# BUSINESS PLAN

## FOR THE

# CONTROL PERIOD FY 2019-20 TO FY 2021-22

## OF

## ELECTRICITY DEPARTMENT, GOA

## SUBMITTED TO

## JOINT ELECTRICITY REGULATORY COMMISSION

## GURGAON

## BY

## ELECTRICITY DEPARTMENT, GOA

## SEPTEMBER 2018

**BEFORE THE JOINT ELECTRICITY REGULATORY COMMISSION FOR THE STATE OF GOA, & UNION TERRITORIES, GURGAON**

Filing No……

Case No……

IN THE MATTER OF: Petition for approval of the Business Plan for control period from FY 2019-20 to FY 2021-22 for the Electricity Department of Goa as per Regulation 8 and 16 of JERC (Generation, Transmission & Distribution Multi Year Tariff) Regulations, 2018.

AND

IN THE MATTER OF: Electricity Department, Government of Goa
Vidyut Bhavan, Panaji, Goa

.....Petitioner

**AFFIDAVIT ON BEHALF OF ELECTRICITY DEPARTMENT, GOVERNMENT OF GOA (ED-Goa)**

I, Shri N. Neelakanta Reddy, son of Shri. N. Basappa Reddy aged 61 years, the deponent named above do hereby solemnly affirm and state on oath as under:-

1) That I am Chief Electrical Engineer and Head of Electricity Department, Government of Goa and am authorised to sign and am acquainted with the facts deposed to below.

2) I say that on behalf of ED-Goa, I am now filing this Petition for approval of the Business Plan for control period from FY 2019-20 to FY 2021-22 as per Regulation 8 and 16 of JERC (Generation, Transmission & Distribution Multi Year Tariff) Regulations, 2018 for the Electricity Department of Goa, for its Licensee Area.

3) I further say that the statements made and financial data presented in the aforesaid Petition are as per records of the Department and on the information received from the concerned officials and believe that to be true to the best of my knowledge.
4) Further, to my knowledge and belief, no material information has been concealed in the aforesaid Petition.
5) Further, the delay in filing of the Business Plan for the Control Period FY 2019-20 to FY 2021-22 may please be condoned.

**DEPONENT**

**Chief Electrical Engineer**
**Electricity Department Goa**

**Place: Panaji**
**Date: September, 2018**

**VERIFICATION**

I, Shri Shivprasad V. Manekar, Advocate and Notary having office at Panaji-Goa, do hereby declare that the person making this affidavit is known to me through the perusal of records and I am satisfied that he is the same person alleging to be deponent himself.

**Advocate**

Solemnly affirmed before me on this …….. day of September 2018 by the deponent who has been identified by the aforesaid Advocate. I have satisfied myself by examining the deponent that he understood the contents of the affidavit which has been read over and explained to him. He has also been explained about section 193 of Indian Penal Code that whoever intentionally gives false evidence in any of the proceedings of the Commission or fabricates evidence for purpose of being used in any of the proceedings shall be liable for punishment as per law.

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# *List of Abbreviations*

| Sr. No | Abbreviations | Descriptions |
|---|---|---|
| **1.** | A&G | Administrative and General |
| **2.** | AC | Auxiliary Consumption |
| **3.** | ABR | Average Billing Rate |
| **4.** | APR | Annual Performance Review |
| **5.** | ARR | Aggregate Revenue Requirement |
| **6.** | CAGR | Compound Annual Growth Rate |
| **7.** | CAPEX | Capital Expenditure |
| **8.** | CERC | Central Electricity Regulatory Commission |
| **9.** | JERC | Joint Electricity Regulatory Commission |
| **10.** | CGS | Central Generating Station |
| **11.** | CoS | Cost of Supply/ Service |
| **12.** | CPPs | Captive Power Plants |
| **13.** | Crs | Crores |
| **14.** | CWIP | Capital Work in Progress |
| **15.** | DF | Distribution Franchisee |
| **16.** | Discom | Distribution Companies |
| **17.** | DPC | Delayed Payment Charges |
| **18.** | DSM | Demand Side Management |
| **19.** | DTC | Distribution Transformer |
| **20.** | EA/The Act | The Electricity Act 2003 |
| **21.** | EDG/ED-Goa | Electricity Department-Goa |
| **22.** | FY | Financial Year |
| **23.** | GFA | Gross Fixed Assets |
| **24.** | G.O.G | Government Of Goa |
| **25.** | GoI | Government of India |
| **26.** | HR | Human Resource |
| **27.** | HT | High Tension |
| **28.** | IPP | Independent Power Producers |
| **29.** | KV | Kilo Volt |
| **30.** | kVA | Kilo Volt Ampere |
| **31.** | kVAh | Kilo Volt Ampere Hour |
| **32.** | kW | Kilo Watt |
| **33.** | kWh | Kilo Watt Hour |
| **34.** | LF | Load Factor |
| **35.** | LT | Low Tension |
| **36.** | MD | Maximum Demand |

| Sr. No | Abbreviations | Descriptions |
|---|---|---|
| **37.** | MOD | Merit Order Despatch |
| **38.** | MoP | Ministry of Power |
| **39.** | MOU | Memorandum of Understanding |
| **40.** | MU | Million Units (Million kWh) |
| **41.** | MVA | Mega Volt Ampere |
| **42.** | MW | Mega Watt |
| **43.** | MYT | Multi Year Tariff |
| **44.** | NEP | National Electricity Policy |
| **45.** | NTP | National Tariff Policy |
| **46.** | NTPC | National Thermal Power Corporation |
| **47.** | O&M | Operation & Maintenance |
| **48.** | PAF | Plant Availability Factor |
| **49.** | PF | Provident Fund |
| **50.** | PFC | Power Finance Corporation |
| **51.** | PLF | Plant Load Factor |
| **52.** | PLR | Prime Lending Rate |
| **53.** | PPA | Power Purchase Agreement |
| **54.** | R-APDRP | Restructured-Accelerated Power Development and Reform Programme |
| **55.** | REC | Rural Electrification Corporation |
| **56.** | R&M | Repair and Maintenance |
| **57.** | ROE | Return on Equity |
| **58.** | RPO | Renewable Purchase Obligation |
| **59.** | Rs | Rupees |
| **60.** | SBI | State Bank of India |
| **61.** | SWOT | Strength, Weakness, Opportunities & Threats |
| **62.** | T&D | Transmission and Distribution |
| **63.** | w.e.f | With effect from |
| **64.** | Y-o-Y | Year on Year |

# CHAPTER 1. INTRODUCTION

## 1.1 Background

1.1.1 The Electricity Department was formed in January 1963 under the Government of Goa, Daman & Diu. It is the only licensee operating in the State of Goa for transmission and distribution of Electrical Energy.

1.1.2 The Electricity department (ED-Goa) does not own any generation plant. The majority of the power requirement for the State of Goa is met through its share from Central Sector Power Stations of the National Thermal Power Corporation as allocated by the Central Government. ED-Goa has arrangement of power purchase from three Co-generation Power Plants in the State:

- Goa Energy Private Limited for 14-21 MW
- Goa Sponge and Power Limited for 3 MW
- Sesa Sterlite for minimum 2 MW

## 1.2 Business Activities

1.2.1 ED-Goa came into regulatory regime wef FY 2011-12 i.e. the first tariff filing year. The Electricity Department is a deemed Distribution Licensee within the meaning of Section 2 (17) of Electricity Act 2003 and pursuant to the Section 14 of the Electricity Act. Further, Section 42 and 43 of the Electricity Act 2003 prescribes the following duties of the deemed Distribution Licensee:

- To develop and maintain an efficient, co-ordinated and economical distribution system;
- To supply electricity on an application of the consumer in accordance with the provisions specified in the Electricity Act 2003;
- To provide non-discriminatory open access to the consumers;
- To establish a forum for redressal of grievances of the consumers.

1.2.2 The Main purpose is to undertake the transmission, distribution and retail supply of electricity in its license area and for this purpose to plan, acquire, establish, construct, erect, lay, operate, run, manage, maintain, enlarge, alter, renovate, modernize, automate, work and use a power system network in all its aspects and also to carry on the business of purchasing, selling, importing of electrical energy, including formulation of tariff, billing and collection thereof and then to study, investigate, collect information and data, review operations, plan, research, design and prepare project reports, diagnose operational difficulties and weaknesses and advise on the remedial measures to improve and modernize existing sub-transmission and supply lines and sub-stations.

1.2.3 ED-Goa submitted its first Business Plan for the period starting from April 2015 to March 2018 (3 year control period) on 01.10.2014 under Regulation 12.1 of the MYT Regulation, 2014. As per provisions in clause 5.1 (as per amendment dated 10th August 2015) and 12.1 of the JERC Multi Year Distribution Tariff Regulations, 2014, the Petitioner has filed for approval of its Business Plan for three years control period i.e. from FY 2016-17 to FY 2018-19 with details for each year of the control period before the Commission. The Commission has approved the Business Plan for three years control period FY 2016-17 to FY 2018-19 vide order dated 22.12.2015.

## 1.3 Objective of Business Plan

1.3.1 A business plan is conventionally defined as:

*"Business Plan is a formal statement of a set of business goals, the reasons why they are believed attainable, and the plan for reaching those goals. It may also contain background information about the organization or team attempting to reach those goals."*

1.3.2 Accordingly, the business plan for ED-Goa is developed keeping in mind the growth plan for the control period after considering the strengths and weaknesses of the department and evaluating its business environment. The business environment has evolved considerably in a number of ways that affects ED-Goa's strategic planning.

1.3.3 The business plan is intended to give a comprehensive and up-to-date representation of the department, its market, the impact of new regulations, and the strategies that has been developed by ED-Goa to achieve the same. *However, as mentioned above, there are number of internal and external factors which affect the planning of the department and thus, it makes this a very dynamic document and which calls for regular reviews of the plan with a view to introduce any corrections.*

1.3.4 The Commission has come with the new MYT Regulations 2018 and as per Regulation 8 of the new MYT Regulations 2018 for the Control Period FY 2019-20 to FY 2021-22, the Business Plan shall cover as under:

Quote

*"8 Business Plan*

*8.1 The Transmission Licensee and Distribution Licensee shall file for the Commission's approval a Business Plan for the entire Control Period, approved by its authorized signatory by August 31, 2018:*

*Provided that the Generation Company shall not be required to file a Business Plan for the Control Period.*

*8.2 The Business Plan filed by the Distribution Licensee shall contain separate sections*

*on Distribution Wires Business and Retail Supply Business.*

*8.3 The Business Plan filed by the Transmission Licensee shall inter-alia contain:*

*a) Projections for growth of load in the transmission network;*

*……..*

*……..*

*8.4 The Business Plan filed by Distribution Licensee shall inter-alia contain;*

*a) Capital Investment Plan for each Year of the Control Period commensurate with load growth, distribution loss reduction trajectory and quality improvement measures proposed in the Business Plan in accordance with Regulation 8.5;*

*b) Capital Structure of each scheme proposed and cost of financing (interest on debt and return on equity), terms of the existing loan agreements, etc;*

*c) Sales Forecast for each customer category and sub-categories for each Year of the Control Period in accordance with Regulation 8.6;*

*d) Power Procurement Plan based on the Sales Forecast and distribution loss trajectory for each Year of the Control Period in accordance the Regulation 8.7;*

*e) Targets for distribution loss for each Year of the Control Period consistent with the Capital Investment Plan proposed by the Licensee;*

*f) Projections for number of employees during each Year of the Control Period based on proposed recruitments and retirement;*

*g) Proposals in respect of income from Other Business for each Year of the Control Period.*

Unquote

1.3.5 The Business Plan of ED-Goa does not include the forecast of Aggregate Revenue Requirement for the control period as the same has to be submitted based on the Business Plan as approved by the Hon'ble Commission by order. The relevant extracts, Regulation 5.2, of the MYT regulations 2018 are mentioned below:

*"5.2 The Multi-Year Tariff framework for determination of Aggregate Revenue Requirement and expected revenue from tariff and charges for Generating Company, Transmission Licensee, Distribution Wires Business and Retail Supply Business shall include the following:*

*a) Business Plan for the Licensee, for the entire Control Period as submitted to the Commission for approval, prior to the start of the Control Period;*

*b) A detailed Multi-Year Tariff Application comprising of the year-wise forecast of Aggregate Revenue Requirement for the entire Control Period and determination of expected revenue from existing tariffs for the first Year of the Control Period submitted by the Applicant:*

*Provided that the performance parameters, whose trajectories have been specified in*

*these Regulations or the Business Plan or the Multi-Year Tariff Order, shall form the basis for projection of these performance parameters in the Aggregate Revenue Requirement for the entire Control Period:*

*Provided further that a Mid-term Review of the Aggregate Revenue Requirement may be undertaken for the Generating Company, Transmission Licensee and Distribution Licensee on an application that shall be filed by the utilities along with the application for tariff determination for the third Year of the Control Period;*"

## 1.4 Approach to Business Plan

1.4.1 ED-Goa has prepared the Business Plan taking cognizance of the existing internal factors and external business environment affecting the business. ED-Goa submits that the Business Plan being a dynamic document may need to be updated at periodic intervals taking into account the changes in the internal and external environment and these changes would be intimated to the Hon'ble Commission from time to time.

1.4.2 In line with clause 8.4 of the MYT Regulations 2018, the Business Plan comprises of the category-wise sales and demand projections, power procurement plan, capital investment plan, financing plan and targets of distribution loss for the control period starting from FY 2019-20 to FY 2021-22. Apart from this, ED-Goa has also attempted to develop this business plan with a view to chart out the growth plan for the period after considering the strengths and weaknesses of the department and evaluating its business environment by conducting a SWOT analysis. The significant key elements of a Business Plan are as follows:

- SWOT (Strength, Weakness, Opportunities, Threats) Analysis.
- Review of Previous Control Period
- Sales Forecast
- Power Procurement Plan
- Capital Investment Plan
- Allocation for Wires & Supply business.

1.4.3 The projections are based on the CAGR of provisional actual figures of FY 2014-15, FY 2015-16, FY 2016-17 and FY 2017-18 and upcoming projects, pending connections coming up in the control period. The figures of FY 2018-19 i.e. the base year have been considered as revised projections on the basis of actuals of quarter 1 figures of FY 2018-19. Therefore, the basic principles considered while preparing the Business Plan is keeping in mind the requisites to address the initiatives to enhance the performance of power sector viz. network development, tariff management, efficient operation and customer service.

## 1.5 Review of previous Control Period (FY 2016-17 to FY 2018-19)

This section elucidates briefly of business plan filed in the earlier control periods providing the highlights of the targets vs. achievement on various parameters discussed as under:

### 1.5.1 Capital Investment Plan vs Actuals:

The Commission in the business plan for the control period FY 2016-17 to FY 2018-19 approved the capital expenditure after detailed scrutiny of the justifications provided by Electricity Department, Goa.

The Commission has taken note of the expenditure proposed under each scheme during finalization of business plan for the control period FY 2016-17 to FY 2018-19.

The status of targets vs. achievement is provided in the table below:

**Table 1: Capital Expenditure for previous control period**

| Project Details | | | | | | Capital Expenditure | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Approved | | | Actuals | | Revised |
| Name of scheme | Estimated Cost (Rs. Crs) | Nature of Project * | Approved by the Commission** (YES/NO) | Project Start Date (DD-MM-YY) | Project Completion date (DD-MM-YY) | FY 2016-17 | FY 2017-18 | FY 2018-19 | FY 2016-17 | FY 2017-18 | FY 2018-19 |
| 1 | 2 | 3 | 4 | 5 | 6 | | | | | | |
| Scheduled castes development scheme(P) | 1.57 | b | | 2015-16 | 2018-19 | 0.50 | 0.50 | 0.50 | | | - |
| Schedule Tribe Development Scheme (P) | 263.58 | b | Partly | 2009-10 | 2018-19 | - | 45.00 | 45.00 | 23.51 | 9.99 | 35.00 |
| Machinery and Equipment's (Plan) Motor Vehicles | 0.83 | f | Yes | 2013-14 | 2013-14 | | | | | | - |
| Infrastructure development through Electricity Duty (Plan) | 780.77 | b | Yes | 2008-09 | Beyond 2018-19 (Continuos) | 140.00 | 150.00 | 225.77 | 50.13 | 31.84 | 250.00 |
| Erection and Augmentation of 33/11 KV S/S line (Plan) | 26.00 | b | Yes | 2010-11 | 2018-19 | 1.00 | 1.00 | 1.00 | 0.62 | 0.01 | 1.00 |
| Normal Development Schemes (Plan) | 95.82 | b | Yes | 2010-11 | 2018-19 | 18.00 | 20.00 | 20.00 | 8.78 | 5.60 | 14.00 |
| System Improvement Schemes (Plan) | 15.21 | b | Yes | 2011-12 | 2018-19 | 2.00 | 2.00 | 2.00 | 1.73 | 4.27 | 18.00 |
| Construction of staff quarters and office buildings (Plan) | 9.89 | f | Yes | 2011-12 | 2018-19 | 2.00 | 2.00 | 2.00 | 0.52 | 0.24 | 2.00 |
| Erection of 220/33 KV 1X50 MVA Sub- Station at Cuncolim | 72.74 | a | Yes | 2007-08 | 2016-17 | | | | 1.92 | | - |
| Erection of 220 KV line from Xeldem to Cuncolim | 15.87 | a | Yes | 2007-08 | 2016-17 | | | | 0.56 | | - |
| Strengthening of 220 KV Transmission Network | 11.85 | a | Yes | 2013-14 | 2017-18 | 1.00 | - | - | 0.65 | 0.41 | 1.00 |

| Project Details | | | | | | Capital Expenditure | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Approved | | | Actuals | | Revised |
| Name of scheme | Estimated Cost (Rs. Crs) | Nature of Project * | Approved by the Commission** (YES/NO) | Project Start Date (DD-MM-YY) | Project Completion date (DD-MM-YY) | FY 2016-17 | FY 2017-18 | FY 2018-19 | FY 2016-17 | FY 2017-18 | FY 2018-19 |
| Erection of 220/33KV, 1x50 MVA Sub-Station Xeldem | 0.14 | a | Yes | | | | | | | | - |
| Accelerated Power Development Reforms Programme | 0.06 | b | Yes | | | | | | | | - |
| Erection of 2nd 100 MVA transfomer at Xeldem 220/110 KV S/S | 0.28 | a | Yes | | | | | | | | - |
| Erection of 220/110/33/11 KV Sub-Station at Verna (New) | 90.00 | a | Yes | 2017-18 | 2018-19 | 40.00 | 30.00 | 11.00 | | | 5.00 |
| Erection of 220 KV line from Ponda-Verna-Xeldem | 40.00 | a | Yes | 2017-18 | 2018-19 | 20.00 | 10.00 | 6.00 | | | - |
| Erection of 220/110/33/11 KV Sub-Station at Soccorro | | | | | | | | | | | - |
| Erection of 220 KV D/C line from Colvale to Soccorro | | | | | | | | | | | - |
| Erection of 110 KV D/C line from Soccorro to Kadamba | | | | | | | | | | | - |
| APDRP(State Schemes) | 86.00 | b | Yes | 2009-10 | 2015-16 | - | | | | | 1.72 |
| Restructured Accelerated Power Development and Reforms Programme Part A | 136.73 | f | Yes | 2011-12 | 2017-18 | 34.57 | - | - | 42.43 | 46.87 | 16.00 |
| Research training and human research development | 0.07 | f | Yes | | | | | | | | - |
| Underground Cabling | 171.86 | b | Partly | 2013-14 | 2018-19 | 4.48 | 9.04 | 100.00 | 0.86 | 0.36 | 20.00 |
| (R-APDRP) during Eleventh Plan period | | | | | | | | | | | - |
| Public Lighting Scheme | 4.68 | b | Yes | 2013-14 | 2018-19 | 1.00 | 1.00 | 1.00 | 0.32 | 0.41 | 1.00 |

| Project Details | | | | | | Capital Expenditure | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Approved | | | Actuals | | Revised |
| Name of scheme | Estimated Cost (Rs. Crs) | Nature of Project * | Approved by the Commission** (YES/NO) | Project Start Date (DD-MM-YY) | Project Completion date (DD-MM-YY) | FY 2016-17 | FY 2017-18 | FY 2018-19 | FY 2016-17 | FY 2017-18 | FY 2018-19 |
| R-APDRP Part B / IPDS | 52.07 | b | Yes | 2015-16 | 2017-18 | 300.00 | 500.00 | 443.99 | 0.55 | 0.87 | 35.00 |
| EHV new Transmission / Sub-Station / Capacitor banks schemes | 800.00 | a | Yes | 2015-16 | 2018-19 | 12.00 | 438.00 | 300.00 | 30.74 | 2.49 | 0.16 |
| Smartgrid Development of existing network | 120.00 | | No | 2019-20 | 2021-22 | | | | | | - |
| Sub-transmission and distribution improvement scheme | 550.00 | | No | 2019-20 | 2021-22 | | | | | | - |
| **Total** | **3,346.02** | | | | | **576.55** | **1,208.54** | **1,158.26** | **163.32** | **103.36** | **399.88** |

1.5.2 ED-GOA had plans during the last control period for taking up a number of works for sub-transmission and distribution improvement under the R-APDRP Part B (IPDS/DDUGJY), which would have virtually overhauled the entire distribution network of the Department. However it was not to be so, since the Ministry of Power did not accord sanction for the system improvement works worth more than Rs. 1000 crores and instead accorded sanction for a mere Rs. 52 crores totally (IPDS/DDUGJY) for installation of digital meters and Solar rooftops. Thus the works have spilled over to this control period and now the ED has forwarded DPR worth Rs. 465 crores for sanction under IPDS. The implementation depends upon sanction by the Central authorities. In the meantime the Department has framed new Scheme for implementation during the new control period namely sub-transmission and distribution improvement scheme for taking up works similar to that provided under IPDS/DDUGJY scope including automation/SCADA.

The other works which could not be taken up during the last control period as initially envisaged was under the EHV New Transmission/Sub-Station/Capacitor banks scheme. Under this scheme a number of new 110/33 KV Sub-Stations along with the 110 KV lies were to be taken up, however due to changed conditions such as setting up of additional 400 KV Sub-Station in South Goa by the Central Transmission Utility, the same have not been taken up. These schemes have been revisited and instead other alternative and more viable options have been considered such as setting up of 220/33 KV Sub-Stations and having 220 KV network linking North and South Goa thus providing ring system at the EHV level. Change of conductors of the existing 110 KV lines were taken up for immediate remedial measures and another change of conductor is being undertaken. The Verna 220/110/33 KV Sub-Station has also spilled over and therefore the line linking this Sub-station has also been changed as per the present prevailing conditions as explained herein above.

The underground cabling scheme has also spilled over as works of conversion to underground system in the important towns could not be taken up earlier and will be executed during the new control period.

Capitalization:

1.5.3 The Capitalisation schedule as planned earlier during the last control period has thus been pushed forward to the next control period since the proposed Capital Projects could not be executed. The capitalisation has also been considered upon completion of the Projects. Most of the Capital intensive Projects will be completed during the new control period and thus there is huge Capitalisation proposed during the new control period. It is pertinent to mention here that a number of works have already

been tendered and the major execution and expenditure incurred will happen during the new control period, thus Capitalisation

**Table 2: Capitalization for previous control period**

| Project Details | Capitalisation | | | | | |
|---|---|---|---|---|---|---|
| Name of scheme | Approved | | | Actuals | | |
| | FY 2016-17 | FY 2017-18 | FY 2018-19 | FY 2016-17 | FY 2017-18 | FY 2018-19(Revised projections) |
| Scheduled castes development scheme(P) | - | 1.00 | 0.50 | | | |
| Schedule Tribe Development Scheme (P) | 10.00 | 30.00 | 30.00 | 23.51 | 9.99 | 15.00 |
| Machinery and Equipment (Plan) Motor Vehicles | | | | | | |
| Infrastructure development through Electricity Duty (Plan) | | | | 62.65 | 30.24 | 156.00 |
| Erection and Augmentation of 33/11 KV S/S line (Plan) | 2.50 | 1.00 | 1.00 | | 0.01 | 1.00 |
| Normal Development Schemes (Plan) | 18.00 | 20.00 | 20.00 | 8.78 | 5.60 | 14.00 |
| System Improvement Schemes (Plan) | 1.00 | 2.00 | 1.00 | 1.73 | 4.27 | 15.00 |
| Construction of staff quarters and office buildings (Plan) | 2.00 | 2.50 | 1.00 | 0.52 | 0.24 | 2.00 |
| Erection of 220/33 KV 1X50 MVA Sub-Station at Cuncolim | | | | 1.92 | | |
| Erection of 220 KV line from Xeldem to Cuncolim | | | | 0.56 | | |
| Strengthening of 220 KV Transmission Network | 1.00 | - | - | 0.65 | 0.41 | 1.00 |
| Erection of 220/33KV, 1x50 MVA Sub-Station Xeldem | | | | | | |
| Accelerated Power Development Reforms Programme | | | | | | |
| Erection of 2nd 100 MVA transfomer at Xeldem 220/110 KV S/S | | | | | | |
| Erection of 220/110/33/11 KV Sub-Station at Verna (New) | - | 79.00 | 11.00 | | | |
| Erection of 220 KV line from Ponda-Verna-Xeldem | - | 34.00 | 6.00 | | | |
| Erection of 220/110/33/11 KV Sub-Station at Soccorro | | | | | | |
| Erection of 220 KV D/C line from Colvale to Soccorro | | | | | | |
| Erection of 110 KV D/C line from Soccorro to Kadamba | | | | | | |
| APDRP(State Schemes) | | | | | | 1.72 |
| Restructured Accelerated Power Development and Reforms Programme Part A | 34.57 | - | - | 42.43 | 46.87 | 16.00 |
| Research training and human research development | | | | | | |
| Underground Cabling | | | | 0.86 | 0.36 | 20.00 |
| (R-APDRP) during Eleventh Plan period | | | | | | |
| Public Lighting Scheme | | | | 0.32 | 0.41 | 1.00 |

| Project Details | Capitalisation | | | | | |
|---|---|---|---|---|---|---|
| Name of scheme | Approved | | | Actuals | | |
| | FY 2016-17 | FY 2017-18 | FY 2018-19 | FY 2016-17 | FY 2017-18 | FY 2018-19(Revised projections) |
| R-APDRP Part B / IPDS | | | | | | 35.00 |
| EHV new Transmission / Sub-Station / Capacitor banks schemes | | | | 30.74 | 2.49 | 0.16 |
| Smartgrid Development of existing network | | | | | | |
| Sub-transmission and distribution improvement scheme | | | | | | |
| **Total** | **69.07** | **169.50** | **70.50** | **174.67** | **100.89** | **277.88** |

1.5.4 Distribution loss trajectory:

The Distribution loss as projected could not be achieved due to less infusion of funds than proposed in the previous Business Plan to strengthen and improve the distribution network. Additionally, there were a lot of billing and collection issues in the department. However, now SAP has been implemented, up and running since end of FY 2016-17 and lot of billing, metering issues have been resolved. Accordingly, the actual losses for FY 2017-18 have been 14.41%. Hence, the revised projection of 14.25% distribution loss for FY 2018-19 is proposed.

**Table 3 : Distribution losses in previous control period**

| Approved | | | Actuals | | |
|---|---|---|---|---|---|
| FY 2016-17 | FY 2017-18 | FY 2018-19 | FY 2016-17 | FY 2017-18 | FY 2018-19 (Revised Projections) |
| 11.25% | 11.00% | 10.75% | 22.30% | 14.41% | 14.25% |

1.5.5 Sales, No. of Consumers and Connected load:

There were a lot of billing and collection issues in the department till FY 2016-17 due to frequent changes in billing agencies and data migration issues and a clear picture could not be obtained. However, now SAP has been implemented, up and running since end of FY 2016-17 and lot of billing, metering issues have been resolved. Accordingly, the sales and no. of consumers for FY 2017-18 have increased against the approved figures. ED-Goa has revised the FY 2018-19 figures based on actuals of FY 2017-18.

