

A Joint Initiative of



सत्यमेव जयते

Government of India



Andaman and Nicobar Administration

# Power for All

Andaman and Nicobar





# Foreword



## Piyush Goyal

Minister of State  
Power, Coal and Renewable Energy  
Government of India



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Government of India

Electricity consumption is one of the most important indices for measuring the development level of a nation. The Government of India is committed to improving the quality of life of its citizens by ensuring adequacy of electricity availability. The aim is to provide each household access to electricity, round the clock. The 'Power for All' program is a major step in this direction.

Andaman and Nicobar Islands are one of Union Territory of India and have scenic and picturesque clean sea beaches. Further, the islands are home to rich biodiversity and protected bio reserves. Being isolated from the mainland, these islands have unique challenges in terms of power supply and it is aimed to reduce the diesel generation in the Islands by enhancing the share of renewable energy in a phased manner.

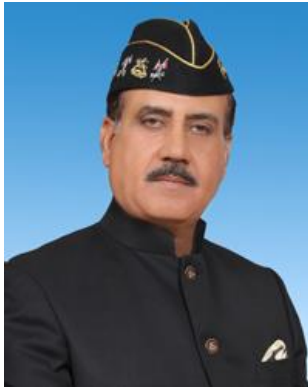
This joint initiative of Government of India and Administration of Andaman and Nicobar aims to further enhance the satisfaction levels of the consumers and improve the quality of life of people through 24x7 power supply to all. This would lead to rapid economic development of the UT in primary, secondary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

I compliment the UT Administration and wish them all the best for implementation of this program. The Government of India will complement the efforts of Andaman and Nicobar Administration in bringing uninterrupted quality power to each household, industry, commercial business, small & medium enterprise and establishment, any other public needs and adequate power to agriculture consumer as per the administration's policy.





# Foreword



Lt General Ajay Kumar Singh, PVSM,  
AVSM, SM, VSM (Retd)  
Lieutenant Governor  
Andaman and Nicobar Administration



Andaman and Nicobar  
Administration

Andaman and Nicobar islands have played a significant part in India's independence struggle. The significance of these islands lies in the fact that the islands have become one of the major tourist attractions mainly due to the clean beaches and rich aquatic life. Moreover, the islands are home to protected tribes and have very rich bio-diversity.

The electricity sector has been of great significance to the administration. Being disconnected from the mainland, the group of islands rely on isolated generation and distribution systems powered by the diesel generation systems. However, the administration has been able to supply 24X7 reliable and quality power to the people of Andaman and Nicobar Islands.

The power department of Andaman and Nicobar have already lined up various programs of investments to achieve the objectives of the 24X7 Power for All Program.

The administration will provide all necessary support to the power utilities in achieving the various milestones and targets outlined in this PFA Roadmap.

I would like to thank the Government of India, Hon'ble Prime Minister and Hon'ble Union Minister of State for Power, for supporting Andaman and Nicobar for implementation of 'Power for All' program.



# Foreword



Anindo Majumdar, IAS  
Chief Secretary  
Andaman and Nicobar Administration



Andaman and Nicobar  
Administration

The Power Sector is the driver of socio economic development of the Andaman and Nicobar Islands. After achieving 24X7 electricity supply, now the Administration is working towards introduction of clean and sustainable sources of energy. This is crucial for sustaining the delicate ecological balance of the islands.

To complement the growth story of the islands Electricity Department is also working towards reduction of losses and implement energy efficiency and Demand Side Management (DSM) projects.

With this view of sustainability, reliability and quality of power supply this Power For All (PFA) document is prepared

The administration will provide all necessary support to the electricity department in achieving the various milestones and targets outlined in this PFA Roadmap.

I would like to thank the Hon'ble Lieutenant Governor of Andaman and Nicobar Administration, Hon'ble Prime Minister and Hon'ble Union Minister of State for Power for supporting Andaman and Nicobar for implementation of 'Power for All' program.





## Power for All – Andaman & Nicobar



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सत्यमेव जयते

Government of India

## Joint Statement



Andaman and Nicobar  
Administration

24X7 Power for All Program for Andaman and Nicobar will be implemented by the Andaman and Nicobar Administration with active support from the Government of India. The Program aims at providing 24X7 supply to all electricity consumers and providing electricity access to all unconnected households in the UT.

This PFA Roadmap document highlights all-encompassing power sector interventions including generation, transmission, distribution, renewable energy and energy efficiency/DSM measures proposed to be implemented during FY16 to FY19.

The Andaman and Nicobar Administration shall continue to support the power sector through targeted capital subsidy schemes aimed at supporting the poor and marginal consumers and elimination of regional disparities in the UT..

The Administration is committed to support the utilities and other development agencies engaged in the power sector in implementation

of the various measures and targets considered in the PFA Roadmap.

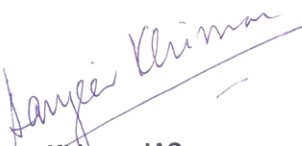
The Administration will put in place appropriate/ suggested UT level governance mechanisms for periodic review and monitoring of the PFA Roadmap implementation

The Ministry of Power, GoI would supplement the efforts of UT on various issues to be dealt with at the Central Government level including those listed in this document.

The Administration shall endeavor to support utilities in improving/ maintaining their financial sustainability and credit worthiness.

The Central Government and Andaman and Nicobar Administration would meet regularly over the next three years to review and monitor the progress on the rollout plan and strive to achieve the objectives of the program by taking the necessary steps as envisaged in the PFA document

  
**Jyoti Arora, IAS**  
Joint Secretary  
Ministry of Power  
Government of India

  
**Sanjeev Khirwar, IAS**  
Commissioner Cum Secretary (Power)  
Department of Power  
Andaman and Nicobar Administration



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# List of Abbreviations

Abbreviation	Full Form
A&N	Andaman & Nicobar Islands
ARR	Aggregate Revenue Requirement
AT&C	Aggregate Technical & Commercial
BOOT	Build-own-operate-transfer
BPL	Below Poverty Line
CAGR	Compound Annual Growth Rate
CEA	Central Electricity Authority of India
CFL	Compact Fluorescent Bulbs
CKM	Circuit Kilometers
CoD	Commercial Operation Date
CSC	Common Service Centre
DDG	Decentralized Distributed Generation
DDUGJY	Deendayal Upadhyaya Gram Jyoti Yojana
DPR	Detailed Project Report
DSM	Demand Side Management
DT/ DTR	Distribution Transformer
EBIDTA	Earnings Before Interest Depreciation Taxes and Amortization
EDA&N	Electricity Department, Andaman and Nicobar Islands
EE	Energy Efficiency
EESL	Energy Efficiency Services Limited
EPC	Engineering, Procurement and Construction
EPS	Electric Power Survey
FY	Financial Year
GoI	Government of India
GSS	Grid Substation
GWp	Giga Watt Peak
HH	Household
IL	Incandescent Lamps
IPDS	Integrated Power Development Scheme
IPP	Independent Power Producer
ISTS	Inter State Transmission System
JICA	Japan International Corporation Agency
LED	Light-emitting Diode



Abbreviation	Full Form
LT	Low Tension
MNRE	Ministry of New and Renewable Energy
MoP	Ministry of Power, Government of India
MU	Million Unit of Electricity (in kWh)
MuDSM	Municipal Demand Side Management
MVA	Mega Volt Ampere
MW	Mega Watt
NESCL	NTPC Electric Supply Company Limited
NHPC	National Hydroelectric Power Corporation
NTPC	National Thermal Power Corporation
O&M	Operation & Maintenance
PAT	Profit After Taxes
PBT	Profit Before Taxes
PFA	Power For All
PFC	Power Finance Corporation
PGCIL	Power Grid Corporation Of India Limited
PH	Power House
PLF	Plant Load Factor
PMA	Project Monitoring Agency
PPA	Power Purchase Agreement
PPP	Public-private Partnership
R&M	Renovation & Modernization
RE	Renewable Energy
REC	Rural Electrification Corporation
REIL	Rajasthan Electronics & Instruments Ltd.
RGGVY	Rajiv Gandhi Grameen Vidyutikaran Yojana
RPO	Renewable Energy Purchase Obligation
SDA	State Designated Agency
SECI	Solar Energy Corporation of India
SFC	Specific Fuel Consumption
SHR	Station Heat Rate
SLDC	State Load Dispatch Center
SPV	Special Purpose Vehicle
T&D	Transmission & Distribution
TBCB	Tariff Based Competitive Bidding
ToR	Terms of Reference
TPS	Thermal Power Station
UJALA	Unnat Jyoti by Affordable LEDs for All
VGF	Viability Gap Funding
YoY	Year on Year

# 1. Executive Summary

## 1.1. Introduction

The Andaman & Nicobar Islands, one of the Union Territories (UTs) of India are an archipelago of over 572 Islands, in the Bay of Bengal, scattered over a distance of more than 750 Km. with northern tip being in the vicinity of Myanmar and the southernmost tip being close to Indonesia. The capital of the UT, Port Blair is about 1,200 kms. from the mainland cities of Chennai and Kolkata. Out of the total 572 islands, 37 islands are inhabited. Of which 19 inhabited islands has been electrified and remaining inhabited islands are electrified by captive power plants of agencies like Armed Forces, Police, Lighthouse & Lightships and Forest Department

Most of the population is concentrated in South, Middle and North Andaman Islands. Majority (85%) of the population are in the rural areas.

## 1.2. Power Supply Scenario

The power generation and distribution system of Andaman and Nicobar islands is served by standalone systems and each island has its own generation & distribution system. As per information/data provided by the Electricity Department of A&N Administration, the peak load of about 58 MW (FY16) in A&N Islands is being met through cumulative Generation Capacity of around 109.45 MW in various Islands of A&N. Out of the total generating capacity, the Diesel based generation is around 99.2 MW, Hydro based generation is around 5.25 MW and Solar PV generation is about 5.0 MWp but out of the 99.2 MW DG capacity, about 51.745 MW of DG capacity have already outlived their lives thereby making the effective DG available capacity as 47.465 MW.

The consumer base in the islands largely comprises of domestic consumers which account for 83% of the total consumer base. Due to geographical isolation and limited industrial growth in the islands, the consumption of electrical energy is limited (A&N recorded a total energy requirement of 294 MU in FY15). However, the islands already have 24X7 power supply to all consumer categories which is one of the key objectives of the PFA

program. There are no un-electrified rural or urban households in the islands except few remote & inaccessible households in the protected forest areas.

Since the electricity consumers in UT already have access to 24X7 electricity, per HH per day consumption may not see a significant increase in the near future, specific consumption (kWh/HH/day) is expected to increase on account of the natural growth in consumption levels due to lifestyle changes. Considering the past trend and expected requirement from planned industrial and commercial units, the energy sales for A&N islands is expected to increase by about 44%, from 229 MUs in FY15 to 330 MUs in FY19. Domestic consumers account for the largest share in power consumption, but owing to higher growth in industrial and commercial categories, their share of energy sales is expected to decrease from 50.4% in FY15 to nearly 46% in FY19.

Amongst the islands, South Andaman has the highest installed capacity and highest recorded sales as of FY15. The sales in the islands is projected to grow from 229 MU in FY15 to around 330 MU by FY19 at a CAGR of 10% with Peak demand is expected to grow from around 58 MW to around 68 MW by FY19. Most of the non-domestic consumers are located in the South Andaman, Neil and Havelock islands of the South Andaman district due to tourist inflow. Havelock islands being one of the major tourist destination requires additional capacity to increase system reliability as the islands have reported power failure during high demand periods.

Apart from these, the Middle and North Andaman Islands have the next highest installed capacity and demand in the island region. Remaining islands including Nicobar group of Islands have majorly domestic consumers with limited demand, which is somewhat stable and not expected to grow significantly by FY19.

### 1.3. Generation Plan

Electricity Department of Andaman and Nicobar (EDA&N) Islands is responsible for managing the generation sector. Since, the islands are disconnected from the mainland of India, generation in the individual islands are managed by isolated Diesel generating stations and associated distribution systems.

The power generation in A&N Islands is through 53 Power Plants in 19 inhabited Islands, out of which 12 Power Houses are in North & Middle Andaman, 16 PHs in South Andaman and 25 PHs in Nicobar District. With few private companies in South Andaman, most of the generation is owned by the EDA&N.

The generation plan for the islands envisages the proposed capacity additions by the UT keeping in view the expected demand and expected life of exiting DG sets. . Petronet LNG has proposed to install a 30 MW (expandable to 50 MW) LNG based generation plant in south Andaman Island in recent future to reduce the consumption of diesel in the island. EDA&N has also planned capacity addition of 5.2 MW through individual DG sets in Long Island, Havelock Island and Neil Island by FY17. For other locations, the capacity addition program is under planning stage. EDA&N has also planned for replacement of 15 MW DG set at Chatham with Solar-Fuel Efficient Diesel Hybrid Power Plant and a Solar Pumped Storage Plant in North Andaman at downstream of Kalpong Hydro Power Plant. Apart from this, 100MWp of solar capacity is also envisaged to be added across the islands keeping in view the grid requirement.

Some DG sets installed in the islands have either aged beyond rated life or have high specific fuel consumption. DG sets having a total of 51.745 MW of the installed capacity have aged and need replacement or refurbishment. The Electricity department has identified these units and have prepared a replacement plan. Replacement of these units are essential for meeting the projected demand and supporting the Solar PV plan proposed for the islands.

Based on the anticipated demand and planned capacity, it is expected that there will be adequate peak supply availability with no deficit till FY19.

However, the islands depend heavily on Government. Subsidy due to high power generation cost which for the last few years was varying between 14.0 Rs./kWh to 14.8 Rs./kWh due to dependence on Diesel generation. As new LNG

and RE based generation capacity addition is planned, EDA&N must accordingly plan the evacuation arrangement for effective utilization of the proposed generations.

### 1.4. Distribution Plan

The power distribution system of A&N Islands is a "Stand Alone System", with each island having its own distribution system. The South, Middle & North Andaman islands have a 33KV distribution and no transmission system while other islands have 11 KV distribution system

All the consumers in Andaman and Nicobar Islands are metered with a small percentage having defective meters. To increase collection efficiency, all domestic consumers are billed through Common Service Centre (CSC). In addition, installation of V-SAT system has been proposed in the islands to improve system monitoring and to provide quality and 24 x7 Power Supply to all citizens of these islands.

AT&C losses in the A&N Islands have varied in the range of 18 to 20%. Keeping the collection efficiency of up to 97%, the investment plans are targeted towards bringing AT&C losses to 16% by FY19. To achieve the proposed reduction in AT&C losses, EDA&N should complete feeder level as well generator level metering expeditiously and should also change defective meters with correct meters. The department should also undertake initiatives for IT integration and installation of smart meters at consumer level. These initiatives shall help to examine areas of losses in the network. In addition, conducting a system wide technical audit shall help to determine the causes of high loss levels. Establishment of a functional energy auditing and monitoring cell shall also help in increasing system efficiency in the long run.

EDA&N plans to increase the number of DTs to 998 by end of FY19. It also plans to increase the 11kV and LT feeder lines to around 1,000 ckt. Kms and 3,708.4 ckt.km by FY19 from present level of 841 km and 3,496 km. In view of the planned capacity addition and expected power supply position, EDA&N should expedite the efforts for system strengthening for providing reliable power to all.

The total fund requirement for the distribution system works in the UT is about Rs. 171 Cr, which is expected to be funded through UT plan and Central Government Schemes (DDUGJY/ IPDS etc.).



### 1.5. RE and EE

Andaman and Nicobar islands meet 10% of the energy requirement through renewable energy sources comprising of small hydro and solar power plant in the Andaman region. As per the Policy for Power Generation through New and Renewable Energy Sources in Andaman and Nicobar Island-May 2012, the A&N administration intends to achieve 25% of the energy generation through new and renewable sources of energy by the end of 2017.

The islands are dependent on high cost diesel generated power and with growing consumption requirements, adoption of low cost sustainable renewable resources is required.

Keeping view of this, the A&N administration with the help of GoI have envisaged large scale penetration of renewable energy sources in the islands. To this effect, 100 MW solar parks are various locations are planned to be commissioned depending upon the condition of the grid and availability of firm power along with battery system with SPV Plants. A Plan is also envisaged to install grid connected rooftop solar systems as well as wind and biomass generation units in some of the island region as per the feasibility. However, considering the intermittent nature of RE technologies, the existing diesel sets or any other form source like LNG would be required for stability the grid and some of the balancing source of generation should also be viable as a backup during cloudy/rainy season.

In view of the planned RE capacity, establishing an Energy Management Center shall help manage the higher share of intermittent RE power. In addition, due to inherent technical and cost challenges in transmitting power between disconnected islands, it is preferable that individual RE generation systems are developed to meet energy requirements of each island. Further, as the share of RE power increases, EDA&N must also plan to

phase out inefficient and high O&M cost generators.

A&N administration is supporting energy efficiency through Domestic Efficient Lighting Program (DELP). The proposal envisages distribution of four lakh LED bulbs of 9 Watt each at a cost of Rs. 10 each to around one lakh domestic consumers with anticipated energy savings of up to 22.6 MU.

The A&N Administration has also prepared draft notification of Energy Conservation which has provisions for mandatory use of Solar Water Heating systems, mandatory use of LED lamps in Government buildings and mandatory use of ISI marked & star rated electrical devices. This shall however require a plan to ensure sustainable disposal of CFL and incandescent lamps (IL) being replaced. Further, to promote use of green energy the draft notification also mandates use of roof top solar PV for promotion of energy efficient building design. These efforts shall require market transformation efforts to prevent sale of non ISI marked devices as well as incandescent lamps.

### 1.6. Financial Sustainability

One of the major cost drivers for EDA&N is the high cost of generation as EDA&N is powered almost entirely by Diesel Generators running on HSD. The cost of generation for FY15 was 15.81 Rs. /kWh. With the O&M cost and other fixed charges including depreciation, the Cost of Supply for EDA&N is upwards of 25.00 Rs./kWh. Low consumer base along with high cost of generation are the main reasons behind the high cost of supply in the islands. This high cost of supply means that the power tariff in the islands are always lower than the cost of supply. For FY15 the average billing rate was about 4.73 Rs./kWh. Due to the high cost of supply, the UT is expected to depend on UT funds for meeting the revenue deficit.

