Performance Improvement Plan 2020-2024

BEDC

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1 Executive Summary

An affordable and reliable power is key for development of any economy. The Consortium of investors in BEDC and BEDC itself are committed to bringing to its customers and Nigeria, , "RELIABLE, EFFICIENT AND SUSTAINABLE ELECTRICITY SUPPLY". This will be done in manner that takes into account the expectations of all stakeholders including the investors themselves.

Performance Improvement plan

Under the Power Sector Recovery Program (PSRP), NERC intends to implement a more robust tariff review process aiming at improving the performance of the Nigerian Electricity Supply Industry (NESI). The process will involve a review of the application of the capital expenditure allowances in the MYTO model for compliance with Performance Improvement Plans (PIPs) to be prepared by the Distribution Companies (DisCos) and approved by the Commission. The approved PIP shall from the basis for the DisCos to prioritise and monitor the CAPEX & OPEX initiatives proposed. The approved PIPs shall be form the basis for the defining KPIs for the next 5 years by the NERC with emphasis on emphasis on improvement in energy throughput and improving service delivery to the customers.

The Management of BEDC with the assistance of the Consortium partners, with in-depth knowledge and analysis of the operations of BEDC over the last three and half years, has formulated this Performance Improvement Plan. As such, the Performance Improvement Plan of BEDC has been prepared with the basic strategy of reduction of AT&C losses, reduction of input energy through reduction of technical losses and managing the operating costs to attain financial profitability and meet stakeholders expectations.

The Performance Improvement Plan has been structured into the following major sections:

Section 2: of the report presents the Introduction to the BEDC and background of Privatization of Nigerian Power Sector.

Section 3: of the report presents the Objectives of the Performance Improvement plan to identify infrastructural gaps and achieve sustainable improvements

Section 4: provides a summary of the current infrastructure and resources of BEDC

Section 5: captures the achievements in the past 4 years and initiatives taken by BEDC to improve network conditions

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Section 6: Assesses the current gaps in network infrastructure, metering, power supply and manpower skills

Section 8: Details out BEDC's envisaged service levels for the future to improve quality & network availability

Section 9: Provides details of the ongoing programs and projects to meet the envisaged service levels

Section 10: Provides details of IT Tools and Management Systems implemented in BEDC

Section 11: Provides the yearly capex and capitalization forecasts up to 2025

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2 Introduction

2.1 Background of Power Sector in Nigeria

Electricity in Nigeria was governed by the erstwhile vertically integrated, the Power Holding Company of Nigeria (PHCN), formerly also known as the National Electric Power Authority (NEPA). Faced with the issue of persistent outage and unreliable supply under PHCN and considering the need of a reliable supply for a better economic growth, the Federal Government of Nigeria It enacted the Electric Power Sector Reform Act of 2005, which called for unbundling the national power utility company into a series of 18 successor companies: six generation companies, 12 distribution companies. Further, the Government came out with a Roadmap for Power Sector Reform in 2010. The envisaged vision of this roadmap was to increase the generation to 40,000 MW by year 2020 solving the power shortage situation. It was estimated that an investments to the tune of at least US$ 35 billion will be required to meet the target for power generating capacity alone, while much higher investment will be required to crate the matching transmission and distribution network. The Federal Government of Nigeria rightly acknowledged that such as huge investment cannot come from the government alone and will require private sector participation

"These sums cannot and will not be funded and directed by the Federal Government. Rather, central to the development of the sector will be the need to incentivise the private sector to partner with government in this endeavour"[1]

Accordingly, with the aim to increase efficiency and profitability of the sector, the erstwhile PHCN was unbundled into six generation companies (GENCOs, four thermal and two hydro), one Transmission and 11 distribution companies (DISCOs). The restructured generation and distribution companies were sold to new private owner and in November 2013, the formal handover of the successor companies to private investors was completed.

2.2 The Rationale for Performance Improvement Plan

One of the key component of privatization was to allow cost reflective tariff as proposed in MYTO 2. After privatization, four revisions (MYTO 2.1 in January 2015, MYTO 2.1 (Amended) in April 2015, MYTO 2015 in February 2016 and 2016-2018 minor review in August 2019) has been carried out. However, several key parameters with significant economic and financial impacts on DisCos have evolved differently from what was envisaged during privatization, leading to a huge accumulation of tariff shortfall. As such, NERC needs to conduct a major review of MYTO and fully update the values of the parameters defining the conditions for the distribution business for a new multi-year tariff period and assess the Revenue Requirement (RR) for each DisCo.

Under the Power Sector Recovery Program (PSRP), the Commission is implementing a more robust tariff review process aiming at improving the performance of the Nigerian Electricity Supply Industry (NESI). The process will involve a review of the application of the capital expenditure (CAPEX) and operating expenditures (OPEX) allowances in the MYTO model for Distribution Company (DisCo) to achieve its projected Performance Improvement Plan (PIP). PIP also aims at the elimination of tariff shortfalls by providing true cost reflective tariff.

[1] Roadmap for Power Sector Reform

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The approved PIPs will also be the basis for the defining Performance Standards/KPIs for the next five-year tariff period by the Commission with emphasis on improvement in energy throughput and delivery by DisCos, reduction in aggregate technical/commercial losses and overall improvement in service delivery to customers.

2.3 Strategic Intent

This Performance Improvement Plan (PIP) presents the strategies and actions planned to be deployed by BEDC over the 5 years from 2020 to 2024 within its service area. This will serve as a blue print for the sustainable development and utilization resources in an efficient and effective manner to meet the expectations of all key Stakeholders.

The major objectives of this Performance Improvement Plan can be described as follows:

1) An Objective, Fact Based Evaluation of the Benin Disco Business in its current reality

We believe the strategy and action plan must be developed with due consideration of present status of Benin Disco and Nigerian Energy Sector and the future prospects of the same. The PIP starts from the achievement of Benin Disco Business in last six year since takeover. The learnings, challenges, efforts and achievements of last 6 years and in achieving the Key Performance Indicators (KPI) targets of the Disco have been considered for developing future strategies in all key areas. Accordingly, the PIP aims to realistically align the required capex and opex to the KPI targets.

2) Alignment of Business Plan to meet Key Stakeholders' Expectations

As described in NERC guidelines for development of PIP, the DisCos are required to demonstrate clearly that in the preparation of the PIP, it has engaged stakeholders and that the outcome of such engagement has influenced the content of its Plan. Accordingly, BEDC has conducted stakeholder engagement secessions in 3 major locations to understand the stakeholder's views and aspirations and align the PIP to meet the expectations of all key stakeholders.

3) 100% metering of Customers under MAP scheme

One of the key challenges that BEDC is facing on collection front, is customers refusing to pay their estimated bill on pretext of it being high. Although the estimated bills are raised as per NERC approved methodology for estimated bill, the right to disconnect the customers in case of non-payment of those estimated bills are not fully provided to Discos. The limitation of approved capex in MYTO has limited the capacity of Discos in past to do 100% metering. However, with recent launch of MAP scheme where a third-party MAP is responsible for financing, procuring, installing and maintaining meters for customers. BEDC has rolled-out MAP scheme recently and plan to complete 100% customer metering by August 2021.

4) Metering of communities with bulk pre-paid and counter meters

BEDC have more than 1500 communities. The energy consumption per house and consequently per house revenue billing for such communities is quite low. Metering and subsequent monitoring of each customers within such communities not only lead to a high cost meter being used against very low per month billing but also increases effort in metering, billing and collection. Thus, the situation in case of these communities is exactly opposite to MD customers where per unit expected revenue is low but cost of servicing is very high. Considering this, BEDC has taken an initiative of providing cluster meters to these communities where a bulk prepaid meter is provided and the responsibility for collection and payment rests on the Community. In addition, in order to assist bulk billed communities in allocation of energy and

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cost among themselves, BEDC has installs counter meters to be utilized by customers in these bulk billed communities. All new community metering is expected to be MD PPM coupled with counter meters while we are also covering existing MD PPM bulk communities with counter meter.

NERC has come out with a consultation paper on Distribution Franchisee Scheme under which BEDC can utilise these communities as small franchisee based on cluster of DTRs for operation and collection. Once this franchisee scheme is approved the same bulk mater and counter meter will be used by franchisee for billing and collection.

BEDC plan to do franchisee of around 250 communities with 100 out of these 250 communities being served more reliable power through a combination of grid power and grid connected solar projects.

5) Improved Power Availability for Customers

One of the key objectives of PIP is to improve the quality of supply. To achieve this BEDC plans to undertake two-pronged strategy.

a. **Network Modernization:** BEDC Plans to completely revamp 13 Sample BU locations (Out of 27 BUs) using LT/ABC and Overhead Cabling in the following locations.

i. Benin City (Edo State)

- GRA- Full Modernization
- Sakponba
- Part of Okada

ii. Delta State

- Asaba
- Koka
- Warri
- Effuruma
- PTI

iii. Ondo State

- Akure
- Igbara Oke

iv. Ekiti State

- Ado Ekiti

Out of the above, 5 city modernization is planned in 1st phase for GRA, Asaba/Koka, Warri/Effurun, Akure and Ado-Ekiti at the cost of 46.78 billion Naira.

Such revamping aims to increase the reliability of supply with drastic reduction in outages due to failures.

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Reduced Dependence on Grid Power: Off late several large transformers of TCN has failed which put a large area in darkness/very low availability for months. Also, in absence of reliable grid supply BEDC is not able to ensure reliability and is losing some of the large industrial customers (i.e. plastic industries, breweries, processing industries) for whom reliability is utmost important. BEDC aims to tie up with Independent Power Producers (IPPs) in its area to provide alternative to grid supply and thereby increasing redundancy and reliability of supply.

For this at 2019, BEDC has received offers from over 35 IPP developers who wish to set up their Plants in BEDC's service area for a total of over 1,700MW. Out of this, 335 MW projects are Verified and strong for conclusion. BEDC is in process of inviting expression of interest to procure the power from these IPPs at a price discovered through transparent competitive bidding.

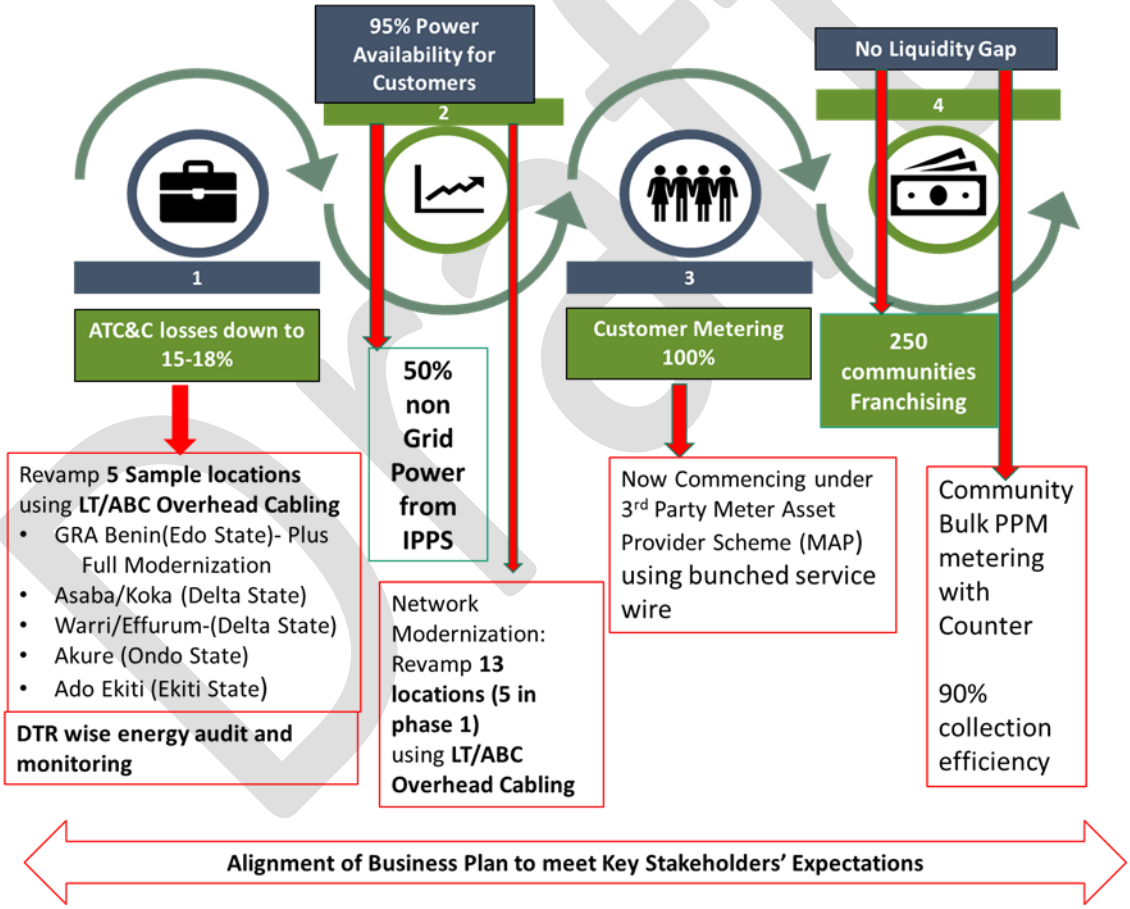

Figure 1: Alignment of Business Plan to meet Stakeholder Expectations

2.4 Company's Description

2.4.1 About BEDC

Benin Electricity DisCo ("BEDC" or "Benin DisCo") is one of the successor distribution companies ("DisCos") created following the unbundling and privatization of the state-owned Power Utility, Power Holding Company of Nigeria Plc. BEDC is responsible for retail distribution of electricity in Delta, Edo, Ekiti, and Ondo States with geographical coverage of 55,770 square kilometers. The company operates from twenty-seven business units with approximately 350 offices located across the four states with about 18 million people and about 4 million households.

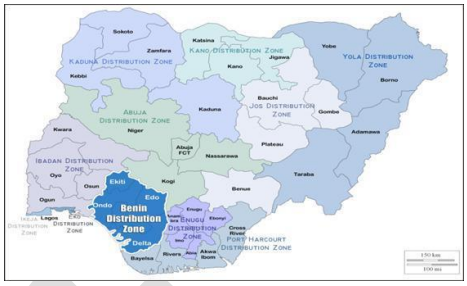

Figure 2: BEDC service area

BEDC is the 4th largest DisCo in distribution capacity and 3rd largest in number of households among the DisCos being privatized. BEDC is strategically located and uniquely positioned to maximize the opportunities that may arise as Nigeria's power trading market becomes more competitive and liberalized, as there are a number of major power generations and transmission hubs located within the distribution licensee area of BEDC.

2.4.2 Group Structure

BEDC is a joint venture between Vigeo Power Limited (VPL) and the Federal Government of Nigeria (FGN) represented by Bureau of Public Enterprises (BPE) and the Ministry of Finance (MOFI), with the majority being held by Vigeo Power as the core investor. The share holding Pattern of Vigeo Power Limited is as shown in the table.

Table 1: Shareholding Pattern

Share Holder	% Share
VIGEO HOLDINGS LIMITED (VHL)	32.06%
VHL INTERNATIONAL LIMITED	25.00%
AFRICA FINANCE CORPORTION	20.16%
DESIGN INNOVATION LIMITED	16.15%
GLOBAL UTILITIES MANAGEMENT CO. LTD, GUMCO	6.63%

BEDC through the majority equity partner (Vigeo Power Ltd.) has highly experienced and competent investors and technical partners comprising amongst others of Vigeo Holdings Limited (VHL) as the Lead Financial Investor; Africa Finance Corporation (AFC) as an Investor, Global Utilities Management Company Limited (GUMCO) as Technical Service Provider/Financial Investor and Tata Power as Technical Service Provider.

2.4.2.1 About GUMCO

GUMCO is a leading power utilities management company in Nigeria with over 14 years track record of performance in Ikeja, Ikorodu and Benin in Revenue Cycle Management (RCM) and National Pre-Paid

Metering Program (NPPMP) programs, both of which were private sector initiatives. GUMCO maintains strong relationships at all levels in the Nigerian Power Industry, and in particular, BEDC.

VPL has entered into a Management and Technical Services Agreement (MTSA) with GUMCO wherein GUMCO will use its experience in revenue cycle management in Lagos Nigeria to help BEDC in improving collection efficiency and metering. In terms of metering, GUMCO is one of the registered and licensed meter installers in Nigeria.

2.4.2.2 About Tata Power

VPL has entered into a Management & Technical Service Agreement (MTSA) with Tata Power Company (TPC), of India. Under the terms of the agreement TPC will provide the technical expertise that will drive the transformation of BEDC. TPC along with Govt. of Delhi has joint venture company TATA Power Delhi Distribution Limited (TPDDL). This company has distinguished itself by being the first success story of the Power Sector Reforms in New Delhi, India under the Public Private Partnership model. It succeeded in reducing ATC&C losses in its licensed area from over 53% to around 10.2% and exceeded benchmarks set by the regulator and international best practice for SAIFI, SAIDI, CAIFI and CAIDI over a period of ten years. The challenges and environment in Delhi at the time TPDDL take over were very similar to what BEDC is currently facing with. As such, the Nigeria Power Sector reform being carried out mirrors the Delhi Model and hence the experience of TPC is crucial in successful turnaround of the distribution business of the consortium.

2.4.2.3 About AFC

The AFC is leading Pan-African infrastructure financial institution, with strong in house power and utility management expertise. AFC brings to the Consortium, strong financial backing and its knowledge from prior similar transactions.

2.4.2.4 Vigeo Power

Vigeo Holdings is a multi-business enterprise with investments in oil & gas, shipping, financial services; power and marketing services.

Vigeo Power along with its highly experienced consortium partners, is geared to deliver on BEDC's full potential, providing electricity to its constituents.

2.4.3 Vision, Mission and Goals of BEDC

Mission and vision is crucial to communicate the purpose of the organization to stakeholders. A clear and concise, Mission and vision statement helps organization to develop right strategy and measurable goals to gauge the success of the organization's strategy. BEDC has developed its vision and mission statement to help the company align its efforts and focus its strengths on goal achievement.

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Figure 3: Vision, Mission and Goals

2.4.4 Business Overview: Operational and Financial

2.4.4.1 Business Description

At the time of takeover, BEDC had around 3.6 Million households with just 700,000 active customer. This clearly shows the potential BEDC had in terms of customer base expansion and revenue growth given the difference between actual live customers and the population of the service area. Also, the concentration of gas sources in Delta state was expected to spurt industrial development leading to increased demand of power. Although the growth of sales in initial years has not as per the expectations, the same is expected to grow at a faster pace with some big industries coming up and energization of communities bringing more and more household to electrification net. The table below gives the brief of BEDC operational spread.

Table 2: BEDC Operational spread

DisCo Information	Nov 2013	Aug 2019
Operational Area (Covering Edo, Delta, Ondo & Ekiti States)	57,500 sq. km.	57,500 sq. km.
Population	13.2 Million	18 Million
Households	3.6 Million	4.5 Million
State	4	4
Local Government Area	77	78
Customer Population*	700,000	1,005,313

*NERC estimates the customer base at over 1.1 million customers

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2.4.4.2 Existing Infrastructure

BEDC Electricity Plc. distributes Electricity in franchise area in 4 major states [Edo, Delta, Ondo and Ekiti states]. BEDC's operational is spread over 57,357 sq. km. We have inherited the Electrical network from erstwhile PHCN which was in the verge of collapse. Major challenges were, wooden poles and cross arms, tilted poles, undersized AAC conductors, lengthy lines, overgrown vegetation, Heavy oil leakages in Power and Distribution Power Transformers, absence of adequate protections and many more.

Presently, BEDC Electricity Plc. is fed from 17 TCN Substations through 68 nos. of 33kV lines. BEDC has invested lot of CAPEX in feeder rehabilitation, Transformer repairs and replacement of obsolete equipment. Also, BEDC has taken over 52 Nos. 33/11kv Injection substations, HVDS network, 33kv and 11kv lines from NIPP, PMU, FG and State Government projects. Present infrastructure details are given below:

Table 3: Current infrastructure details

S/N	DESCRIPTION	UNIT	QTY
1	Power Transformer	No	293
	Capacity	MVA	1,851.50
2	Distribution Transformer	No	13916
	Capacity	KVA	3,803.400
3	33KV Line	Circuit Km	5,436.08
	O/H	Circuit Km	5,378
	U/G	Circuit Km	58.08
4	11KV Line	Circuit Km	4,787.48
	O/H	Circuit Km	4,645.12
	U/G	Circuit Km	142.36
5	0.415KV Line	Circuit Km	26,499.20
	O/H	Circuit Km	26,206.90
	U/G	Km	292.30
6	33KV Outdoor Breaker	No	143
7	11KV Indoor Breaker	No	330
8	11KV Outdoor Breaker	No	69
9	Existing DSS Fenced	No	327

2.4.4.3 Financial Overview

Over the years leading up to the privatization, BEDC financial performance has been steadily worsening. The poor financial results was a result of weak cash flows, resulting from nearly stagnant revenue (mainly due to unauthorized supply and theft of power, non-collection of billed revenue, poor enforcement of debt recovery and uneconomic tariffs) and rapidly increasing operational cost. The increase in operational costs was mainly in the area of cost of power and staff salaries and not in maintenance of the network expenditure. As at October 2013 BEDC had over 6,000 staff with an average wage bill of nearly N 1 billion monthly. Monthly cash collection averaged at around N 1.6 billion and while cost of input power averaged around N 3.5 billion. Average monthly billing was around N 3.4 billion indicating poor revenue

management. It has to be noted that even with full recovery of revenue billed, the recovery of cost was not possible indicating that tariff set by regulator was not sufficient to recover the cost of supply.

After takeover, BEDC has worked towards rationalizing cost and improving collection, however, absence of cost reflective tariff, inability to raise debt due to poor financial position on paper and several regulatory hurdles has slowed down the improvement that was expected.

3 Activities involved in PIP

Under the Power Sector Recovery Program (PSRP), NERC is implementing a more robust tariff review process aiming at improving the performance of the Nigerian Electricity Supply Industry (NESI). The PIP guidelines for DisCos expects an output-based plan specifying target outputs over next 5 years, with a clear roadmap to achieve them along with resource mapping, cost and risk analysis. Based on the guidelines notified by NERC the overall activities can be broadly summarised as following:

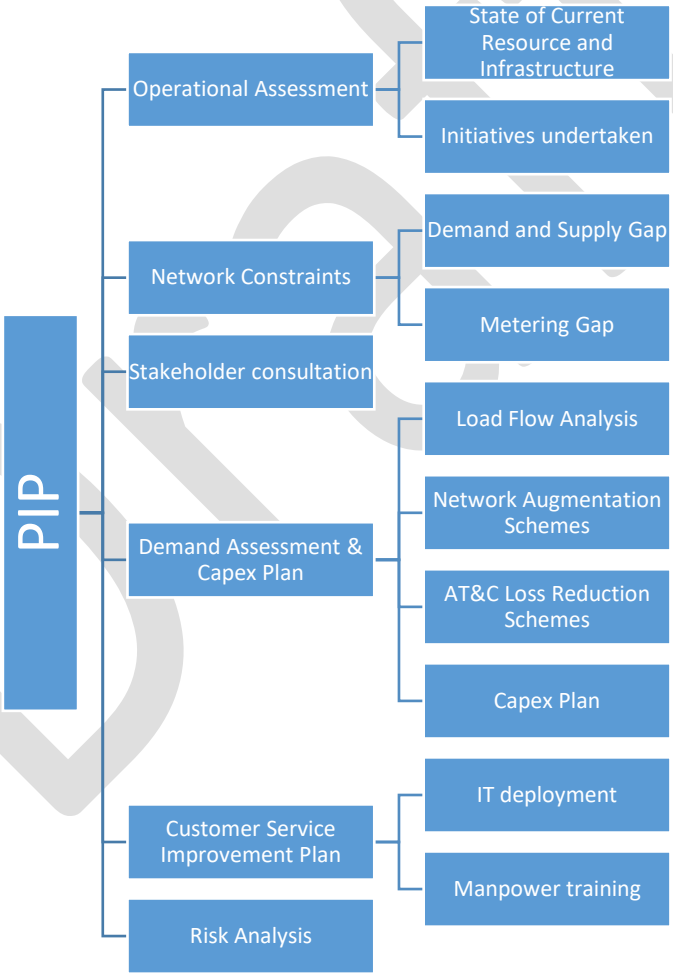


Figure 4: PIP structure

Each of these activities have been detailed in subsequent sections where in the with emphasis on improvement in energy throughput and delivery to customers, reduction in aggregate technical/commercial losses and overall improvement in service delivery.

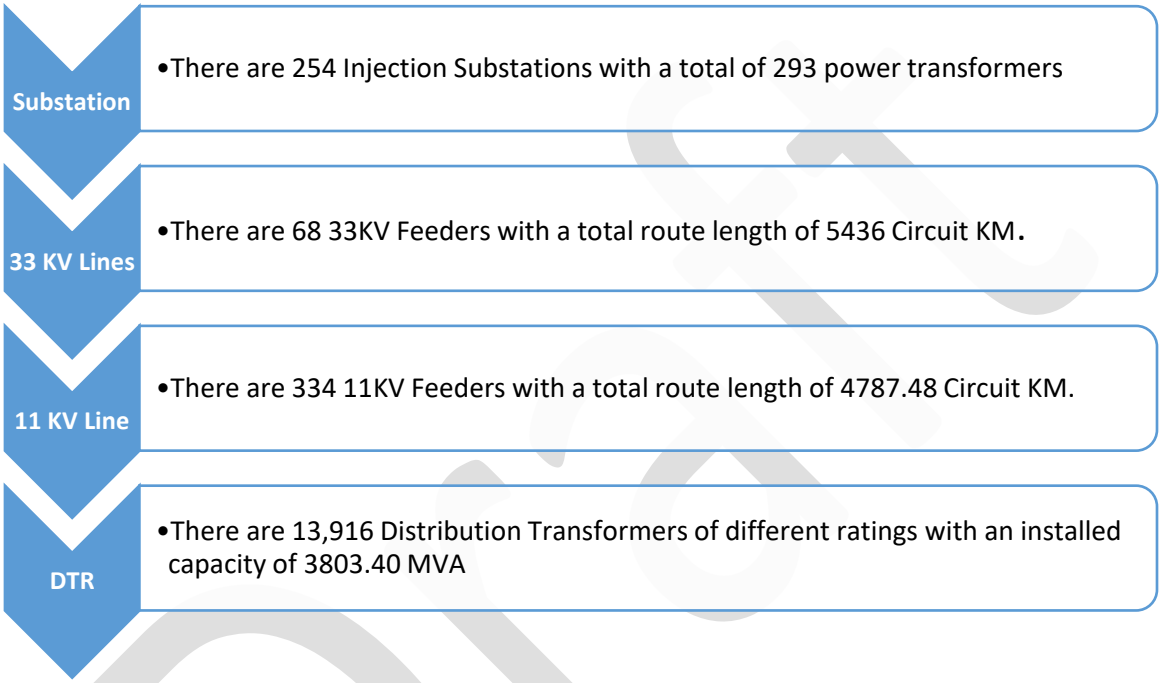
4 State of Current Resources and Infrastructure

4.1 Current Infrastructure

4.1.1 Network

BEDC inherited the network which was vastly inadequate and in a dilapidated condition. However, since takeover, the network has expanded significantly to improve power supply quality. The details of the network components is provided in section 2.4.2.2.

