Final Report

TRANSMISSION DEVELOPMENT PLAN 2014-2015

Volume II (Part 2)

OPERATION AND MAINTENANCE (METERING)

JULY 2016

NGCP

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PREFACE

The 2014-2015 TDP consists of three volumes. This Volume II-Part 2 contains the proposed expansion, upgrade, rehabilitation, and replacement programs of NGCP for Transmission Revenue Metering Facilities.

Volume II-Part 2 consists of six (6) Chapters.

Chapter 1 provides an overview of NGCP Metering Services' functions and services as mandated in the EPIRA.

Chapter 2 describes the System/Asset profiles of the metering installations at NGCP's load and generator customers in Luzon, Visayas and Mindanao.

Chapter 3 discusses the requirements of metering infrastructure based on its expansion, upgrade, rehabilitation and replacement analysis.

Chapter 4 explains the assessment made on the existing metering installations and the planning criteria to support the identified metering requirements for expansion, upgrade, rehabilitation, and replacement activities.

Chapter 5 describes how the project will be developed and implemented.

Chapter 6 contains different appendices that support the discussions on relevant topics.

CHAPTER 1: NGCP Metering Services' Functions and Services

Provision, operation and maintenance of Revenue Metering Facilities are utility functions that TransCo assumed from the National Power Corporation (NPC) with the industry restructuring that was implemented as mandated by R.A. 9136, or the Electric Power Industry Reform Act (EPIRA).

Grid revenue metering became an integral part of TransCo's utility functions; specifically the metering requirements for its own Transmission Service. TransCo also became the "de facto" metering service provider of NPC and other Energy Suppliers for the purpose of billing their energy sales to their Customers.

TransCo's role as Metering Service Provider for all Grid connections was transferred to the National Grid Corporation of the Philippines (NGCP) along with that of Transmission Provider and System Operator in accordance with the privatization of the Power Transmission Business.

1.0 The EPIRA mandated the setting up and operation of the Philippine Wholesale Electricity Spot Market (WESM).

The WESM Rules designates TransCo, now NGCP, as the default Metering Service Provider for the WESM. As such, NGCP has undertaken the following projects:

a. Upgrading of the metering facilities of delivery points from the Luzon, Visayas, and Mindanao Grids to Distribution Utilities and other Load Customers to make these metering facilities "WESM-ready".
b. Putting up the "WESM-ready" revenue metering facilities for the injection points of NPC's power plants into the Grids.
c. Upgrading for WESM-readiness the metering facilities that measure the energy injected by the IPP's into the Grids.
d. Installation and operation of an Automated Meter Data Retrieval (AMR) System to satisfy the requirement of the WESM for daily delivery of Load Profile-type of meter data from all metering facilities that are required for the settlement of energy in the WESM.

2.0 The revenue metering capital assets consist of:

2.1 Revenue Metering Assets at Power Plants and at Load Customers' Receiving Substations, consisting of:

2.1.1 Instrument Transformers and their Mounting Structures (for selected metering points)
2.1.2 Electronic Meters (Main and Alternate)
2.1.3 Meter Test Blocks
2.1.4 GSM Modems
2.1.5 Lightning Arresters dedicated to the protection of metering assets
2.1.6 Meter Security Enclosures, Conduits and Wirings

2.2 Automated Meter Data Retrieval System, which consist of:

2.2.1 The AMR Software System

2.2.2 Server Equipment
2.2.3 AMR Workstations
2.2.4 Data Communication Devices and Services

2.3 Metering Field Offices and Service Facilities

2.4 Metrology Laboratory Equipment and Measurement Standards for Revenue Metering Service

2.5 Field Calibration/Testing Equipment

2.6 Spares

Recovery of capital investments in revenue metering assets and the operating costs in providing metering service is provided for under the ERC's Transmission Wheeling Rates Guidelines, OATS Rules, and the WESM Rules.

One of the requirements for revenue metering capital projects to be recovered under the Transmission Wheeling Rate Guidelines is the inclusion of these projects in the annual 10-year Transmission Development Plan (TDP).

CHAPTER 2: System/Asset Profile

1.0 The Metering Systems/Asset Profiles, which present the

a. Asset categories,
b. Distribution,
c. Age, and
d. Conditions of the Revenue Metering Assets are attached as Annexes.

CHAPTER 3: Requirement Analysis and Planning Criteria

1.0 Requirements and Standards for Transmission-Level Revenue Metering Installations and Service Facilities

The technical and infrastructure requirements, which translate into capital assets such as revenue metering equipment to be installed at the metering facilities of grid-connected power plants and load customers, as well as the meter data retrieval system, service infrastructure for equipment testing and calibration are defined by the Philippine Grid Code, the WESM Metering Manual, and the ERC Guidelines for WESM Metering Service Providers.

These requirements are then translated into technical standards and specifications for metering equipment, Automated Meter Data Retrieval (AMR) System, and metering equipment testing and calibration facilities and equipment.

Table Number 1: Regulatory Requirements

Rule	Requirements	Impacted Capital Assets
Philippine Grid Code	Metering Circuit Configuration & Accuracies	a. Instrument Transformers b. Electronic Billing Meter c. Lightning Arresters d. Security Enclosures
	Periodic Testing & Calibration of Metering Equipment	Metering Equipment Maintenance & Testing/Calibration Equipment
WESM Metering Manual	Load Profile Recording Metered Energy	Electronic Billing Meters
	Daily Collection, Validation and Delivery of Load Profile Meter Data	AMR System Hardware & Software for: a. Luzon AMR Station b. Vis/Min AMR Station c. National Back-up Station
ERC Guidelines for WESM MSP	MSP capabilities for: a. Establishing & maintaining measurement traceability b. Periodic calibration & accuracy testing of metering equipment	a. AMR System compatible with the Market Operator's Meter Data Collection System b. Metrology Laboratory & Secondary Standards for Revenue Metering Service c. Metering Field Testing/Calibration Equipment

2.0 Provisions of the Open Access Transmission (OATS) Rules on Metering Asset Ownership

The OATS Rules state that the Transmission Customer, which may be either a Generator or a Load Customer, may own/provide the metering equipment installed at the transmission metering facilities except for the revenue billing meter, which will be provided by the Transmission Provider.

Based on this premise, NGCP is not obligated to provide the instrument transformers and other assets to be installed at the metering facilities. NGCP may consider providing instrument transformers on the request of the Transmission Customer.

Appropriate tariff for provision of metering equipment and services under the OATS Rules:

a. Meter Only MSP Charge for metering facilities where NGCP owns only the meter.
b. Full MSP Charge for metering facilities where NGCP owns all the metering equipment.

3.0 Transmission System Expansion

Expansions of the Transmission System that involve the installation of new substations and feeder connection points should include revenue metering facilities at the sending end of the feeders, which serve as the asset boundaries with future Customers' connection assets.

The revenue metering facilities at the feeder connection points are to be included in the project scope for the Substations, which are covered in Volume I or II of the TDP.

Revenue-class metering facilities for measuring the Substation Energy Consumption are likewise to be included in the Project scope.

4.0 New Metering Facilities

The OATS Rules provisions on the supply of revenue metering equipment to be installed in the new metering assets of Generator Customers and Load Customers is that only the billing meter needs to be supplied by the Transmission Provider. The instrument transformers and lightning arresters as well as their mounting structures may be supplied by the Customer subject to agreement.

Thus, capital assets for the metering facilities of new Generator and Load Customers to be connected to the transmission system and for additional metering facilities of existing Customers will be provided as follows:

Table Number 2: Metering Capital Assets

Asset Item	Scope of Provision		Remarks
	NGCP	Plant Owner	
1. Concrete Foundations and Steel Mounting Structures	--	Yes	
2. Instrument Transformers	--	Yes	May be provided by NGCP as agreed with the Customer.
3. Lightning Arresters	--	Yes	
4. Electronic Meter	Yes	--	
5. Telephone Modem	Yes	--	
6. Telephone Connection	GSM	PSTN	
7. HV Connectors, Insulators & Cables	--	Yes	
8. Meter Box & Conduits & Fittings	--	Yes	NGCP to provide the meter box design drawings.
9. LV Cables	--	Yes	
10. Meter Test Block	--	Yes	
11. Grounding Cable & Connectors	--	Yes	

5.0 Programmed Replacement and Upgrade of Installed Metering Assets

Installed metering equipment and other assets need to be replaced and upgraded to address the following conditions:

a. Asset ageing, or reaching of regulatory/economic asset life
b. Obsolescence
c. Failure rate
d. Asset condition (failed, under-rated due to increase in loading, etc.)
e. Non-compliance with the Grid Code & WESM Rules requirements

Table Number 3: Metering Equipment and Assets

Asset Categories	Primary Trigger	Secondary Triggers
1. Instrument Transformers	End of Asset Life (30 Years)	Asset Condition/Failure Rate
2. Lightning Arresters	End of Asset Life (30 Years)	Asset Condition/Failure Rate

3. Electronic Billing Meters*	End of Asset Life (7 Years)	Obsolescence/ Failure Rate
4. GSM Modems	End of Asset Life (7 Years)	Obsolescence & Failure Rate
5. Mounting Structures	End of Asset Life (25 Years)	Condition
6. Conduits and Meter Boxes	End of Asset Life (15 Years)	Condition
7. AMR System Hardware (Server and Workstation Equipment)	End of Asset Life (5 Years)	Obsolescence
8. AMR System Software	Obsolescence or End of Asset Life (7 Years)	Management Decision
9. Metrology Laboratory Equipment	End of Asset Life (12 Years)	Condition/New Technical Requirements.
10. Field Metering Test & Calibration Equipment	End of Asset Life (10 Years)	Condition/New Technical Requirements.
11. Office Equipment (Computers, Printers, etc.)	End of Asset Life (5 Years)	Asset Condition/Failure Rate

• Electronic billing meters that are replaced at the end of asset life but are still serviceable may be installed as Alternate Meters

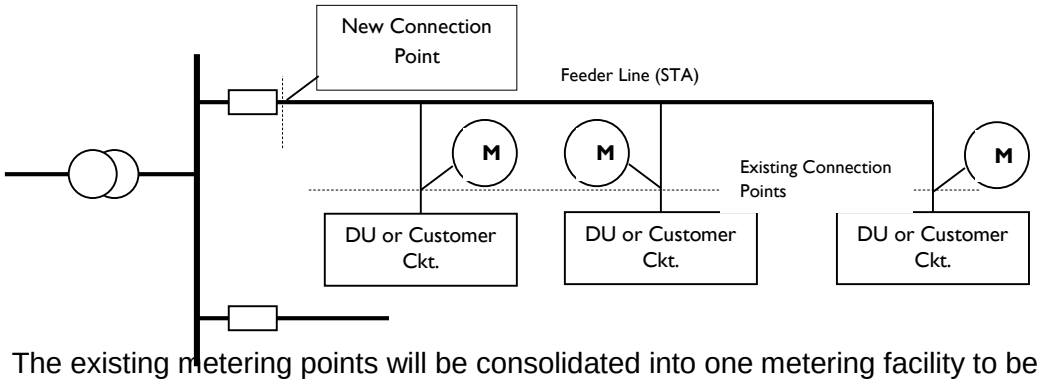
6.0 Procurement of Spare Metering Equipment

A standard quantity of 3% of the installed metering equipment will be stocked for replacement of installed equipment that may fail in service.

For asset types that exhibit higher failure rates, a correspondingly higher percentage of installed quantities will be stocked as spares. In recent years, we have experienced greater than 3% failure rates for meters and GSM modems. Thus, 5% annual procurement of stocks will be assigned to address failure rate of meters and modems.