## 2. Background

### 2.1. Andaman and Nicobar Islands

Andaman and Nicobar (A&N) islands represent an Archipelago of around 572 islands in the Bay of Bengal of which only 37 islands are inhabited. Andaman and Nicobar islands are one of the seven union territories of India. Andaman Island spans around 6,408 sq. km., comprises of the majority with 550 islands (26 of which are inhabited) and Nicobar Island spread across 1,841 sq. km. comprises of 22 islands (10 of which are inhabited). The islands of Andaman and Nicobar are grouped into three major districts- North Andaman, Middle Andaman, South Andaman and Nicobar. The Ten Degree Channel (10° N Latitude-150 kms wide) separates the Nicobar Islands from Andaman Islands. The nearest ports of Chennai, Kolkata and Vishakhapatnam are about 1,200 kms.

The Andaman and Nicobar Islands hold prominence owing to its marine borders. During the British period, a Cellular Jail was built to house convicted political leaders and dissenters, on the sea coast of Atlanta Point in the North-Eastern part of Port Blair known as the 'Black Water Prison' or 'Kala Pani' earlier.

The islands are home to wide varieties of flora and fauna as more than 92% of the land area is enveloped by forest cover. The picturesque islands with white sands and blue waters have made the islands an attractive tourist spot. People from across the world come here to enjoy the beaches and engage in water sports and sea water adventures like Snorkeling and Scuba diving.

With a population of about 4 lakhs, Andaman and Nicobar is one of the regions of India having low population density. A&N's per capita income (Rs. 107,418 at current prices for FY14) is higher than the national average (Rs. 39,904 at current prices for FY14). Fishing and agriculture are the largest contributor to the economy of Andaman and Nicobar islands closely followed by the tourism industry. Table 1 shows selected highlights of the UT.

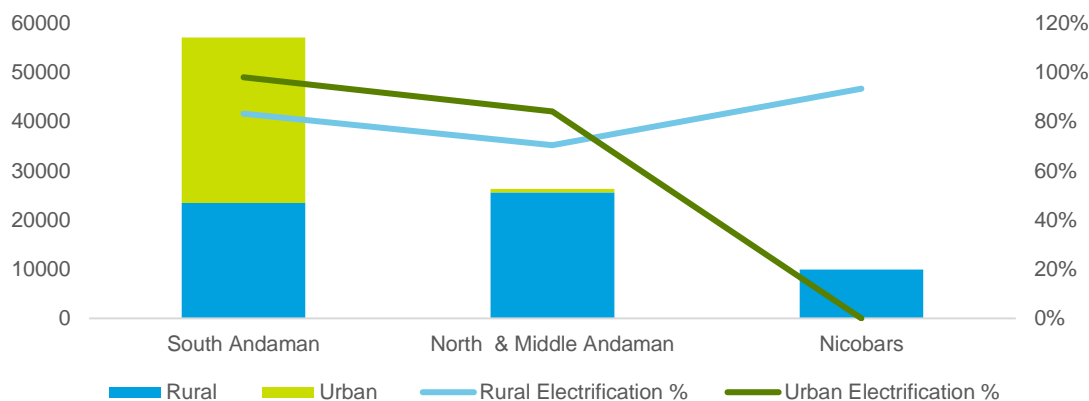
The islands have about 93,376 HH as per the 2011 Census. Most of the population (60%) is in the South Andaman District whereas the remainder of the population is distributed across rest of the area.

**Table 1: Key Highlights of State: Andaman and Nicobar**

Parameter	Information
Year of Creation	1947
Population & Demographics	<p>Total Population at 3,80,581 as per 2011 census</p> <ul style="list-style-type: none"> <li>63% Rural, 37% Urban</li> <li>Decadal population growth: 6.86%</li> </ul>
Area	<p>8,249 square kilometers (0.25% of country)</p> <ul style="list-style-type: none"> <li>Forest cover – 87%</li> <li>Total cropped area – 2%</li> </ul>
Administrative Set-up	<ul style="list-style-type: none"> <li>3 Districts</li> <li>Population: 3,80,581 (2011 Census)</li> </ul>
Neighboring States	<ul style="list-style-type: none"> <li>None (Group of islands in Bay of Bengal)</li> <li>Nearest Ports : Chennai 1,190 km, Kolkata: 1,255 km, Vishakhapatnam: 1,200 km)</li> </ul>
Economic Activities	<ul style="list-style-type: none"> <li>Fishing</li> <li>Agriculture</li> <li>Tourism</li> </ul>

Parameter	Information
HHs	As per census 2011 Rural HH: 59,030 (63.2%) Urban HH: 34,346 (36.8%)

**Figure 1: HH no and Electrification level in Andaman and Nicobar (2011 Census)**



Andaman and Nicobar have achieved 100% electrification at both Rural and Urban level. Only some households in the areas under protection of Environment and Forest ministry have remained un-electrified.

## 2.2. Andaman and Nicobar power sector at a glance

Power sector in Andaman and Nicobar islands is managed by the Electricity Department of Andaman and Nicobar (EDA&N). These islands are managed by isolated systems powered by diesel generators.

In Andaman & Nicobar Islands, Electricity Department is the solely responsible for generation

and distribution of power in 19 inhabited islands. The power generation and distribution system in these islands is stand-alone system i.e. without connection to any grid of other islands. The highest system voltage is 33 KV and there is no transmission system in existence. Table 2 shows selected parameters of the power sector in UT.

During FY15 EDA&N had a consumer base of about 1.18 Lakh and an annual sales of about 230 MU. The islands have an installed capacity of about 109.45 MW, out of which, the Diesel based generation is around 99.20 MW, Hydro based generation is around 5.25 MW and Solar PV generation is about 5.0 MWp.

**Table 2: Andaman & Nicobar Power Sector at a Glance**

Aspect	Key Highlights					
Demand Supply Position	As compared to national figures, A&N islands have no reported energy and peak deficit in FY15					
	Peak (in MW)		Energy (in MUs)			
	Demand/Requirement	58	294			
	Availability	58	294			
	Surplus/(Deficit)	0	0			
Per Capita Consumption	Per capita consumption (At generation busbar including all losses) in kWh for last five years					
		FY11	FY12	FY13	FY14	FY15
	A&N Islands	492	501	549	568	604



Aspect	Key Highlights																									
	(Source: EDA&N)																									
Generation	A&N islands are dependent on stand-alone diesel generation sets. The total installed capacity of A&N island is 109.4 MW																									
	<table><tr><th>Sector</th><th>Thermal</th><th>SHP</th><th>Solar</th><th>Total</th></tr><tr><td>State</td><td>62.87</td><td>5.25</td><td>0</td><td>68.22</td></tr><tr><td>Private</td><td>36.33</td><td>0</td><td>0</td><td>36.23</td></tr><tr><td>Central</td><td>0</td><td>0</td><td>5.0</td><td>5.0</td></tr><tr><td>Total</td><td>99.20</td><td>5.25</td><td>5.0</td><td>109.45</td></tr></table>	Sector	Thermal	SHP	Solar	Total	State	62.87	5.25	0	68.22	Private	36.33	0	0	36.23	Central	0	0	5.0	5.0	Total	99.20	5.25	5.0	109.45
	Sector	Thermal	SHP	Solar	Total																					
	State	62.87	5.25	0	68.22																					
	Private	36.33	0	0	36.23																					
	Central	0	0	5.0	5.0																					
Total	99.20	5.25	5.0	109.45																						
Distribution	A&N Islands do not have any transmission system. Power supply is through isolated systems.																									
	<table><tr><th>Particulars</th><th>Unit</th><th>Capacity</th></tr><tr><td>Distribution Transformers</td><td></td><td></td></tr><tr><td>Quantity</td><td>Nos</td><td>907</td></tr><tr><td>Capacity</td><td>MVA</td><td>142</td></tr><tr><td>Lines</td><td></td><td></td></tr><tr><td>33kV Feeders</td><td>Ckt. Kms</td><td>472</td></tr><tr><td>11kV Feeders</td><td>Ckt. Kms</td><td>841</td></tr><tr><td>LT Feeders</td><td>Ckt. Kms</td><td>3,496</td></tr></table>	Particulars	Unit	Capacity	Distribution Transformers			Quantity	Nos	907	Capacity	MVA	142	Lines			33kV Feeders	Ckt. Kms	472	11kV Feeders	Ckt. Kms	841	LT Feeders	Ckt. Kms	3,496	
	Particulars	Unit	Capacity																							
	Distribution Transformers																									
	Quantity	Nos	907																							
	Capacity	MVA	142																							
	Lines																									
	33kV Feeders	Ckt. Kms	472																							
11kV Feeders	Ckt. Kms	841																								
LT Feeders	Ckt. Kms	3,496																								
Financial Position	The Electricity Department of Andaman and Nicobar islands being a government department does not have any commercial account statements. The gap between revenue and income is funded through central government budgetary allowances.																									
	The cost of supply for FY16 is 28.02 Rs./kWh. This is mainly due to high cost of generation @ 16.21 Rs./kWh.																									
	The T&D loss for A&N islands are about 20% for FY15.																									

## 3. Power Supply Scenario

### 3.1. Power supply position

Andaman and Nicobar islands had a total energy requirement of 294 MU in FY15. Due to the geographical isolation and limited industrial growth in the islands, consumption of electrical energy is limited. Table 3 below shows the peak demand and availability trend from FY12 to FY15.

**Table 3: Peak demand vs Availability as per EDA&N**

Particulars	FY12	FY13	FY14	FY15
Peak Demand (MW)	45	48	55	58
Peak Available (MW)	45	48	55	58
Peak Shortage (%)	0%	0%	0%	0%

One of the key objective of PFA program is to provide 24X7 electricity to all consumers, on which the islands already score fully, as Electricity Department of Andaman and Nicobar (EDA&N) already supplies 24X7 power to all connected consumers, including rural areas. The supply hours for both rural and urban areas are 24 hours and currently there are no load restrictions being imposed anywhere in Andaman and Nicobar Islands.

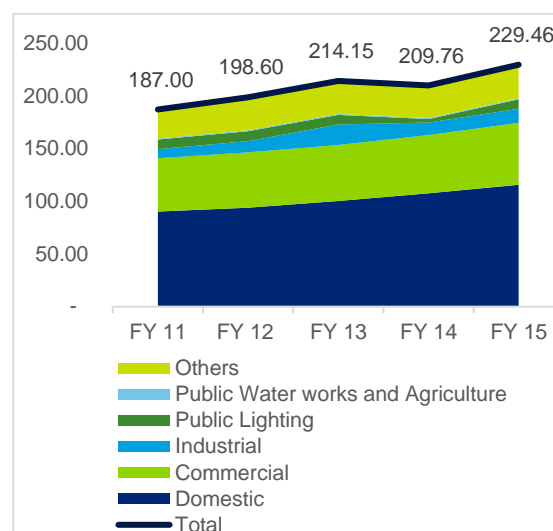
There is very little seasonal variation in the load requirement in Andaman and Nicobar Island. This can be attributed to the Tropical climatic conditions prevalent in the islands, implying that there are no large temperature variations during the year.

### 3.2. Consumer & sales mix

Figure 2 shows the historical growth in sales in A&N islands from FY11 to FY 15. It can be seen that domestic consumers in Andaman and Nicobar Islands contribute to about 48% of the total energy sales followed by commercial consumers contributing about 27% of the total sales. The sales to domestic consumers have grown at a CAGR of 6.4% in past 4 years, whereas the total sales have grown at CAGR of 5.2%. The 4 Year CAGR for other than domestic consumers is about 4.2%.

As on Dec 2015 there were 1.19 Lakh consumers in Andaman and Nicobar Islands. Domestic consumers contribute to 83% of the total consumers in the islands. There are close to a lakh domestic consumers in the island.

**Figure 2: Historical Sales in MU**



### 3.3. Methodology for demand projections

In line with the objective of PFA program, to provide 24X7 power to all HHs, electricity demand projection has been done separately for electrified rural and urban HHs. Whereas, for rest of the consumer categories a growth rate based on EDA&N's estimation of the expected growth along with a review/ validation of the past trend has been considered. The following steps detail out the approach adopted for estimation of energy requirement for the State.

#### **Estimation of Rural and Urban electrified and un-electrified HHs**

The number of rural and urban HHs are estimated based on the available census data for 2011, extrapolated with past 10 years CAGR.

In addition to the level of electrification in rural areas as per 2011 census data, the actual rural HHs electrified since 2011 has been considered to arrive at the present level of electrification. It may be noted that there are no un-electrified rural or urban HHs in the islands as depicted in Table 4.

**Table 4: Estimated Un-Electrified Households in A&N (As on 31.3.2015)**

Particulars	Rural	Urban	Total
Total HHs	57,338	42,609	99,947
Electrified	57,338	42,609	99,947
Balance	-	-	-

#### **Estimation of energy requirement from HHs**

The energy requirement from domestic category consumers (HHs) has been estimated using the end use method under the following two broad categories:

- Latent demand from existing HHs on account of increase in specific consumption (kWh/HH/day) for each of the electrified HH due to life style advancements and natural growth;
- Additional energy requirement due to construction of new urban and rural HHs;

Latent demand growth from already electrified HHs has been estimated based on expected increase in consumption levels in accordance with the objectives of the PFA program. Since the

consumers in State already have access to 24X7 electricity, per HH per day consumption may not see a significant increase. The increase in consumption levels is due to lifestyle changes. Due to the expected benefits from the DSM activities (mainly UJALA), growth in specific consumption (kWh/HH/day) growth would be limited. The specific consumption of rural and urban HHs has been considered based on the past trend as well as the expected benefits from UJALA, is provided in Table 5.

**Table 5: Specific consumption (kWh/HH/Day)**

Particulars	FY15	FY16	FY17	FY18	FY19
Rural	2.35	2.47	2.59	2.72	2.86
Urban	3.77	3.96	4.16	4.37	4.59

Considering the State has already achieved 24X7 Power Supply, the corresponding energy requirement from newly connected HHs is estimated based on specific consumption as listed in Table 5.

The increase in Rural and Urban HH are shown in Table 6. Yearly addition of 1,180 HH in urban areas and 1,029 HH in rural areas is assumed for the period FY16 to FY19. The corresponding energy requirement from new HHs is estimated based on the projected specific consumption.

#### **Estimation of energy requirement from other consumer categories**

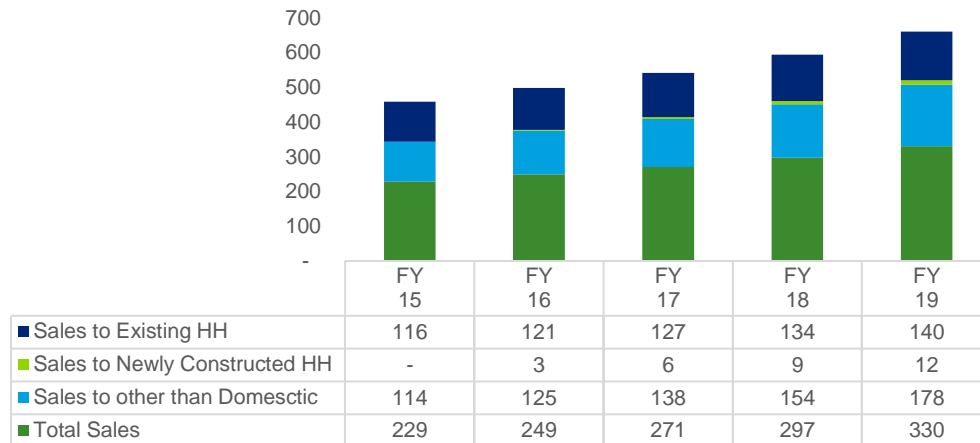
The energy requirement projections from other consumer categories have been done factoring the

**Table 6: Year wise electrification plan for EDA&N (HH Nos) FY15 to FY19**

Particulars	FY15 (A)	FY16	FY17	FY18	FY19
<b>Urban</b>					
Opening Un-electrified HHs	-	-	-	-	-
Electrification of Newly Constructed HHs	1,180	1,180	1,180	1,180	1,180
Electrification of Existing UE HHs (Opening of FY15)	-	-	-	-	-
Balance Un-electrified HHs	-	-	-	-	-
<b>Rural</b>					
Opening Un-electrified HHs	-	-	-	-	-
Electrification of Newly Constructed HHs	1,029	1,029	1,029	1,029	1,029
Electrification of Existing UE HHs (Opening of FY15)	-	-	-	-	-
Balance Un-electrified HHs	-	-	-	-	-



**Figure 3: Projected Energy sales for HH and Other categories (MU) for A&N Islands**



Expected natural growth considering the past trend and projections for economic growth.

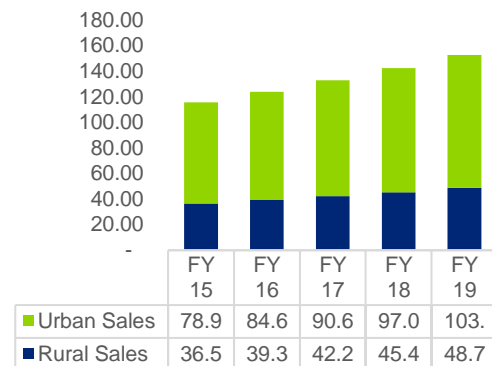
The other than domestic category includes consumer categories of industrial, commercial, public lighting, agriculture and water works etc. Based on their actual growth rate (CAGR) during the last 3 years (10%-14%), a composite growth rate of 10% is considered for projecting the energy sales. For FY18 and FY19, additional growth of 2% and 5% respectively, is considered as there are few commercial and institutional consumers expected to be connected to the system. This includes Medical College (2 MW), New terminal building of Airport (4 MW), Coast Guard Jetty (1.6 MW) and Naval Ship repair Yard (2.5 MW)

### 3.4. Demand projections

Based on above, the energy sales for A&N islands is expected to increase by about 44%, from 229 MUs in FY15 to 330 MUs in FY19, as presented in Figure 3 & Table 7. Owing to higher growth in industrial and commercial categories, the share of energy sales to domestic consumers is expected to decrease from 50.4% in FY15 to nearly 46% in FY19.