A broad overview of the network infrastructure is as following:



4.1.2 Metering and Metering Infrastructure

At the time of takeover, BEDC entered into a performance agreement for metering of customers based on baseline data provided during takeover. The same is as shown in the table below:

Table 4: Metering Targets

	Year 1	Year 2	Year 3	Year 4	Year 5
Metering Target	187523	290103	381520	376577	197814
New Connection Target	84199	91777	100037	109041	118853

Based on this Performance Agreement, an internal target for each head was set by BEDC to enable it in achieving the required performance target in a phased manner and thus transform BEDC into a benchmark utility in the Nigerian power sector. However, the base line information available at the time of takeover with respect to actual number of customers, numbers of defective meters, network adequacy etc. were far from reality. In reality, BEDC had more than 50% of unmetered customers. Among the

customers having meter, a large number of meters were either defective or have become sluggish over a period of time. While, old sluggish meters where directly contributing to loss of revenue by capturing lesser units, high estimated bills on account of defective meter or unmetered supply was used as an excuse for non-payment of bills by customers.

To counter this problem of lack of meters, faulty and sluggish meters and in some cases by-passed meters, BEDC aimed for 100% metering of customers and started mass scale metering under CAPMI scheme. A total of over 115,937 meters have been installed under the NERC approved CAPMI scheme wherein customers paid for pre-paid meters and received a credit for the fixed charge through vending. However, the progress of metering slowed down after CAPMI scheme was stopped by NERC as the level of capex allowed in MYTO was too small for such a huge metering gap.

At present BEDC has 1,005,313 customers out of which 554,469 customers are metered indicating close to 50% metering. While the overall metering of customer is low due to high number of inherited unmetered customers, BEDC has focused on grid metering and metering of MD customer achieving nearly 100% feeder metering and metering of MD customers.

The table below summarizes the existing metering infrastructure:

Table 5: Existing metering infrastructure

	Count	Count of meters
33 KV Feeders	70	70
11 KV feeder	330	330
Unmanned substation	130	130
DTR (public)	9,135	480
MD customers	3,462	3462
Non MD customers	1,001,851	551,006

4.1.3 IT and Automation

a. As on date Dedicated Internet Services available in the head office and Etete; including both Primary and Secondary services.
b. Billing Apps include:
✓ Pre-paid: Conlog Solutions
✓ Post-paid:
- eBMS (both web-based and On-Premise billing App);
- Cash Office Payment Systems (COPS)
- Automatic Meter Reader (AMR) = MOJEC and Genus Solutions

c. Website for BEDC: www.bedcpower.com;
d. Email Platform that uses bedcpower.com domain.
e. Intranet Portal built on our corporate domain.
f. On-Premise Servers for Tally, PPM and Post-paid deployed in the Server Room with complementary Servers in the Cloud.
g. Email and Intranet Portal Servers are exclusively in the Cloud.
h. Centralized Billing Centre at Etete for both PPM and post-paid Solutions.
i. PoS based options for both PPM and Post-paid, Banks, Agents and other Payment Channels are now available.

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4.2 Current Resources

4.2.1 Manpower

BEDC had a total of six thousand and ninety four (6,094) members of staff across all levels, as of 1st November 2013. Out of this number a total of 2,577 were given engagement letters by BPE for 6 months terminating April 30, 2014. While, the strength of manpower was quite high, the workforce diagnostics conducted at takeover revealed that the workforce was not aligned to the business objective. The performance was subjective, there was a complete absence of recruitment strategy, payroll was decentralized, training was not strategic and skewed towards Management Staff, industrial relations were poor and finally the employees had limited technical skills to carry out the day to day O&M work. Lack of administrative infrastructure such as computers, printers, ergonomically acceptable furniture and fittings with battered and un-hygienic buildings/offices further added to the woes of the situation.

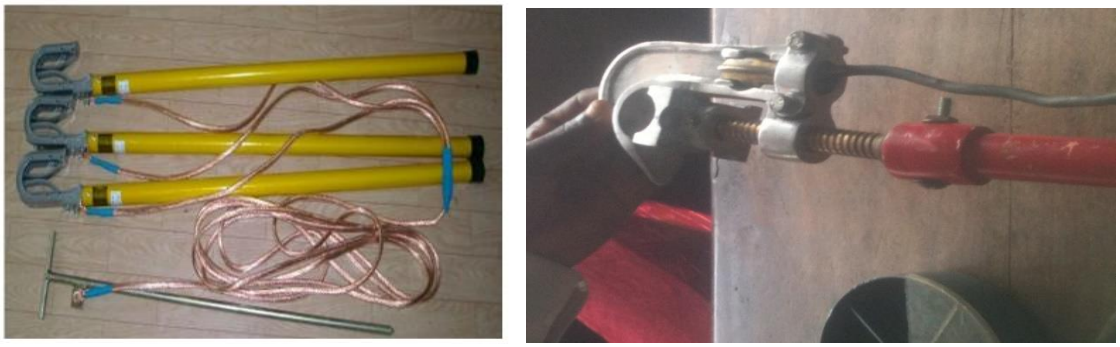
Further, the civil service mind-set of existing staff which has been there over the years has instilled a culture that was not compatible with the new privatized environment that the staff were supposed to operate in. There was a clear need for staff reorientation towards developing a new culture in the areas of maintenance, loss reduction drive, revenue building, customer service etc. through focused training and skill development programmes, manpower restructuring and reward and punishment structure that is supportive of this objective.

4.2.2 Tools and Equipment

Below are list of Safety Tools and Equipment purchased by BEDC:

1. Operating Rods.
2. 3-Phase Grounding Devices/Kits.
3. Neon-Testers (220v – 33kV)
4. Earth Rods.
5. Electrical Tool Boxes for Technicians.
6. Electrical Tool Boxes for PC & M Engineers.
7. Rubber Insulating Mats for Injection Substations.
8. Fire Extinguishers.
9. Earth Resistant Testers for PC &M Engineers.
10. LT and HT Fiber Ladders.

Figure 5: Samples of Tools purchased by BEDC



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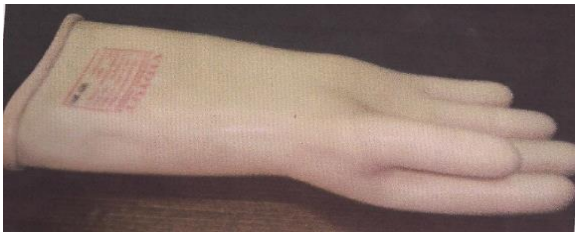
Other Safety Garget Provided by BEDC Management *(Neon tester, Grounding Kit, Operating rods/Hot Stick)*

Neon Tester

Safety Harness

Rubber Insulating Mat



Rated Safety Hand Glove.

Operating Rods.

Technicians' Working Tools.

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5 Achievements in Past 4 years

Since take over, Management of BEDC has focused on understanding the business and bring about operational efficiency, reduction in losses and improved services to the customers in terms of quality, reliability and consistency in the supply of electricity. Over the last 4 years, BEDC has targeted to reduce the operational costs and increase revenue through planned and focused effort. While, we targeted for quick wins at the initial stage, investment with long term focus of load growth and quality of supply has not been ignored. The section details of some of the key initiatives undertaken by BEDC over last 4 years in pursuit of achieving its goal.

5.1 Initiatives for Increasing Power Availability

5.1.1 Load Management

BEDC Electricity PLC receives 9% of total Generation of Nigerian Grid, i.e. around 360MW as against the total requirement of > 1400MW. Therefore, Regimented load management is introduced in BEDC. Regimented load management (RLM) schedule is published in the leading newspapers so that the customers would know when they will have electricity. Also, RLM schedule is designed in such a way that the commercial areas will get electricity in the day time and residential areas will get electricity in the night. Further initiative in load management are as listed below:

1. Restructuring of 18 local load dispatch offices to one CENTRAL and 3 STATE LOAD DISPATCH (EFFURUN, ADO and AKURE)
2. Digitalization of records. (All the data since Year 2017 available in soft copy).
3. Implementation of P.T.W. process from Central Load Dispatch with documentation resulted in to Safe Work Environment for organization staff.
4. Effective monitoring of Energy Allocation v/s Drawl for monitoring MU's consumption by BEDC.
5. Introduction of Energy Forecast and communication to NCC (National Control Centre (OSHOGBO).
6. Introduction of BEDC regimented load management program, for effective coordination to ensure more availability of power supply to consumers.
7. The Broadcast of daily operational reports to all the management personnel to enable them know the status of the network.
8. Power supply availability is brought to least Six hours against initial availability of average one hour in past four years on 11 kV Feeders by implementing Regimented Load Management Schedule.
9. Regimented Load Management schedule is being revised on quarterly bases with proper announcement through various means of communication media e.g. Internet, Radio announcements, Newspaper etc.

5.1.2 Dedicated feeders for MD and commercial customers

One of the Drawbacks in our distribution network is that, all categories of customers including paying /nonpaying customers are connected on the same network. Therefore, it was decided to construct MD dedicated feeders in the cities to provide 24x7 electricity to Government offices, Hospitals, Banks and other commercial establishments including street lights. Total 17 nos. of MD dedicated feeders constructed across the cities in all 4 states. This initiative helped all commercial and essential services to carryout business with ease, thus saving lot of money on Diesel Generators. Secondly, rehabilitation top tripping 33kv lines to decrease the downtime has been done

5.1.3 Other Initiatives

1. Upgrading of GRA and NEKPENEKPEN Injection Substations Network from radial to ring, so as to increase reliability and availability in case of any fault on one of the sources.
2. Uprating of critical Injection Substation capacities.
3. Repairs of faulty transformers (twenty-three Power Transformer and forty-eight distribution transformers repaired during last four-year period).

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4. Construction of new 33 and 11 kV networks to electrify new areas.
5. Trace clearing projects to minimize faults Pan BEDC PLC.
6. MD dedicated feeders have been commissioned so as to increase power availability as these feeders are on the bases of 24x7 supply. A total of Three Thousand One Hundred Seventy-Three MD customers are enjoying 24x7 and reliable power supply.
7. Commissioning of 33kV dedicated feeder to Premier Steel and Mines Ltd. (PSML) 5mw for Plant commissioning activity.
8. HVDS projects are being planned for prime customers/commercial markets/saw millers/cold storage units especially in small commercial areas to reduce ATC and C losses and increase revenue by increasing power availability. A total of 4 proposals are in preparation stage.
9. Replacement of Old Electromechanical relays (Obsolete) with new static relays so as to reduce cascading effect on 33 kV feeders resulting into effective isolation of downstream breaker and preventive blackout of whole 33 kV Feeders. A total of ten relays have been replaced on 11 kV Airport, Feeder 1, 2, GRA 33 kV, Etete 33 kV etc. till date.
10. Replacement of Old Transformer Control and Relay Panels for ensuring correct operations and tripping in case of fault. A total of nine Transformer Control and relay panels and one line panel replaced so far.
11. Replacement of old obsolete 11 kV panel Boards at Oba Ile (in Akure) seven panel Board year 2015, Siluko ISS – Seven Panel Board-2015, Nekpenekpen seven panel Board (Benin)-2017, Enheren ISS – Seven Panel Board-2017, Guinees ISS (Ikpoba Hill) – Three Panel Board-2016, Agbaro ISS – Three Panel Board -2016, Ozoro ISS-Three Panel Board-2016, Okoloba ISS-Three Panel Board-2017.
12. Replacement of Old 33 kV SF6 breakers continuously going under breakdown due to SF6 leakage with new Vacuum Circuit Breakers so as to minimize breakdowns and preventing Ozone Layer Depletion, in turn making atmosphere healthy.
13. Replacement of thirty numbers of Oil circuit breakers with SF6 breakers.

5.2 Initiatives taken for improving reliability of supply

5.2.1 Network Refurbishment:

Power and Distribution Transformers:

Total of twenty three power transformers, and forty eight distribution transformers have been repaired/refurbished during last four year. :

- Details: 2015-2016: Six Power Transformers at MOSOGAR, EMA, ORE, FEDERAL MEDICAL CENTRE ONDO, and ADEYEMI COLLEGE OF EDU, UMUTU.
- 2016:- (1x7.5 MVA Guinness ISS, 1x15 MVA EVBUOTUBU ISS, 1x15 MVA EDGEBA ISS, 1x7.5 MVA IKPOBA DAM ISS, 1X7.5 MVA OKPARA INLAND ISS.
- 2017: (1X15 MVA ILESHA ROAD ISS, 1X7.5 MVA ONICHA UKU ISS)
- 2017: 1x7.5 MVA (ASABA- ONITSHA)
- 2016-2017: Repaired 27 Distribution Transformers at KOTKO (LAGOS) Business Associates' place.
- 2015-2019: Rehabilitation of more than 500 DSS in upcoming communities (ILLAH, IBUSA, Ihovbour, OKITIPUPA, IGBOKODA, IGODANLISA, OGWASHI UKU, ONICHA OLONA, AFESERE, AKUKUWU IGBO, ORE, ONDO.

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- 2018: Rehabilitation and Repair of 1X7.5 MVA at ENHEREN ISS.
- 2018: Complete Rehabilitation of ILESHA ROAD ISS including 33 kV Switchyard, 11 kV Panel Boards and Control Room.

5.2.2 Addition of network to offload the loaded feeders and DTRs:

Table 6: Network additions to offload loaded feeders

S/N	DESCRIPTION	UNIT	BASELINE (AS AT DEC., 2013)	ADDED 2014	ADDED 2015	ADDED 2016	ADDED 2017	Added 2018	Qty as on Q-1 2019	% Increment
1	Power Transformer	No	262	12	7	8	4	5	298	14%
	Capacity	MVA	1,592.50	80.0	82.5	78.5	18.0	1,851.50	1,871.50	17.5%
2	Distribution Transformer	No	9,357	274	336	136	131	10,282	13,916	49%
	Capacity	KVA	2,860,260	56,650	74,625	31,430	43,200	737.5	3,803.4	33%
3	33KV Line	Km	5,004.43	30.86	139.06	67.41	77.24	91.62	5,436.8	8.63%
	O/H	Km	4,968.80	29.53	133.03	65.01	75.33	80.43	5378	8%
	U/G	Km	35.623	1.338	6.026	2.39	1.914	10.47	58.08	63%
4	11KV Line	Km	4,552.53	57.82	32.11	23.28	49.30	60.88	4787.48	5%
	O/H	Km	4,426.74	54.36	30.19	21.46	48.29	55.03	4645.92	5%
	U/G	Km	125.783	3.461	1.913	1.822	1.01	6.65	142.36	13%
5	0.415KV Line	Km	26,270.07	115.78	31.71	18.82	22.70	35.42	26499.20	1%
	O/H	Km	25,997.07	112.08	27.95	15.72	19.33	31.94	26,206.90	1%
	U/G	Km	273	3.7	3.76	3.1	3.368	3.48	292.30	1%
7	33KV Outdoor Breaker	No	114	13	7	9	Nil	Nil	143	25%
8	11KV Indoor Breaker	No	279	24	12	12	3	330	330	18%
9	11KV Outdoor Breaker	No	69	Nil	Nil	Nil	Nil	Nil	69	0%
10	Existing DSS Fenced	No	-	4	1	41	70	130	460	

5.2.3 Preventive and Predictive Maintenance Practices:

Holistic preventive maintenance is scheduled as ANNUAL MAINTENANCE PLAN for 33, 11 kV feeders, Injection Substation and Distribution Substations. All Equipment and Lines are having maintenance

frequency as once in a year with duly filled standardized MAINTENANCE CHECKLISTS so as to keep and maintain Health status of all equipment. Activities are being carried out as per the below mentioned list with timelines:

Table 7: Preventive and Predictive Maintenance

S/N	Job Description
1	Inspection of each distribution substation once every three month
2	Inspection of each Injection substation once in a month
3	Inspection of each 33KV feeder once in a month
4	Inspection of 11KV feeders
5	Inspection of LT distribution network
6	Correction of all identified defects
7	Stocking of fast-moving materials
8	Weeding of injection and distribution substations
9	Weeding of wooden HT pole bases
10	Load reading of distribution substation

5.3 Initiatives for Improving Distribution Infrastructure

1. Replacement of undersized conductors on 11 kV and 33 kV lines.
2. Replacement of worn out wooden poles with cement concrete poles is done as and when required, whereas most critical locations such as main Road crossings forty feet poles have been erected so as to make the network free from low clearance. Also, the poles which were on the verge of collapse are being replaced with new cement concrete poles. Quantity of wooden poles across BEDC domain is in the range of 1,500,000 so a lot of expenditure is incurred in replacement of wooden poles with Cement Poles.
3. Upgrading of Overloaded Distribution Transformers so as to cater the supply requirement of existing customer population.
4. Replacement of Undersized up riser cables is going on as the load of existing customers is increasing and new customers are also being added on a regular basis.
5. Replacement of Damaged/Worn out feeder pillars is ongoing.
6. Termination of up riser with bi-metal and taps on the overhead lines, as this was one of the biggest contributions to jumper/conductor parting, resulting into increased reliability as well general public safety.
7. Since inception no distribution substation was fenced and if fenced then it was brick work which got depleted with passing time and Distribution substations getting converted into risky zone, which was taken care of by BEDC. Substation fencing is being done on a regular basis as it is of top priority.
8. Replacement of obsolete 11 kV panels carried out at so as to ensure safety of workforce and reliability of power supply.

5.3.1 Details of Network Addition:

a. Addition of Power Transformers, Breakers, 33/11/0.415 kV Feeders:

BEDC has continuously expanded the network by adding different ratings of power and distribution transformers and also 33kv, 11kv and 0.415kv lines to cater to the power supply requirements of customers. Details of network added in the past four years is shown in the table mentioned earlier in 5.2.2.

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Table 8: Completed projects

Sr No.	Project Description/Name	State	BU	MW
1	Construction of 3.9 km 11KV Single Circuit Feeder in Akure	Ondo	Akure	1.78
2	GRA 11KV Dedicated Feeder (Phase II)	Edo	GRA	4.72
3	Construction of new 1.85 km dedicated MD 11kv feeder to IDSL Main	Edo	GRA	1.12
4	Construction of new MD feeder 6.65 km in Warri/Effurun	Delta	Warri/ Effurun	2.5
5	Construction of a new single circuit 11kv feeder of 7.4 km from Agbor mains to James Hope College, Agbor	Delta	Agbor	0.75
6	Construction of 7.7km of33kv over-head line from Akure junction to Cocoa Factory, Ileluji town.	Ondo	Ondo	1.8
7	Rehabilitation of 50 km of Ikpeshi 33kv feeder, 22km of re -conductoring and 28 km of trace clearing in Auchi BU.	Edo	Auchi	4.2

5.4 Bridging the Metering Gap

As stated above, BEDC had high number of unmetered customers or customers with faulty, obsolete and sluggish meters. Even after investing larger portion of capex in customer metering each year, the metering gap has increased as the metering is unable to keep pace with new customer addition and new meters getting faulty. As of now close to 450,000 customers are unmetered. Considering the huge capex required for meeting the metering gap of discos which could not be provided through tariff, NERC came out with MAP Regulations, 2018 through its Order dated 8th March, 2018. The regulation allows for 100% metering of customers by a third party "MAP" at the cost of Customer.

5.4.1 Appointment of MAP

BEDC has conducted the Bid process to select Meter Asset Provider (MAP) in line with "NERC METER ASSET PROVIDER (MAP) REGULATIONS 2018". The procurement process was through Open Public Tendering for all those or had been precleared by NERC i.e., has No Objection Certificate. After which BEDC called for Expression of Interest (EoI) through publication in national dailies. After preliminary evaluation at EoI stage, selected parties were called to put in their Technical and Commercial Proposal at Request for Proposal (RfP) stage. The technical evaluation also included Proof of Concept (PoC) installation by each bidders to gauge their capability in meter installation. The entire selection process was monitored by NERC appointed independent auditors. Based on technical and commercial evaluations, final details for selection of 5 successful parties were submitted to NERC in February 2019. NERC approved the five MAP parties for BEDC with upfront meter cost of N 36,991.05 and N 67,055.85 for single phase and three phase meter respectively.

NERC has issued MAP License to all the selected 5 MAP parties in July 2019. Subsequently, MAP parties have to provide performance bank guarantee, open an account in bank, sign an agreement with their corresponding MSPs and complete the other checklist before the start of the meter installation. BEDC started MAP on 2nd September 2019.

While the monthly installation in initial three months of ramping period is expected to be low, by August-October 2019, the installation per month is expected increase to above twenty thousand per month. A total of around 573,000 meters is projected to be installed under MAP in next 2 years. The monthly deployment plan is as below.

Table 9: Meter deployment plan

Month	1	2	3	4	5	6	7	8	9	10	11	12	Total Year 1
No of Meters to be deployed	3,650	5,150	6,250	10,750	23,270	26,600	28,100	22,600	28,100	28,100	28,100	28,100	238,770
Month	13	14	15	16	17	18	19	20	21	22	23	24	Total Year 2
No of Meters to be deployed	28,100	28,100	28,100	28,100	28,100	28,600	29,100	22,175	29,100	29,100	29,300	27,131	335,006
Grand Total	**573,776**												

5.4.2 Metering POC to decide on new Installation standard

Metering is about revenue protection, therefore it is not just metering for metering sake but to achieve the purpose for which the meters are meant to achieve. In pilot implementation by BEDC, high level of meter bypass was detected, even for meter installed newly on pole. There was therefore the need to come back to the drawing board and design an installation standard which is more robust and tamper proof. BEDC had conducted several Proof of Concept (POC) to improve installation standard and ensure revenue protection in 2017 and 2018, before finalising on the new installation standard.

The new standard of installation of meter is above the LT line in a box of 4-6 meters with branded service cable (insulated 16mm 2-core and 4-core service cable for single phase and three phase respectively, made to BEDC specification and not available in open market).

5.4.3 Cluster metering of communities

BEDC have more than 1500 communities. The energy consumption per house and consequently per house revenue billing for such communities is quite low. Metering of each customers within such communities not only lead to a high cost meter being used against very low per month billing but also increases effort in metering, billing and collection. Thus, the situation in case of these communities is exactly opposite to MD customers where per unit expected revenue is low but cost of servicing is very high. Considering this, BEDC has taken an initiative of providing cluster meters to these communities where a bulk prepaid meter is provided and the responsibility for collection and payment rests on the Community. Such cluster metering is also used in other areas where a bulk meter can be provided to one organisation/set-up (i.e. security services establishments) who in turns are responsible for collection from individuals.

Based on BEDC's plan for MD PPM metering for communities and MDAs, 553 MD PPM meters have been installed under the scheme. In addition, in order to assist bulk billed communities in allocation of energy and cost among themselves, in line with Board approval, BEDC has procured counter meters to be utilized

by customers in these bulk billed communities. A pilot Bluetooth meters and reading with android device has already been tested successfully. BEDC had placed order for 100,000 Bluetooth based counter meters through the Genus/Gumco partnership out of which order for 20,000 meters has already been received. All new community metering is expected to be MD PPM coupled with counter meters while we are also covering existing MD PPM bulk communities with counter meter.

NERC has come out with a consultation paper on Distribution Franchisee Scheme under which BEDC can utilise these communities as small franchisee based on cluster of DTRs for operation and collection. Once this franchisee scheme is approved the same bulk mater and counter meter will be used by franchisee for billing and collection. For this BEDC is already working of crating necessary software upgrade in its (EBMS) billing system.

5.4.4 New Connection

BEDC area had around 3.6 million households, but it just had 0.638 million customers, at the time of takeover. This posed an opportunity for BEDC to bring more and more customers to its billing network. In August 2019, the total customer count of BEDC stood at slightly above 1 million. However, BEDC capacity to bring more and more customer to its billing network was constrained in past by availability of power and limited capex approved under MYTO. BEDC is in process of customer enumeration which will help BEDC to clearly identify potential new customers and bring them to billing network. BEDC intends to increase its customer count to 1.3 million customers by 2021. Also, with Cluster metering for communities and Non-MD metering under MAP, BEDC aims to complete its metering gap in by 2021. Initiatives Taken for ATC&C Loss Reduction.

5.5 Initiatives Taken for ATC&C Loss Reduction

5.5.1 Technical Loss

BEDC has taken various measures to reduce the technical losses. These are as below:

a. Reduction of length of 33/11/0.415 feeders resulting into reduction of transmission and Distribution losses.
b. Refurbishment and IR value [Insulation Resistance] improvement of Power and Distribution Transformers
c. HVDS projects are being planned for prime customers/commercial market/saw millers/cold storage units especially in small commercial areas to reduce ATC and C losses and increase revenue by increasing power availability. A total of four proposals are in preparation stage.
d. Replacement of undersized conductor, with proper size conductor. Proposals to increase the size of some 33kv in Benin City feeders from $150mm^2$ of Aluminum conductor to $240mm^2$ Aluminum conductor. This is almost at the approval stage.
e. Load balancing of on Distribution Transformers, which will reduce Overloading and Phase imbalance.
f. Implementation of AMR Enabled energy meters on 33 kV Lines and All Distribution Transformers so as to pinpoint pilferage points and take action accordingly.
g. Optimization of feeders length –20KM for urban and 40KM for rural. Use of AAAC or ACSR conductors.
h. Review technical specifications and adapt procurement of all new components to recognize the value of equipment with lower electrical losses. A total of 76 Technical specifications for

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Major Materials like Transformers, Breakers etc. have been prepared so far along with Standard drawings of installations.

i. De-loading of overloaded lines includes 33kv, 11kv and 0.415kv lines proposal for construction of overhead and LT lines have been put in place to reduce the lengthy lines which have been contributing to losses as a result of far distance customers they feed. Distribution transformers and injection substations reliefs are not left in the new proposals.
j. Upgrading of old lines are in the preparing stage. Some 33kv and 11kv feeders are to be upgraded from $150mm^2$ to $240mm^2$ Aluminum conductor's sizes. With this, undersized conductors are eliminated and joints which causes hot spots are removed from the network.
k. Preventive maintenance are systematically planned and carried out on equipment and aged once are replaced with new and modern types. This eradicates poor repair and maintenance of equipment which leads to ATC and C loss reduction.
l. Introduction of PG Clamps and power connectors on 33kv lines to minimize / avoid handmade conventional joints.
m. Procurement of loss Power and Distribution Transformers

5.5.2 Commercial Loss

- **Technical Intervention**
  - **Energy Audit and Accounting:** Accurate measurement of losses is the first step towards effective loss reduction strategy, as it helps in assessing the quantum of benefits to be realized – Naira value of the energy loss prevented. At the time of takeover, meters were installed with TCN on all 33kV feeders as a way of ensuring the accuracy of the quantum and cost of power being charged to BEDC. Over a period of time some of the 33 kV feeder meters have gone bad showing higher variations between incomer and outgoing of 33kV bus bar. While TCN is taking more than normal time to replace or recalibrate these meters, BEDC is suffering from higher billing by TCN as TCN is using higher of the incomer or outgoing meters from the 33kV bus for billing to BEDC. In order to sub substantiate its claim against any high billing, BEDC is now in process of installing check meters on all 33KV feeders of BEDC at TCN boundary. To ensure that an accurate measurement of losses at Business Unit level is conducted, BEDC has installed boundary meters in addition to 11 kV feeder metering. At present 100% metering of 11kv feeders at manned substations is complete. Further, there is plan for 100% metering of all unmanned substations for which an order of 150 meters has already been procured and installation of meters at unmetered unmanned substations is ongoing.