**Table 4 : Energy sales in previous control period**

| Sales | Approved | | | Actuals | | Revised projections |
|---|---|---|---|---|---|---|
| Consumer Category | FY 2016-17 | FY 2017-18 | FY 2018-19 | FY 2016-17 | FY 2017-18 | FY 2018-19 |
| Tariff LTD/Domestic | 866.96 | 923.87 | 984.51 | 803.78 | 1096.91 | 1151.76 |
| Tariff LTIG/Low Income Group | 1.10 | 1.10 | 1.10 | 1.64 | 1.65 | 1.65 |
| Tariff LTC/Commercial | 307.44 | 323.42 | 340.26 | 300.86 | 412.37 | 432.99 |

| Sales | Approved | | | Actuals | | Revised projections |
|---|---|---|---|---|---|---|
| Consumer Category | FY 2016-17 | FY 2017-18 | FY 2018-19 | FY 2016-17 | FY 2017-18 | FY 2018-19 |
| Tariff LTI/Industry | 119.82 | 125.43 | 131.29 | 78.62 | 91.79 | 94.30 |
| Tariff LTP/Mixed (Hotel Industries) | 4.39 | 4.83 | 5.31 | 5.10 | 5.33 | 5.48 |
| Tariff LTAG/Agriculture (Pump sets / Irrigation) | 23.86 | 23.86 | 23.86 | 13.43 | 16.36 | 16.36 |
| Tariff LTAG/Agriculture (Allied Activities) | 5.56 | 5.83 | 6.13 | 0.62 | 0.87 | 0.87 |
| Tariff LTPL/ Public Lighting | 36.95 | 36.95 | 36.95 | 36.60 | 2.66 | 2.66 |
| Tariff LTH/ Hoarding and Signboards | 0.00 | 0.00 | 0.00 | 0.16 | 0.24 | 0.24 |
| Tariff-LTTS/ Temporary Supply | 22.08 | 22.08 | 22.08 | 15.45 | 20.53 | 21.25 |
| Tariff-HTI/ Industrial | 1216.26 | 1260.97 | 1307.81 | 1180.74 | 1277.03 | 1340.88 |
| Tariff HTFS Industrial (Ferro Metallurgical/ Steel Melting/ Power Intensive/ Steel Rolling ) | 561.19 | 571.84 | 582.70 | 454.16 | 421.10 | 442.15 |
| Tariff HTC/ Commercial | 0.00 | 0.00 | 0.00 | 97.81 | 103.56 | 108.74 |
| Tariff HTAG/ Agriculture (Pump Sets/ irrigation) | 6.08 | 6.08 | 6.08 | 4.57 | 4.62 | 4.62 |
| Tariff HTAG/ Agriculture (allied activity) | 153.24 | 161.22 | 169.61 | 3.42 | 4.52 | 4.52 |
| Tariff HTD/ Domestic | 0.00 | 0.00 | 0.00 | 0.27 | 0.29 | 0.29 |
| Tariff HTMES/ Defence Establishment | 26.89 | 26.89 | 26.89 | 24.90 | 26.89 | 26.95 |
| Tariff HTTS/ Temporary Supply | 0.00 | 0.00 | 0.00 | 0.13 | 0.30 | 0.30 |
| Single Point Supply | | | | 5.21 | 5.46 | 5.46 |
| **Total** | **3351.82** | **3494.37** | **3644.58** | **3027.50** | **3492.47** | **3661.47** |

**Table 5 : No. of consumers in previous control period**

| Sales | Approved | | | Actuals | | Revised projections |
|---|---|---|---|---|---|---|
| Consumer Category | FY 2016-17 | FY 2017-18 | FY 2018-19 | FY 2016-17 | FY 2017-18 | FY 2018-19 |
| Tariff LTD/Domestic | 477436 | 486985 | 496725 | 463272 | 498741 | 508716 |
| Tariff LTIG/Low Income Group | 3049 | 3049 | 3049 | 1125 | 1835 | 1835 |
| Tariff LTC/Commercial | 93662 | 95447 | 97268 | 89328 | 94802 | 96275 |
| Tariff LTI/Industry | 5968 | 6030 | 6093 | 6010 | 5963 | 5963 |
| Tariff LTP/Mixed (Hotel Industries) | 212 | 222 | 233 | 109 | 138 | 142 |
| Tariff LTAG/Agriculture (Pump sets / Irrigation) | 10821 | 10821 | 10821 | 11118 | 11280 | 11532 |
| Tariff LTAG/Agriculture (Allied Activities) | 373 | 373 | 373 | 188 | 185 | 185 |
| Tariff LTPL/ Public Lighting | 2740 | 2740 | 2740 | 3042 | 215 | 215 |
| Tariff LTH/ Hoarding and Signboards | 104 | 104 | 104 | 62 | 63 | 63 |
| Tariff-LTTS/ Temporary Supply | 2581 | 2581 | 2581 | 4224 | 5181 | 5350 |
| Tariff-HTI/ Industrial | 721 | 727 | 732 | 657 | 692 | 745 |
| Tariff HTFS Industrial (Ferro Metallurgical/ Steel Melting/ Power Intensive/ Steel Rolling ) | 37 | 37 | 37 | 32 | 29 | 30 |
| Tariff HTC/ Commercial | 0 | 0 | 0 | 191 | 210 | 219 |

| Sales | Approved | | | Actuals | | Revised projections |
|---|---|---|---|---|---|---|
| Consumer Category | FY 2016-17 | FY 2017-18 | FY 2018-19 | FY 2016-17 | FY 2017-18 | FY 2018-19 |
| Tariff HTAG/ Agriculture (Pump Sets/ irrigation) | 41 | 41 | 41 | 39 | 41 | 42 |
| Tariff HTAG/ Agriculture (allied activity) | 36 | 37 | 38 | 2 | 3 | 3 |
| Tariff HTD/ Domestic | 0 | 0 | 0 | 3 | 3 | 3 |
| Tariff HTMES/ Defence Establishment | 12 | 12 | 12 | 12 | 12 | 12 |
| Tariff HTTS/ Temporary Supply | 0 | 0 | 0 | 1 | 1 | 1 |
| Single Point Supply | | | | 1 | 1 | 1 |
| **Total** | **597793** | **609206** | **620847** | **579415** | **619395** | **631333** |

**Table 6: Connected load in previous control period**

| Sales | Approved | | | Actuals | | Revised projections |
|---|---|---|---|---|---|---|
| Consumer Category | FY 2016-17 | FY 2017-18 | FY 2018-19 | FY 2016-17 | FY 2017-18 | FY 2018-19 |
| Tariff LTD/Domestic | 1282744 | 1354057 | 1429336 | 1152770 | 1382385 | 1375773 |
| Tariff LTIG/Low Income Group | 338 | 338 | 338 | 106 | 231 | 182 |
| Tariff LTC/Commercial | 293177 | 294577 | 295985 | 296465 | 309108 | 308370 |
| Tariff LTI/Industry | 111703 | 111703 | 111703 | 109195 | 140551 | 139208 |
| Tariff LTP/Mixed (Hotel Industries) | 4285 | 4285 | 4285 | 2075 | 2868 | 2845 |
| Tariff LTAG/Agriculture (Pump sets / Irrigation) | 34481 | 34481 | 34481 | 38939 | 44255 | 44226 |
| Tariff LTAG/Agriculture (Allied Activities) | 3877 | 3877 | 3877 | 4082 | 1535 | 1495 |
| Tariff LTPL/ Public Lighting | 9598 | 9598 | 9598 | 11840 | 1600 | 1604 |
| Tariff LTH/ Hoarding and Signboards | 0 | 0 | 0 | 599 | 619 | 582 |
| Tariff-LTTS/ Temporary Supply | 1098 | 1098 | 1098 | 15327 | 20684 | 18799 |
| Tariff-HTI/ Industrial | 429095 | 429095 | 429095 | 460234 | 462691 | 474980 |
| Tariff HTFS Industrial (Ferro Mettallurgical/ Steel Melting/ Power Intensive/ Steel Rolling ) | 114756 | 114756 | 114756 | 109050 | 98700 | 101300 |
| Tariff HTC/ Commercial | 0 | 0 | 0 | 65210 | 70965 | 71057 |
| Tariff HTAG/ Agriculture (Pump Sets/ irrigation) | 8378 | 8378 | 8378 | 7800 | 8240 | 8000 |
| Tariff HTAG/ Agriculture (allied activity) | 30885 | 30885 | 30885 | 860 | 1310 | 1310 |
| Tariff HTD/ Domestic | 0 | 0 | 0 | 0 | 300 | 300 |
| Tariff HTMES/ Defence Establishment | 7080 | 7080 | 7080 | 6955 | 6955 | 6955 |
| Tariff HTTS/ Temporary Supply | 0 | 0 | 0 | 350 | 350 | 620 |
| Single Point Supply | | | | 4035 | 4035 | 0 |
| **Total** | **2331495** | **2404208** | **2480895** | **2285892** | **2557382** | **2557606** |

### 1.5.6 Power Procurement Plan

Based on actual sales and energy requirement in FY 2016-17 and FY 2017-18, and revised projections in FY 2018-19, power procurement has been scheduled.

**Table 7 : Power procurement plan approved for previous control period**

| Particulars | Approved FY 2016-17 | | | Approved FY 2017-18 | | | Approved FY 2018-19 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Purchase | Total Cost | Rate | Purchase | Total Cost | Rate | Purchase | Total Cost | Rate |
| | MUs | Rs. Crs | Rs./unit | MUs | Rs. Crs | Rs./unit | MUs | Rs. Crs | Rs./unit |
| **NTPC** | | | | | | | | | |
| KSTPS | 1,483.17 | 248.02 | 1.67 | 1,483.17 | 252.76 | 1.70 | 1,483.17 | 257.73 | 1.74 |
| VSTPS - I | 258.32 | 58.15 | 2.25 | 258.32 | 59.16 | 2.29 | 258.32 | 60.21 | 2.33 |
| VSTPS - II | 93.58 | 21.20 | 2.27 | 93.58 | 21.57 | 2.30 | 93.58 | 21.96 | 2.35 |
| VSTPS -III | 78.98 | 21.99 | 2.78 | 78.98 | 22.53 | 2.85 | 78.98 | 23.09 | 2.92 |
| VSTPS-IV | 87.96 | 28.28 | 3.22 | 87.96 | 29.05 | 3.30 | 87.96 | 29.87 | 3.40 |
| VSTPS-V | 37.92 | 11.47 | 3.02 | 37.92 | 11.77 | 3.10 | 37.92 | 12.08 | 3.19 |
| KGPP | 40.15 | 21.68 | 5.40 | 40.15 | 22.14 | 5.51 | 40.15 | 22.61 | 5.63 |
| GGPP | 41.39 | 24.39 | 5.89 | 41.39 | 24.97 | 6.03 | 41.39 | 25.58 | 6.18 |
| SIPAT- I | 160.38 | 43.82 | 2.73 | 160.38 | 45.16 | 2.82 | 160.38 | 46.56 | 2.90 |
| solaphur | 71.15 | 27.68 | 3.89 | 27.33 | 10.63 | 3.89 | 87.44 | 34.02 | 3.89 |
| KSTPS-III | 37.66 | 10.84 | 2.88 | 37.66 | 11.19 | 2.97 | 37.66 | 11.55 | 3.07 |
| KHSTPS-I | | | | | | | | | |
| RSTPS | 708.25 | 214.42 | 3.03 | 708.25 | 217.24 | 3.07 | 708.25 | 220.20 | 3.11 |
| SIPAT- II | 76.33 | 21.25 | 2.78 | 76.33 | 21.89 | 2.87 | 76.33 | 22.56 | 2.96 |
| Mouda I | 100.10 | 46.66 | 4.66 | 100.10 | 47.75 | 4.77 | 100.10 | 48.90 | 4.89 |
| Mouda II | 50.83 | 15.45 | 3.04 | 101.65 | 30.90 | 3.04 | 101.65 | 30.90 | 3.04 |
| Lara I & II | 38.96 | 12.74 | 3.27 | 155.84 | 50.96 | 3.27 | 155.84 | 50.96 | 3.27 |
| Gadarwara I | | | | 57.60 | 20.91 | 3.63 | 115.20 | 41.82 | 3.63 |
| Kameng HEP | | | | 11.03 | 4.41 | 4.00 | 11.03 | 4.41 | 4.00 |
| Subansiri (Lower ) HEP | | | | | | | 44.15 | 17.66 | 4.00 |
| Add/ Less: Other Adjustments | | | | | | | | | |
| | | | | | | | | | |
| **NPCIL** | | | | | | | | | |
| KAPS | 106.96 | 25.39 | 2.37 | 106.96 | 25.39 | 2.37 | 106.96 | 25.39 | 2.37 |
| TAPS | 81.24 | 23.20 | 2.86 | 81.24 | 23.20 | 2.86 | 81.24 | 23.20 | 2.86 |
| | | | | | | | | | |
| **Traders** | | | | | | | | | |
| a)IEX PURCHASEAND SALES | 55.34 | 16.60 | 3.00 | | | | | | |
| b) Traders | | | | | | | | | |
| | | | | | | | | | |
| **OVER DRAWAL** | | | | | | | | | |
| | | | | | | | | | |
| **Banking** | | | | | | | | | |

| Particulars | Approved FY 2016-17 | | | Approved FY 2017-18 | | | Approved FY 2018-19 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Purchase | Total Cost | Rate | Purchase | Total Cost | Rate | Purchase | Total Cost | Rate |
| | MUs | Rs. Crs | Rs./unit | MUs | Rs. Crs | Rs./unit | MUs | Rs. Crs | Rs./unit |
| | | | | | | | | | |
| **Within State Generations** | | | | | | | | | |
| **CO-GENERATION** | | | | | | | | | |
| Vedanta Plant-1 | 107.52 | 25.80 | 2.40 | 107.52 | 25.80 | 2.40 | 107.52 | 25.80 | 2.40 |
| Vedanta Plant - 2 | 55.00 | 13.20 | 2.40 | 55.00 | 13.20 | 2.40 | 55.00 | 13.20 | 2.40 |
| Goa Sponge and private limited | 4.72 | 1.13 | 2.39 | 4.72 | 1.13 | 2.39 | 4.72 | 1.13 | 2.39 |
| | | | | | | | | | |
| **Solar RPO** | | | | | | | | | |
| NVVNL Solar | 9.79 | 7.82 | 7.99 | 9.79 | 7.82 | 7.99 | 9.79 | 7.82 | 7.99 |
| Short term tender DEEP portal (Solar) | | | | | | | | | |
| SECI Solar | 40.78 | 22.43 | 5.50 | 40.78 | 22.43 | 5.50 | 40.78 | 22.43 | 5.50 |
| Short term tender DEEP portal (Non-Solar) | | | | | | | | | |
| NVVNL Hydro (Non Solar) | 34.69 | 15.58 | 4.49 | 34.69 | 15.58 | 4.49 | 34.69 | 15.58 | 4.49 |
| SECI Wind | | | | | | | | | |
| | | | | | | | | | |
| **REC Certificates** | | | | | | | | | |
| | | | | | | | | | |
| **OTHER CHARGES** | | | | | | | | | |
| PGCIL Transmission Charges, Wheeling & Other Charges | | 265.85 | | | 291.45 | | | 300.68 | |
| | | | | | | | | | |
| **Total** | **3,861.17** | **1,245.04** | **3.22** | **3,998.34** | **1,330.99** | **3.33** | **4,160.20** | **1,417.90** | **3.41** |

**Table 8 : Actual Power procurement in previous control period**

| Particulars | Actual FY 2016-17 | | | Provisional FY 2017-18 | | | Revised for FY 2018-19 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Purchase | Total Cost | Rate | Purchase | Total Cost | Rate | Purchase | Total Cost | Rate |
| | MUs | Rs. Crs | Rs./unit | MUs | Rs. Crs | Rs./unit | MUs | Rs. Crs | Rs./unit |
| **NTPC** | | | | | | | | | |
| KSTPS | 1,590.99 | 366.62 | 2.30 | 1,571.75 | 252.33 | 1.61 | 1,587.61 | 300.24 | 1.89 |
| VSTPS - I | 267.34 | 75.35 | 2.82 | 275.70 | 51.76 | 1.88 | 290.06 | 67.66 | 2.33 |
| VSTPS - II | 90.91 | 23.58 | 2.59 | 108.81 | 24.19 | 2.22 | 119.69 | 24.28 | 2.03 |
| VSTPS -III | 88.25 | 26.22 | 2.97 | 99.63 | 25.14 | 2.52 | 104.84 | 24.19 | 2.31 |
| VSTPS-IV | 103.48 | 33.15 | 3.20 | 109.29 | 33.67 | 3.08 | 126.53 | 34.60 | 2.73 |
| VSTPS-V | 46.58 | 14.40 | 3.09 | 58.62 | 17.39 | 2.97 | 59.55 | 17.19 | 2.89 |
| KGPP | 36.40 | 17.27 | 4.74 | 43.89 | 18.58 | 4.23 | 44.36 | 17.96 | 4.05 |

| Particulars | Actual FY 2016-17 | | | Provisional FY 2017-18 | | | Revised for FY 2018-19 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Purchase | Total Cost | Rate | Purchase | Total Cost | Rate | Purchase | Total Cost | Rate |
| | MUs | Rs. Crs | Rs./unit | MUs | Rs. Crs | Rs./unit | MUs | Rs. Crs | Rs./unit |
| GGPP | 53.25 | 21.16 | 3.97 | 57.55 | 24.15 | 4.20 | 58.49 | 26.50 | 4.53 |
| SIPAT- I | 180.80 | 50.35 | 2.78 | 193.71 | 50.69 | 2.62 | 232.22 | 57.30 | 2.47 |
| solaphur | | | | 23.36 | 13.14 | 5.62 | 37.33 | 17.66 | 4.73 |
| KSTPS-III | 44.58 | 12.30 | 2.76 | 46.57 | 12.98 | 2.79 | 55.13 | 12.89 | 2.34 |
| KHSTPS-I | | | | - | - | | - | - | |
| RSTPS | 765.46 | 219.80 | 2.87 | 737.70 | 187.99 | 2.55 | 683.95 | 213.70 | 3.12 |
| SIPAT- II | 89.18 | 25.75 | 2.89 | 89.94 | 23.12 | 2.57 | 101.24 | 19.01 | 1.88 |
| Mouda I | 17.16 | 20.90 | 12.18 | 94.34 | 44.47 | 4.71 | 62.34 | 31.40 | 5.04 |
| Mouda II | 1.19 | 1.63 | 13.70 | 45.72 | 19.35 | 4.23 | 81.25 | 34.83 | 4.29 |
| Lara I & II | - | - | | - | - | | - | - | |
| Gadarwara I | - | - | | - | - | | | - | |
| Kameng HEP | - | - | | - | - | | | - | |
| additional allocation | - | - | | - | - | | 11.17 | 3.91 | 3.50 |
| Add/ Less: Other Adjustments | | -0.72 | | - | 4.94 | | | | |
| | | | | | | | | | |
| **NPCIL** | | | | | | | | | |
| KAPS | - | 0.28 | | - | 0.00 | | - | - | |
| TAPS | 101.12 | 30.42 | 3.01 | 69.69 | 21.60 | 3.10 | 90.37 | 27.76 | 3.07 |
| | | | | | | | | | |
| **Traders** | | | | | | | 210.45 | 94.70 | 4.50 |
| a)IEX PURCHASEAND SALES | 40.58 | 18.39 | 4.53 | 87.78 | 48.20 | 5.49 | | | |
| b) Traders | 45.53 | 13.77 | 3.02 | 149.72 | 49.65 | 3.32 | | | |
| | | | | | | | | | |
| **OVER DRAWAL** | | | | **64.34** | **23.39** | | | | |
| | | | | | | | | | |
| **Banking** | **3.65** | - | | **-19.68** | **-** | | | | |
| | | | | | | | | | |
| **Within State Generations** | | | | | | | | | |
| **CO-GENERATION** | | | | | | | | | |
| Vedanta Plant-1 | 96.28 | 23.13 | 2.40 | 92.90 | 22.35 | 2.41 | 92.90 | 22.35 | 2.41 |
| Vedanta Plant -2 | 75.21 | 18.02 | 2.40 | 69.89 | 16.76 | 2.40 | 69.89 | 16.76 | 2.40 |
| Goa Sponge and private limited | 5.82 | 1.41 | 2.42 | 5.40 | 1.30 | 2.40 | 5.40 | 1.30 | 2.40 |
| | | | | | | | | | |
| **Solar RPO** | | | | | | | | | |
| NVVNL Solar | 11.73 | 10.00 | 8.53 | 11.60 | 10.12 | 8.72 | 11.60 | 10.06 | |

| Particulars | Actual FY 2016-17 | | | Provisional FY 2017-18 | | | Revised for FY 2018-19 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Purchase | Total Cost | Rate | Purchase | Total Cost | Rate | Purchase | Total Cost | Rate |
| | MUs | Rs. Crs | Rs./unit | MUs | Rs. Crs | Rs./unit | MUs | Rs. Crs | Rs./unit |
| Short term tender DEEP portal (Solar) | | | | 21.43 | 10.50 | 4.90 | 69.12 | 33.52 | 4.85 |
| SECI Solar | 53.81 | 31.98 | 5.94 | 51.10 | 29.89 | 5.85 | 51.10 | 29.84 | 5.84 |
| Short term tender DEEP portal (Non-Solar) | | | | | | | 195.72 | 91.64 | 4.68 |
| NVVNL Hydro (Non Solar) | 72.88 | 32.72 | 4.49 | 102.12 | 48.07 | 4.71 | - | - | |
| Hindustan Waste | | | | | | | 2.00 | 1.10 | 5.50 |
| | | | | | | | | | |
| **REC Certificates** | | | | | **11.95** | | | - | |
| | | | | | | | | | |
| **OTHER CHARGES** | | **192.52** | | - | **174.65** | | | 182.49 | |
| PGCIL Transmission Charges, Wheeling & Other Charges | | 192.52 | | - | 174.65 | | | 182.49 | |
| | | | | | | | | | |
| **Total** | **4,067.58** | **1,328.08** | **3.27** | **4,262.87** | **1,272.24** | **2.98** | **4,454.30** | **1,414.82** | **3.18** |

1.5.7 O&M Expenses

Employee expenses and Administrative and General Expenses are provisional actuals (unaudited) as per Government account books and Repair and Maintenance expenses are shown as per normative numbers – 2.92% of GFA, which was approved in Business plan order for the Control period. Opening GFA base for the control period has increased due to consideration of FAR till FY 2013-14.

**Table 9 : O&M Expenses in previous control period**

| | Approved | | | Actuals | | |
|---|---|---|---|---|---|---|
| | FY 2016-17 | FY 2017-18 | FY 2018-19 | FY 2016-17 | FY 2017-18 | FY 2018-19 |
| Employee Expense | 239.21 | 254.24 | 270.41 | 228.96 | 313.40 | 377.00 |
| A&G Expense | 9.48 | 10.12 | 10.81 | 15.29 | 14.90 | 3.83 |
| R&M Expense | 27.86 | 30.57 | 45.6 | 39.80 | 44.90 | 47.85 |

# CHAPTER 2. POWER BUSINESS IN GOA

## 2.1 Goa Power Sector

2.1.1 Goa, a tiny emerald land on the west coast of India, the 25th State in the Union of States of India, was liberated from Portuguese rule in 1961. It was part of Union territory of Goa, Daman & Diu till 30th May 1987 when it was carved out to form a separate State. Goa covers an area of 3702 square kilometres and comprises two Revenue district viz North Goa and South Goa. Boundaries of Goa State are defined in the North Terekhol River which separates it from Maharashtra, in the East and South by Karnataka State and West by Arabian Sea.

**Figure 1: Goa Map**


*Source: goa.gov.in*

2.1.2 Goa, for the purpose of revenue administration is divided into district viz. North and South Goa with headquarters at Panaji and Margao respectively. The entire State comprises 11 talukas. For the purpose of implementation of development programmes the State is divided into 12 community development blocks. As per 2011 census, the population of the State is 14,59,000. Administratively the State is organised into two districts North Goa comprising six talukas with a total area of 1736 sq. kms. and South Goa comprising five talukas with an area of 1966 sq. kilometres. In all there are 334 villages of which 224 are in North Goa district and 110 in South Goa district.

2.1.3 Every society has its peculiarity and that has to be understood individually for the society. The Goan society has very high expectations from its governing bodies. Also

Goa is one of the tourism capitals of India and a lot of foreign and domestic tourists visit Goa frequently on various festive occasions; hence, the basic facilities have to be on world class level especially domestic electricity availability and services. There are so many events being organized in Goa such as International Live Concerts, International Film Festival, Huge Christmas and New Year Celebrations etc. Hence, these events and the society impose stringent challenges to the governing bodies owing to high public expectations on maintaining un-interrupted supply.

1.1.1 As the Electricity Department is the only licensee in the state of Goa for transmission and distribution of electrical energy, ED-Goa takes up efficient measures to provide world class services to the consumers and hence utilizes more capital investment on the system, more number of employees for better operation and maintenance facilities and efficient redressal of consumer complaints.

**Figure 2: Goa Statistics**

| STATISTICS | |
|---|---|
| Area | 3702 Sq Km (Source: Goa Economy Survey 2016-17) |
| No of Villages | 334 (Source: Goa Economy 2016) |
| Households | 3,43,611 (Source: 2011 census) |
| Population | 14.59 Lakhs (Source: 2011 Census) |
| Electrification | Fully electrified (Source: Goa Economy 2016) |
| Per Capita Consumption | 2076 *(Source: Goa Economy 2016)* |
| Number of Industrial Estates | 22 (GIDC) *(Source: Goa Economy Survey 2016-17)* |
| Ports | 1 Major (Mormugao) and 5 Minor<br>(Source: 24*7 power for all Goa) |
| Tourists visited | Domestic 56.50 (P) & Foreign 6.81 (P)<br>*(Source: Goa Economy Survey 2016-17)* |

## 2.2 Company Profile

2.2.1 ED-Goa came into regulatory regime wef FY 2011-12 i.e. the first tariff filing year. The Electricity Department is a deemed Distribution Licensee within the meaning of Section 2 (17) of Electricity Act 2003 and pursuant to the Section 14 of the Electricity Act. Further, Section 42 and 43 of the Electricity Act 2003 prescribes the following duties of the deemed Distribution Licensee:

- To develop and maintain an efficient, co-ordinated and economical distribution system;
- To supply electricity on an application of the consumer in accordance with the

provisions specified in the Electricity Act 2003;

- To provide non-discriminatory open access to the consumers;
- To establish a forum for redressal of grievances of the consumers.

2.2.2 The Main purpose is to undertake the transmission, distribution and retail supply of electricity in its license area and for this purpose to plan, acquire, establish, construct, erect, lay, operate, run, manage, maintain, enlarge, alter, renovate, modernize, automate, work and use a power system network in all its aspects and also to carry on the business of purchasing, selling, importing of electrical energy, including formulation of tariff, billing and collection thereof and then to study, investigate, collect information and data, review operations, plan, research, design and prepare project reports, diagnose operational difficulties and weaknesses and advise on the remedial measures to improve and modernize existing sub-transmission and supply lines and sub-stations.

2.2.3 ED-Goa is under control of State Government and the maintenance of the accounts or Income and expenditure statement is on “cash” basis unlike other utilities/ licensees where it is being maintained on “accrual” basis. However, ED-Goa has also started preparation of financial statements on commercial principles as per directions of Hon’ble Commission. The financial statements of FY 2014-15 has already been audited by CAG and certificate is awaited. FY 2015-16 & FY 2017-16 are under preparations.

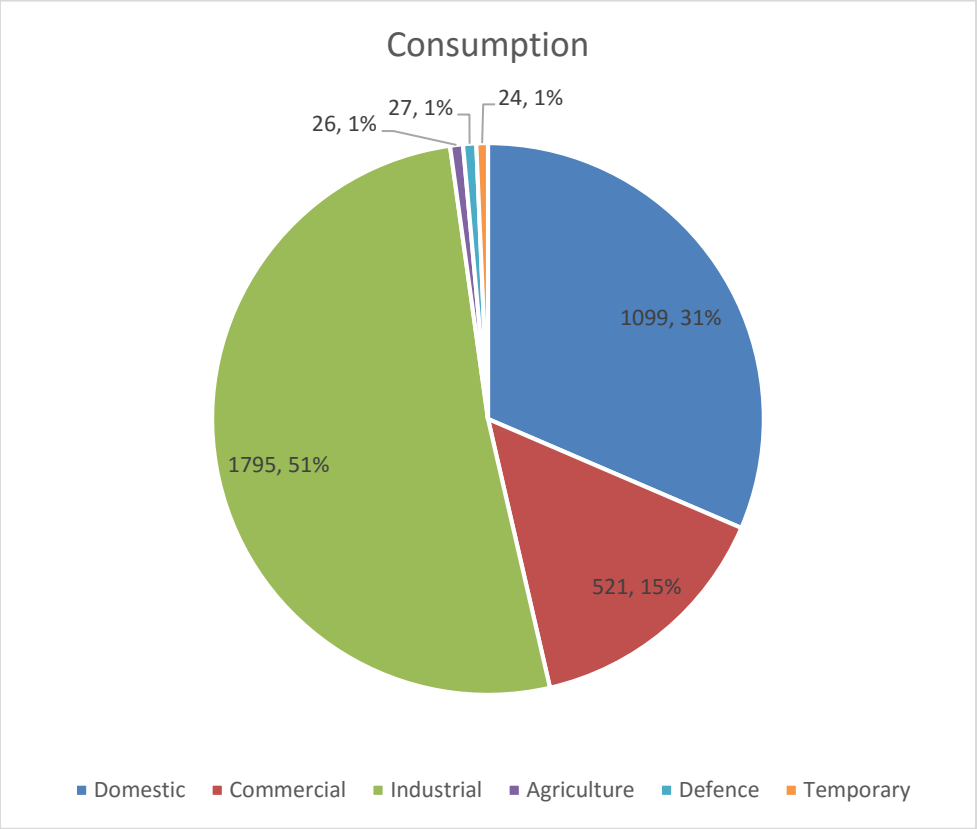
## 2.3 Consumer Profile

2.3.1 The Electricity Department of Goa caters to around 6.19 Lacs consumers with an annual energy consumption of approx 3492 MUs. The Consumers of the Electricity Department of Goa are classified as under:

- Domestic (31% of consumption)
- Commercial (15% of consumption)
- Industrial (51% of consumption)
- Agriculture (1% of consumption)
- Temporary (5% of consumption)
- Defence Establishments(1% of consumption)

2.3.2 As seen from the above classification, the energy consumption of industrial consumers is the highest (51%) amongst all these categories.

**Figure 3: Category-wise Consumption for 2017-18**




2.3.3 The peak demand of Goa during FY 2017-18 was around 644 MW. As per CEA LGBR report, for FY 2017-18, the Energy Deficit and the peak deficit for the State of Goa were 0.0% (NIL) and 0.2% (1 MW) respectively. The total firm allocation of power from central sector is approx 575 MW. In addition, the department also purchases power from Co-generation stations within state and short term power procurement from the market, Traders, DEEP portal.