The share of rural and urban sales is expected to remain at similar level throughout the period FY16 to FY19.

**Figure 4: Rural Vs Urban Sales (MU) for A&N**



This is mainly due to the fact that there are no additional electrification of un-electrified HH in rural and urban areas. The share of rural sales is expected to remain at 32% whereas share of urban sales are expected to be 68%.

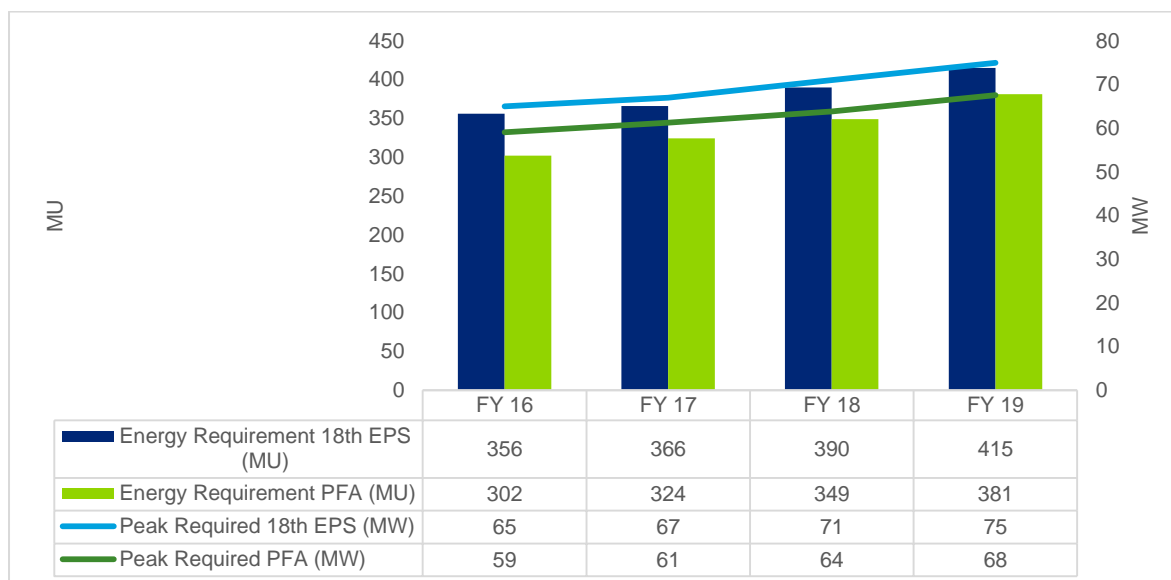
EDA&N has projected AT&C loss of 16% by FY19. The corresponding distribution loss is 13.40%. Based on the projected loss trajectory the energy requirement for FY19 is 381 MU. Using current Load factor of 56.42% and an improvement of 2% yearly to include impact of DSM programs and expected flattening of load curve, the peak demand for FY19 is 68 MW.

**Table 7: Energy Requirement & Peak Demand Projections – A&N islands**

Particulars	Units	FY15 (A)	FY16	FY17	FY18	FY19
Energy requirement/ Sales	MU	229	249	271	297	330
AT&C losses	%	23.96%	20.00%	19.00%	17.50%	16.00%

Particulars	Units	FY15 (A)	FY16	FY17	FY18	FY19
Distribution Losses	%	19.96%	17.53%	16.49%	14.95%	13.40%
Energy Input Requirement	MU	287	302	324	349	381
Load Factor	%	56.42%	58.42%	60.42%	62.42%	64.42%
Peak Demand	MW	58	60	62	65	68

Figure 5: PFA Projected Energy Req. & Demand vs 18th EPS Projections



### 3.5. Island wise demand projections

#### South Andaman and Rutland Island

In FY15, South Andaman and Rutland Island together had the highest installed capacity of about 77 MW. The islands have around 13 Diesel Generator (DG) sets with capacity ranging from 12 kW to 5,000 kW and one solar PV plant of 5 MWp capacity. Total sales in these islands is projected to grow from 168.16 MU in FY15 to around 259.30 MU by FY19 at a CAGR of 11%. This region, contributes to more than 70% of the peak demand as most of the population of the UT is concentrated here. Peak demand is expected to grow from around 42 MW in FY15 to around 51.43 MW by FY19.

#### Neil Island

Neil Island had 0.6 MW installed capacity at the end of FY15. The island recorded sales of around 1.3 MU in FY15 which is expected to grow to 1.8 MU by FY19. Current Peak Demand of 0.3 MW (FY15) is expected to increase by around 22% to reach 0.38 MW by FY19.

#### Havelock Island

Havelock Island had installed capacity of around 1.7 MW (FY15), but the unrestricted peak demand is more than 2 MW in the island. The sales are expected to grow from current level of 4.96 MU in FY15 to 7.09 MU by FY19. Peak demand is also expected to increase at a CAGR of 15% to reach 3.0 MW by FY19.

This island is one of the major tourist attraction in A&N, essentially requiring continuous source of power. The present installed capacity at the island is not sufficient to meet the demand in peak time. There are reported incidents of power cut during high demand periods. Havelock islands require additional capacity to maintain reliability and avoid power disruption incidents during high demand periods.

#### Little Andaman, D/Creek & Straight Island

Little Andaman, D/Creek & Straight Island in the South Andaman district had around 5.7 MW of installed capacity as of FY15. Sales in these islands are expected to increase from present level of 7.45 MU (FY15) to 8.39 MU by FY19. Peak demand is not expected to grow significantly, reaching 2.27 MW by FY19 from current level of 2.07 MW (FY15)

**Baratang & Middle Andaman Island**

During FY15, Baratang & Middle Andaman islands had second highest peak demand of 5.7 MW, which is expected to increase to 6.25 MW by FY19. The islands have an installed capacity of around 10.6 MW. Electricity sales in the islands is expected to increase from current level of 18.36 MU in FY15 to 20.66 MU by FY19.

**Long Island**

Long Island had installed capacity of 0.89 MW and recorded sales of around 0.42 MU in FY15. Sales is expected to reach 0.47 MU by FY19. Peak demand in the island is also expected to grow marginally from 0.10 MW in FY15 to 0.11 MW by FY19.

**North Andaman Island**

North Andaman Islands have installed capacity of around 8 MW from 7 DG sets of capacity ranging from 60 kW to 1000 kW. The recorded sales were 11.40 MU in FY15 which is expected to grow to 12.83 MU by FY19. Peak demand in the North Island which currently stands at 3.97 MW is expected to increase to 4.39 MW.

**Smith Island**

Smith Island has the lowest installed capacity of 0.04 MW. The island recorded sales of around 0.07 MU in FY15 which is expected to increase marginally to 0.08 MU by FY19. Peak demand is expected to stay close to present levels of around 0.02 MW by FY19.

**Car Nicobar**

As of FY15, Car Nicobar Island had an installed capacity of about 5 MW. The islands recorded sales of around 8.84 MU in FY15 which is expected to increase to 9.95 MU by FY19. Peak demand is expected to grow from 1.97 MW to around 2.16 MW by FY19.

**Kamorta Island**

Kamorta Island in Nicobar district had an installed capacity of 1.2 MW at the end of FY15. Sales

recorded at 2.0 MU in FY15 is expected to grow to around 2.25 MU by FY19. Peak demand is expected increase marginally to 0.51 MW by FY19.

**Nancowry Island**

Nancowry Island has an installed capacity of about 0.3 MW. The island had sales of around 0.30 MU in FY15 which is expected to grow to 0.34 MU by FY19. Peak demand at 0.07 MW in FY 15 is expected to remain same by FY19.

**Katchal Island**

Katchal Island with an installed capacity of around 1.2 MW as of FY15 had sales of around 0.87 MU in FY15. Sales is expected to grow marginally to reach a level of about 0.98 MU by FY19. Peak demand in the island is also expected to grow marginally from 0.65 MW in FY15 to 0.71 MW by FY19.

**Teressa Island**

Teressa Island have installed capacity of 0.75 MW as of FY15. Sales is expected to grow from 0.64 MU in FY15 to 0.72 MU by FY19. Peak demand is expected to reduce marginally from current level of 0.158 MW in FY15 to 0.152 MW in FY19.

**Chowra Island**

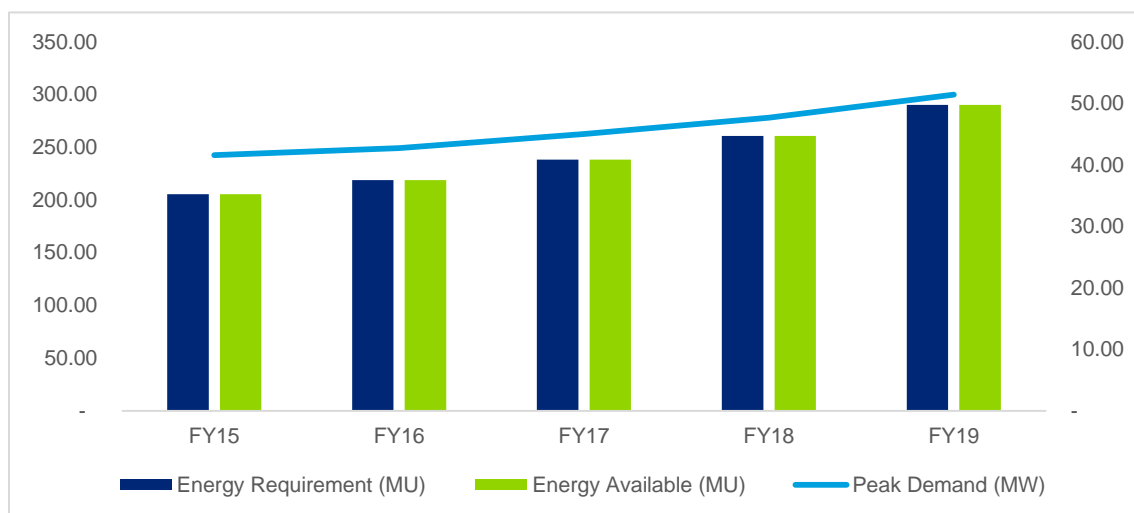
With 4 DG sets, Chowra Island presently has an installed capacity of 0.16 MW. Peak demand stands at 0.15 MW, which is expected to remain at the current level by FY19. The sales are expected to grow from current level of 0.64 MU in FY15 to 0.72 MU by FY19.

**Great Nicobar & P/Panja Island**

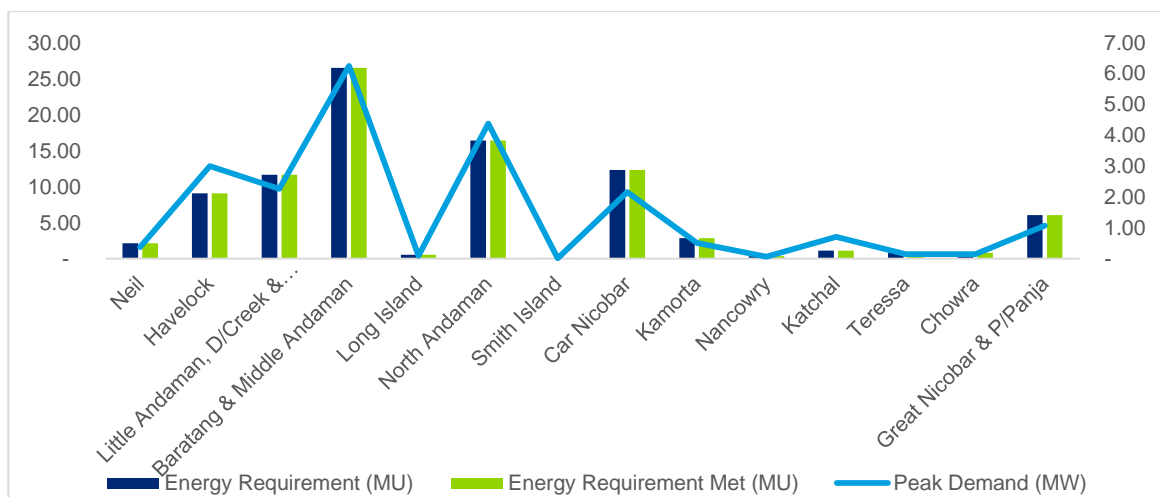
Great Nicobar & P/Panja Island have an installed capacity of around 2.8 MW from 11 DG sets of capacity ranging from 12 kW to 800 kW. The islands recorded sales of 4.10 MU in FY15 which is expected to grow to 4.62 MU by FY19. Peak demand in the Island is expected to reduce marginally from current level of 1.12 MW to 1.07 MW in FY 19.

Detailed projected demand and sales for each island is as detailed in the Table 8.

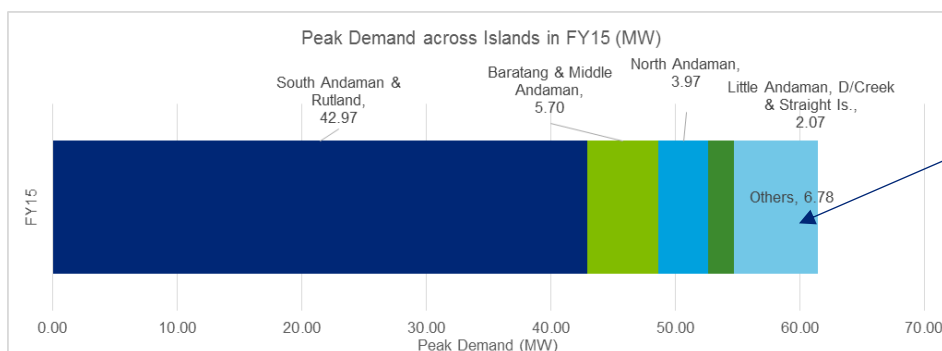
**Figure 6: Projected Energy Supply position of South Andaman & Rutland Islands**



**Figure 7: Projected Energy Supply Position across islands (Except South Andaman) (FY19)**



**Figure 8: Peak Demand across islands (FY 15) (MW)**



Car Nicobar	1.97
Havelock	1.70
Great Nicobar & P/Panja	1.12
Kamorta	0.53
Neil	0.31
Katchal	0.65
Teresa	0.16
Chowra	0.15
Long Is.	0.10
Nancowry	0.07
Smith Is.	0.02



**Table 8: Energy Requirement & Peak Demand Projections – A&N islands**

Island	FY 15	FY 16	FY 17	FY 18	FY 19
<b>South Andaman &amp; Rutland</b>					
Domestic	58.38	64.97	72.05	79.66	87.81
Non-Domestic	109.78	120.76	132.84	148.88	171.48
Total Sales	168.16	185.73	204.89	228.53	259.3
T&D Loss	19.44%	16.87%	15.63%	13.74%	11.91%
Total Energy Required at Periphery	205.45	218.71	238.33	260.62	290.26
Load Factor	56.42%	58.42%	60.42%	62.42%	64.42%
Peak Demand (MW)	41.57	43.46	45.77	48.42	52.22
<b>Neil</b>					
Domestic	0.43	0.46	0.50	0.54	0.58
Non-Domestic	0.83	0.91	1.01	1.11	1.22
Total Sales	1.26	1.38	1.50	1.65	1.80
T&D Loss	18.02%	17.52%	17.02%	16.52%	16.02%
Total Energy Required at Periphery	1.54	1.67	1.81	1.97	2.14
Load Factor	56.42%	58.42%	60.42%	62.42%	64.42%
Peak Demand (MW)	0.31	0.33	0.34	0.36	0.38
<b>Havelock</b>					
Domestic	1.65	1.79	1.93	2.08	2.25
Non-Domestic	3.31	3.64	4.00	4.40	4.84
Total Sales	4.96	5.42	5.93	6.48	7.09
T&D Loss	23.83%	23.33%	22.83%	22.33%	21.83%
Total Energy Required at Periphery	6.51	7.07	7.68	8.35	9.07
Load Factor	43.7%	42.5%	41.8%	38.1%	34.5%
Peak Demand	1.70	1.90	2.10	2.50	3.00
<b>Little Andaman, D/Creek &amp; Straight Is</b>					
Domestic	7.45	7.67	7.90	8.14	8.39
Non-Domestic	0	0	0	0	0
Total Sales	7.45	7.67	7.90	8.14	8.39
T&D Loss	30.09%	29.59%	29.09%	28.59%	28.09%
Total Energy Required at Periphery	10.66	10.90	11.15	11.40	11.66
Load Factor	58.8%	58.77%	58.77%	58.77%	58.77%
Peak Demand	2.07	2.12	2.17	2.21	2.27
<b>Baratang &amp; Middle Andaman</b>					
Domestic	18.36	18.91	19.48	20.06	20.66
Non-Domestic	0	0	0	0	0
Total Sales	18.36	18.91	19.48	20.06	20.66
T&D Loss	24.13%	23.63%	23.13%	22.63%	22.13%
Total Energy Required at Periphery	24.20	24.76	25.34	25.93	26.54
Load Factor	48.5%	48.46%	48.46%	48.46%	48.46%
Peak Demand	5.70	5.83	5.97	6.11	6.25
<b>Long Island</b>					
Total Sales	0.42	0.43	0.44	0.45	0.47
T&D Loss	19.48%	18.98%	18.48%	17.98%	17.48%
Total Energy Required at Periphery	0.52	0.53	0.54	0.55	0.57
Load Factor	56.42%	58.42%	60.42%	62.42%	64.42%
Peak Demand	0.10	0.10	0.10	0.10	0.10
<b>North Andaman</b>					