    BEDC plans to do 100% DTR metering of locations that MAP will be working. This is to ring fence the losses and ensure proper energy accounting and performance monitoring of MAP. Order for total of 10,000 DTR meters has been placed, out of which 1st consignment of 2,000 meters has arrived. Based on MAP roll-out plan and considering high loss making and high revenue potential areas, 5 feeders (one in each MAP) has been selected for priority roll-out of this DT metering. The metering of DTR has commenced and we expect to complete the

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installation of 2000 meters in one month time. Another batch of 2000 meters has already been dispatched and will be arriving soon.

Also, AMR software for remote reading Genus meters and DT wise energy accounting has been deployed and tested. The communication and remote reading of initial 15 DTR meters installed through this AMR has been tested and the system is working fine. With the installation of DTR meters in one complete feeder we will be able to do DT wise energy accounting.

Further, all customer meters deployed under MAP are AMI compliant. This AMR and AMI based metering coupled with mapping of all customers to feeder and DTRs will enable BEDC to calculate feeder and DTR level ATC&C loss calculation helping BEDC in plugging the revenue leakages in more precise way.

- **Load Management:** With the limited power availability, allocation of power in a manner that low loss-making areas gets higher supply helps in reducing overall losses by pulling down the weighted average loss. BEDC has developed a load management plan which is dynamic and is updated daily based on power availability and monthly based on loss profile of the region. The aim of the load management plan is to ensure equitable distribution of power (as far as possible within the ambit of network constraints) while at the same time regulate it in a manner to reduce losses to the company.
- **Dedicated feeder for MD & Prime customers:** MD & Prime customers are mostly large industrial and commercial customers which require reliable supply for the sustenance of their business. Due to paucity of power, BEDC is regulating supply to its feeders for 6-16 hours in a day on rotational basis. The actual availability to customers is even lower due to frequent failure of aged network. While, many of the large customers like Coca-Cola, Nigeria Breweries, Shell have shifted to captive generation due to unreliability of GRID supply. BEDC cannot afford to lose its large paying customers. Considering this, BEDC has started providing 24x7 dedicated supply to MD & Prime customers through 11kV dedicated feeders. Already, 17 11kv dedicated feeders have been constructed and energized, supplying 24x7 power to MD & Prime customers.
- **Auto Recloser:** BEDC has large number of communities connected directly at 33kV level. While the collection from these communities are far from expectations, they normally enjoy much higher hours of power availability by virtue of being directly connected at 33kV level. While most of these communities are either non-paying or are paying fixed amount monthly which is low compared to the hours of supply, BEDC is not able to regulate the power to these communities. To enable BEDC to regulate the power to these communities based on the payment history, BEDC has installed 11kV Auto Re-closures (AR). After installation of these ARs, BEDC would be able to divert load going to loss making communities to dedicated feeders supplying to MD customers thus generating additional revenue to.
- **New Installation Standard:** As mentioned above, BEDC had conducted several Proof of Concept (POC) to improve installation standard and ensure revenue protection in 2017 and 2018, before finalising on the new installation standard. As per new installation standard, all

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new meters are installed in a box above the LT line making it difficult and risky to access band bypass.

- **Meter re-certification for all MD meters:** Every year all MD meters are examined for intactness of installation, calibration and any kind of tampering. This helps us to plug the revenue leakage points in MD customers who are the highest contributors to the revenue.

- **Managerial Intervention**
  - **Improving the Customer Mix:** BEDC customers can be classified in broad two categories of MD and Non-MD customers. With MD being high value customers with higher revenue per customer, the cost of serving such customer vis-à-vis the revenue is low. Thus a higher percentage of revenue coming from MD customers means an overall lower cost of service per unit of power sold which ultimately translates into higher profitability. At the time of takeover, the total revenue billed to MD customers was less than 20%**.** BEDC has set up a target of achieving above 50% of revenue billing from MD customers. Working towards this strategy, BEDC has taken several initiatives like construction of dedicated feeders for ensuring 24x7 supply and setting up of a special department of Key Consumer Group to provide improved and focused service to such high value consumers. The initiative of BEDC has started showing results with nearly 31.7% of revenue billed being contributed by MD customers having a revenue contribution of more than 54.6%.
  - **Managing Community Relations**
    - **Community Relations:** BEDC has over 1,500 communities in its service area. These communities had been a major source of losses at the time of takeover as they had the view that power was an entitlement and so payment thereof was discretionary. BEDC has taken deliberate action to change the attitude towards payment of bills through following initiatives:
      - Creation of a dedicated Community Relations department – A dedicated community relations team has been set up that holds regular town hall meetings to address customer concerns. The department is headed by a senior manager whose responsibility it is to engage the communities and ensure that they understand the need for payment of bills. Also to deal with any issues they may have with their supply and payment arrangements.
      - Prepaid Bulk Metering – BEDC has planned for MD PPM metering for communities. For this, a step by step process and document requirements has been prepared and discussion with all existing communities has been initiated. Communities tend to have a leadership structure and through this structure BEDC has been able to arrange bulk prepaid metering for some of the communities. This transfers the responsibility for collection and payment to the Community. Thus the community members contribute towards the payment for power. The results indicate a general improvement in cash received from such communities as compared to before the installation

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thereof. Till now, more than 553 MD PPM meters have been installed. In addition, in order to assist bulk billed communities in allocation of energy and cost among themselves, in line with Board approval, BEDC has procured counter meters to be utilized by customers in these bulk billed communities. A pilot Bluetooth meters and reading with android device has already been tested successfully. BEDC had placed order for 100,000 Bluetooth based counter meters through the Genus/Gumco partnership out of which order for 20,000 meters has already been received. All new community metering is expected to be MD PPM coupled with counter meters while we are also covering existing MD PPM bulk communities with counter meter.

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MD PPM scheme has been applied to some security services establishments as well.

- **Feeder Wise Billing Methodology**: With precise energy accounting being in place, BEDC is now re-organizing its commercial activities based on feeder from earlier practice where Business Unit and Service Units were accounting units. On the same line, BEDC has recently introduced the new feeder wise billing methodology.
- **Feeder Team Initiative:** BEDC has recently introduced feeder team initiative where one team is given responsibility for entire process of billing and collection for a feeder. Idea is to assign proper accountability based on precise energy accounting.
- **PPM Initiatives:** Losses on account of bypass and infraction by PPM customers was one of the major loss areas for Nigerian Discoms at the time of takeover. The neglect of monitoring of PPM customer by Discos since long, even after takeover, created several issues in the field, such as:
    - Rampant theft and bypass with most of the customer not vending for more than a year
    - Disallowing of BEDC staff to enter PPM premise for any kind of monitoring
    - Shifting of meters as personal belonging from one place to other without informing Disco, leading to a situation that most of the PPM customer were not at the addresses as in BEDC database
    - Reselling of meters like normal commodity without informing Disco leading to unauthorized change of ownership

  Considering the need to create a proper strategy and robust monitoring framework for PPM Customer, a dedicated department for PPM monitoring and improvement was created in 2017. The PPM team has taken several initiatives for the improvement of vending including but not limited to:

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- **PPM premises capture by Route Marshals/Feeder Team:** After takeover, the key issue that BEDC faced while trying to target non-vending PPM customers resorting to bypass was non-traceability of such customers. Due to shifting of meters as personal belonging from one place to other without informing Disco, most of the PPM customer were not at the addresses as in BEDC database. This has resulted in enforcement team wasting lot of time in finding the addresses of suspected bypass customers. To tackle this issue, and to find the correct address of PPM customers, Route Marshalls were asked to move from house to house and capture all the PPM customers in the route assigned to them. Once these PPM customers are captured by Route Marshalls their enforcement team was sent to suspected bypass cases as per credit risk rating of the customers.
- **Implementation of credit risk ratings for PPM customers:** To better track the vending pattern of customers, each customer was assigned a credit risk rating based on his average vending units and his last vend date. The system of assigning Credit Risk rating to each customer was also automated whereby at the start of every month credit risk rating is assigned to each customers. The customers with good average monthly vending and who have been vending regularly were assigned credit risk rating of A (A1 to A3), while the customers with not so good average monthly vending and who have not been vending regularly were assigned credit risk rating of B (B1 to B4). The customers who have not vended since 1st January 2016 are assigned credit risk rating of C1 while the customer who have never vended since takeover was assigned a credit risk rating of C2. Similarly the customers who have not vended since connection are assigned a credit risk rating of D (D2 risk rating for customers connected before take over and never vended since then). These risk rating has helped categorisation of customers in several broad group on which specific actions can be taken. Using the credit rating, the following process were initiated
    - **SMS to lower risk ratings to vending appropriately:** Based on the assigned risk rating, SMS is being sent to customers with lower risk ratings of B2 to B4(average vending low), C and D (not vended since 2016 or since connection), asking them to vend appropriately and improve their risk rating failing which the customer may face disconnection. SMS as a medium was selected as it was very cheap to send a message to customer with each message costing in range of 2-4 Naira only. We have received a positive response with decrease in number of customer never vended (category C and D).

      For those not responding to SMS, the route marshals/feeder teams are utilised to locate the customers to know what is going on. This process will be continued as more and more C and D PPM customers are brought under vending net.
    - **Disconnection of High Risk Rating Customers Resorting to Bypass:** Based on the precise address details received by the route marshals/feeder teams and the assigned risk rating of customers, a disconnection list of customers with

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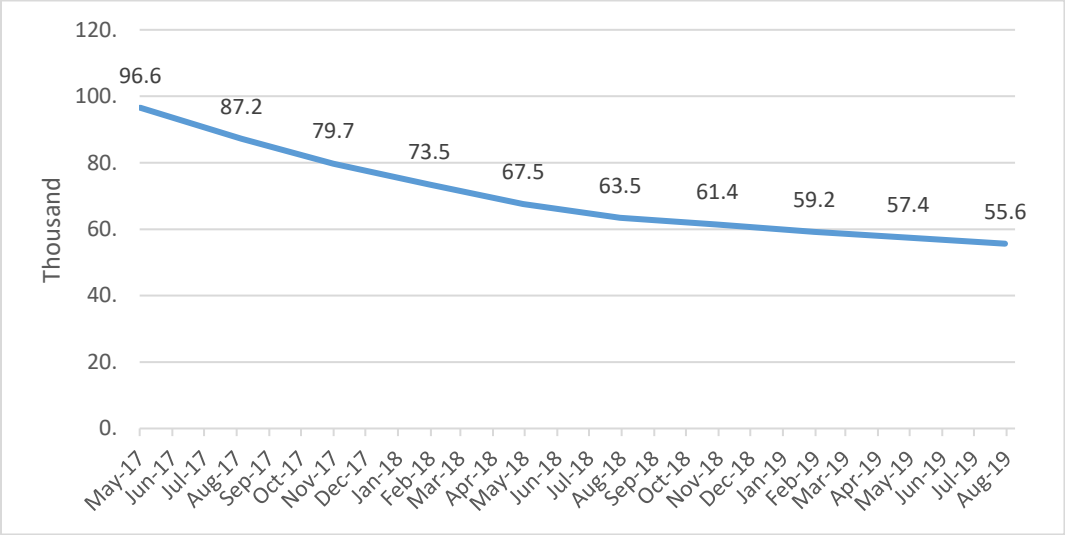
credit risk rating of C and D are sent to respective BU for investigating and effecting disconnection in case bypass or infraction is found.

Figure 6: C&D Customer Count



All the initiatives for PPM vending improvement has started showing results and there is a consistent decrease in non-vending customers having C&D Risk Category. Currently we have around 55,631 C&D Risk Category customers.

- **Improving Billing Efficiency**
  - **Billing and Collection Cycle Management:** After takeover, the billing cycle has been compressed and billing and bill distribution is completed within the first 10 days of the month such that customers have the remaining twenty days for making payment. This compressed billing cycle has not only reduced the working capital requirements but it has also helped in better calculation of monthly ATC&C losses. For MD or large customers, the billing cycle is three days with disconnection falling ten days thereafter.
  - **Estimated Billing:** In the absence of meters for a large number of customers, high estimated bills has been one of the common excuses for customers not making payments. BEDC has implemented feeder wise billing methodology to ensure that total billing under feeder is under acceptable limits while each estimated bills are reviewed before final printing of bills. Further, with 100% metering being rolled out under MAP, the problem of estimated billing is expected to be resolved permanently.
- **Collection**
  - **More Collection channel for ease of payment:** Ease of payment if one of the factor impacting collection efficiency, especially in rural areas. In a rural set-up with limited availability of public transport, moving to distribution collection centres for making payment, sometimes take up nearly half of the day. For a daily wage earner, this become difficult and sometimes lead to non-payment. BEDC has introduced multiple

payment channels for ensuring ease of payment to its customers like Banks, Point of Sales (POS, where BEDC agents visit customer premise to collect payment), Scratch Cards, Automated Teller Machines (ATM) and online payment facility.

- **Enforcement**
  - BEDC has a dedicated enforcement team which is responsible for curbing theft and bypass of electricity. This enforcement team, many time with help of police, visit the suspected customer (suspected of resorting to theft and bypass of electricity) for vigilance check. These customers if involved in theft and bypass of electricity are changed for loss of revenue and made to pay penalties, failing which they are disconnected. BEDC has also introduced security deposit for such customers which is payable before supply is restored.

- **Policy, Regulatory and Legal Intervention**
  - Criminalization of Theft of Power: Customer awareness through print and electronic media is being actively engaged in to educate the public about the penalties and sentences linked to theft of power. Nigerian law allows for up to 21 years jail term for such crime while NERC has authorized the charging of interest on any backlog bills plus payment of security deposit before reconnection. The recent NERC Order on "Unauthorised Access, Meter Tampering and Bypass- Order No: NERC/REG/41/2017" puts severe penalties for power theft and infraction. Further, some state governments have adopted this zero tolerance for power theft by issuing similar legislation or providing BEDC with armed support when dealing with errant customers/ communities.
  - Legal Action on repeated defaulters of theft: To further discourage the theft of electricity, BEDC has recently initiated legal action against repeated offenders leading to non bailable warrant and penalty imposed by court.

5.6 IT and Automation Initiatives

In today's scenarios operational efficiency and reduction in losses in a distribution utility can only be achieved with the use of adequate Information Technology (IT) tools. While we have already installed a state-of-the-art billing software, Fault and Call Centre Management software called footprint, Tally ERP9 for accounts and some small software/tools catering to different needs of different departments, BEDC intends to be at par in terms of technology adaptations with some of the best utilities in the world.

Table 10: IT and Automation Initiatives

Processes	Inherent Processes	Achieved in past four years
IT Local Area Network Connectivity and Internet Services	Not available. Users relied on shared internet services such as personal Dongles, MIFI, WIFI, and Phones to communicate.	Dedicated Internet Services available in the head office and Etete; including both Primary and Secondary services. New wireless access points deployed to improve wireless Lan quality and availability.

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Billing Apps – Limited to: ✓ **Pre-paid: Conlog Solutions** ✓ **Post-paid:** ▪ **Add Valorem Records (AVR)** ▪ **Universal Cash Receipting Machines (UCRM)** **Automatic Meter Reader (AMR) = MOJEC Solutions only** **No corporate Email System**	Staff used public Email Systems such as Yahoo, Gmail for official communications.	Billing Apps include: ✓ Pre-paid: Conlog Solutions ✓ Post-paid: ▪ eBMS (both web-based and On-Premise billing App); ▪ Cash Office Payment Systems (COPS) ▪ Automatic Meter Reader (AMR) = MOJEC and Genus Solutions ✓ Website for BEDC = www.bedcpower.com; ✓ Email Platform that uses bedcpower.com domain Intranet Portal built on our Corporate domain. On-Premise Servers for Tally, PPM and Post-paid deployed in the Server Room with complementary Servers in the Cloud. Email and Intranet Portal Servers are exclusively in the Cloud.
Billing Centers	Several Billing Centers as each BU had its own Billing Centre. All in all, about 17 Billing Centers across old PHCN	Centralized Billing Centre at Etete for both PPM and post-paid Solutions
Payment Options	Customers pay cash at designated Cash Points in the BUs	PoS based options for both PPM and Post-paid, Banks, Agents and other Payment Channels are now available
IT Equipment	Users either did not have IT equipment or were using very old IT equipment like desktops/laptops and printers	New IT equipment procured and ensured that users can now work efficiently.

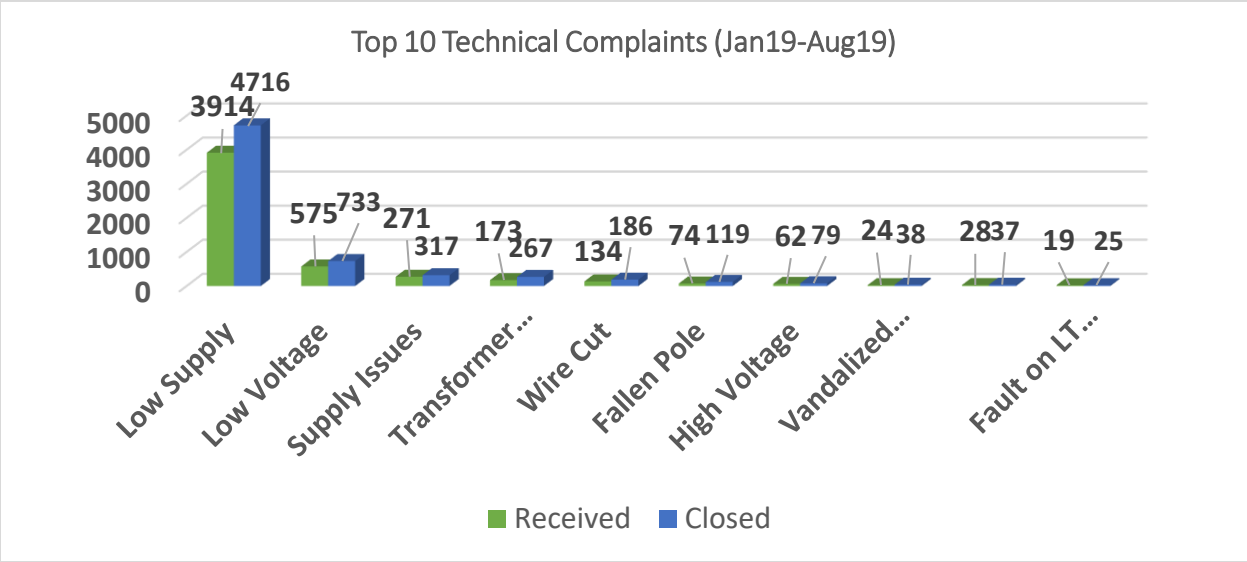
5.7 Customer Service Improvement

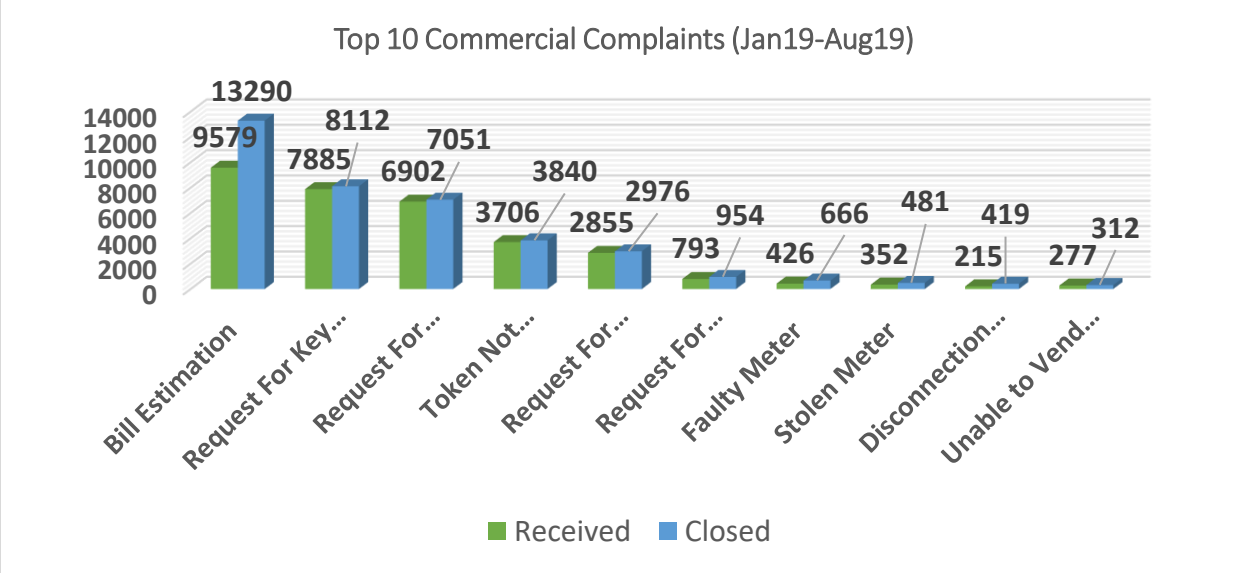
BEDC has taken several initiatives to improve customer service delivery as highlighted below.

- State of Art Customer care centres: BEDC has opened state of art customer care centres with civic amenities at various office location to enable, new connection/attribute change requests, billing, metering, reading and payment related complaints and queries at one place.
- Multiple payment channels for the convenience of customer like banks, ATM, PoS, online etc.

- Centralized fault call centres: BEDC has set up a 24/7 Customer Complaints supported by a state-of-the-art tracking system called Footprint. Through this call centre, customer can log a call for fault, without visiting the BEDC office over phone. The call centre is run by dedicated customer care officers who on receipt of call will assign calls to responsible officers to resolve and follow up on the resolution thereof. The status of fault resolution is monitored at the bi-weekly Management meeting. Below is a sample of the latest report extracted from the Footprint system.

Figure 7: Complaints Received vs Closed





- Customer Forum Office: BEDC has opened 2 Customer Forum offices where BEDC handles issues of the customers. Apart from this BEDC conducts quarterly Town hall meetings where issues of customers are discussed on a face to face basis.

- Key Customer Group: BEDC has dedicated cell called key customer group (KCG) which provides premium services to our key customer (MD and Prime) and target to grow the MD and Prime customer class.
- SMS: BEDC has initiated SMS alert service for payment details, bill details and other key details to costumers so as to provide necessary details to customer in a convenient way.
- Creation of Functional website with company information for customers
- Creation of BEDC Social Media Twitter, Facebook and email for providing customer connect

5.8 Increased Focus on Safety

In a bid to increase the focus on HSE, BEDC Management has carried out the following Safety Initiatives. These initiatives contributed a great deal to the continuous decrease in the number of incident cases recorded within our area of coverage.

ACCIDENT/INCIDENT REDUCTION STRATEGIES

1. BEDC HSE Policies: As an eloquent testimony of Management's commitment to health and safety, a lot of Health and Safety Policies were rolled out. They are:
   a. Environment and Social Policy (E & S) with effect from January, 2016
   b. Access Control Policy with effect from January, 2016
   c. Drug and Alcohol Policy with effect from January, 2016
   d. Journey Management Policy with effect from January, 2016
   e. Use of Armed Security Policy with effect from January, 2016
   f. Forced and Child Labour Policy with effect from January, 2016
   g. Litter Policy with effect from January, 2016
   h. PPE Policy with effect from January, 2016.
2. **BEDC Safety Pledge**: BEDC recognizes that success in health and safety is won or lost in the hearts and minds of people, especially the workforce. Thus, BEDC went a step further to inculcate a culture of safety in the hearts and minds of the workforce. BEDC has systematically engraved the Safety Pledge in the minds of the workforce, to the extent that all BEDC employees recite it off-hand. This is to psychologically sensitize them to practice safety at all times and at all places.
3. **In-house Reporting of Unsafe situations, Unsafe Acts, Near Misses etc. by Employees to Head Office Safety Team:** This in addition to NEMSA monitored network defects. BEDC In House Network Defects Observation Reporting Format has been circulated to all staff to report all unsafe conditions within the network. They are also advised to fill in details of unsafe Conditions in the format, include pictures if possible, to send to HSE e-mail: hse@bedcpower.com. The HSE Team, in turn, sends out the details to affected Business Units for compliance. To monitor and evaluate compliance, MIS is usually released fortnightly to all BUs.
4. **Releasing preventive Safety Alerts/Safety Tips on best practices on Safety compliances, usage of safety tools etc**.: Safety tips are released periodically to all workers from Safety Team in Head Office. This has brought safety consciousness among the workforce as they read the messages every morning. This has helped in building a culture of safety among workers in ensuring that they enthrone safe practices at work.

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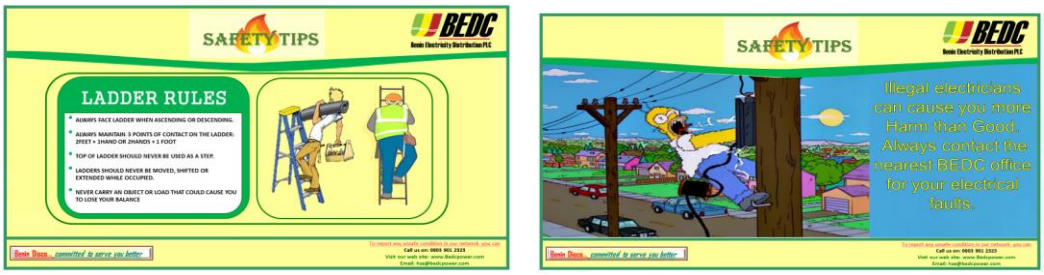
Figure 8: Samples of BEDC safety tips



Identification of Areas of low ground, Vertical and Horizontal clearances especially on Major Roads to avoid accidents at site: Some locations have been identified proactively by concerned BUs and have been captured in the BEDC Incident Reporting Database for rectification of the identified defects.