## 2.4 Power Purchase Portfolio

2.4.1 The peak demand recorded till August 18 is 657 MW (in April 18). To cater the demand, the Electricity Department of Goa does not have its own generation. The majority of the power requirement for the State of Goa is met through its share from Central Sector Power Stations of the National Thermal Power Corporation as allocated by the Central Government. In addition, the department also purchases power from Co-generation, Exchange and Traders. The firm allocation and unallocated share of power from Central Sector Stations is provided in the table below:

**Table 10: Share Power Allocation of Central Sector Stations (WR+SR)**

| Sr. No | Station | Peak Hrs (18.00 to 22.00) | | | Off Peak Hrs. (00 to 18.00 & 22.00 to 24.00) | | |
|---|---|---|---|---|---|---|---|
| | | Share from firm Allocation (MW) | Share from unallocated Allocation (MW) | Total Allocation (MW) | Share from firm Allocation (MW) | Share from unallocated Allocation (MW) | Total Allocation (MW) |
| 1 | Korba STPS | 210 | 5.86 | 215.86 | 210 | 6.03 | 216.03 |
| 2 | Korba STPS-III | 4.5 | 2.86 | 7.36 | 4.5 | 2.94 | 7.44 |
| 3 | Vindhyachal STPS-I | 35 | 5.34 | 40.34 | 35 | 5.49 | 40.49 |
| 4 | Vindhyachal STPS-II | 12 | 4.03 | 16.03 | 12 | 4.14 | 16.14 |
| 5 | Vindhyachal STPS-III | 10 | 4.03 | 14.03 | 10 | 4.14 | 14.14 |
| 6 | Vindhyachal STPS-IV | 11.2 | 5.71 | 16.91 | 11.2 | 5.87 | 17.07 |
| 7 | Vindhyachal STPS-V | 5.18 | 2.86 | 8.04 | 5.18 | 2.94 | 8.12 |
| 8 | Sipat Stage-I | 20 | 11.31 | 31.31 | 20 | 11.83 | 31.83 |
| 9 | Sipat Stage-II | 10 | 3.82 | 13.82 | 10 | 3.93 | 13.93 |
| 10 | Mouda STPS-I | 11.2 | 5.71 | 16.91 | 11.2 | 5.87 | 17.07 |
| 12 | Mouda STPS-II | 14.5 | 7.54 | 22.04 | 14.5 | 7.75 | 22.25 |
| 11 | Kawas Gas PP | 12.37 | 0.05 | 12.42 | 12.37 | 0.04 | 12.41 |
| 12 | Gandhar Gas PP | 12.63 | 0.05 | 12.68 | 12.63 | 0.04 | 12.67 |
| 13 | Solapur STPS | 7.55 | 3.77 | 11.32 | 7.55 | 3.88 | 11.43 |
| 14 | KAPP | 15 | 2.72 | 17.72 | 15 | 2.18 | 17.18 |
| 15 | TAPP3&4 | 11 | 6.66 | 17.66 | 11 | 5.33 | 16.33 |
| 16 | Ramagundum STPS | 100 | 0 | 100 | 100 | 0 | 100 |
| 17 | Extra Allocation | | 18 | 18 | | | |
| | **Total** | **502.13** | **90.32** | **592.45** | **502.13** | **72.4** | **574.53** |

* - As per WRPC Allocation Circular No:WRPC/Comml.-I/6/Alloc/2018/8673 dated 21st September 2018

2.4.2 ED-Goa is in requirement of

2.4.3 The total firm allocation of power from central sector is approx 575 MW. As can be seen, more than 75% demand of EDG is met from three major sources viz VSTPS, KSTPS and RSTPS. If there is any forced outage/ event in any of these power stations, it severely affects power position of EDG and it needs to resort to short term power procurement from Traders, Exchange, DEEP portal & UI Pool to the extent of permissible limit and grid frequency norms.

2.4.4 EDG also has arrangement of power purchase from three Co-generation Power Plants in the State:

- Goa Energy Private Limited for 14-21 MW
- Goa Sponge and Power Limited for 3 MW
- Vedanta Ltd. (Erst while Sesa Sterlite) for minimum 2 MW

2.4.5 Apart from above, to meet its RPO obligations, ED-Goa has been procuring power from the Renewable Sources whereby 6 MW Solar Power is procured from NVVNL, 25 MW

from SECI, Non-Renewable power from NVVNL Hydro and balance is purchased through DEEP portal.

## 2.5 Transmission & Distribution Infrastructure

2.5.1 There are no direct link lines between the generating station of central sector and Goa and hence this power was wheeled through the Grids of the neighbouring State of Maharashtra and Karnataka. Electricity Department earlier paid wheeling charges to MSETCL & KPTCL for using their line network for wheeling of power from central sector stations to Goa. Now the lines from MSETCL are kept in standby condition for utilisation in case of emergencies and presently the power is obtained from the nearest Central Transmission Utility (CTU) point to ED-Goa at Colvale i.e 400/220 KV Powergrid substation.

2.5.2 The power from the Western region is wheeled from the MSETCL's 400 kV Sub-Station at Kolhapur to the 400 kV Sub-Station at Colvale in Goa. The power from this Sub-Station is transmitted at 220 kV level to Ponda and Tivim substations of the Department. Similarly the Southern region power is transmitted from Nagjhari to Ponda & Xeldem. The Karnataka lines of Ambevadi-Ponda link (now under control of CTU) is often at fault and till the restoration takes place, power is diverted and re-routed through WR. This adds to 4% losses and excess wheeling charges to WR. Also the changeover took place in 1-2 hrs with 15 minutes time blocks.

The Central Electricity Authority and the CTU had carried out the study and proposed for establishing a 400/220 KV Sub-Station in South Goa at Xeldem alongwith the 400 KV link line for drawal of Southern Region power, which has been approved. The Ministry of Power appointed PFC Consulting Limited as Bid Process Co-ordinator (BPC) for selection of Bidder as Transmission Service Provider (TSP) to establish transmission system for "Additional 400 KV feed to Goa and additional system for power evacuation". The scheme comprises of LILO of one ckt. of Narendra (existing) – Narendra(New) 400 KV D/c quad line at Xeldem, Xeldem – Mapusa (Colvale) 400 KV D/c (quad) line, and establishment of 2x500 MVA, 400/220 KV Substation at Xeldem and associated bay and other works. The Transmission service provider has been selected for the purpose.

Due to unavailability of land at Xeldem, the proposed Sub-Station is most likely being set up at Dharbandora/Mollem which is near to Xeldem, for which land has been identified by the Transmission Service Provider and further process has been initiated by them. There are some issues about the routing of the lines by the TSP, since the proposed lines are crossing the intra-state transmission lines and the matter is being resolved.

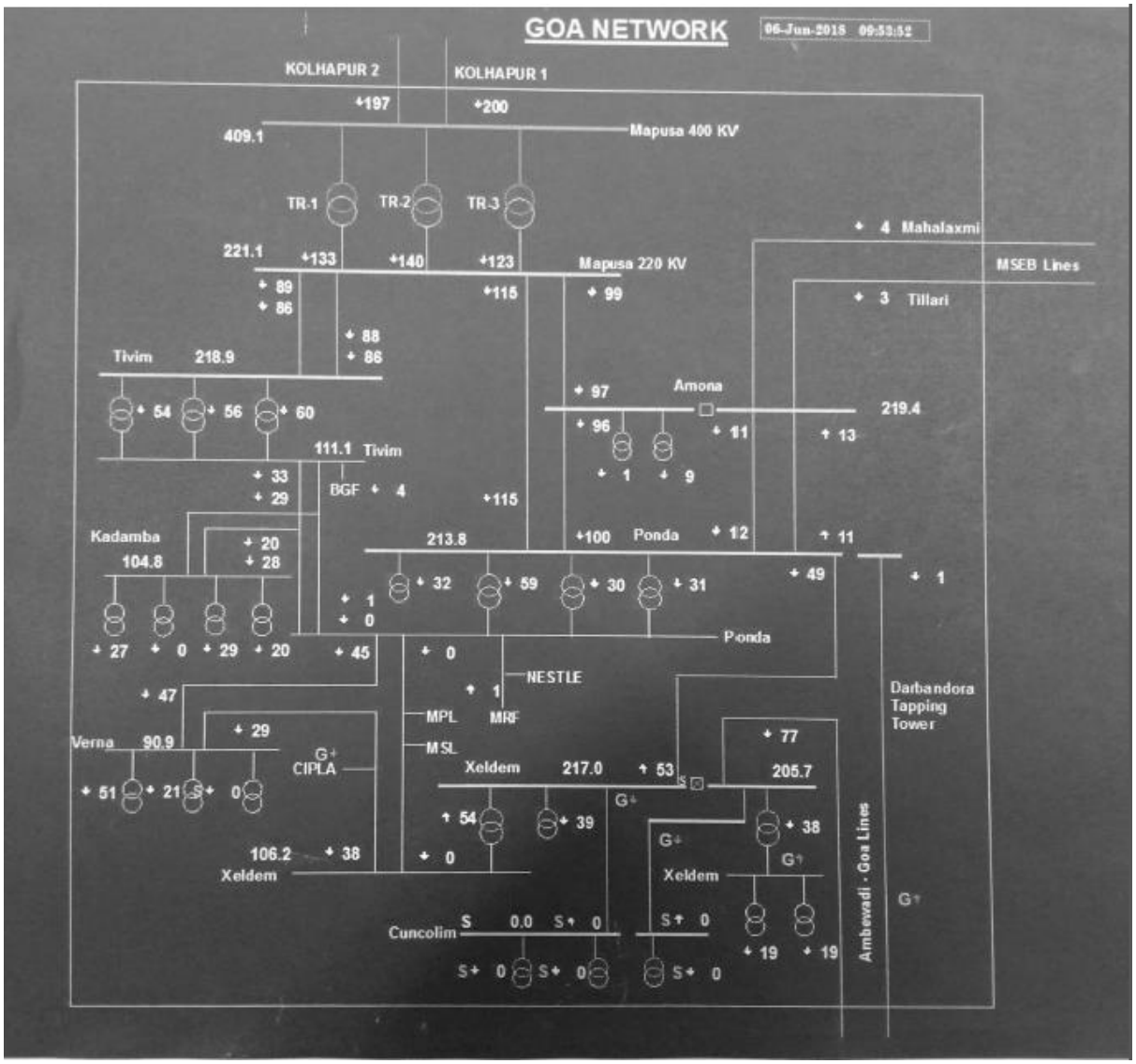
2.5.3 The Department has already taken up the work of linking 33 kV S/S through 33Kv underground cabling from various main EHV substation to the 33/11 kV Sub-Stations. The distribution network in parts of Panaji & Margao town and the coastal belt of Candolim etc in North Goa and Benaulim etc. in South Goa is covered by underground system.

2.5.4 The Department has adopted overhead line system for transmission and distribution except for those areas which are covered by underground system. The 11 KV overhead network has been taken up for conversion to Aerial bunched cabling.

2.5.5 All the towns and villages of Goa are electrified and any intending consumer can avail power supply by submitting requisition in the prescribed form to the appropriate office of the Department subject to fulfilling the required conditions and payment of charges as per conditions of supply of Electrical Energy and miscellaneous charges. However, the current infra capacity is not growing in proportion to consumer growth especially in the coastal belt areas of North Goa and the need to be augmented and new infra has to be installed to cater to new consumers. The power supply to the consumers is released as per the Conditions of Supply framed by ED-Goa which is based on the JERC Electricity Supply Code Regulations 2010.

2.5.6 The Existing EHV Infrastructure is represented in the diagrammatic format as below:

**Figure 4: Existing EHV Infrastructure**




2.5.7 The current network configuration is as given below:

**Table 11: Network Configuration (as on July 2018)**

| Particulars | TOTAL |
|---|---|
| No. of 220/110/33kV Substations | 5 |
| No. of 33/11 KV Stations available | 52 |
| No. of 33 KV Feeders | 219 |
| Ckt length of 33 KV feeders (Kms) | 1664 |
| No. of 33/11KV Power Transformers | 188 |
| No. of 11 KV Feeders | 299 |
| Ckt Length of 11 KV Feeders (Kms) | 3886 |
| No. of 11 KV RMUs | 1846 |
| No. of Distribution Transformers | 7106 |
| Ckt Length of LT network (Kms) | 7712 |
| Ckt Length of LT network Service Line(Kms) | 7905 |

2.5.8 The Transmission and Distribution Losses and the AT&C Losses are comparatively lower than those in many of the other states and Union Territories. The provisional actual Transmission & Distribution loss of the system is estimated to be around 14.41% for FY 2017-18.

2.5.9 The Government of Goa has initiated a lot of schemes to improve the power scenario. The objectives of the schemes are to achieve sustainable development by ensuring quality and reliable power supply to all consumers at affordable cost and to make the electricity department commercially viable. The power utilities all over the country have taken up institutional strengthening through sustainable initiatives in a systematic and focused approach. Goa is also planning to bifurcate the electricity department into two entities i.e. transmission and distribution so as to improve the efficiency and accountability of both the wings.

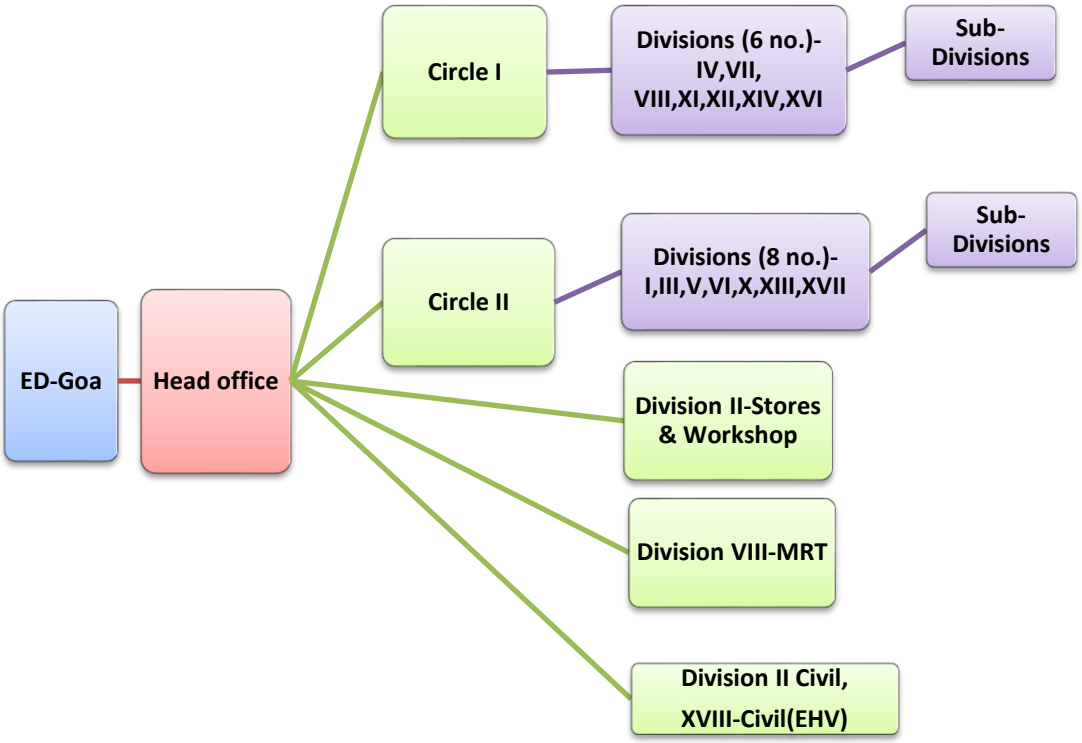
## 2.6 Organisational Structure

The hierarchy of the organization is with Head Office at the top of the vertical and goes down from Circles to Divisions and Subdivisions. Consumer services and network management are the core function of the company for which reporting is from sub-division office to divisions and divisions to circles. Further, the Department also has a fully operational SLDC. In addition to this the department has centralized reporting structures for Civil, Stores, Training, etc. which directly report to the Head office level.

The present structure prevailing in the department of electricity is as follows:

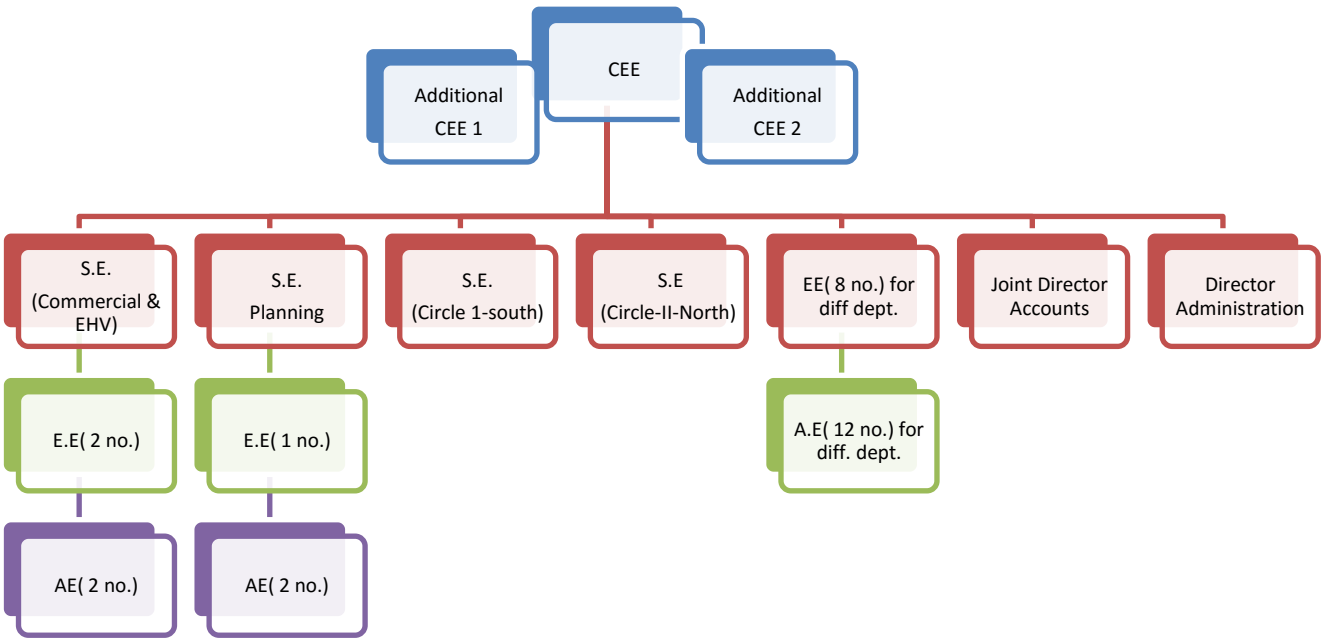
- Total no. of Circles: 2
- Total no. of Divisions: 18 (11 with consumers and 7 O&M/others)
- Total no. of Sub-Divisions: 53
- No. of Divisions in Circle 1- 6 namely division IV,VII,XI,XII,XIV,XVI
- No. of Divisions in Circle 2- 8 namely division I,III,V,VI,X,XIII,XVII
- Special Divisions- Stores, Civil, MRT namely division II, VIII, XV,XVIII

**Figure 5: Existing Structure of ED-Goa**




On the basis of the above discussed Organizational structure, the post wise hierarchy also exists in the department with Chief Electrical Engineer as the head of the department and Superintending Engineer, Executive Engineer, Assistant Engineer reporting to each other respectively as per the organizational structure.

**Figure 6: Existing Hierarchical Posts in ED-Goa**



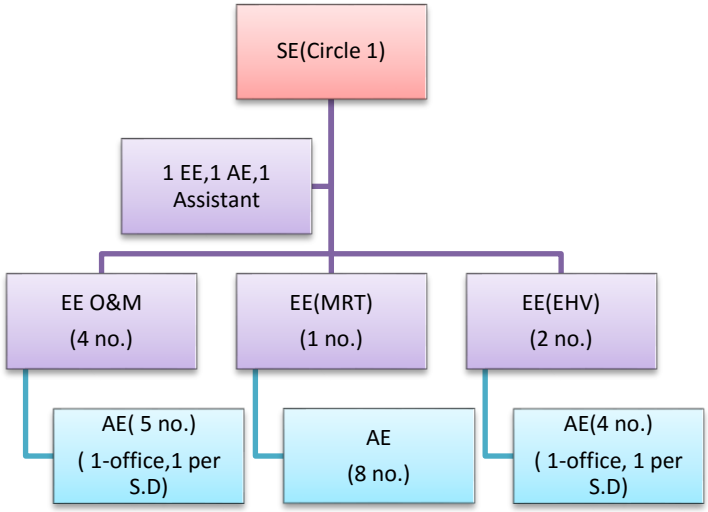
At the site/field level, the departments are divided according to the areas and number of consumers into Circles, divisions and sub-divisions with employees working at offices and field i.e. sub-stations and operation and maintenance of T&D system.

The organization structure is divided into head office and circle offices which includes staff at division and sub-division level i.e. the field level.

At Circle office level, the organization structure is as follows:

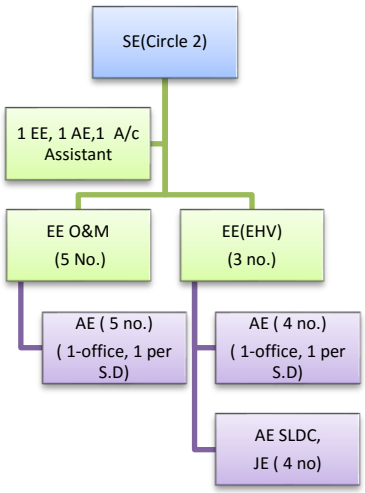
- Circle I (South Goa): The chart below provides the actual existing organization structure at Circle 1 in South Goa**.**

**Figure 7: Structure of Circle I**




- Circle II ( North Goa): The chart below provides the actual existing organization structure at Circle II in North Goa

**Figure 8: Structure of Circle II**



### 2.6.1 Operation and Maintenance Functions

**a) <u>Distribution Network:</u>**

In the existing set up, Transmission and Distribution O&M is handled by Divisions I,III,IV, V,VI,VII,VIII,IX,X,XI,XII,XIII,XIV,XVI,XVII, Division II handles central stores for the region and Division XV & Div XVIII handles Civil and infra part.

The main activities falling under O&M of distribution Divisions are:

- Operation and Maintenance of 220/110,33/11 KV EHT,HT Sub-Stations
- Providing needed supply to consumers of various categories like domestic, Commercial, industry, (HT, LT) Street Lights, agriculture and others.
- Maintenance of quality power supply.
- Breakdown and Preventive maintenance of , DTRs, overhead lines and cables, managing Breakdowns and fuse off calls
- Accurate metering.
- Prompt billing.
- Efficient Collections.
- Customer Care and Customer Services.
- Planning for improvement works
- HT Meter reading (by JE)
- Identification of pilferage and theft.

### 2.6.2 Other Functions

a) There are 4 Superintending Engineers (S.E.) in Department of Electricity –Goa.
   a. S.E for Circle I(South)
   b. S.E. for Circle II(North)
   c. S.E. for Planning
   d. S.E. for EHV & Commercial

Each S.E. is the head of the above department and reports to CEE. The Superintending Engineer looks after the proper functioning of the circle which includes technical and commercial works, billing, collection and revenue generation, Loss reduction, operation and maintenance, future planning of network and new projects according to load/consumer growth etc.

b) Scope of work of Executive Engineers:

Each Executive Engineer is the head of the division which correspond to the S.E

and some report directly to CEE for different sections such as Operation and Maintenance (O&M), Civil, EHV and commercial, stores, procurement, interstate power matters, training, vigilance etc.

The works of Executive Engineers at circle level comprises mainly of technical profile, i.e. O&M, Civil, EHV, loss reduction, Load projections, DSM measures and abiding by the Standards of Performance of the commission.

c) Work responsibility of a Circle

Circle is responsible for 7-8 divisions. The main functions of Circle include review performance of Subdivisions & sections, review of capital works & various schemes, energy accounting, billing & revenue monitoring, MIS, establishment activities etc. The main functional departments at Division office are Technical, Accounts/Revenue. Circle offices are equipped with computerized infrastructure. The circle is headed by the Superintending Engineer.

d) Work responsibility of Division

Division is defined as unit comprising of approx 3-5 sub-divisions. The activities division includes monitoring & co-coordinating between various sub-divisions, Meter reading, Bill printing, Cash collection, and handling commercial complaints. A Subdivision comprises of mainly Technical, Accounts/Revenue, and general administration departments. Each division is headed by an Executive Engineer and Assistant Engineer and the office staff helps in operation.

e) Work responsibility of Sub-Division

The sub-division is the unit at the bottom of hierarchy and has direct interface with the consumers. The section is responsible for most of the consumer related activities be it technical (O&M) or commercial. O&M activities of section includes breakdown maintenance of HT & LT line & equipments, attending fuse call, operation & maintenance of Substation, and street light complaints. Commercial activities include recovery, bill distribution, and collection, need based meter reading, handling billing complaints, release of new connection, meter replacement, and theft detection. In addition to these, activities related to system augmentation are also carried out by sub-division. Junior Engineers, lineman, and other field staff operate at the sub-division level.

f) Work responsibility of SLDC

Electricity Department, Goa (ED-Goa) has been historically managing the Load Dispatch & Scheduling activities in house through SLDC wing. The State Load Despatch Centre is the apex body to ensure integrated operation of the power

system in the State. Presently ED-Goa is functioning SLDC at Margao.

The SLDC is The SLDC-MARGAO is currently functioning in two shifts daily from 08:00Hrs. to 20:00 Hrs. The system operations on daily basis are being handled by 8 nos. of Assistant Engineers/Junior Engineers posted at SLDC, Margao on working arrangement basis.

It is very much essential that the SLDC should function round-the-clock for effective load management, thereby avoid over drawal/under drawal to maintain grid & curtail the power purchase cost. In order to run the SLDC for 24 hrs. (3 shifts operation) ED-Goa is in the process of recruitment of manpower (contractual/permanent) for round-the =-clock functioning of the SLDC.

Further, there is a Backup SLDC at Cuncolim-Goa for upkeep and maintenance of the SLDC SCADA system. All the EHV telemetry data is first reporting to Backup SLDC and is routed to Main SLDC via a BSNL Leased Line thus making importance of Backup SLDC more critical for proper functioning of SLDC.

## 2.7 Human Resource Management

### 2.7.1 *Man Power Planning*

The biggest asset of any organization is its work force. Their optimum performance can elevate its progress. At the same time, it is also true that the career growth of its employees is directly related to the growth of the organization. The responsibility towards maintenance of a highly efficient distribution system and the accountability towards discharge of the duties as a service provider have to be shared by the engineers and employees of the ED-Goa.

Considering the fact that Goa is one of the tourism capitals of India and approximately 5 lakh foreign tourists and 20 lakh domestic tourists visit Goa annually, hence the basic facilities have to be on world class level especially power and domestic electricity availability.

ED-Goa takes up efficient measures to provide world class services to the consumers and hence utilizes more number of employees especially the contractual employees to keep on track the operation and maintenance facilities and efficient redressal of consumer complaints. There are so many events being organized in Goa such as International Live Concerts, International Film Festival, Huge Christmas and New Year Celebrations etc.

Post entry into regulatory regime by Electricity Department-Goa, the activities/ tasks have increased which has necessitated creation of separate department/ addition in

manpower strength. The activities/ tasks which have become routine and needs dedicated resources for successful compliances are:

a) Compliance to Standards of Performance
b) Compliance to Supply Code
c) Implementation of MYT Regulations and responding to JERC draft regulations
d) ED-Goa's expansion of Retail Business
e) Increasing number of Regulatory, Legal and Consumer Court Cases
f) Compliance to various other Directives of JERC
g) Counterpart team for R-APDRP Part –A

The implementation of R-APDRP Part-A, Implementation of IT, Automation including AMR, SCADA, Call centres, Automation of Collection Activities, Procurement- E-procurement, HR, MIS etc will help the department to optimally utilize its employee resources, especially the ones at the site level i.e. contractual staff and meter readers, lineman, data entry operators etc.