7.0 Impact of Divestment of Sub-Transmission Assets on Metering Facilities

The divestment of Sub-Transmission Assets (STAs) consisting of Feeder Lines and power transformers to qualified Distribution Utilities will result in the Connection Points to the Transmission Networks moving “upstream” towards the sending end of the Feeder Lines. For a typical Feeder Line:



The existing metering points will be consolidated into one metering facility to be installed at the new Connection Point, where new metering equipment will have to be installed. Metering assets at the affected individual points consisting of meters, voltage and current transformers, and GSM modems will be retired and considered part of the spares inventory.

8.0 RE Generation Facilities

Installation of revenue metering facilities will be undertaken for committed RE Generation Facilities for Wind Power Project, Solar Power Projects, Biomass Projects, Hydropower Projects and Geothermal Projects in Luzon, Visayas and Mindanao.

Large generating facilities may be directly connected to the grid while the small RE generating facilities may be embedded to load customers. The metering assets to be provided to embedded generators shall be limited to the meters only.

CHAPTER 4: Project Development

1.0 Transmission System Expansion

Revenue metering facilities for new transmission substations and existing transmission substations being upgraded as initiated by Engineering will be covered in the Transmission Projects under TDP Volume I. These metering facilities consist:

a. Revenue-class metering facilities for Substation Service Consumption
b. Revenue-class metering facilities at the sending end of the new Feeders

2.0 New Metering Facilities for Generator and Load Customers

The arrangement for the provision of capital assets for the metering facilities of new Transmission Customers (Generators and Loads) to be connected to the transmission system, and for additional metering facilities of Transmission Customers as presented in the Planning Criteria will be followed.

For new metering points of Generator and Load Customers, the CAPEX Program will be based on the estimated numbers of new connection points to the Transmission Grids annually:

Table Number 3: Metering Asset Provision

	Luzon	Visayas	Mindanao
Full	10	6	7
Meter Only	6	3	4
Total per year	16	9	11

3.0 Programmed Replacement and Upgrading of Installed Metering Assets

Information on asset age and condition contained in the Asset Profiles are extracted to serve as primary basis for the Metering CAPEX replacement program for installed metering equipment. Following the Planning Criteria:

a. Installed metering assets such as Instrument Transformers, Lightning Arresters, Mounting Structures, Electronic Meters, GSM Modems, and Meter Boxes are to be

replaced towards the end of their assigned Asset Life and when they exhibit impending failure.

Current Transformers that are operating at the upper limit of the current range will likewise be replaced.

Obsolescence will be an added consideration to be used for Electronic Meters and GSM Modems. Electronic Meters installed as Main meters that are still operable at the end of their Asset Life may be used as Alternate Meters.

Lightning Arresters will be likewise replaced towards the end of their assigned Asset Life.

b. The AMR System Hardware will be replaced as they reach their assigned Asset Life or when they become obsolete or fail in service.

   The AMR System Software (currently the MV-90 System), will be replaced at the end its 5 – year Asset Life or when it becomes obsolete and can no longer be supported even by in-house technical resources. A Management decision, driven by business considerations, can be an added consideration for replacing the System. Also included in the upgrading of the AMR System is the upgrading of communication modem from GSM to GPRS is scheduled from 2016 to 2020. The AMR System is scheduled for upgrading in 2017.

c. The Metrology Laboratory Equipment for supporting the calibration and testing of metering equipment will also be replaced at the end of their Asset Life, or when they exhibit impending failure. New capabilities and features that address new technical requirements will be incorporated in the replacement units.

d. Field Calibration and Testing Equipment for Installed Metering Equipment will likewise be replaced at the end of their Asset Life, or when they exhibit impending failure.

e. Office Equipment such as computers and computer accessories will likewise be replaced after their age has exceeded their Asset Life or when they can no longer be used due to failure or obsolescence.

4.0 Procurement of Spare Metering Equipment

A standard quantity of 3% of the installed metering equipment will be stocked for replacement of installed equipment that may fail in service. For asset types that exhibit higher failure rates, such as meters, a correspondingly higher percentage of installed quantities will be stocked as spares. Thus, 5% will be used for meters.

5.0 Impact of Divestment of Sub-Transmission Assets on Metering Facilities

In accordance with the OATS Rules provision for the supply of the metering equipment for the new Connection Point is that NGCP may provide only the billing meter for the new metering point. The Customer may provide the other assets.

Metering assets, consisting of meters, voltage and current transformers, and GSM modems at the former metering points will be retired and will be included in the spares inventory.

6.0 Substation Consumption Metering Upgrade

All transmission substations are already equipped with revenue-class electronic billing meters for measuring the energy consumption of transmission substation. The revenue-class meters are installed in series with the statistical metering equipment of the Substation.

Subsequently, the metering circuits will be upgraded further by installation of revenue class instrument transformers from 2016 to 2020.

7.0 RE Generation Projects

Installation of revenue metering facilities will be undertaken for committed RE Generation Facilities for Wind Power Project, Solar Power Projects, Biomass Projects, Hydropower Projects and Geothermal Projects in Luzon, Visayas and Mindanao.

Large generating facilities may be directly connected to the grid while the small RE generating facilities may be embedded to load customers. The metering assets to be provided to embedded generators shall be limited to the meters only.

Appendix

A. Metering Installation Profile

The metering installation profile shows the total number of NGCP metering points in Luzon, Visayas and Mindanao. The metering points are classified as either full or meter only metering facilities.

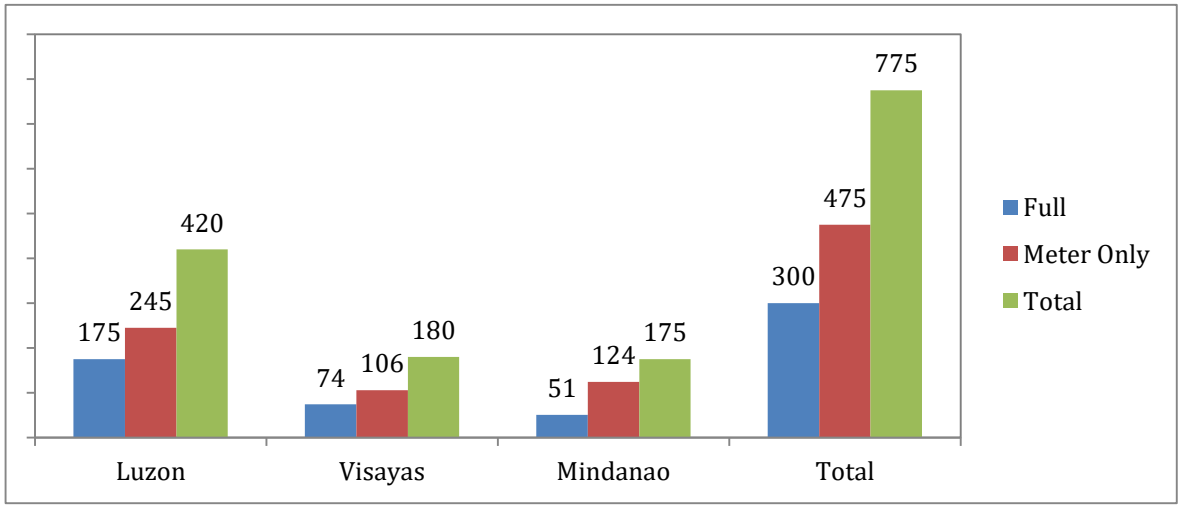


Figure Number A1: Load Customers (Graphical)

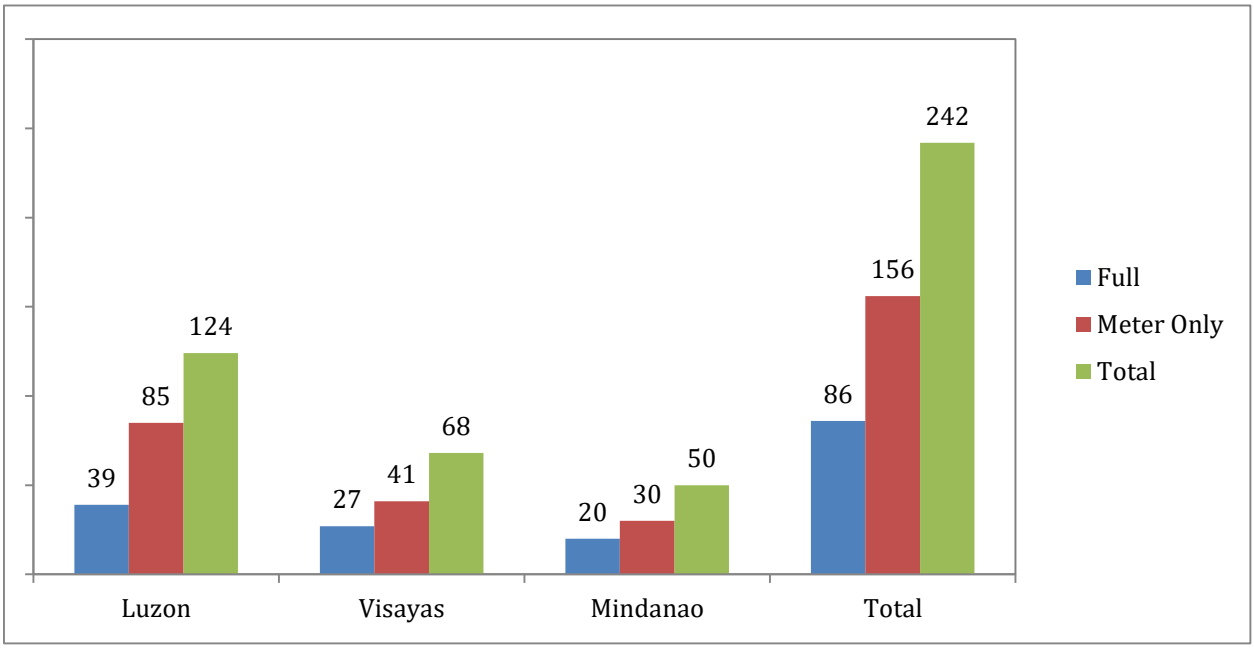


Figure Number A2: Generators (Graphical)

Table Number A1: Load Customers (Tabular)

Grid	Voltage Level (kV)	Quantity		
		Full	Meter Only	Total
Luzon	230	7	23	30
	115	24	10	34
	69	107	176	283
	34.5	5	5	10
	23	2	3	6
	13.8	26	28	54
	4.16	1	-	1
	0.48	3	-	3
Total for Luzon		**175**	**245**	**420**
Visayas	138	7	-	7
	69	63	98	161
	34.5	-	4	4
	13.8	4	4	8
Total for Visayas		**74**	**106**	**180**
Mindanao	138	2	5	7
	69	38	102	140
	34.5	2	2	4
	13.8	9	15	24
Total for Mindanao		**51**	**124**	**175**
Total for Load Customers		**300**	**475**	**775**

Table Number A2: Generator Customers (Tabular)

Grid	Voltage Level (kV)	Quantity		
		Full	Meter Only	Total
Luzon	500	-	2	2
	230	28	48	76
	115	7	8	15
	69	3	19	22
	23	-	2	2
	13.8	1	-	1
	6.6	-	2	2
	4.16	-	4	4
Total for Luzon		**39**	**85**	**124**
Visayas	230	-	4	4
	138	20	7	27
	115	-	1	1
	69	5	17	22
	34.5	1	9	10
	13.8	1	3	4
Total for Visayas		**27**	**41**	**68**
Mindanao	138	16	19	35
	69	4	9	13
	34.5	-	1	1
	13.8	-	1	1
Total for Mindanao		**20**	**30**	**50**
Total for Generators		**86**	**156**	**242**
Total Number of Metering Points		**386**	**671**	**1017**

B. Metering Asset Profile

The metering asset profile presents the categories, regulatory asset life, distribution and age of revenue metering assets.