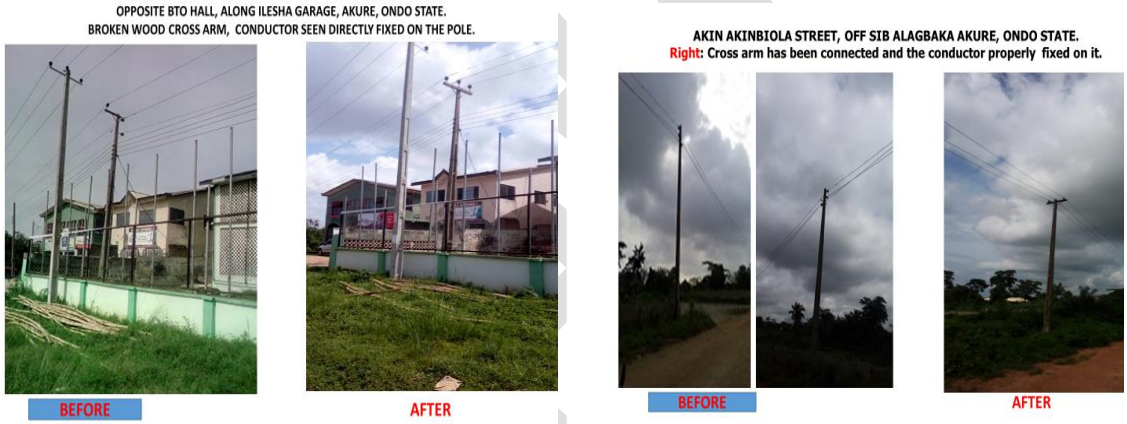


Figure 9: Samples of BEDC In-House Network Defects Observations/Resolution

1. **Surprise Safety Audits by Head Office Safety Team and Safety Officers:** There is Site Safety Audit Checklist, especially for safety inspection of Contractors during Project Work. This is aimed at accident prevention by spotting unsafe acts/wrong Job Procedures at site of work.
2. **General monthly Safety meetings in every Business unit on the first Thursday of the month:** All Business Units have been directed to organize General Monthly Safety Meetings on the first Thursday of each month. This is to create a platform where Staff can raise peculiar safety issues in their various work locations.
3. **Incident Investigation and Reporting:** In compliance with the Company's Corporate Health and Safety Policy on Incident/Accident Investigation and Reporting as well as NERC's requirement on prompt investigation and reporting of all incidents, BEDC ensures that all incidents are properly investigated and learning points are used for training purposes to prevent future occurrences.
4. **Work Permit system:** To proper co-ordination of all jobs on HT lines, BEDC has centralized its Permit to Work System to ensure proper documentation and issuance. This has eliminated careless and illegal operations in the network.
5. **Public enlightenment via mobile Jingles:** BEDC Management procured Public Address Systems for most Operational Vehicles with Loud Speakers to ensure that all BEDC customers

are widely sensitized against unsafe acts and unsafe conditions in the network and safe use of electricity.

6. **Periodic Town Hall meetings:** HSE Unit has been continuously collaborating with Community Relations and Corporate Affairs Sections to organize Community Town Hall Meetings within our coverage area.

Figure 10: BEDC HSE Manager Facilitating during One of BEDC Town Hall meetings

7. **Conducts safety induction/training for BEDC Staff and Contractor Staff:** BEDC HSE Unit usually organize HSE Inductions for all Contractors' Staff before they start any technical job on the Company's facilities. This is to ensure that they understand their job roles and safety implications.

8. **Fencing of Distribution Substations**: BEDC Management has started a gradual fencing of all Distribution Substations within the network and as on today, more than 250 Distribution Substations have been fenced. This will reduce cases of trespass and electrocution arising from illegal entry into the network.

Figure 11: Fenced Substations within BEDC Network Area

9. **Provision of PPE and Safety Gargets for Technical Staffs:** Management has provided Personal Protective Equipment for Staff and as we speak, another set of PPE are already purchased to ensure that each worker has two sets. BEDC has also purchased some Safety Tools such as Neon testers, Grounding Kits, Operating Rods, etc. for all field locations.

Staff well kitted for the job

Fully Kitted Linesman working

10. **NEMSA (Nigerian Electricity Management Service Agency) Safety Ranking:**

As part of our commitment to Electricity Network Revamping, especially within our coverage area, we have consistently cleared all identified NEMSA observed Network Defects by NEMSA Area Inspector Engineers. BEDC has been ranked among the top performing DISCO by NEMSA during Monthly Power Stake Holders Meeting, with the Minister of Power, Work and Housing.

Mock Drill on how to revive an unconscious staff or a staff who suddenly collapsed in the course of work.

Safety Milestones for the Period under Review

1. **Violation of Right of Way:** As a safety compliant Organization that places high premium on the safety of lives and properties, a lot of initiatives have been implemented towards reducing accidents resulting from violation of Right of Way. They include:

   a) Collaboration with Edo State Government to ensure that all those who build or trade under power lines are sensitized and relocated. In the pursuit of this, HSE Team working in consonance with the Edo State Committee on Violation of Right of Way gave power-point presentations at Oredo, Egor and Ikpoba-Okha Local Government Areas in a stake-holders meeting held in the Headquarters of these Local Governments.

b) In-house Network Defect Observations: Apart from the routine network monitoring by a Team of Technical and Safety Officers, our Managing Director and her Team usually carry out routine network visitations to identify bad network and areas where there are violations of Right of Way for immediate clean-up.

c) Compilation of list of all persons and structures under the Right of Way had been done and Notification Letters served on the affected Landlords.

d) Safety Officers' Visitations to areas where there are violations of Right of Way to verbally sensitize and warn those trading/building structures under Power Lines to desist from doing so.

e) Approval of Danger Signage on Right of Way for fixing at strategic public and commercial places to raise the tempo of awareness among persons living and trading under power lines.

Signage for Market and Commercial places

a) Safety Trainings and Formation of Energy/Joule's Club in Primary/ Secondary Schools: As part of BEDC Corporate Social Responsibility, the company will be visiting some Primary and Secondary schools to sensitize the children on the need to use electricity safely, the need to stay away from power infrastructures (Electric Poles/Towers, Power Lines and Substations) and to ensure that they are trained on the dangers of violating general safety rules. This is to reduce the rate of accident involving children within our network. Below is pilot study of Joules Club.

Secondary School Students on excursion at BEDC

b) Near-Miss Reporting and Analysis:
In a bid to reduce the rate of accident within our coverage area, we are developing a process for identifying, reporting and Analysing, Near-Misses. Some of these near-misses are often times overlooked by staff and the challenge of tracking near-misses/Unsafe Act in our various field locations can be very overwhelming. However, HSE Unit plans to come up with a reward scheme for Staff that Identify and report Near-Misses. This is to encourage all Staff to imbibe the habit of Near-Miss Reporting.

c) Fire Drills: Fire drills are important part of BEDC fire Safety Procedure, as it helps to ensure that all staff, contractors, customers and visitors to our premises understand what they need to do in case of a fire incident and it also help to test our fire evacuation plan and to improve certain aspect of our fire provisions. There is currently a plan to establish a fire drill Schedule in all BEDC facilities (Injection Substations, Business Unit and Service Unit Buildings).

d) Increase Health Awareness among Staff: As a company that cares about the health of its staff, BEDC has engaged the services of a Health Maintenance Organisation (HMO) to take care of the health issues of Staff. This has given Staff a platform to attend to most of their health complaints and those of members of their immediate families. Other health awareness programs are also coming on board to educate staff to take proactive steps to ensure that they live a healthy life during and after their service years, some of these programs are: Health Trainings, BEDC Health Campaign, Health Fitness Centres etc.

e) BEDC Safety Hand Book: BEDC Management has approved the printing of BEDC Safety Hand Book. Copies distributed amongst all BEDC PLC Employees.

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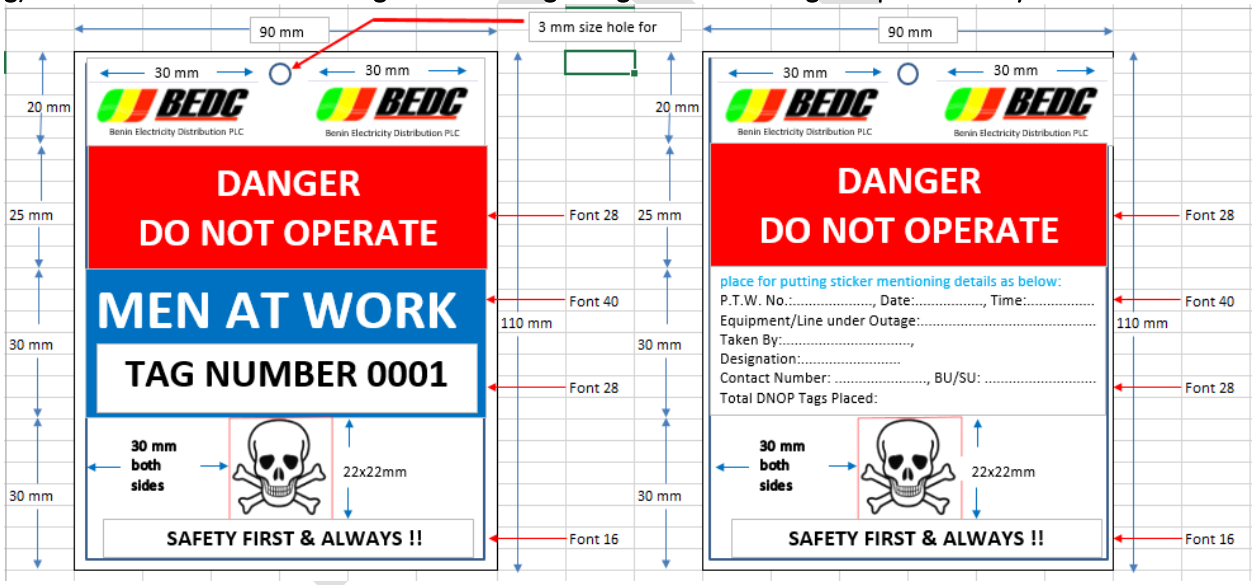
Sample Copy of BEDC Safety Hand Book

f) **ISO 9001 and OHSA 18001 Certifications:** One of the BEDC's future plans is to seek ISO 9001 Certification, when implemented will help to improve our Quality Management Systems, thereby improving employee's efficiency and customer Relationship. In addition to ISO 9001 we are also planning to obtain OHSA 18001 Certification which will also help to provide a framework to identify, control and decrease the risks associated with health and safety in our various work locations. Implementing this international standard will send a clear signal to BEDC stakeholders that we view employee's health and safety as a priority in line with our core values.

g) Standardization of DNOP Tags to use during outages for increasing manpower safety:



These DNOP tags will be used during any Equipment /Line is under Permit To Work and is being maintained by Authorized person and will be used at Isolation points, Circuit Breakers in field and control rooms. This initiative will eliminate chances of equipment charging by mistake. This Tag will also ensure that now PTW will be issued to any authorized personal until DNOP tag is placed at isolation points and details Serial Number at Central Load Dispatch for issuance of PTW.

5.9 HR Initiatives

The transition process to transformation of BEDC began in 2014, after the HR diagnostics conducted with the assistance of Phillips Consulting. Based on the recommendation of the consultants, following initiatives were taken to set the workforce to understanding the importance of individual accountability in achieving company set goals.

- **Staff Documentation and Records:** Legacy staff records were verified, and data created for each employee.
- **Staff alignment to business objectives:** Based on record verification, interviews were conducted and staff skills and exiting job roles were considered in aligning staff to achieve the immediate business objective.
- **Manpower Restructuring:** BEDC has reduced staff from 6,000 plus to around 2,000 core staff. The company has engaged various companies who provide contracted labour in some of the non-core areas. Consequent on the above is a significant reduction in manpower costs per month. However, it shall be understood that the manpower restructuring is an initiative targeted at reducing organisational layers and manpower involved in non-core activities while at the same time maintaining a critical mass of qualified staff who are ready to take the company forward. Accordingly there was an urgent need to immediately introduce young analytical graduates to the system to learn the scope of the existing network and use their initiatives to suggest solutions. A Recruitment drive to bring in a new graduate and technicians was started in collaboration with Elizade University. These staff has replaced some of the existing high cost staff while some are used to fill the need arising out of growth in network and customer base.
- **Training and skill development:** BEDC has entered into an agreement with Elizade University and created a training curriculum and facility that will prepare new graduates and Technicians for the requirements of their job at BEDC. They will spend at least six months at the facility before being assigned duties in service units. To date, more than 800 trainees have already been inducted into BEDC through this route. Further, BEDC is providing various in-house training to the existing staff to enhance their skill especially on safety and changes to key processes such as staff code of conduct.
- **Performance review and monitoring mechanism:** Fixing up the staff level accountability and a robust monitoring mechanism is key to any organisational performance. BEDC has set KPIs for each of the staff and their performance is being monitored through a performance management dashboard. Further, to keep the field units accountable for their performance, BEDC holds Monthly Performance Review sessions at which the performance of Business Units and Service Unit (the lowest management level in the organization) is measured against the target.

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5.10 CSR Initiatives

Table 11: CSR Initiatives undertaken

CSR PLANS	LEVEL	ACHIEVEMENT	MORE ACTION PLAN
THREE TIERS OF EDUCATION	**PRIMARY SCHOOLS**	• Safety sensitization exercise carried out in different schools across Edo and Delta States • Distribution of over 20,000 Safety Branded Notebooks, Snapper Frames and other items to the pupils	• Safety Sensitization in 1 primary school in each of the 77 LGA across our franchise area • Distribution of safety animated videos to schools
	SECONDARY SCHOOLS	• Safety Sensitization exercise carried out in schools across Edo and Delta States • Distribution of over 20,000 Safety Branded Notebooks, Snapper Frames and other items to the pupils	• Safety Sensitization in 1 secondary schools in each of the 77 LGA across our franchise area • Quiz Competition to be held across interested good grade schools in the 4 states and the best 20 schools (5 schools from each state) will be adopted for the establishment of the BEDC Joules Club • Distribution of safety animated videos to schools
	TERTIARY INSTITUTION	• Identified the tertiary institution to benefit from BEDC's CSR Initiatives	• Employment for graduates with 2:1 and above CGPA through BEDC graduate trainee program for approved Discipline in Universities/Polytechnic chosen within our franchise area • Introduction of BEDC best graduating student prices in best customer tertiary institutions for BEDC related Discipline to be given

CSR PLANS	LEVEL	ACHIEVEMENT	MORE ACTION PLAN
			cash prices of N250,000 (i.e. Elect-Elect)
SPONSORSHIP OF TWO ATLETHES FROM ONDO AND EKITI	**SPECIAL OLYMPICS WORLD SUMMER GAMES 2019 HELD IN ABU-DHABI**	• BEDC in the last 1 year sponsored two special athletes within our franchise state and both athletes won Gold and Silver in their respective games.	• Increase the number of athletes to cover all BEDC's coverage states

6 Current Gaps

6.1 Demand and Supply Gap

Although Nigeria has the generation capacity, a large part of it is wasted due to transmission or sub-transmission network constraints. Thus, the growth and performance of the industry and of BEDC is intricately tied to the effectiveness of TCN. With limited power availability, effective load management is the tool to efficiently allocate power between different regions and ensure that the best return is received for the unit of power actually received and delivered.

6.2 Network Infrastructure

6.2.1 Network Inadequacy:

As installed MVA Capacity of BEDC is increased from **2860.26 MVA** to **3808 MVA**. Still as per geographical condition of the customer base BEDC is having lot to increase the capacity in terms of lines and Transformers so as to meet the requirements of energy drawl. 33 kV and 11 kV lines are having length ranging from **150 kM to 360 kM** which is main reason behind reduction in energy drawl and these need rehabilitation. The summary of the same is given in tabular form in section 6.2.2

The current National generation stands at about 4,000MW of which 360 MW is allocated to BEDC to meet a load demand of about 1400MW. [approx.]

10 33kV feeders are overloaded out of 68 feeders, namely;

Asaba (II), Otovwodo/Patani, GRA, Xing-1, Xing-2, Enheren, Refinery-2Oluku, Switching Station, Etete, Egba, and Ihovbor.

66 11kV feeders out of 363 are overloaded. To de-load them, 27 11KV feeders are proposed based on as on date loading conditions.

500 distribution transformers are needed to de-load the overloaded DSS.

6.2.2 Old Dilapidated Network:

Most of the 33 kV and 11 kV feeders, Power and Distribution transformers as inherited in bad shape having lot of deficiencies on account of, old age, Vandalization of de-energized portions, dilapidated conductor and wooden poles and these conditions are making the things critical. Most of the feeders whether 33 kV /11 kV network is passing through dense vegetation is prone to faults and is facing frequent tripping. The inherent system is mostly in dilapidated condition having multiple size conductors, undersize conductor and worn-out poles. Also, other hardware fittings, insulators are in dilapidated conditions, there are Encroachments with passage of time, and deep forest and vegetation make the situation so critical that some of the feeders require rehabilitation. (Re- routed, conductor replacement, trace clearing, Isolators replacement, Rehabilitation of T-Offs which are contributing to major tripping.

Details of Feeder requiring Rehabilitation are as given below:

Table 12: Feeders requiring Rehabilitation

S/N	Feeder Name	Description
1	Otun 33KV feeder	Aged conductor, damaged cross arms and other deficiencies. Long Circuit length.
2	Ilawe/Aramoko 33KV feeder	Aged conductor, damaged cross arms and other deficiencies. Long Circuit length.
3	Okitikpokpa 33KV feeder	Aged conductor, damaged cross arms and other deficiencies. Long Circuit length.
4	Ehor 33KV feeder	Aged conductor, damaged cross arms and other deficiencies. Long Circuit length.
5	Uzebba 33KV feeder	Aged conductor, damaged cross arms and other deficiencies. Long Circuit length.
6	Isoko/Kwale 33KV feeder	Aged conductor, damaged cross arms and other deficiencies. Long Circuit length.
7	Agbor/Irrua	Aged conductor, damaged cross arms and other deficiencies. Long Circuit length.
8	Owo 33KV feeder	Aged conductor, damaged cross arms and other deficiencies. Long Circuit length.
9	Aladja 33KV feeder	Aged conductor, damaged cross arms and other deficiencies. Long Circuit length.
10	Express 33KV feeder	Aged conductor, damaged cross arms and other deficiencies. Long Circuit length.

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Complete Rehabilitation cases:

Table 13: Complete Rehabilitation cases

S/N	Job Description	Location
1	Rehabilitation of Sapele 33KV Line	Sapele
2	Rehabilitation of Olomoro/Igbide 33/11KV Lines	Olomoro
3	Rehabilitation of Koko Feeder from Oghara TCN to Koko Isolator.	Oghara
4	Rehabilitation of Isele-Uku/Ubuluku 11kv Line and Trace widening	Isele-Uku
6	Rehabilitation of 9.8Km Ikpoba Dam 33KV Feeder	Ugbowo
7	Rehabilitation of 14.3Km Guinness 33KV Feeder	Benin City
8	Rehabilitation of 194Km Okada 33KV Feeder	Okada
9	Rehabilitation of 31.13Km Evbuotubu 33KV Feeder	Benin City
10	Rehabilitation of 92.6Km Koko 33KV Feeder	Koko
11	Rehabilitation of Ogwashi-Uku 33KV Feeder	Ogwashi-Uku
12	Rehabilitation of 2Km 11KV Line from Control Room to Garage Substation in Ogwashi-Uku	Ogwashi-Uku
13	Rehabilitation of Asaba 33KV Lines	Asaba
14	Rehabilitation of Refinery 1 33KV Line in Effurun Business Unit.	Effurun
15	Rehabilitation of Warri, Refinery II and Enerhen 33KV Lines	Warri and PTI
16	Rehabilitation of Patani/Otovwodo 33KV Lines.	Ughelli
17	Rehabilitation of Urhonigbe 33KV Network	Urhonigbe
18	Rehabilitation of 14Km and Diversion of 4Km Route Length on Ifetedo - Ondo 33KV Line.	Ondo
19	Rehabilitation of Okada 33KV Feeder from Siluko Injection Substation to Boundary Meter (CT Meter).	Evbuotubu
20	Rehabilitation of Okada 33KV Feeder from Boundary Meter (CT Meter) to River Iguoyasa	Evbuotubu
21	Rehabilitation/Trace Clearing of Okada 33KV Feeder from River Iguoyasa to Udo Junction	Evbuotubu
22	Rerouting of Vandalized Section of Koko 33KV Feeder through Benin Sapele Road	Sapele
23	Rerouting of 4Km HT on Igbara Oke 33KV Line and Rehabilitation of 120Km Route Length	Igbara-Oke
24	Rehabilitation of Owena 33KV Feeder of 58.5km Route Length in Akure	Akure
25	Construction of a New MD Customer Feeder to Premium Steel for 5MW from TS (4.0Km)	Otor Udu
26	Rehabilitation of 6No. Power and Distribution Transformers	Edo, Delta, Ondo and Ekiti
27	Rehabilitation of Egba 33 kV Line.	Ikpoba-Hill
28	Rehabilitation of 50Km Ikpeshi 33KV Undersized Overhead Lines (22Km Re-conductoring and 28Km Trace Clearing)	Ikpeshi - Auchi
29	Rehabilitation of LT Network in Ibusa	Ibusa
30	Rehabilitation of 33kv Feeder from Ikole to Ode Ekiti	Ido Ekiti
31	Rehabilitation of Okitipupa 33kv Feeder from Ore Open Point to Ode- Aye Town and Substations	Okitipupa

32	Rehabilitation of 24.7Km 33KV Overhead Line Rehabilitation from Ogborbor Junction to Ofosun.	Okada
33	Re- conductoring of PTI 11KV feeder.	PTI

6.2.3 Transmission Constraints:

Table 14: Transmission constraints

S/N	TRANSMISSION S/S	BOTTLENECKS	POSSIBLE SOLUTIONS	PRESENT STATUS
1	Akure 132/33KV TS	Load limitation due to undersized conductor on the 132KV line between Oshogbo and Akure TS.	Early commissioning of Ogbese Akure 2 X 150MVA, 330/132/33KV Transmission Station.	As reported by TCN, 330/132/33kv Transmission s/s is ready. However, 330kv lines from Oshogbo and Benin-Evhobhor is held up due to community issues.
2	Okada 132/33KV TS	40MVA Power transformer -2 Grounding transformer has failed on 12.06.2017.	Early replacement of Failed grounding transformer of 40MVA Power Transformer	Only 1x40MVA is feeding Okada and part of Evhotubu BU.
3	Effurun 132/33KV TS	1x60mva 132/33 KV power transformer is faulty. Also, there is an undersized conductor on the 132KV line between Ugheli and Effurun	Replacement of undersized conductors between Ughelli to Effurun and early replacement of failed 60 MVA Power Transformer	Heavy Load management is taking place in Effurun, Warri, PTI and Sapale Axis.
4	Oghara 132/33KV TS	1x 40mva Power Transformer is out since commissioning of Transmission s/s.	Early replacement of defective bushing or replacement of 40MVA Power Transformer	BEDC is unable to bring more power to Benin. TCN is trying to resolve the issue
5	Benin 330/132/33KV TS	Power Crises in Benin city due to failure of 2x60MVA Power Transformers [T21 and T23]. Total Power requirement of Benin Metropolis is in the vicinity of 260MVA. However, the present available capacity is only [48+35] = 83MVA. [excluding 80 MVA dedicated Power transformer of Yongxing]	As an immediate measure, TCN arranged 1x60mva Power transformer from IRRUA [De-rated to 35MVA] and 1 x40 MVA Mobitra. Long terms: All 3nos Underrated /failed Power transformers to be replaced by 3x100 mva power transformers and construct new 33kv feeders to mitigate the ongoing power crisis and future load growth of next 5 years	Immediately after the failure of 2x60mva Power transformers at Benin TCN, we constructed and rehabilitated 33kv feeders from Okada, Oghara and Ihovbor TCN and succeeded in bringing 28 MW. Benin Metropolis. Benin Metropolis total power requirement is in the vicinity of 260MVA. The total power available is only 95mva [excluding 80mva dedicated Power transformer of Yongxing]

6	Ondo 132/33KV TS	1] 33kV B/S 1 of indoor switchgear is out on fault 2] Grounding transformer of 30MVA T2 Power transformer is faulty. 3] There is load limitation on Oshogbo-Ife Ondo 132KV line due to perceived overloading at Oshogbo.	1] Replacement of 33kv indoor breakers at ONDO TCN. 2] Replacement of failed grounding transformer of 30MVA at ONDO TS. 3] Permanent **solution**: Total load requirement of Ondo south [ORE, Ode-Ayi, Okitipupa, Igbokoda, Irele and other communities is in the vicinity of 70 MVA. This quantum of power can't be provided from ONDO-TCN. Therefore, the proposed 132/33kv TCN TS project at Okitipupa to be Expedited. Also, New TCN –TS 132/33KV TCN-TS at Omotosho to be constructed to provide power in Omotosho and Ore Axis.	Presently 1 no 30mva Power transformer is feeding Ondo Town and Ore Axis. Recently, In view of His Excellency VP 's Visit to IGBOKODA, NDPHC and BEDC jointly rehabilitated 33kv feeders from Ore to IGBOKODA [Approx. 60KMs] and Associated, DSS, Injection s/s and LV network in Ode-Ayi, Okitipupa, Igbokoda and Ondo University. However, the power availability in Ondo-TCN is very limited. Therefore, the proposed 132/33kv TCN s/s project be expedited at the earliest.
7	Ado-Ekiti 132/33KV TS	Load limitation due to undersized conductor on the 132KV line between Oshogbo and Akure	1] Replacement of undersized conductor of 132kv line from Oshogbo to Akure. 2] Expedite commissioning of 330/132/33kv OGBESE [Akure] TCN with installed capacity of 2x150MVA 330/132kv and 2x60MVA 132/33kv Power Transformers	Nevertheless, TCN added 1x60mva in Ado-Ekiti s/s, we are unable to draw more than 20MW in Ado-Ekiti S/S for Ekiti State due to main bottleneck in 132kv line from Oshogbo – Akure. Early commissioning of 330/132/33 KV at Ogbese [Akure]

6.3 Metering Gap

BEDC has achieved 100% feeder metering and is in process of metering 100% DTRs. Currently, 480 number of DTR is already metered while remaining DTRs are expected to be metered before this year end. Also 100% metering of MD customers has been achieved. This leaves metering gap for only Non-MD customers for which BEDC plans to install around 573,000 meters under MAP in next 2 years as per schedule below.

Table 15: Metering deployment schedule

Month	1	2	3	4	5	6	7	8	9	10	11	12	Total Year 1
No of Meters to be deployed	3,650	5,150	6,250	10,750	23,270	26,600	28,100	22,600	28,100	28,100	28,100	28,100	238,770
Month	13	14	15	16	17	18	19	20	21	22	23	24	Total Year 2
No of Meters to be deployed	28,100	28,100	28,100	28,100	28,100	28,600	29,100	22,175	29,100	29,100	29,300	27,131	335,006
Grand Total	**573,776**												

6.4 Customer Satisfaction and Stakeholder View on the Current Service Levels

As a part of the PIP development, BEDC has undertaken the "Stakeholder Engagement Session" with key stakeholders. This session was facilitated by Phillips Consulting (**PCL.**). A focused group discussion to harness stakeholder's views on our service delivery, future expectations and preferences was conducted with participants. Key discussion areas for the session was:

- Quality & reliability of supply
- Quality of the metering, billing and payment process
- Consumers' Perception of processes
- Customer Relationship Management
- Quality of fault complaint & repairs process

The findings of the focused group discussion is as presented below:

6.4.1 Major challenges

The key stakeholder challenges across all locations have been highlighted.