The Electricity Department has a total work force of 7113 employees (including those on contract basis) of different ranks who perform multifaceted technical duties, viz., maintaining power supply, metering, billing, revenue collections, customer services etc.

| Sr. No. | Designation | Strength | Filled | Vacant |
|---|---|---|---|---|
| 1 | Chief Electrical Engineer | 1 | 1 | 0 |
| 2 | Add. Chief Engineer | 2 | 2 | 0 |
| 3 | Superintending Engineer (Elect) | 4 | 3 | 1 |
| 4 | Executive Engineer (Elect) | 27 | 19 | 8 |
| 5 | Executive Engineer (Civil) | 2 | 2 | 0 |
| 6 | Director (Admin) GCS | 1 | 1 | 0 |
| 7 | Jt. Director of Accounts, CAC | 1 | 1 | 0 |
| 8 | Dy. Director (Administration) GCS | 1 | 0 | 1 |
| 9 | Asst. Engineer (Elect) | 183 | 159 | 24 |
| 10 | Asst. Engineer (Civil) | 9 | 7 | 2 |
| 11 | Asst. Engineer (Planning) | 1 | 1 | 0 |
| 12 | Asst. Accounts Officer | 2 | 2 | 0 |
| 13 | Research Assistant | 1 | 1 | 0 |
| 14 | Estt. Superintendent | 1 | 1 | 0 |
| 15 | Sr. Wireless Mechanic | 1 | 1 | 0 |
| 16 | Accountant | 21 | 12 | 9 |

| Sr. No. | Designation | Strength | Filled | Vacant |
|---|---|---|---|---|
| 17 | Head Clerk | 56 | 54 | 2 |
| 18 | Senior Stenographer | 1 | 0 | 1 |
| 19 | Junior Engineer (Elect) | 291 | 226 | 65 |
| 20 | Junior Engineer (Civil) | 22 | 19 | 3 |
| 21 | Foreman (Elect) | 6 | 4 | 2 |
| 22 | Draughtsman Gr-I | 3 | 0 | 3 |
| 23 | Wireless Mechanic | 2 | 0 | 2 |
| 24 | Meter Mechanic | 15 | 6 | 9 |
| 25 | U.D. Clerk | 141 | 105 | 36 |
| 26 | Junior Stenographer | 25 | 12 | 13 |
| 27 | Draughtsman Gr. II | 8 | 5 | 3 |
| 28 | Station Operator | 258 | 246 | 12 |
| 29 | Investigator | 1 | 1 | 0 |
| 30 | Draughtsman Gr. III | 9 | 6 | 3 |
| 31 | L.D. Clerk | 525 | 521 | 4 |
| 32 | Meter Reader | 362 | 332 | 30 |
| 33 | Meter Tester | 21 | 13 | 8 |
| 34 | Lineman/Wireman | 832 | 682 | 150 |
| 35 | Driver (H/V) | 34 | 20 | 14 |
| 36 | Driver (L/V) | 279 | 229 | 50 |
| 37 | Cable Jointer | 2 | 0 | 2 |
| 38 | Mason Mistry | 6 | 4 | 2 |
| 39 | Plumber | 2 | 0 | 2 |
| 40 | Carpenter | 1 | 0 | 1 |
| 41 | Turner/Fitter | 10 | 9 | 1 |
| 42 | Welder | 7 | 6 | 1 |
| 43 | Store Clerk | 17 | 13 | 4 |
| 44 | Telephone Operator | 33 | 33 | 0 |
| 45 | Asst. Data Entry Operator | 165 | 149 | 16 |
| 46 | Daftary | 14 | 1 | 13 |
| 47 | Switch Board Operator | 13 | 4 | 9 |
| 48 | Oil Filter Operator | 2 | 0 | 2 |
| 49 | Lift Operator | 2 | 0 | 2 |
| 50 | Blue Printer | 3 | 1 | 2 |
| 51 | Asst. Lineman/Wireman | 1382 | 1327 | 55 |

| Sr. No. | Designation | Strength | Filled | Vacant |
|---|---|---|---|---|
| 52 | Line Helper | 2330 | 2175 | 155 |
| 53 | Peon | 82 | 68 | 14 |
| 54 | Watchman | 53 | 27 | 26 |
| 55 | Sweeper | 21 | 8 | 13 |
| | **Total** | **7294** | **6519** | **775** |
| 56 | Contract Meter Reader | | 217 | |
| 57 | Contract Line Helper | | 377 | |
| | **Total No. of Employees** | | **7113** | |

2.7.2 **Staffing**

**a) <u>Tech & Non-tech structuring and staffing</u>**

Currently the total employee strength of the department is 7113 of which 594 are contractual employees. Outsourced/contractual staff is generally at the sub-division level for menial jobs such as linemen helper, and meter readers. Apart from this, technical, administrative, financial workforce is also there. Further watchman, sweeper, peon at office, lower division clerks or data entry operators are there. Highest no. of Lineman/wireman and line helpers are required in proportion to the no. of consumers and area.

**b) <u>Transferability</u>**

All technical employees are transferable to any of the circles and within divisions and sub divisions offices.

2.7.3 **Training**

There is a need to ascertain the training of the existing human resource and to identify their core competencies with an aim to enhance their skills and finally place them in appropriate job positions. ED-Goa endeavours to conduct training at periodic intervals for capacity building of its manpower.

## 2.8 IT Initiatives

2.8.1 ED-Goa had started the IT related Part A works of R-APDRP for execution through the appointed IT implementing agency (ITIA) REC Power Distribution Company Ltd during the last control period. The work has been completed. The Data centre has already been established.

2.8.2 The Customer Care Centre (Call Centre) is fully functional for the convenience of the public who can lodge their billing, Metering, electricity complaints etc. on 1912 toll

free number, which is then forwarded to the concerned section offices for redressal by issuing notification. Facebook page is also available for the public. During last 5 years, the Call Centre was outsourced. Presently from January'18, it is running with Departmental Telephone Operators and thus will help in savings of approximately Rs. 2 crores per annum.

2.8.3 Online electricity bill payment has been introduced all over Goa for enabling the public to pay their electricity bills online. This facility has been extended further by developing mobile app through which public can pay their electricity bills. This has alleviated the inconvenience caused to a large number of consumers in paying their electricity bills in time. Any Time Payment (ATP) machine alongwith Information Kiosks have also been installed at Panaji, Ponda, Mapusa, Margao, and Vasco for public to pay their bills through these machines. This is in addition to the cash collection centres which are already functioning at the Sub-division level for the convenience of the public. Facility for any amount and payment from anywhere is also possible. The Online Application for new service connection is also made functional.

2.8.4 The Department has hosted a fully functional Website of the Department wherein many details for public are made available. Online Applications for service connections can also be submitted through the website.

2.8.5 Bharat Bill Payment System is also being contemplated to be adopted.

2.8.6 <u>In-house activities:</u>

The entire billing process is being done in-house right from the recording of the meter readings, generation of the bills through the SAP system established by the Department through the ITIA, as well as for delivery of the electricity bills to the consumers through the Meter Readers.

2.8.7 <u>Outsourced activities:</u>

The printing of the electricity bills has been outsourced to a private party. The bills are generated by the Department and converted to PDF format and then handed over to the party for printing of the bills. The bills are then printed and received in the Department for issuing the same to the consumers.

2.8.8 <u>New / Upcoming initiatives and upgrades planned:</u>

New initiatives such as web services for BHIM / UPI has been planned and will be made operational.

2.8.9 <u>Benefits of the planned initiatives:</u>

The new planned initiatives will result in ease of payment to the consumers with many

collection centres.

## 2.9 Technological initiatives

2.9.1 Key technological initiatives under progress

The adoption of the Gas Insulated Technology has been a new technological initiative for the GED. The GED has adopted this key technology for establishing Gas Insulated Sub-Stations both at the 33/11 KV Sub-Stations and at the EHV level for 220/33 KV Sub-Stations. Although there is cost implication for adopting this technology, it outweighs the advantages derived from the same.

- It occupies very less space as compared to the Air insulated substations. Hence these Gas Insulated Substations (GIS) are most preferred where area for substation is small especially in the cities and the congested coastal belt tourist destinations.
- All the switchgear equipments are encapsulated in metallic chambers filled with SF6 Gas which has high di-electric properties.
- It is most reliable compared to Air Insulated Substations, number of outages due to the fault is less.
- It is generally maintenance free.
- It can be assembled at the shop and modules can be commissioned at the site easily and hence requires lesser time for execution of the project.

2.9.2 New/Upcoming initiatives and upgrades planned

It is planned to have the Supervisory Control and Data Acquisition System (SCADA) upto the 33 KV Sub-Station level. Lack of SCADA system in the Department has hampered the distribution activities of the Department from being automated. The adoption of the SCADA system will enable the Department to have advanced data collection capabilities and thus will play a significant role in the power system operation. At the distribution side SCADA will enable to do more than just collecting data by automating entire distribution network and facilitating remote monitoring, coordinate, control and operating the different distribution components through Distribution Management System (DMS). SCADA/DMS system will replace the manual labour to perform electrical distribution tasks and manual processes in distribution systems with automated equipment's.

It is also planned to introduce Smartgrid as a pilot project in a particular area for effective control of the consumer loads during peak demand. The pros and cons will be studied before implementing in other areas. Smart meters/Prepaid meters are also being planned for installation to the consumers.

2.9.3 Benefits of the planned initiatives

ED-Goa envisages the following benefits of the planned initiatives:

a) Due to timely recognition of faults, equipment damage can be avoided.
b) Continuous monitoring and control of distribution network can be performed from remote locations.
c) Saves labour cost by eliminating manual operation of distribution equipment.
d) Reduce the outage time by a system-wide monitoring and generating alarms so as to address problems quickly.
e) Improves the continuity of service by restoring service after the occurrence of faults (temporary).
f) Automatically improves the voltage profile by power factor correction and VAR control.
g) Facilitates the view of historical data.
h) Loads can be controlled remotely.

## 2.10 Customer Service Related Activities

2.10.1 Current initiatives

The Customer Care Centre (Call Centre) is fully functional for the convenience of the public who can lodge their billing, Metering, electricity complaints etc. on 1912 toll free number, which is then forwarded to the concerned section offices for redressal by issuing notification.

2.10.2 Mechanism of collecting feedbacks and complaints from customers

The Inter-active Voice Response System (IVRS) Menu of the Call Centre enables the customers to give in their feedback or lodge complaints, which is recorded in the system.

2.10.3 Steps taken to act on feedbacks and customer complaints

The pending complaints and also the time taken to redress the complaints of the customers are monitored through SAP.

2.10.4 Initiatives related to on-line payment and other online services

Online electricity bill payment has been introduced all over Goa for enabling the public to pay their electricity bills online. This facility has been extended further by developing mobile app through which public can pay their electricity bills. The payment gateway SBI is collecting online payment in sync with NIC e-challan system.

The Online Application for new service connection is also made functional through the Departmental web-site.

2.10.5 Future Plans

In future, it is planned to have independent gateway i.e single hop instead of multiple hops so as to facilitate swifter complaints tackling and with only one Agency.

## 2.11 Energy Efficiency and Demand Side Management (DSM):

2.11.1 Ministry of Power and Bureau of Energy Efficiency (BEE) have been promoting energy efficiency. Efficient lighting in households, which accounts for 20% of energy, is an important thrust area to reduce peak demand as well as enhance awareness about energy efficiency and conservation to household consumers.

2.11.2 ED-Goa has already undertaken the DSM-based Efficient Lighting Programme (DELP) scheme in the state. Under the scheme, 3 Nos. of 9W LED bulbs each were provided to all the domestic consumers of the State consumers at a cost of Rs. 25 each for each 9W LED bulb.

2.11.3 The Government of Goa then came up with the 'Jyotirmay Goa Scheme' wherein the bulbs were provided free of cost to all the domestic consumers. Around 8.20 lakh LED bulbs have been distributed to the domestic consumers and the scheme has been closed since June' 17.

2.11.4 The State has also undertaken the Street Lighting National Programme (SLNP) launched by Central Government, wherein all the conventional street lighting fixtures are to be replaced with the LED street lighting fixtures. Around 1.95 lakhs of street light fixtures in Goa have been replaced by LED street lights as per the work order. The scheme has been implemented through the Energy Efficiency Services Limited (EESL), an arm of the BEE. There is no upfront cost to the Department. The monthly repayments to EESL will be through energy savings and savings on cost of maintenance. The scheme also includes Centralised control and monitoring system (CCMS) wherein remote switching on/off of lights is being done. M/s EESL will maintain and monitor the street lights for a period of 10 years.

There are still exist some streetlight fixtures which are to be replaced, which will be taken up separately.

2.11.5 New Scheme has also been planned for distribution of energy efficient LED tube light fixtures, LED bulbs, and energy efficient fans to all the consumers at a upfront cost through a vendor selected for the purpose.

## 2.12 Way Forward for ED-GOA

ED-Goa has been successfully supplying power to its consumers throughout the years, but there is much more that needs and can be done to provide reliable and quality power to the people. To achieve this, ED-Goa has planned the following activities:

- Improve Meter reading, Billing and Collection;
- Use of technological for improving the efficiency, accountability, information levels & consumer satisfaction.
- Introduction of pre-paid and smart metering for all revenue intensive consumers.
- Round the clock working of SLDC and planned scheduling and forecasting.
- Power Purchase Strategy in place for optimum day ahead scheduling

# CHAPTER 3. SWOT ANALYSIS

## 3.1 SWOT Analysis

3.1.1 The analysis of the strength, weakness, opportunities and threats as perceived by ED-GOA is summarized in the following figure:

**Figure 9: SWOT Analysis of ED-GOA**

| STRENGTHS | WEAKNESS |
|---|---|
| • High Industrial base<br>• Competitive tariffs<br>• Relatively Lower Losses<br>• Implementation of IT Infrastructure (i.e. SAP, Data Centre, Disaster Recovery Centre, GIS Mapping & Consumer Indexing) | • Complete dependence on external sources for Power<br>• Absence of upto date audited account<br>• Manual Meter reading for LT consumers and AMR only for HT consumers.<br>• Ageing & overloaded Distribution Infra<br>• Absence of automation in Distribution system operations.<br>• Capacity building |
| **OPPORTUNITIES** | **THREATS** |
| • Improvement in system of Meter Reading, Billing and Collection<br>• Improving Customer Services and Satisfaction<br>• Implementation of new technologies in front of metering (Pre-paid meters, smart meters).<br>• Ensuring quality of supply and make it reliable for industry by adopting automated distribution system.<br>• Increasing industrial base and revenue<br>• Rooftop Solar power generation by consumers | • Increasing Power Purchase Cost of Conventional Power, may lead to tariff increase (due to coal shortages)<br>• Reduction of Consumption of Industrial Consumers<br>• Additional requirement of Peaking Power<br>• Market Uncertainty |

## 3.2 STRENGTHS

- **High Industrial base:** ED-Goa has a high industrial base in terms of hotels, steel/ferro industries, and other industries which means higher revenue and lower losses.
- **Relatively Lower Losses:** ED-Goa has been very proficient in reducing the Distribution Losses over the last few years.
- **Competitive Tariff and Simple & Robust Tariff Structure:** ED-Goa has lower tariffs as compared to the other utilities in the neighbouring States and the tariff structure is the one of the simplest and robust when compared to other utilities in the Country.

- **Implementation of IT Infrastructure:** ED-Goa under RAPDRP Part A has installed the ERP software SAP, Data Centre for data collection and analysis, Disaster Recovery Centre, and is in process of finalizing GIS Mapping & Consumer Indexing. This IT infrastructure will help ED-Goa in increasing the reliability and quality of power supply, reduces the billing and collection issues and bring down the losses.

### 3.3 WEAKNESSES

- **Complete Dependence on External Sources for Power:** ED-Goa has to entirely rely on power from external sources like CGS. Temporary shutdown or outage of any power plant leads to power cuts or purchase of power from open market/ exchange.
- **Poor MIS database:** ED Goa lacks on a proper MIS database. The information regarding the department's network, consumers and the upcoming capex schemes need to be maintained properly and be readily available which is presently being maintained manually.
- **Absence of up-to-date audited accounts:** ED Goa, being a government department, has been maintaining accounts on cash basis and has recently started maintaining on commercial principles and as desired by Hon'ble Commission from FY 2007-08 onwards. The financial statements upto FY 2014-15 has been prepared and audited and FY 2015-16 & FY 2016-17 are under preparation.
- **Manual Meter reading, Billing and Collection for LT consumers:** With the implementation of APDRP Part-A, the billing and collection has been computerised and hence accounting / data management issues have got resolved. However, the LT meter reading is still being done on manual basis. The Demand, Collection and balance statements are being compiled.
- **Ageing and overloaded Distribution Infra:**

  The assets of ED-Goa are old and proper maintenance is required on timely basis to ensure quality and reliable power supply. Further, in most of the divisions, the old network is overloaded and cannot afford any more upcoming load without augmentation.
- **Absence of automation in Distribution system operations:** ED-Goa has almost negligible automation in the distribution system to enable it for quick fault identification and rectification. ED-Goa is in talks to implement SCADA and then automation will be the next step.
- **Capacity building:** ED-Goa lacks in a proper capacity building/training facilities to train the new employees before moving to the site. Capacity building is also needed to educate all the staff about the new and upcoming technologies and the regulations etc.

## 3.4 OPPORTUNITIES

- **Improvement in system of Meter Reading, Billing and Collection:** ED-Goa has taken steps towards improving LT billing and has outsourced bill printing activity.
- **Improving Customer Services and Satisfaction:** ED-Goa has the opportunity to open new customer care centres and Customer cash collection/ complaint centres for anywhere payment facility to improve the customer satisfaction as well as improve the revenue collection.
- **Promotion of Renewable sources of energy through proper RE policy:** Renewable Energy Policy for the state of Goa has been finalised, only minor amendment is expected. To promote solar and non-solar energy sources in the state of goa and to fulfil the RPO obligations, there is a need for promotion of renewable sources in the state**.** Hence Rooftop Solar generation and feed into the ED Grid is being anticipated.
- **Implementation of new technologies in front of metering (AMR,pre-paid, smart meters), distribution.** ED-GOA, as part of RAPDRP Part A has installed AMR meters for HT and high value LT consumers. In order to further leverage upon the benefits of the IT infrastructure already created, ED Goa has the opportunity to get MIS reports for corrective actions. Further the installation of AMR can be increased, installation of Smart Meters / Prepaid Meters for the consumers as per geographical area wise can also to be taken up in phases. The distribution infrastructure to increase the pace and scale of distribution system strengthening efforts also need to be taken up.
- **Ensuring quality of supply and make it reliable for Industry by adopting automated distribution system:** ED-Goa, has one of the most competitive tariff in the country and has the perfect opportunity to promote the industries in the area by adopting newer technologies and ensuring quality and reliable supply of power, thereby increasing industrial base and in turn revenue.

## 3.5 THREATS

- **Increase in Cost of Conventional Power:** ED-Goa relies on external source of power and the cost of generation has been increasing (primarily due to domestic fuel supply concerns and use of imported coal) which may lead to increase in tariffs for consumers. Further, the capital cost of new power plants has gone up substantially resulting in higher power tariff from new generating units both under central sector as well as private power generating companies. This shall cause hardship on the consumers and ED-Goa in no way wants to burden its consumers.

- **Reduction of Consumption of Industrial Consumers:** The domestic consumer base has been increasing at a faster pace than the industrial consumer base which may

be a cause of concern as decrease in number of high paying consumer's (cross subsidising consumers) may affect revenue generation for the department.

- **Additional requirement of Peaking Power –** Being a tourist destination, ED-Goa faces a lot of peak demand during holidays and tourism season apart from the seasonal increase in demand. Without any considerable PPA, the department will have to resort to open market sources/ exchanges at higher market prices.

- **Market Uncertainty:** The power sector has been very volatile in the last couple of years. With RE power costs reaching new lows, however projects not getting completed, PPAs being cancelled. Further, the convention thermal generating stations declaring NPAs with the stranded capacities, the future of power availability is uncertain.

3.5.1 The growth path for ED-Goa would be the key takeaways which have emerged from the SWOT analysis. While, there would be opportunities galore on the horizon, it would be only prudent on part of ED-Goa to first target the short-comings and overcome them. Simultaneously, it would also be necessary to start identifying areas which it intends to target in the short to medium term and which areas it intends to target in the long term.

# CHAPTER 4. DEMAND & SALES PROJECTIONS

For any Distribution utility, keeping track of Demand and sales is one of the most basic and important aspect as they are key drivers for revenue generation. There are many approaches to project the demand and sales for the future years; CAGR method is one of the most advanced forms of end use survey approach. In fact, CEA has been using partial end use method to project demand in different states. However, the technique adopted is mainly dependent of the kind of data that is available, nature of consumption and size of customer category.

Further, Demand and Sales Assessment is not a one-time exercise but needs to be constantly monitored against actual demand and updated for any major development or changes in other external drivers like policies, regulatory developments, industrial growth, changes in specific industry segments etc.

## 4.1 Regulatory Provisions for Sales Forecast

4.1.1 The Commission in the Regulation 8 of JERC (Multi Year Tariff) Regulations, 2018 has mentioned the methodology to be adopted for sales forecast in business plan. The relevant provisions of the JERC MYT Tariff Regulations, 2018 are extracted for reference as under:

*"6. Values for Base Year*

*6.1 The values for the Base Year of the Control Period shall be determined on the basis of the audited accounts or provisional accounts of last three (3) Years, and other factors considered relevant by the Commission:*

*Provided that, in absence of availability of audited accounts or provisional accounts of last three (3) Years, the Commission may benchmark the parameters with other similar utilities to establish the values for Base Year:*

*Provided further that the Commission may change the values for Base Year and consequently the trajectory of parameters for Control Period, considering the actual figures from audited accounts.*

*6.2 The Commission may revisit the performance targets for the Control Period during the Mid-term Review, carried out in accordance with the proviso to Regulation 5.2 (b).*

*…….*

*8.6 Sales Forecast*

*a) The Distribution Licensee shall forecast sales for each Consumer category and sub-categories, at different voltage levels, for each Year of the Control Period in their Business Plan filings, for the Commission's review and approval;*

*b) The forecast shall be based on the actual demand of electricity in previous Years, anticipated growth in demand in coming Years, expected growth in the number of*

*Consumers, changes in the pattern of consumption, target distribution losses and other relevant factors;*

*c) The Licensee shall indicate separately the sale of electricity to traders or another Licensee and category wise sales to Open Access Consumers."*

## 4.2 Approach for Forecast No. of Consumers, Connected Load and Sales for the Control Period

4.2.1 The petitioner has adopted the methodology to arrive at the projections, as mentioned in the Regulations and as considered by the Commission in the last tariff order, i.e ED-Goa has taken the compounded annual the compounded annual growth rate (CAGR) of past years of each consumer category as per the audited figures for FY 2013-14 and provisional figures thereafter till FY 2016-17. The figures for FY 2017-18 and Q1 of FY 2018-19 are taken from SAP accounts, which are more reliable, hence ED-Goa has considered these figures and has forecasted the no. of consumers for the control period FY 2019-20 to FY 2021-22.

4.2.2 The petitioner has adopted the methodology mentioned by the Commission and has taken the base year as FY 2018-19. The petitioner has arrived at the revised projections of the base year after considering the provisional actual figures of FY 2017-18 and actual figures of Q1 of FY 2018-19 extracted from SAP software. Further, ED-Goa has also considered the connections released in the quarter and the pending no. of connection applications.

## 4.3 Forecast of No. of Consumers, Connected Load and Sales

4.3.1 Based on the past data, the category wise CAGR of past 3 years, 4 year and 5 years of each consumer category as per provisional are considered for the projections of no. of consumers for the control period is given in the table below

4.3.2 The petitioner has arrived at the revised projections of the base year after considering the provisional actual figures of FY 2017-18 and actual figures of Q1 of FY 2018-19 extracted from SAP software. Further, ED-Goa has also considered the connections released in the quarter and the pending no of connection applications. For FY 2019-20, the petitioner has considered that the pending connections (approx. 8000 applications) shall be released by end of FY 2019-20, accordingly, the petitioner has considered the category wise pending applications along with load (kW/kVA/HP) extracted from SAP to arrive the values of FY 2019-20.

4.3.3 For the rest of the years of the control period, i.e. FY 2020-21 and FY 2021-22, since the current infrastructure and network is overloaded, hence while preparation of the projections, the petitioner has taken CAGR combined with its best judgement and has taken a conservative approach for CAGR. Further, since the past unaudited data does

not provide a clear picture we have calculated the three year, four year and five year CAGR`s and considered the optimum growth for the respective category.

4.3.4 For LT Categories, based on SAP data, pending connections and connected load for those connections is estimated and FY 2018-19 numbers are grossed up by these additional no. of consumers, their connected load and estimated sales to these consumers to arrive at FY 2019-20 figures. Further, CAGR or an estimated % figure is used for each category for Sales, Connected load and No. of consumer projection for FY 2020-21 and FY 2021-22.

4.3.5 For Sales, No. of consumers and Connected load, 5 year CAGR is being considered for all categories where 5 year CAGR is considered for projections with a cap of 5% for each category.

4.3.6 Connected load for FY 2018-19 is arrived at based on Q1 data for FY 2018-19

4.3.7 For HT Industrial, HT Industrial (Ferro metallurgical/ steel melting/power intensive/steel rolling) and HT Commercial categories, increase in sales and connected load projections are arrived after taking the inputs of divisional engineers in all the divisions/sub-divisions in the state and only the upcoming major projects envisaged to come up in the Control period. For other HT categories, CAGR methodology described above has been adopted which is more or less negligible.

4.3.8 The category-wise addition of consumers, connected load and sales considered for FY 19-20 as per SAP as is hereunder:

**Table 12: Category-wise addition of Consumers, Connected Load and Sales (MU) Considered for FY 2019-20**

| S.No. | Consumer Category | 19-20 | | |
|---|---|---|---|---|
| | | No. of Consumers/ connection released | KW/KVA/HP Load | Estimated Sales |
| 1(a) | Tariff LTD/Domestic | 5576 | 30895 | 24.51 |
| 1(b) | Tariff LTIG/Low Income Group | 5 | 6 | 0.04 |
| 2 | Tariff LTC/Commercial | 1356 | 7302 | 9.74 |
| 3 | Tariff LTI/Industry | 38 | 1376 | 0.90 |
| 4 | Tariff LTP/Mixed (Hotel Industries) | | | |
| 5A | Tariff LTAG/Agriculture (Pump sets / Irrigation) | 273 | 1105 | 0.41 |
| 5B | Tariff LTAG/Agriculture (Allied Activities) | 8 | 37 | 0.02 |
| 6 | Tariff LTPL/ Public Lighting | 22 | 42 | 0.07 |
| 7 | Tariff LTH/ Hoarding and Signboards | | | |
| 8 | Tariff-LTTS/ Temporary Supply | 651 | 2746 | 2.71 |
| 9 | Tariff-HTI/ Industrial | 37 | 21406 | 59.08 |

| S.No. | Consumer Category | 19-20 | | |
|---|---|---|---|---|
| | | No. of Consumers/ connection released | KW/KVA/HP Load | Estimated Sales |
| 10 | Tariff HTFS Industrial (Ferro Mettallurgical/ Steel Melting/ Power Intensive/ Steel Rolling ) | 2 | 1000 | 4.27 |
| 11 | Tariff HTC/ Commercial | 11 | 12313 | 17.97 |
| 12 A | Tariff HTAG/ Agriculture (Pump Sets/ irrigation) | 1 | 635 | 0.36 |
| B | Tariff HTAG/ Agriculture (allied activity) | | | |
| 13 | Tariff HTD/ Domestic | | | |
| 14 | Tariff HTMES/ Defence Establisment | | | |
| 15 | Tariff HTTS/ Temporary Supply | 3 | 1748 | 1.48 |
| 16 | Single Point Supply | | | |
| | Total | **7,983** | **80,610** | **121.55** |

4.3.9 The category-wise projections considered for FY 2020-21 & 2021-22 are discussed hereunder:

**LTD - Domestic Consumers:**

There has been an increasing trend in sales, connected load and no. of consumers of domestic category on y-o-y basis. 5 year CAGR for Sales and Connected load is more than 5%, since the current infrastructure and network is overloaded, hence while preparation of the projections, the petitioner has taken a conservative growth rate of 5% for sales projections. For projection of number of consumers, 2% growth rate is considered instead of 5 year CAGR.

**LTD Low Income Group:**

The number of consumers in the LIG category is not expected to grow as more and more consumers are shifting from this category to LT Domestic category due to increased consumption. Hence, NIL CAGR is assumed for this categories.

**LTC-Commercial Consumers:**

Commercial Consumers have been showing significant increase in their consumption of around 8%-12%. However 5% sales and connected load growth is assumed in commercial activities considering various developments and increasing tourism activities in the State. 3 year CAGR is considered from projecting connected load for FY 2020-21 and FY 2021-22.

**LT Industry**

There has been dip in no. of consumers and connected load in this category. In this case, NIL growth is considered for projection for FY 2020-21 and FY 2021-22. For sales projection, 5 year CAGR has been considered

**LTP Mixed (Hotel Industries)**

For LTP Mixed Hotel Industries category, Sales and No. of consumers has increased slightly over past few years. In this case, 5 year CAGR was used for projection for FY 2020-21 and FY 2021-22. NIL growth rate is considered for connected load since there has been decrease in growth of connected load.

**LTAG/Agriculture (Pumpsets), LTAG/Agriculture (Allied Activities), LTPL/Public Lighting & LH/Hoarding and Signboards:**

LT-AG, LT Public Lighting & LH Hoarding and Sign board categories have negative CAGR in case of Sales and Connected load. Hence, NIL growth rate is assumed in the respective categories for Sales and Connected load. For projecting no. of consumers for this category, 5 year CAGR is being used for projections.

**LT Temporary supply**

For Temporary connections, 5 year CAGR is used for projections of Sales, Connected load and No. of consumers for FY 2020-21 and FY 2021-22. In case 5 year CAGR is more than 5%, it is capped at 5%. Even though projections are made based on CAGR, temporary supply connections and sales are not expected to follow any definite pattern and may increase or decrease on year on year basis.

**HTI/ Industrial**

For HT Industries category, ED-Goa after taking the inputs of divisional engineers in all the divisions/sub-divisions in the state, envisages that two electronic cities (namely Chimbel electronic city and TUEM electronic city are upcoming in the area, with total load of 63MVA and 40 MVA. However, only part load will come in this control period, accordingly, ED-Goa has envisaged 5 MVA in FY 2020-21 and 10MVA load in FY 2021-22 and corresponding increase in sales and consumers are arrived at after taking the inputs of divisional engineers in all the territories in the state into consideration.

**HTFS Industrial (Ferro Metallurgical/ Steel Melting/ Power Intensive/ Steel Rolling)**

For these categories, increase in sales and connected load projections are arrived at after taking the inputs of divisional engineers in all the territories in the state into consideration. It is expected that there will be addition of 1 consumer per year with approx. load of 1 MW.