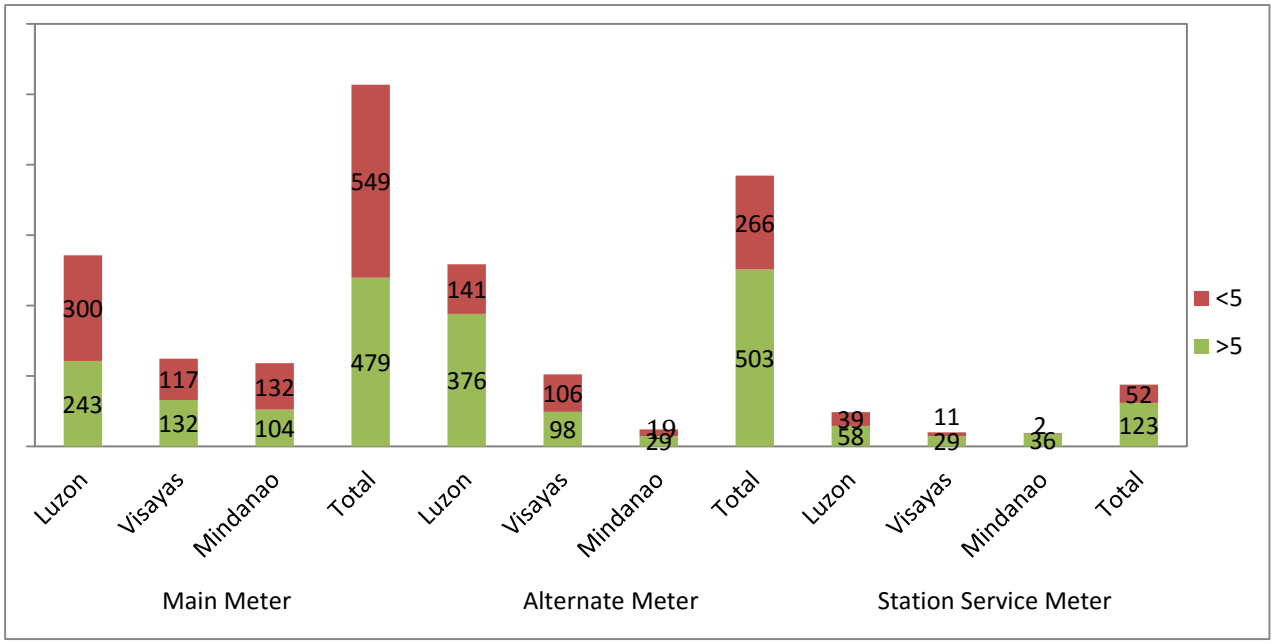


Figure Number B1: Revenue Meter (Graphical)

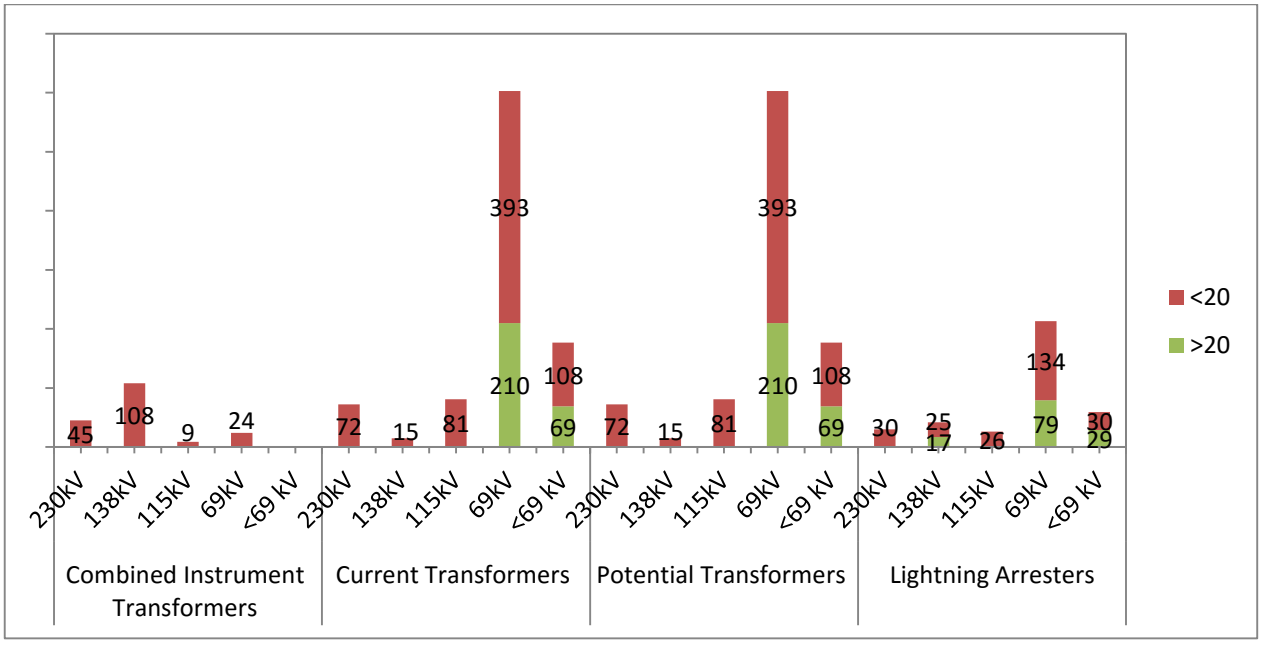


Figure Number B2: Instrument Transformers (Graphical)

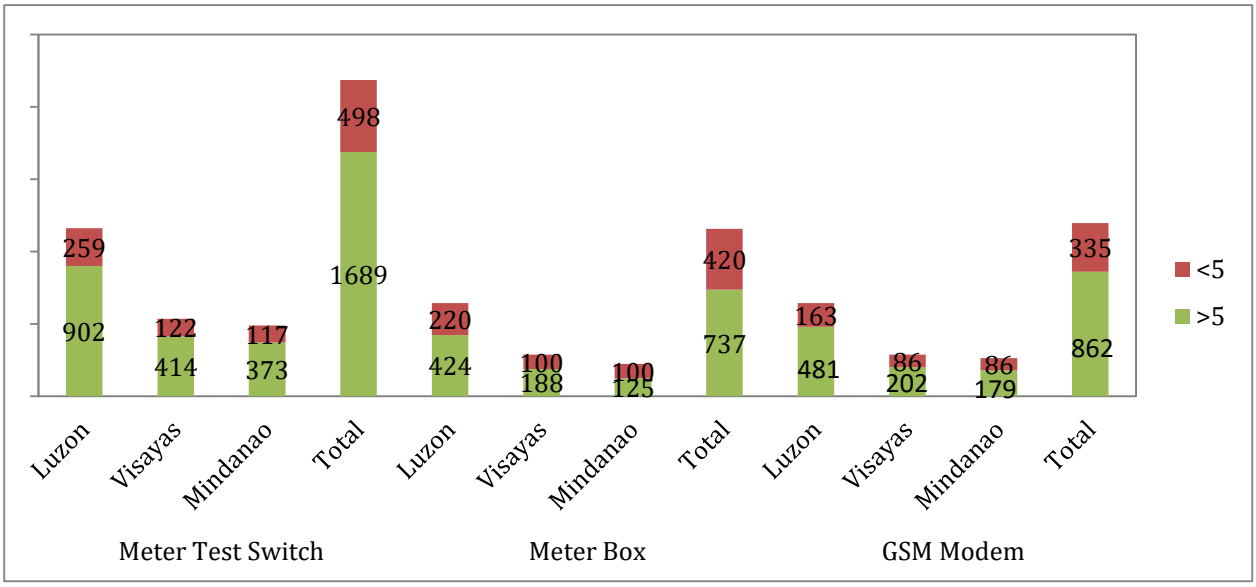


Figure Number B3: Other Accessories (Graphical)

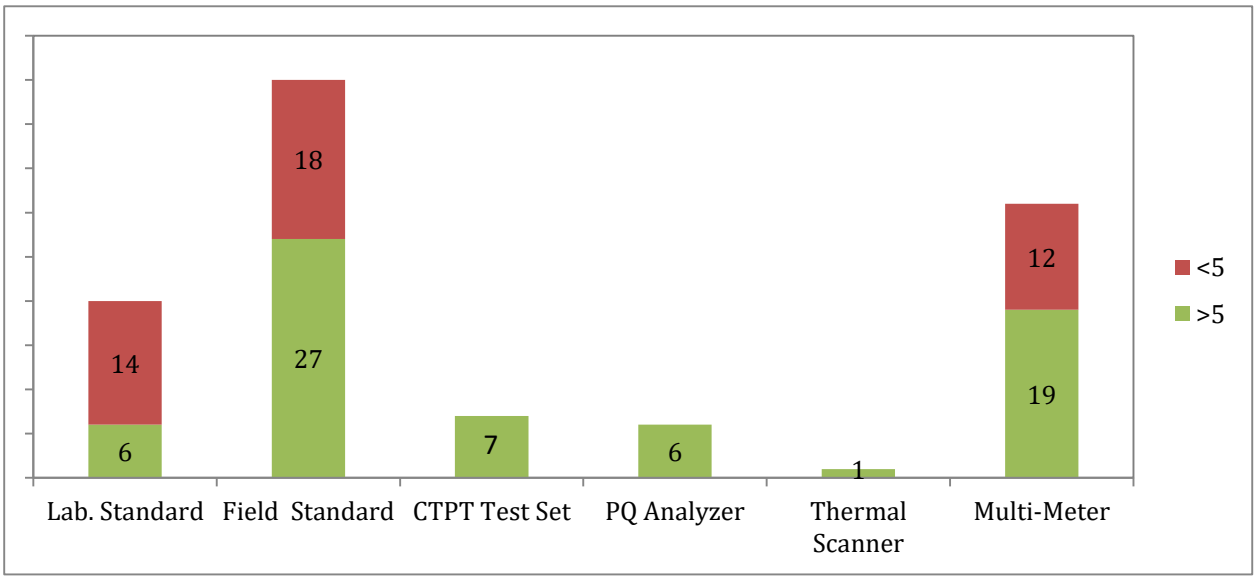


Figure Number B4: Laboratory/ Test Equipment (Graphical)

Table Number B1: Revenue Meter (Tabular)