Table 16: Stakeholder consultation- Challenges

Location	Key Challenges
Ondo	• Abrupt cutting of power supply without notice • Inconsistent load shed and unequal spread across all communities • Overloaded distribution facilities • No clearing of bushes under power lines

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	• Failure to replace power poles regularly • Inaccurate prepaid meter readings • High power bills • Lack of communication between BEDC and customers • No means to identify authentic BEDC staff • Power theft • Extortion of customers
Ekiti	• Unequal spread of power across all communities • High voltage electricity that damage equipment and properties • Poor maintenance of poles and wires • Use of low-grade wire • Poor grid supply equipment • No supply of pre-paid meters • Billings without supply of electricity in some communities • Shortage of BEDC manpower • Poorly trained BEDC staff • Poor monitoring of meters • Poor socialization of officers which leads to communication gap between BEDC and community • High vandalism of equipment
Delta	• Only 6 hours of electricity supply daily with very low voltage • In the past month, BEDC has provided electricity just twice on Former Deputy road • Few hours of power despite being a commercial line • There is an absence of prepaid meters in several areas • Presence of obsolete transformers which is insufficient for the areas • Exorbitant electricity billing or high rates • Estimated electricity billing should be discouraged

Draft

	• Communication between BEDC and customers is poor • Slow response time from BEDC representatives on public holidays • Unexpected disconnections • Cumbersome process in acquiring meters • Extortion of customers • BEDC officers collect bribe
Edo	• Lack of coherent and scheduled system of power supply • Power supply reduced from 9 hours to 6 hours or even 4 hours daily • Poor metering • Poor infrastructure • Obsolete transformers and conductors • Burden of repairing transforms carried by customers • Overestimated bills for customers without prepaid meter • The unit price in Edo state is one of the highest in the country • Slow response when called for reconnection • None implementation of official BEDC/FGN 10-year tariff plan provided by BEDC in 2016/17 • Disruption of power supply without notice

6.4.2 Key Recommendations from Stakeholders

The key recommendations that came forward during stakeholder consultations in each location have been highlighted below:

Table 17: Stakeholder Consultation- Recommendations

Location	Key Recommendations
Ondo	• Fencing of transformers • Provision of meters • Hiring more staff • Responding to customers compliant within 48 hours

Draft

	• Accurate billing, such that customers will not be billed when the electricity supply is faulty • Notify consumers before tripping-off the lines
Ekiti	• BEDC should procure more work equipment like utility vehicles, ladders • Provision of prepaid meters • BEDC staff should have a proper customer relation process • Provide infrastructure like transformers, poles, wires etc. • BEDC should deploy adequate security measures to prevent breaking into the transformer house • Electricity supply should be regular • Partner with community to agree on price of transformers, cables etc.
Delta	• BEDC should supply MAP meters • Improve power supply • Provide meters to customers • Quick responses to complaints • Remove buildings and trees under high tension wires to avoid loss of lives • Replace old transformers • Stop collecting bribes • BEDC should maintain their lines regularly
Edo	• Electricity voltage should be increased • All vandalized transformers should be replaced to ensure steady power supply • BEDC should have at least 2-3 33kv lines, from Ihonvbere power station to Ikpoba to Auchi & Agbhor road to create better output • Provide prepaid meters to all customers • Identify business areas to enhance equal distribution of power supply • Provide transformers in every location with no/obsolete transformers

The inputs received from the various stakeholder consultations have been considered while preparing for undertaking systematic improvements in the Performance improvement Plan

6.5 Skill and Manpower Gap

BEDC will keep on realigning its Manpower structure and performance measurement matrix to suit the changing need of business. Further, BEDC believes that it will have to focus more on training and skill development in future to meet the current requirement of skilled workforce. For this purpose, BEDC has entered into an agreement with Elizade University and created a training curriculum and facility that will prepare new graduates and Technicians for the requirements of their job at BEDC. They will spend at least six months at the facility before being assigned duties in service units. To date, more than 800 trainees have already been inducted into BEDC through this route. Further, BEDC is providing various in-house training to the existing staff to enhance their skill especially on safety and changes to key processes such as staff code of conduct.

7 BEDC's Envisaged Services Levels

7.1 Meeting the Demand and Supply Gap

The current BEDC infrastructure has enough capacity to distribute up to 1,400MW at Distribution level but there is need to enhance infrastructure at 11 kV level and ISS level. The identified load gaps is therefore mainly due to limited generation and load constraints at the Transmission Stations. In order for us to meet our demand and reduce load gap there is need for us to look into the following bottle necks. They are as follows:

1. **Feeder Limitation:**
    a. All 33kv feeders have been proposed for upgrading from $150mm^2$ aluminum conductor to $240mm^2$ aluminum conductor as present capacity of all 33 kV feeders is between 20-22 MW.
    b. Same limitation is applicable on 11 kV also as the feeders conductor size is in the range of 100-120 mm^2 which can carry a load of 5 MW. Hence there is need of additional 11 kV additional feeders.
2. **Load (transformer) Limitation:**
    Most of BEDC injection substations are over loaded. Proposals of 12nos injection substations are prepared for relief the over loaded ones in our network.
3. **Network Decay:**
    The state of our network 33kv, 11kv and 0.415kv lines are deplorable. Hence, the management has taken upon itself to find a lasting solution to this present state. Majority of our 33kv and 11kv lines have been submitted to management for approval of trace clearing and rehabilitation including replacement of broken concrete poles, wooden poles and cross arms, bent and rusted channel and angle irons.
4. **Installation of Relief Power and Distribution Transformers:**
    Proposals have been prepared for relief injection substations, installation of new distribution substations and construction of new 33kv and 11kv overhead lines.

7.1.1 Demand Forecast (optimistic and Realistic Scenarios)

Demand forecasting is the predicting of electrical power required to meet the short term, medium term or long-term demand. The forecasting helps the utility companies in their operation and management of the supply to their customers. It helps in determining the areas of future growth and plan network capabilities to improve the last mile connectivity to the customers.

Draft

Table 18: Demand Forecast

	2018	2019		2020		2021		2022		2023		2024	
LOAD CATEGORY	BASE LINE	Load Addn.	2019	Load Addn.	2020	Load Addn.	2021	Load Addn.	2022	Load Addn.	2023	Load Addn.	2024
PEAK LOAD of BEDC	1228	61	1276	96	1372	103	1474	111	1585	119	1704	128	1832
Unserved Communities	42	2	45	3	48	4	52	4	55	4	60	4	64
Disconnected Communities	98	5	103	8	111	8	119	9	128	10	137	10	148
Total Load Forecast (MW)	1369	68	1423	107	1530	115	1645	123	1768	133	1901	143	2043

Demand forecasting is essential to identify system requirements for the future to plan for network augmentation, strengthening and capex planning. BEDC is responsible for retail distribution of electricity in Delta, Edo, Ekiti, and Ondo States and operates from twenty-five (25) business districts with approximately 350 offices located across the four (4) states.

Delta State is an oil and agricultural producing state in Nigeria. It is situated in the region known as the South-South geo-political zone with an estimated population of 5.6 million people. Asaba is the state capital located at the northern end of the state, while Warri, located in the southern end, is the most populated city which serves as the economic center of the state. The state has a total land area of 17,108 square kilometers.

Ondo is a state in Nigeria created on 3 February 1976 from the former Western State. Akure is the state capital. The state has an area of 15,820 square kilometers and an estimated population of 4.7 million. **Ekiti** State is in Southwest region of Nigeria, declared a state on 1 October 1996 alongside five other states in the country and was carved out of the territory of old Ondo State. Ado Ekiti is the capital city of the state. The state has an area of 5,435 square kilometers and an estimated population of 3.3 million.

Edo State is a state in Nigeria. Its capital is Benin City. The estimated population of the Edo state is 4.2 million people and the state area is 19,187 square kilometers. The State has a high presence of residents from across the country and the world because of its cosmopolitan tendencies.

The population density for the four states has been outlined in the graph below:

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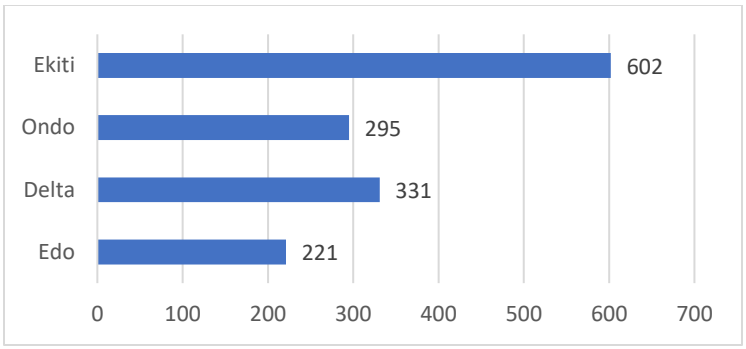

Figure 12: Population density in BEDC states

Ekiti is the most densely populated state in the BEDC supply region. The energy input data has been forecasted for each region based on historical growth rates, as shown below:

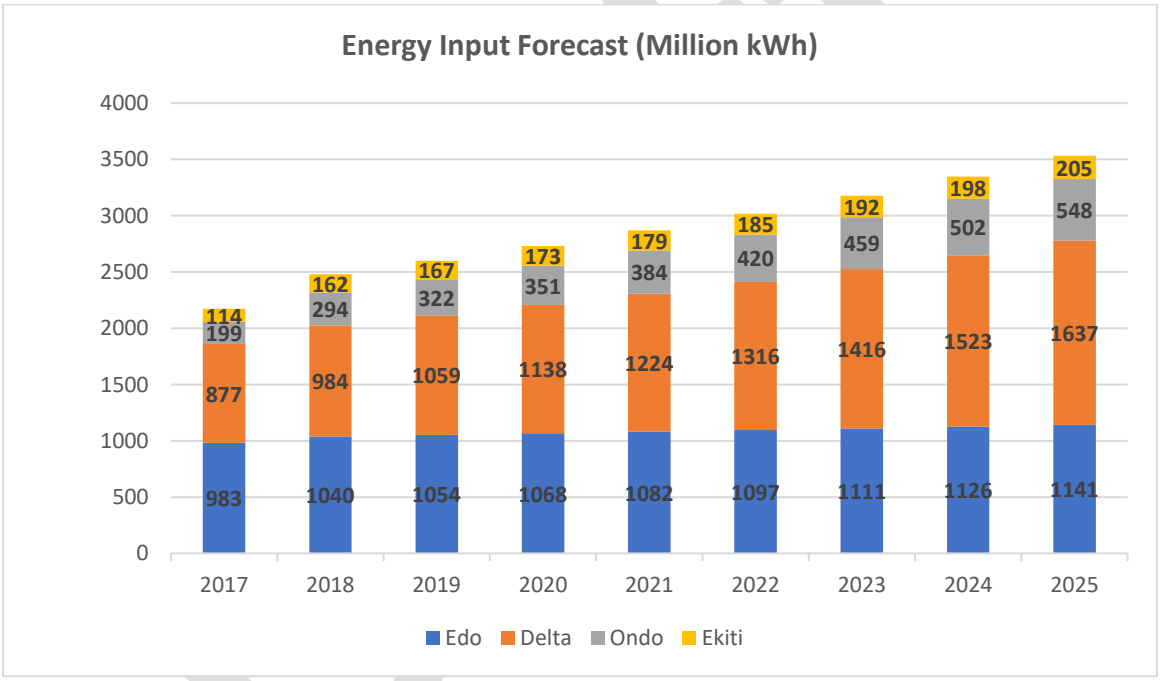

Figure 13: Energy Input Forecast (Million kWh)

The states of Edo and Delta form the major share of energy input for BEDC. On an overall level, the energy input for BEDC is projected to grow annually at 5%.

7.1.1.1 Assessment of Suppressed Demand:

1. 33 kV Nekpenekpen feeder, feeding Nekpenekpen ISS with installed DSS capacity on 11 kV Feeders is 21 MW, which is 100% of the installed capacity of ISS, so as to de-load ISS 2X15 MVA EKENWAN 2X15 MVA ISS is proposed which will share 30% load of Nekpenekpen ISS, also the same will de-load overloading Country home 2X15 MVA ISS running at 22 MVA 100% of its Capacity. 30% of the load will go to EKANWAN 2X15 MVA ISS.
2. ETETE ISS is running on 40 MW (233%) overloading if all feeders made ON, Similarly Welfare ISS is running on 27.6 MW (138%) of its Installed Capacity, hence to de-load ETETE and WELFARE ISS, 2X20 MVA SWITCHING STATION ISS is proposed.

3. ALAGBAKA 1X7.5 MVA ISS is overloaded by 130%, hence additional 1x7.5 MVA Power Transformer is proposed.
4. Iyokokba ISS 1X15 MVA is running on 100% of its Installed Capacity, hence additional 1X15 MVA is required.
5. Government Core 2X15 MVA ISS is overloaded by 100% of its installed capacity, hence Upgrade to 2X20 MVA is proposed.

7.1.1.2 Large Industries Growth Outlook

Nigeria's economic recovery has strengthened over last few years, but growth still remains constrained which is expected to grow at ~2% in medium term. The growing importance of services has bolstered growth in the economy and the sector accounts for about half of GDP.

The largest industries which drive the country's economy and account for the bulk of its annual GDP are its petroleum, tourism, agriculture, and mining industries. The biggest industries in the country also employ a large number of the country's workforce with the agricultural industry alone employing about 30% of the country's total labor force. These industries are also responsible for the bulk of the country's exports. The largest and most economically important industry in Nigeria is the country's petroleum industry. The country is among the top ten largest producers of oil globally and has the largest oil producer in the continent

The pace of implementing the Economic Recovery and Growth Plan, which anchors Nigeria's industrialization by establishing industrial clusters and staple crop processing zones to give firms a competitive edge through access to raw materials, skilled labor, technology, and materials is the key to future growth of the sector.

Large scale industry is expected to grow at rate of 3% over next three years.

7.1.1.3 Demand form electrified communities/areas

Study has been completed in this regard and details are as below:

Present Load Pan BEDC Electricity PLC is 1368.8 MW including load of disconnected communities due to Non-Payment and additional load of these disconnected communities is (98.042 MW).

7.1.2 Power Procurement Plan to meet the forecasted demand

Strategies for tackling TCN bottleneck: BEDC has identified transmission bottlenecks to with identified schemes for easing out constraints. The schemes include augmentation of substation transformers, replacement of undersized conductors, shifting of feeders and other identified interventions.

The impact assessment of each scheme on reliability of the network has been carried out.

Effective co-ordination with TCN: BEDC and TCN (Benin Zone), have resolved to work together for the satisfaction of customers in the power sector. Agreed to a resolution that they would continue to work together as critical partners in the power sector value chain that are dependent on each other.

Exploring additional sources of Power:

- Off late several large transformers of TCN has failed which put a large area in darkness/very low availability for months. Also, in absence of reliable grid supply BEDC is not able to ensure reliability

and is losing some of the large industrial customers (i.e. plastic industries, breweries, processing industries) for whom reliability is utmost important. BEDC aims to tie up with Independent Power Producers (IPPs) in its area to provide alternative to grid supply and thereby increasing redundancy and reliability of supply.

- BEDC is also blessed with the location in its service area of some of the large IPP that supply power to the Grid. These parties have PPA contracts with NBET to supply contracted capacity to the grid. These contracts however allow the Gencos to sell any surplus capacity to any other off-taker on a bilateral basis. BEDC will take advantage of this opportunity and wherever possible it will contract the extra capacity to supply additional power to its customers.

Development of mini grids:

Mini-grids provide potential opportunities over grid-connected electrification, such as enhanced reliability of supply, lower costs in remote locations and better environmental performance. BEDC has signed a Memorandum of Understanding with Rocky Mountain Institute, Colorado, U.S.A (RMI) and Rubitec Nigeria Limited to provide mini-grid electricity for customers. Under MoU, it is proposed to bring solar mini grid electricity to communities within the franchise area who are unserved or underserved

Load management:

BEDC Electricity PLC receives 9% of total Generation of Nigerian Grid, i.e. around 360MW as against the total requirement of > 1400MW. Therefore, Regimented load management was introduced in BEDC network to pre-inform the customers and manage the load requirement of the system.

7.1.3 Targets for reduction in load shedding and average power availability improvements:

Load shedding have been implemented to provide reliable power system operations under normal and emergency conditions. It is still a methodology used worldwide to prevent power system degradation to black outs, but also reduces availability and revenue generation for the distribution companies.

Benin Electricity Distribution Company has come up with modalities to reduce the number of interrupted areas (customers). They are as follows:

1. Quick response to fault clearing.
2. Preventive maintenance schedule.
3. Construction of new 33kv and 11kv overhead lines to relief existing overload feeders.
4. Installation of new power and distribution substations to relief over loaded ones.
5. Reduction in time out set in load shedding preparation list. This will improve revenue generation from customers, if properly metered.
6. Effective metering of customers to prevent theft and losses.
7. Replacement of aged equipment to pave way for easy intake of energy delivered.

7.2 Removing Infrastructure Bottlenecks and improving availability

1. Two additional 33 kV Feeders are proposed from 132/33 kV IHOVBOUR TCN for enhancing Power Availability in Benin Metropolis.

2. One 33 kV Link has been created between BENIN and IHOVBOUR TCN so as to arrange for Back-feeding customers in case of failure of 33 kV Circuit from any of the above mentioned TCN.

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3. Re-conductoring of GRA, NEKPENEKPEN, ETETE 33 kV feeders from Benin TCN for evacuation of more Power.

4. Proposal for New ISS where 11 kV feeder length is extending more than 30 KM.

5. Proposal for two new 33 kV Bays from Benin TCN for creating Ring Main System in Benin Metropolis.

6. De-loading of ASABA TCN by back feeding 33 kV feed from AGBOR TCN.

7. Connecting ALEDJA 33 kV Feeder to P.S.M.L. feeder to improve Voltage level to ALEDJA ISS, EKETE ISS and EDJOPHE ISS. Also to reduce length of 33 kV ALEDJA feeder.

8. Construction of 2 33 kV Feeders from Auchi TCN.

9. UPRATING OF ONYERUGBULEM 2.5MVA TO 1 X 7.5MVA, 33/11KV INJECTION SUBSTATION IN AKURE.

10 Disconnection of Lengthy 33 kV Feeder OSOSO from OKENE TCN and connection to Okpella TCN for system reliability in ONDO State.

7.2.1 Envisaged Benefits for Stakeholders:

1. Improve system reliability
2. Improved customer satisfaction
3. Reduced breakdown time
4. Cost saving from repairs
5. Improved network safety
6. Improved power availability
7. Improved Living standard of customers
8. Improved security during night hours for general public.

7.3 Increasing the coverage area and powering under served and unserved areas

BEDC Licensee area had a population of around 13.2 million at the time of takeover, with around 3.6 million household but only 0.68 million customers. While this situation presented an opportunity for BEDC to add large number of customers to its network, it also presented a challenge in terms of requirements for expanding the network manifold to cover the un-electrified customers/areas. However, any mass scale Electrification program can only be carried out after the improvement of supply situation and availability of generation capacity so that any outreach electrification programme does not impact the supply to existing customers. BEDC has detailed out its network expansion plans in section 9.1.2 of this report.

7.4 ATC&C Loss Reduction Targets

NERC initially approved the Baseline ATC&C of 54.1% under MYTO 2.1 issued in the January 2015 Tariff Order. The relative % Loss Reduction committed by Bidder at the time of the bid was kept same to arrive at targeted ATC&C loss level for next 5 years. Further NERC removed MDA debt was removed from Baseline and final approved loss level by NERC was as in table below.

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Table 19: Approved loss levels by NERC

	2015	2016	2017	2018	2019
Distribution Losses, %	13.0%	10.7%	8.5%	6.6%	5.0%
Non-technical losses, %	14.0%	12.3%	10.5%	8.6%	6.8%
Non-Collected Billable, %	29.3%	21.6%	15.6%	10.8%	7.3%
ATC&C Losses %	47.09%	38.62%	30.89%	23.91%	17.94%

However, due to several delays in meeting the commitment of privatization by the government, especially no tariff review in years 2017 and 2018 shrouding the full recovery of tariff, NERC in its latest Tariff Order has recognized year years 2017 and 2018 as years of mutual non-performance and exempting the ATC&C loss reduction target for these years. Accordingly, the allowed loss reduction trajectory is as in table below.

Table 20: Revised (final) approved loss levels by NERC

	2015	2016	2017	2018	2019	2020	2021
Distribution Losses, %	13.0%	10.7%	8.5%	8.5%	8.5%	6.6%	5.0%
Non technical losses, %	14.0%	12.3%	10.5%	10.5%	10.5%	8.6%	6.8%
Non-Collected Billable, %	29.3%	21.6%	15.6%	15.6%	15.6%	10.8%	7.3%
ATC&C Losses %	47.09%	38.62%	30.89%	30.89%	30.89%	23.91%	17.94%

7.4.1 Current Loss Levels

While BEDC has taken several initiatives for reduction of technical and commercial loss, major challenge hampering the targeted ATC&C loss reduction are

i. **Unavailability of required amount of power:** Given the availability of power, BEDC has to resort to load shedding which is as high as 16-20 hours in some of the areas. Unavailability for power for major part of day is becoming a key point of customer protest and many of the customers have started refusing to pay for this quality of supply which is severely impaction the collection efficiency of BEDC. Further, inability to provide reliable supply has made many of the large industries opting for captive generation.

ii. **Inadequate and dilapidated network and infrastructure:** BEDC has inherited a network which was old, dilapidated and hugely inadequate to efficiently serve even the existing customers. Given this situation, BEDC had to focus more towards the refurbishment of existing infrastructure to be able to make available the existing feeders than to create new infrastructure for catering to load growth and shifting the load from the overloaded feeders and transformers. Thus, the initial few years has been used for setting right the existing network and infrastructure, rather than focusing on fact paced technical loss reduction. With operational performance (network availability and reliability) improving over a period of time, BEDC has now started to focus on technical loss

reduction strategies like HVDS, load balancing, feeder segregation, replacement of undersized cables etc.

iii. Further, with limited capex approved under MYTO, the capex is not sufficient for the creation of network based on increasing load demand and refurbishment of old dilapidated network. Such network condition is further worsening the network reliability and power availability situation which in turn is impacting the collection.

iv. **Requirement for sensitization of customers towards the change:** BEDC customers were not properly metered and billed during the incumbent PHCN era. Thus, the customer has developed an expectation of either enjoying electricity for free or pay a very low fixed amount monthly irrespective of the quantum of power use. With increase in availability, the quantum of power being used by each customers have increased, added with the Tariff changes, the customers are seeing the actual bills (which is quite naturally higher compared to what they used to pay earlier) as very high and are reluctant to pay. BEDC has encountered several protests from customers groups regarding this. It has to be understood that this change management of consumer behavior was required before any large scale capex is invested for loss reduction initiative and hence for the initial few years after takeover, BEDC has first focused on such change management initiatives thereby continuously sensitizing the customers towards the need to pay their bills.

Over the period of last 6 years, BEDC has worked towards resolving the above issues related to power availability, network reliability and customer sensitization. The effort has also reflected in reducing loss trajectory of the company as in table below.

Table 21: Reducing loss levels of BEDC

S. No.	FY	Achievement							
		2014	2015	2016	2017	2018	Q1 -19	Q2 -19	Jul-19
1	Total Billing	35.79Bn	41.33Bn	51.38Bn	62.89Bn	75.33Bn	20.34Bn	19.64Bn	5.42Bn
2	Total Collection	23.62Bn	25.95Bn	26.99Bn	35.47Bn	41.81Bn	10.38Bn	10.46Bn	3.46Bn
3	Billing Efficiency	76.56%	73.45%	85.03%	83.06%	85.56%	86.18%	87.58%	87.55%
4	Collection Efficiency	53.51%	62.79%	52.52%	56.40%	55.50%	51.04%	53.24%	63.96%
6	ATC&C# Loss Level	68.52%	56.32%	54.59%	53.14%	52.55%	56.02%	53.38%	44.00%

Based on Energy Input as per BEDC 33 KV Feeder Readings

While BEDC has seen consistent loss reduction trajectory over the years, the loss reduction has not met the target and expectations. The slow pace of loss reduction is mainly on account of extremely low capex which is not even sufficient to do maintain the network, leave apart refurbishing and upgrading it. This has led to further worsening of network condition leading to poor network reliability and power availability situation which in turn is impacting the collection.

While preparing the future loss reduction target corresponding capex and opex requirements needs to be assessed for achieving those targets. In absence of matching capex and opex in tariff, it will not be possible for any Disco to meet the projected performance standards. Considering all these situation, BEDC is proposing following scenarios for future loss reduction targets.

7.4.2 Capital Expenditure and Operating expenses

Capital expenditure

While BEDC looks for network augmentation, it is important to realize the present constraints and ability. Many of the planned strategies for future may not be achievable in the short run due to constraints of resources and fund. Considering from the perspective of a Performance Improvement Plan, it important to set up a priority order for the planned initiatives. BEDC network infrastructure plan has been guided by the priority of requirements and cost benefit analysis with major focus on refurbishment of existing network.

The major areas of focus are reduction of AT&C Losses, reliability improvement and infrastructure development to cater the growth in load. Several critical upgrades are expected to be fast-tracked and completed within three to five years, enabling network strengthening to meet existing & rising demand for electricity for customers in residential, commercial and industrial areas.

- **Metering focus:** Metering effectively represents the basis for sustainable revenue generation and commercial viability of the power sector. Metering is a top priority for any DisCos and the entire power sector value chain whose respective costs of service are all embedded in the final utility bill borne by the customer. Essentially, the power sector value chain is wholly dependent on the DisCos to provide last mile services to the customer and perform the role of revenue collections.

  A comprehensive metering program has been envisaged over next five years to improve. BEDC targets to achieve 100% metering with DTR level energy accounting based on AMR and AMI readings recorded remotely. The target of 100% metering is planned to achieve in next 2 years under MAP starting September 2019.

- **Network Rehabilitation & Augmentation:** Currently capex is required for major refurbishment of old dilapidated network, improving 33KV and 11 KV network. Distribution network rehabilitation and replacement of defective equipment is critical from network stability and improving last mile connectivity to the customers. Development of comprehensive augmentation plan for network expansion is essential to meet the desired goal of loss reduction and increase reliability of Power supply.

- **Reduction of ATC&C Losses:** Aggregate Technical and Commercial (AT&C) loss is a critical yardstick for measurement of performance of distribution utilities. With specific ATC&C benchmark roadmap for BEDC, the requirement to undertake capex is critical to meet the committed loss levels.

Operating Expenses:

The proposed additional Capital expenditure over period 2020 to 2024 is expected to have high impact on the operating expenditure. Considering this, operating expenses are expected to increase due to

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additional network maintenance cost, increase in manpower cost, new IT deployment and software expenses, growth in customers service charges, administrative and general expenses.

All these proposed programs like network augmentation, improvement in metering, and reduction in ATC&C are expected to drive the increase in Operating expenses.

7.4.3 Scenarios for Future Loss Reduction Targets

1. **Scenario 1: Existing Loss reduction targets till 2021 and existing Capex and Opex till 2021 and increased Capex and Opex from 2022 to 2024 and corresponding loss reduction for these years**

   This scenario is not feasible as the capex required for achieving MYTO loss reduction targets by 2021 is grossly insufficient for the years till 2021.

Table 22: Scenario 1 for future loss reduction

	Existing Targets					Proposed under PIP				
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Distribution Losses, %	13.00%	10.70%	8.50%	8.50%	8.50%	6.60%	5.00%	4.75%	4.50%	4.25%
Non-technical losses, %	14.00%	12.30%	10.50%	10.50%	10.50%	8.60%	6.80%	6.50%	6.25%	6.00%
Non-Collected Billable, %	29.30%	21.60%	15.60%	15.60%	15.60%	10.80%	7.30%	7.00%	6.75%	6.50%
ATC&C Losses %	**47.09%**	**38.62%**	**30.89%**	**30.89%**	**30.89%**	**23.91%**	**17.94%**	**17.18%**	**16.51%**	**15.85%**

2. **Scenario 2: Existing Loss reduction targets till 2021 and corresponding required Capex and Opex for entire period**

   Considering that current loss is very high mainly on account of low investment (limited capex) over the years, it is nearly impossible to bridge the gap crated in so many years and meet the required loss reduction target by 2020. If this has to be achieved, huge investments in network modernization will be required to be taken in 1st 2 years to achieve target ATC&C in 2020 and 2021. Based on the outcome of load flow study and network expansion plan and considering modernization of 13 BUs instead of 5, the yearly capex and opex required in this scenario is as below.