Island	FY 15	FY 16	FY 17	FY 18	FY 19
Total Sales	11.40	11.74	12.09	12.46	12.83
T&D Loss	26.00%	25.00%	24.00%	23.00%	22.00%
Total Energy Required at Periphery	15.41	15.66	15.91	16.18	16.45
Load Factor	44.30%	42.27%	42.46%	42.64%	42.82%
Peak Demand	3.97	4.23	4.28	4.33	4.39
Smith Island					
Total Sales	0.07	0.07	0.07	0.08	0.08
T&D Loss	21.18%	20.68%	20.18%	19.68%	19.18%
Total Energy Required at Periphery	0.09	0.09	0.09	0.09	0.10
Load Factor	56.42%	56.42%	56.42%	56.42%	56.42%
Peak Demand	0.018	0.02	0.02	0.02	0.0171
Car Nicobar					
Total Sales	8.84	9.11	9.38	9.66	9.95
T&D Loss	21.34%	20.84%	20.34%	19.84%	19.34%
Total Energy Required at Periphery	11.24	11.50	11.77	12.05	12.34
Load Factor	65.12%	65.12%	65.12%	65.12%	65.12%
Peak Demand	1.97	2.02	2.06	2.11	2.16
Kamorta					
Total Sales	2.00	2.06	2.12	2.19	2.25
T&D Loss	23.95%	23.45%	22.95%	22.45%	21.95%
Total Energy Required at Periphery	2.63	2.69	2.75	2.82	2.88
Load Factor	56.42%	58.42%	60.42%	62.42%	64.42%
Peak Demand	0.53	0.53	0.52	0.52	0.51
Nancowry					
Total Sales	0.30	0.31	0.32	0.33	0.34
T&D Loss	16.15%	15.65%	15.15%	14.65%	14.15%
Total Energy Required at Periphery	0.36	0.37	0.38	0.38	0.39
Load Factor	56.42%	58.42%	60.42%	62.42%	64.42%
Peak Demand	0.07	0.07	0.07	0.07	0.07
Katchal					
Total Sales	0.87	0.90	0.92	0.95	0.98
T&D Loss	16.58%	16.08%	15.58%	15.08%	14.58%
Total Energy Required at Periphery	1.04	1.07	1.09	1.12	1.15
Load Factor	18.32%	18.32%	18.32%	18.32%	18.32%
Peak Demand	0.65	0.67	0.68	0.70	0.71
Teressa					
Total Sales	0.64	0.65	0.67	0.69	0.72
T&D Loss	18.63%	18.13%	17.63%	17.13%	16.63%
Total Energy Required at Periphery	0.78	0.80	0.82	0.84	0.86
Load Factor	56.42%	58.42%	60.42%	62.42%	64.42%
Peak Demand	0.158	0.16	0.15	0.15	0.152
Chowra					
Total Sales	0.64	0.65	0.67	0.69	0.72
T&D Loss	15.08%	14.58%	14.08%	13.58%	13.08%
Total Energy Required at Periphery	0.75	0.77	0.78	0.80	0.82
Load Factor	56.42%	58.42%	60.42%	62.42%	64.42%
Peak Demand	0.15	0.15	0.15	0.15	0.15
Great Nicobar & P/Panja					

Island	FY 15	FY 16	FY 17	FY 18	FY 19
Total Sales	4.10	4.22	4.35	4.48	4.62
T&D Loss	25.71%	25.21%	24.71%	24.21%	23.71%
Total Energy Required at Periphery	5.52	5.65	5.78	5.91	6.05
Load Factor	56.42%	58.42%	60.42%	62.42%	64.42%
Peak Demand	1.12	1.10	1.09	1.08	1.07

## 4. Generation Plan

### 4.1. Generation sector in Andaman and Nicobar Islands

Electricity Department of Andaman and Nicobar (EDA&N) Islands is responsible for managing the generation sector. Since the islands are isolated from the mainland of India and are not connected with each other, the generation in the individual islands is managed by standalone generating systems with associated distribution system. Due to the large distances from mainland, the islands are expected to depend on these isolated systems for the foreseeable future.

The total installed generating capacity in the islands is 109.45 MW (Dec, 2015). Most of the generation is from Diesel Generation units owned by the EDA&N. There are a few private generation companies in the islands like SPCL which is owning 20 MW Power at Port Blair.

During the period FY16 to FY19 the peak demand and energy requirement are expected to increase from 58 MW and 229 MU to 68 MW and 330 MU respectively in the UT. In order to meet the increase in power demand, the department will need to plan its resources to meet this future demand.

### 4.2. Existing generation capacity- EDA&N

Generation requirement in A&N Islands is met through 53 Power Houses in 19 inhabited Islands, out of which 12 Power Houses are in North & Middle Andaman, 16 in South Andaman and 25 in Nicobar District. The total installed capacity in the islands is 109.45 MW. The share of Govt. Sector (State and Central) is 73.22 MW (156 Nos. DG sets & 3 Nos. Hydro Turbines) out of which 68.24 MW is owned by EDA&N. The remaining 36.25 MW (27 DG sets) is owned by the private generators and community centers. EDA&N has PPAs with the private producers on short term basis and had PPA with 20 MW SPCL Plant for 15 years since 2003.

### 4.3. Generation plan

The generation plan for the islands envisages the proposed capacity additions by the UT along with

the upcoming solar plants and few private generating stations. The generation capacity addition and power procurement plans have been aligned with the energy requirement and power demand assessed in the earlier sections of this report.

#### *Petronet LNG based Project*

Petronet LNG has proposed to install a 30 MW (expandable to 50 MW) plant in South Andaman Island. The feasibility report for the proposed plan is under consideration of the UT administration. The plant is proposed to commence operations by 2019. The Plant is proposed to be installed on per unit cost basis. With LNG being cheaper and cleaner source of power, the project shall support the initiative to reduce diesel dependence along with reduction in cost of Generation.

#### *UT Projects*

EDA&N has planned DG capacity addition in some of the islands including Long Island, Havelock Island and Neil Island based on the expected demand, the available capacity and expected lives of existing DG sets. The total proposed addition in capacity is 5.2 MW through individual DG sets. EDA&N has completed the tendering process in Havelock Island and the new DG set is expected to be available by Q1 of FY17. For other locations the capacity addition program is under planning stage.

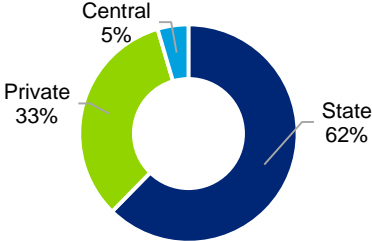
EDA&N has also planned for replacement of 15 MW DG set at Chatham with Solar-Fuel Efficient Diesel or Hybrid Plant with the help of "Japan International Corporation Agency".

#### *DG replacement/repair*

Some of the DG sets in the islands have passed their serviceable age. Based on the data available with EDAN a replacement plan of existing DG sets is being shown in table



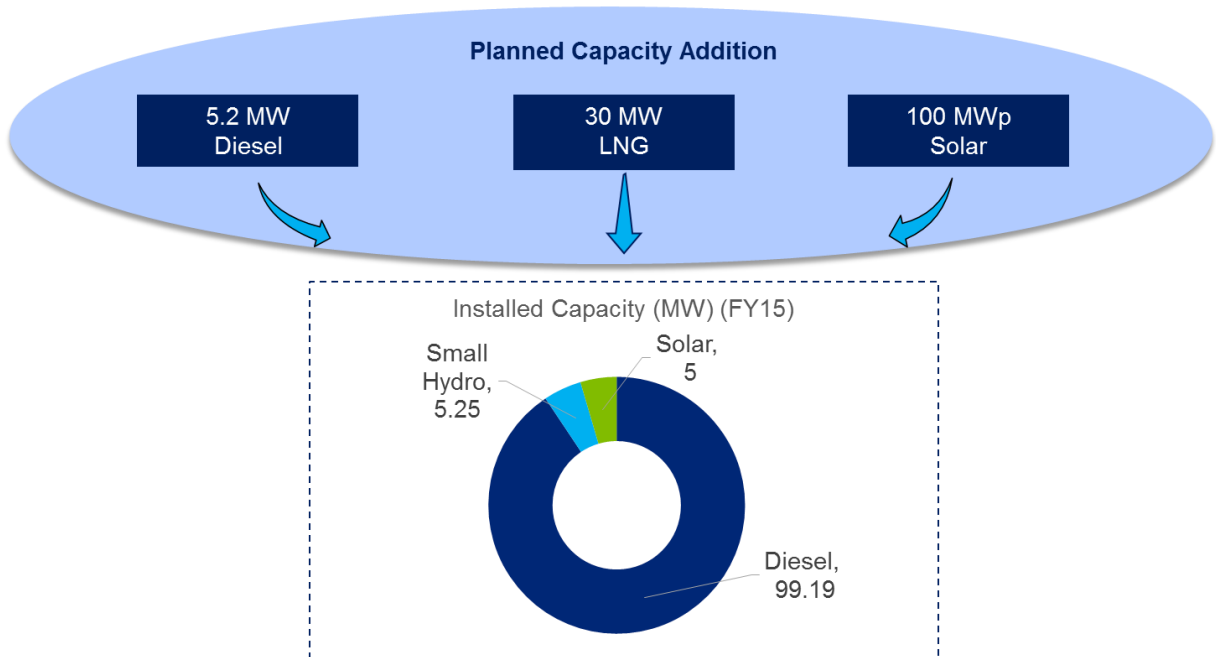
**Table 9: Installed Capacity for EDA&N (MW) Dec 2015 (Source: EDA&N)**

Share	Sector	Thermal	Hydro	RE	Total
	State	62.87	5.25	-	68.22
	Private	36.33	-	-	36.23
	Central	-	-	5.0	5.0
	<b>Total</b>	<b>99.20</b>	<b>5.25</b>	<b>5</b>	<b>109.45</b>

**Table 10: Existing Diesel Plants in the State and Private Sector**

Area	No of Units	Installed Capacity (MW)	Status
South Andaman	37	68.8	Includes a 20 MW IPP and 15 MW Hired Power plants at Phoenix Bay.
Rutland	2	0.024	Includes a community power house 24 kW at 45 Acre
Neil	6	0.0634	Operational
Havelock	7	1.33	Operational
Little Andaman	7	5.65	Operational
Dugong Creek	3	0.047	Operational
Baratang	2	0.512	Operational
Middle Andaman	20	10.08	Includes a community power house in Bangaon 16 kW
Long Islands	11	0.892	Operational
North Andaman	10	3.598	Includes a community power house in Gandhi Nagar
Car Nicobar	12	5.636	Operational
Kamorta	17	1.236	Includes 88 kW of Community Power House in Munak, Derring, Alukheak, Changua
Nancowry	8	0.323	Includes 3 sets running as community power house (28 kW) in Hitoi
Katchal	9	1.23	Operational
Teressa	8	0.756	Operational
Chowra	4	0.164	Operational
Great Nicobar	10	2.836	Includes 3 plants running as community power house in Afra Bay, Pillowlow and Pilobha
Pillowpanja	1	0.012	Community Power house
<b>Total</b>	<b>174</b>	<b>103.1894</b>	

**Table 11: A&N planned capacity addition**



#### 4.4. R&M and replacement plan

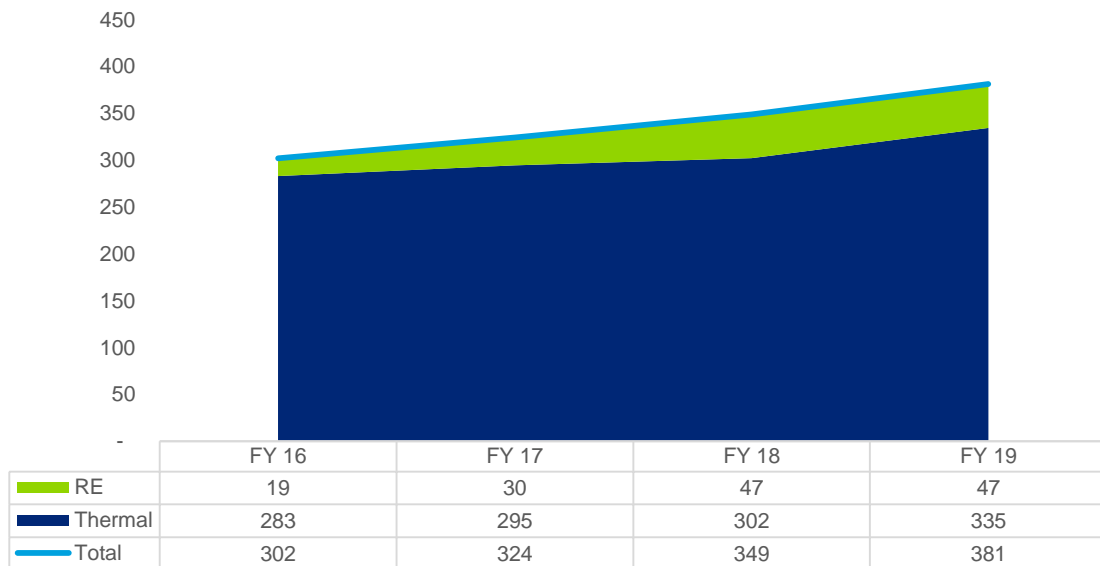
EDA&N is carrying out regular R&M of the diesel sets in the islands.

Some units in the islands have aged beyond 25 years. R&M costs of such units are high. Based on the data available with EDA&N, expected demand projection and inputs from CEA some of these units

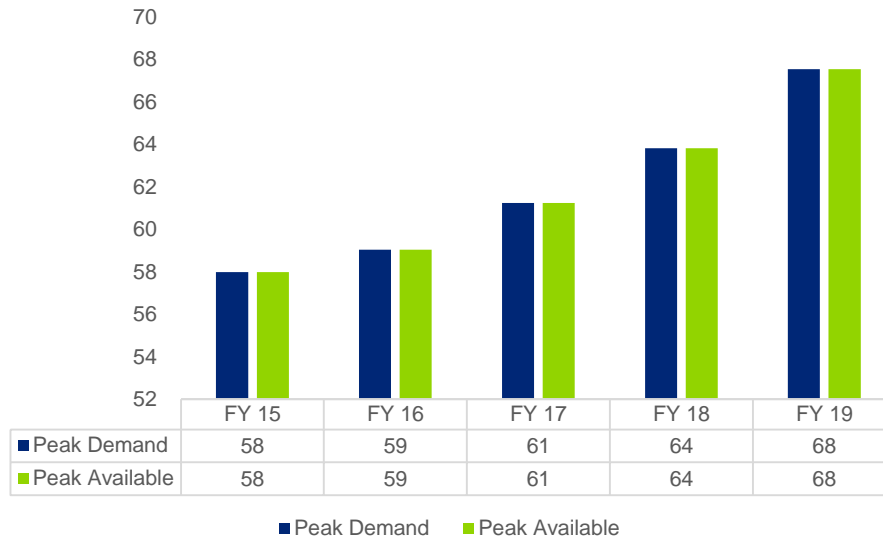
are recommended to be replaced with new units. A summary of these recommendation are provided in section 4.6.

According to EDA&N's estimates additional fund of Rs. 165 Cr. is required for replacement of older units. The details of this plan are provided in annexure 2b.

**Figure 9: Energy available from various sources during FY16 to FY19 (MU)**



**Figure 10: Anticipated Peak Availability Position of EDA&N (MW)**



**Table 12: Anticipated Power Availability Position for EDA&N (MW)**

Parameter	FY 15	FY 16	FY 17	FY 18	FY 19
South Andaman					
Peak Demand	45.65	47.08	49.63	52.73	57.08
De-rated/Installed Capacity	51.35	57.40	65.01	63.01	93.01
North Andaman					
Peak Demand	3.97	4.23	4.28	4.33	4.39
De-rated/Installed Capacity	7.6	7.6	7.6	7.6	22.6
Middle Andaman					
Peak Demand	5.80	5.94	6.07	6.21	6.35
De-rated/Installed Capacity	7.5	7.5	7.5	7.5	7.5
Nicobar					
Peak Demand	4.65	4.69	4.73	4.78	4.83
De-rated/Installed Capacity	6.67	6.67	6.67	6.67	6.67

#### 4.5. Recommendation

Few DG sets in the islands have aged beyond 20 years and have been performing poorly as the SFC (Specific Fuel Consumption) is higher than 0.3 lit/kWh. It is recommended that these units are to be replaced by FY19 in order to meet the expected demand and reduce fuel consumption. A detailed analysis is provided in Annexure-2a.

Summary of these recommendations are as follows:

- Port Blair:** As per the Plan, a 30 MW LNG Plant is expected in South Andaman by 2019 after operationalization of the plant, the old units may be dismantled and remaining units may kept as stand by for emergency purposes. The small DG sets of capacities upto 16 kW installed at various buildings as stand by source may be reviewed by Electricity Department and further action for their replacement may be taken based on their performance, hours of usage and SFC.

- b) **Neil islands:** 2x128 kW DG be installed by FY19 to be added along with existing 3x128 KW DG sets and old DG sets may be dismantled.
- c) **Havelock Islands:** The DG sets in Havelock islands are performing poorly. The de-rated capacity (1.131 MW) is 64% of the installed capacity (1.730 MW). EDA&N and NTPC have started tendering process of new units which will replace these units. It is recommended that the procurement process be expedited for improving the supply position of the island.
- d) **Hutbay:** Two units in Hutbay have already aged by 20 years. The SFC of these units are higher than 0.3. It is recommended that the two units be replaced by a 1,000 kW unit by FY19. Smaller units in Dugong Creek may be replaced by new and efficient units to improve efficiency.
- e) **Rangat:** The island has five units of 1,000 kW capacity installed in 2010. Other units in the island have aged beyond 20 years. Considering the demand of the island. It is recommended that another 1,000 kW unit may be installed to serve as stand by unit to be used during repair/maintenance works.
- f) **Car Nicobar:** Five units of 256 kW capacity in the island may be replaced as these units have high SFC. The distribution network may be re-aligned so as to feed the HQ from Kinyuka PH.
- g) **Nancowry:** The units in Champion power house may be replaced with one 128 kW unit. Age of these units are not known (presumably more than 30 years old) and the reported SFC is at 0.336.
- h) **Teressa :** It is advisable that EDA&N carry out a study to evaluate the SFC of unit's smaller capacity (12-50 kW). A replacement plan for these units may be prepared If these units are found to perform poorly.
- i) **Great Nicobar:** The units at Campbell bay have aged beyond 30 years. It is

recommended that these units be replaced by three new 800 kW units.

- j) **HPP/Community Power House:** It is recommended that EDA&N reviews the performance of these units periodically and prepare a replacement plan or new contracts (as the case may be) for these units.

