



Report on 4TH Review of Metering Installations & Arrangements (4RMIA)

26 June 2016 to 25 June 2022

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Philippine Electricity Market Corporation –
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GLOSSARY OF TERMS

APEX	Alliance of Power and Energy Xponents
BCP	Business Continuity Plan
CT	Current Transformer
CRB	Central Registration Body
CRSS	Central Registration and Settlement System
dBm	Decibel milliwatts
DOE	Department of Energy
ERC	Energy Regulatory Commission
4RMIA	4 th Review of Metering Installation Arrangements
IBP	Internal Business Process
IEMOP	Independent Electricity Market Operator of the Philippines
LA	Lightning Arrester
MAR1	First Metering Arrangements Review
MAR2	Second Metering Arrangements Review
MIRF	Metering Installation Registration Form
MSP	Meter Services Provider
MTR	Meter Trouble Report
MW	Megawatt
NA	Not Applicable or Not Available
PDC	Philippine Distribution Code
PEM	Philippine Electricity Market
PEMC	Philippine Electricity Market Corporation
PST	Philippine Standard Time
RCC	Rules Change Committee
3RMIA	3 rd Review of Metering Installation Arrangements
RMSP	Retail Metering Service Provider
TOR	Terms of Reference
TP	Trading Participant
VT	Voltage Transformer
WESM	Wholesale Electricity Spot Market

FOREWORD

The Philippine Electricity Market Corporation (PEMC) has engaged the Alliance of Power and Energy Xponents (APEX) to undertake the 4th Review of Metering Installations and Arrangements (4RMIA).

The objective of this Review is to audit the processes, procedures, systems, and performance of the Market Operator (MO) and Metering Services Providers (MSP) regarding compliance to WESM and Retail Rules, its applicable Manuals, and other relevant laws and issuances of the Department of Energy (DOE) and Energy Regulatory Commission (ERC) with respect to metering installations and arrangements.

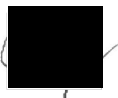
This Report covers the audit results of the following auditees: one (1) WMSP, 57 RMPs, and the Market Operator.

The PAC wishes to convey its appreciation and gratitude to the management of PEMC, IEMOP and MSPs for their continuous cooperation and support which were invaluable in ensuring the successful completion of the audit.


For the PEM Audit Committee,



FRANCISCO LEODEGARIO R. CASTRO, JR.
Chairperson



CONCEPCION I. TANGLAO
Member



ROSSANO C. LUGA
Member

EXECUTIVE SUMMARY

WESM MSP (WMSP)

The NGCPMSP is the sole WMSP. The audit findings for NGCPMSP under the three (3) main tasks are summarized below:

- Task 1: Procedures / Process Compliance Review
 - With Opportunities for Improvement but no non-compliance
- Task 2: Review of Systems used by MSPs
 - Conformed with applicable rules and manuals
- Task 3: Review of Metering Installations (On-site inspection)
 - 5.2.2.1 Nine (9) metering sites have CT primary tap changer facilities without security seals
 - 5.2.2.2 12 metering sites have capacitive-type VTs instead of inductive-type VTs
 - 5.2.2.3 19 metering sites have VT/CT secondary wirings that are not traceable
 - 5.2.2.4 Nine (9) metering sites secondary wirings have flexible liquid-tight metallic conduits used for VT/CT instead of Rigid Metal Conduit (RMC)

The NGCPMSP is commendable for the generally high level of compliance of its practices and facilities with the PGC and WESM Rules and Manuals and other applicable rules, as evident from the results of the current Review. There have been noticeable improvements compared to the previous 3RMIA assessment. This positive outcome is attributed to NGCPMSP management's dedicated support in ensuring their metering facilities and operations comply with the PGC and WESM Manuals.