**HTC/Commercial**

For HT Commercial category, ED-Goa after taking the inputs of divisional engineers in all the divisions/sub-divisions in the state, envisages that one International Airport (namely MOPA Airport) is upcoming in the area, with total load of 30MVA. However, only part load will come in this control period, accordingly, ED-Goa has envisaged 10 MVA in FY 2020-21. Further, additional load with 2 new substations of Konkan Railways of 6MVA each are envisaged to come in the Control period, ED-Goa has considered 6 MVA in FY 2020-21 and 6 MVA in FY 2021-22 and corresponding increase in sales and consumers are arrived at after taking the inputs of divisional engineers in all the territories in the state into consideration.

**HTAG/Agriculture (Pump sets and irrigation), HTAG/Agriculture (allied activity), HTD/Domestic, HTMES/Defence establishment and HTTS/Temporary**

For these HT Categories, 5 year CAGR is considered for projections if CAGR is positive and NIL growth rate is considered if CAGR is negative. For HTAG/Agriculture (Pump sets/irrigation), a minimal increase if 1 consumer per year is considered for projections.

The table below shows the past five year Category wise data of LT and HT consumers, % CAGR assumed and the projections of no. of consumers for the control period:

**Table 13: Summary of Category-wise Sales (MU) Growth Rate Considered for Projections**

| SALES (MU) | Actuals | | Actual Provisional | | | CAGR | | | |
|---|---|---|---|---|---|---|---|---|---|
| | FY 2013-14 | FY 2014-15 | FY 2015-16 | FY 2016-17 | FY 2017-18 | 3yr | 4yr | 5yr | Considered |
| **Tariff LTD/Domestic** | 844.2 | 905.2 | 1,022.7 | 803.8 | 1,096.9 | 3.57% | 6.61% | 6.76% | **5%** |
| **Tariff LTIG/Low Income Group** | 8.262 | 9.4 | 2.3 | 1.6 | 1.7 | -15.04% | -43.98% | -33.12% | **0%** |
| **Tariff LTC/Commercial** | 286.0 | 319.9 | 324.7 | 300.9 | 412.4 | 12.69% | 8.83% | 9.58% | **5%** |
| **Tariff LTI/Industry** | 82.4 | 95.2 | 87.1 | 78.6 | 91.8 | 2.64% | -1.22% | 2.73% | **3%** |

| SALES (MU) | Actuals | | Actual Provisional | | | CAGR | | | |
|---|---|---|---|---|---|---|---|---|---|
| | FY 2013-14 | FY 2014-15 | FY 2015-16 | FY 2016-17 | FY 2017-18 | 3yr | 4yr | 5yr | Considered |
| Tariff LTP/Mixed (Hotel Industries) | 4.7 | 5.5 | 6.7 | 5.1 | 5.3 | -10.85% | -1.33% | 3.00% | **3%** |
| Tariff LTAG/Agriculture (Pump sets / Irrigation) | 17.8 | 20.1 | 16.4 | 13.4 | 16.4 | 0.01% | -6.55% | -2.03% | **0%** |
| Tariff LTAG/Agriculture (Allied Activities) | 2.1 | 5.2 | - | 0.6 | 0.9 | 0.00% | -44.91% | -19.61% | **0%** |
| Tariff LTPL/ Public Lighting | 37.1 | 35.7 | 2.8 | 36.6 | 2.7 | -1.83% | -57.92% | -48.25% | **0%** |
| Tariff LTH/ Hoarding and Signboards | | 0.1 | 0.2 | 0.2 | 0.2 | 16.39% | 34.15% | | |
| Tariff-LTTS/ Temporary Supply | 17.9 | 17.0 | 16.2 | 15.5 | 20.5 | 12.57% | 6.46% | 3.50% | **4%** |
| Tariff-HTI/ Industrial | 955.1 | 898.4 | 1,079.1 | 1,180.7 | 1,277.0 | 8.78% | 12.44% | 7.53% | **5%** |
| Tariff HTFS Industrial (Ferro Metallurgical/ Steel Melting/ Power Intensive/ Steel Rolling ) | 517.4 | 803.9 | 500.0 | 454.2 | 421.1 | -8.22% | -19.39% | -5.02% | **5%** |
| Tariff HTC/ Commercial | 117.9 | 144.0 | 56.4 | 97.8 | 103.6 | 35.53% | -10.40% | -3.19% | **5%** |
| Tariff HTAG/ Agriculture (Pump Sets/ irrigation) | 6.1 | 6.5 | 21.0 | 4.6 | 4.6 | -53.13% | -10.69% | -6.70% | **0%** |
| Tariff HTAG/ Agriculture (allied activity) | 138.1 | 138.5 | - | 3.4 | 4.5 | 0.00% | -68.05% | -57.47% | **0%** |
| Tariff HTD/ Domestic | | | 0.24 | 0.3 | 0.3 | 10.55% | | | **0%** |
| Tariff HTMES/ Defence Establishment | 26.65 | 26.423 | 24.67 | 24.90 | 26.9 | 4.40% | 0.58% | 0.22% | **0%** |
| Tariff HTTS/ Temporary Supply | 0.06 | 0.27 | - | 0.13 | 0.3 | | | 46.08% | **0%** |
| Single Point Supply | - | - | - | 5.21 | 5.5 | | | | 0% |
| **Total** | **3070.56** | **3,431.2** | **3,160.4** | **3,027.5** | **3,492.47** | **5.12%** | **0.59%** | **3.27%** | |

**Table 14: Summary of Category-wise Connected Load (kW/KVA/HP) Growth Rate Considered for Projections**

| Connected Load (kW) | Actuals | | | | | CAGR | | | |
|---|---|---|---|---|---|---|---|---|---|
| Consumer Category | FY 2013-14 | FY 2014-15 | FY 2015-16 | FY 2016-17 | FY 2017-18 | 3yr | 4yr | 5yr | Considered |
| Tariff LTD/Domestic | 1127149 | 1634435 | 1642607 | 1152770 | 1382385 | -8.26% | -5.43% | 5.24% | 5.00% |
| Tariff LTIG/Low Income Group | 1201.0 | 2046.0 | 2046.0 | 106 | 231 | -66.40% | -51.67% | -33.78% | 0.00% |
| Tariff LTC/Commercial | 335851.0 | 280456.0 | 281843.0 | 296465 | 309108 | 4.73% | 3.30% | -2.05% | 5.00% |
| Tariff LTI/Industry | 459406.0 | 168091.0 | 168091.0 | 109194.9 | 140551 | -8.56% | -5.79% | -25.63% | 0.00% |

| Connected Load (kW) | Actuals | | | | | CAGR | | | |
|---|---|---|---|---|---|---|---|---|---|
| Consumer Category | FY 2013-14 | FY 2014-15 | FY 2015-16 | FY 2016-17 | FY 2017-18 | 3yr | 4yr | 5yr | Considered |
| Tariff LTP/Mixed (Hotel Industries) | 3298.0 | 4569.0 | 4569.0 | 2075.2 | 2868 | -20.77% | -14.38% | -3.43% | 0.00% |
| Tariff LTAG/Agriculture (Pump sets / Irrigation) | 63970.0 | 61326.0 | 61326.0 | 38938.6 | 44255 | -15.05% | -10.30% | -8.80% | 0.00% |
| Tariff LTAG/Agriculture (Allied Activities) | 21463.0 | 5600.0 | 5600.0 | 4082.0 | 1535 | -47.64% | -35.04% | -48.29% | 0.00% |
| Tariff LTPL/ Public Lighting | 9011.0 | 9598.0 | 9598.0 | 11840.1 | 1600 | -59.17% | -44.96% | -35.09% | 0.00% |
| Tariff LTH/ Hoarding and Signboards | | 523.0 | 523.0 | 599.0 | 619 | 8.79% | 5.78% | 0.00% | 0.00% |
| Tariff-LTTS/ Temporary Supply | 16316.4 | 7502.0 | 7502.0 | 15327.3 | 20684 | 66.05% | 40.22% | 6.11% | 6.11% |
| Tariff-HTI/ Industrial | 455290.5 | 340788.0 | 340788.0 | 460234.0 | 462691 | 16.52% | 10.73% | 0.40% | - |
| Tariff HTFS Industrial (Ferro Metallurgical/ Steel Melting/ Power Intensive/ Steel Rolling ) | 93316.0 | 111840.0 | 111840.0 | 109050.0 | 98700 | -6.06% | -4.08% | 1.41% | - |
| Tariff HTC/ Commercial | 67716.0 | 74767.0 | 74767.0 | 65210.0 | 70965 | -2.58% | -1.72% | 1.18% | - |
| Tariff HTAG/ Agriculture (Pump Sets/ irrigation) | 8211.0 | 8258.0 | 8258.0 | 7800.0 | 8240 | -0.11% | -0.07% | 0.09% | 0.09% |
| Tariff HTAG/ Agriculture (allied activity) | **26879.0** | **90796.0** | **30796.0** | **860.0** | 1310 | -79.38% | -75.66% | -53.01% | 0.00% |
| Tariff HTD/ Domestic | | | | | 300 | | | | |
| Tariff HTMES/ Defence Establishment | 6818 | 7080 | 7080 | 6955 | 6955 | -0.89% | -0.59% | 0.50% | 0.50% |
| Tariff HTTS/ Temporary Supply | 0 | | | 350 | 350 | | | | 0.00% |
| Single Point Supply | | | | 4035 | 4035 | | | | 0.00% |
| Total | **2696260** | **2807675** | **2757234** | **2286192.45** | **25,57,382** | **-3.69%** | **-3.06%** | **-1.31%** | |

**Table 15: Summary of Category-wise No. of consumers Growth Rate Considered for Projections**

| | Actuals | | | | | CAGR | | | |
|---|---|---|---|---|---|---|---|---|---|
| Consumer Category | FY 2013-14 | FY 2014-15 | FY 2015-16 | FY 2016-17 | FY 2017-18 | 3yr | 4yr | 5yr | Considered |
| Tariff LTD/Domestic | **420855** | **463295** | **468864** | **463272** | **498741** | **3.14%** | **2.49%** | **4.34%** | **2.00%** |
| Tariff LTIG/Low Income Group | **11340** | **6778** | **2177** | **1125** | **1835** | **-8.19%** | **-35.31%** | **-36.58%** | **0.00%** |
| Tariff LTC/Commercial | **86013** | **95328** | **91923** | **89328** | **94802** | **1.55%** | **-0.18%** | **2.46%** | **1.55%** |
| Tariff LTI/Industry | **46309** | **11652** | **6050** | **6010** | **5963** | **-0.72%** | **-20.01%** | **-40.10%** | **0.00%** |

| | Actuals | | | | | CAGR | | | |
|---|---|---|---|---|---|---|---|---|---|
| Consumer Category | FY 2013-14 | FY 2014-15 | FY 2015-16 | FY 2016-17 | FY 2017-18 | 3yr | 4yr | 5yr | Considered |
| Tariff LTP/Mixed (Hotel Industries) | 122 | 75 | 190 | 109 | 138 | -14.78% | 22.54% | 3.13% | 3.13% |
| Tariff LTAG/Agriculture (Pump sets / Irrigation) | 10325 | 11113 | 10904 | 11118 | 11280 | 1.71% | 0.50% | 2.24% | 2.24% |
| Tariff LTAG/Agriculture (Allied Activities) | 230 | 512 | 0 | 188 | 185 | | -28.77% | -5.30% | 0.00% |
| Tariff LTPL/ Public Lighting | 1457 | 1664 | 112 | 3042 | 215 | 38.55% | -49.45% | -38.02% | 0.00% |
| Tariff LTH/ Hoarding and Signboards | | 36 | 64 | 62 | 63 | -0.78% | 20.51% | 0.00% | 0.00% |
| Tariff-LTTS/ Temporary Supply | 4557 | 5352 | 4452 | 4224 | 5181 | 7.88% | -1.08% | 3.26% | 3.26% |
| Tariff-HTI/ Industrial | 515 | 535 | 557 | 657 | 692 | 11.46% | 8.96% | 7.67% | 7.67% |
| Tariff HTFS Industrial (Ferro Metallurgical/ Steel Melting/ Power Intensive/ Steel Rolling ) | 24 | 37 | 37 | 32 | 29 | -11.47% | -7.80% | 4.84% | 2.00% |
| Tariff HTC/ Commercial | 176 | 186 | 96 | 191 | 210 | 47.90% | 4.13% | 4.51% | 4.51% |
| Tariff HTAG/ Agriculture (Pump Sets/ irrigation) | 41 | 42 | 43 | 39 | 41 | -2.35% | -0.80% | 0.00% | 0.00% |
| Tariff HTAG/ Agriculture (allied activity) | 33 | 34 | 0 | 2 | 3 | | -55.48% | -45.09% | 0.00% |
| Tariff HTD/ Domestic | | | 2 | 3 | 3 | | | | |
| Tariff HTMES/ Defence Establishment | 12 | 12 | 11 | 12 | 12 | 4.45% | 0.00% | 0.00% | 0.00% |
| Tariff HTTS/ Temporary Supply | 1 | 2700 | | 1 | 1 | | -92.82% | 0.00% | 0.00% |
| Single Point Supply | | | | 1 | 1 | | | | |
| Total | 582010 | 5,99,351 | 5,85,482 | 5,79,415 | 6,19,395 | 2.86% | 1.10% | 1.57% | |

## 4.4 Projected No. of Consumers, Connected Load and Sales for the MYT Control Period

4.4.1 Based on the above discussions and assumptions of growth rate, the projection for the sales/ consumption and number of consumers during the control period is given below.

**Table 16: Projection of category wise Sales (MUs) for the MYT Control Period**

| | SALES (MU) | Base Year Projections | Projections | | |
|---|---|---|---|---|---|
| | | FY 2018-19 | FY 2019-20 | FY 2020-21 | FY 2021-22 |
| 1(a) | Tariff LTD/Domestic | 1,151.76 | 1,176.27 | 1,235.09 | 1,296.84 |
| 1(b) | Tariff LTIG/Low Income Group | 1.65 | 1.70 | 1.70 | 1.70 |
| 2 | Tariff LTC/Commercial | 432.99 | 442.73 | 464.87 | 488.11 |
| 3 | Tariff LTI/Industry | 94.30 | 95.19 | 97.79 | 100.47 |
| 4 | Tariff LTP/Mixed (Hotel Industries) | 5.48 | 5.48 | 5.65 | 5.82 |
| 5A | Tariff LTAG/Agriculture (Pump sets / Irrigation) | 16.36 | 16.77 | 16.77 | 16.77 |
| B | Tariff LTAG/Agriculture (Allied Activities) | 0.87 | 0.89 | 0.89 | 0.89 |
| 6 | Tariff LTPL/ Public Lighting | 2.66 | 2.73 | 2.73 | 2.73 |
| 7 | Tariff LTH/ Hoarding and Signboards | 0.24 | 0.24 | 0.24 | 0.24 |
| 8 | Tariff-LTTS/ Temporary Supply | 21.25 | 23.96 | 24.80 | 25.66 |
| 9 | Tariff-HTI/ Industrial | 1,340.88 | 1,399.96 | 1,413.76 | 1,441.36 |
| 10 | Tariff HTFS Industrial (Ferro Mettallurgical/ Steel Melting/ Power Intensive/ Steel Rolling ) | 442.15 | 446.42 | 450.69 | 454.95 |
| 11 | Tariff HTC/ Commercial | 108.74 | 126.71 | 150.06 | 158.81 |
| 12 A | Tariff HTAG/ Agriculture (Pump Sets/ irrigation) | 4.62 | 4.97 | 4.97 | 4.97 |
| B | Tariff HTAG/ Agriculture (allied activity) | 4.52 | 4.52 | 4.52 | 4.52 |
| 13 | Tariff HTD/ Domestic | 0.29 | 0.29 | 0.29 | 0.29 |
| 14 | Tariff HTMES/ Defence Establishment | 26.95 | 26.95 | 27.01 | 27.07 |
| 15 | Tariff HTTS/ Temporary Supply | 0.30 | 1.77 | 1.77 | 1.77 |
| 16 | Single Point Supply | 5.46 | 5.46 | 5.46 | 5.46 |
| | Total | **3,661.47** | **3,783.02** | **3,909.05** | **4,038.44** |

**Table 17: Projection of category wise No. of Consumers for the MYT Control Period**

| | | Base Year Projections | Projections | | |
|---|---|---|---|---|---|
| | Consumer Category | FY 2018-19 | FY 2019-20 | FY 2020-21 | FY 2021-22 |
| 1(a) | Tariff LTD/Domestic | 5,08,716 | 5,14,292 | 5,24,578 | 5,35,069 |
| 1(b) | Tariff LTIG/Low Income Group | 1,835 | 1,840 | 1,840 | 1,840 |
| 2 | Tariff LTC/Commercial | 96,275 | 97,631 | 99,148 | 1,00,689 |
| 3 | Tariff LTI/Industry | 5,963 | 6,001 | 6,001 | 6,001 |
| 4 | Tariff LTP/Mixed (Hotel Industries) | 142 | 142 | 147 | 151 |

| | | Base Year Projections | Projections | | |
|---|---|---|---|---|---|
| | Consumer Category | FY 2018-19 | FY 2019-20 | FY 2020-21 | FY 2021-22 |
| 5A | Tariff LTAG/Agriculture (Pump sets / Irrigation) | 11,532 | 11,805 | 12,069 | 12,339 |
| B | Tariff LTAG/Agriculture (Allied Activities) | 185 | 193 | 193 | 193 |
| 6 | Tariff LTPL/ Public Lighting | 215 | 237 | 237 | 237 |
| 7 | Tariff LTH/ Hoarding and Signboards | 63 | 63 | 63 | 63 |
| 8 | Tariff-LTTS/ Temporary Supply | 5,350 | 6,001 | 6,197 | 6,399 |
| 9 | Tariff-HTI/ Industrial | 745 | 782 | 842 | 907 |
| 10 | Tariff HTFS Industrial (Ferro Mettallurgical/ Steel Melting/ Power Intensive/ Steel Rolling ) | 30 | 32 | 33 | 34 |
| 11 | Tariff HTC/ Commercial | 219 | 230 | 241 | 252 |
| 12 A | Tariff HTAG/ Agriculture (Pump Sets/ irrigation) | 42 | 43 | 44 | 45 |
| B | Tariff HTAG/ Agriculture (allied activity) | 3 | 3 | 3 | 3 |
| 13 | Tariff HTD/ Domestic | 3 | 3 | 3 | 3 |
| 14 | Tariff HTMES/ Defence Establishment | 12 | 12 | 12 | 12 |
| 15 | Tariff HTTS/ Temporary Supply | 1 | 4 | 4 | 4 |
| 16 | Single Point Supply | 1 | 1 | 1 | 1 |
| | Total | **6,31,333** | **6,39,316** | **6,51,655** | **6,64,242** |

**Table 18: Projection of category wise Connected Load (kW/kVA/HP) for the MYT Control Period**

| | Connected Load (kW) | Base Year Projections | Projections | | |
|---|---|---|---|---|---|
| | Consumer Category | FY 2018-19 | FY 2019-20 | FY 2020-21 | FY 2021-22 |
| 1(a) | Tariff LTD/Domestic | 13,75,773 | 14,06,668 | 14,77,001 | 15,50,851 |
| 1(b) | Tariff LTIG/Low Income Group | 182 | 188 | 188 | 188 |
| 2 | Tariff LTC/Commercial | 3,08,370 | 3,15,672 | 3,31,456 | 3,48,029 |
| 3 | Tariff LTI/Industry | 1,39,208 | 1,40,584 | 1,40,584 | 1,40,584 |
| 4 | Tariff LTP/Mixed (Hotel Industries) | 2,845 | 2,845 | 2,845 | 2,845 |
| 5A | Tariff LTAG/Agriculture (Pump sets / Irrigation) | 44,226 | 45,331 | 45,331 | 45,331 |
| B | Tariff LTAG/Agriculture (Allied Activities) | 1,495 | 1,532 | 1,532 | 1,532 |
| 6 | Tariff LTPL/ Public Lighting | 1,604 | 1,646 | 1,646 | 1,646 |
| 7 | Tariff LTH/ Hoarding and Signboards | 582 | 582 | 582 | 582 |

| | Connected Load (kW) | Base Year Projections | Projections | | |
|---|---|---|---|---|---|
| | Consumer Category | FY 2018-19 | FY 2019-20 | FY 2020-21 | FY 2021-22 |
| 8 | Tariff-LTTS/ Temporary Supply | 18,799 | 21,545 | 22,622 | 23,753 |
| 9 | Tariff-HTI/ Industrial | 4,74,980 | 4,96,386 | 5,01,386 | 5,11,386 |
| 10 | Tariff HTFS Industrial (Ferro Mettallurgical/ Steel Melting/ Power Intensive/ Steel Rolling ) | 1,01,300 | 1,02,300 | 1,03,300 | 1,04,300 |
| 11 | Tariff HTC/ Commercial | 71,057 | 83,370 | 99,370 | 1,05,370 |
| 12 A | Tariff HTAG/ Agriculture (Pump Sets/ irrigation) | 8,000 | 8,635 | 8,643 | 8,650 |
| B | Tariff HTAG/ Agriculture (allied activity) | 1,310 | 1,310 | 1,310 | 1,310 |
| 13 | Tariff HTD/ Domestic | 300 | 300 | 300 | 300 |
| 14 | Tariff HTMES/ Defence Establishment | 6,955 | 6,955 | 6,990 | 7,025 |
| 15 | Tariff HTTS/ Temporary Supply | 620 | 2,368 | 620 | 620 |
| 16 | Single Point Supply | - | - | - | - |
| | **Total** | **25,57,606** | **26,38,216** | **27,45,705** | **28,54,301** |

## 4.5 Distribution Loss

4.5.1 The Distribution loss as projected in the previous Business Plan control period could not be achieved due to lot of billing issues, lot of changes and transition of billing and collection agencies and less infusion of funds to strengthen and improve the distribution network. Since, now all the issues are resolved and data billing etc is done through SAP, the provisional actual distribution losses observed for FY 2017-18 are 14.41%. Further, considering that it is technically difficult to further reduce the transmission and distribution loss, and efforts are being taken to reduce these losses further with implementation of SAP, R-APDRP Part A schemes it expects results in control period. Accordingly, the revised projection of distribution loss for FY 2018-19 is considered as 14.25%.

4.5.2 The proposed distribution loss trajectory by ED-Goa for the control period is mentioned below.

**Table 19: Distribution Loss Reduction (%) Trajectory for the Control Period**

| Particulars | FY 2018-19 | FY 2019-20 | FY 2020-21 | FY 2021-22 |
|---|---|---|---|---|
| **Loss (%)** | 14.25% | 14.00% | 13.50% | 13.00% |

# CHAPTER 5. POWER PURCHASE PLAN

ED-Goa has prepared a power purchase plan through which it envisages to source power during the control period. In the previous section, ED-Goa had projected sales and the demand requirement for the State; based on that power requirement for the control period has been discussed in this chapter.

## 5.1 Energy Requirement

5.1.1 Based on the energy sales and distribution loss trajectory forecasted for the control period, the petitioner requests the Hon'ble Commission to approve the proposed energy balance for the control period based on the above projections.

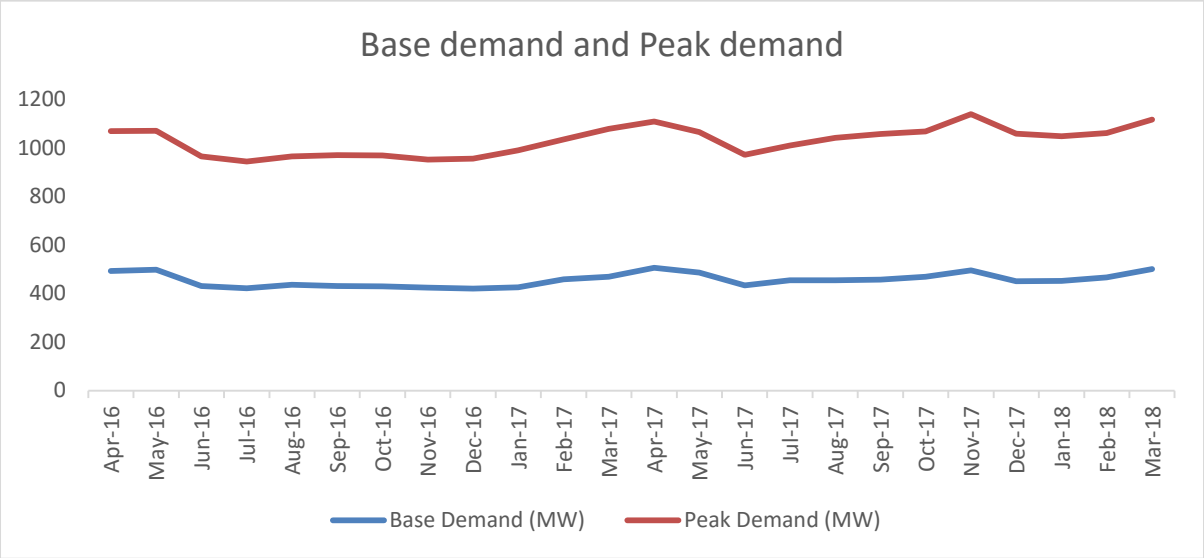
**Table 20: Energy Balance for the MYT Control Period**

| Energy Requirement (MU) | Projections | | | |
|---|---|---|---|---|
| | FY 2018-19 | FY 2019-20 | FY 2020-21 | FY 2021-22 |
| **Total Sales within Goa** | **3,661** | **3,783** | **3,909** | **4,038** |
| Loss (%) | 14.25% | 14.00% | 13.50% | 13.00% |
| Loss (MU) | 608 | 616 | 610 | 603 |
| Sales- UI/ Export to Exchange | - | - | - | - |
| **Total Energy Requirement at UT Periphery (MU)** | **4,270** | **4,399** | **4,519** | **4,642** |

## 5.2 Peak demand

5.2.1 The peak demand of Goa during FY 2017-18 was around 644 MW. As per CEA LGBR report, for FY 2017-18, the Energy Deficit and the peak deficit for the State of Goa were 0.0% (NIL) and 0.2% (1 MW) respectively. The total firm allocation of power from central sector is approx 575 MW. In addition, the department also purchases power from Co-generation stations within state and short term power procurement from the market, Traders, DEEP portal.

**Figure 10: Base Demand and Peak Demand (MW)**




5.2.2 Further, the highest demand recorded till August 18 is 657 MW (in April 18). To cater the peak demand, Hon`ble Chief Minister of Goa on behalf of Electricity Department of Goa had written to Hon`ble Minister of State, MNRE stating that the state is facing shortage during peak hours and surplus during off peak hours and requested to swap the off-peak hour allocation and peak hour allocation. In response, ED-Goa has received additional allocation of 18MW during peak hours from September 22, 2018 onwards. Further, ED-Goa needs to cater the peak demands it observes during summer season i.e. March to June months.

## 5.3 Power Purchase Sources

5.3.1 In this section, the Petitioner has projected energy requirement based on the existing and upcoming sources available to ED-Goa in the next control period. The power required for control period would be met through following sources:

- Central Generating Stations
- Within State Generation (Co-Generation Plants)
- Renewable Energy tie-ups
- Traders/Open Market/Short Term

Following assumptions have been considered for projecting the quantum of power purchase:

## 5.4 Share Allocation for CGS Station

5.4.1 The Petitioner has considered the plant wise share allocation from Central Generating Stations as per the latest per WRPC Allocation Circular No:WRPC/Comml.-

I/6/Alloc/2018/8673 dated 21st September 2018.

5.4.2 The following table shows the capacity share allocation (allocated +unallocated) for Central Generating Stations considered for projecting quantum of power purchase for the next control period.

**Table 21: Share of CGS from Allocated and Unallocated Capacity**

| Sr. No | Station | Peak Hrs (18.00 to 22.00) | | | Off Peak Hrs. (00 to 18.00 & 22.00 to 24.00) | | |
|---|---|---|---|---|---|---|---|
| | | Share from firm Allocation (MW) | Share from unallocated Allocation (MW) | Total Allocation (MW) | Share from firm Allocation (MW) | Share from unallocated Allocation (MW) | Total Allocation (MW) |
| 1 | Korba STPS | 210 | 5.86 | 215.86 | 210 | 6.03 | 216.03 |
| 2 | Korba STPS-III | 4.5 | 2.86 | 7.36 | 4.5 | 2.94 | 7.44 |
| 3 | Vindhyachal STPS-I | 35 | 5.34 | 40.34 | 35 | 5.49 | 40.49 |
| 4 | Vindhyachal STPS-II | 12 | 4.03 | 16.03 | 12 | 4.14 | 16.14 |
| 5 | Vindhyachal STPS-III | 10 | 4.03 | 14.03 | 10 | 4.14 | 14.14 |
| 6 | Vindhyachal STPS-IV | 11.2 | 5.71 | 16.91 | 11.2 | 5.87 | 17.07 |
| 7 | Vindhyachal STPS-V | 5.18 | 2.86 | 8.04 | 5.18 | 2.94 | 8.12 |
| 8 | Sipat Stage-I | 20 | 11.31 | 31.31 | 20 | 11.83 | 31.83 |
| 9 | Sipat Stage-II | 10 | 3.82 | 13.82 | 10 | 3.93 | 13.93 |
| 10 | Mouda STPS-I | 11.2 | 5.71 | 16.91 | 11.2 | 5.87 | 17.07 |
| 12 | Mouda STPS-II | 14.5 | 7.54 | 22.04 | 14.5 | 7.75 | 22.25 |
| 11 | Kawas Gas PP | 12.37 | 0.05 | 12.42 | 12.37 | 0.04 | 12.41 |
| 12 | Gandhar Gas PP | 12.63 | 0.05 | 12.68 | 12.63 | 0.04 | 12.67 |
| 13 | Solapur STPS | 7.55 | 3.77 | 11.32 | 7.55 | 3.88 | 11.43 |
| 14 | KAPP | 15 | 2.72 | 17.72 | 15 | 2.18 | 17.18 |
| 15 | TAPP3&4 | 11 | 6.66 | 17.66 | 11 | 5.33 | 16.33 |
| 16 | Ramagundum STPS | 100 | 0 | 100 | 100 | 0 | 100 |
| 17 | Extra Allocation | | 18 | 18 | | | |
| | **Total** | **502.13** | **90.32** | **592.45** | **502.13** | **72.4** | **574.53** |

* - As per WRPC Allocation Circular No:WRPC/Comml.-I/6/Alloc/2018/8673 dated 21st September 2018

5.4.3 Allocations of power have been obtained from the Ministry of Power (MoP) against the demand made by the State from Central Sector Generating Stations;

- For meeting the peak hour power requirement, MoP has allocated additional 18 MW to Goa from 22.9.2018 during peak hours
- Apart from this, power is obtained to some extent from the U.I (Unscheduled interchanges) pool depending upon permissible grid frequency and also from traders/ open market.