Revenue Meter	Model	Regulatory Asset Life	Quantity		Age in Service (No. of Years)		
					0-5	5-10	>10
Main Meter	Ametek Ci20	7	Luzon	105	65	40	-
			Visayas	185	75	110	-
			Mindanao	57	35	22	-
	Ametek Jemstar	7	Luzon	121	121	-	-
			Visayas	30	30	-	-
			Mindanao	55	55	-	-
	Elster A3RL	7	Luzon	114	114	-	-
			Visayas	12	12	-	-
			Mindanao	42	42	-	-
	ION	7	Luzon	24	-	24	-
			Visayas	17	-	17	-
			Mindanao	68	-	68	-
	Landis+Gyr RXRS4e	7	Luzon	23	-	23	-
			Visayas	1	-	1	-
			Mindanao	10	-	10	-
	EIG Nexus 1272	7	Luzon	156	-	-	156
			Visayas	1	-	-	1
			Mindanao	3	-	-	3
	TransData Mark V	7	Luzon	0	-	-	-
			Visayas	0	-	-	-
			Mindanao	1	-	-	1
	Siemens MaxSys 2510	7	Luzon	0	-	-	-
			Visayas	3	-	-	3
			Mindanao	0	-	-	-
Alternate Meter	Ametek Ci20	7	Luzon	77	45	32	-
			Visayas	141	61	80	-
			Mindanao	4	-	4	-
	Ametek Jemstar	7	Luzon	53	41	-	-
			Visayas	14	14	-	-
			Mindanao	0	0	-	-
	Elster A3RL	7	Luzon	55	55	-	-
			Visayas	31	31	-	-
			Mindanao	19	19	-	-
	ION	7	Luzon	5	-	6	-
			Visayas	0	-	0	-
			Mindanao	3	-	3	-
	Landis+Gyr RXRS4e	7	Luzon	187	-	187	-
			Visayas	10	-	10	-
			Mindanao	2	-	2	-
	EIG Nexus 1272	7	Luzon	30	-	-	30
			Visayas	0	-	-	-
			Mindanao	3	-	-	3
	TransData Mark V	7	Luzon	0	-	-	-
			Visayas	0	-	-	-
			Mindanao	9	-	-	9
	Siemens MaxSys 2510	7	Luzon	0	-	-	-
			Visayas	8	-	-	8
			Mindanao	0	-	-	-
	Schlumberger	7	Luzon	29	-	-	29
			Visayas	0	-	-	-
			Mindanao	7	-	-	7
Alternate Meter	ABB	7	Luzon	13	-	-	13
			Visayas	0	-	-	-
			Mindanao	0	-	-	-

	GE	7	Luzon	11	-	-	11
			Visayas	0	-	-	-
			Mindanao	0	-	-	-
	Vectron SV4AR	7	Luzon	63	-	-	63
			Visayas	0	-	-	-
			Mindanao	0	-	-	-
	S. Columbus	7	Luzon	2	-	-	2
			Visayas	0	-	-	-
			Mindanao	1	-	-	1
	Quantum	7	Luzon	1	-	-	1
			Visayas	0	-	-	-
			Mindanao	0	-	-	-
	PM	7	Luzon	1	-	-	1
			Visayas	0	-	-	-
			Mindanao	0	-	-	-
	Fulcrum	7	Luzon	1	-	-	1
			Visayas	0	-	-	-
			Mindanao	0	-	-	-
Station Use Meters	Ametek Ci20	7	Luzon	21	10	11	-
			Visayas	13	8	5	-
			Mindanao	4	-	4	-
	Ametek Jemstar	7	Luzon	6	6	-	-
			Visayas	1	1	-	-
			Mindanao	1	1	-	-
	Elster A3RL	7	Luzon	23	23	-	-
			Visayas	2	2	-	-
			Mindanao	1	1	-	-
	ION	7	Luzon	1	-	-	1
			Visayas	0	-	-	-
			Mindanao	4	-	-	4
	Landis+Gyr RXRS4e	7	Luzon	40	-	40	-
			Visayas	21	-	21	-
			Mindanao	17	-	17	-
	EIG Nexus 1272	7	Luzon	6	-	-	6
			Visayas	0	-	-	-
			Mindanao	0	-	-	-
	TransData Mark V	7	Luzon	0	-	-	-
			Visayas	0	-	-	-
			Mindanao	11	-	-	11
	Siemens MaxSys 2510	7	Luzon	0	-	-	-
			Visayas	3	-	-	3
			Mindanao	0	-	-	-

Table Number B2: Instrument Transformer

Instrument Transformer	Voltage Level	Regulatory Asset Life	Quantity		Age in Service (No. of Years)		
					0-10	10-20	>20
Combined Instrument Transformer (CIT)	230 kV	30	Luzon	45	45	-	-
			Visayas	-	-	-	-
			Mindanao	-	-	-	-
	138 kV	30	Luzon	-	-	-	-
			Visayas	60	60	-	-
			Mindanao	48	48	-	-
	115 kV	30	Luzon	9	9	-	-
			Visayas	-	-	-	-
			Mindanao	-	-	-	-
	69 kV	30	Luzon	3	3	-	-

Instrument Transformer	Voltage Level	Regulatory Asset Life	Quantity		Age in Service (No. of Years)		
					0-10	10-20	>20
			Visayas	6	6	-	-
			Mindanao	12	120	-	-
Current Transformer (CT)	230 kV	30	Luzon	72	45	24	3
			Visayas	-	-	-	-
			Mindanao	-	-	-	-
	138 kV	30	Luzon	-	-	-	-
			Visayas	6	3	-	3
			Mindanao	9	3	-	6
	115 kV	30	Luzon	81	24	57	-
			Visayas	-	-	-	-
			Mindanao	-	-	-	-
	69 kV	30	Luzon	309	45	186	78
			Visayas	171	51	48	72
			Mindanao	123	-	63	60
	34.5 kV	30	Luzon	24	-	24	-
			Visayas	3	3	-	-
			Mindanao	3	-	-	3
	23 kV	30	Luzon	3	-	3	-
			Visayas	-	-	-	-
			Mindanao	-	-	-	-
	≤13.8 kV	30	Luzon	123	15	60	48
			Visayas	12	3	-	9
			Mindanao	9	-	-	9
Potential Transformer (PT)	230 kV	30	Luzon	72	45	24	3
			Visayas	-	-	-	-
			Mindanao	-	-	-	-
	138 kV	30	Luzon	-	-	-	-
			Visayas	6	3	-	3
			Mindanao	9	3	-	6
	115 kV	30	Luzon	81	24	57	-
			Visayas	-	-	-	-
			Mindanao	-	-	-	-
	69 kV	30	Luzon	309	45	186	78
			Visayas	171	51	48	72
			Mindanao	123	-	63	60
	34.5 kV	30	Luzon	24	-	24	-
			Visayas	3	3	-	-
			Mindanao	3	-	-	3
	23 kV	30	Luzon	3	-	3	-
			Visayas	-	-	-	-
			Mindanao	-	-	-	-
	≤13.8 kV	30	Luzon	123	15	60	48
			Visayas	12	3	-	9
			Mindanao	9	-	-	9
Lightning Arrester (LA)	230 kV	30	Luzon	57	36	18	3
			Visayas	3	3	-	-
			Mindanao	-	-	-	-
	138 kV	30	Luzon	-	-	-	-
			Visayas	51	39	-	12
			Mindanao	12	9	-	3
	115 kV	30	Luzon	72	42	30	-
			Visayas	-	-	-	-
			Mindanao	-	-	-	-
	69 kV	30	Luzon	291	81	156	54
			Visayas	186	63	18	105
			Mindanao	138	24	18	96

Instrument Transformer	Voltage Level	Regulatory Asset Life	Quantity		Age in Service (No. of Years)		
					0-10	10-20	>20
	34.5 kV	30	Luzon	36	9	27	-
			Visayas	-	-	-	-
			Mindanao	6	3	-	3
	23 kV	30	Luzon	6	-	6	-
			Visayas	-	-	-	-
			Mindanao	-	-	-	-
	≤13.8 kV	30	Luzon	159	21	72	66
			Visayas	15	6	6	3
			Mindanao	6	3	-	3

Table Number B3: Other Accessories

Item	Classification	Regulatory Asset Life	Quantity		Age in Service (No. of Years)		
					0-5	5-10	>10
Meter Test Switch	Isolator	15	Luzon	1188	259	641	288
			Visayas	536	122	248	166
			Mindanao	490	117	265	108
Meter Box	Enclosure	15	Luzon	644	220	312	112
			Visayas	288	100	103	85
			Mindanao	225	100	91	34
GSM Modem	Comm. Link	7	Luzon	644	163	481	-
			Visayas	288	86	202	-
			Mindanao	225	86	179	-

Table Number B4: Laboratory/ Test Equipment

Equipment	Classification	Regulatory Asset Life	Quantity		Age in Service (No. of Years)		
					0-5	5-10	>10
Laboratory Standard	Reference Standards	12	MSD	20	14	3	3
			Luzon	0	0	0	0
			VisMin	0	0	0	0
Field Watt-hour Standard	Working Standard	10	MSD	0	0	0	0
			Luzon	26	9	5	12
			VisMin	19	8	5	6
Instrument Transformer Test Set	Working Standard	10	MSD	0	0	0	0
			Luzon	4	2	2	0
			VisMin	3	1	2	0
Power Quality Analyzer	Measuring Instrument	10	MSD	-	-	-	-
			Luzon	4	-	4	-
			VisMin	2	-	2	-
Thermal Scanner	Measuring Instrument	10	MSD	-	-	-	-
			Luzon	1	-	1	-
			VisMin	-	-	-	-
Multi-meter/ Clamp Meter	Measuring Instrument	10	MSD	1	-	1	-
			Luzon	16	13	3	-
			VisMin	12	8	4	-

C. Metering Asset Replacement Program

The metering asset replacement program presents the replacement schedule of installed metering equipment and other assets to address asset ageing, obsolescence, failure rate and non-compliance to WESM Rules and Grid Code requirements.

Table Number C1: Revenue Meter

Revenue Meter	Grid	Replacement Schedule										
		Total	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Main Meter	Luzon	654	88	88	96	10	9	10	-	50	50	10
	Visayas	244	10	9	9	-	-	5	50	100	100	5
	Mindanao	232	4	4	44	40	40	5	-	5	5	5
	Spares	723	63	66	69	72	73	74	75	76	77	78
Alternate Meter	Luzon	515	53	53	52	-	-	-	10	-	-	-
	Visayas	173	6	6	6	-	-	-	5	-	-	-
	Mindanao	26	3	3	3	-	-	-	5	-	-	-
	Spares	723	63	66	69	72	73	74	75	76	77	78

- See footnote at Table Number C4 – Assumption and Consideration

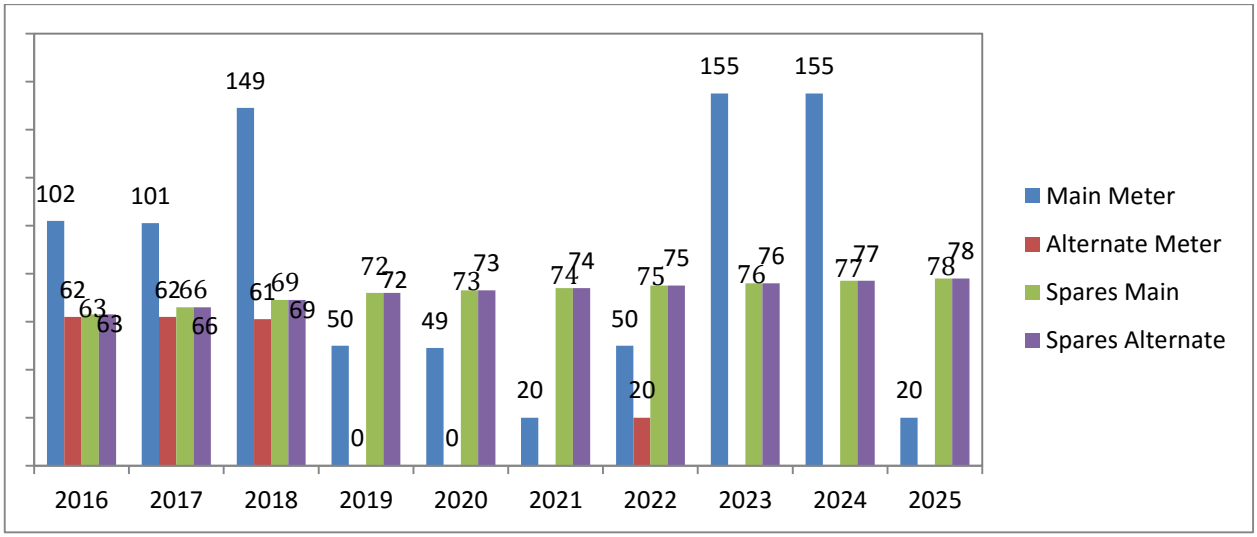


Figure Number C1: Revenue Meters (Graphical)