In addition to the above EDA&N has also identified units which are to be replaced due to ageing and performance issues. The proposed plan by EDA&N is shown in Annexure 2a.

#### 4.6. Anticipated power availability position- ED-A&N

The power availability for the islands is prepared by considering the capacity addition plan and the replacement plan proposed by EDA&N.

The state and private players continue to play a major role in power generation with RE planned to replace costly diesel based power generation to large extent by FY19.

The generation capacity addition plan along with the replacement plan proposed by EDA&N is adequate to meet the proposed peak demand in the UT.

#### 4.7. Power purchase cost

EDA&N's power purchase cost for the last few years was varying between 14.0 Rs./kWh to 14.8 Rs./kWh. The high cost of Power Purchase is primarily due to use of Diesel generation. The power purchase costs of EDA&N is the primary reason for high cost of supply. The high cost of supply government subsidies.

For reducing the dependence on diesel generation, EDA&N has proposed ambitious plan of meeting most of the energy requirements through cheaper and cleaner source of solar power.

It is expected that about 100 MWp of solar sources would be installed in the islands to meet the demands of the islands. The details of the solar plan are discussed in the Renewable Energy Plan Chapter of this document.

Further, the proposed 30 MW LNG plant would help in reducing the diesel consumption by meeting the demand of South Andaman district through cleaner and cheaper fuel like LNG.



Energy from Proposed Solar parks and LNG is expected to be cheaper than the existing Diesel energy which will aide in reducing carbon emissions with the additional advantage of reduction in power purchase cost and cost of supply.

#### 4.8. Action plan & support required

The action plan and support requirements for generation are covered in Table 13 below:

**Table 13: Action points for Generation Plan**

Agency	Action Plan
PGCIL/ EDA&N	<ul style="list-style-type: none"> <li>Power evacuation arrangement from the proposed 30-50 MW LNG Based Power Plant at Hope Town, South Andaman.</li> </ul>
MoP	<ul style="list-style-type: none"> <li>Allocation of funds for fulfilling the equity requirements for the proposed LNG Plant at Hope Town</li> </ul>
EDA&N/NTPC	<ul style="list-style-type: none"> <li>Expedite the capacity addition program in Havelock and Neil islands.</li> <li>Replacement of DG sets having high SFC (more than 0.3), low capacity (&lt;100 kW) and high running hours (more than 20 years of running life)</li> </ul>
A&N Administration	<ul style="list-style-type: none"> <li>Creation of separate entity for management and operation of LNG Plant</li> </ul>
GoI	<ul style="list-style-type: none"> <li>Funding for proposed DG replacement plan.</li> </ul>

## 5. Distribution Plan

### 5.1. Introduction

In Andaman & Nicobar Islands, Electricity Department is responsible for distribution of power in 19 inhabited islands. Electricity is available to 1.18 lakh consumers of the Islands of Andaman & Nicobar through 53 Power Houses, 472 ckm of 33 kV lines, 841 ckm of 11 kV lines, 3,496 kms of LT feeders and 907 distribution transformers. The Power Generation and Distribution system of A&N Islands is a “Stand Alone System” without an integrated grid. Each island has its own generation & distribution system. 100% electrification of revenue villages has been achieved.

### 5.2. Objectives of the distribution plan

The peak demand and energy requirement for Andaman & Nicobar is expected to increase from 58 MW and 229 MU in FY15 to 68 MW and 330 MU by FY19. This growth will be due to natural increase in demand from the present consumer base and more importantly because of the initiatives proposed under this PFA Roadmap which aims to ensure provision for 24X7 quality supply to all consumers in the state. This would require investments in the sub-transmission and distribution infrastructure.

The objectives of the distribution plan, in accordance with the 24X7 PFA objectives, includes the following:

- Making provisions for 24X7 supply to all connected consumers through capacity augmentations and building redundancies in network for improving reliability of supply and connecting the unconnected;
- Provision of 24X7 supply to cater to increase in demand from existing consumers and owing to new consumer growth in the UT;
- Making system improvements for reducing AT&C losses in accordance with the targets agreed with MoP; and
- Adopting appropriate technologies and systems to support RE integration and EE/ DSM measures in the State.

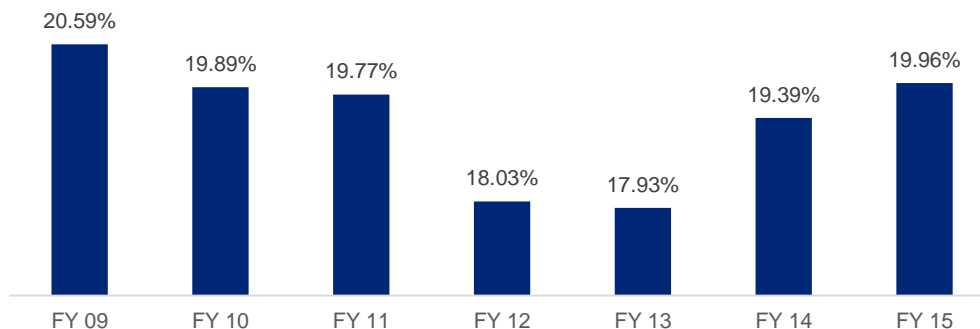
### 5.3. Existing distribution system- EDA&N

The distribution network at South, Middle and North Andaman comprise of 33 kV , 11 kV & LT system while in other islands, the distribution network comprise of 11 kV & LT system which delivers electricity to the end consumers. There is no transmission system in existence. An overview of department's network infrastructure in terms of installed transformation capacity and line lengths of feeders at various voltage levels is provided in Table below.

**Table 14: Existing Distribution Network of EDA&N (2015)**

Particulars	Unit	Capacity
Distribution Transformer	Nos	907
Transformation Capacity	MVA	142
<b>Lines</b>		
33kV Feeders	Ckt. Kms	472
11kV Feeders	Ckt. Kms	841
LT Feeders	Ckt. Kms	3,496

Figure 11: Year wise T&D Losses for EDA&N



### AT&C Losses

Looking at the past performance, the EDA&N has managed to restrict the AT&C losses in the range of 18 to 20%. Keeping the collection efficiency of up to 97%, the investment plans are targeted towards reducing AT&C losses to 16 % by FY19

Table 15: AT&C loss reduction target

Particulars	FY16	FY17	FY18	FY19
AT&C Losses	20%	19%	17.5%	16%

### Metering Status

All the consumers in Andaman and Nicobar Islands are metered. However, about 4% of Domestic consumers have defective meters. Similarly other categories also have defective meters. About 20% of the domestic consumers are yet to be upgraded to static meters. EDA&N plans to convert all electro mechanical meters to static meters shortly.

At feeder level, out of the total feeders, thirty five (35) 11 kV feeders are yet to be metered. Meters have also been installed on many of the distribution transformers but, the meters in Distribution transformers are awaiting metering equipment (CT and PT) to become operational.

The investments proposed under DDUGJY and IPDS is aimed towards achieving 100% metering at all levels. Table 16 below illustrates the metering roll plan under DDUGJY.

Table 16: Metering roll out plan by FY17

Metering	South Andaman		North & Middle Andaman	
	Qty	Rs. Lakhs	Qty	Rs. Lakhs
DTR Metering	102	4	72	3
Feeder metering	11	10	17	19
LT Metering	10,062	177	21,053	373

Metering	South Andaman		North & Middle Andaman	
	Qty	Rs. Lakhs	Qty	Rs. Lakhs
Total	10,175	191	21,142	395

### Central Government Schemes

Being a union territory, the investments in distribution network of Andaman and Nicobar islands is generally supported from UT funds allocated by Government of India.

Further, EDA&N has submitted the DPR for grant under DDUGJY for an estimated amount of Rs.153.52 cr. and the monitoring Committee has approved Rs.20.96 Cr in the meeting held on 28th April, 2016. The DPR under IPDS is under preparation.

Being a Department, it is important to note that 100% of capital investments are in the form of grants only. This is due to the fact that the own contribution of the department is expected in the form of grant from the UT Administration.

### 5.4. Funding plan- EDA&N

The following table shows the funding requirement for the distribution plans described.

Table 17: Fund Requirement in Rs. Cr. under various schemes for EDA&N

Scheme	FY17	FY18	FY19	Total
DDUGJY (Requisitioned)	76	77	0	153
Other Central Assistance	10	8	0	18
<b>Total</b>	<b>86</b>	<b>85</b>	<b>0</b>	<b>171</b>
Available	30	29	0	59
<b>Gap</b>	<b>56</b>	<b>56</b>	<b>0</b>	<b>112</b>

The total fund requirement for the distribution system works in the UT is about Rs. 171 Cr. EDA&N expects this to be funded through the

Central Government Schemes. However, an amount of Rs.112 Cr. is not approved under the DDUGJY scheme.

EDA&N may require additional funds to meet this gap. The financial and physical targets are detailed in the Annexure 1a. The plan also includes capex of Rs 6.34 Crore for Neil and Havelock islands

### 5.5. Other initiatives

**Common Service Centre:** Collection of Electricity bills for all domestic consumers through Common service Centre (CSC) has been extended to consumers of South Andaman District through 20 CSCs under the National e-Governance Program. The extension of the billing & revenue collection facility through CSC at rural South Andaman has benefited around 60,000 consumers of electricity in a big way.

**Feeder Segregation:** In order to improve the reliability of power system, segregation of feeder has been completed and 33 KV feeder control room at IPP Bambooflat has been commissioned in April, 2015. Further UG cable has also been laid for a stretch of 61 Km in North & Middle Andaman.

**Reliable Communication System:** Presently, there is no communication system to monitor and acquire data from all the Power Generating Plants, Sub-Stations, and Distribution Sub-Stations etc. The inception and installation of V-SAT system has been proposed which will improve the overall system in-terms of monitoring all the parameters to provide quality and 24X7 Power Supply to all Citizens of these islands. As a back- up support, it is proposed to have Satellite Phone to further improve the reliability. In order to establish “Reliable Communication System” to maintain 24x7 power, the Electricity Department, A&N Administration will require fund to the tune of Rs 246.42 Lakhs.

### 5.6. Rollout Plan

The infrastructure roll out plan shown in Table 18 considers the proposed infrastructure in the DPRs submitted for DDUGJY and system strengthening works for Neil and Havelock islands. EDA&N would update the roll out plan once the parameters for IPDS are finalized.

### 5.7. Action Plan

EDA&N has prepared DPRs for DDUGJY and once these DPRs are approved, EDA&N shall expedite the construction and commissioning of the proposed works.

The DPRs for projects to be taken up through investments in IPDS are being prepared.

Further, EDA&N and PGCIL may work towards developing transmission plan for evacuation of the upcoming LNG project. EDA&N is contemplating handing over its operation and maintenance of HT lines and substations to a suitable agency for better and efficient upkeep of the systems as EDA&N does not have adequately skilled manpower to maintain the HT systems in the islands.

The increase in AT&C loss in last few years is of concern and EDA&N has prepared a plan for reduction of the losses. EDA&N will ensure completion of feeder level metering expeditiously to monitor power flow and examine losses in the distribution network. This shall help in highlighting the geographical areas with higher losses as well as the causes of high loss levels. EDA&N is devoid of any modern IT systems to manage its billing and customer service requirements. The department plans to upgrade its existing IT systems through the IPDS scheme of GoI. It may be noted that due to lack of R-APDRP investment in the past, the department lacks in adequate IT systems.

EDA&N is pursuing smart metering initiatives to support system monitoring. Consumer meter would be upgraded to smart meters which shall not only control theft but also support load management. Also, EDA&N shall also undertake auditing of DG sets and ensure metering at all generation sources. In addition, conducting a system wide technical audit shall help determine the causes of high loss levels.

These action points may be supplemented with efforts to establish a functional Energy auditing and monitoring cell to increase system wide efficiency.

The action plan for distribution function is summarized in Table 19.



**Table 18: Distribution Infrastructure rollout plan for EDA&N**

Particulars	Unit	FY 15 Capacity	FY 16	FY 17	FY 18	FY 19	Total additions	Capacity at the end of FY19
<b>Transformer</b>								
Distribution Transformers	Nos	907	0	54	37	0	91	998
Capacity	MVA	142	0	9	6	0	15	157
<b>Lines</b>								
33kV Feeders	Ckt. Kms	472	0	6.5	6.5	0	13	485
11kV Feeders	Ckt. Kms	841	0	84.45	69.45	0	153.9	994.9
LT Feeders	Ckt. Kms	3,496	0	106.2	106.2	0	212.4	3,708.4

**Table 19: Action items for Distribution Plan**

Stakeholder	Action Item
EDA&N	<ul style="list-style-type: none"> <li>Preparation of DPRs for IPDS in urban areas by July 2016</li> <li>Expedite the system strengthening works of Neil and Havelock islands</li> <li>Complete DT and Feeder metering by December 2016</li> <li>Replacement of old and defective meters of consumers by July 2017</li> <li>Roadmap for reduction of AT&amp;C losses in next two months</li> <li>Introduction of IT systems, ERP and 24X7 customer service centres</li> <li>Conduct technical audit to determine causes of high loss levels</li> <li>Initiate smart metering to support loss reduction, load management as well as grid management</li> <li>Taking up the work of establishment of Energy Management Centre with communication facilities to connect all the generating stations and feeders</li> <li>Tender for selection of agency for operation and maintenance of 33 kV systems in the Islands</li> </ul>
Gol	<ul style="list-style-type: none"> <li>Explore funding options for EDA&amp;N for the unapproved portion of DDUGJY DPR</li> <li>Funding for reliable communication systems to monitor and acquire data from all the Power Generating Plants, Sub-Stations, and Distribution Sub-Stations</li> </ul>
PGCIL/EDA&N	<ul style="list-style-type: none"> <li>Power evacuation arrangement from the proposed 30-50 MW LNG Based Power Plant at Hope Town, South Andaman.</li> </ul>

## 6. Renewable Energy Plan

### 6.1. Introduction

At present, the renewable energy requirement of the union territory is met by 5.25 MW of Hydro based generation and 5 MW of Solar PV Generation which translates to 10% of energy requirement through renewable energy sources, EDA&N, is also procuring renewable energy from other sources to fulfill its RPO obligations. The RPO obligations and achievement trend for the distribution licensee are shown in the table below.

**Table 20: RPO Targets & Achievements for Andaman & Nicobar**

Year	Solar RPO		Non-Solar RPO	
	Target	Achieved	Target	Achieved
FY 11	0.25%	0%	0.75%	4.09%
FY 12	0.30%	0%	1.70%	4.50%
FY 13	0.40%	0%	2.60%	4.56%
FY 14	0.40%	2.35%	2.60%	4.41%
FY 15	0.60%	2.37%	2.70%	3.80%

It can be observed that EDA&N is not just achieving but far exceeding both solar and non-solar RPO targets. One of the reasons which can be attributed to RPO compliance trend is the lower cost of renewable power in comparison to diesel generated power which costs upward of Rs.15/kWh on an average.

As per the Policy for Power Generation through New and Renewable Energy Sources in Andaman and Nicobar Island- May 2012, the A&N administration intends to achieve 25% of the energy generation through new and renewable sources of energy by the end of 2017. However, the policy restricts power produced by wind and solar energy to 50% of the total requirement of the island and rating of existing DG sets. Also, in case of Hydro and Biomass power generation, at least 75% of installed capacity should be available as continuous base load supply to grid. The policy also provides for banking facility and exemption on electricity duty for RE projects. Further, as part of the 175GW plan for RE power by 2022, MNRE has set a target of 27

MW of solar power for Andaman and Nicobar by 2022.

With growing consumption requirements, unless low cost sustainable renewable resources are developed on the island, using diesel is likely to be extremely expensive in the long run. To ensure expeditious implementation of renewable energy, the Andaman and Nicobar Islands need a dedicated agency for speedy development of Renewable Projects in place of NRSE Division of Electricity Department.

The Secretary, MNRE has also recommended that a dedicated agency – A&N Renewable Development Agency may be carved out from the Department of Electricity (NRSE Division) to look after the program and activities of the Ministry as well as for ensuring expeditious implementation of the projects. The Administration has already initiated the proposal to establish a dedicated agency in line with the Agencies formed in other States/UTs.

### 6.2. Scope & Potential of RE development

As per the MNRE targets for A&N islands the targeted capacity addition from RE sources is 27 MW from Solar sources only.

The Energy and Resources Institute (TERI) conducted a feasibility study to estimate potential of RE technology in Andaman & Nicobar Islands to phase out diesel based power supply. The key findings from the study report are as follows:

**Car Nicobar Island:** As per the report findings, the coconut husk generated in the islands can be utilized to establish biomass power generation plant of capacity around 2.25 MW. The investment shall result in annual savings of around Rs. 16.3 Crore through avoided diesel cost.

**North Andaman:** The report highlights that the Island meets more than 85% of its energy needs from Kalpong hydro plant and rest 15% can be met from ground mounted and rooftop solar installations.

**Middle Andaman:** The Island have limited potential for biomass and wind power. However, rooftop solar can be developed of around 1.8-3.8 MW capacity.

Presently, around 60 hectare of land has been allotted to EDA&N to develop 30 MWp of solar plant in Diglipur and Rangat in North and Middle Andaman.

**South Andaman:** Report findings highlight that, though the island has low biomass potential, it has around 7 MW of wind power generation potential. Also, the Island has the highest rooftop solar potential of about 4.8-10.7 MW.

However, the islands presently have 5 MW installed capacity of solar and 42.53 hectare land has been allotted at Mithakhari, South Andaman for 20 MWp Solar Plant. In addition, around 120 hectare of land has been allotted in the South Andaman for setting solar plants. In addition, MoU has been signed with SECI to develop 1 MWp of rooftop solar plants on govt. buildings in Port Blair.

**Mayabunder and Baratang:** These Islands too have limited potential for biomass and wind energy. Rooftop and ground mounted solar can be explored for development.

The study recommends RE implementation in two phases:

**Phase I:** (a) 1 MW biomass power plant in Car Nicobar; (b) Energy storage system for the 5 MW solar plant; (c) 500 kW solar plant for North Andaman; (d) 1.8 MW rooftop solar plant for Middle Andaman and (e) Technical feasibility assessment for 7 MW wind farm in Collinpur, South Andman.

