	8.12%	5.72%	3.32%
3	Androth	20.39%	16.65%	12.91%	9.17%	5.43%
4	Bitra	15.66%	12.00%	8.33%	4.67%	1.00%
5	Chetlat	22.06%	18.64%	15.21%	11.76%	8.29%
6	Kadmat	31.38%	26.09%	20.62%	14.99%	9.19%
7	Kalpeni	19.40%	16.18%	12.95%	9.71%	6.46%
8	Kavaratti	22.32%	19.09%	15.84%	12.57%	9.29%
9	Kiltan	26.80%	22.50%	18.12%	13.66%	9.13%
10	Minicoy	13.36%	11.14%	8.91%	6.69%	4.47%
	Total	21.05%	17.48%	13.90%	10.32%	6.72%

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

Table 85: Roll Out Plan (Capacity Augmentation) – Step-Up Transformers (in MVA)

Sl. No.	Island	Base year scenario (FY 16)	Capacity Addition (in MVA)				Total expected capacity FY 19
			FY 17	FY 18	FY 19	Total	
1	Agatti	2.00	1.00	0.00	0.00	**1.00**	3.00
2	Amini	1.00	0.00	1.00	0.00	**1.00**	2.00
3	Androth	4.50	0.00	0.00	0.00	**0.00**	4.50
4	Bitra	0.00	0.00	0.00	0.00	**0.00**	0.00
5	Chetlat	0.50	0.00	0.00	0.00	**0.00**	0.50
6	Kadmat	1.50	0.00	1.00	0.00	**1.00**	2.50
7	Kalpeni	1.00	0.00	1.00	0.00	**1.00**	2.00
8	Kavaratti	6.00	0.00	1.00	0.00	**1.00**	7.00
9	Kiltan	1.10	0.00	1.00	0.00	**1.00**	2.10
10	Minicoy	6.00	0.00	0.00	0.00	**0.00**	6.00
	Total	**23.60**	**1.00**	**5.00**	**0.00**	**6.00**	**29.60**

Table 86: Roll Out Plan (Capacity Augmentation) – Step-Down Transformers (in MVA)

Sl. No.	Island	Base year scenario (FY 16)	Capacity Addition (in MVA)				Total expected capacity FY 19
			FY 17	FY 18	FY 19	Total	
1	Agatti	1.60	0.50	0.00	0.50	**1.00**	2.60
2	Amini	1.30	0.00	0.75	0.00	**0.75**	2.05
3	Androth	2.56	0.25	0.25	0.50	**1.00**	3.56
4	Bitra	0.00	0.00	0.00	0.00	**0.00**	0.00
5	Chetlat	0.30	0.00	0.00	0.00	**0.00**	0.30
6	Kadmat	1.00	0.00	0.75	0.00	**0.75**	1.75
7	Kalpeni	1.00	0.00	0.75	0.00	**0.75**	1.75
8	Kavaratti	4.53	0.00	0.50	0.00	**0.50**	5.03
9	Kiltan	0.70	0.00	0.25	0.00	**0.25**	0.95
10	Minicoy	2.90	0.00	0.25	0.00	**0.25**	3.15
	Total	**15.90**	**0.75**	**3.50**	**1.00**	**5.25**	**21.15**

Table 87: Roll Out Plan (Capacity Augmentation) – HT Lines (in Ckt. Km)

Sl. No.	Island	Base year scenario (FY 16)	Capacity Addition (in Ckt KM)				Total expected capacity FY 19
			FY 17	FY 18	FY 19	Total	
1	Agatti	14.51	1.00	1.00		**2.00**	16.51
2	Amini	6.86	1.00	1.00		**2.00**	8.86
3	Androth	12.00	2.00	1.00		**3.00**	15.00
4	Bitra					**0.00**	0.00
5	Chetlat	2.71		1.00		**1.00**	3.71
6	Kadmat	18.21	1.00	1.00		**2.00**	20.21
7	Kalpeni	7.57	1.00	1.00		**2.00**	9.57
8	Kavaratti	25.50	1.00	1.00		**2.00**	27.50
9	Kiltan	5.84	1.00			**1.00**	6.84
10	Minicoy	11.36	0.75	0.75		**1.50**	12.86
	Total	**104.56**	**8.75**	**7.75**	**0.00**	**16.50**	**121.06**

Table 88: Roll Out Plan (Capacity Augmentation) – LT Lines (in Ckt. Km)

Sl. No.	Island	Base year scenario (FY 16)	Capacity Addition (in Ckt KM)				Total expected capacity FY 19
			FY 17	FY 18	FY 19	Total	
1	Agatti	31.25	2.00	2.00		**4.00**	35.25
2	Amini	32.59	2.00	3.00		**5.00**	37.59
3	Androth	45.52	2.00	2.00		**4.00**	49.52
4	Bitra					**0.00**	0.00
5	Chetlat	8.49			1.50	**1.50**	9.99
6	Kadmat	32.69	1.00	3.00		**4.00**	36.69
7	Kalpeni	29.03	2.00	2.00		**4.00**	33.03
8	Kavaratti	41.98	3.00	5.00		**8.00**	49.98
9	Kiltan	12.30	1.00	1.00		**2.00**	14.30
10	Minicoy	34.37	2.00	2.00		**4.00**	38.37
	Total	**268.21**	**15.00**	**20.00**	**1.50**	**36.50**	**304.71**

Table 89: Roll Out Plan (Capacity Augmentation) – Street Lights (in No.s)

Sl. No.	Island	Base year scenario (FY 16)	Capacity Addition (in No.s)				Total expected capacity FY 19
			FY 17	FY 18	FY 19	Total	
1	Agatti	541	159			**159**	700
2	Amini	690	60			**60**	750
3	Androth	583	167			**167**	750
4	Bitra					**0**	0
5	Chetlat	358			42	**42**	400
6	Kadmat	658	92			**92**	750
7	Kalpeni	568	132			**132**	700
8	Kavaratti	865	75			**75**	940
9	Kiltan	373	52			**52**	425
10	Minicoy	698		65		**65**	763
	Total	**5334**	**737**	**65**	**42**	**844**	**6178**

Table 90: Roll Out Plan (Capacity Augmentation) – Solar Street Lights (in No.s)

Sl. No.	Island	Base year scenario (FY 16)	Capacity Addition (in No.s)				Total expected capacity FY 19
			FY 17	FY 18	FY 19	Total	
1	Agatti	204	96			**96**	300
2	Amini	260	50			**50**	310
3	Androth	160	40			**40**	200
4	Bitra	80		20		**20**	100
5	Chetlat	80		20		**20**	100
6	Kadmat	210	65			**65**	275
7	Kalpeni	167	83			**83**	250
8	Kavaratti	298	50			**50**	348
9	Kiltan	100	50			**50**	150
10	Minicoy	435	45			**45**	480
	Total	**1994**	**479**	**40**	**0**	**519**	**2513**

The concerned officials of the Electrical Divisions/Islands should be apprised about their individual targets and effective and robust monitoring mechanism is required to be evolved and put in place to achieve these targets.