Table Number C2: Instrument Transformer

Inst. Xformer	Level (kV)	Grid	Replacement Schedule									
			2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
CIT	230	Luzon	-	-	-	-	-	-	-	-	-	-
		Visayas	-	-	-	-	-	-	-	-	-	-
		Mindanao	-	-	-	-	-	-	-	-	-	-
		Spares	3	1	1	-	-	1	1	1	1	1
	138	Luzon	-	-	-	-	-	-	-	-	-	-
		Visayas	6	-	-	-	-	3	-	-	-	-
		Mindanao	-	-	-	-	-	-	-	-	-	-
		Spares	8	4	1	1	-	2	2	2	2	2
	115	Luzon	-	-	-	-	-	-	-	-	-	-
		Visayas	-	-	-	-	-	-	-	-	-	-
		Mindanao	-	-	-	-	-	-	-	-	-	-
		Spares	4	3	1	1	-	1	1	1	1	1
	69	Luzon	6	-	-	-	-	-	-	-	-	-
		Visayas	6	3	-	-	-	-	-	-	-	-
		Mindanao	-	-	-	-	-	-	-	-	-	-
		Spares	2	1	1	1	-	1	1	1	1	1
CT	230	Luzon	-	-	-	-	-	3	-	-	-	-
		Visayas	-	-	-	-	-	-	-	-	-	-
		Mindanao	-	-	-	-	-	-	-	-	-	-

Inst. Xformer	Level (kV)	Grid	Replacement Schedule									
			2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
		Spares	4	4	3	1	-	2	2	2	2	2
	138	Luzon	6	-	-	-	-	-	-	-	-	-
		Visayas	-	-	-	-	-	-	-	-	-	-
		Mindanao	6	-	-	-	-	-	-	-	-	3
		Spares	-	-	-	2	-	1	1	1	1	1
	115	Luzon	6	-	-	-	-	-	-	-	-	-
		Visayas	-	-	-	-	-	-	-	-	-	-
		Mindanao	-	-	-	-	-	-	-	-	-	-
		Spares	10	6	3	-	-	2	2	2	2	2
	69	Luzon	33	66	27	12	9	3	6	12	9	57
		Visayas	24	21	9	-	-	-	-	-	-	-
		Mindanao	19	27	12	-	-	-	9	3	-	-
		Spares	27	13	3	2	4	13	13	13	13	13
	34.5	Luzon	3	-	-	-	-	-	-	-	-	-
		Visayas	-	-	-	-	-	-	-	-	6	9
		Mindanao	3	-	-	-	-	-	-	-	-	-
		Spares	1	3	-	2	-	1	1	1	1	1
	23	Spares	-	-	-	1	1	-	-	-	-	-
	13.8	Luzon	12	15	3	3	3	3	-	3	3	15
		Visayas	2	-	-	-	-	-	-	-	-	-
		Mindanao	3	3	-	-	-	-	-	-	-	-
		Spares	6	4	3	5	3	3	3	3	3	3
PT	230	Luzon	-	-	-	-	-	3	-	-	-	-
		Visayas	-	-	-	-	-	-	-	-	-	-
		Mindanao	-	-	-	-	-	-	-	-	-	-
		Spares	2	1	1	1	1	2	2	2	2	-
	138	Luzon	-	-	-	-	-	-	-	-	-	-
		Visayas	-	-	-	-	-	-	-	-	-	-
		Mindanao	9	-	-	-	-	-	-	-	-	3
		Spares	1	-	-	-	1	-	-	-	1	-
	115	Luzon	3	-	9	-	-	-	-	-	-	-
		Visayas	-	-	-	-	-	-	-	-	-	-
		Mindanao	-	-	-	-	-	-	-	-	-	-
		Spares	2	1	1	1	1	1	1	1	1	1
	69	Luzon	21	66	30	15	6	3	6	12	9	57
		Visayas	18	21	9	-	-	-	9	3	-	-
		Mindanao	13	21	12	-	-	-	-	-	-	-
		Spares	-	5	5	5	5	13	13	13	13	13
	34.5	Luzon	-	-	-	-	-	-	-	-	6	9
		Visayas	-	-	-	-	-	-	-	-	-	-
		Mindanao	3	-	-	-	-	-	-	-	-	-
		Spares	1	1	-	-	-	1	-	-	1	-
	13.8	Luzon	9	15	3	3	3	3	-	3	3	15
		Visayas	2	-	-	-	-	-	-	-	-	-
		Mindanao	3	3	-	-	-	-	-	-	-	-
		Spares	2	2	-	-	-	2	-	-	2	-
LA	230	Luzon	-	-	-	-	-	3	3	3	3	3
		Visayas	-	-	-	-	-	3	-	3	-	3
		Mindanao	-	-	-	-	-	-	-	-	-	-
		Spares	3	1	1	1	1	1	1	1	1	1
	138	Luzon	-	-	-	-	-	-	-	-	-	-
		Visayas	-	-	-	-	-	3	3	3	3	3
		Mindanao	3	-	-	-	-	3	-	3	-	3
		Spares	1	1	1	1	1	1	1	1	1	1
	115	Luzon	3	-	-	-	-	3	3	3	3	3
		Visayas	-	-	-	-	-	-	-	-	-	-

Inst. Xformer	Level (kV)	Grid	Replacement Schedule									
			2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
		Mindanao	-	-	-	-	-	-	-	-	-	-
		Spares	3	2	2	2	2	2	2	2	2	2
	69	Luzon	24	39	12	3	3	12	12	12	36	36
		Visayas	18	18	9	-	-	9	9	9	45	45
		Mindanao	12	21	12	-	-	6	6	6	36	36
		Spares	6	6	6	6	6	6	6	6	6	6
	34.5	Luzon	-	-	-	-	-	3	3	3	3	3
		Visayas	-	-	-	-	-	-	-	-	-	-
		Mindanao	3	-	-	-	-	-	-	3	-	-
		Spares	1	1	-	-	-	1	-	-	1	-
	13.8	Luzon	6	12	3	-	-	-	6	-	-	-
		Visayas	2	-	-	-	-	-	3	-	-	-
		Mindanao	3	3	-	-	-	-	3	-	-	-
		Spares	4	2	2	1	1	2	1	2	2	1

- See footnote at Table Number C4 – Assumption and Consideration

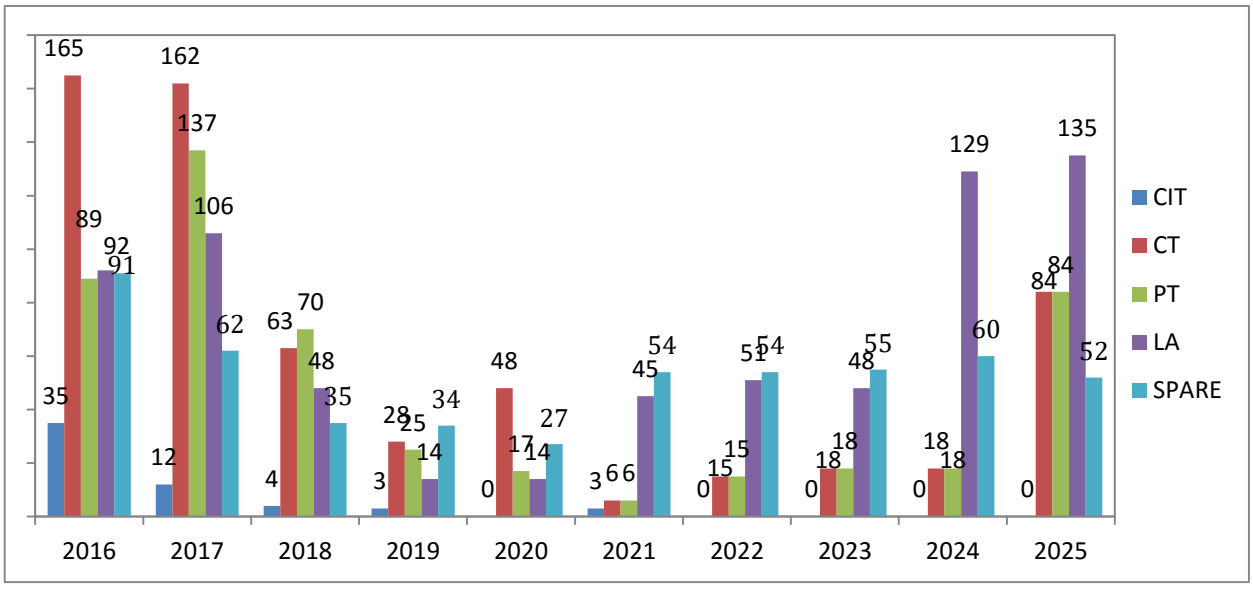


Figure Number C2: Instrument Transformers (Graphical)

Table Number B3: Other Accessories

Item	Grid	Replacement Schedule										
		Total	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Meter Test Switch	Luzon	372	23	13	13	16	7	60	60	60	60	60
	Visayas	62	6	3	3	3	-	10	10	10	10	10
	Mindanao	101	1	-	-	-	-	20	20	20	20	20
Meter Box	Luzon	113	14	9	9	9	12	12	12	12	12	12
	Visayas	41	3	-	3	-	-	7	7	7	7	7
	Mindanao	47	2	-	-	-	-	9	9	9	9	9
GSM / GPRS Modem	Luzon	880	300	200	126	-	-	48	49	50	53	54
	Visayas	457	150	150	78	-	-	15	16	16	16	16
	Mindanao	477	150	150	66	-	-	19	20	23	23	26

- See footnote at Table Number C4 – Assumption and Consideration

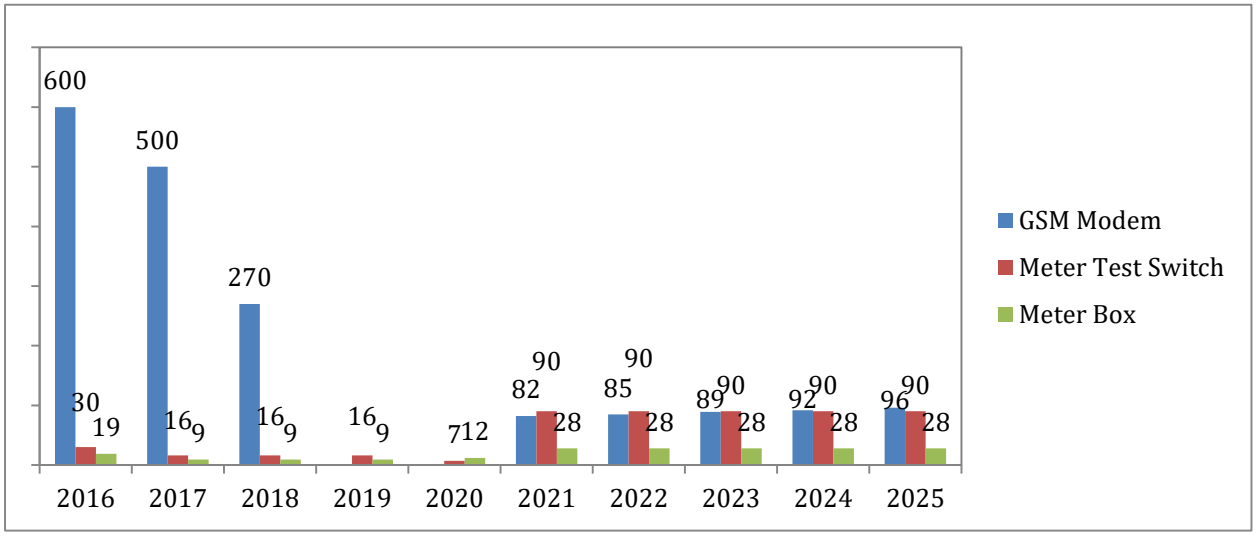


Figure Number C3: Other Accessories (Graphical)