**Phase II:** (a) 1.25 MW biomass power plant in Car Nicobar; (b) 5 MW rooftop solar plant in South Andaman and (c) 1 MW ground mounted solar for North Andaman.

MNRE has taken an initiative for increased RE deployment in Andaman and Nicobar to reduce diesel dependence. In the background, ministry has prepared a detailed report to assess feasibility of PV generation with storage battery. The report details different scenarios for PV plant configurations with varying battery storage options-

**Scenario 1 (Super Scenario):** 100% of required energy is supplied by solar with PV battery; **Scenario 2 (12 hour scenario):** PV power together with battery backup supplies 70% of the load for 12 hour between 8 AM to 8 PM; **Scenario 3 (8 hour scenario):** PV power together with battery backup supplies 70% of the load for 8 hour between 8 AM

to 4 PM; **Scenario 4: No battery scenario.** Key findings and recommendations of the report:

**South Andaman:** The report discuss four different scenarios for PV plant development. The report proposes the best scenario- “Super scenario” in which 100% of required electricity 24hours is supplied by solar PV with battery which is however constrained due to high cost. This is however, recommended for Neil Islands which have lower power requirements. The report also analyses other scenarios of battery backed solar supply. For each of the scenarios, PV generation profile, annual generation, cost of plant, levelized cost and potential saving have also been estimated as below:

**Table 21: PV installation scenario analysis findings by MNRE for South Andaman**

Parameter	Super Scenario	12 hour Scenario	8 hour Scenario	No Battery
PV size (MWp)	176.97	61.94	41.29	34.21
Generation (MU)	206.59	72.31	48.21	34.23
Battery size (MWh)	466.45	76.34	25.85	0
Plant Cost (Rs. Cr)	2788.45	792.42	448.61	306.21
LCOE (Rs./kWh)	11.12	8.78	7.18	6.55
Diesel savings (Mil./year)	68.86	24.1	16.07	11.41

Based on the findings, the study recommends “8 hour” scenario in which battery backed PV supplies 70% of the load for 8 hours from between 8AM to 4PM. It also recommends the 12 hour scenario for long term.

**PV plant at Mithakhari:** The report also analyses scenarios for installation of 25 MWp PV plant at Mithakhari in South Andaman. Based on the findings, the report suggests “8 hour” scenario with battery.

**Havelock and Neil Islands:** Due to small power requirement at islands, the report suggests the “Super scenario”, which shall require DG sets only in system failure emergencies.

The report also illustrates the PV technologies, and suggests deployment of mono-crystalline or multi-crystalline technology. For storage, use of Li-ion

battery is recommended considering the long term life-cycle costs.

However, it is important to highlight that issues related to O&M- *transportation of battery banks and maintenance and repair of battery given the remote location and long travel time to islands*, shall be a bottleneck in success/efficiency of battery backed solar plants. In addition, high battery system cost may also be restrictive in setting up large scale battery backed solar systems.

Considering the dispersed nature of habitats of varying sizes and population densities in the islands calls for developing feasible mix of centralized and decentralized generation plan. Decentralized RE systems can solve this problem through small scale solar, wind and hydro power systems designed specifically for each island.

### 6.3. Existing and Planned RE Generation

Andaman and Nicobar presently has 10.5 MW of renewable energy installed capacity. District wise existing and planned initiatives entail the following-

#### Middle & North Andaman

- A 5.25 MW Kalpong Hydro Electric Power (KHEP) is functioning at Diglipur, North Andaman since February, 2001 which generates around 12 MU annually.
- KHEP runs its full capacity during the rainy season for about 6 months in a year (June to November) but during the dry season there is insufficient water in the reservoir to run the plant for 24 hours. So, the plant runs for 3-6 hours per day as per the availability of the water during the dry season. Hence, UT Administration has proposed to construct pumped storage plant at KHEP by installing a water reservoir to collect discharged water during the dry season and use solar power to pump the stored water back to the main reservoir for generation of electricity 24 hours in dry season.
- UT Administration has allotted a land at North Andaman where about 15 MW SPV plant will be installed by Neyveli Lignite Corporation. However, a detailed study for construction of reservoir at the downstream is required before taking up the solar plant at the proposed site and the size of the solar plant would also be finalized accordingly to the capacity of the pumps to be used in the pumping station. UT Administration has also to study the feasibility

of storing of the discharged water in the reservoir as this water might being used by the public in dry season.

In addition, amidst present grid conditions in North and Middle Andaman, it is also proposed that 3 MW of grid connecting SPV Plant with 1 MWh batter back up may be established at present for safe operation of the grid. However only after finalization of pumped storages capacity, any action will be taken.

#### South Andaman

- Currently, a 5 MWp Solar Photovoltaic (SPV) power plant has been installed & commissioned by NTPC at Garachama, South Andaman. This plant has PPA with EDA&N for 25 years. The total project was completed at a cost of Rs.60.00 crores which was funded by NTPC. This project has helped to reduce diesel consumption of South Andaman. However, the plant does not have any battery backup due to which, solar generated power is only available during day time and that too with significant variation due to frequent cloudy conditions. Hence, a 2MWh Battery is being proposed by NTPC at the SPV Plant for taking care of intermittency of solar power for stability of 33 KV Grid at South Andaman.

#### Havelock Island

- NTPC is entrusted for procurement and commissioning of 3 MW DG power house at Havelock where the existing DG sets have outlived their life. In addition a 1.5 MW SPV plant along with 500 kWh battery system for taking care the intermittency of solar power may be established at Havelock Island.
- EDA&N also plans to take immediate action to revive the already established 50 kW Plant at Havelock Island, lying idle due to issues with the inverter.

Figure 12: Garachama 5 MW Solar PV



90% of the land mass in Andaman and Nicobar islands is covered by protected forests. The use of HSD is detrimental to the ecological balance of the

islands. Keeping view of this, the A&N administration with the help of GoI have envisaged large scale penetration of renewable energy sources in the islands. Various studies have been undertaken to assess the suitability of RE sources like wind and solar in the islands. Given, the thrust on Solar power in the recent times and limited wind potential in Andaman and Nicobar, it is envisaged that major part of future energy demand may be met through solar PV. JERC has also notified the solar net-metering regulations to support proliferation of rooftop solar in UTs. Some of the key planned projects in this direction include the following:

**Table 22: A&N Planned RE generation**

Details	Capacity	CoD	Status
Grid Connected SPV	0.05	FY16	Developer Selected
Grid Connected Rooftop SPV	1	FY17	SECI is implementing
Grid Connected Rooftop SPV	5	FY18	SECI is implementing
Solar park in various locations	100	FY22	Sites allotted to EDA&N for 87 MWp,
Wind solar hybrid 3X250 kW	0.75	FY 20	To be implemented in Capex model
Total	106.75		

- Under Special Area Demonstration Programme (SADP), a 50 KWp Grid Connected Solar Power Plant at Raj Niwas is installed.
- In association with Solar Energy Corporation of India (SECI), the administration is planned to establish 1 MWp Rooftop Solar PV Plant in 13 Govt buildings on RESCO mode, which will be completed by December, 2016 and an additional 5 MWp is expected to be operational by December, 2017.
- MNRE has sanctioned solar park of 100 MWp capacity. The 100 MWp program is to be implemented in three phases:

**Phase 1:**

- 42.53 Ha (105 Acre) of land has been allotted for installation of 20 MWp of Solar PV in south

Andaman Islands at Garachama for catering to the demand of Port Blair.

- 2.94 Ha land is allocated in Vijay Nagar for 2 MWp Solar Plant (Havelock Island)
- 1.62 Ha land is allocated it Neil Kendra for 1 MWp Plant at Neil Kendra ( Neil Island)

DPRs for Solar PV plants in Neil and Havelock islands are being prepared by M/S Rajasthan Electronics and Instruments Ltd. (REIL)

**Phase 2:**

The proposed capacity addition in Phase 2 is expected to add more solar plants under 100 MWp Solar Park in South, Middle and North Andaman Islands. Status of key projects under the plan:

- Chidiyatapu- More than 36 Hectare of land allotted to develop 15 MWp capacity of plant by end of 2017,
- Garachama: 42 Hectare of land has been allotted to develop 15 MWp solar capacity;
- Manglutang : 39 Hectare of land allotted to develop 17 MWp capacity;
- Hut Bay: 11 Hectare of land allocated to develop 3 MWp capacity plant by end of 2017
- Diglipur & Rangat- 60 Hectare of land has been allotted to develop 30 MWp capacity,
- Long Island- 0.2 Hectare land has been allotted to develop 0.02 MWp Solar PV plant.

**Phase 3:**

The proposed capacity addition in Phase 3 is expected to add more solar plants under 100 MWp Solar Park in the Nicobar group of islands. Land is being identified at following islands for development of solar plants.

- Car Nicobar – 4.0 Hectare for 1.5 MWp.
- Chowra – 0.5 Hectare for 0.25 MWp.
- Teresa – 0.5 Hectare for 0.25 MWp.
- Katchal – 1.0 Hectare for 0.5 MWp.
- Champion – 0.5 Hectare for 0.25 MWp.
- Kamorta – 1.0 Hectare for 0.5 MWp.

Campbell Bay – 6.7 Hectare for 3.0 MWp.

- National institute of Wind Energy (NIWE) has identified a potential site for 3x250 kW Wind Power Plant at Hog Point, Car Nicobar. However, the wind generator manufacturers have expressed their inability to undertake the project under PPP mode as suggested by MNRE. As a result, A&N administration have requested MNRE to take up the project under capex model. Further, given the nature of demand and geographical constraints, it is proposed to have a wind-solar hybrid at the location to meet the demand of Car Nicobar Island.



- For establishment of 1-2 MW Biomass Power Plant at South Andaman tenders were floated on two occasions. On the first occasion, bid was cancelled and on second occasion tender could not be finalized due to single bid. However, establishment of Biomass Power Plant at South Andaman & Car Nicobar Islands is still under active consideration.

#### 6.4. RE plan-Issues and rollout plan

The solar parks are expected to reduce diesel consumption in Andaman and Nicobar islands to a great extent. This can be further reduced if adequate battery banks are installed at the Solar PV sites so that power from Solar PV is available even during night. However, as mentioned, battery system maintenance and repair and high installation cost may be a challenge due to remote location of the island region.

As mentioned earlier, the existing 5 MWp SPV plant does not have any battery backup due to which solar generated power is available during day time; and that too with significant diurnal variation, as well as variation due to frequent cloudy conditions. These variations in generated PV power result in operational challenges for the Grid (Diesel Power Stations) and many a times have resulted in grid collapse. The fluctuation in PV power in islands could systematically be decreased only together with battery storage facility in plants.

Keeping in view the present conditions of grid at South Andaman, all proposed four grid connected solar power plants of about 60-80 MW capacity at four identified sites cannot be established immediately keeping in view the reliability of the grid and non-availability of the additional DG sets for balancing power. At best, it would be appropriate that at present a 15 MW solar plant at Chidiyatapu, which is about 25 Km from 33/11 KV Garachama S/S, may be established along with 5 MWh storage battery system for adjusting the intermittency of the solar generation due to sudden cloud formations causing drop in solar generation. Subsequently, as and when the firm power 50 MW LNG based plant is available at South Andaman, the other one or two appropriate sites of about 15-20 MW along with some battery system may be taken up in future.

In addition, the proposed solar parks would need adequate evacuation facility. Considering the

technical challenges of power transmission between disconnected islands, evacuation infrastructure shall have to be planned to effectively utilize the renewable power.

It is proposed, that an Energy Management Center with advanced forecasting tools to support real time monitoring of RE generation, load management and grid management should be established at Port Blair. The EMC should have the following functions/capabilities:

- Data acquisition, monitoring and control
- Information collection from all islands
- Forecasting, scheduling, control, balancing and monitoring of RE power across each island with installed RE capacity
- Data management and preparation of reports
- Training and skill development for grid integration and management of RE power

It can be seen that the total installed capacity of the islands would exceed the requirement of 78 MW. Thus, EDA&N must make a roadmap to gradually phase out the inefficient and high O&M cost DG generators with some other firm power generation like LNG along with a suitable mix of renewable energy to ensure grid stability.

Considering the above, rollout of RE plants in UT are provided in Table 23. It may be noted that except solar PV other technologies are less likely to be installed by FY19.

**Table 23: Solar PV Addition Plan by FY19 (MWp)**

Location	FY17	FY18	FY19	Total
Neil and Havelock	4.5	0	0	4.5
South Andaman	0	15	0	15
North Andaman	0	0	15	15
Rooftop SPV	6.05	0	0	6.05
Total	10.55	15	15	40.55

#### 6.5. Action plan and fund requirement

The action plan and support requirements for RE are covered in Table 24.

It is proposed that some of the solar parks would be implemented by NTPC, NLC, REIL and SECI in BOOT basis and as such there is no investment required by EDA&N. However, EDA&N has to enter into appropriate offtake agreements to ensure fair return for the project developers.

**Table 24: Action items for RE Plan**

Stakeholder	Action Item
EDA&N	<ul style="list-style-type: none"> <li>Provide support to the implementing agencies for installation and commissioning of the proposed RE projects in the islands</li> </ul>
A&N administration	<ul style="list-style-type: none"> <li>Consider creation of separate agency/organization for monitoring, administration and operation of proposed RE projects</li> </ul>
MNRE	<ul style="list-style-type: none"> <li>MNRE to direct NIWE (National Institute of Wind Energy) to undertake the Wind Solar Hybrid Plant at Hog Point, Car Nicobar in CAPEX Model.</li> <li>MNRE has to finalize the implementing agencies for development of Solar Power Plants as per requirement of grid under 100 MWp Solar Park</li> </ul>
ED A&N POSOCO/PGCIL	<ul style="list-style-type: none"> <li>Initiate setting up of Energy Management Centre to manage higher quantum of intermittent RE power in the island grids.</li> </ul>
EDA&N	<ul style="list-style-type: none"> <li>Power evacuation arrangement from all Solar PV Projects being implemented under Solar Park at South Andaman, North &amp; Middle Andaman, and Havelock &amp; Neil Islands.</li> <li>Establishing a control system with SCADA in the existing grid along with system study software (PSS) at South Andaman, North &amp; Middle Andaman for smooth integration of new projects including Solar PV Plants</li> </ul>

## 7. Energy Efficiency Plan

### 7.1. Energy efficiency plan

EDA&N is the State Designated Agency (SDA) to co-ordinate, regulate and enforce the Energy Conservation Act 2001 within Andaman & Nicobar. The role of SDA is to create general awareness among masses on benefits of energy conservation measures and to institutionalize the energy efficiency project implementation in domestic, commercial and industrial segments.

The utility has carried out the following activities in the area of energy conservation and energy efficiency:

- Draft Notification for use of Energy efficient star rated equipment
- Mandatory use of Solar water heater for hotels, schools and commercial institutions
- LED village scheme under BEE is being implemented.

### 7.2. Energy efficiency action plan

Unnat Jyoti by Affordable LEDs for All (UJALA) for domestic consumers in Andaman & Nicobar is proposed to be initiated during FY16. The proposal envisages distribution of four lakh LED bulbs to around one lakh domestic consumers with anticipated energy savings of up to 22.6 MU. The cost recovery model is to be sent for approval to JERC.

Further, the A&N Administration has prepared draft notification of Energy Conservation which has the following provisions:

- Mandatory use of Solar Water heating Systems-** The notification mandates use of BIS marked solar water heating systems for industrial establishments, hospitals and nursing homes, hotels and restaurants, all govt. buildings, residential schools, colleges, housing complexes etc.
- Mandatory use of LEDs in Government Buildings / Government Aided Institutions / Boards / Corporations-** It proposes to ban use of CFL and incandescent lamp in govt. buildings. It also proposes that the electricity dept. shall

make modifications in connection agreements to promote use of LEDs.

- Mandatory use of ISI Marked and Star Rated Electrical Devices / Appliances-** It is proposed to mandate use of ISI marked wires and switch gear, mandatory star rating for electrical appliances like ACs, fridge etc.
- Promotion of Energy Efficient Building Design by including Renewable Energy Technologies with immediate effect-** To promote use of green energy the draft notification also mandates use of roof top solar PV in certain buildings.

### 7.3. Fund requirement

Energy efficiency is planned to be increased majorly through mandating use of LED lamps under the UJALA scheme being implemented by EESL. Each consumer will be supplied 4 LED bulbs of 9 W at Rs. 10 each. The project cost is planned to be paid by the department in a single instalment. Currently, 1 Lakh LED bulbs are awaiting shipment at Chennai.

### 7.4. Issues

Energy efficiency programs for Street Lighting (MuDSM) may be pursued by EDA&N with EESL.

EDA&N plans to shift generation to more efficient energy generation technologies, but it is understood that diesel based power generation units shall be required to be functional during emergencies. Thus, EDA&N should undertake R&M programs for improving the efficiency of the existing DG generation systems through adequate investments.

Due to tropical climate, there is continuous usage of ceiling fans in households, offices and commercial premises. EDA&N may consider distribution of super-efficient fans to its consumers through EESL.

The draft notification by A&N administration has proposed mandatory use of ISI marked star rated devices and applications. However, the A&N administration shall have to make necessary amendments in the new connection forms to ensure compliance. Also, a plan shall have to be formulated

for phasing out of existing devices. This shall also require market transformation efforts to prevent sale of non ISI marked devices as well as incandescent lamps.

The notification also mandates ban of CFL and IL in Government Buildings / Government Aided Institutions / Boards / Corporations. However, disposal of CFL and IL may pose environmental challenges. CFL bulbs contain small amounts of mercury which is toxic and essentially requires safe disposal. The materials forming the incandescent lamps are non-toxic, however, their direct disposal in

garbage is not sustainable considering they have glass parts and metal. Thus, ban on use of incandescent lamps and CFL bulbs shall require establishment of disposal management system by A&N administration to ensure sustainable shift.