Table 23: Scenario 2 for future loss reduction

	Existing Targets					Proposed under PIP				
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Distribution Losses, %	13.00%	10.70%	8.50%	8.50%	8.50%	6.60%	5.00%	4.75%	4.50%	4.25%
Non-technical losses, %	14.00%	12.30%	10.50%	10.50%	10.50%	8.60%	6.80%	6.50%	6.25%	6.00%
Non-Collected Billable, %	29.30%	21.60%	15.60%	15.60%	15.60%	10.80%	7.30%	7.00%	6.75%	6.50%
ATC&C Losses %	47.09%	38.62%	30.89%	30.89%	30.89%	23.91%	17.94%	17.18%	16.51%	15.85%
Yearly Capex (Naira Billion)	3.05	3.05	-	-	3.05	46.92	46.92	26.92	26.92	26.92

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Yearly Opex (Naira Billion)	9.84	10.57	12.16	13.52	14.95	17.47	19.43	22.30	25.07	27.84

The scenario is not practical as even with approved capex, it will be difficult to complete all the required projects in one year and achieve the target loss reduction by 2020.

3. **Scenario 3: Realistic Loss reduction targets based on current loss levels and corresponding required Capex and Opex undertaken but deferred for tariff recovery till 2022**
   As highlighted above, the current loss is very high mainly on account of low investment (limited capex) over the years. Accordingly, it is pertinent that a realistic loss reduction target based on achievable loss levels in 2019 is considered for next 5 years. The targeted loss and the yearly capex and opex required in this scenario is as below.

Table 24: Scenario 3 for future loss reduction

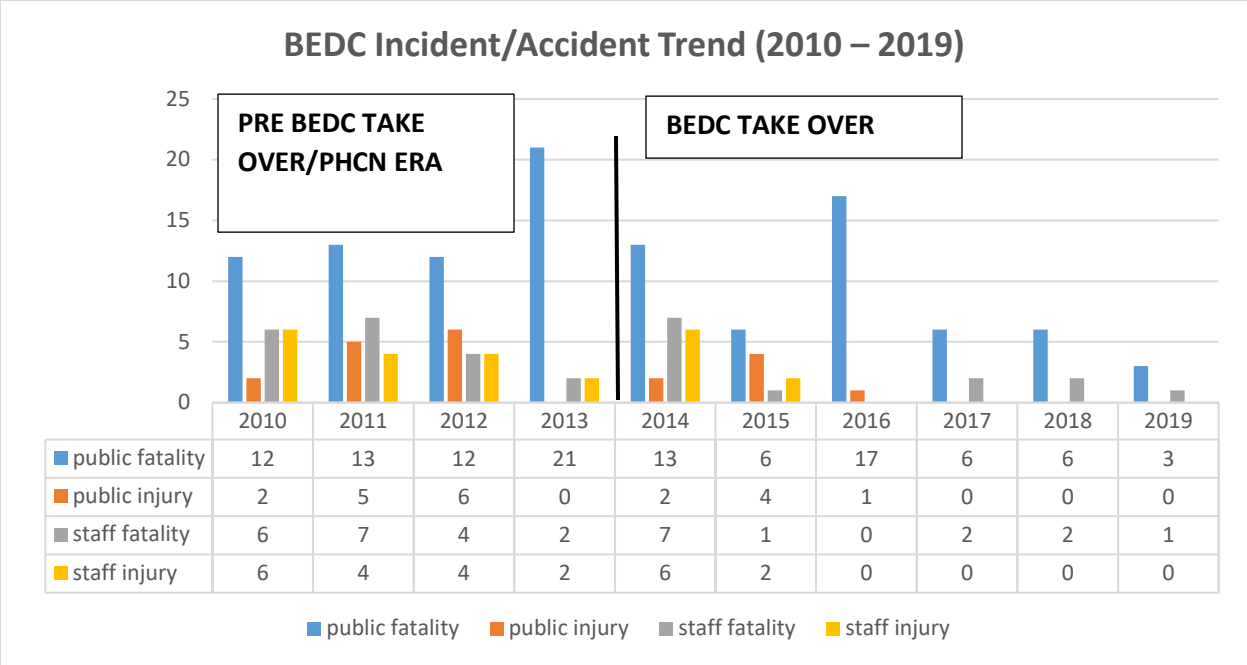
	Existing Targets						Proposed under PIP				
	2015	2016	2017	2018	2019	2019 (Actual)	2020	2021	2022	2023	2024
Distribution Losses, %	13.00%	10.70%	8.50%	8.50%	8.50%	11.00%	9.00%	8.00%	7.00%	6.50%	6.00%
Non technical losses, %	14.00%	12.30%	10.50%	10.50%	10.50%	13.00%	11.00%	9.00%	8.00%	7.00%	6.00%
Non-Collected Billable, %	29.30%	21.60%	15.60%	15.60%	15.60%	27.00%	23.00%	19.00%	16.00%	13.00%	11.00%
ATC&C Losses %	**47.09%**	**38.62%**	**30.89%**	**30.89%**	**30.89%**	43.48%	37.64%	32.19%	28.13%	24.35%	21.36%
Yearly Capex (Naira Billion)							26.92	26.92	26.92	26.92	26.92
Yearly Opex (Naira Billion)							17.47	19.43	22.30	25.07	27.84

7.5 Metering Targets

BEDC targets to achieve 100% metering with DTR level energy accounting based on AMR and AMI readings recorded remotely. The target of 100% metering is planned to achieve in next 2 years under MAP starting September 2019.

7.6 Health and Safety Targets

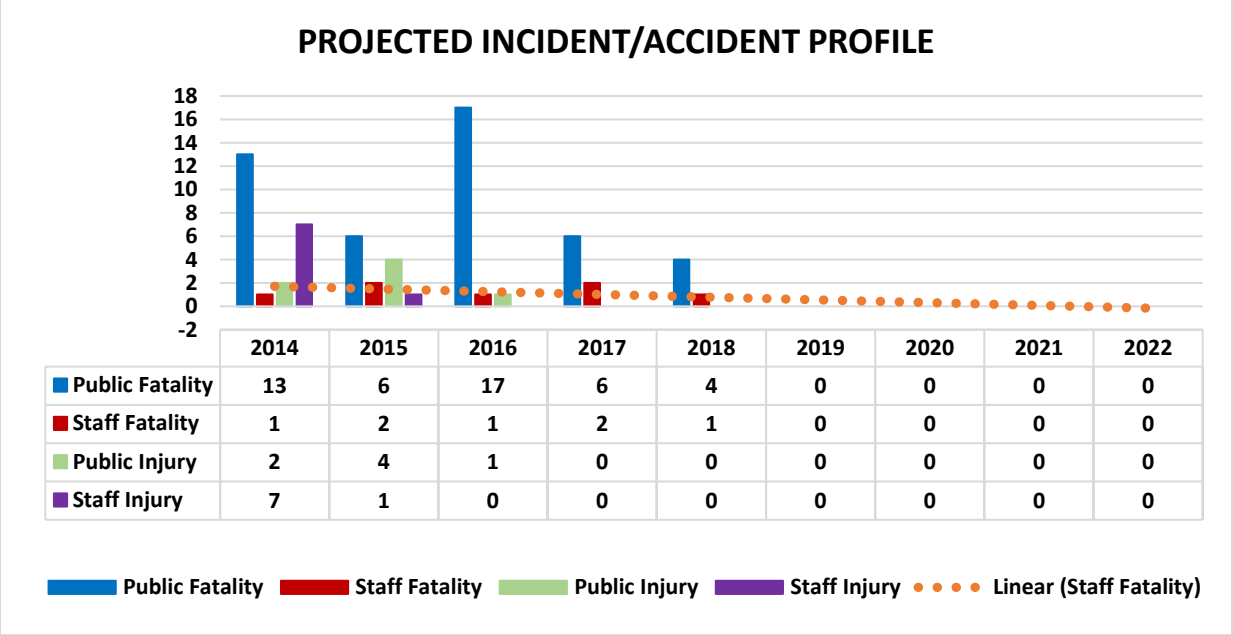
Preamble: Benin Electricity Distribution Company (BEDC) is a safety friendly Organization that is committed to providing a safe and healthy workplace for its esteemed employees, customers, visitors, contractors and general public and also ensures the protection of the Company's equipment/installations and the operational environment. The Company's passionate commitment and consciousness to health and safety is amply reflected in its Mission Statement which places Safety, Teamwork, Integrity, Continuous Learning, Innovation and Resilience in service as its core values.



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
public fatality	12	13	12	21	13	6	17	6	6	3
public injury	2	5	6	0	2	4	1	0	0	0
staff fatality	6	7	4	2	7	1	0	2	2	1
staff injury	6	4	4	2	6	2	0	0	0	0

Figure 14: BEDC Incidents/Accidents Profile

There has been consistent effort at gradual reduction of incident/accident occurrence in the network. We do hope that some the measures enumerated above and the proposed ones below will go a long way to reducing accident/incident occurrence to ZERO.



	2014	2015	2016	2017	2018	2019	2020	2021	2022
Public Fatality	13	6	17	6	4	0	0	0	0
Staff Fatality	1	2	1	2	1	0	0	0	0
Public Injury	2	4	1	0	0	0	0	0	0
Staff Injury	7	1	0	0	0	0	0	0	0

Figure 15: BEDC Projected Accident/Incident Profile

PROPOSED HEALTH and SAFETY INITIATIVES TO MEET PROJECTIONS:

a) Proliferation of Unauthorised persons in BEDC Network: BEDC Management will work with the law enforcement agencies to ensure that the issue of unauthorised persons tampering with BEDC network is tamed. Also, sanction awaits any BEDC Staff found culpable for engaging the services of Non-BEDC Staff to work in the network.

b) Replacement of Obsolete Tripping Units in some BEDC injection substations: All obsolete BEDC tripping Units will be replaced and our PC and M team will be made to carry out routine maintenance of tripping systems to ensure they are sensitive to faults at any time. This will reduce cases of electrocution as a result of contact with snapped conductors.

c) Violation of Right of Way Signage for Market Places: BEDC has approved the procurement of Signage for Right of Way violation by traders in Market places and other commercial places.

d) Safety Trainings and Formation of Energy/Joule's Club in Primary/ Secondary Schools: As part of BEDC Corporate Social Responsibility, the company will be visiting some Primary and Secondary schools to sensitize the children on the need to use electricity safely, the need to stay away from power infrastructures (Electric Poles/Towers, Power Lines and Substations) and to ensure that they are trained on the dangers of violating general safety rules. This is to reduce the rate of accident involving children within our network. This is the ongoing activity.

e) Near-Miss Reporting and Analysis: This is the ongoing activity.

f) Fire Drills: This is the ongoing activity.

g) Increase Health Awareness among Staff: This is the ongoing activity.

h) BEDC Safety Hand Book: This is required for new joinees in BEDC

i) ISO 9001 and OHSA 18001 Certifications: ISO 14001, 23001, 40001 and SA8000 certification

7.6.1 Expected benefit of investment

1. **Financial Gains:** It is expected that when accident occurrence is reduced to as low as reasonably practicable, the net profit of the Company will increase as litigation costs, compensation, medical bills, man-hour losses, down-time of equipment etc. will be eliminated or drastically reduced.

2. **Reduction in Death of Personnel:** The benefits of investment in health and safety will translate to drastic reduction in the number of electrocution and severe injuries to employees and third parties.

3. **EQUIPMENT DAMAGE:** One way of assessing the expected benefits of investment in health and safety is in the area of the number and cost of equipment/installation damage due to accident. It is an obvious fact that with improvement and good investment in health and safety, there will total reduction and in some cases total elimination damage to equipment or installations.

4. **ENVIRONMENTAL POLLUTION:** When there is concerted effort to eliminate/reduce some incidence of transformer oil leakage because of the effect of PCB, proper handling of disposal of SF6 Canisters and bad batteries in the Battery Bank and other environmental pollutants in our operating environment, the Company will be better for it.

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7.7 CSR Commitments

Businesses today play a crucial role in sustainability by employing their resources in ingenuity, creativity and talent to resolve some of the most pressing social and environmental issues. CSR has become increasingly more relevant among businesses and their stakeholders, to the point of becoming one of the aspects with the greatest bearing on an organization's performance. Corporate social responsibility is basis on which company results improve to the extent to which companies are able to build relationships based on trust with their stakeholders. CSR should be in accordance with the corporate model of sustainable development, a model that attempts to strike a balance with maximum benefits for everyone, while complying with applicable legislation with the utmost integrity and transparency.

8 Description of program projects and activities

8.1 Infrastructure and Resource Requirements for Meeting the Envisaged Service Levels

8.1.1 Network Gaps and Limitations:

Key metrics of the network are:

- Installed capacity of injection S/S: 1851.50 MVA or 1481.2 MW
- Allocation: 472.99 MW
- Drawn: 343.73 MW
- Gap: 129.26 MW

Although there is enough capacity available considering installed MVA capacity, but keeping in view the dilapidated condition of the 33 kV/11 kV /0.415 kV network and overloading of the lines, Injection Substations, and lengthy 33 kV lines it is difficult to serve power to consumers in accordance with installed capacity. Some of the overloaded 33 kV lines as per their length are as below. These lines once tripped takes a lot of time in restoration, hence reduction in length of the feeder is the only option by enhancing TCN network and radiating new feeders from them so as to increase reliability as well availability of Power Supply. Some of the feeders are as below:

Table 25: Overloaded 33 kV feeders

Feeder Name	No. of Tripping	Feeder Length in KM
ISOKO/KWALE	515	168
OTOWODO/PATANI	467	90
EHOR 33KV FDR	362	202
EVBUOTUBU	355	74
OLUKU 33KV	317	60
KOKO	315	65
UBIAJA 33KV FDR	294	176
IGBARA OKE	285	124
ADEJE	262	140
AGENEBODE	258	306
OGHARA	256	54

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OSOSO	242	175
EGBA 33KV	239	54
UZEBBA 33KV FDR	239	155
ENERHEN 33KV	230	43
SAPELE (SAPELE)	229	42
AGBOR IRRUA	216	87
AGBARHO/EKU	208	184
OTUN	145	290
OKITIPUPA	206	367
EXPRESS	181	150
EGOR 33KV	343	60

LIMITATIONS:

1. **Load limitations on 33KV feeders:** 33 kV feeders are having lot of joint as well multiple size conductors ranging from 100 mm^2 to 150 mm^2 making it not sufficient for catering the full load capacity utilization, details of conductors proposed for replacement of conductor from 100 mm^2 to 150 mm^2 /200mm^2 (ACSR) is as below:
   GRA, ETETE, EVBUOTUBU, EGOR, NEKPENEKPEN, KOKO,
2. **Load limitations on 11KV feeders:** Following is the list of 11 kV feeders which are getting overloaded and also having multiple conductor size that is (100 and 150 mm) used during attending breakdowns as per the availability so overall diameter of conductor of feeder is not sufficient to carry full load current and hence requiring conductor replacement/augmentation.

    a. Obiaruku/Obinomba feeders at Obiaruku ISS. (100-150mm^2).
    b. Campus 111 feeder at NIPP ABRAKA ISS.
    c. Agbarho town feeder at Agbarho Town.
    d. Usieffurun line.
    e. Agbara Town at Abraka ISS Eku 11 kV Line.
    f. Owa Feeder.
    g. Agbor Town Feeder.
    h. Agbor Obi Feeder.
    i. Igbanke Feeder.
    j. Abudu Feeder.
    k. Re-enforcement of Dumez 11KV feeder.

3. Overloaded distribution S/S.
4. Overloaded injection S/S:
    a. Guinness ISS.
    b. Country Home ISS.
    c. Siloku ISS.
    d. NIPP ISS.
    e. Iguosa ISS.
    f. Nekpenekpen ISS.
    g. Ikpoba Dam ISS.
    h. Okpanam ISS.
    i. Enheren ISS.

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j. Ogorode ISS.
k. Ogorode NIPP ISS.
l. Ovwor ISS.
m. NPA ISS.
n. Alagbaka ISS.

8.1.2 Network Expansion Plan for Meeting the Gaps and Limitations:

1. Auchi (BU): Proposal for the extension of 13KM 33kv line from Okpella 60MVA Transformer, 132/33Kv S/S to Igarra - Ososo axis - To improve power supply to the areas which are currently being fed from Okene 40/30 MVA, 132/33kv TX s/s on Ososo 33kv feeder that is not reliable and cut off entirely from Abuja DISCO. This will improve our cash collection and stabilize supply to the area.
2. All affected BU's IN Benin City: Reconductoring of all 33KV feeders radiating from BENIN TRANSMISSION STATION TO 240mm^2 (GRA, ETETE, EVBUOTUBU, EGOR, NEKPENEKPEN, KOKO). Resulting into reduction in ATC and C losses, relief from overloading and enhanced safety.
3. GRA (BU): Installation OF 2nd 15MVA, 33/11KV Power Transformer for IYEKOGBA ISS and Installation Of 1 X 15MVA, 33/11KV Power Transformer for NEW ALGOBASIMIN ISS, GRA. To relieve 2 X 15MVA Injection for optimum utilization.
4. SOKPONBA (BU): Complete and comprehensive rehabilitation of Nekpenekpen (2 X 15 MVA Injection S/S with complete 11KV panel board. To increase the efficiency of the injection S/S as Power Transformers are very old and beyond economical repairs.
5. EVBUOTUBU (BU): Installation OF 2 X 15MVA, 33/11KV Power Transformer for proposed (UNIBEN) EKENWAN CAMPUS INJECTION SUBSTATION, EKENWAN ROAD and installation of 1 X 15MVA, 33/11KV Power Transformer for proposed ARMY BARRACKS INJECTION SUBSTATION, UPPER EKENWAN ROAD BENIN CITY. This will enable assuming load/de-loading from the overloaded 11kV feeders "Feeder II" and "Feeder IV" and "Reservation feeder".
6. UGBOWO (BU): Complete and comprehensive rehabilitation of Ugbowo 2 X 15 MVA Injection S/S. To increase the efficiency of ISS.
7. Ikpoba Hill: Extension of 33kV lines from UTEH and extension of 11KV lines from UTEH (4KM 11kV Line). Load Relief.
8. EVBUOTUBU (BU): Construction of new 33kV line from TCN SS Ihovbor 132/33kV via Benin/Lagos Expressway to Siluko Inj. S/S. This new 33kV line will be used as alternative supply for current and new I/S 33/11kV. This new 33kV line will be dedicated line to supply only BU Evboutubu, which will increase the availability of supply and eliminate the problems associated with delivered energy shared with other BU's.
9. OKADA: Replacement of 11kV panels at OKADA MAINS ISS. Technical Loss reduction, safety enhancement.
10. OKADA: Upgrading of 7.5MVA Power Transformer at IGUOSA INJ. S/S. TO 15MVA, 33 /11KV Power Transformer. To enable the BU accommodate EKOSODIN s/u and properly manage its load as the s/unit is being fed from UGBOWO BU.
11. AUCHI: Proposal for the extension of 33kv line from Okpella TS 60MVA, 132/33KV s/s to link existing Agenebode 33kv line through Iyamho/Iyora to Apana/Okpekpe/ Imiegba network. To improve supply to the areas and reduce the load on Agenebode 33kv feeder from Irrua TS. And there by improve our cash collection.
12. EVBUORIARIA: Construction of 4KM 11kV line from EVBUABOGUN ISS and Maintenance of 33 kV feeders and 33/11kV ISS (KOKO 33KV FEEDER Re-construction): To increase line availability.

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13. EGBOR: Re-conductoring of Irrua - Agbor 33KV feeder alongside with T- off and creation of dedicated feeder (11 kV): Enhancing Safety and to reduce ATC and C losses.
14. Re-Conductoring of 11 kV Feeders: Owa, Agbor Town, Agbor Obi, Igbanke, Abudu for increasing safety and power line availability.
15. ASABA: Trace widening of the following 33KV Feeders:
    i. Asaba-1,
    ii. Asaba-2,
    iii. Asaba-3,
    iv. Asaba-4,
    v. Asaba-5.
16. ASABA: De-loading of ASABA -2 Feeder as already running on Maximum Power drawl.
17. EFFURUN: Replacement of 1 No. GEC 33 kV BOCB at 1X15 MVA, 33/11KV ARMY BARACKS ISS. Safety and Reliability.
18. EFFURUN: Proposed DDPA 1X7.5MVA, 33/11KV, ISS at DDPA, Airport Road. To relief 2X15MVA, 33/11KV, OKOLOBA and EJEDBA ISS.
19. EFFURUN: Upgrade of 1 X 15MVA, 33/11KV TO 2 X15MVA, 33/11KVA ARMY BARRACKS ISS and complete re-habilitation of ISS. For relief of overloaded JAKPA AND EKPAN 11kV Feeders.
20. OBIARUKU: Replacement of second faulty 11KV Outgoing panel at Obiaruku 1X7.5 MVA, 33/11KV Injection substation for enhanced safety, improvement in revenue and reduction of ATC and C losses.
21. Re-conductoring of following 11 kV Feeders:
    a. Obiaruku/Obinomba feeders at Obiaruku ISS. (100-150mm^2).
    b. Campus 111 feeder at NIPP ABRAKA ISS.
    c. Agbarho town feeder at Agbarho Town.
    d. Usieffurun line.
    e. Agbara Town at Abraka ISS Eku 11 kV Line.

22. SAPELE:
    a. Relocation of load from (Amukpe) BEDC control room to NIPP control room in same switch yard. ATC and C Loss Reduction.
    b. Relocation of load from (Ogorode) BEDC control room to NIPP control room in same switch yard. ATC and C Loss Reduction.
    c. To construct a new 11KV dedicated feeder, named commercial feeder from 3X7.5MVA, 33/ 11KV Amukpe Injection sub-station. (1) To increase supply availability to 9 banks and 9 other prime customers. (2) To reduce the ATCand C losses by 3.1%.
    d. Rehabilitation of 2KM of ADEJE 33KV Feeder. ATC and C Loss reduction.
    e. Proposed 3.5km 33kV feeder from OGHARA T/S to OGHARA TOWN: ATC and C Loss reduction and improvement in reliability.
    f. Rehabilitation OF 2KM OF MOSOGAR 33kV feeder. ATC and C Loss reduction and improvement in reliability.
23. PTI:
    a. Replacement of 2No. Faulty ABB CALOR EMAG ZSI Indoor breakers. Required for effective operation and protection of 6.6KV feeders, LEVENTIS AND MCDERMOTT.
    b. Rehabilitation of PTI 11KV Feeder. Frequent snapping of conductor. The network is replete with brittle and undersized conductor. THIS IS TO DELOAD EFFURURN TRANSMISSION STATION TO REDUCE ATC and C LOSSES AND IMPROVE RELIABILITY OF THE NETWORK.

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24. UDU :
    a. CONSTRUCTION OF 20KM OF 33KV LINE FROM UGHELLI TRANSMISSION STATION TO ALADJA TOWN.
    b. Diversion of the Egini T/Off to Orhuwhorun from the swampy forest terrain. It will enable us give stable supply to customers which will encourage good response.
25. UGHELLI:
    a. Construction of dedicated 11KV feeder. To remove paying MD customers from non-paying customers which will enhance revenue of BU
    b. Re-enforcement of Dumez 11KV feeder. To minimize Voltage Drop and tripping on the feeder.
26. WARRI:
    a. Extension of Eboh 11KV dedicated commercial Feeder toward Airport road and Okumagba Avenue. To divert Load to paying Customers in order to increase our revenue base and reduce our ATCand C Loses to single digit.
    b. Extension of Mix and Bake11KV dedicated commercial Feeder toward Ogunu/Airport Rd. To divert Load to paying Customers in order to increase our revenue base and reduce our ATC and C Loses to single digit.
    c. Construction of 11KV dedicated commercial Feeder along Warri Sapele Rd. To divert Load to paying Customers in order to increase our revenue base and reduce our ATC and C Loses to single digit.
    d. Construction of 2 X 7.5MVA at AGBOR PARK, WARRI. This will reduce overloading of existing ISS in order to reduce ATC and C Losses.
    e. Revamping of NPA ISS in WARRI. To reduce ATC and C Losses and provide safety for equipment and personnel.
    f. Revamping of OKOLOBA 2 X 15MVA, 33/11KV INJECTION SUBSTATION. Reducing ATC and C Losses and provide safety for equipment and personnel.
27. OWO:
    a. Proposed Construction of 4.3KM 11KV dedicated feeder for commercial Banks and some other MD Customers in Owo Town. This proposed line will enable us give stable power supply to MD customers.
    b. Proposed Relief Alayere Junction No II 300KVA, 33/0.415KV S/S to relieve existing Alayere Junction S/S, Ogbese. To give quality supply to 5 no. sawmills in Ogbese Township.
28. AKURE:
    a. Diversion of Owena 33KV feeder at Army Barrack, Akure. ATC and C Loss reduction.
    b. Installation of 300KVA 11/0.415KV transformer at Abusoro Zone 10B Ijoka, Akure. It is needed to improve power supply to over 150 PPM customers in Agbomo L/Out. It will also de-load overloaded Agbomo 300KVA 11/0.415KV Transformer.
    c. Installation of 300KVA 11/0.415KV transformer at Amodeni Junction, Alagbaka, Akure. To de-load overloaded Kingsley Kuku 300KVA 11/0.415KV Transformer.
    d. Installation of 300KVA 11/0.415KV transformer at Olokunwolu Estate, Behind School of Nursing, Alagbaka, Akure. To improve power supply to School of Nursing, School of Midwifery (2 MD customers) and many PPM customers.
29. ONDO:
    a. Construction of 11kV dedicated feeder to 12 Nos. of MD customers (7.7km) along Ademulegun Road. To improve revenue from the MD customers.
30. IGBARA-OKE:

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a. Proposed installation of 2.5MVA 33/11kV ISS AT ORITA OBELE community in Akure to relieve highly overloaded Ilesha Road 11 kV feeder. Ilesha Road feeder is the most viable feeder, and in order to reduce frequent tripping and conductor snapping as a result of overload. Another outcome is ATC and C loss reduction.
b. Proposed AULE III 500KVA, 11/0.415kV TO relieve overloaded AULE II 500KVA, 11/0.415KV Transformer, reduction of ATC and C loss.