Table Number B4: Laboratory/ Test Equipment/ AMR System

Item	Grid	Replacement Schedule										
		Total	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Lab. Std.	MSD	22	18	2	0	1	1	0	0	2	2	0
Field Std.	MSD	0	0	0	0	0	0	0	0	0	0	0
	Luzon	22	5	7	4	4	2	0	0	0	0	0
	VisMin	19	8	5	2	4	0	0	0	0	0	0
CTPT Test Set	MSD	1	0	1	0	0	0	0	0	0	0	0
	Luzon	4	0	0	0	2	2	2	0	0	0	2
	VisMin	5	1	1	1	0	2	1	0	0	0	1
Multi/ Clamp	MSD	4	2	0	0	0	0	1	0	0	0	1
	Luzon	24	1	0	0	3	0	4	4	4	4	4
	VisMin	24	2	0	0	0	2	4	4	4	4	4
AMR System	MSD	0	0	1	0	0	0	0	0	0	1	0

- Footnote for Tables Number C1-C4 – Assumption and Consideration
- Regulatory Asset Life of the metering equipment, devices and accessories
- Metering equipment and devices failure rate
- Obsolescence of equipment, technological advancement and product support
- Load Growth forecast

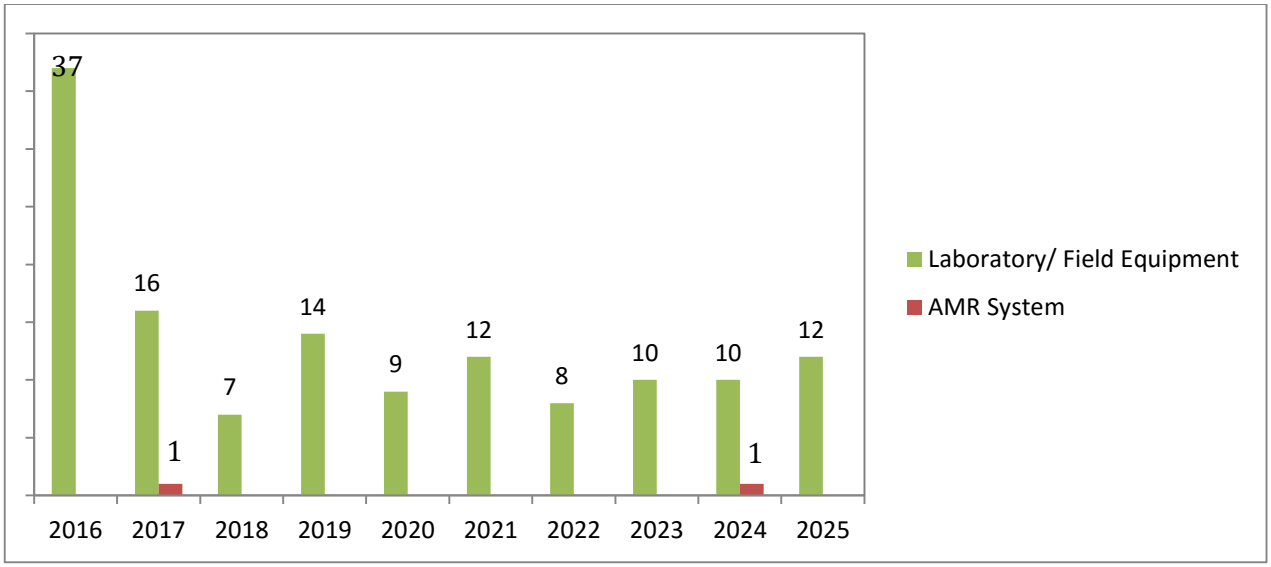


Figure Number C4: Laboratory/Test Equipment/AMR System (Graphical)

D. Metering CAPEX Programs

The metering CAPEX Program lists the capital projects that are to be implemented for the period 2016-2025. These projects are group into three (3) categories: 1) Expansion 2) Relocation, rehabilitation and upgrade 3) Replacement program.

Table Number D1: Expansion Program

Item No.	Metering Point	Grid	Project Schedule	Remarks
New Metering Facilities for Load Customers – Full Metering				
1	Dasma T04 115 kV	L	2016	
2	Dasma T05 115 kV	L	2016	
3	Mahabang Parang - Batangas Lipa Line Totalizer Line 1 69 kV	L	2016	
4	Power Barge 69 kV	V	2016	
5	Tie Metering – Kidapawan 69 kV	M	2016	
6	Surneco placer Tot 69 kV	M	2016	
7	Sukelco Tacurong Tot 69 kV	M	2016	
9	Dasureco Matanao Tot 69 kV	M	2016	
10	Milaor, Camarines Sur - NFH Substation	L	2017	
11	CASURECO IV San Jose Substation	L	2017	
12	Unified Leyte 230KV	V	2018	
13	To be identified 230kV	L	2018-2025	16 Metering Points
14	To be identified 115kV	L	2018-2025	8 Metering Points

16	To be identified 69kV	L	2018-2025	56 Metering Points
17	To be identified 138kV	V	2018-2025	8 Metering Point
18	To be identified 69kV	V	2018-2025	34 Metering Points
19	To be identified 230kV	M	2018-2025	8 Metering Point
21	To be identified 138kV	M	2018-2025	8 Metering Point
22	To be identified 69kV	M	2018-2025	40 Metering Points
New Metering Facilities for Load Customers – Meter Only				
1	Meralco - Antipolo Line 1	L	2016	
2	Meralco - Antipolo Line 2	L	2016	
3	Esamelco Guian	V	2016	
4	Samelco I Rawis	V	2016	
5	Ceneco Cybercenter S/S	V	2016	
6	Palm Concepcion Power Corp	V	2016	
7	Dlpc Magtuod Line 1	M	2017	
8	Dlpc Magtuod Line 2	M	2017	
9	To be identified 69kV	L	2018-2025	72 Metering Points
10	To be identified 69kV	V	2018-2025	38 Metering Points
11	To be identified 69kV	M	2018-2025	38 Metering Points
New Metering Facilities for Generators – Full Metering				
1	Partido Rice Mill Power Plant 1 69 kV	L	2016	
2	Tabango Line 1 230kv	V	2018	
3	Tabango Line 2 230kv	V	2018	
4	BDPP TR 1 138 kV	V	2017	
5	BDPP TR 2 138 kV	V	2018	
6	Conal Phase I 138 kV	M	2016	
7	Smc Global Power 230 kV	M	2017	
8	Lanao Del Sur Solar Power Plant 69 kV	M	2017	
9	Hedcor Bukidnon 69 kV	M	2017	
New Metering Facilities for Generators – Meter Only				
1	Tinoc Ifugao (Quad River)	L	2016	
2	Tinoc Benguet (Quad River)	L	2016	
3	San Gabriel HEP	L	2016	
4	NLUPCAC -Baloi	L	2016	

5	NLUPCAC - Caparispisan	L	2016	
6	PPCAC - Labrador	L	2016	
7	Energy Development Corp Baloi	L	2016	
8	FMIC Gonzaga	L	2016	
9	NPWPC Aparri	L	2016	
10	TAREC Abulog-Ballesteror-Aparri	L	2016	
11	TAREC Sta. Ana	L	2016	
12	Energy World Corporation Pagbilao 600 MW (3rd Unit)	L	2016	
13	FDC CFB Coal Power Plant	L	2016	
14	Redondo Peninsula Energy Inc. Unit 1	L	2016	
15	Redondo Peninsula Energy Inc. Unit 2	L	2016	
16	SLPGC CFPP Unit 1	L	2016	
17	SLPGC CFPP Unit 2	L	2016	
18	Limay Power Plant Phase 1 Unit 1	L	2016	
19	Limay Power Plant Phase 1 Unit 2	L	2016	
20	434MW San Gabriel Phase II Combined Cycle Power Plant	L	2016	
21	Burgos Solar Power Plant Proj.3	L	2016	
22	Aes Masinloc Power Partners Co. Inc Unit 3	L	2017	
23	Aes Masinloc Power Partners Co. Inc Unit 4	L	2017	
24	Quezon Power Expansion Project	L	2017	
25	Limay Power Plant Phase 2 Unit 1	L	2017	
26	Limay Power Plant Phase 2 Unit 2	L	2017	
27	Combined Cycle Gas Turbine PP Unit1	L	2017	
28	Trans Asia Oil And Energy Development Corp. - San Isidro Combined Cycle Gas Turbine PP	L	2017	
29	FMIC - Sanchez Mira	L	2017	
30	FMIC - Claveria	L	2017	
31	Aboitiz Power - SBMA	L	2018	

32	Gnpower Mariveles Coal Plant Ltd. Co - Mariveles Expansion	L	2018	
33	Atlantic, Gulf And Pacific Company Manila Inc. - Combined Cycle Gas Turbine PP Unit2	L	2018	
34	Energy Development Corporation Tanawon Geotherma PP	L	2018	
35	Meralco Powergen Corp And Chubu Electric Power - Lng-Fired Combined Cycle Power Plant	L	2018	
36	Concepcion Coal Fired Power Plant	V	2016	
37	Fdc Danao Cfb Coal Power Plant	V	2016	
38	Helios Solar Energy Corp	V	2016	
39	Negros Island Solar Power, ISLASOL	V	2016	
40	Sacasol Solar Farm	V	2016	
41	Silay Solar Power Inc.	V	2016	
42	Therma Visyas Energy Project	V	2017	
43	Timbaban Hydroelectric Power Plant	V	2017	
44	Dauin-Geothermal Project	V	2018	
45	Zamboanga Coal Fired Power Plant	M	2016	
46	Filinvest Coal Fired Power Plant	M	2016	
47	Zamcelco Diesel Power Plant	M	2016	
48	Smc Davao Power Plant Phase 1	M	2016	
49	Sibuguey Power Plant	M	2016	
50	Kauswagan Coal Fired Power Plant	M	2017	
51	GN Power - PSAG Corp	M	2017	
52	Balingasag Thermal Power Plant	M	2017	
53	Mindanao 3 Geothermal	M	2017	
54	Limbatangon Hydroelectric Power	M	2017	
55	Energy Development Corporation MAGPP Unit 3	M	2018	
56	SMC Davao Power Plant Phase 2	M	2018	
57	Culaman Hydroelectric Power	M	2018	