## 5.5 Power Purchase from New Stations

5.5.1 ED-Goa has also considered the power allocation made by the Ministry of Power for some of the upcoming power sectors of central generating companies during the control period. The same is as under:

**Table 22: Future Power Allocation/PPA with Central Sector Projects (MW)**

| Sr. | Power Projects | Capacity for Goa (MW) | Estimated date of Power Supply |
|---|---|---|---|
| 1 | Lara STPP – I & II | 7.31 | Oct 2019 |
| 2 | Khargone STPP | 11.75 | Oct 2019 |
| 3 | Gadarwara STPP | 14.55 | Oct 2019 |
| 4 | Kameng HEP | 2 | Oct 2019 |

5.5.2 The petitioner envisages supply from the above new generating stations is expected to be received from mid of FY 19-20. ED Goa has considered the cost (fixed +variable) of Rs 3.27/unit, Rs. 3.63/unit,Rs 4.32/unit for the plants Lara 1&II, Gadarwara and Khargone respectively, as provided by the Generator NTPC. Further, rate of Rs 3.99/unit has been considered for Kameng HEP. The above mentioned rates are for FY 2019-20 and have been escalated by 2% to arrive at the cost of each year for the control period.

5.5.3 ED-Goa has been provided additional peak allocation of 18MW from 22.9.2018, since the rate is not clear, ED-Goa has considered a rate of Rs.3.50/unit (fixed+variable) for the control period.

5.5.4 Apart from the above conventional sources, Ed-Goa has planned the tie-ups of Renewable energy during the control period to meet its RPO obligations. For Solar Power, ED-Goa is in advance stage of finalization of 125 MW solar with NTPC Solar and envisages the supply to start from second half of FY 2020-21 at the rate of Rs 3.0/unit at goa periphery.

Further, the petitioner has also tied up with SECI for 2x50 MW Wind power. The expected COD of first is 50 MW is May 2019 and for the next 50 MW is November 2019. ED-Goa has tied-up the power at a rate of Rs. 2.72/unit at goa periphery.

## 5.6 Plant Load Factor for CGS Stations

5.6.1 Since the present scenario for the conventional power stations is very volatile and competitive, hence, the past data cannot be relied upon for the correct picture. Accordingly, the petitioner has consider the actual PLF of the CGS for FY 2017-18 as per the monthly reports of CEA. It is submitted that CEA reports only provide for the actual PLF of the whole stations and not stage wise PLF. Hence, the PLF for all the stages of a CGS has bene considered same. The following table shows the actual PLF of Central Generating stations for last five years.

**Table 23: Actual PLF of CGS from FY 2017-18**

| Sr. No | Station | FY 2017-18 |
|---|---|---|
| 1 | Korba STPS | 89.91 |
| 2 | Korba STPS-III | 89.91 |
| 3 | Vindhyachal STPS-I | 89.92 |
| 4 | Vindhyachal STPS-II | 89.92 |
| 5 | Vindhyachal STPS-III | 89.92 |
| 6 | Vindhyachal STPS-IV | 89.92 |
| 7 | Vindhyachal STPS-V | 89.92 |
| 8 | Sipat Stage-I | 88.14 |
| 9 | Sipat Stage-II | 88.14 |
| 10 | Mouda STPS-I | 44.30 |
| 12 | Mouda STPS-II | 44.30 |
| 11 | Kawas Gas PP | 41.85 |
| 12 | Gandhar Gas PP | 54.04 |
| 13 | Solapur STPS | 39.62 |
| 14 | KAPP | 0.00 |
| 15 | TAPP3&4 | 90.96 |
| 16 | Ramagundum STPS | 82.84 |

*Source: CEA Monthly reports*

5.6.2 In case of new generating stations, normative PLF of 85% has been considered to carry out power purchase projections.

## 5.7 Auxiliary consumption

5.7.1 The Petitioner has considered auxiliary consumption for each of the central generating station as per the CERC Tariff Order for the period FY 2014-19 for the respective stations. The following table shows the auxiliary consumption considered for each of the FY of the control period.

**Table 24: Auxiliary Consumption considered for next control period**

| Sr. No | Station | Capacity | Aux. Consumption |
|---|---|---|---|
| 1 | Korba STPS | 2,100 | 6.68% |
| 2 | Korba STPS-III | 500 | 5.75% |
| 3 | Vindhyachal STPS-I | 1,260 | 9.00% |
| 4 | Vindhyachal STPS-II | 1,000 | 5.75% |
| 5 | Vindhyachal STPS-III | 1,000 | 5.75% |
| 6 | Vindhyachal STPS-IV | 1,000 | 5.75% |

| Sr. No | Station | Capacity | Aux. Consumption |
|---|---|---|---|
| 7 | Vindhyachal STPS-V | 500 | 6.75% |
| 8 | Sipat Stage-I | 1,980 | 5.75% |
| 9 | Sipat Stage-II | 1,000 | 5.75% |
| 10 | Mouda STPS-I | 1,000 | 5.75% |
| 12 | Mouda STPS-II | 660 | 5.75% |
| 11 | Kawas Gas PP | 656 | 2.50% |
| 12 | Gandhar Gas PP | 657 | 2.50% |
| 13 | Solapur STPS | 660 | 5.75% |
| 14 | KAPP | 440 | 10.00% |
| 15 | TAPP3&4 | 1,080 | 10.00% |
| 16 | Ramagundum STPS | 2,100 | 5.75% |

*As per CERC Tariff Orders for FY 2014-19

5.7.2 In case of new generating stations, normative Aux. Consumption has been considered as per as per CERC Tariff Regulation FY 2014-19 to carry out power purchase projections.

### 5.8 Fixed Charges

5.8.1 The draft Tariff Regulations for the tariff period FY 2019-23 have recently been notified by CERC and comments invited. However, CERC regulations and tariff orders the period FY 2020-24 for the central generating stations is not present. In absence of the tariff orders for FY 2020-24 of the central generating station. The Fixed costs of FY 2018-19, has been calculated based on the Q1 figures of FY2018-19 and considered for calculation of revised projections of base year FY 2018-19 for respective Central Generating Stations (wherever FY 2018-19 Q1 figures are not available, actual figures of FY 2017-18 are considered), and projections has been done with an escalation of 5% for purpose of estimation of the fixed charges for the control period. The fixed costs for each year of the control period has been considered same without any escalation.

### 5.9 Variable Charges

5.9.1 The petitioner has considered the actual per unit variable costs of FY 2018-19 Q1 and has calculated the revised projections of base year FY 2018-19 w.r.t to power purchase projections for respective Central Generating Stations(wherever FY 2018-19 Q1 figures are not available, actual figures of FY 2017-18 are considered). Further, y-o-y escalations of 2% has been considered during the control period. For PPCL, the same approach has been taken.

### 5.10 Principles of MoD

5.10.1 The Petitioner has considered the nuclear plants, hydro, Renewable energy as must run and has not subjected them to merit order dispatch. Accordingly, during the years FY 2020-21 & FY 2021-22, ED-Goa has not considered power of some costly CGS such as KGPP, GGPP,Solapur,Mouda-1, Mouda-II, Lara 1&2, Gadarwara and Khargone, wherever surplus has bene found.

5.10.2 For determining the power purchase cost, merit order dispatch principles have been applied. The must-run stations have been assumed at the top of the merit order and variable cost incurred for meeting the energy requirement within the state has been calculated from the plants at the top of the merit order.

5.10.3 Fixed Charges from all the generating stations (irrespective of the merit order) have been considered for arriving at the power purchase cost.

5.10.4 UI Over-drawal/ Under-drawal: As per the merit order principles adopted for estimating the energy requirement for the control period, no surplus sale of power has been considered for the control period and power purchase corresponding to meeting the requirement. The UI over-drawal has not been considered for the control period. Further, the UI over-drawal/ under-drawal quantum and amount would be submitted at the time of true-up based on the actual performance during the year based on the actual UI bills.

### 5.11 Transmission Losses

5.11.1 The Petitioner has considered the actual transmission losses of FY 2017-18 as the revised transmission losses for the base year FY 2018-19 and the same % losses have been considered over the control period. The transmission losses are to the extent of 3.26% for Western Region and 9.87% for Southern Region. The following table shows the transmission losses that are considered for energy projection.

**Table 25: Transmission Losses considered for the next control period**

| Transmission Loss | Projections | | | |
|---|---|---|---|---|
| | Base Year FY 2018-19 | FY 2019-20 | FY 2020-21 | FY 2021-22 |
| **Western Region** | **3.26%** | **3.26%** | **3.26%** | **3.26%** |
| Southern Region | 9.87% | 9.87% | 9.87% | 9.87% |

5.11.2 Accordingly, a weighted avg. Transmission loss of 4.45% has been considered for the entire control period.

### 5.12 Transmission Charges

5.12.1 The petitioner has considered the actual transmission charges for FY2017-18 and calculated the transmission charges per unit for PGCIL and has considered the same per unit charges for the base year FY 2018-19 and the entire control period without any escalations.

5.12.2 Based on the above assumptions, power purchase quantum for Central Generating Stations is derived for entire control period.

### 5.13 Energy Projection within State Generation

5.13.1 ED-Goa has tied up power from three Co-Generating Plants within State namely Goa Energy Private Limited (GEPL), Goa Sponge and Power Limited (GSPL) and Sesa Sterlite Limited (SSL).

5.13.2 The total energy projection from GEPL, SSL and GSPL for the entire control period is based on actual energy received in FY 2017-18 i.e 168.19 MUs and at the same rates.

### 5.14 Energy from Solar

5.14.1 EDG has been procuring power from the Renewable Sources whereby 6 MW Solar Power is procured from NVVNL and 25 MW from SECIL to meet its RPO obligations. The NVVNL tie-up will be till FY 19-20 only. Hence, power purchase from NVVNL has been considered in revised projections of FY 2018-19 and FY 2019-20 only. Power Purchase from SECI of approx. 51 MUs has been during the base year i.e FY 2018-19 and the entire control period.

5.14.2 Further, ED-Goa has planned the tie-ups of Renewable energy during the control period to meet its RPO obligations. For Solar Power, ED-Goa is in advance stage of finalization of 125 MW solar with NTPC Solar and envisages the supply to start from second half of FY 2020-21 at the rate of Rs 3.0/unit at goa periphery.

5.14.3 Apart from above, to meet any shortfall (if any) and to fulfill the Solar RPO obligation, EDG shall purchase power through short term (Traders) through DEEP portal.

### 5.15 Energy from Non-Solar

5.15.1 ED-Goa would be procuring non-solar Renewable power for meeting the RPO during MYT control period through short term on DEEP portal. ED-Goa is also procuring 2 MUs every year from Hindustan Waste Energy Ltd and the same has been envisaged to buy during the entire control period.

5.15.2 Further, the petitioner has also tied up with SECI for 2x50 MW Wind power. The expected COD of first is 50 MW is May 2019 and for the next 50 MW is November 2019. ED-Goa has tied-up the power at a rate of Rs. 2.72/unit and Rs.2.52/unit

respectively at goa periphery.

### 5.16 RPO Obligation

5.16.1 As discussed above, ED-Goa envisages to meet its RPO obligation through purchase of physical renewable power and may even exceed the RPO obligations as cheap power is available in the market, in comparison to the conventional sources. ED-Goa does not plan to buy and REC during the control period.

5.16.2 The following table shows the Renewable Purchase Obligation for Solar and Non Solar for ED-Goa for the respective years.

**Table 26: Details of RPO Obligation for ED-Goa for entire control period**

| S.No | Description | Unit | Revised Projections | Projections | | |
|---|---|---|---|---|---|---|
| | | | FY 2018-19 | FY 2019-20 | FY 2020-21 | FY 2021-22 |
| | | | | | | |
| 1 | Sales Within State | MUs | **3661** | **3783** | **3909** | **4038** |
| 2 | RPO Obligation | % | 9.00% | 11.50% | 14.10% | 17.00% |
| | - Solar | % | 3.60% | 4.70% | 6.10% | 8.00% |
| | - Non Solar | % | 5.40% | 6.80% | 8.00% | 9.00% |
| 3 | RPO Obligation | **MUs** | **329.53** | **435.05** | **551.18** | **686.53** |
| | - Solar | MUs | 131.81 | 177.80 | 238.45 | 323.07 |
| | - Non Solar | MUs | 197.72 | 257.25 | 312.72 | 363.46 |
| 4 | Power Purchase | **MUs** | **329.53** | **574.00** | **1,028.85** | **1,115.25** |
| | - Solar | MUs | 131.81 | 177.80 | 238.45 | 324.85 |
| | - Non Solar | MUs | 197.72 | 396.20 | 790.40 | 790.40 |

### 5.17 Power Purchase from Traders/ Short Term

5.17.1 To meet any shortfall, if occurs, EDG purchase power through short term (Traders). For FY 2018-19, ED-Goa has envisaged purchase of 210 MUs from traders/exchange/DEEP e-portal at a rate of Rs. 4.50/unit depending upon the past rates.

5.17.2 However, for the entire control period, ED-Goa does not envisage to buy any power from the traders/exchange/short term.

### 5.18 Power Purchase Projections

5.18.1 Based on the above assumptions, ED-Goa has considered projection on quantum of power in MU's for FY 2018-19 (base year revised projections) to FY 2021-22. The following table shows the quantum of power projected from different sources for the next control period.

**Table 27: Power Procurement in MU's for the entire control period**

| Sr. No. | Source | Capacity (MW) | Firm allocation to Licensee | | Avail. / PLF (in %) | Gross Generation (MU) | Aux consumption (%) | Net Generation (MU) | Power Purchase (MUs) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Base Year Projections | Projections | | |
| | | | % | MW | | | | | 2018-19 | 2019-20 | 2020-21 | 2021-22 |
| 1 | 2 | 3 | 4 | | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| **A** | **Central Sector Power Stations** | | | | | | | | | | | |
| **I** | **NTPC** | **24,034** | | **574.31** | | **1,69,741** | | **1,59,721** | 3,656 | 3,734 | 3,383 | 3,421 |
| | *KSTPS* | 2,100 | *10.29%* | *216.00* | 89.91% | 16,540 | 6.68% | 15,435 | 1,587.61 | 1,587.61 | 1,587.6 | 1,587.6 |
| | *VSTPS - I* | 1,260 | *3.21%* | *40.47* | 89.92% | 9,925 | 9.00% | 9,032 | 290.06 | 290.06 | 290.06 | 290.06 |
| | *VSTPS - II* | 1,000 | *1.61%* | *16.12* | 89.92% | 7,877 | 5.75% | 7,424 | 119.69 | 119.69 | 119.69 | 119.69 |
| | *VSTPS -III* | 1,000 | *1.41%* | *14.12* | 89.92% | 7,877 | 5.75% | 7,424 | 104.84 | 104.84 | 104.84 | 104.84 |
| | *VSTPS-IV* | 1,000 | *1.70%* | *17.04* | 89.92% | 7,877 | 5.75% | 7,424 | 126.53 | 126.53 | 126.53 | 126.53 |
| | *VSTPS-V* | 500 | *1.62%* | *8.11* | 89.92% | 3,938 | 6.75% | 3,673 | 59.55 | 59.55 | 59.55 | 59.55 |
| | *KGPP* | 656 | *1.89%* | *12.41* | *41.85%* | 2,406 | 2.50% | 2,346 | 44.36 | 44.36 | - | - |
| | *GGPP* | 657 | *1.93%* | *12.67* | *54.04%* | 3,112 | 2.50% | 3,034 | 58.49 | 58.49 | - | - |
| | *SIPAT- I* | 1,980 | *1.60%* | *31.74* | 88.14% | 15,288 | 5.25% | 14,485 | 232.22 | 232.22 | 232.22 | 232.22 |
| | *Solaphur* | 660 | *1.73%* | *11.41* | 39.62% | 2,291 | *5.75%* | 2,159 | 37.33 | 37.33 | - | 37.33 |
| | *KSTPS-III* | 500 | *1.49%* | *7.43* | 89.91% | 3,938 | *5.75%* | 3,712 | 55.13 | 55.13 | 55.13 | 55.13 |
| | *RSTPS* | 2,100 | *4.76%* | *100.00* | 82.84% | 15,239 | 5.75% | 14,363 | 683.95 | 683.95 | 683.95 | 683.95 |
| | *SIPAT- II* | 1,000 | *1.39%* | *13.91* | 88.14% | 7,721 | 5.75% | 7,277 | 101.24 | 101.24 | 101.24 | 101.24 |
| | *Mouda I* | 1,000 | *1.70%* | *17.04* | 44.30% | 3,881 | 5.75% | 3,658 | 62.34 | 62.34 | - | - |
| | *Mouda II* | 660 | *3.37%* | *22.22* | 44.30% | 2,561 | *5.75%* | 2,414 | 81.25 | 30.38 | - | - |
| | ***New Thermal Stations*** | | | | | | | | | | | |
| | *LARA 1&II* | 4,000 | *0.18%* | *7.31* | 85.00% | 29,784 | *5.75%* | 28,071 | | 25.65 | - | 0.71 |
| | *Gadarwara* | 2,640 | *0.55%* | *14.55* | 85.00% | 19,657 | *5.75%* | 18,527 | | 51.05 | - | - |
| | *Khargone* | 1,320 | *0.89%* | *11.75* | 85.00% | 9,829 | *5.75%* | 9,264 | | 41.23 | - | - |
| | *Additional Allocation* | | | *3.00* | 85.00% | 22 | *5.75%* | 22 | 11.17 | 22.34 | 22.24 | 22.34 |
| | *Add/ Less: Other Adjustments(URS Power)* | | | | | | | | - | - | - | - |
| | | | | | | | | | - | - | - | - |

| Sr. No. | Source | Capacity (MW) | Firm allocation to Licensee | | Avail. / PLF (in %) | Gross Generation (MU) | Aux consumption (%) | Net Generation (MU) | Power Purchase (MUs) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Base Year Projections | Projections | | |
| | | | % | MW | | | | | 2018-19 | 2019-20 | 2020-21 | 2021-22 |
| II | **New Hydro Station** | | | **2.00** | | | | | | **11.03** | **11.03** | **11.03** |
| | *Kameng HEP* | | | 2.00 | | | | | | 11.03 | 11.03 | 11.03 |
| | | | | | | | | | | | | |
| III | NPCIL | 1,520 | | 28 | | 8,606 | | 7,745 | 90 | 90 | 90 | 90 |
| | *KAPS* | 440 | *3.53%* | *15.52* | 0.00% | - | 10.00% | - | - | - | - | - |
| | *TAPS* | 1,080 | *1.17%* | *12.60* | 90.96% | 8,606 | 10.00% | 7,745 | 90.37 | 90.37 | 90.37 | 90.37 |
| | | | | | | | | | - | - | - | - |
| IV | Traders | | | | | | | | 210.45 | - | - | - |
| | *a)IEX PURCHASEAND SALES* | | | | | | | | - | - | - | - |
| | *b) Traders* | | | | | | | | - | - | - | - |
| | | | | | | | | | - | - | - | - |
| V | OVER/ UNDER DRAWAL | | | | | | | | - | - | - | - |
| | | | | | | | | | - | - | - | - |
| VI | *Banking of Power* | | | | | | | | - | - | - | - |
| | | | | | | | | | - | - | - | - |
| B | Within State Generations | | | | | | | | - | - | - | - |
| I | CO- GENERATION | 26.0 | | | | | | | **168.19** | **168.19** | **168.19** | **168.19** |
| | *Vedanta Plant-1* | 14.0 | | | | | | | 92.90 | 92.90 | 92.90 | 92.90 |
| | *Vedanta Plant -2* | 10.0 | | | | | | | 69.89 | 69.89 | 69.89 | 69.89 |
| | *Goa Sponge and private limited* | 2.0 | | | | | | | 5.40 | 5.40 | 5.40 | 5.40 |
| | | | | | | | | | | | | |
| C | **RPO Obligation** | ***225.0*** | | **-** | | | | | **329.53** | **574.00** | **1,028.85** | **1,115.25** |
| | | | | | | | | | | | | |
| | Solar | | | | | | | | 131.81 | 177.80 | 238.45 | 324.85 |
| | *NVVNL Solar* | | | | | | | | 11.60 | 11.60 | | |

| Sr. No. | Source | Capacity (MW) | Firm allocation to Licensee | | Avail. / PLF (in %) | Gross Generation (MU) | Aux consumption (%) | Net Generation (MU) | Power Purchase (MUs) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Base Year Projections | Projections | | |
| | | | % | MW | | | | | 2018-19 | 2019-20 | 2020-21 | 2021-22 |
| | *Short Term Tender DEEP portal* | | | | | | | | 69.12 | 115.11 | 50.48 | - |
| | *SECI Solar* | | | | | | | | 51.10 | 51.10 | 51.10 | 51.10 |
| | *NPTC Solar* | 125.0 | | | | | | | | | 136.88 | 273.75 |
| | *Non-Solar* | | | | | | | | 197.72 | 396.20 | 790.40 | 790.40 |
| | *Short Term Tender DEEP portal (Non Solar)* | | | | | | | | 195.72 | - | - | - |
| | SECI WIND (Non Solar) | 100.0 | | | | | | | | 394.20 | 788.40 | 788.40 |
| | Hindustan waste treatment plant Goa | | | | | | | | 2.00 | 2.00 | 2.00 | 2.00 |
| D | REC Certificates | - | | | | | | | - | - | - | - |
| | | | | | | | | | - | - | - | - |
| E | OTHER CHARGES | - | | - | - | - | - | - | - | - | - | - |
| | *PGCIL Transmission Charges, Wheeling, Open Access & Trading Marrgin & Other Charges* | | | | | | | | - | - | - | - |
| F | **Total** | **25,905** | | **602.43** | **-** | **1,78,346** | **-** | | **4,454** | **4,578** | **4,682** | **4,806** |

**Table 28: Power Procurement Cost (in Rs. Cr) for the entire control period**

| Sr. No. | Source | Power Purchase Cost - Variable Cost (VC) (Rs.Cr) | | | | Power Purchase Cost - Fixed Cost Cost (FC) (Rs.Cr) | | | | Total Power Purchase Cost - (Rs.Cr) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Base Year Projections | Projections | | | Base Year Projections | Projections | | | Projections | | | |
| | | FY 2018-19 | 2019-20 | 2020-21 | 2021-22 | FY 2018-19 | 2019-20 | 2020-21 | 2021-22 | 2018-19 (Base Year) | 2019-20 | 2020-21 | 2021-22 |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| **A** | **Central Sector Power Stations** | | | | | | | | | | | | |
| **I** | **NTPC** | **591** | **635** | **538** | **562** | **313** | **328** | **328** | **328** | **903** | **963** | **866** | **890** |
| | *KSTPS* | 198.65 | 202.63 | 206.68 | 210.81 | 101.59 | 106.67 | 106.67 | 106.67 | 300.24 | 309.30 | 313.35 | 317.48 |
| | *VSTPS - I* | 42.30 | 43.15 | 44.01 | 44.89 | 25.36 | 26.63 | 26.63 | 26.63 | 67.66 | 69.77 | 70.64 | 71.52 |
| | *VSTPS - II* | 16.31 | 16.63 | 16.97 | 17.30 | 7.97 | 8.37 | 8.37 | 8.37 | 24.28 | 25.01 | 25.34 | 25.68 |
| | *VSTPS -III* | 14.29 | 14.57 | 14.87 | 15.16 | 9.90 | 10.39 | 10.39 | 10.39 | 24.19 | 24.97 | 25.26 | 25.56 |
| | *VSTPS-IV* | 17.37 | 17.72 | 18.07 | 18.44 | 17.23 | 18.09 | 18.09 | 18.09 | 34.60 | 35.81 | 36.16 | 36.52 |
| | *VSTPS-V* | 8.34 | 8.51 | 8.68 | 8.86 | 8.84 | 9.28 | 9.28 | 9.28 | 17.19 | 17.79 | 17.96 | 18.14 |
| | *KGPP* | 10.41 | 10.62 | - | - | 7.54 | 7.92 | 7.92 | 7.92 | 17.96 | 18.54 | 7.92 | 7.92 |
| | *GGPP* | 13.48 | 13.75 | - | - | 13.02 | 13.67 | 13.67 | 13.67 | 26.50 | 27.42 | 13.67 | 13.67 |
| | *SIPAT- I* | 28.56 | 29.13 | 29.71 | 30.30 | 28.74 | 30.18 | 30.18 | 30.18 | 57.30 | 59.30 | 59.89 | 60.48 |
| | *Solaphur* | 12.18 | 12.43 | - | 12.93 | 5.48 | 5.75 | 5.75 | 5.75 | 17.66 | 18.18 | 5.75 | 18.68 |
| | *KSTPS-III* | 6.73 | 6.86 | 7.00 | 7.14 | 6.17 | 6.47 | 6.47 | 6.47 | 12.89 | 13.34 | 13.47 | 13.61 |
| | *RSTPS* | 164.87 | 168.17 | 171.53 | 174.96 | 48.83 | 51.27 | 51.27 | 51.27 | 213.70 | 219.44 | 222.80 | 226.23 |
| | *SIPAT- II* | 12.50 | 12.75 | 13.00 | 13.26 | 6.52 | 6.84 | 6.84 | 6.84 | 19.01 | 19.59 | 19.84 | 20.10 |
| | *Mouda I* | 18.16 | 17.66 | - | - | 13.24 | 13.90 | 13.90 | 13.90 | 31.40 | 31.56 | 13.90 | 13.90 |
| | *Mouda II* | 22.68 | 8.05 | - | - | 12.15 | 12.75 | 12.75 | 12.75 | 34.83 | 20.80 | 12.75 | 12.75 |
| | ***New Thermal Stations*** | | | - | - | | | | | - | - | - | - |
| | *LARA 1&II* | - | 8.39 | - | 0.24 | - | | | | - | 8.39 | - | 0.24 |
| | *Gadarwara* | | 18.53 | - | - | - | | | | - | 18.53 | - | - |
| | *Khargone* | | 17.81 | - | - | - | | | | - | 17.81 | - | - |
| | *additional Allocation* | 3.91 | 7.82 | 7.78 | 7.82 | - | | | | 3.91 | 7.82 | 7.78 | 7.82 |

| Sr. No. | Source | Power Purchase Cost - Variable Cost (VC) (Rs.Cr) | | | | Power Purchase Cost - Fixed Cost Cost (FC) (Rs.Cr) | | | | Total Power Purchase Cost - (Rs.Cr) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Base Year Projections | Projections | | | Base Year Projections | Projections | | | Projections | | | |
| | | FY 2018-19 | 2019-20 | 2020-21 | 2021-22 | FY 2018-19 | 2019-20 | 2020-21 | 2021-22 | 2018-19 (Base Year) | 2019-20 | 2020-21 | 2021-22 |
| | *Add/ Less: Other Adjustments(URS Power)* | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| II | New Hydro Station | - | 4.41 | 4.50 | 4.59 | - | - | - | - | - | 4.41 | 4.50 | 4.59 |
| | *Kameng HEP* | - | 4.41 | 4.50 | 4.59 | | - | - | - | - | 4.41 | 4.50 | 4.59 |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| **III** | NPCIL | 28 | 28 | 29 | 29 | - | - | - | - | 28 | 28 | 29 | 29 |
| | *KAPS* | | | | | | | | | - | - | - | - |
| | *TAPS* | 27.8 | 28.3 | 28.9 | 29.5 | | | | | 27.76 | 28.31 | 28.88 | 29.46 |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| **IV** | Traders | 94.70 | - | - | - | | | | | 94.70 | - | - | - |
| | *a)IEX PURCHASEAND SALES* | | | | | | | | | - | - | - | - |
| | *b) Traders* | | | | | | | | | - | - | - | - |
| | | | | | | | | | | | | | |
| **V** | OVER/ UNDER DRAWAL | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| **VI** | *Banking of Power* | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| **B** | Within State Generations | | | | | | | | | | | | |
| **I** | CO- GENERATION | 40.40 | 40.40 | 40.40 | 40.40 | - | - | - | - | 40.40 | 40.40 | 40.40 | 40.40 |
| | *Vedanta Plant-1* | 22.35 | 22.35 | 22.35 | 22.35 | | | | | 22.35 | 22.35 | 22.35 | 22.35 |
| | *Vedanta Plant -2* | 16.76 | 16.76 | 16.76 | 16.76 | | | | | 16.76 | 16.76 | 16.76 | 16.76 |

| Sr. No. | Source | Power Purchase Cost - Variable Cost (VC) (Rs.Cr) | | | | Power Purchase Cost - Fixed Cost Cost (FC) (Rs.Cr) | | | | Total Power Purchase Cost - (Rs.Cr) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Base Year Projections | Projections | | | Base Year Projections | Projections | | | Projections | | | |
| | | FY 2018-19 | 2019-20 | 2020-21 | 2021-22 | FY 2018-19 | 2019-20 | 2020-21 | 2021-22 | 2018-19 (Base Year) | 2019-20 | 2020-21 | 2021-22 |
| | *Goa Sponge and private limited* | 1.30 | 1.30 | 1.30 | 1.30 | | | | | 1.30 | 1.30 | 1.30 | 1.30 |
| | | | | | | | | | | | | | |
| **C** | RPO Obligation | **257.80** | **302.24** | **507.84** | **526.19** | **-** | **-** | **-** | **-** | **166.16** | **198.96** | **301.28** | **319.63** |
| | | | | | | | | | | | | | |
| | Solar | 73.42 | 94.58 | 93.62 | 111.96 | | | | | 73.42 | 94.58 | 93.62 | 111.96 |
| | *NVVNL Solar* | 10.06 | 10.06 | - | - | | | | | 10.06 | 10.06 | - | - |
| | *Short Term Tender DEEP portal* | 33.52 | 54.68 | 22.72 | - | | | | | 33.52 | 54.68 | 22.72 | - |
| | *SECI Solar* | 29.84 | 29.84 | 29.84 | 29.84 | | | | | 29.84 | 29.84 | 29.84 | 29.84 |
| | *NPTC Solar* | | | 41.06 | 82.13 | | | | | | | | |
| | *Non-Solar* | 92.74 | 104.38 | 207.66 | 207.66 | | | | | 92.74 | 104.38 | 207.66 | 207.66 |
| | *Short Term Tender DEEP portal (Non Solar)* | 91.64 | - | - | - | | | | | 91.64 | - | - | - |
| | SECI WIND (Non Solar) | | 103.28 | 206.56 | 206.56 | | | | | - | 103.28 | 206.56 | 206.56 |
| | Hindustan waste treatment plant Goa | 1.10 | 1.10 | 1.10 | 1.10 | | | | | 1.10 | 1.10 | 1.10 | 1.10 |
| D | REC Certificates | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| **E** | OTHER CHARGES | - | - | - | - | - | - | - | - | 182 | 188 | 192 | 197 |
| | *PGCIL Transmission Charges, Wheeling, Open Access & Trading Margin & Other Charges* | | | | | | | | | 182.49 | 187.54 | 191.90 | 196.90 |
| **F** | **Total** | **1,011** | **1,011** | **1,120** | **1,163** | **313** | **328** | **328** | **328** | **1,415** | **1,423** | **1,433** | **1,481** |

# CHAPTER 6. CAPITAL EXPENDITURE

The Electricity Department has carried out significant improvement in transmission and distribution networks over the last few years, however the prevailing infrastructure is insufficient to cater to the present load growth. To meet the ever increasing demand from HT and LT consumers and moreover to overcome the constant interruptions, it is absolutely necessary to undertake significant capital expenditure. The strengthening of the sub-transmission and distribution infrastructure is of utmost importance in order to ensure reliable power supply to the end consumers. The transmission sector new schemes have also been proposed for ensuring flexibility of availing power supply from the Western Region and Southern Region and having a robust transmission network within the State to take care of future load growth. Further the network/ infrastructure in some parts of the state is insufficient to carry the required power to the consumers of that area.