It is noteworthy that, as previously observed, the unresolved issues are mostly related to existing Energy Conversion Agreement (ECA) contracts of TP-owned facilities. The NGCP has made significant progress in addressing many of these issues and is making every effort to rectify them. Many of the outstanding issues are due to planning and budget constraints, as well as the challenges of scheduling work while critical facilities are in operation. However, it is important to highlight and address these non-conformances.

The following are the prevalent findings for NGCPMSP under the 4RMIA:

CTs with Primary Tap Changer Facility without seals

Only nine (9) out of the 37 metering sites have CTs with primary tap change facilities. The rest have primary single ratio transformers with secondary tap-change facilities based on the physical markings on the primary terminal, Nameplate and Routine Test Reports. Tampering would also pose as a challenge as discussed in this report.

Metering sites covered by ECA contracts

A number of findings were due to metering sites being covered by Energy Conversion Agreement (ECA) contracts. The findings are as follows:

- Metering sites with capacitive instead of inductive VTs
- VT/CT secondary wirings that are not traceable or concealed underground
- Metering sites with no alternate meters
- Metering sites that have non-standard VT-CT-LA arrangements
- Metering site with no dedicated meter test block/switch

In the previous audits, there were no exemptions provided for ECA meters under the WESM Rules. However, with the issuance of WESM Manual on Metering Standards and Procedures Issue 14, Clause 2.5.2.b which took effect on 16 November 2021, the WESM meters and ECA meters are now permitted to share the instrument transformers used for ECA.

VT-CT-LA Arrangements

These findings are being cited because of the ruling for VT-CT-LA Arrangements as seen in Appendix H of the WESM Manual on Metering Standards and Procedures. Nevertheless, it has a low-risk rating and the VT core loss is negligible compared with the generation/load MW. Besides, the metering operations could not be easily interrupted because of critical loads that will be affected.

Retail MSP (RMSP)

There were 57 RMSPs reviewed. The prevalent findings for these RMSPs under the three (3) main tasks are summarized below:

- Task 1: Procedures / Process Compliance Review
 - 3.3.1 29 RMSPs have no established BCP
 - 3.3.2 35 RMSPs have no established policy on inventory of meters and/or seals
 - 3.3.3 32 RMSPs have no established procedure for metering services, i.e., Registration Procedure, Maintenance Procedure, and/or Calibration Procedure
 - 3.3.4 35 RMSPs have no training program for calibration personnel
 - 3.3.5 27 RMSPs have no established maintenance plan/program for metering facilities
 - 3.3.6 Nine (9) RMSPs have no calibration procedure for test equipment
 - 3.3.7 16 RMSPs have MTRs that were not resolved within the allowed time frame
 - 3.3.8 16 RMSPs have expired ERC Certificates of Authority for their calibration laboratories
 - 3.3.9 11 RMSPs have no in-service sampling plans or their in-service action plan have not been implemented/conducted
- Task 2: Review of Systems used by MSPs
 - 4.3.1 21 RMSPs have no established policy for meter data management
 - 4.3.2 14 RMSPs do not comply with the required 8am deadline submission of meter data
 - 4.3.3 Nine (9) RMSPs perform manual download of meter data
 - 4.3.4 One (1) RMSP has contracted its metering services to a 3rd party service provider
- Task 3: Review of Metering Installations (On-site inspection)
 - 5.3.1 30 RMSPs have meter clocks not synchronized with PST

- 5.3.2 One (1) RMSP has meter cabinets with padlock-type seals; 23 RMSPs have meter cabinets with no padlocks
- 5.3.3 28 RMSPs have VT/CT secondary wirings that use polyvinyl chloride (PVC) / liquid-tight conduits / flexible plastic conduits instead of RMC
- 5.3.4 22 RMSPs have VT/CT secondary boxes with no seals
- 5.3.5 20 RMSPs have non-standard meter test blocks/switches or no meter test block/switch
- 5.3.6 14 RMSPs have VT/CT secondary wirings that use flexible liquid-tight metallic conduits instead of RMC

Moreover, below are brief details of prevalent findings for RMSPs for the 4RMIA:

Physical Metering Security and Installation

It was observed that RMSPs have non-conformances with regard to the following:

- Meter cabinets with “padlock-type seals” instead of the conventional padlocks; some metering sites have meter cabinets with no padlocks
- VT/CT secondary wirings that use PVC / Liquid-tight conduits / flexible plastic conduits / flexible liquid-tight metallic conduits instead of RMC
- VT/CT secondary boxes with no seals
- Non-standard meter test switches/blocks or no meter test switch/block

Unsynchronized Meter Clocks with the PST

The RMSPs need to address meter clocks that are not synchronized with PST. APEX made recommendations on how to effectively implement time synchronization of meters.

Non-Standard VT-CT-LA Arrangement

There have been findings on VTs being on the load side. The policy under the WESM Manual on Metering Standards and Procedures to place VTs on the source side is to eliminate the burden of the core from residual measurements, but the effect on meter data readings is minimal. The WESM Manual on Metering Standards and Procedures has a rule on the location of the VT and CT for both generators and distribution utility. PEMC may propose amendments to the PDC and the Retail Manual on Metering Standards and Procedures to harmonize the provisions of PDC, Retail Manual and WESM Manual on Metering Standards and Procedures.

Use of Flexible Liquid-Tight Metallic Conduit instead of RMC

Flexible liquid-tight metallic conduit can be considered as an equivalent to the RMC. The basis is Philippine Electrical Code Section 2.25.10.1 Wirings on Buildings (particular to outside wiring). However, flexible liquid-tight metallic conduit is not defined in the PDC as equivalent to the RMC. RMSPs may initiate proposing amendments to the PDC for the flexible liquid-tight metallic conduit to be defined as an equivalent to RMC.

IEMOP

The Review findings for IEMOP, the Market Operator, under the two (2) main tasks are summarized below:

- Task 1: Procedures / Process Compliance Review
Opportunities for Improvement
 - 3.4.1 MSPs are having difficulty accessing the CRSS. This can be attributed to network problems, slow servers, and database issues.
 - 3.4.2 MSPs lack training on their role as MSPs. With IEMOP's regular conduct of trainings, they may enhance the modules provided to the MSPs with more emphasis on the MQ submission and MTR resolution.
 - 3.4.3 Performance measurement does not clearly define requirements to compel underperforming MSPs to improve. APEX recommended for PEMC to propose amendments to the rules on Performance Management Measurement to clearly define the requirements for MSPs.
- Task 2: Review of Systems used by MSPs
Opportunity for Improvement
 - 4.4.1 Dependency of some MSPs on IEMOP's interim 5-minute load profile converter. The MSP should develop their own capability to download 5-minute load profiles when the time comes for its implementation.

Overall, IEMOP's internal business processes have been well documented. However, these processes need to be improved to incorporate and strengthen the process of reporting and enforcing compliance of MSPs to the defined rules.

The corresponding MSPs' and IEMOP's Action Plans are reflected in the individual reports. In compliance with its responsibility under Section 3.3.7 of the PEM Audit Manual, the PAC will closely monitor the updates to the Auditee action plans addressing the findings from the 4RMIA. These updates will be submitted to the PEM Board on a quarterly basis. Furthermore, the progress and implementation of these action plans will be re-evaluated during the next cycle of the RMIA Audit.

1.0 ABOUT THIS REPORT

This Report is prepared in accordance with Section 3.3.2 of the PEM Audit Manual. It contains the objectives, scope, and audit approach for the conduct of the 4RMIA Audit as well as the findings and recommendations identified during the audit.

2.0 BACKGROUND

WESM Rules Clause 4.5.5.4 provides that the PEM Audit Committee (PAC), in consultation with the MO and MSPs, shall review the security arrangements and requirement of metering installations. This requirement is further detailed in Section 5.4 of the PEM Audit Market Manual Issue 3.0.