Table Number D2: Relocation, rehabilitation and upgrade

Item No.	Metering Point	Grid	Project Schedule	Remarks
Relocation of Metering Installation to the prescribed connection point – Full Metering				
1	1590EC OATS 1	L	2016	Non-compliant due to improper location of MP
2	1590EC OATS 2	L	2016	
3	MECO – Balintawak T1	L	2016	Relocation from Line to Transformer metering
4	MECO – Balintawak T2	L	2016	
5	Quezelco - Gumaca	L	2016	Relocation from Line to Transformer metering
6	Binan TO1 Line	L	2016	Totalize to 2 NGCP-MECO metering supplied by three tie lines on T01
7	Binan TO2 Line	L	2016	Totalize to 2 NGCP-MECO metering supplied by three tie lines on T02
8	Binan TO3 Line	L	2016	Totalize to 2 NGCP-MECO metering supplied by three tie lines on T03
9	Batelec II Lipa S/S Totalizer	L	2016	Relocation from Line to Transformer metering
10	Batangas Taal 10 MVA	L	2016	Totalize from load end of 69 kV line at primary side of MECO Sta. Cruz PT to 52CL4, load side, Caliraya S/S
11	Apec (Aleco) – Ligao T2 S/S	L	2016	Relocation of metering facilities from 13.2 kV side to 69 kV side
12	Quezelco – Antimonan	L	2016	Relocation from Line to Transformer metering
13	Quezelco – Tagkawayan	L	2016	Relocation from Line to Transformer metering
14	Casureco II – Tinambac	L	2016	Totalize due to existing low CTs, PTs age is more than 25 yrs
15	Casureco II – Bula	L	2016	Relocation of metering facilities from 13.2 kV side to 69 kV side
16	Canoreco – 52LB4	L	2016	Relocation from Line to Transformer metering
17	Canoreco – 53LB4	L	2016	Relocation from Line to Transformer metering
18	1590EC OATS 3	L	2017	Non-compliant due to improper location of MP
19	MECO – Balintawak T3	L	2017	Relocation from Line to Transformer metering
20	MECO – Balintawak T4	L	2017	
21	Dasmarinas TO6	L	2017	Relocate from secondary side to primary side
22	Dasmarinas TO7	L	2017	
23	Makban – Calamba 69 kV Line	L	2017	Relocate from secondary side to primary side

24	Calaca 52CC4 Line 2	L	2017	Totalize from load end of 69 kV line at primary side of MECO Sta. Cruz PT to 52CL4, load side, Caliraya S/S
25	AES Botolan – Masinloc	L	2017	Relocate due to Subtransmission Assets Sale
26	Batangas – Limaland	L	2017	Relocate from Limaland s/s to Batangas 55BS8, sending end/ at asset boundary
27	Casureco II – Calabanga	L	2017	Relocation of metering facilities from 13.2 kV side to 69 kV side
28	Texas Instrument – Concepcion Clark L1	L	2018	MP's located at customers premises to 2-230 kV MPs at Concepcion S/S
29	Texas Instrument – Concepcion Clark L2	L	2018	MP's located at customers premises to 2-230 kV MPs at Concepcion S/S
30	PSPC L1	L	2018	Relocation from Line to Transformer metering
31	PSPC L2	L	2018	Relocation from Line to Transformer metering
32	Lagonoy – Presentacion	L	2018	Relocation of metering facilities from 13.2 kV side to 69 kV side
33	Cebeco I and Veco Naga Substation	V	2016	Installation of 69 KV totalizer metering point at Naga Substation due to divestment of STA to CEBECO I & VECO
34	Esamelco – Taft	V	2016	Relocation from Line to Transformer metering
35	Boheco – Janopol	V	2016	
36	Noceco Kabankalan – La Castellana	V	2016	
37	Ileco II – Dingle & Pototan	V	2016	
38	Norsamelco – Bobolosan	V	2016	
39	Veco – Mandaue GIS Fdr 1	V	2017	Relocation of metering facilities to prescribed 69 kV metering location
40	Veco – Mandaue GIS Fdr 2	V	2017	
41	Noreco II Siaton	V	2017	Relocation of metering facilities to prescribed 69 kV metering location
42	Meco Lapu-Lapu GIS Fdr 1	V	2018	
43	Veco – Mandaue GIS Fdr 4	V	2018	
44	Meco – Lapu-Lapu Fdr 2	V	2019	Installation of 69KV totalizer metering point at Lapu-Lapu GIS FDR 4 due to divestment of STA to MECO
45	Veco – Mandaue GIS Fdr 5	V	2019	Relocation of metering facilities to prescribed 69 kV metering location
46	Meco – Lapu-Lapu GIS Fdr 4	V	2020	

47	Noreco II Banaba	V	2020	
48	Moelci 2 M2 – Jomi	M	2016	Relocation of metering facility from 13.8 KV to 69 KV
49	Moelci 2 M3 – Dimalooc	M	216	Relocation of metering facility from 13.8 KV to 69 KV
50	Dasureco M4	M	2016	Relocate from secondary side to primary side
51	Moelci 2 M4 – Tudela S/S	M	2017	Relocation of metering facility from 13.8 KV to 69 KV
52	Magelco – Capiton	M	2016	Relocation from Line to Transformer metering
53	Aselco – M3 Trento	M	2016	
54	Cotelco – Villarica	M	2016	
55	Magelco – M2 Salbu	M	2016	
56	Surneco Placer Surigao Totalizer	M	2017	Totalization
57	Holcim M1 – Alisons	M	2017	Relocation of metering facility to Lugait Ss due to ownership of line by MORESCO1
58	Ilpi 2 Feeder	M	2017	Totalization of ILPI loads from two sources, Agus 6 Swyd and Lugait Substation due to acquisition of lines.
59	Zamsureco 2 M4 – Imelda	M	2017	Relocation of metering facility from 13.8 KV to 69 KV
Rehabilitation of Metering Structure				
1	QUEZELCO I - Gumagaca	L	2016	Rehabilitation of Wooden meter structure.
2	CASURECO I - Libmanan	L	2016	Replacement of wooden with metal structures of instrument transformers and resurfacing of metering facilities ground level.
3	Cebeco II Compostela Totalizer	V	2016	Replacement of wood pole metering structure of CEBECO II Compostela Totalizer
4	SORECO I - Irosin Mobile Substation	L	2016	Replacement of wooden with metal structures of instrument transformers
5	SNAP-Aboitiz- Binga HEP, Transformer A	L	2017	Rehabilitation of rotten wood pole
6	SNAP-Aboitiz Binga HEP, Transformer B	L	2017	Rehabilitation of rotten wood pole

7	SORECO I - Bulan T1	L	2017	Replacement of wooden with metal structures of instrument transformers and resurfacing of metering facilities ground level.
8	SORECO II -Putiao	L	2017	Replacement of wooden with metal structures of instrument transformers and resurfacing of metering facilities ground level.
9	PILMICO - M1 - Kiwalan	M	2017	Rehabilitation of Wooden meter structure and Construction of Perimeter Fence
10	APEC (ALECO) - Washington	L	2018	Construction perimeter fencing for instrument transformers in the 69 kv metering facilities
11	APEC (ALECO) - Tabaco	L	2018	Construction perimeter fencing for instrument transformers in the 69 kV metering facilities
Upgrade of Metering Facilities – Upgrade to dedicated instrument transformers				
1	Bakun Ac Luzon Hydro T1	L	2016	With non-compliant billing CTs and PTs
2	Bakun Ac Luzon Hydro T2	L	2016	With non-compliant billing CTs and PTs
3	SMEC - Sual CFTPP Gen 1	L	2016	With non-compliant billing CTs and PTs
4	San Lorenzo FGPP Transformer 5 (Module 50)	L	2016	Non-compliant Instrument transformer. Program for upgrade
5	Batobalani Feeder	L	2016	Non-compliant Instrument transformer. Program for upgrade
6	Talisay T1	L	2016	Non-compliant Instrument transformer. Program for upgrade
7	San Lorenzo FGPP Transformer 6 (Module 60)	L	2016	Non-compliant Instrument transformer. Program for upgrade
8	Sta. Rita FGPLP T2016ransformer 1 (Module 10)	L	2016	Non-compliant Instrument transformer. Program for upgrade
9	Sta. Rita FGPP Transformer 2 (Module 20)	L	2016	Non-compliant Instrument transformer. Program for upgrade
10	Sta. Rita FGPP Transformer 3 (Module 30)	L	2016	Non-compliant Instrument transformer. Program for upgrade

11	Tayabas QPP LINE 1	L	2016	Capacitor-typed PT is used for revenue metering. CT is being shared to other circuit.
12	Luelco Naguilian	L	2016	Replacement due to sharing of instrument transformer of Luelco Naguilian with Luelco Bauang Totalizer
13	Inec Marcos	L	2016	Non-compliant Instrument transformer. Program for upgrade
14	Dow Chemicals	L	2016	For upgrading of metering facility from 2 element to 3 element
15	AG&P	L	2016	
16	CEPZA - Rosario 41RS4	L	2016	CT's and PT's are used but PT's were being shared with other circuit
17	CEPZA - Rosario 44RS4	L	2016	With non-compliant billing CT's & PT's
18	CEPZA - Rosario 46RS4	L	2016	With non-compliant billing CT's & PT's
19	ERDB Fori - Los Banos	L	2016	Non-compliant Instrument transformer. Program for upgrade
20	SMEC - Sual CFTPP Gen 2	L	2017	With non-compliant billing CTs and PTs
21	Panasia BCCPP Block A ST1	L	2017	With non-compliant billing CTs and PTs
22	Panasia BCCPP Block A GT1	L	2017	With non-compliant billing CTs and PTs
23	Panasia BCCPP Block A GT2	L	2017	With non-compliant billing CTs and PTs
24	Panasia BCCPP Block A GT3	L	2017	With non-compliant billing CTs and PTs
25	Panasia BCCPP Block B ST1	L	2017	With non-compliant billing CTs and PTs
26	MECO - Balintawak - San Jose Line 2	L	2017	Non-compliant Instrument transformer. Program for upgrade
27	Sta. Rita FGPP Transformer 4 (Module 40)	L	2017	Non-compliant Instrument transformer. Program for upgrade
28	PSALM - Casecnan Line 1	L	2017	PT's are CVT. Non-compliant.
29	PSALM - Casecnan Line 2	L	2017	PT's are CVT. Non-compliant.
30	Tayabas QPP LINE 2	L	2017	Capacitor-typed PT is used for revenue metering. CT is being shared to other circuit.
31	Cedc Unit 1	L	2017	Non-compliant Instrument transformer. Program for upgrade

32	SMEC - Sual CFTPP Startup	L	2018	With non-compliant billing CTs and PTs
33	Panasia BCCPP Block B GT1	L	2018	
34	Panasia BCCPP BLOCK B GT2	L	2018	
35	Panasia BCCPP Block B GT3	L	2018	With non-compliant billing CTs and PTs
36	ECSCO - AS-IS	L	2018	Non-compliant Instrument transformer. Program for upgrade
37	MECO Bolboc 20 MVA	L	2019	Non-compliant Instrument transformer. Program for upgrade
38	CBK - KSPPP ST 1	L	2020	Non-compliant Instrument transformer. Program for upgrade
39	CBK - KSPPP ST 2	L	2020	Non-compliant Instrument transformer. Program for upgrade
40	CBK - KSPPP ST 3	L	2020	Non-compliant Instrument transformer. Program for upgrade
41	Philphos Line 2	V	2018	Non-compliant Instrument transformer. Program for upgrade
42	Doreco M2 - Bislig	M	2016	Non-compliant Instrument transformer. Program for upgrade
43	Cotelco	M	2016	Non-compliant Instrument transformer. Program for upgrade