31. IDO EKITI:
    a. Installation of 33 kV Auto Re-closure on OTUN 33 kV feeder at ERINMOPE EKITI. ATC and C loss reduction.
    b. Construction of 6kM 33KV line between IRARE EKITI and IKUN EKITI. This will enable us to load shed OTUN TOWNSHIP and other six towns on the main line thereby reduction in ATC and C loss.
    c. Installation of 33 kV Auto Re-closure on ILAWE - ARAMOKO 33 kV feeder IGEDE EKITI. For effective load management by segmenting the feeder into two parts; (1) AWO LEG takes care of 12 DS AND (2) ARAMOKO SEGMENT takes care of 14 DS. This scheme will enable BEDC to cater supply to paying customers.
32. IGBARA-OKE:
    a. Proposed OBELE ROAD 500KVA 11/0.415KV transformer to relieve overloaded FAGOTE 500 KVA, 11/0.415KV Transformer. ATC and C loss reduction.
33. OWO:
    a. Proposed Relief G.R.A 500KVA, 11/0.415KV S/S to relieve existing G.R.A No1 S/S, Owo Town. To improve power supply quality to new GRA extension.
34. Other ongoing projects

Table 26: Other ongoing projects

Sr. No	Project Description/Name	State	BU	MW	Completion Status	Completion (%)	Constraints/ Remarks
1	Construction of 3.9 km 11KV Single Circuit Feeder in Akure	Ondo	Akure	1.78	Construction Completed	100	NEMSA NoC received. Awaiting Load Transfer
2	GRA 11KV Dedicated Feeder (Phase II)	Edo	GRA	4.72	Construction Completed and Feeder Energised	90	NEMSA NoC received. Load Transfer in progress. Minor defects not yet completed.

3	Construction of a new 1.85km dedicated MD 11kv feeder to IDSL Main	Edo	GRA	1.12	Construction completed	100	NEMSA NoC received.Awaitng Load Transfer
4	Construction of new MD feeder 6.65km in Warri/ Effurun	Delta	Warri/ Effurun	2.5	Construction on going	85	Work in progress. Stringing of line is ongoing. Just few spans to completion of construction.
5	Construction of a new single circuit 11kv feeder of 7.4km from Agbor mains to James Hope College, Agbor	Delta	Agbor	0.75	Construction completed	95	NEMSA NoC received.Awaitng Load Transfer. Minor defects not yet completed.
6	Construction of 7.7km of33kv overhead line from Akure junction to Cocoa Factory, Ileluji town.	Ondo	Ondo		Construction on going	60	Erection of poles and stringing in progress.
7	Rehabilitation of 50km of Ikpeshi 33kv feeder, 22km of re-conductoring and 28km of trace clearing in Auchi BU.	Edo	Auchi		Construction on going	80	Rehabilitation, Trace clearing and Re-conductoring in progress.

8.1.3 Capex Requirements:

For better services and improving reliability, and availability of Power Supply to all paying customers some schemes are proposed state wise with a cumulative Budget requirement of **2,897,050,293.00** Naira. Details are as below:

EDO State Capex Requirement:

Table 27: EDO State Capex Requirement

BUSINESS UNIT	PROJECT SCHEME DESCRIPTION	OBJECTIVE/JUSTIFICATION INCLUDING IMPACT ON ATC and C LOSS	BUDGET HEAD	ESTIMATED COST(₦)
AUCHI	Proposal for the extension of 13KM 33kv line from Okpella Transformer 60MVA, 132/33Kv S/S to Igarra - Ososo axis	To improve power supply to the areas which are currently being fed from Okene TCN	Reliability, Availability	39,385,987.50
ALL AFFECTED BU's IN BENIN	Re-conductoring of all 33KV feeders radiating from BENIN TRANSMISSION STATION to 240mm^2 (GRA, ETETE, EVBUOTUBU,EGOR,NEKPEN EKPEN, KOKO)	LOAD RELIEF	Reduction in ATC and C LOSSES, Safety Hazards.	117,828,000.00
GRA	Installation of 2ND 15MVA, 33/11KV Power Transformer for IYEKOGBA ISS.	To relieve 2x15MVA Injection for.	Load Relief.	100,581,337.63
	Installation of 1 X 15MVA, 33/11KV Power Transformer for NEW AIGOBASIMIN ISS, GRA.			128,507,679.56
SOKPONBA	Complete and comprehensive rehabilitation of Nekpenekpen 2 X 15 MVA Injection S/S with complete 11KV panels.	To increase the efficiency of the injection S/S.	Increase of Power drawl.	337,598,906.38
EVBUOTUBU	Installation of 2 X 15MVA, 33/11KV Power Transformer for PROPOSED (UNIBEN) EKENWAN CAMPUS INJECTION SUBSTATION, EKENWAN ROAD.	Deloading of Overloaded feeders from GRA ISS	Load Relief.	337,598,906.38
	Installation of 1 X 15MVA, 33/11KV Power Transformer for proposed ARMY BARRACKS ISS, UPPER EKENWAN ROAD BENIN CITY.	Load Relief	Load Relief.	192,929,132.06

UGBOWO	Complete and comprehensive rehabilitation of Ugbowo 2 X 15 MVA Injection S/S.	Safety Enhancement	Load Relief.	337,598,906.38
IKPOBA HILL	Extension of 33 kV lines from UTEH	Deloading of FEDERAL SECRETARIAT 2 X 15MVA ISS through FEDERAL HOUSING ESTATE FEEDER	LOAD RELIEF	63,324,866.00
	Extension of 11KV lines from UTEH(4KM 11KV LINE)	To de-load FEDERAL SECRETARIAT 2 X 15MVA ISS and FHE FEEDER	LOAD RELIEF	10,442,050.00
EVBUOTUBU	Construction of new 33kV line from TCN SS Ihovbor 132/33kV via Benin/Lagos Expressway to Siluko Inj. S/S.	For improved power supply to EVUTUBU BU.	LOAD RELIEF	56,754,475.00
OKADA	Replacement of 11 kV panels at OKADA Mains ISS.	Proposed for the safety of equipment as well personal	Technical Loss Reduction, Safety Hazard reduction.	35,000,000.00
	Upgrading OF 7.5MVA at IGUOSA INJ. S/S. TO 15MVA,33/11KV TRANSFORMER	System Improvement	Load Relief.	145,000,000.00
AUCHI	Proposal for the extension of 33kv line from Okpella Transformer 60MVA, 132/33KV s/s to link existing Agenebode 33kv line through Iyamho/Iyora to Apana/Okpekpe/ Imiegba network	System Improvement.	Reliability, Availability.	97,447,812.50
EVBUORIARIA	Construction of 4kM 11KV line from EVBUABOGUN ISS.	System Improvement.	Reliability, Availability.	10,442,050.00
EVBUORIARIA	Maintenance of33 kV feeders and33/11 kV ISS (KOKO 33KV FEEDER RECONSTRUCTION)	Increase in Line Availability, reduction in downtime and increased safety and revenue	Reliability, Availability.	14,093,210.00
	Total Budget Required for EDO State:			2,024,533,319.39
			VAT 5%	101,226,665.97
			GRAND TOTAL	2,125,759,985.36

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Delta State Capex Requirements:

Table 28: DELTA State Capex Requirements

BU	Scheme Description	Objective/Justification including impact on ATC and C Loss	IMPACT	ESTIMATED COST
AGBOR	Re-conductoring of Irrua - Agbor 33KV feeder	Safety and to reduce ATC and C losses.	Safety and ATC and C Loss.	67,000,000.00
	Creation of dedicated 11KV feeder	Enhancement of Power Supply	Safety and ATC and C Loss.	250,000,000.00
	1. Owa Feeder	Safety and to reduce ATC and C losses	Safety and ATC and C Loss.	15,000,000.00
	2. Agbor Town Feeder	Safety and to reduce ATC and C losses	Safety and ATC and C Loss.	12,000,000.00
	3. Agbor- Obi Feeder	Safety and to reduce ATC and C losses	Safety and ATC and C Loss.	12,000,000.00
	4. Igbanke 11 KV line	Safety and to reduce ATC and C losses	Safety and ATC and C Loss.	80,000,000.00
	5. Abudu 11KV line	Safety and to reduce ATC and C losses	Safety and ATC and C Loss.	35,000,000.00
	Installation of 11KV SF6 RMU	Safety	Safety	80,000,000.00
ASABA				
	1. Feeder 1	Safety and reduce ATC and C losses.	Safety and ATC and C Loss.	700,000.00
	2. Feeder 2	Safety and reduce AT C and C losses.	Safety and ATC and C Loss.	680,000.00
	3. Feeder 3	Safety and reduce ATC and C losses.	Safety and ATC and C Loss.	2,187,000.00
	4. Feeder4	Safety and reduce ATC and C losses.	Safety and ATC and C Loss.	1,964,700.00
	5. Feeder 5	Safety and reduce ATC and C losses.	Safety and ATC and C Loss.	1,080,000.00
	1. Summit substation	Improve revenue and reduce ATC and C losses	Safety and ATC and C Loss.	2,227,500.00
	2. Airport substation	Improve revenue and reduce ATC and C losses	Safety and ATC and C Loss.	3,330,000.00
	Relocation of load from U15(BEDC control room) to NIPP control room	Improve revenue and reduce ATC and C losses	Safety and ATC and C Loss.	14,000,000.00

EFFURUN	Replacement of BOCB outdoor Circuit breaker at 1X15 MVA, 33/11KV ARMY BARACKS ISS.	Safety and ATC and C loss reduction	Safety and ATC and C loss reduction	7,000,000.00
	Proposed DDPA 1X7.5MVA, 33/11KV, ISS AT DDPA, AIRPORT ROAD.	TO RELIEF 2X15MVA, 33/11KV, OKOLOBA AND EJEDBA ISS.	Safety and ATC and C loss reduction	85,000,000.00
	UPGRADE OF 1 X 15MVA, TO 2 X15MVA, 33/11KVA ARMY BARRACKS	Relieving of Overloaded JAKPA AND EKPAN 11KV FEEDERS	Safety and ATC and C loss reduction	4,500,000.00
OBIARUKU	Replacement of Faulty 11 kV Panel Boiard at 1X7.5 MVA, 33/11KV ISS	Safety, improve revenue and reduce ATC and C losses.	Safety and ATC and C loss reduction	4,200,000.00
	Re-conducting of 11KV Feeders		Safety and reduce ATC and C losses.	
	1.Obiaruku/Obinomba feeders at Obiaruku 1X7.5 MVA, 33/11KV ISS	Safety, improve revenue and reduce ATC and C losses.	Safety and to reduce ATC and C losses.	26,200,000.00
	2. Campus 111 feeder at NIPP Abraka 1X7.5MVA, ISS	Safety, improve revenue and reduce ATCand C losses.	Safety and ATC and C loss reduction	19,000,000.00
	3. Agbarho Town at Agbarho 1X 7.5MVA ISS	Safety, improve revenue and reduce ATC and C losses.	Safety and ATC and C loss reduction	7,440,000.00
	4. Usieffurun Line	Safety, improve revenue and reduce ATC and C losses.	Safety and ATC and C loss reduction	3,240,000.00
	5. Abraka town feeder at Abraka 1X7.5MVA, 33/11KV inj. Substation	Safety, improve revenue and reduce ATC and C losses.	Safety and ATC and C loss reduction	9,120,000.00

	Eku 11KV Line	Safety, improve revenue and reduce ATC and C losses.	Safety and ATC and C loss reduction	3,240,000.00
SAPELE	Relocation of load from (Amukpe) BEDC control room to NIPP control room in same switch yard	The unused panels and other devices can be used where necessary like: for dedicated feeders, point loads etc.	SYSTEM IMPROVEMENT	5,580,000.00
	Relocation of load from (Ogorode) BEDC control room to NIPP	Safety, improve revenue and reduce ATC and C losses.	SYSTEM IMPROVEMENT	70,000,000.00
	New 11KV dedicated feeder, - commercial feeder from 3X7.5MVA, 33/ 11KV Amukpe Injection sub-station	(1) To increase supply availability to 9 banks and 9 other prime customers	SYSTEM IMPROVEMENT	78,000,000.00
	REHABILITATIO N OF 2KM OF ADEJE 33KV FEEDER	THIS IS TO REDUCE ATC and C LOSSES AND IMPOROVE RELIABILITY	REDUCTION OF ATC and C LOSSES	48,000,000.00
	PROPOSED 3.5km 33KV FEEDER FROM OGHARA T/S TO OGHARA TOWN	THIS IS TO REDUCE ATC and C LOSSES AND IMPOROVE RELIABILITY	REDUCTION OF ATC and C LOSSES	22,553,000.00
	REHABILITATIO N OF 2KM OF MOSOGAR 33KV FEEDER	THIS IS TO REDUCE ATC and C LOSSES AND IMPOROVE RELIABILITY	REDUCTION OF ATC and C LOSSES	3,502,500.00
PTI	REPLACEMENT OF FAILED TRANSFORMER T2 7.5MVA, 33/6.6KV	Power supply availability	Power supply availability.	75,850,000.00
	Replacement of 2No. faulty ABB CALOR EMAG ZSI indoor Panel Board	Required for effective operations and protection of 6.6 kV feeders, LEVENTIS AND MCDERMOTT	SAFETY AND INCREASE REVENUE	15,615,000.00

	Rehabilitation of PTI 11KV FEEDER	Network is replete with brittle and undersized conductors.	Safety and ATC and C	4,200,000.00
	Procurement and installation of 4 NOs 33 kV line isolators.	OGBOMORO, OTOKUTU, EBRUMEDE AND OKUOKOKOR tee offs of ENERHEN 33KV feeder.	Safety and ATC and C loss reduction.	3,800,000.00
UDU	CONSTRUCTION OF 20KM OF 33KV LINE FROM UGHELLI TRANSMISSION STATION TO ALADJA TOWN	THIS IS TO DELOAD EFFURURN TRANSMISSION STATION	Safety and System Reliability	138,000,000.00
	Diversion of the Egini T/Off to Orhuwhorun from the swampy forest terrain.	stable supply to customer which will encourage good response	Safety and ATC and C loss reduction	800,000.00
UGHELLI	Construction of dedicated 11KV feeder	To provide 24X7 to M D Customers.	ATC and C Losses.	35,790,000.00
	Re-enforcement of Dumez 11KV feeder.	To minimize Voltage Drop and tripping on the feeder	ATC and C losses.	5,000,000.00
WARRI	Extension of Eboh 11KV dedicated commercial Feeder toward Airport road and Okumagba Avenue	To provide 24X7 to M D Customers.	ATC and C Losses	7,100,000.00
	Extension of Mix and Bake11KV dedicated commercial Feeder	To provide 24X7 to M D Customers.	To Improve Revenue and ATC and C Losses	800,000.00
	Construction of 11KV dedicated commercial Feeder along Warri Sapele Rd.	To provide 24X7 to M D Customers.	To Improve Revenue and ATC and C Losses	6,500,000.00

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	CONSTRUCTION OF 2 X 7.5MVA AT AGBOR PARK, WARRI	Load Relief	System Improvement	120,000,000.00
	REVAMPING OF NPA INJECTION SUBSTATION IN WARRI	System Improvement	System Improvement	130,300,000.00
	REVAMPING OF OKOLOBA 2 X 15MVA, 33/11KV INJECTION SUBSTATION	System Improvement	System Improvement	50,000,000.00
			TOTAL ESTIMATED COST	1,266,169,700.00
			VAT 5%	63308485
			GRAND TOTAL (DELTA)	1,329,478,185.00

Ondo and Ekiti States Capex Requirements:

Table 29: Ondo and Ekiti Capex Requirement

BU	PROPOSAL	Head	IMPACT	ESTIMATED COST
OWO	Construction: 4.3KM 11KV dedicated feeder for commercial Banks and some other MD Customers in Owo Town.	24X7 Power Supply to MD Customers	System Improvement	10,900,300.00
Akure	Diversion of Owena 33KV feeder at Army Barrack, Akure	ATC and C losses reduction	ATC and C	12,838,752.12
Ondo	Construction of 11kV dedicated feeder to 12Nos MD customers (7.7km) along Ademulegun Road	24X7 Power Supply to MD Customers	System Reliability	31,065,766.25
IGBARA -OKE	New 2.5MVA 33/11KV INJEECTION S/S AT ORITA OBELE COMMUNITY-AKURE TO RELIEVE HIGHLY	System Improvement(Load Relief)	System Reliability	25,000,000.00

	OVERLOADED ILESHA ROAD 11KV FEEDER			
IDO EKITI	Installation of 33 kV Auto Reclosure on OTUN 33KV feeder at ERINMOPE EKITI	Load Management and ATC and C Loss Reduction	System Reliability	1,016,948.00
IGBARA -OKE	PROPOSED OBELE road 500KVA 11/0.415KV transformer to relieve loaded FAGOTE 500KVA, 11/0.415KV TRANSFORMER	System Improvement	System Reliability	6,100,000.00
IGBARA -OKE	PROPOSED OWENA ROAD 300KVA, 33/0.415KV TRANSFORMER TO RELIEVE OVER LOADED FAITH COTTAGE 500KVA, 33/0.415KV TRANSFORMER, IGBARA OKE	Load Management and ATC and C Loss Reduction	System Reliability	6,800,000.00
OWO	Proposed Relief G.R.A 500KVA,11/0.415KV S/S to relieve existing G.R.A No1 S/S, Owo Town	System Improvement		4,290,200.00
IGBARA -OKE	PROPOSED AULE III 500KVA, 11/0.415KV TO RELIEVE OVER LOADED AULE II 500KVA, 11/0.415KV TRANSFORMER	System Improvement and ATC and C LOSS REDUCTION	ATC and C	7,800,000.00
Akure	Installation of 300KVA 11/0.415KV transformer at Abusoro Zone 10B Ijoka, Akure	System Improvement and ATC and C LOSS REDUCTION	System Improvement	20,306,671.00
IDO EKITI	CONSTRUCTION OF 6KM 33KV LINE BETWEEN IRARE EKITI AND IKUN EKITI	LOAD MGMT, and ATC and C	System Improvement	7,009,775.00
Akure	Installation of 300KVA 11/0.415KV transformer at Amodeni Junction, Alagbaka, Akure	LOAD RELIEF	System Improvement	917,599.44

Akure	Installation of 300KVA 11/0.415KV transformer at Olokunwolu Estate, Behind School of Nursing, Alagbaka, Akure	System Improvement and ATC and C LOSS REDUCTION	System Improvement	893,671.39
IDO EKITI	INSTALLATION OF 33KV AUTO RECLOSER ON ILAWE - ARAMOKO 33KV FEEDER AT IGEDE EKITI	LOAD MANAGEMENT	System Improvement	1,016,948.00
AKURE	Augmentation of 2.5 MVA to 7.5 MVA 33/11 kV Power Trafo at **ONYERUGBULEM**	System Improvement	System Improvement	25,000,000.00
Akure	Upgrade og Alagbaka ISS from 1X7.5 to 2X7.5 (Revamping Also)	System Improvement	System Improvement	70,000,000.00
			Total	230,956,631.20
			VAT 5%	11547831.56
			GRAND TOTAL	**242,504,462.76**

Total CAPEX Requirement for FY 2019 is: **N 3,697,742,633.12**

8.1.4 Network Modernization Project

BEDC Plans to completely revamp 13 Sample BU locations (Out of 27 BUs) using LT/ABC and Overhead Cabling in the following locations.

i. **Benin City (Edo State)**

- GRA- Full Modernization
- Sakponba
- Part of Okada

ii. **Delta State**

- Asaba
- Koka
- Warri
- Effurum
- PTI

iii. **Ondo State**

- Akure

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- Igbara Oke

iv. Ekiti State

- Ado Ekiti

Out of the above, 5 city modernization is planned in 1st phase for GRA, Asaba/Koka, Warri/Effurun, Akure and Ado-Ekiti at the cost of 46.78 billion Naira is planned in 1st phase under this PIP. The details are as presented below

Table 30: GRA BENIN BU- PRESENT AND PROPOSED NETWORK DETAILS

SLNO	PARTICULARS	PRESENT NETWORK	PROPOSED NETWORK
1	AVERAGE AVAILABILITY	12	24
2	TYPE OF FEEDERS	RADIAL [No back feeding facility]	RING [Back feeding possible]
3	REDUNDANCY	NIL	N-1
4	TYPE OF NETWORK	BARE OVERHEAD	UNDER GROUND CABLES
5	NO OF 33KV FEEDERS	**1**	**2**
6	NO OF INJECTION S/S	**1**	**3**
7	POWER TRANSFORMER CAPACITY [MVA]	**52.5**	**110**
8	TOTAL POWER REQUIREMENT OF GRA [MW]	**25**	**51**
9	DSS CAPACITY [MVA]	**51**	**91**
10	NO OF 33KV FEEDERS [NOS]	**1**	**2**
11	NO OF 11KV FEEDERS [NOS]	**9**	**14**
12	LENGTH OF 33KV FEEDER [KMs]	**10.5**	**21**
13	LENGTH OF 11 KV FEEDER [KMs]	**130**	**176**
14	LENGTH OF .415 KV FEEDER [KMs]	**350**	**800**

PRESENT 33 & 11KV RADIAL NETWORK

PROPOSED 33 & 11KV RING NETWORK

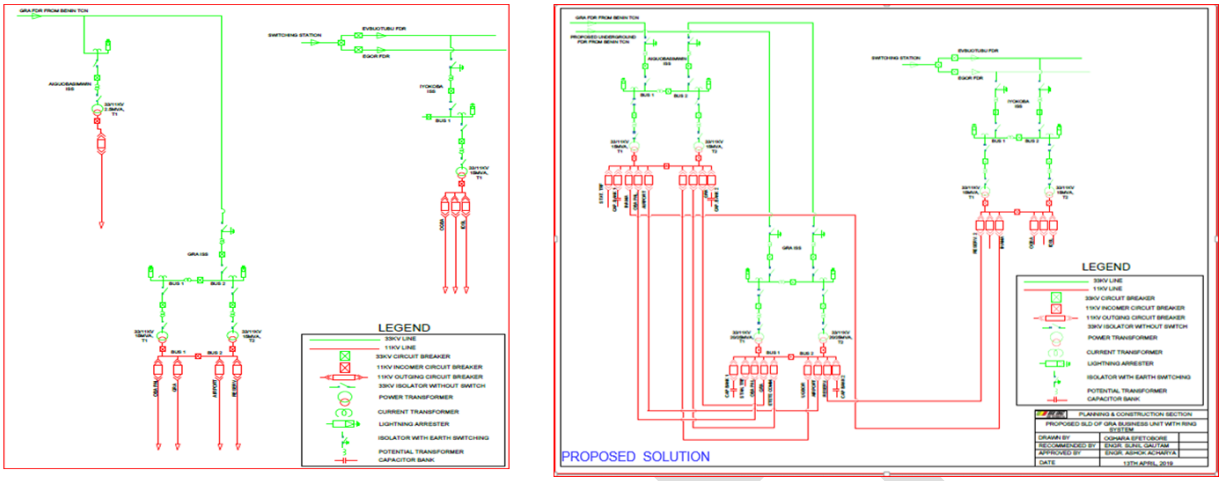

Figure 16: Present vs Proposed network

RADIAL NETWORK: Power is flowing in one direction [no back feeding possible]

RING NETWORK: Power can be fed from both sides [back feeding possible]

PRESENT I33/11KV INJECTION S/S WITH 11KV RADIAL DISTRICUTION RADIAL NETWORK

PROPOSED 33 /11KV INJECTION SUBSTATION WITH 11KV RING NETWORK

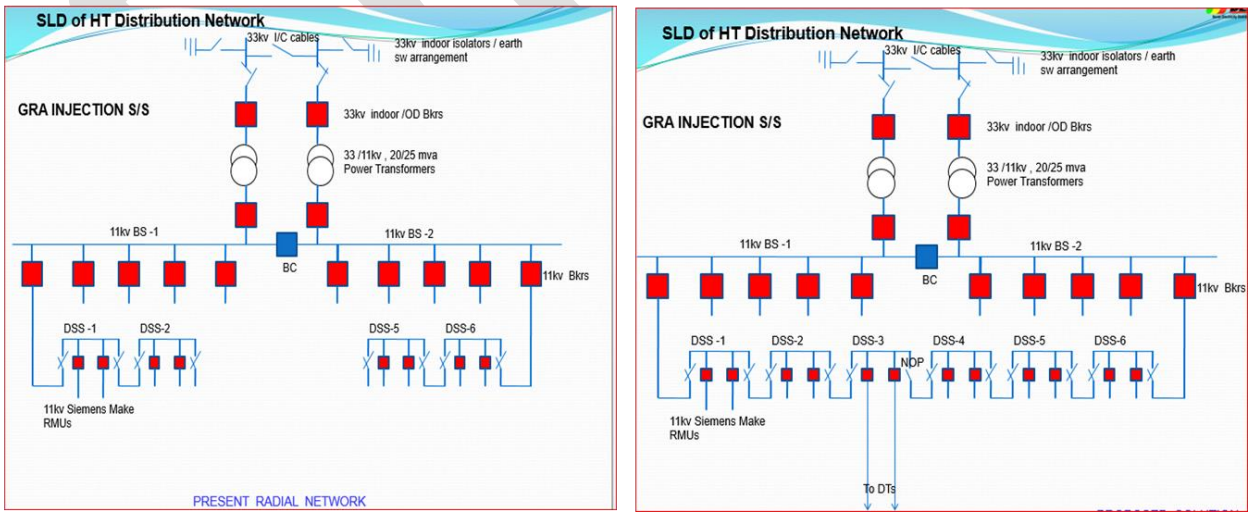

Figure 17: Proposed injection substation with 11kV Network

No redundancy / standby in present 11kv system

Table 31: GRA BENIN BU 11KV FEEDER WISE CUSTOMERS COUNT

S/N	FEEDER Names	Single PHASE	3 PHASE	MD	TOTAL
1	33 /.415kv point load			7	7
2	AIRPORT (COMMERCIAL)			78 [96]	78
3	COUNTRY HOME	142	5		147
4	DUMEZ	51	19	1	71
5	EKENWAN	1,626	231	2	1,859
6	ETETE - COMMERCIAL			37	37
7	FEEDER 3	1,130	128	1	1,259
8	GRA	1,413	937	31	2,381
9	IHAMA	2,080	909	18	3,007
10	OBA-PALACE	1,509	248	9	1,766
11	OGBA	3,166	322	8	3,496
12	OKO	3,410	557	13	3,980
13	RESERVATION	6,277	914	11	7,202
14	UGBOR	1,929	566	11	2,506
	Grand Total	22,733	4,836	227	27,796

CHALLENGES ON PRESENT GRA BENIN BU NETWORK

- Present 33, 11 and .415 KV network is radial. Should there be any fault on the line, feeder will trip thus interrupting the power to all customers. No back-feeding facility.
- LV bare conductors are easily available for hooking [Direct theft]
- All overhead bare conductors are subjected to frequent transient and other faults.
- Overhead network is a safety threat.
- Vulnerable to vandalism and external damage

- ROW issue. Posing danger in Markets, schools and Public places
- Shabby and Aesthetically not good looking

TOTAL COST OF TRANSFORMATION PROJECT

Total cost for modernisation of GRA business unit by total underground network and only conversion into LT ABC with BEDC's service cable.

Table 32: Total cost of transformation project

S. NO.	DESCRIPTION	AMOUNT IN MILLION NAIRA	
		UNDER GROUND NETWORK	OVERHEAD LT ABC NETWORK
1	ADDITIONAL TRAFO AND MODERANIZATION OF IYOKOKBA ISS	247	**247**
2	REVAMPING OF GRA ISS 2X15 TO 2X25 MVA	587	**587**
3	NEW ISS AIGUOBASWIMIN 2X15	201	**201**
4	CONVERSION OF .415 KV NETWORK	7,416	**5,137**
	GRAND TOTAL	**8,452**	**6,173**

Conversion of LT conventional network to LT ABC [Aerial Bundle conductors] along with replacement of existing service cables by BEDC's Branded cables in 5 major cities of BEDC's Franchise area.