## 7.5. Action plan

The action plan and support requirements for EE are covered in Table 25 below:

**Table 25: Action items for Energy Efficiency Plan**

Stakeholder	Action Item
EDA&N	<ul style="list-style-type: none"> <li>• Provide support to the implementing agencies for EE projects in the islands</li> <li>• Make necessary amendments in connection forms as per standards notified</li> <li>• Communication program to increase consumers awareness about EE</li> <li>• Establish a monitoring program to compare energy savings viz.a viz baseline</li> </ul>
A&N Administration	<ul style="list-style-type: none"> <li>• Develop guidelines and procedures to undertake EE projects/activities</li> <li>• Support R&amp;M activities of existing capacity</li> <li>• Consider creation of separate department/agency/organization for monitoring, administration and operation of proposed EE projects</li> <li>• Ensure compliance by all govt. buildings</li> <li>• Manage safe disposal of incandescent lamps and CFL.</li> </ul>
EESL	<ul style="list-style-type: none"> <li>• EESL to undertake efficient roll out of bulbs in the prescribed timelines</li> </ul>

## 8. Financial Position of Utility (EDA&N)

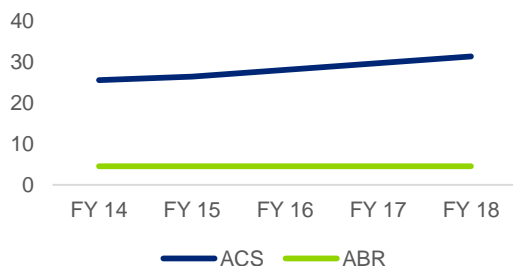
### 8.1. Introduction

EDA&N is responsible for the Generation and distribution function of the UT of Andaman and Nicobar Islands. Being a government department, EDA&N does not maintain commercial accounts.

This chapter is based on the budget figures of the department along with the regulatory filings and approved tariff orders for EDA&N.

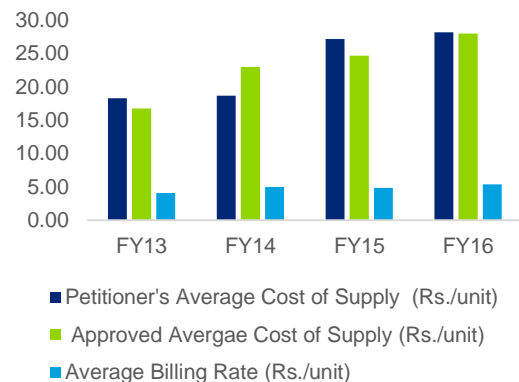
One of the major drivers of cost for EDA&N is the high cost of generation as EDA&N is powered almost entirely by Diesel Generators running on HSD. The cost of generation for FY15 was 15.81 Rs./kWh. With the O&M cost and other fixed charges including depreciation, the Cost of Supply for EDA&N is upwards of 25.00 Rs./kWh. Low consumer base along with high cost of generation are the main reasons behind the high cost of supply in the islands. This high cost of supply means that the power tariff in the islands are always lower than the cost of supply. For FY15 the average billing rate was about 4.73 Rs./kWh.

**Figure 13: Historical and Projected ACS vs ABR in Rs./kWh as per MYT petition of EDA&N**



Joint Electricity Regulatory Commission is responsible for administering Tariff and regulations in the UT of Andaman and Nicobar islands.

**Figure 14: A&N ACS vs ABR (Rs./unit)**



It can be observed that cost of supply has continuously increased to reach 28.02 Rs/unit in FY16 from 16.74 Rs. /unit in FY13. This is mainly due to increasingly high cost of power purchase. Though the Avg. billing rate has also increased but there still is high difference between the cost of supply and billing rate which has persistently led to high revenue gap. Since, existing tariff is not sufficient to recover cost of supply, the remaining gap is recovered from budgetary support from central govt.

### 8.2. Financial Projections

In order to estimate the impact of PFA program on the financials of a utility, it is pertinent to assess the incidental cost of the program vis-à-vis the potential of generating additional revenue due increase in energy sales.

Table 26 shows the assumptions used for various parameters to estimate the financial impact of the capital investment program.



**Table 26: Common assumptions for Financial Analysis**

Particulars	Assumptions																					
Power purchase	<ul style="list-style-type: none"><li>Power purchase from various sources as provided by EDA&amp;N.</li><li>Since there is no provision of export or import outside the state, the total generation is balanced as per the energy requirement.</li><li>The upcoming capacities in RE and LNG have been projected as per the data submitted by EDA&amp;N</li></ul>																					
Power Purchase Rate	<ul style="list-style-type: none"><li>The PP rate for FY16 to FY19 is considered to be constant at the projected rate of FY16 as per the MYT petition of EDA&amp;N. Any change in PP rate is expected to be passed on to the consumers through FPPPA mechanism.</li><li>PP rate for RE (Solar) plants are projected at 6.0 Rs./kWh (Expected to be installed through PPP mode)</li><li>PP rate for LNG plant 13.0 Rs./kWh (based on discussion held at MoP)</li></ul>																					
Revenue and Sales growth	<ul style="list-style-type: none"><li>Sales growth as per the projections in Chapter 3</li><li>ABR for Domestic category at 2.79 Rs./kWh and Other than domestic category at 6.7 Rs./kWh as per the data available in MYT petition filed by EDA&amp;N.</li></ul>																					
Losses (%)	<ul style="list-style-type: none"><li>Loss targets for FY16 to FY19 as per the projection of EDA&amp;N</li></ul> <table><tr><th>Loss</th><th>Units</th><th>FY15 (A)</th><th>FY16</th><th>FY17</th><th>FY18</th><th>FY19</th></tr><tr><td>AT&amp;C losses</td><td>%</td><td>23.96%</td><td>20.00%</td><td>19.00%</td><td>17.50%</td><td>16.00%</td></tr><tr><td>Distribution Losses</td><td>%</td><td>19.96%</td><td>17.53%</td><td>16.49%</td><td>14.95%</td><td>13.40%</td></tr></table>	Loss	Units	FY15 (A)	FY16	FY17	FY18	FY19	AT&C losses	%	23.96%	20.00%	19.00%	17.50%	16.00%	Distribution Losses	%	19.96%	17.53%	16.49%	14.95%	13.40%
Loss	Units	FY15 (A)	FY16	FY17	FY18	FY19																
AT&C losses	%	23.96%	20.00%	19.00%	17.50%	16.00%																
Distribution Losses	%	19.96%	17.53%	16.49%	14.95%	13.40%																
Capex & capitalization	<ul style="list-style-type: none"><li>Capex plan as per the submission of EDA&amp;N</li><li>Capitalization in 2 years (60% in Y1 and 40% in Y2)</li></ul>																					
Employee cost, R&M, A&G costs and Other costs	<ul style="list-style-type: none"><li><b>Employee cost:</b> Based on employee cost for FY15 with escalation of 10% YoY over the period of projection (FY 16 to FY19) considering the CPI.. Additional 7% escalation in FY17 to account for pay revision.</li><li><b>A&amp;G cost:</b> Based on A&amp;G cost for FY15 with escalation of 6% p.a over the period of projection (FY 16 to FY19)</li><li>R&amp;M cost:<ul style="list-style-type: none"><li><b>For existing assets:</b> Based on the actual R&amp;M cost as percentage of GFA (Past 2 years Average has been considered)</li><li><b>For New Assets – 1% of GFA</b></li></ul></li></ul>																					
Depreciation	<ul style="list-style-type: none"><li><b>For existing assets:</b> Based on the existing rate of depreciation</li><li><b>For new assets: 5.28%</b> (As new assets being added through 100% grants there is no addition in depreciation)</li></ul>																					
Funding of capital expenditure and financing terms	<ul style="list-style-type: none"><li>Entire capex is funded through 100% grants from Govt/Andaman and Nicobar islands</li><li>DDUGJY is expected as 100% grant as the utility's own contribution is expected as a grant from Andaman and Nicobar Administration</li><li>Another centrally funded project (for Neil and Havelock) is expected as 100% grants from Central Government</li></ul>																					
Working capital and cash deficit loan and interest	<ul style="list-style-type: none"><li>Working capital as per regulatory provisions</li><li>Cash deficit is assumed to be funded through budgetary provisions</li><li>Interest of Rs. 3 Cr assumed for FY16 to FY19 based on the interest charges shown in Proforma accounts (FY13) of EDA&amp;N.</li></ul>																					
Subsidy	<ul style="list-style-type: none"><li>Subsidy amount is equal to the income and expenditure deficit (ref: tariff orders and current practice)</li></ul>																					

It can be seen from the financial statements that the utility's expenses are higher than its income mainly due to its high cost of generation (fuel cost).

The base case has been prepared considering that per unit billing rate shall remain constant with no increase in tariff. It can be seen from Table 27 that

due to addition of cheaper sources of power, the cost of power purchase is expected to reduce.

Further as the tariffs are much lower than the cost of supply, the department will remain dependent on government subsidy to meet its expense in the near future.

However, the P&L account in Table 28 shows that there is an increase of Government Subsidy from current level of Rs. 491 Cr in FY16 to Rs. 548 Cr. in FY19.

There is no impact of the capital investment program as all of the capital investments are expected to be done through Central Government grant and grants from A&N Administration.

**Table 27: Parameters for Base Case**

Particulars	Unit	FY16	FY17	FY18	FY19
<b>Energy related parameters</b>					
Sales	MUs	249	271	297	330
Distribution Loss	%age	17.53%	16.49%	14.95%	13.40%
AT&C Loss	%age	20.00%	19.00%	17.50%	16.00%
Energy Input	Rs./kWh	302	324	349	381
Power purchase cost	Rs./kWh	15.9	15.6	15.1	14.2
<b>Revenue &amp; Expenditure parameters</b>					
Tariff Increase	%age	0.00%	0.00%	0.00%	0.00%
Collection efficiency	%age	97%	97%	97%	97%
Average Billing Rate- Domestic	Rs./kWh	2.8	2.8	2.8	2.8
Average Billing Rate- Other than domestic	Rs./kWh	6.7	6.7	6.7	6.7
Employee cost escalation	%age	10.00%	17.00%	10.00%	10.00%
A&G escalation	%age	6.00%	6.00%	6.00%	6.00%

**Table 28: P&L statement for Base Case (Rs. Crore)**

Details	FY 16	FY 17	FY 18	FY 19
Revenue from Sale of Power	119	129	143	162
Govt Revenue Subsidy	491	521	541	548
Power Purchase cost	479	505	528	543
O&M Cost	-	-	-	-
Employee cost	71	83	91	100
A&G Expenses	1	1	2	2
R&M Expenses	41	43	45	45
EBIDTA	-	-	-	-
Depreciation	8	8	8	8
Interest and finance charges	3	3	3	3
Interest on working capital	7	7	8	8
Interest on cash deficit loan	0	0	0	0
Revenue Deficit	0	0	0	0

### 8.3. Scenario Analysis

Any change in tariff or under achievement of AT&C losses considered for the base case or non-availability of funding in form of grants will translate into additional impact on the financial position of the utility. The impact of existing accumulated losses of EDA&N or the impact of purchase and sale of surplus power available to EDA&N also need to be

evaluated. Therefore, analysis under following scenarios have been carried out:

1. Increase in tariff required to ensure that utility becomes viable by FY19
2. Under achievement of AT&C loss targets: considering the utility misses the MOP targets by 1% every year.

### Scenario 1: Increase in tariff required for the utility to become viable

As the existing gap between average cost of supply and average realization is significant, an increase in tariff of up to 16% is required to reduce the Government grant in FY19. It can be seen that the expected Govt Subsidy support in FY19 is Rs.457 Cr. as compared to Rs. 548 Cr in the Base Case. Table 29 summarizes the underlying assumptions.

To achieve financial turnaround by FY19, tariff hike of 64% is required.

The resultant P&L account under this scenario is presented in Table 30

Base case analysis and scenario 1 assumes the achievement of AT&C loss trajectory by the utility. However, in case the utility misses T&D loss reduction and it remains at 1% higher than the targets, the impact on financial position is significant. Table 31 summarizes the key parameters underlying the analysis in scenario 2. Due to additional cost and under-achievement of T&D loss trajectory there is an adverse impact on the financials of the utility, as presented in Table 32. Govt. revenue subsidy increases to Rs.555 Cr. in FY19 as compared to Rs. 548 Cr under base case, where loss reduction target is assumed to be achieved, thus emphasizing the need for focusing on reduction in AT&C losses

### Scenario 2: Under achievement of AT&C loss reduction trajectory

Table 29: Parameters for Scenario 1

Particulars	Unit	FY16	FY17	FY18	FY19
<b>Energy related parameters</b>					
Sales	MUs	249	271	297	330
Distribution Loss	%age	17.53%	16.49%	14.95%	13.40%
AT&C Loss	%age	20.00%	19.00%	17.50%	16.00%
Energy Input	Rs./kWh	302	324	349	381
Power Purchase Cost	Rs./kWh	15.9	15.6	15.1	14.2
<b>Revenue &amp; Expenditure parameters</b>					
Tariff Increase	%age	0.00%	16.00%	16.00%	16.00%
Collection efficiency	%age	97%	97%	97%	97%
Average Billing Rate- Domestic	Rs./kWh	2.8	3.2	3.8	4.4
Average Billing Rate- Other than domestic	Rs./kWh	6.7	7.8	9.0	10.5
Employee cost escalation	%age	10.00%	17.00%	10.00%	10.00%
A&G escalation	%age	6.00%	6.00%	6.00%	6.00%

Table 30: P&L Statement for Scenario 1 (Rs. Crore)

Details	FY 16	FY 17	FY 18	FY 19
Revenue from Sale of Power	119	150	193	252
Govt Revenue Subsidy	491	500	491	457
Power Purchase cost	479	505	528	543
O&M Cost	-	-	-	-
Employee cost	71	83	91	100
A&G Expenses	1	1	2	2
R&M Expenses	41	43	45	45

Details	FY 16	FY 17	FY 18	FY 19
EBIDTA	-	-	-	-
Depreciation	8	8	8	8
Interest and finance charges	3	3	3	3
Interest on working capital	7	7	8	8
Interest on cash deficit loan	0	0	0	0
Revenue Deficit	0	0	0	0

**Table 31: Parameters for Scenario 2**

Particulars	Unit	FY16	FY17	FY18	FY19
Energy related parameters					
Sales	MUs	249	271	297	330
Distribution Loss	%age	18.53%	17.49%	15.95%	14.40%
AT&C Loss	%age	20.97%	19.97%	18.47%	16.97%
Energy Input	Rs./kWh	306	328	353	386
Power Purchase Cost	Rs./kWh	15.9	15.6	15.1	14.3
Revenue & Expenditure parameters					
Tariff Increase	%age	0.00%	0.00%	0.00%	0.00%
Collection efficiency	%age	97%	97%	97%	97%
Average Billing Rate- Domestic	Rs./kWh	2.8	2.8	2.8	2.8
Average Billing Rate- Other than domestic	Rs./kWh	6.7	6.7	6.7	6.7
Employee cost escalation	%age	10.00%	17.00%	10.00%	10.00%
A&G escalation	%age	6.00%	6.00%	6.00%	6.00%

**Table 32: P&L Statement for Scenario 2 (Rs. Cr.)**

Details	FY 16	FY 17	FY 18	FY 19
Revenue from Sale of Power	119	129	143	162
Govt Revenue Subsidy	497	528	548	555
Power Purchase cost	485	511	535	551
O&M Cost	-	-	-	-
Employee cost	71	83	91	100
A&G Expenses	1	1	2	2
R&M Expenses	41	43	45	45
EBIDTA	-	-	-	-
Depreciation	8	8	8	8
Interest and finance charges	3	3	3	3
Interest on working capital	7	7	8	8
Interest on cash deficit loan	0	0	0	0
Revenue Deficit	0	0	0	0

#### 8.4. Action Plan

The action items for EDA&N for improvement in financial parameters are shown in

Table 33. One of the priority tasks of the department is preparation of commercial accounts.

**Table 33: Action Items for Financial Sustainability**

Stakeholder	Action Item
EDA&N	<ul style="list-style-type: none"><li>• Develop procedures and practices to move towards commercial accounting system</li><li>• Conduct diesel price auditing and explore models to procure low cost diesel</li><li>• Establish standards on diesel utilization to ensure minimum conversion efficiency standards (electricity generation per unit of diesel consumption)</li></ul>



## 9. Roll out Plan

**Table 34: Roll out plan for Generation and Distribution**

Particular	Unit	Existing	Year wise addition				Total Till FY19
		ending FY15	FY16	FY17	FY18	FY19	
G E N E R A T I O N							
State Sector (DG) + LNG	MW	58	0	5.2	0	30	93
Renewable (Solar PV+SHP)	MWp	10	0	5.2	0	30	50.55
Private Sector	MW	36.2	0	0	-20	0	16.2
Total IC	MW	104.2	0	10.4	-20	60	159.75
Peak Demand	MW	58	59	61	64	68	-
D I S T R I B U T I O N							
Distribution Transformers	Nos	907	0	54	37	0	998
33kV Feeders	Ckt. Kms	472	0	6.5	6.5	0	485
11kV Feeders	Ckt. Kms	841	0	84.45	69.45	0	994.9
LT Feeders	Ckt. Kms	3,496	0	106.2	106.2	0	3,708.4

## 10. Institutional Arrangement for monitoring

A strong monitoring framework is essential to ensure the success of “Power for All” scheme.

the progress of all initiatives being undertaken in this Roadmap.