The Capital investment plan for the State is needed to improve efficiency and to meet the constant growth in demand of the existing consumers; meet the requirement of strengthening of the system and to meet the Standards of Performance (SOP) laid down by the Hon'ble Commission. The Capital Investment is essential to undertake following initiatives:

- Improving quality of supply and reduction of interruptions;
- Proactive distribution network planning with viable funding plan;
- Distribution System Loss Reduction;
- Demand Side Management;
- Provide adequate transmission and distribution network to meet the growing load demands;
- Measures for capacity building and to improve working (including safety) conditions of employees.

## 6.1 Details of Capital Expenditure

6.1.1 ED-GOA plans to carry out the capital expenditure during the control period for augmentation and expansion of its capacity and to reduce the transmission and distribution loss in the system. The works to be carried out are with an intention to maintain a reliable and efficient system.

6.1.2 The major capital expenditure schemes being executed by ED-Goa are as follows:

- EHV New Transmission/Sub-Station/Capacitor banks

- RAPDRP Part A
- RAPDRP Part B/IPDS
- Underground cabling scheme
- Infrastructure development through Electricity Duty (Plan)
- Schedule Tribe Development Scheme
- Erection and Augmentation of 33/11 kV S/S & Lines
- Normal Development Schemes
- System improvement scheme
- Strengthening of 220 KV Transmission Network
- Erection of 220/110/33/11 KV Sub-Station at Verna (New)
- Construction of Staff Quarters and Office Buildings etc

6.1.3 The following are the proposed capital expenditure to be carried out in the control period.

**Table 29: Proposed Capital Expenditure for Control Period (Rs. Crore)**

| Project Details | | | | | Capital Expenditure | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Projections | | | |
| Name of scheme | Estimated Cost (Rs.Crs) | Approved by the Commission** (YES/NO) | Project Start Date (DD-MM-YY) | Project Completion date (DD-MM-YY) | FY 2018-19 Total | FY 2019-20 | FY 2020-21 | FY 2021-22 |
| | | | | | | | | |
| Schedule Tribe Development Scheme (P) | 379.08 | Partly | 2009-10 | Beyond 2021-22 (continuous) | 35.00 | 35.00 | 35.00 | 35.00 |
| | | | | | | | | |
| Infrastructure development through Electricity Duty (Plan) | 1,913.77 | Yes | 2008-09 | Beyond 2021-22 (continuous) | 250.00 | 470.00 | 360.00 | 200.00 |
| | | | | | | | | |
| Erection and Augmentation of 33/11 KV S/S line (Plan) | 59.00 | Yes | 2010-11 | 2021-22 | 1.00 | 10.00 | 10.00 | 10.00 |
| | | | | | | | | |
| Normal Development Schemes (Plan) | 145.32 | Yes | 2010-11 | 2021-22 | 14.00 | 15.00 | 15.00 | 15.00 |
| | | | | | | | | |
| System Improvement Schemes (Plan) | 58.11 | Yes | 2011-12 | 2021-22 | 18.00 | 15.00 | 12.00 | 12.00 |
| | | | | | | | | |
| Construction of staff quarters and office buildings (Plan) | 19.79 | Yes | 2011-12 | 2021-22 | 2.00 | 2.00 | 2.00 | 5.00 |
| | | | | | | | | |
| Strengthening of 220 KV Transmission Network | 20.65 | Yes | 2013-14 | 2021-22 | 1.00 | 6.00 | 1.00 | 1.00 |
| | | | | | | | | |
| Erection of 220/110/33/11 KV Sub-Station at Verna (New) | 343.00 | Yes | 2017-18 | 2020-21 | 5.00 | 100.00 | 130.00 | |
| | | | | | | | | |
| APDRP(State Schemes) | 86.00 | Yes | 2009-10 | 2018-19 | 1.72 | | | |
| | | | | | | | | |
| Restructured Accelerated Power Development and Reforms Programme Part A | 163.13 | Yes | 2011-12 | 2021-22 | 16.00 | 8.00 | 8.00 | 8.00 |
| | | | | | | | | |
| Underground Cabling | 391.86 | Partly | 2013-14 | 2021-22 | 20.00 | 50.00 | 50.00 | 100.00 |
| (R-APDRP) during Eleventh Plan period | | | | | | | | |
| | | | | | | | | |
| Public Lighting Scheme | 4.68 | Yes | 2013-14 | 2019-20 | 1.00 | | | |
| | | | | | | | | |

| Project Details | | | | | Capital Expenditure | | | |
|---|---|---|---|---|---|---|---|---|
| Name of scheme | Estimated Cost (Rs.Crs) | Approved by the Commission** (YES/NO) | Project Start Date (DD-MM-YY) | Project Completion date (DD-MM-YY) | Projections | | | |
| | | | | | FY 2018-19 Total | FY 2019-20 | FY 2020-21 | FY 2021-22 |
| R-APDRP Part B / IPDS | 563.57 | Yes | 2015-16 | 2021-22 | 35.00 | 115.00 | 150.00 | 200.00 |
| | | | | | | | | |
| EHV new Transmission / Sub-Station / Capacitor banks schemes | 827.50 | Yes | 2015-16 | 2021-22 | 0.16 | | | 25.00 |
| | | | | | | | | |
| Smartgrid Development of existing network | 252.00 | No | 2019-20 | 2021-22 | | 30.00 | 40.00 | 50.00 |
| | | | | | | | | |
| Sub-transmission and distribution improvement scheme | 1,155.00 | No | 2019-20 | 2021-22 | | 100.00 | 150.00 | 300.00 |
| | | | | | | | | |
| | | | | | | | | |
| **Total** | **6,382.46** | | | | **399.88** | **956.00** | **963.00** | **961.00** |

As can be seen from the table, the major capital expenditure is through funding through the Electricity Duty Fund (wherein establishment of new substations including EHV Sub-Stations and system strengthening is being undertaken). Also significant amount of capital expenditure is towards renovation and modernization / augmentation of system capacity under IPDS / DDUGJY (R-APDRP Part B subsumed into these schemes), Underground cabling for a reliable system in the towns etc. The new EHV schemes planned and under execution are basically for having a robust transmission network and making available the alternate source of power supply in case of eventualities. The proposed capital expenditure will definitely be helpful to achieve the loss targets set by ED-GOA in its distribution loss trajectory and to meet any additional load surging due to increase in demand

6.1.4 This section discusses the scheme wise capital expenditure and funding of the same to be carried out by ED-GOA for the MYT control period. Capital Expenditure Schemes other than Electricity Duty Fund are funded through the internal reserves/ equity contribution from Government of Goa or from the Electricity Duty fund. The funding for R-APDRP schemes had been facilitated through loan by Power Finance Corporation (PFC) which has been converted to grant upon timely completion of projects and as per the terms and conditions laid down in the agreement. The Project cost thus involves grant as well as internal reserves/ equity contribution from Government of Goa. The R-APDRP Part-B (now IPDS / DDUGJY) is being funded by Ministry of Power, GOI, to the extent of 60% of the Project cost and the 40% is being invested by internal reserves/ equity contribution.

ED-Goa has discussed below the benefits/ need for undertaking the major types of capital expenditure schemes only.

***EXISTING SCHEMES:***

6.1.5 **Normal Development Scheme** - The Scheme is for extending the HT and LT network and providing distribution transformer centres and releasing of service connections to all categories of consumers. The laying of underground cable for releasing connection to major consumers are also taken up. Electrification of upcoming hamlets are also taken up. The works are summarised as follows:

1. Extension of 33 KV, 11 KV and LT lines for arranging power supply to individual and group of consumers;
2. Erection of Transformer centres, metering structure, equipment for releasing of power supply to the intending consumers;
3. Releasing of power supply and providing of metering to the intending consumers at different voltage levels.

**Benefits arising after Execution:**

- Normal Development Schemes are generally undertaken for new consumers; releasing supply connections to them, and thereby increasing the sales and in turn revenue generation.
- In order to ensure timely connection release to the new intending consumers, ED – Goa undertakes such schemes so that power supply can be commenced without any delay and ensuring customer satisfaction. Such schemes will also ensure that ED – Goa complies with Standard of Performance as laid down by the Hon'ble Commission and compliance to the provisions of Electricity Act 2003.

6.1.6 **System Improvement Scheme -** This System improvement scheme / Renovation and improvement Scheme is basically for the change of conductors, cross arms, insulators, metal parts & stay sets, etc. The conversion of LT line from 1 phase to 3 phase is also carried out under this scheme for improving the voltage profile, also enhancing the capacities of the distribution transformer centres and providing new transformer centres at load centre is taken up under this scheme. In Goa, much of the conductors/poles etc. have put in more than 25-30 years of service in the system and thus have become prone to interruptions due to overloading and corrosion of the metal parts. Renovation of the old lines is essential to be carried out in the State to ensure reliability of power supply to the end consumers and avoid electrical accidents and to meet the Standard of Performance in terms of Reliability of Power Supply. Some of the underground conversion works of shorter length network/lesser scope is also being undertaken under the scheme.

The ongoing works and other sanctioned works will soon be completed. During the control period 2019-22, there will be reduction in capital expenditure towards this scheme, since most of the works of this nature have been proposed under the IPDS / DDUGJY scheme of the Central Government wherein grants are given, subject to fulfilment of conditionality and accord of approval to the schemes.

Following are the benefits of the scheme:

- To improve voltage at the tail end of each distribution system.
- Better power transformation.
- Line losses reduction.
- Less electrical accidents and breakdowns.
- Avoiding overloading of transformers and lines.
- Meet the standards of Performance laid down by the Hon'ble Commission.

**Benefits arising after Execution:**

- Renovation and Improvement Schemes are generally undertaken to maintain the distribution network so that breakdowns are avoided and more reliable /uninterrupted services/ supply is available to the consumers
- Such schemes will also ensure that ED – Goa complies with Standard of Performance as laid down by the Hon'ble Commission and compliance to the provisions of Electricity Act 2003.

6.1.7 **Construction of Staff Quarters and Office Buildings etc -** Under this scheme the construction of new office buildings/ extensions to existing buildings at various places and construction of staff quarters and repairs to existing quarters involving capital expenditure, taking up a number of works for enhancing the facilities at the quarters etc are carried out by the Civil Division No. XV and XVIII attached to the Electricity Department. During the control period, the new office building at Bicholim will be taken up and completed, apart from carrying out major renovation works of the staff quarters.

**Benefits arising after Execution**

- New office buildings are proposed in order that the different offices of a Division are housed in a single building which otherwise would often be housed in other rented places.
- Construction/Repairs of Staff Quarters and Office Buildings is to facilitate the availability of staff within premises of the Head Quarters for immediate reporting to duty in case of emergencies. Often such offices/quarters are constructed near the Sub-stations.
- Major capital maintenance works of staff quarters improves the living conditions of the employees.

6.1.8 **Schedule Tribe Development Scheme -**This scheme is basically for execution of works for the benefit of the Scheduled Tribe population. Works in the areas predominantly inhabited by tribal population are carried out under this scheme. Conversion of O/H HT network to underground cabling in major tribal dominated areas which are under execution will be completed. Similarly the conversion of the HT network of Netravali 11 KV feeder which is traversing through the forest areas is being taken up for execution during this year will also be completed in the control period. New works of similar nature will also be undertaken. Similarly works of setting up new distribution transformer centres in the tribal dominated areas are also being undertaken.

**Benefits arising after Execution**

- This scheme is mainly to facilitate the better power services for those areas where the tribal population accounts for 40% and above of the total population of that

area. The Government has also classified different areas under Category A, Category B, and Category C, depending upon the tribal population of the area.

- This will facilitate the development of the area which in turn will ensure the reliability of power supply to consumers of that area. The scheme is also mandatory in accordance with Govt. of India directives as per the constitutional mandate.

6.1.9 **Erection and Augmentation of 33/11 kV S/S & Lines –** This scheme is basically for establishment of new 33/11 KV Sub-Stations in the load areas alongwith the 33 KV line linking this Station, and augmentation of capacities at the existing Sub-Stations. During the control period, erection of new Substation at Balli and Dhabal alongwith the erection of the 33 KV lines will be undertaken.

Initially when the scheme was conceptualised, all new 33 KV Sub-Stations were undertaken under this scheme, however now major 33 KV Sub-Stations works are being undertaken under the Infrastructure Development through Electricity Duty Fund.

**Benefits arising after Execution**

- Initially, the power supply to the consumers in above areas was fed power from other sub-stations & lines which were far away. The length of the feeders was too long resulting into increase in losses and frequent interruptions.
- These schemes are mainly meant for reliability of power supply, bifurcation of feeder length thereby reduction in interruptions and improvement in reliability, better voltage profile and loss reduction.
- Such schemes will also ensure that ED – Goa complies with Standard of Performance as laid down by the Hon'ble Commission and compliance to the provisions of Electricity Act 2003.

6.1.10 **Infrastructure Development through Electricity Duty –** Government of Goa had issued notification on 28$^{th}$ May 2008 for collection of Electricity Duty from various consumer categories at various notified rates. Further the notification also provides that the duty amount such collected shall be transferred to separate reserve/ fund account for creation of required transmission & distribution infrastructure development for the State of Goa. There are various works being carried out under this scheme. Since the assets are created from the ED Fund, the costs such as Depreciation, Interest on Loan and return on Equity are not claimed in ARR and MYT.

Initially more emphasis was laid for linking major 33 KV Sub-Stations from 110 KV Sub-Stations with 33 KV underground cable link. This ensures reliability in power supply to the 33 KV Stations. Augmentation of 33 KV Sub-Station capacities was also undertaken. The conversion of the overhead 11 KV feeders to Aerial bunched cabling

in North Goa and South Goa totalling around 1000kms. of line has also been undertaken under this scheme.

Now emphasis has been laid for erection of new 33/11 KV Sub-Station at the load centres alongwith the extension of the 33 KV line to link this Sub-Station. The Sub-Station works include erection of Air insulated Sub-Station as well as establishment of Gas Insulated Sub-Stations. Gas Insulated Sub-Stations have been introduced for the first time in the State of Goa. In addition, the conversion of the overhead 11 KV network to underground cabling in Industrial estates, major feeders, are also undertaken. Conversion of overhead network to underground cabling in Curchorem and part of Porvorim has been undertaken. Similarly underground conversion in balance areas of Margao which Fatorda has also been undertaken. The conversion to underground system in the balance areas of the Porvorim constituency will be undertaken under phase-II. Underground cabling of the overhead network will also be taken up in Vasco and Navelim,

Further in order to have enhanced transmission capacities, the erection of new 220/33 KV Gas Insulated Sub-Stations are now being undertaken under this scheme. Since the capital investment cost for erection of EHV Sub-Stations is huge and the funds are available under the Electricity Duty Fund, therefore it is proposed to be undertaken under this Scheme. The erection of the Gas Insulated Sub-Station alongwith the associated 220 KV line network is being undertaken at Tuem in North Goa for catering to the load of the upcoming MOPA Airport and other Industrial development at Tuem Industrial Estate including setting up of Electronic cluster, and the loads in the vicinity. A 220/33 KV Gas Insulated Sub-Station is also being undertaken at Saligao in the coastal belt of North Goa to cater to the increasing load of the coastal belt areas which have been facing acute shortage of power owing to unavailability of capacity at the 33 KV level to feed the Sub-stations in the areas. The ED has moved forward in the direction of making a ring system of power system at the 220 KV level.

The change of conductor of the existing 110 KV Ponda-Verna and Ponda- Xeldem with higher capacity HTLS conductor is also being undertaken under this scheme. Similarly change of conductor of Verna to Sancoale 33 KV line with HTLS conductor is also being undertaken.

**Benefits arising after Execution:**

- The setting up of the 33 KV Sub-Stations at the load centres will enable to bifurcate the feeders, provide new feeders and thus be able to provide reliable and quality power supply.
- It will enable to release additional new loads, provide increase of loads of existing consumers.
- Underground cabling works will ensure reliability of the networks in the area chosen and also provide ring main system.

- The setting up of EHV Gas Insulated Sub-Stations at the load centres will enable to provide direct 33 KV link to the 33/11 KV Sub-stations in the vicinity which will drastically reduce the losses, enable to release additional loads from the 33 KV Sub-Stations, and also to avoid load shedding during peak hours. The Sub-Station will provide for industrial development in the region and generate employment opportunities in the region. The Sub-stations at Tuem and Saligao will also result in reduction of loading at Tivim Sub-Station which will in turn be able to take care of the loads of the other areas.
- The change of conductor with higher capacity conductor will enable higher transfer of power from these lines thus aiding additional loads to be released and also ensuring reliability of power supply.

The details of the works being carried out under the Electricity Duty Fund is shown below:

**Proposed Capital Expenditure for Works under Infrastructure Development through ED Fund**

| Sr. No. | Name of Work | Total Cost of Work (Rs. Crore) | Status |
|---|---|---|---|
| 1 | Conversion of overhead 11 KV HT network to Aerial Bunched Cabling in North and South Goa | 145.51 | Work is in progress. Around 25% work completed. |
| 2 | Work of New 50 MVA, 220/33 KV transformer & associated works at 220KV receiving station at Ponda and erection of 220/33/11KV GIS Substation at Tuem & 220KV double circuit transmission line from PGCIL Colvale to Tuem Goa | 180.00 | Tenders have been finalized. Work is in process for award. |
| 3 | Work of 2x10 MVA, 33/11KV (indoor type) sub-station at Badem & Mandrem | 65.66 | Work is in process for award. |
| 4 | Design, Supply, insatllation, Testing and Commisioning of 33/11KV Gas insulated Substation 2x16/20MVA alongwith associated equipments at Patto Plaza Panaji | 25.33 | Work has been recently awarded. |
| 5 | Work of 2x10MVA, 33/11KV Indoor type substation along with associated equipment's at Karaswado Mapusa. | 9.77 | Work has been recently awarded. Drawing approvals are in progress. |
| 6 | Work of laying of underground 33KV double circuit 3Cx400 sqmm cable from Porvorim Substation to Saligao Substation. | 7.43 | Work has been recently awarded. |
| 7 | Work of 2x10MVA, 33/11KV Indoor type substation along with associated equipment's at Sal in the juridiction of V.P Sal in Bicholim | 15.30 | Work has been recently awarded. |
| 8 | Work of conversion of existing O/H 11KV & LT line to U/G cabling system at Cacora Curchorem Municipal area in Curchorem constituency. | 29.47 | Work has been awarded. |
| 9 | Work for conversion of 11KV and LT overhead lines to underground network in the left out parts of Margao Municipal areas in Margao &Fatorda | 28.17 | Work has been awarded and work has commenced. |
| 10 | Work of erection of 33KV O/H line tapping from Mapusa II Circuit at Verla Canca to Nagoa Substation. | 1.76 | Work has been awarded recently. |

| Sr. No. | Name of Work | Total Cost of Work (Rs. Crore) | Status |
|---|---|---|---|
| 11 | Work of S.E.T & C for replacement of 5 Nos of 110 KV SF6 Circuit breakers (MOCB) on the existing foundations with new gang operated spring. | 1.40 | Work has been awarded and work is in progress. |
| 12 | Work of Development of V.P Ibrambur as Model Village under Sansad Adarsh Gram Yojana (SAGY) | 1.00 | Work has been awarded. |
| 13 | Work of laying of 11 KV XLPE underground cable from Candolim church to Saipem village | 1.61 | Work is in process for award. |
| 14 | Work of conversion of existing overhead 11KV line to underground system of feeders namely 11KV Torda, 11KV Housing Board, 11KV Pundalik Nagar feeder and associated LT network on transformer of said feeders and bifurcation of 11KV Torda feeder and Chogum road feeder emanating from 33/11KV Porvorim Sub-Station covering major portion of Porvorim Plateau area in Porvorim constituency. | 45.72 | Work has been recently awarded. Drawing approvals are in progress. |
| 15 | Work of laying of 33KV S/C 3 core 400 Sqmm. XLPE underground cable from Naveli Amona 220/33KV Sub-substation to Marcel for a distance of 8.4kms | 3.45 | Work has been awarded. |
| 16 | Work of linking of 33KV Velim, Canacona & MES DC feeder to 220/33KV Cuncolim Sub-Station. | 3.02 | Work has been awarded. |
| 17 | Work of conversion of HT/LT overhead network to underground HT &LT network in Cuncolim Industrial Estate | 10.80 | Work has been awarded. |
| 18 | Work of survey, design, supply, erection and commissioning of 3x63 MVA, 220/33 KV GIS Sub-Station at Saligao alogwith associated interconnecting 220 KV D/C line from 400/220 KV PGCIL Colvale Sub-Station to Saligao Sub-Station. | 181 | Work has been tendered. |
| 19 | Work of conversion of existing overhead 11 KV feeders to underground system, erection of new DTCs, augmentation of DTC, erection of additional feeders, conversion single phase to three phase, replacement of conductor, providing guarding, DP renovation etc. under Section Office Saligao and Britona. | 12.57 | Work has been tendered. |
| 20 | Work of providing 33 KV underground feeder from 110/33 KV Sub-Station to 33/11 KV Sub-Station at Nachinola. | 12.42 | Work has been tendered. |
| 21 | Change of conductor of 110 KV Ponda -Verna and Ponda -Xeldem with higher current capacity HTLS conductor. | 55.50 | Work has been tendered. |
| 22 | Change of conductor of 33 KV Verna Sancoale line with higher current carrying capacity HTLS conductor. | 14.15 | Work has been tendered. |
| 23 | Work of conversion of overhead network to Underground cabling in the balance areas of Porvorim constituency (Phase II) | 93.00 | Work not yet sanctioned. Wil be taken up later. |
| 24 | conversion of the overhead HT/LT network to underground cabling in the important town of Vasco, Navelim etc. | 200.00 | Estimates is under preparation. |

| Sr. No. | Name of Work | Total Cost of Work (Rs. Crore) | Status |
|---|---|---|---|
| 25 | Erection of 33/11 Kv Sub-Stations at Navelim, Calangute, Colva | 100.00 | Estimates under preparation. |
| 26 | Conversion of overhead HT network to Aerial Bunched Cabling (Phase II) | 150.00 | Estimates not framed. Will be taken up later. |
| | | | |

6.1.11 **Underground cabling scheme:**

The State of Goa being a coastal area with abundant vegetation (both forest & Agricultural) is prone to repeated interruptions in power supply due to uprooting of trees, falling of trees branches, and coconut tree leaves etc on the lines causing trippings, breakdowns and electrical accidents. The aesthetic beauty of the city is also disturbed with overhead lines dangling everywhere. To overcome such a problem, ED – Goa had initiated laying underground system. Initially underground cabling was taken up in the major cities viz Panaji, Madgaon, & some of the coastal belt areas wherein ED – Goa has also laid down 11 kV and LT u/g system and also some 33 KV feeders.

Presently, conversion of the overhead network to underground cabling is in progress in the areas of Bogda, Sada, Baina in Mormugao constituency. The work was hampered due to road/footpath development and beautification from other agencies and digging permission was not available. Now the same has resumed and will be completed during the control period.

New works of conversion of the overhead HT/LT network to underground cabling in the important towns of Mapusa and Ponda will also be undertaken under the underground cabling scheme.

**Benefits arising after Execution:**

- Reduction in Interruption due to Ring Main System/UG system.
- Improvement in Revenue due to less outage time.
- Stability in power Supply and better catering of load demand.
- Improvement in voltage level/ loss reduction.
- Reduction in complaints from Consumers.
- Meeting the SOP.
- Consumer satisfaction due to improved quality of power supply.

6.1.12 **Strengthening of 220 KV transmission network:**

The Scheme was envisaged for strengthening of the transmission network, provide additional power transformation capacities at the EHV Sub-Stations. Earlier a number of works had been carried out under this scheme such as replacement of power transformers with higher capacity power transformers at Tivim 110/33 KV Sub-Station, additional power transformer at Verna 110/33 KV sub-Station, shifting of transformer to Kadamba Sub-Station etc. Recently the work of setting up new SLDC and having feeder integration with existing RTU and SLDC was also undertaken. The work of protection audit at the EHV Sub-stations in the State has also been undertaken.

Under this scheme, immediately the work of replacement of the 40 MVA power transformer with 50 MVA power transformer at Tivim 110/33 KV Sub-Station will be undertaken in the control period. The 40 MVA power transformer which had been installed more than 30 years back is presently not in healthy condition and needs immediate replacement so as to be able to cater to the loads on the Sub-Station. In case of failure of the power transformer, there will be acute crisis since the loads will not be able to be diverted to any other Sub-Station.

**Benefits arising after Execution:**

- Ensuring stable operation of the EHV Sub-Station by being self reliant in transformation capacities..
- Releasing additional loads due to the additional transformation capacity available.
- Protection audit helps the EHV Sub-Stations to operate in healthy conditions by taking corrective measures.

6.1.13 **Erection 220/110/33KV GIS Sub-Station at Verna alongwith associated interconnecting 220 KV D/C line from Verna Sub-Station to 220/33 KV Cuncolim Sub-Station and 220 KV D/C line from Kadamba Sub-Station to Verna Sub-Station.**

The present installed transformation capacity of the 110/33KV Verna sub-station is 2x40MVA and 1x50MVA which are loaded to around 80% and future loads cannot be accommodated due to system constraints. The Verna sub-station is presently feeding to the Verna Industrial Estate, Verna, Sancoale, Vasco, Raia, Fatorda, Goa Airport (Dabolim), MPT, Indian Navy etc. The demand for loads from various categories of the consumers in the vicinity of the Verna areas is increasing day-by day due to upcoming of the new LT & HT consumers, IT, Pharma units, expansion of Verna Industrial Estate under Phase V & VI projects etc. Also the existing 110KV D/C transmission system from Ponda to Verna and Xeldem to Verna is already loaded to its peak and further loading will result in insulator string failure thereby resulting in power tripping. In view of above, it is necessary to upgrade and strengthen the existing Verna 110KV to 220KV level by augmenting transformation capacity with associated switchgear adopting GIS

Technology. It is therefore proposed to install 220/110/33 KV GIS sub-station at Verna alongwith the interconnecting 220KV D/C line from Verna sub-station to 220/33KV Cuncolim sub-station and 220KV D/C line from Kadamba sub-station to Verna sub-station. By erecting the proposed line south Goa can draw their required power directly from WR region from Colvale substation and dependability on SR can be avoided and the power crisis in the event of failure of SR supply can be avoided. This will also act as a ring main to the system.