Table 33: Conversion of LT conventional network to LT ABC

Sl. No	Name of the project	Length of LT ABC [mtr]	Unit cost of LT ABC /mtr [in naira]	Total cost of LT ABC [million]	Length of service cable [mtr]	Unit cost of service cable naira/mtrs	Total cost of service cable [m.naira]	Proj. cost in million naira
1	BENIN CITY [SAKPONBA + UGBOWO + EVHOTAUBU + ETETE + Part of OKADA]	3,700,000	4,000	14,800	2,200,000	706	1553.2	16,353
2	ASABA + KOKA	1,300,000	4,000	5,200	1,125,000	706	794.25	5,994
3	WARRI + EFFURUN + PTI	2,100,000	4,000	8,400	1,725,000	706	1217.85	9,618
4	AKURE + IGBARO -OKE	1,300,000	4,000	5,200	800,000	706	564.8	5,765
5	ADO-EKITI	650,000	4,000	2,600	400,000	706	282.4	2,882
TOTAL COST								40,613

6	GRA MODERNISATION USING LT ABC	6,173
GRAND TOTAL		**46,786**

Performance Forecast

Table 34: Performance Forecast

Business Unit	Month	Customer Population	Response	Energy Input (MWh)	Energy Billed (MWh)	Billing Efficiency (%)	Amount Billed (N' mm)	Amount Collected (N' mm)	Collection Efficiency (%)	Total Outst Debt (N'mm)	ATC & C Losses (%)
GRA Benin	**JAN 2016**	**25,225**	**8,958**	**9,403**	**4,796**	**51.0%**	**119.04**	**105.34**	**88%**	**813.94**	**55%**
	MAR 2019	27,796	**9,328**	**7,324**	**6,303**	**86.1%**	**237.73**	**154.62**	**65%**	**3,252.34**	**44%**
	PROPOSED	**27,796**	**14,166**	**7,324**	**6,958**	**95.0%**	**262.44**	**234.81**	**89%**	**3,172.15**	**15%**
Asaba + Koka	**JULY 2017**	**47,880**	**13,616**	**13,854**	**11,742**	**84.8%**	**429.65**	**274.29**	**64%**	**3,532.90**	**46%**
	MAR 2019	**61,511**	**20,945**	**22,297**	**18,978**	**85.1%**	**688.64**	**499.98**	**73%**	**7,901.57**	**38%**
	PROPOSED	**61,511**	**28,542**	**22,297**	**22,297**	**95.0%**	**809.08**	**681.33**	**84%**	**7,720.23**	**20%**
Warri + Effurun	**JAN 2017**	**74,386**	**21,925**	**20,415**	**17,864**	**87.5%**	**541.69**	**250.13**	**46%**	**3,639.16**	**60%**
	MAR 2019	**76,490**	**32,291**	**21,539**	**18,283**	**84.9%**	**645.23**	**287.44**	**45%**	**9,834.84**	**62%**
	PROPOSED	**76,490**	**68,317**	**21,539**	**20,462**	**95.0%**	**722.15**	**608.13**	**84%**	**9,514.15**	**20%**
Akure	**JAN 2016**	**74,489**	**9,290**	**6,393**	**6,822**	**106.7%**	**156.94**	**59.48**	**38%**	**1,504.90**	**60%**
	MAR 2019	**45,267**	**16,657**	**6,691**	**5,697**	**85.1%**	**200.43**	**111.42**	**56%**	**4,043.67**	**53%**
	PROPOSED	**45,267**	**26,393**	**6,691**	**6,357**	**95.0%**	**223.63**	**176.55**	**79%**	**3,978.54**	**25%**
Ado-Ekiti	**JAN 2016**	**76,177**	**13,168**	**9,004**	**7,261**	**80.6%**	**161.43**	**87.01**	**54%**	**1,921.02**	**57%**
	MAR 2019	**38,317**	**15,973**	**8,581**	**7,276**	**84.8%**	**249.62**	**121.10**	**49%**	**4,644.93**	**59%**

Business Unit	Month	Customer Population	Response	Energy Input (MWh)	Energy Billed (MWh)	Billing Efficiency (%)	Amount Billed (N' mm)	Amount Collected (N' mm)	Collection Efficiency (%)	Total Outst Debt (N'mm)	ATC & C Losses (%)
	PROPOSED	**38,317**	**31,063**	**8,581**	**8,152**	**95.0%**	**279.66**	**235.50**	**84%**	**4,530.53**	**20%**

Strategies for tackling TCN bottleneck:

TRANSMISSION BOTTLENECKS:

Table 35: Transmission bottlenecks with proposed solutions

S/N	TRANSMISSION S/S	BOTTLENECKS	POSSIBLE SOLUTIONS	IMPACT
1	Okpella 132/33KV TS	The 15MVA, 132/33Kv Transformer is grossly overloaded.	Commissioning of 60MVA power transformer will enable us meet power requirement in the Area.	High
2	Akure 132/33KV TS	Load limitation due to undersized conductor on the 132KV line between Osogbo and Akure TS.	Early commissioning of Ogbese Akure 2 X 150MVA, 330/132/33KV Transmission Station	High
3	Omotosho 330/132/33KV TS	Energization of 33KV feeder to Omotosho Injection Substation	Early Energization of 33KV feeder.	High
4	Ondo 132/33KV TS	132/33KV Power Transformer T2 on soak	33KV Incomer breaker has been energized. Awaiting loading of the 33KV outgoing breaker	High
5	Irrua 132/33KV TS	30MVA Transformer is overloaded	60MVA power transformer work to be expedited. Besides, the undersized conductor between Benin and Irrua should be upgraded.	High
6	Irrua / Okpella 132/33KV TS	Overloading of Irrua and Okpella Transmission Substations	Energization of 132/33KV 40MVA Mobile power transformer at Otaru Palace	High
7	Effurun 132/33KV TS	Load limitation due to undersized conductor on the 132KV line between Ughelli and Effurun	Replacement of undersized conductor to avoid load shedding	High
8	Okene 132 / 33Kv TS	Failure of 132/33KV, 40MVA power transformer	Urgent replacement of power transformer to avoid load shedding	High
9	Benin 330/132/33KV TS	Frequent Under Frequency Relay operation on 33KV Switching Station Feeder	Shifting of UFR on 33KV Ikpoba Dam feeder	High

Current ongoing Transmission Projects in BEDC franchise area:

Table 36: Ongoing Transmission Projects

S/N	Description of Projects	Location	Impact when Completed	Remarks
1	Ogbese Akure 2 X 150MVA, 330/132/33KV TS	Ogbese (Ondo State)	This will give relief to the existing Transmission Station at Akure	Project on-going. Still expecting fund from federal government to continue.
2	Oke-Agbe 2 X 60MVA, 132/33KV TS	Oke-Agbe (Ondo State)	This will relieve the Ososo, Ikare, Isua Owo feeders	All equipment including 2Nos 60MVA Power Transformers are at site. Fencing and transformer plinth done so far.
3	Afisere 1X30MVA 132/33KV TS	Ughelli (Delta State)	This will relieve Ughelli TS	Completed. Transformer on soak. Awaiting Loading
4	Ozoro 1 X 30MVA, 132/33KV TS	Ozoro (Delta State)	This will relieve Ughelli TS	Ongoing
5	Okitipupa 2 X 30MVA, 132/33KV TS	Okitipupa (Ondo State)	This project is expected to relief to Ondo TS and improve supply to Okitipupa, Igbokoda and surroundings	Funding from federal government required.

8.2 Metering System

While the customer metering including government metering is covered under MAP, the GRID and DTR metering is already complete in year 2019. Considering this only new and replacement metering for Grid and DTR meters will be required for capex in years 2020 to 2024.

8.3 Arrangements to Secure Payment of Consumption of Government Agencies

BEDC plans to install pre paid meters for all government agencies under MAP. Also, BEDC is in talks with various stakeholders of government to secure a reliable payment channel for them and thereby reduce MDA debts.

9 IT tools and Management System

9.1 Commercial Management System

BEDC has following systems for managing its commercial processes

1. EBMS system for its post paid reading, billing and collection management
2. Ultima Plus platform of Conlog for prepaid vending management

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3. In house application for management of new connection under MAP
4. In house application for tracking of bill distribution and individual performance
5. In house application for enforcement
6. Footprint system for customer service management

While these system are able to perform their task in silos, an integrated commercial management is required for better monitoring and control of commercial processes. BEDC is in process of implementing an integrated commercial management system.

9.2 ERP

9.2.1 ERP and ESB implementation

- **ERP:** All the relevant business processes were discussed and shared with ERP implementation team for configuration. 80% configuration is completed by arranging live sessions with users. Conference room pilot run is done and moving towards UAT.
- **ESB:** Test cases for Route, Foot print and EBMS are successfully tested. Awaiting API from Ultima plus, GIS, Load dispatch and GIS apps.

9.2.2 HR Management System

In a bid to streamline and optimize operations, the company has acquired Popay HR Management System to help in significantly automating HR business processes.

Popay HRMS is a SaaS (Software-as-a-Service) solution that covers key areas of HR practice like Compensation and Benefits (payroll) and HR administration (leave management, self-service and reporting)

Popay's HR Administration module includes the following functionality:

i. Centralised repository for all staff data
ii. Capture of staff data: personal identity, address, family and dependents, previous employment, education, contracts, assignment details (job, organization, location, supervisor), salary information, payment method, competence profile, disciplinary data, performance results, internal training history and documents
iii. Job, Position and grade dictionaries linked to the files of staff
iv. Organisation, position and supervisory hierarchy
v. Optional data entry validation process
vi. Dated tracked history

Self Service tool

Manager Self Service provides the following functionality to supervisors:

i. View of employee records for their collaborators
ii. Be notified of end of employment and disciplinary actions entered by HR Professional
iii. Approve leave requests from collaborators or enter leaves on their behalf
iv. Initiate HR processes (promotion, transfer, probation, absences…) for collaborators

Employee Self Service allows employees to:

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i. View of their personal records
ii. View leave entitlements, request for leaves and attach supporting documents
iii. View their pay slip online

Leave Management

The Self-Service access allows employees to enter leave requests and declare leaves.

Managers enter or approve leaves for collaborators. Alternatively, leaves can be entered by the HR Professional in the HR Administration module. Leaves will be linked to leave allowance where required. The system manages the outstanding days of each staff and ensures upfront validation of leave requests. When applying for leave, an employee sees his or her leave entitlements and the system prevents any policy non-compliant requests.
Approved leaves are automatically taken into account in the payroll, as per the organisation's policy.

Reporting

Popay's platform includes pre-configured reports, monitoring dashboards and possibility to generate pdf documents. Popay's HRMS standard reports can be extended and customized at will, based on the Interactive Reports technology of the underlying platform. Filters can be applied at run time, exports in several formats can be generated, and grouping of data happens by a few clicks.

Popay's Payroll module includes the following functionality:

i. Integration with the Core HR module
ii. Retro pay, a dynamic retroactive engine, so that changes in the past are processed accordingly and are presented on the actual pay slip
iii. Pro rata, hires and terminations in the middle of the month will be processed by the platform to calculate prorated amounts
iv. Payroll cycle monitor, configured to provide a comprehensive presentation of all periodic processes that needs to be run
v. A standard set of Payroll operational and audit reports. Reporting technology of the underlying platform allows applying filters at run time, and generating exports in several formats
vi. Excel upload functionality for payroll element entries
vii. Payment output in various formats and supporting reports, supporting cache payments and EFT payments
viii. A configurable output of journal data, so that the monthly journal can be posted in the General Ledger application in use

Audit Trail

All transactions are monitored within Popay.net. Standard reports show who has changed what and when. Additionally, the system provides an element entry validation processes, where required.

Mobile Application

Popay's system also comes with a mobile application for managers and employees

9.2.3 E-Learning Centre

E-Learning Centre has been fully setup; from Infrastructure viewpoint. However, HR yet to purchase eLearning Apps required for the center.

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9.2.4 VPN/Internet for BUs

- Concluded for Head Office and Etete: We have 2 service providers providing internet for Head office to ensure maximum uptime.
- Work in progress for the remaining BUs (25)
- Received Feasibility reports from Glo, MTN, Airtel and Main-one. and crafting out of proposal for MD's approval is in progress

9.2.5 SharePoint Intranet Portal

Re-implementation is in progress – concluded for Technical and Finance Departments. Re-implementation involves reloading contents for each department.

9.2.6 Client PC for Application end users

Working on proposal for providing client PC for application end users. Awaiting feedback from Procurement and HR on existing data on employees using computers.

9.2.7 GIS of Network

Mapping of MD proposed dedicated feeder

- Mapping of proposed linking of part of Airport dedicated feeder to IDSL (Ogba) dedicated feeder.
- Mapping and planning of MD dedicated feeder from Nekpenekpen to customers in Evbotubu and Sokponba BU.
- Mapping of proposed Auchi 11kV dedicated feeder.
- Mapping of proposed Owo 11kV dedicated feeder.
- Mapping of proposed extension of Okada 11kV dedicated feeder.
- Mapping of proposed extension of Airport Road dedicated feeder to customers along Ekenhuan Road.
- Mapping of proposed extension of MBH 11kV dedicated feeder to customers around New Benin.
- Mapping of proposed extension of Oluku 11kV feeder to MD customers under Okada BU.
- Mapping of proposed extension of 11kV Royal commercial feeder.
- Mapping of proposed extension of GRA commercial 11kV feeder to MD customers along Sapele road Under Etete BU.

Training

- Training of five TAVV mapping team on GIS-based network assets data capturing using Trimble GNSS/GPS device and ArcPad mobile GIS software
- Training of NYSC corp members (Enumeration) on new techniques of data capturing using GNSS/GPS.

Percentage Completion of Network Assets by State:

Table 37: Completion status of feeders mapped

State	Feeder Type	Existing No. of Feeders	No. of Feeders Mapped	Route Length (KM)	Percentage Mapped
Delta	11KV Feeders	130	130	1924.99	100%

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	33KV Feeders	26	26	1790.96	100%
Edo	11KV Feeders	134	58	1137.108	43%
	33KV Feeders	25	12	715.14	48%
Ondo	11KV Feeders	45	13	185.03	29%
	33KV Feeders	9	1	182.29	11%
Ekiti	11KV Feeders	21	21		100%
	33KV Feeders	5	5		100%

Our IT Road Map

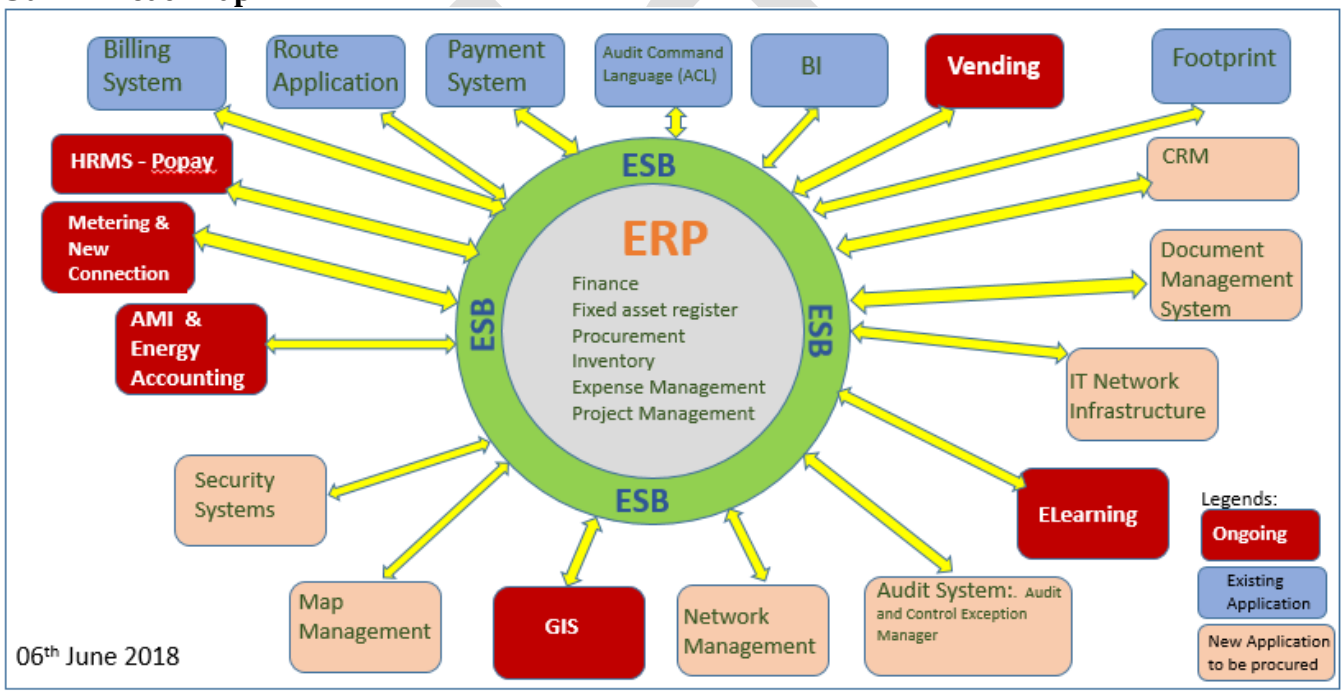

Figure 18: IT Road Map

Proposed new IT Network Architecture and hosting business critical application in cloud and NIBSS.

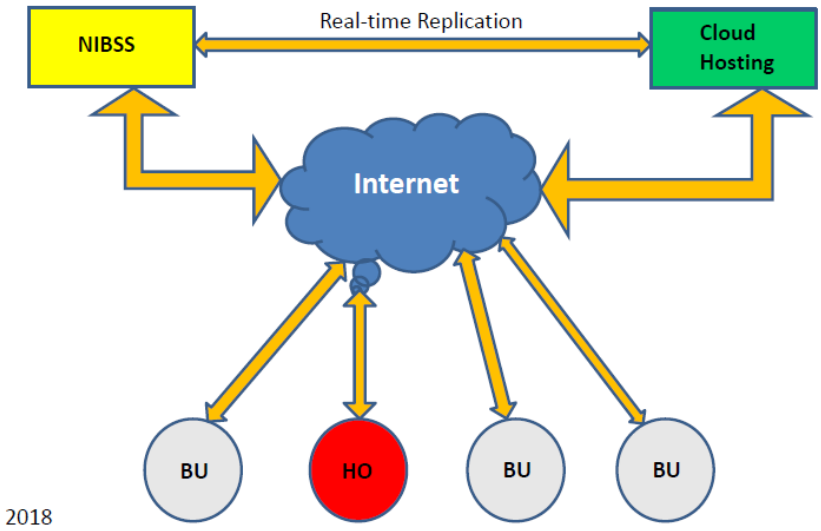

Figure 19: Proposed IT Network Architecture

9.3 Revenue Protection Project (RPP) supported by Advanced Metering Infrastructure (AMI)

All customer metering under MAP is trough AMI compliant meters. BEDC has already implemented AMR for all its Grid and DTR metering. Now BEDC is in talks with several vendors for implementation of AMI solutions for all meters deployed under MAP. This AMR and AMI combined will provide DTR wise energy accounting and better monitoring of temper and bypass of meters, aiding BEDC to reduce theft and bypass.

9.4 Supervisory Control and Data Acquisition System (SCADA)

Centralize Monitoring & Control of Supervisory Control and Data Acquisition (**SCADA**) is a control **system** architecture that uses computers, networked data communications and graphical user interfaces for high-level process supervisory management.

SCADA systems have traditionally played a vital role by providing utilities with valuable knowledge and capabilities that are key to a primary business function - delivering power in a reliable and safe manner. A quality SCADA solution is central to effective operation of a utility's most critical and costly distribution, transmission, and generation assets. SCADA system will help BEDC to achieve

i. New levels in electric grid reliability – increased revenue
ii. Proactive problem detection and resolution – higher reliability
iii. Meeting the mandated power quality requirements – increased customer satisfaction
iv. Real time strategic decision making – cost reductions and increased revenue.

After fully Implementation of SCADA along with its associated applications and modules can ensure:

1) Availability of real time Electrical parameters (like Active & Reactive power, Current, Voltage, Energy, frequency profile etc.) this will help for
2) Proper Energy Accounting. - This will helpful for identifying the high loss pockets in much better way, thereby helpful for controlling the Losses more promptly by hitting lossmaking area precisely.
3) Proper load Management-
    a. Real time monitoring and initiating corrective action without any time delay.
    b. Based on data related to real time power availability, duration of Supply of power to the consumer will be further increased.
4) Proper Power forecasting & Scheduling-
    a. Availability of Load profile & Historical Load flow data
    b. Trigger for requirement of Augmentation of Network based on Feeder / location wise Peak demand.
    c. Knowing the Trend of load growth will be helpful for Planning for future Growth
5) Maintaining Quality Power-Triggers to initiating corrective & preventative action for maintaining Quality Power Supply.
6) Proper Relay Coordination
    a. Thereby clearing the faulty at local level and reducing / cut shorting the affected area & no of consumers affected.
    b. Eliminating the un coordinated tripping at upper level (at TCN)
    c. Fault analyses for initiating corrective & Preventive action for fault rectification will more accurate & easier, Based on Fault Data from SCADA.
7) Maintaining Reliable Power Supply.
    a. Will be helpful for reduction of Equipment failure Based on triggered received from SCADA
8) Creating more safe working environment by issuing Permit to wok (PTW) after implementing proper Lock out Tag out (LOTO) on digital Network using SCADA system will help to ensure more safety for Giving outage or Clearing outage.
9) Customer Satisfaction level will further Increased by integration of SCADA with other applications in BEDC (like ERP / CRM / GIS etc.) will make more convenient to timely address the Customer's Request / complaints etc. It will make available costumer's related details at a common control desk / platform.

Proposed Execution Plan for SCADA in BEDC

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The SCADA execution consists of establishment of Central Control Room controlling the network with the state of art software. It also involves replacement of old switchgear with SCADA compatible ones, installation of Remote Terminal Units (RTUs) in each injection substation and establishment of a robust communication link (Fibre optic or RF) between the Injection substations and Central control room.

1st Year: SCADA will be Implemented in Asaba City

2nd Year: SCADA will be Implemented in Benin City & Akure City

3rd Year: SCADA will be Implemented in complete Edo State

4th Year: SCADA will be implemented in complete Delta State

5th Year: SCADA will be implemented in ONDO and EKITI state

9.5 Works Management System (WMS)

Works Management System (WMS), also identified as Enterprise Asset Management System (EAMS), is a system to support planning and execution of works in electricity networks infrastructure, including construction of new networks (expansion plans), rehabilitation/upgrade of existing networks, works to connect new customers, etc. WMS/EAMS enables efficient execution of processes for network planning, costing, preparation of quotations to applicants, assignment of works to own staff/appointed contractors (work orders generation process), control of flow of materials, supervision of execution of works, commissioning of works.

Some of these activities are covered in ERP Professional Services Module mentioned above.

10 Yearly capex and capitalization

Based on the above Capital Expenditure program towards network augmentation, reduction of AT&C losses, system upgrades and improvement in metering, the year-wise capex and capitalization has been estimated as below:

Table 38: Year-wise capex and capitalization (Naira Billion)

Particulars	2020	2021	2022	2023	2024
Total Capitalization*	26.92	26.92	26.92	26.92	26.92

11 Risk assessment and Risk Mitigation plan

Listed below are the identified risks inherent in the preparation and implementation of PIP that are required to be critically considered.

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Table 39: Risk and Mitigation Plan

Sr. No.	Risk Factor	Implication/Risk	Recommended Mitigants	Remarks
1	Wrong or Incorrect/Incomplete Information input into the PIP	1. Unrealistic Estimates/ propositions	Thorough Review of Data to be used in deriving estimates, Built slack or buffer in the projections to cover for possible inaccurate data.	
2	Shortage in generation/power supplies against proposed level supplies stated in PIP	1. Breach in performance agreement on key indices/KPIs by Disco 2. Volume Risk	Obtain strict commitment with option for penalty from key stakeholders that will be required to provide services/supplies. Eg TCN and Independent GENCOs. Plan for alternative supply source e.g from independent Gencos	This goes beyond the control of Disco hence must be put as a caveat in the PIP documents.
3	Error in setting Benchmarks e.g for ATC & C and other KPIs	1. Unrealistic setting especially on any KPI including ATC&C figures	Continuous engagement of the regulators on any observed error in settings.	
4	Huge Capex for PIP implementation vis a vis country and economic risks	1. Financing Risk; Inability to raise required finances both within and outside the country	1. Need to carry along the possible financiers. 2. Consider option for going to Capital market to raise funds both in equity and debts	The country Risk is very high for Investors especially for foreign investors and financiers. This added to current political risk might hamper the ability of Disco to be able to source the required funding for the PIP.
5	Possible Erratic/conflicting	1. Regulatory Risk 2. Political Risk		

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Sr. No.	Risk Factor	Implication/Risk	Recommended Mitigants	Remarks
	Regulation and Governmental action	The above is because Government may be unwilling to allow the required cost reflective tariff that will result from projections in the PIP due to some political reasons.		
6.	Revenue Protection Challenges that could significantly affects the performances projected	1. Poor Performance 2. Poor Implementation	Need for urgent enactment of Power theft law and creation of special Courts to trial power theft offenders to reduce the incidence of power theft that could threaten the attainment of the performance indices set in PIP	This is beyond the company. However, move could be made with the state government to get same enacted by each state.
7	Internal Resources Challenges and assurance of ethical behavior of staff	1. Staff Buy In into the defined action plan in the PIP 2. Staff Morale	1. Need to make the PIP preparation participatory among key stakeholders and management of the company 2. Need to build sufficient budget for staff benefits to enhance motivation and secure their cooperation 3. Better/Improved compensation/reward to staff. 4. Strict Implementation of employees sanction grid along with reward system to promote performance.	
8	Quality of Contract execution by Contractors for the PIP implementation	1. Poor execution of jobs	1. Adopt Contractor Registration scheme	

Sr. No.	Risk Factor	Implication/Risk	Recommended Mitigants	Remarks
9	Absence of PIP for Genco and MO and other stakeholders in the Power value chain	1. Non-envisaged limitation/challenges 2. Unrealistic projection and performance setting	1. Obtain signed commitments on the deliverables from each stakeholders and incorporate in the PIP.	

12 Financing Plan

Historically, due to delays in providing cost reflective tariff, the books of Disco has accumulated large amount of payables which was not netted off against accumulated regulatory asset by regulator up till now. The latest tariff order in August 2019 has taken all these payables out of Disco books by netting off the payables against the accumulated regulatory asset. This has enhanced the Disco's position to raise debt. BEDC is in talks with several multilateral agencies like AFD, DFID, IFC, World Bank and Siemens (German Government intervention). BEDC Plans to fund the larger part of the capex requirements from these multilateral agencies while a small part will come from equity infusion and debt from banks in Nigeria.

13 Tariff Calculation

Table 40: Category-wise Energy Tariffs

14 Projected Financial Statements

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