The following structure shown in following table is being proposed to undertake regular monitoring of

**Table 35: Institutional Arrangement for Monitoring**

Sl.	Institutional arrangement	Responsibilities	Monitoring frequency
1	<b>Government of India (GOI) Committee</b>	It is proposed that this committee will review the overall progress of the scheme and provide necessary support to ensure a coordinated response from Central Government – where necessary. This committee may be constituted with the following members – PFC, REC, CEA, SECI, EESL, BEE, Ministry of Coal, MNRE, MoPNG and Ministry of Power.	Quarterly
2	<b>State Government Level Committee</b>	It is proposed that a State level committee headed by the Secretary (Power) will be formed to review the progress of the scheme. This Committee will monitor the progress of the works undertaken as a part of the scheme and issue directions to enable faster execution.	Quarterly
3	<b>Department Level Committee</b>	It is proposed that a department level committee headed by Nodal Officer will be formed which shall undertake steps required to ensure the projects are progressing as per the action plan.	Monthly
4	<b>Circle Level Committee</b>	It is proposed to constitute a circle level committee headed by GM to take action that is necessary to ensure the projects are completed in a timely manner.	Monthly
5	<b>Project Monitoring Unit (PMU)</b>	A PMU shall be set up for monitoring the progress of works being undertaken under this scheme. The PMU will operate under Secretary (Power) and shall be operated by an independent agency.	Weekly

# 11. Annexures

## Annexure 1a :DDUGJY Planned Capacity Addition

Sl.	Description	Quantity	Rs. In Lac
1.	<b>South Andaman</b>		
	<b>E. Metering</b>		
	a)DTR Metering		
	Ferrargunj	102 Nos	3.91374
	b)Feeder Metering		
	Ferrargunj	11 Nos	10.43383
	c)LT Metering		
	Ferrargunj	10062 Nos	176.75436
	Total E. Metering		191.10193
2.	<b>Feeder System strengthening</b>		
	a)Capacity augmentation of DTR (Ferrargunj)	28 Nos	99.38
	b)Conversion of existing LT ABC to higher capacity LT ABC	1.5 km	1.53
	c) Conversion of existing LT overhead to LT ABC	309.36 km	1,264.5351
	d)New overhead line	270 km	3,023.20
	e)New 11KV line DTR	25nos	147.11
	f)New 11KV spur line	27.5 km	301.40
	g)New 33/11KV Sub-station	5 (1x1.6, 4x2.5 MVA)	54.94938
	h)New LT ABC	71.5 km	634.515
	Total F. system strengthening		5,526.61948
	Grand Total		5,717.72141

Sl	Description	Quantity	Rs. In Lac
1.	<b>North and Middle Andaman</b>		
	<b>E. Metering</b>		
	a)DTR Metering		
	Diglipur	72 Nos	2.76264
	b)Feeder Metering		
	Diglipur	5 Nos	4.75
	Mayabunder	3 Nos	3.5
	Rangat	9 Nos	10.50
	Total	17 Nos	18.75
	c)LT Metering		
	Diglipur, Mayabunder, Rangat	21053	373.19938
	Total E. Metering		394.71202
2.	<b>Feeder System strengthening</b>		
	a) 11 kV line augmentation	430 Nos.	58.85445
	b) 33 kV line augmentation	886 Nos.	183.72186
	c) 33/11 kV substation	19 Nos.	61.02382

Sl	Description	Quantity	Rs. In Lac
	d) Capacity augmentation of DPR	53 Nos.	175.676
	e) Conversion of LT ABC to higher LT ABC	10 km	20.6
	f) Conversion of existing LT to LT ABC	442.8 km	1,530.085
	g) New overhead line	410 km	4,605.163
	h) New 11 kV line DTR	49 Nos.	280.50
	i) New 11 kV spur line	111.4 km	823.096
	j) New 33 kV line	13 km	209.56
	k) new 33/11 kV Substation	6 nos (3X1+2x1.6+1X2.5MVA)	54.835
	l) New LT ABC		1,158.313
	Total F. system strengthening		9,556.68056
	Grand Total (Rs. Cr.) in PMA (0.5%)		153.52

## Annexure 2a : Recommendations for replacement of existing DG sets

Island	Powerhouse	Installed Capacity	De-rated Capacity	Total Capacity	FY19 Demand	Year of Installation/Age/Current Status	Recommendation
South Andaman	IPP	20	15	46.612	55	The PPA of Bambooflat IPP expires in March 2018. The conditions of DG sets after March 2018 is to be examined. Five DG sets at Chatham PH and Two DG sets of 1,000 KW at Phoenix Bay PH are more than 20 years old and may not be available/ economical beyond 2019.	As per the Plan, a 30 MW LNG Plant is expected in South Andaman by 2019 after operationalization of the plant, the old units may be dismantled and remaining units may kept as stand by for emergency purposes. The small DG sets of capacities upto16 kW installed at various buildings as stand by source may be reviewed by Electricity Department and further action for their replacement may be taken based on their importance, hours of usage and SFC.
	Chatham	15	9.6				
	Phoenix Bay	2	11.4				
	Phoenix Bay	6					
	Phoenix Bay	4.8					
	HPP – I	5	0.6				
	HPP-II	10	10				
	Raj Nivvas	0.512					
	Medical	0.256					
	Secretarait	0.256					
Rutland	Rutland	0.012	0.012				
Neil	Neil	0.384	0.371	0.371	0.43	The 100 KVA and 50 KVA DG sets are more than 20 years old and only 3x128 KW DG sets are supplying power to meet the load at Neil Island. To meet the expected load of 410 KW by 2018-19, some new DG capacity would be required.	2x128 kW DG be installed by FY19 to be added along with existing 3x128 KW DG sets and old DG sets may be dismantled.
	Neil	0.2					
	Neil	0.05					
Havelock	Havelock	1.28	1.101	1.101	1.69	All Units have out-lived their lives and are to be replaced.	3x1000 kW DG sets have already been approved and NTPC has been entrusted to commission the new DG sets at Havelock Island.
	Havelock	0.05					
	Havelock	0.4					
Little Andaman	Hutbay	0.25	2.595	3.119	2.32	Two units are more than 20 years old, one is installed in 2010	Two units would cross 24 years of serviceable life by FY19, it is recommended to have a new 1,000
	Hutbay	2.4					



Island	Powerhouse	Installed Capacity	De-rated Capacity	Total Capacity	FY19 Demand	Year of Installation/Age/Current Status	Recommendation
	Hutbay	3					kW unit by FY19. Smaller DG sets in the islands may be replaced based on the SFC.
	St. Island	0.015	0.012				
	Baratang	0.512	0.512				
North and Middle Andaman	Rangat	10.036	6.71	6.725	5.32	All DG sets except 5x1000 kW DG sets are more than 20 years old and may not be economical to run beyond 2018-19.	As all 5x1000 KW DG sets are essential for meeting the expected peak demand, it is recommended to install 1x1000 KW DG set for taking care of /outage maintenance of DG set in the Island.
	Hanspuri	0.015	0.015				
	Long Island	0.892	0.27	0.27	0.11	Units are about 14-15 years old	The capacity is adequate to meet the expected demand
	Ganeshnagar	0.065	0.065	2.498	3.37	3x256 KW DG sets at Sita Nagar PH are about 20 years old and 2x800 KW DG sets are meeting the peak demand along with KHEP.	To have the back up in case of any maintenance/outage of any 800 KW DG set, 2x800 KW DG sets are recommended at Sita nagar PH for providing reliable power supply in the season when hydro power is not available fully.
	Shanti nagar	0.065	0.065				
	Sita Nagar	2.368	2.368				
	Smith Island	0.04	0.04	0.04	0.028		
	Mayabunder	1	1				
Car Nicobar	Kinyuka NPH	4	2.7	2.7	2.06	4x1000 kW DG sets are available for meeting the load .	Car Nicobar - 5x256 kW old DG sets may be replaced at HQ or or network may be redesigned so as to feed the HQ from Kinyuka PH.
	Head Quarter	1.536					
Kamorta	Kamorta	1.024	0.77	0.882	0.57	The SFC for 4x256 KW existing DG sets are very high.	The high SFC DG sets may be replaced with new DG sets in a phased manner.

Island	Powerhouse	Installed Capacity	De-rated Capacity	Total Capacity	FY19 Demand	Year of Installation/Age/Current Status	Recommendation
	Pillpillow	0.056	0.056				
	Kakana	0.056	0.056				
Nancowry	Champion	0.295	0.295	1.451	0.07	The SFC of the existing DG sets at Champion PH is very high as the existing DG sets might be very old.	2x128 kW DG sets are recommended at Champion Power house to replace the existing inefficient DG sets.
	Kathchal	0.75	0.75				
	Kathchal NPH	0.406	0.406				
Teressa	Teressa	0.662	0.662	0.756	0.174	Age of the untis are not known	EDA&N may carry out studies to study the condition, running hours and SFC of the small DG sets and prepare a replacement/R&M plan accordingly.
	Miryuk	0.05	0.05				
	Chukmachi	0.044	0.044				
Great Nicobar	Campbell Bay	2.73	2.73	2.73	1.99	All the existing DG sets at Campbell Bay Ph are very old and in efficient.	It is recommended to install 3x1000 KW DG sets to replace old DG sets to provide reliable power supply in the Island.

## Annexure 2b: Proposed DG replacement plan of A&N

Sl.	Island	Power house No.	Particulars	Total Installed capacity			Power House wise installed capacity	Make	Date / Year of installation	Derated capacity				Fund required for replacement with new/recon engine (Rs. in Cr.	
			Ars	DG size	Qty.	Total				2015-16	2016-17	2017-18	2018-19		
				KW	Nos.	MW	MW			MW	MW	MW	MW		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	18
1	South Andaman	1	IPP	5000	4	20	20	Mak - Catterpillar	Apr-03	12	10	10	0		120
		2	Chatham	2500	6	15	15	Bergen	02 Nos - February 1990	7.5	7	6	5		
									03 Nos - May 1991						
									01 No - August 2011						
		3	Phoenix Bay	1200	5	6	10.8	Cummins	Feb-05	3.5	3	3	3		
				2400	2	4.8			Feb-15	4	4	4	4		
		4	HPP – I	1000	5	5	5		May-12	0	0	0	0		
		5	HPP-II	1250	8	10	10		Dec-12	10	10	0	0	Agreement expiring during Nov.2016	
		6	Raj Niwas	256	2	0.512	1.024	Cummins	Apr-94	0.3	0.3	0	0	Outlived their useful life. Replacement required.	2
		7	Medical	256	1	0.256		Cummins						Outsourced by Health Deptt.	

Sl.	Island	Power house No.	Particulars	Total Installed capacity			Power House wise installed capacity	Make	Date / Year of installation	Derated capacity				Fund required for replacement with new/recon engine (Rs. in Cr.)	
			Ars	DG size KW	Qty. Nos.	Total MW	MW			2015-16 MW	2016-17 MW	2017-18 MW	2018-19 MW		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	18
		8	Secretarait	256	1	0.256		Cummins		0.16	0.16	0	0	Outlived their useful life. Replacement required.	1.5
		9	G/Ch. SPV	5000	1	5	5		March 31st' 2013	5	5	5	5		
2	Rutland	10	RutLand	12	1	0.012	0.024	Cummins							
		11	45 Acre*	12	1	0.012			Jul-10						
3	Neil	12	Neil	128	3	0.384	0.634	Greaves	Feb-06						
				100	2	0.2		Cummins							
				50	1	0.05			Feb-94						
4	Havelock	13	Havelock	256	5	1.28	1.73	Greaves	Aug-03						
				50	1	0.05			November 1993						
				400	1	0.4		Greaves							
5	Little Andaman	14	Hutbay	1000	3	3	3	Cummins	Jul-10	2.4	2.4	2.4	2.4		2.4
		15	Dugong Creek	16	2	0.032	0.047	Cummins						Outlived their useful life. Replacement required.	0.7
				15	1	0.015		Greaves						Outlived their useful life. Replacement required.	

Sl.	Island	Power house No.	Particulars	Total Installed capacity			Power House wise installed capacity	Make	Date / Year of installation	Derated capacity				Fund required for replacement with new/recon engine (Rs. in Cr.)
			Ars	DG size KW	Qty. Nos.	Total MW	MW			2015-16 MW	2016-17 MW	2017-18 MW	2018-19 MW	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
6	Strait Is.	16	Strait Island	15	1	0.015	0.015	Cummins						Outlived their useful life. Replacement required.
South Andaman District					61	72.124	72.124							126.6

Sl.	Island	Power house No.	Particulars	Total Installed capacity			Power House wise installed capacity	Make	Date / Year of installation	Derated capacity				Fund required for replacement with new/recon engine (Rs. in Cr.)
			ars	DG size KW	Qty. Nos.	Total MW	MW			2015-16 MW	2016-17 MW	2017-18 MW	2018-19 MW	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	Kadamtala	1	Kadamtala	256	2	0.512	0.512	Cummins	2015	0.3	0.25	0	0	DG Sets are running since 1990 and shifted from different locations to Kadamatala needs replacement.
														2.9



Sl.	Island	Power house No.	Particulars	Total Installed capacity			Power House wise installed capacity	Make	Date / Year of installation	Derated capacity				Fund required for replacement with new/recon engine (Rs. in Cr.)	
				ars	DG size	Qty.				Total	2015-16	2016-17	2017-18		2018-19
					KW	Nos.				MW					
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	18
7	Baratang	17	Baratang	256	1	0.256	0.512	Cummins		0.3	0.25	0	0	DG Sets are running since 1990 and shifted from different locations to Kadamatala needs replacement.	2.9
				256	1	0.256									
8	Middle Andaman	18	Rangat	800	4	3.2	10.036	Cummins	Mar-92	1.6	1.6	0	0	Outlived their useful life. Replacement required.	5.8
				1000	5	5			Mar-10	3.5	3.5	3.5	3.5		
				248	7	1.736		Kirloskar	Jun-86						
				100	1	0.1		Cummins							
		19	Bangaon*	16	1	0.016	0.016		Jun-08						
		20	Hanspuri	12	1	0.012	0.027	Cummins							
				15	1	0.015									
		21	Long Island	128	4	0.512	0.892	Greaves	Dec-03	0.3	0.25	0	0	All the DG sets are old outlived and required replacement	1.23
				65	2	0.13									

Sl.	Island	Power house No.	Particulars	Total Installed capacity			Power House wise installed capacity	Make	Date / Year of installation	Derated capacity				Fund required for replacement with new/recon engine (Rs. in Cr.)	
			ars	DG size KW	Qty. Nos.	Total MW	MW			2015-16 MW	2016-17 MW	2017-18 MW	2018-19 MW		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	18
				50	5	0.25		Ruston							
Middle Andaman					33	11.483	11.483								
9		22	Gandhinagar*	60	1	0.06	0.06		Nov-12						
		23	Ganesh Nagar	65	1	0.065	0.065		Oct-12						
		24	Shanti Nagar	65	1	0.065	0.065		Oct-12						
		25	Smith Island	40	1	0.04	0.04		Nov-12						
		26	Sita Nagar	256	3	0.768	4.168	Cummins	1987						
				800	3	2.4			Shifted from Rangat and Hut Bay	1.5	1.3	0	0	Outlived their useful life. Replacement required.	7.2
				1000	1	1			Shifted from PBPH -	0.7	0.6	0	0	All the DG sets are old outlived and required replacement	
		27	Mayabunder	1000	1	1	1		Mar-13						2.4
28	KHEP **	1750	3	5.25	5.25		Aug-01	4.8	4.8	4.8					
North Andaman					13	8.848	8.848								
Middle & North Andaman District					46	20.331	20.331								22.43

Sl.	Island	Power house No.	Particulars	Total Installed capacity			Power House wise installed capacity	Make	Date / Year of installation	Derated capacity					Fund required for replacement with new/recon engine (Rs. in Cr.)
				DG size KW	Qty. Nos.	Total MW	MW			2015-16 MW	2016-17 MW	2017-18 MW	2018-19 MW		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	18
10	Car Nicobar	29	Kinyuka NPH	1000	4	4	5.636	Cummins	Jun-10	3.2	3.2	3.2	3.2		
				100	1	0.1									
11	Kamorta	31	Kamorta	256	4	1.024	1.236	Cummins		0.7	0.7	0	0	Outlived their useful life. Replacement required.	4
		32	Bunderkhari*	12	1	0.012			Oct-05						1.5
		33	Derring*	8	1	0.008									
				12	1	0.012			Oct-03						
		34	Alukheak*	6	1	0.006			May-10						
		35	Changua*	12	1	0.012									
				6	1	0.006			Oct-03						
		36	Munak*	24	1	0.024									
				12	1	0.012									
				8	1	0.008			Apr-01						
12	Nancowry	39	Champion	65	3	0.195	0.323	Greaves							

Sl.	Island	Power house No.	Particulars	Total Installed capacity			Power House wise installed capacity	Make	Date / Year of installation	Derated capacity				Fund required for replacement with new/recon engine (Rs. in Cr.)	
				DG size	Qty.	Total				2015-16	2016-17	2017-18	2018-19		
				KW	Nos.	MW				MW	MW	MW	MW		MW
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	18
				50	2	0.1		Ruston							
		40	Hitoi*	12	1	0.012									
				8	2	0.016			Sep-03						
13	Katchal	41	Katchal (NTPC)	250	3	0.75	1.23	Cummins	Mar-10						
		42	Katchal NPH	256	1	0.256									
				100	1	0.1									
				50	2	0.1									
		43	Upper Katchal*	12	2	0.024		Kirloskar	Aug-10						
14	Teressa	44	Teressa	50	3	0.15	0.756	Kirloskar							1.3
				256	2	0.512		Cummins							
15	Chowra	47	Chowra	50	2	0.1	0.164	Kirloskar							0.7
				32	2	0.064									
16	Great Nicobar	48	Campbell Bay	800	3	2.4	2.848	Cummins	Jun-87	1.8	1.5	0	0	Outlived their useful life. Replacement required.	7.2
				256	1	0.256			Dec-92					DG sets used are uneconomical since they have already outlived their	
				50	1	0.05		Ruston	Feb-84						
				24	1	0.024		Kirloskar							
		49	Afra Bay*	32	1	0.032			Dec-10						1.2

Sl.	Island	Power house No.	Particulars	Total Installed capacity			Power House wise installed capacity	Make	Date / Year of installation	Derated capacity				Fund required for replacement with new/recon engine (Rs. in Cr.)	
				DG size KW	Qty. Nos.	Total MW	MW			2015-16 MW	2016-17 MW	2017-18 MW	2018-19 MW		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	18
		50	Pilpilow*	12	1	0.012			Dec-10					useful life and required replacement	
		51	Pilowbha*	12	1	0.012			Dec-10						
		52	Pilowpanja*	12	1	0.012			Dec-10						
		53	Macachuwa*	50	1	0.05			Dec-10						
Nicobar District					69	12.193	12.193								15.9
Grand Total					176	104.648	104.648								164.93
** Hydro Power Station *** SPV Power Plant															



*Power for All – Andaman and Nicobar*