Table Number D3: Replacement Program

Item No.	Metering Point	Grid	Project Schedule	Remarks
1	RCC Norzagaray, Bulacan	L	2016	Replacement of CTs, PTs & LAs
2	MECO - Sucat-Transf.Bank	L	2016	Replacement of CTs
3	Peza Loakan	L	2016	Replacement of CTs & PTs
4	RVA Palauig	L	2016	Replacement of LAs
5	AFAB Mariveles, Bataan	L	2016	Replacement of PTs & LAs
6	Sfelapco Floridablanca	L	2016	Replacement of PTs & LAs
7	Puyat Flooring Products Mariveles, Bataan	L	2016	Replacement of CTs, PTs & LAs
8	BATELEC II Tanauan	L	2016	Replacement of CITs
9	Ingasco San Simon	L	2016	Replacement of CTs & LAs
10	APEC (ALECO) - Bitano	L	2016	Replacement of CTs
11	CLSI Consort Land Inc	L	2016	Replacement of CTs, PTs & LAs
12	BATELEC II - Rosario	L	2016	Replacement of CITs
13	Cocochem	L	2016	Replacement of CTs
14	LUECO Bauangt Totalizer	L	2016	Replacement of CTs, PTs & LAs
15	LUELCO Bauang Totalizer	L	2016	Replacement of CTs

Item No.	Metering Point	Grid	Project Schedule	Remarks
16	BATELEC II Mabini S/S	L	2016	Replacement of CITs
17	Batangas Bay Terminal	L	2016	Replacement of CTs & PTs
18	Coastal Bay Chemicals	L	2016	Replacement of CTs
19	MECO Dasma - Feeder 1	L	2016	Replacement of CTs
20	NIA UPRIIS	L	2016	Replacement of CTs, PTs & LAs
21	UPLB Totalizer	L	2016	Replacement of CTs & PTs
22	NUVELCO - Bayombong Feeder 4	L	2016	Replacement of CTs
23	SORECO I T1- Bulan	L	2016	Replacement of CTs, PTs & LAs
24	SORECO I Irosin, Gulang Gulang	L	2017	Replacement of CTs & PTs
25	NIA Amulung	L	2017	Replacement of CTs, PTs & LAs
26	NIA Magapit	L	2017	Replacement of CTs, PTs & LAs
27	Planters Limay	L	2017	Replacement of CTs, PTs & LAs
28	Aurelco Baler	L	2017	Replacement of CTs, PTs & LAs
29	Clsu Munoz	L	2017	Replacement of CTs, PTs & LAs
30	NEECO II Talavera	L	2017	Replacement of CTs, PTs & LAs
31	NMT Bongabon	L	2017	Replacement of CTs, PTs & LAs
32	Oliver Rice Mill Oliver Enterprise	L	2017	Replacement of CTs, PTs & LAs
33	CAT San Miguel	L	2017	Replacement of CTs, PTs & LAs
34	KSP 1ST Point	L	2017	Replacement of CTs & PTs
35	Pilipinas Shell Tabangao	L	2017	Replacement of CTs & PTs
36	PELCO III Guagua	L	2017	Replacement of CTs & PTs
37	ALECO Tabacco	L	2017	Replacement of CTs, PTs & LAs
38	ALECO Legazpi	L	2017	Replacement of CTs, PTs & LAs
39	IFELCO LAGAWE	L	2017	Replacement of CTs, PTs & LAs
40	Planters Product Lamao, Bataan	L	2017	Replacement of CTs, PTs & LAs
41	NEECO II Bongabon	L	2017	Replacement of CTs & PTs
42	Presco Anao	L	2017	Replacement of CTs & PTs
43	ZAMECO I Salaza	L	2017	Replacement of CTs & PTs
44	FLECO 1ST Point Baybay	L	2017	Replacement of CTs & PTs
45	UPI Bitin (Phil. Geothermal)	L	2017	Replacement of CTs & PTs
46	ZAMECO I Candelaria	L	2017	Replacement of PTs
47	ZAMECO I San Antonio	L	2017	Replacement of CTs & PTs
48	ISELCO FDR 2 - Santiago	L	2017	Replacement of CTs, PTs & LAs
49	ISELCO 2FDR 1 - Iligan	L	2017	Replacement of CTs, PTs & LAs
50	Pantabangan Municipal Electric Sys	L	2017	Replacement of CTs, PTs & LAs
51	Fprdi Los Baños	L	2017	Replacement of CTs & PTs
52	SORECO I Putiao	L	2017	Replacement of CTs, PTs & LAs

Item No.	Metering Point	Grid	Project Schedule	Remarks
53	MECO Dolores T1	L	2018	Replacement of PTs
54	MECO Dolores T2	L	2018	Replacement of PTs
55	MECO Dolores T3	L	2018	Replacement of PTs
56	NEECO I - San Isidro	L	2020	Replacement of CTs
57	PELCO III Apalit	L	2018	Replacement of CTs, PTs & LAs
58	UPPC Calumpit	L	2018	Replacement of CTs, PTs & LAs
59	TARLECO I Paniqui	L	2018	Replacement of CTs, PTs & LAs
60	Celcor Cabanatuan	L	2018	Replacement of CTs & PTs
61	COC Norzagaray, Bulacan	L	2018	Replacement of CTs & PTs
62	ECOSIP San Leonardo	L	2018	Replacement of CTs, PTs & LAs
63	CIGI San Simon	L	2018	Replacement of CTs & PTs
64	NIA FDR 2 - Cauayan	L	2018	Replacement of CTs, PTs & LAs
65	PUD Olongapo	L	2019	Replacement of CTs, PTs & LAs
66	GIPACS San Leonardo	L	2019	Replacement of PTs
67	BATELEC I 2ND Point Nasugbo/Balayan 54CC4	L	2019	Replacement of CTs & PTs
68	Steel Corpsteel Corp SS	L	2019	Replacement of CTs & PTs
69	OEDC OLOngapo City	L	2019	Replacement of CTs & PTs
70	MECO – Los Banos 2nd Point	L	2019	Replacement of CTs & PTs
71	PELCO I Mexico	L	2020	Replacement of CTs, PTs & LAs
72	EEI 1ST Point	L	2020	Replacement of CTs & PTs
73	BCWD 1st Point - Alingilang	L	2020	Replacement of CTs & PTs
74	Pasar LINE 1	V	2016	Replacement of CITs
75	Pasar LINE 2	V	2016	Replacement of CITs
76	ANTECO Sibalom	V	2016	Replacement of CTs, PTs & LAs
77	Orica Bacong	V	2016	Replacement of CTs, PTs & LAs
78	NORECO 1 Bindoy	V	2016	Replacement of CTs, PTs & LAs
79	NORECO 2 Pulantubig	V	2016	Replacement of CTs, PTs & LAs
80	BOHECO I Macaas	V	2016	Replacement of CTs, PTs & LAs
81	CEBECO II Daanbantayan	V	2016	Replacement of CITs
82	MECO (MEPZA1) GIS IN & OUT	V	2016	Replacement of CTs
83	LEYECO V Isabel	V	2016	Replacement of CTs, PTs & LAs
84	CAPELCO Roxas	V	2016	Replacement of CITs
85	AKELCO - Andagao	V	2016	Replacement of CTs
86	Bohol Enterprises Inc	V	2016	Replacement of CTs, PTs & LAs
87	CAPELCO Panit-An	V	2017	Replacement of CTs, PTs & LAs
88	CEBECO I Dumanjug	V	2017	Replacement of CTs, PTs & LAs
89	MECO (GMC) Lapu Lapu City	V	2017	Replacement of CTs, PTs & LAs

Item No.	Metering Point	Grid	Project Schedule	Remarks
90	VECO Naga	V	2017	Replacement of CTs, PTs & LAs
91	LEYECO III Tunga	V	2017	Replacement of CTs, PTs & LAs
92	LEYECO V Simangan	V	2017	Replacement of CTs, PTs & LAs
93	CAPELCO Dao	V	2017	Replacement of CITs
94	PMSC Alcoy	V	2017	Replacement of CTs & PTs
95	LEYECO IV Baybay	V	2018	Replacement of CTs, PTs & LAs
96	SAMELCO I Palanas Cara	V	2018	Replacement of CTs, PTs & LAs
97	LEYECO II Sagkahan (T1 & T2)	V	2018	Replacement of CTs, PTs & LAs
98	PSC M1 - PSC S/S	M	2016	Replacement of CTs, PTs & LAs
99	ECAC	M	2016	Replacement of CTs
100	SPPC	M	2016	Replacement of PTs
101	WMPC	M	2016	Replacement of PTs
102	MOELCI 2 M1 - Banadero	M	2016	Replacement of PTs
103	ZANECO M4 - Polanco	M	2016	Replacement of CTs & PTs
104	NEWTECH Baloi LDN	M	2016	Replacement of CTs, PTs & LAs
105	MOELCI 1 M1 - Villaflor	M	2016	Replacement of CTs, PTs & LAs
106	MVC MC Switchyard	M	2016	Replacement of CTs, PTs & LAs
107	PGMC MC Switchyard	M	2016	Replacement of CTs, PTs & LAs
108	CAMELCO M1 - Balingoan	M	2016	Replacement of CTs, PTs & LAs
109	ICC Compound	M	2016	Replacement of CTs
110	DMPI M1 - Damilag	M	2016	Replacement of CTs, PTs & LAs
111	ILPI M1 - Overton	M	2016	Replacement of CTs, PTs & LAs
112	CAMELCO M1 - Balingoan	M	2017	Replacement of CTs, PTs & LAs
113	LANECO M1 - Kauswagan	M	2017	Replacement of CTs & PTs
114	MSU Marawi City	M	2017	Replacement of CTs & PTs
115	MCC PNOC	M	2017	Replacement of CTs & PTs
116	SIOM M1 - Malangas	M	2017	Replacement of CTs, PTs & LAs
117	ZAMSURECO I M1 - Switch	M	2017	Replacement of CTs, PTs & LAs
118	ZAMSURECO II M1 - Kabasalan	M	2017	Replacement of CTs, PTs & LAs
119	PILMICO M1 Kiwalan	M	2017	Replacement of CTs, PTs & LAs
120	CEPALCO M2- Aplaya	M	2017	Replacement of CTs, PTs & LAs
121	Tesda M1 - Iligan City	M	2017	Replacement of CTs, PTs & LAs
122	Menzi Agri	M	2017	Replacement of CTs, PTs & LAs

Item No.	Metering Point	Grid	Project Schedule	Remarks
123	ZAMCELCO M2 - Baliwasan	M	2018	Replacement of CTs, PTs & LAs
124	MORESCO I M1	M	2018	Replacement of CTs, PTs & LAs
125	BUSCO M1 - Butong	M	2018	Replacement of CTs, PTs & LAs
126	BUSECO M1 - Tagoloan S/S	M	2018	Replacement of CTs, PTs & LAs
Metering equipment, devices, accessories and test equipment				
1	Revenue Meter	LVM	2016-2025	1130 pcs (MM) 714 pcs (AM)
2	Instrument Transformer	LVM	2016-2025	608 sets
3	GPRS Modem	LVM	2016-2025	1814 pieces
4	Meter Box	LVM	2016-2025	201 pieces
5	Meter Test Switch	LVM	2016-2025	535 pieces
6	Spares	LVM	2016-2025	3% or 5% of installed
7	Laboratory and Field Equipment	LVM	2016-2025	135 units