The proposed GIS 220KV sub-station will be accommodated within the existing premises in the space available adjacent to the existing 110/33KV Sub-station.

It may also be noted that the Central Government under the aegis of the Ministry of Power, has approved establishment of Additional 400KV sub-station at Xeldem/Dharbandora in Goa and Additional system for power evacuation from Generation projects pooled at Raigarh (tamnar) pool, with the introduction of new concept of 400KV connectivity between new Xeldem/Dharbandora and existing 400/220KV Colvale(Mapusa) sub-station, to take care of any N-1-1 contingency involving problem/outage of any one 400KV infeed to Goa.

The evacuation and wheeling of power from this sub-station to Electricity GRID thereby interlinking Southern Region to Western Region through Goa Grid at 220KV level, is very important.

**Benefits arising after Execution:**

- Quality, reliable and uninterrupted power can be feed to MPT, Dabolim Airport, Vasco, Sancoale etc.
- Laying of 33KV dedicated feeder to the HT consumers in the vicinity of Verna Industrial Estate will also feasible after the commissioning of this sub-station.
- Load shedding on the various consumers including industrial feeder will be eliminated thereby reducing outage time of power supply. The un-interrupted power supply to the various HT consumers will result in boosting revenue of the Department.

### 6.1.14 EHV New Transmission/Sub-Station/Capacitor banks-

The scheme was basically envisaged for taking up new EHV Sub-Stations and new lines and installation of capacitor banks at the Sub-Stations. During the earlier control period although new EHV station was planned, however same was not taken up and instead the change of the conductor of the Ponda-Kadamba-Tivim 110 KV lines with higher current carrying capacity conductor (Casa Blanca) was undertaken. Additional 40 MVA power transformer was also installed at Kadamba Sub-Station. This measure has resulted in elimination of tripping of the lines due to overloading and helped in catering additional loads. The reliability of power supply to the capital city has

drastically improved.

By the end of the control period, it is proposed to augment the capacities of the other Sub-Station with additional power transformers so as to be self sufficient under any contingent situations and also installation of capacitors banks wherever necessary.

**Benefits arising after Execution:**

- Increase in power transfer through change of conductors of existing EHV transmission lines
- Increase in transformation capacity at the EHV Sub-Stations thus enabling additional loads.
- Providing capacitor banks at the Sub-Stations wherever necessary, will result in better voltage profile.

6.1.15 **R-APDRP Part A Schemes :**

The Ministry of Power/Government of India, had launched the Restructured APDRP scheme. The objective of the Restructured APDRP Scheme isto provide quality and reliable power supply to the consumers and to bring down the AT&C losses.

Restructured Accelerated Power Development and Reforms Programme (R-APDRP) focused on:

- Actual demonstrable performance in loss reduction;
- Establishment of reliable and automated systems for sustained collection of accurate base line Data and
- Adoption of information Technology in the areas of Accounting and auditing which will enable objective evaluation of the programme of utility before and after Implementation of the programme.

The project is being carried out in two parts:

**PART A:** It covers preparation of base-line data for the project area covering consumer indexing, GIS mapping, metering of distribution transformers and feeders and automatic data logging for all distribution transformers and feeders. It will also include adoption of IT applications for meter reading, billing and collection, energy accounting and auditing.

Under the programme, the Government of India has sanctioned projects that aim at establishment of reliable and automated systems for sustained collection of accurate base line data and the adoption of information technology in the area of energy accounting. The Power Finance Corporation had been nominated as the nodal agency

to make the above program operational.

The Electricity Department had undertaken the implementation of the Part A sanctioned Project at a cost of Rs. 104 crores. The Department has carried out the the work through the IT implementing Agency namely RECPDCL at a cost of Rs. 116 crores. The Project has been completed and the Department had requested the Power Finance Corporation, the nodal agency for the same, to covert the loan to grant. PFC has agreed to convert the same to grant amounting to Rs. 80 crores.

The scope of work completed involves energy billing which is being done on monthly basis, online payment avenues including mobile app have been developed, Customer care centre for registering their complaints have been established. The Customer Care Centre (Call Centre) is fully functional for the convenience of the public who can lodge their billing, Metering, electricity complaints etc. on 1912 toll free number, which is then forwarded to the concerned section offices for redressal by issuing notification. Facebook page is also available for the public.

Any Time Payment (ATP) machine alongwith Information Kiosks have also been installed at Panaji, Ponda, Mapusa, Margao, and Vasco for public to pay their bills through these machines. In addition cash collection centres are also functioning at the Sub-division level for the convenience of the public. Application for aviling service connection has also been made online.

Part A has also benefitted the Department in terms of GIS mapping of the Assets, generation of MIS reports for monitoring, etc.

The Facility Management Services are presently being availed as per the contract and cost towards the same will be met during the control period.

### 6.1.16 R-APDRP, Part B Schemes /IPDS/DDUGJY

**PART B:** covers renovation, modernisation and strengthening of 11kV Sub Station and distribution systems.

The scope of works under R-APDRP Part B covers renovation, modernization and strengthening of 11 kV level Substations, Transformers/Transformer Centers, Re-conductoring of lines at 11 kV level and below, Load Bifurcation, feeder separation, load Balancing, HVDS (11 kV), Aerial Bunched Conductoring in dense areas, replacement of electromagnetic energy meters with tamper proof electronic meters, installation of capacitor banks and mobile service centers etc. In exceptional cases, where sub-transmission system is weak, strengthening at 33 kV or 66 kV levels are also considered.

The Part-B of R-APDRP has been subsumed into **IPDS/ DDUGJY**, the new schemes that have been launched by the Government of India.

The Government of Goa had forwarded DPRs covering the above scope of works, under IPDS and DDUGJY separately to the Nodal agencies namely Power Finance Corporation (PFC) and the Rural Electrification Corporation(REC), however only an amount of Rs. 32.07 crores was sanctioned under IPDS for Metering scheme and Solar Rooftop, and an amount of Rs. 20 crores was sanctioned under DDUGJY for the metering scheme. Under this metering scheme the replacement of the old electro-mechanical and non-working meters with digital meters is under implementation. The rooftop Solar is also being undertaken shortly.

Since Goa has serious issues about reliability of supply due to breakdowns on account of various reasons such as corrosion of cross-arms, poles etc due to saline conditions, under size conductors installed around 20 to 30 years back, and therefore has serious plans to focus on renovating, modernizing, strengthening distribution network for improving operational and commercial efficiency, aesthetics, reliability and above all making network ready for Smart initiatives in the future

The Department has therefore submitted DPR to PFC for sanction under IPDS amounting to Rs. 465 crores covering the above scope of work, and the same will be taken up and completed during the control period.

The State is endeavouring to become a Model State in the country as regards the Power sector.

***NEW SCHEMES IN CONTROL PERIOD:***

6.1.17 **Sub-transmission and Distribution Improvement Scheme:**

The GED wants to automate its distribution network since this is the core sector which has a direct interface with the consumers. The entire focus will be two dimensional:-

a) Analysis based investment plan for strengthening of network, for which new sub-stations / lines / interconnectors / reconductoring, transformer augmentation / addition, revamping of Sub-Stations, High voltage distribution system, load balancing/feeder segregation, HT/LT Aerial bunched cables, capacitor banks/reactors at 11 KV and 33 KV, Laying of Under Ground cables in densely populated areas, have been planned.

b) Quantum jump in reliability, for which plans are afoot to have Grid Sub-Station automation and integration with SCADA, Strategic distribution RMU, FPI and Integration with DMS, Outage management system and integration with GIS and CRM, provisioning compatibility with SMART technologies etc.

The estimated cost of the works proposed to be executed is to the tune of say Rs. 550 crores to Rs. 600 crores.

In line with this objective GED is taking up implementation of **SCADA** (Supervisory Control and Data Acquisition), DMS (Distribution Management System), Distribution Automation, and Sub-Station Modernisation and Automation.

SCADA is an automation system for acquiring operational data from and controlling the numerous devices placed on the electrical grid. Distribution Management System (DMS) is a software that helps to monitor and manage the power flows in real-time on the electrical network equipped with SCADA. Together SCADA/DMS are used to measure the voltage, current, active power, reactive power, power factor etc., acquiring the status of switches, protection relays and faults of Feeder Terminal Unit (FRTU) controlling switches and relays from the control centre.

Typically, a Remote Terminal Unit (RTU) acts as an intermediate device between the control centre and Intelligent Electronic Devices (IEDs) placed on the grid. The communication requirements for SCADA have to be very reliable and secure.

**Distribution Automation (DA)** involves employing automation elements at various places on the electricity grid such as motorized Ring Main Units (RMU), sectionalizers, auto-reclosers and fault passage indicators (FPI) – all with communication systems. This centralizes the monitoring and control of the distribution network which further improves the reliability and efficiency of the electrical network. In case a feeder trips owing to a fault in one section, that portion can be isolated and supply to rest of the network can be restored immediately. Moreover, the exact location of the fault is known in the control centre and crew can be dispatched straight to that location instead of patrolling the entire feeder.

6.1.18 **Substation modernization and Automation:**

**Substation Automation (SA)** involves equipping the substation with digital relays and connecting them through reliable and secured communication systems with the control centre so that the substation can be remotely monitored and operated.

Sub-Stations will be converted into Gas Insulated Substations (GIS) so as to be remotely monitored and controlled.

**Advantages of Implementing SCADA systems for Electrical Distribution**

- Due to timely recognition of faults, equipment damage can be avoided
- Continuous monitoring and control of distribution network is performed from remote locations
- Saves labour cost by eliminating manual operation of distribution equipment
- Reduce the outage time by a system-wide monitoring and generating alarms so as to address problems quickly

- Improves the continuity of service by restoring service after the occurrence of faults (temporary)
- Automatically improves the voltage profile by power factor correction and VAR control
- Facilitates the view of historian data in various ways
- Reduces the labour cost by reducing the staff required for meter reading

6.1.19 **Smartgrid Development of the existing network:**

The GED also wants to have in place a Smartgrid network so as to be able to control the peak hour power situations. In line with this objective it is proposed to take up implementation of Smartgrid as a pilot project initially and then weighing the pros and cons and further implementing on a larger scale.

A **smart grid** is an electrical grid which includes a variety of operational and energy measures including smart meters, smart appliances, renewable energy resources, and energy efficiency resources. Electronic power conditioning and control of the production and distribution of electricity are important aspects of the smart grid. The following will form part of the SmartGrid system

**Advanced Metering Infrastructure (AMI)**

**AMI** shall be installed for all categories of customers to improve visualization of energy consumption and power quality management at customer level and facilitate peak load management through demand side management / demand response. Utility can have consumption record of each customer in fifteen-minutes-time-blocks which will be helpful in analysing consumption pattern and forecasting energy usage. At the same time customer can access their consumption data, which would help them in controlling monthly bills. Automatic meter recording would eliminate requirement of manual process of meter reading, which would make billing system more accurate, efficient and faster. Using two way communication system of the AMI, pricing signals can be sent to customers and enable their participation in demand response programs. With the implementation of ToU tariff, customers may avail lower tariff at off-peak load conditions thereby helping them to reduce their electricity bills.

## 6.2 Funding of Capital Expenditure

6.2.1 ED-GOA plans for funding majority of its capital expenditure is through the Government equity infusion and from the Electricity Duty fund of Government of Goa. The works carried out under R-APDRP (Part A) and IPDS / DDUGJY is funded by Ministry of Power, Government of India through Power Finance Corporation / Rural Electrification Corporation.

6.2.2 For IPDS / DDUGJY works the petitioner seeks to being funded to the extent of 75% by Ministry of Power, Government of India (at present considered 60% in MYT). The 25% funding for this scheme is proposed to be arranged from the State's own resources ( at present 40%).

### 6.3 Spill over of schemes from last control period and Capitalization Schedule

6.3.1 ED-GOA had plans during the last control period for taking up a number of works for sub-transmission and distribution improvement under the R-APDRP Part B (IPDS/DDUGJY), which would have virtually overhauled the entire distribution network of the Department. However it was not to be so, since the Ministry of Power did not accord sanction for the system improvement works worth more than Rs. 1000 crores and instead accorded sanction for a mere Rs. 52 crores totally (IPDS/DDUGJY) for installation of digital meters and Solar rooftops. Thus the works have spilled over to this control period and now the ED has forwarded DPR worth Rs. 465 crores for sanction under IPDS. The implementation depends upon sanction by the Central authorities. In the meantime the Department has framed new Scheme for implementation during the new control period namely sub-transmission and distribution improvement scheme for taking up works similar to that provided under IPDS/DDUGJY scope including automation/SCADA.

The other works which could not be taken up during the last control period as initially envisaged was under the EHV New Transmission/Sub-Station/Capacitor banks scheme. Under this scheme a number of new 110/33 KV Sub-Stations along with the 110 KV lies were to be taken up, however due to changed conditions such as setting up of additional 400 KV Sub-Station in South Goa by the Central Transmission Utility, the same have not been taken up. These schemes have been revisited and instead other alternative and more viable options have been considered such as setting up of 220/33 KV Sub-Stations and having 220 KV network linking North and South Goa thus providing ring system at the EHV level. Change of conductors of the existing 110 KV lines were taken up for immediate remedial measures and another change of conductor is being undertaken. The Verna 220/110/33 KV Sub-Station has also spilled over and therefore the line linking this Sub-station has also been changed as per the present prevailing conditions as explained herein above.

The underground cabling scheme has also spilled over as works of conversion to underground system in the important towns could not be taken up earlier and will be executed during the new control period.

6.3.2 The Capitalisation schedule as planned earlier during the last control period has thus been pushed forward to the next control period since the proposed Capital Projects could not be executed. The capitalisation has also been considered upon completion of the Projects. Most of the Capital intensive Projects will be completed during the new control period and thus there is significant Capitalisation proposed during the new control period. It is pertinent to mention here that a number of works have

already been tendered and the major execution and expenditure incurred will happen during the new control period, thus Capitalisation.

**Table 30: Proposed Capitalization for the Control period**

| Project Details | | | |
|---|---|---|---|
| Name of scheme | Projections | | |
| | FY 2019-20 | FY 2020-21 | FY 2021-22 |
| 1 | | | |
| Scheduled castes development scheme(P) | | | |
| | | | |
| Schedule Tribe Development Scheme (P) | 55.00 | 25.00 | 40.00 |
| | | | |
| Machinery and Equipment (Plan) Motor Vehicles | | | |
| | | | |
| Infrastructure development through Electricity Duty (Plan) | 250.00 | 394.00 | 400.00 |
| | | | |
| Erection and Augmentation of 33/11 KV S/S line (Plan) | | 20.00 | 10.00 |
| | | | |
| Normal Development Schemes (Plan) | 15.00 | 15.00 | 15.00 |
| | | | |
| System Improvement Schemes (Plan) | 13.00 | 10.00 | 15.00 |
| | | | |
| Construction of staff quarters and office buildings (Plan) | 1.50 | 1.50 | 4.00 |
| | | | |
| Strengthening of 220 KV Transmission Network | 6.00 | 1.00 | 1.00 |
| | | | |
| Erection of 220/110/33/11 KV Sub-Station at Verna (New) | | 235.00 | |
| | | | |
| Restructured Accelerated Power Development and Reforms Programme Part A | 8.00 | 8.00 | 8.00 |
| | | | |
| Research training and human research development | | | |
| | | | |
| Underground Cabling | 50.00 | 50.00 | 100.00 |
| (R-APDRP) during Eleventh Plan period | | | |
| | | | |
| Public Lighting Scheme | | | |
| | | | |
| R-APDRP Part B / IPDS | 115.00 | 150.00 | 200.00 |
| | | | |
| EHV new Transmission / Sub-Station / Capacitor banks schemes | | | 25.00 |
| | | | |
| Smart grid Development of existing network | 30.00 | 40.00 | 50.00 |
| | | | |
| Sub-transmission and distribution improvement scheme | 100.00 | 150.00 | 300.00 |
| | | | |
| **Total** | **643.50** | **1,099.50** | **1,168.00** |

## 6.4 Funding of Capital Expenditure

6.4.1 ED-GOA plans on funding majority of its capital expenditure through the Government and from the Electricity Duty fund of Government of Goa. The works carried out under R-APDRP (Part A) and IPDS / DDUGJY is funded by Ministry of Power, Government of India through Power Finance Corporation / Rural Electrification Corporation.

6.4.2 The disbursement from PFC has been availed against the scheme under R-APDRP Part A. As per the Central Government scheme the same may be converted into grant if the operational targets are achieved. In case of non-achievement of those operational targets the same disbursements will be considered as loan which may have an interest rate of 12% - 13%. Therefore this is an early stage at present to consider the PFC disbursement as loan or grant.

6.4.3 For IPDS / DDUGJY works the petitioner seeks to avail loan from PFC / REC and also to link some of the works with IPDS scheme to avail the loans from Central Government. The Integrated Power Development Scheme (IPDS) which is being funded to the extent of 75% by Ministry of Power, Government of India has been proposed to be taken up (at present considered 60% in MYT). The 25% funding for this scheme is proposed to be arranged from the State's own resources.

6.4.4 The EHV new Transmission / Sub-Station / Capacitor banks schemes have also been proposed to be taken up by availing loans from financial Institutions like REC/PFC. Loan repayment is proposed to be arranged through State's own resources.

**Table 31: Source of financing for Capex scheme**

| Project Details | SOURCE OF FINANCING for Capex Scheme | | | | |
|---|---|---|---|---|---|
| Name of scheme | Equity component | | Capital Subsidies / grants | Loan | Consumer Contribution component |
| | Electricity Duty Fund | Equity infusion - EDG/GoG | | | |
| 1 | | | | | |
| | | | | | |
| Schedule Tribe Development Scheme (P) | | 379.08 | | | |
| | | | | | |
| Machinery and Equipment's (Plan) Motor Vehicles | | | | | |
| | | | | | |
| Infrastructure development through Electricity Duty (Plan) | 1,913.77 | | | | |
| | | | | | |
| Erection and Augmentation of 33/11 KV S/S line (Plan) | | 59.00 | | | |
| | | | | | |
| Normal Development Schemes (Plan) | | 145.32 | | | |
| | | | | | |
| System Improvement Schemes (Plan) | | 58.11 | | | |
| | | | | | |
| Construction of staff quarters and office buildings (Plan) | | 19.79 | | | |
| | | | | | |
| Erection of 220/33/11kV Sub- Station at Verna | | 343.00 | | | |
| | | | | | |
| Strengthening of 220 KV Transmission Network | | 20.65 | | | |
| | | | | | |
| APDRP(State Schemes) | | 86.00 | | | |
| | | | | | |
| Restructured Accelerated Power Development and Reforms Programme Part A | | | 163.13 | | |
| | | | | | |
| Underground Cabling | | 391.86 | | | |
| (R-APDRP) during Eleventh Plan period | | | | | |
| | | | | | |
| Public Lighting Scheme | | 4.68 | | | |
| | | | | | |
| R-APDRP Part B / IPDS | | 563.57 | | | |
| | | | | | |
| EHV new Transmission / Sub-Station / Capacitor banks schemes | | 827.50 | | | |
| | | | | | |
| Smartgrid Development of existing network | | 252.00 | | | |
| | | | | | |
| Sub-transmission and distribution improvement scheme | | 1,155.00 | | | |
| | | | | | |
| **Total** | **1913.77** | **4305.56** | **163.13** | **-** | **-** |

# CHAPTER 7. NO. OF EMPLOYEES

As per Regulation 8 of the new MYT Regulations 2018 for the Control Period FY 2019-20 to FY 2021-22, the Business Plan shall cover as under:

*"8.4 The Business Plan filed by Distribution Licensee shall inter-alia contain;*

*a) Capital Investment Plan for each Year of the Control Period commensurate with load growth, distribution loss reduction trajectory and quality improvement measures proposed in the Business Plan in accordance with Regulation 8.5;*

*b) Capital Structure of each scheme proposed and cost of financing (interest on debt and return on equity), terms of the existing loan agreements, etc;*

*c) Sales Forecast for each customer category and sub-categories for each Year of the Control Period in accordance with Regulation 8.6;*

*d) Power Procurement Plan based on the Sales Forecast and distribution loss trajectory for each Year of the Control Period in accordance the Regulation 8.7;*

*e) Targets for distribution loss for each Year of the Control Period consistent with the Capital Investment Plan proposed by the Licensee;*

*f)* ***Projections for number of employees during each Year of the Control Period based on proposed recruitments and retirement;***

*g) Proposals in respect of income from Other Business for each Year of the Control Period."*

## 7.1 No. of Employees

7.1.1 ED-Goa has forecasted the no. of employees on the basis of the retirements and recruitments in the control period.

**Table 32: Proposed No. of Employees during the Control Period**

| Sr.No | Particulars | Actuals | | | | Projections | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | FY 2015-16 | FY 2016-17 | FY 2017-18 | FY 2018-19 (H1) | FY 2018-19 | FY 2019-20 | FY 2020-21 | FY 2021-22 |
| | | | | | | | | | |
| 1 | Number of employees as on 1st April | 5,845 | 5,769 | 6,566 | 6,601 | 6,519 | 6,373 | 6,241 | 6,100 |
| 2 | No. Employees on contract/deputation / foreign service as on 1st April | 716 | 603 | 594 | 594 | 594 | 594 | 594 | 594 |
| 3 | **Total number of employees (1+2)** | **6,561** | **6,372** | **7,160** | **7,195** | **7,113** | **6,967** | **6,835** | **6,694** |

| Sr.No | Particulars | Actuals | | | | Projections | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | FY 2015-16 | FY 2016-17 | FY 2017-18 | FY 2018-19 (H1) | FY 2018-19 | FY 2019-20 | FY 2020-21 | FY 2021-22 |
| 4 | Number of employees retired/ retiring during the year | 171 | 122 | 128 | 82 | 146 | 132 | 141 | 157 |
| 5 | No. Employees on contract/deputation / foreign service retiring/removed | 113 | 9 | - | - | - | - | - | - |
| 6 | Recruitment | 95 | 919 | 163 | - | - | - | - | - |
| 7 | Number of employees at the end of the year (3-4+5+6) | 5,769 | 6,566 | 6,601 | 6,519 | 6,373 | 6,241 | 6,100 | 5,943 |
| 8 | No. Employees on contract/deputation / foreign service at end of year | 603 | 594 | 594 | 594 | 594 | 594 | 594 | 594 |
| 9 | **Total no. of employees at the end of the year** | **6,372** | **7,160** | **7,195** | **7,113** | **6,967** | **6,835** | **6,694** | **6,537** |

7.1.2 The employee expenses shall be covered in the MYT petition in terms of the MYT Regulations 2018.

## CHAPTER 8. DISTRIBUTION WIRES BUSINESS & RETAIL SUPPLY BUSINESS

The Commission has come with the new MYT Regulations 2018 and as per Regulation 8 of the new MYT Regulations 2018 for the Control Period FY 2019-20 to FY 2021-22, the Business Plan shall cover as under:

*Quote*

*"8 Business Plan*

*8.1 The Transmission Licensee and Distribution Licensee shall file for the Commission's approval a Business Plan for the entire Control Period, approved by its authorized signatory by August 31, 2018:*

*Provided that the Generation Company shall not be required to file a Business Plan for the Control Period.*

***8.2 The Business Plan filed by the Distribution Licensee shall contain separate sections on Distribution Wires Business and Retail Supply Business.***

Further, Regulation 48 of the MYT Regulations 2018 for the Control Period FY 2019-20 to FY 2021-22, provides for the allocation statement for segregation between the for Distribution Wires Business and Retail Supply Business as under:

*"48 Separation of Accounts of Distribution Licensee*

*48.1 Every Distribution Licensee shall segregate accounts for Distribution Wires Business and Retail Supply Business and shall prepare an Allocation Statement. The wheeling charges pertaining to Distribution Wires Business of the Distribution Licensee shall be determined by the Commission on the basis of these segregated accounts:*

*Provided that in case complete accounting segregation has not been done, the following Allocation Statement shall be applicable:*

**Table 33 : Wire and Supply business allocation**

| Particulars | Wires business | Supply business |
|---|---|---|
| Power purchase expenses | 0% | 100% |
| Inter-state transmission charges | 0% | 100% |
| Intra-state transmission charges | 0% | 100% |
| Employee expenses | 40% | 60% |
| A&G expenses | 50% | 50% |
| R&M expenses | 90% | 10% |
| Capital cost | 90% | 10% |
| Depreciation | 90% | 10% |
| Interest on long-term loan | 90% | 10% |
| Interest on working capital and consumer deposit | 10% | 90% |
| Bad debts written off | 0% | 100% |
| Income tax | 90% | 10% |
| Non-tariff income | 10% | 90% |
| Income from other business | 50% | 50% |

Accordingly, ED-Goa has prepared the Business plan for Distribution Wires Business and Retail Supply Business separately using the allocation statement provided by the Commission. Since the Business Plan only covers a few elements of the ARR. Here only Power Purchase Expenses and Capital Investment Plan forecasted for the Control period can be segregated and covered, all other components shall be discussed in detail in the MYT Petition.

## 8.1 Business Plan for Distribution Wire Business

### 8.1.1 Power Purchase Expenses:

No power purchase expenses shall be incurred for the Wire Business.

### 8.1.2 Capital Expenditure, Capital Cost:

90% of the Capital cost, depreciation shall be for the Distribution Wire Business. Accordingly, the following table shows the project Capital Expenditure and Capitalization during the Control Period

**Table 34: Proposed Capital Expenditure for the Distribution Wire Business during the Control Period (Rs. Cr)**

| Projections | | |
|---|---|---|
| **FY 2019-20** | **FY 2020-21** | **FY 2021-22** |
| 860.40 | 866.70 | 864.90 |

**Table 35: Proposed GFA for the Distribution Wire Business during the Control Period (**Rs. Cr**)**

| | Projections | | |
|---|---|---|---|
| **Particulars*** | **FY 2019-20** | **FY 2020-21** | **FY 2021-22** |
| GFA at the beginning of the year | 1724.78 | 2303.93 | 3293.48 |
| Add: Additions during the year/Capitalization | 579.15 | 989.55 | 1051.20 |
| Closing GFA | 2303.93 | 3293.48 | 4344.68 |

## 8.2 Business Plan for Retail Supply Business

### 8.2.1 Power Purchase Expenses:

All the power purchase expenses (100%) shall be incurred for the Distribution Supply Business. The power Purchase expenses for the control period are as under:

**Table 36: Power Purchase Expenses for the Distribution Supply Business during the Control Period (Rs. Cr)**

| Projections | | |
|---|---|---|
| **2019-20** | **2020-21** | **2021-22** |
| 1,360 | 1,384 | 1,396 |

8.2.2 Capital Expenditure, Capital Cost:

10% of the Capital cost, depreciation shall be for the Distribution Wire Business. Accordingly, the following table shows the project Capital Expenditure and Capitalization during the Control Period

**Table 37: Proposed Capital Expenditure for the Distribution Supply Business during the Control Period (Rs. Cr)**

| Projections | | |
|---|---|---|
| **FY 2019-20** | **FY 2020-21** | **FY 2021-22** |
| 95.60 | 96.30 | 96.10 |

**Table 38: Proposed GFA for the Distribution Supply Business during the Control Period (Rs. Cr)**

| | Projections | | |
|---|---|---|---|
| **Particulars*** | **FY 2019-20** | **FY 2020-21** | **FY 2021-22** |
| GFA at the beginning of the year | 191.64 | 255.99 | 365.94 |
| Add: Additions during the year/Capitalization | 64.35 | 109.95 | 116.80 |
| Closing GFA | 255.99 | 365.94 | 482.74 |

1.1.2 Based on the above projections the petitioner requests the Hon'ble Commission to approve the Business Plan filed for Distribution Wires Business and Retail Supply Business for the control period.

# CHAPTER 9. PRAYERS TO COMMISSION

## 9.1 Prayers to Hon`ble Commission

The Electricity Department Goa (ED-Goa) respectfully prays to the Hon'ble Commission to:

a) Condone the delay in filing this Business Plan petition for the Control Period

b) Admit the Business plan for the Control Period FY 2019-20 to FY 2021-22 in accordance with Regulation 8 and Regulation 16 of JERC (GENERATION, TRANSMISSION AND DISTRIBUTION MULTI YEAR TARIFF) Regulations, 2018.

c) Approve the Business plan for the Control Period FY 2019-20 to FY 2021-22 in accordance with Regulation 8 and Regulation 16 of JERC (GENERATION, TRANSMISSION AND DISTRIBUTION MULTI YEAR TARIFF) Regulations, 2018.

d) Approve the principles and methodology proposed by ED-Goa in the Business Plan.

e) Approve the capital expenditure and source of funding as proposed by ED-Goa in the Business Plan.

f) Approve the Demand and Sales Assessment and projections as proposed by ED-Goa in the Business Plan.

g) Approve the Power Purchase Plan as proposed by ED-Goa in the Business Plan.

h) Approve the Capital expenditure and source of funding as proposed by ED-Goa in the Business Plan.

i) Pass any other Order as the Hon'ble Commission may deem fit and appropriate under the circumstances of the case and in the interest of justice.

j) Grant any other relief as the Hon'ble Commission may consider appropriate.

k) Condone any error/omission and to give opportunity to rectify the same.

l) Permit ED-Goa to make further submissions, addition and alteration to this Business Plan as may be necessary from time to time.