Moreover, the Retail Rules Clause 4.8 likewise requires the PAC to conduct review and audit of the metering arrangements and compliance of the RMSPs and the CRB annually or for such other period as determined by the PEM Board.

Furthermore, under the PEM Audit Market Manual Section 5.4.5, the PAC, supported by the Technical Committee (TC), is tasked to conduct an audit regarding the following:

- Compliance with requirements of metering installations;
- Compliance with security arrangements associated to metering systems and processes; and
- Adequacy of security arrangements by the MO and work procedures by MSPs.

In accordance with the PEM Audit Manual Section 4.1, PEMC engaged the services of an Independent Auditor, APEX, to ensure sufficient and adequate expertise in the conduct of 4RMIA.

3.0 AUDIT OBJECTIVES

The objective of this Review is to audit the processes, procedures, systems, and performance of the MO and MSP regarding compliance to WESM and Retail Rules, its applicable Manuals, and other relevant laws and issuances of the DOE and ERC with respect to metering installations and arrangements.

4.0 AUDIT SCOPE

The 4th Review of Metering Installations and Arrangements (4RMIA) has three (3) tasks:

Task 1: Process/Procedures and Compliance Review

Task 2: Review of Systems used by MSPs

Task 3: Review of Metering Installations (On-site inspections)

Further details on the scope of each task are provided in Sections 3, 4 and 5, respectively.

The Review covers the period 26 June 2016 to 25 June 2021 under the 1-hour market and 26 June 2021 to 25 June 2022 under the enhanced WESM design and operations (5-minute market).

The auditees were 1 WMSP, 57 MSPs, involving 659 metering sites, based in Luzon and Visayas and the Market Operator.

For the 57 RMSPs, the audit activities covered two types of sites:

1. The RMSP administrative offices located in Luzon and Visayas; and
2. The retail contestable customers, embedded generators, and GEOP metering sites selected via sampling by the PEM Audit Committee.

Table 1: RMSPs for Luzon

No	RMSP	Short Name	No. of Metering Sites			
			CC	EG	GEOP	Total
1	Angeles Electric Corporation	AECMSP	2	2		4
2	Authority of the Freeport Area of Bataan	AFABMSP	1			1
3	Albay Electric Cooperative, Inc.	ALECOMSP	6			6
4	Batangas I Electric Cooperative, Inc.	BTLC1MSP	3			3
5	Batangas II Electric Cooperative, Inc.	BTLC2MSP	6 ¹			6
6	Camarines Sur II Electric Cooperative, Inc.	CASUR2MSP	3			3
7	Clark Electric Distribution Corporation	CEDCMSP	26	1		27
8	Cabanatuan Electric Corporation	CELCORMSP	3	1		4
9	Central Pangasinan Electric Cooperative, Inc.	CENPELCOMSP	1			1
10	Cagayan 1 Electric Cooperative, Inc.	CGLCO1MSP	1			1
11	Dagupan Electric Corporation	DECORPMSP	2			2
12	Ilocos Norte Electric Cooperative, Inc.	INECMSP	2	3		5
13	Ilocos Sur Electric Cooperative, Inc.	ISECOMSP	Office Review Only ²			
14	Isabela I Electric Cooperative, Inc.	ISLCO1MSP	3			3
15	La Union Electric Cooperative, Inc.	LUELCOMSP	2			2
16	Lima Enerzone Corporation	LEZMSP	16			16
17	Manila Electric Company	MRLCOMSP	81	11	10	102
18	Nueva Ecija I Electric Cooperative, Inc.	NEECO1MSP	1			1
19	Olongapo Electricity Distribution Company, Inc.	OEDCMSP	1			1
20	Pampanga I Electric Cooperative, Inc.	PELCO1MSP	2			2
21	Pampanga II Electric Cooperative, Inc.	PELCO2MSP	1			1
22	Pampanga III Electric Cooperative, Inc.	PELCO3MSP	1			1
23	Peninsula Electric Cooperative, Inc.	PENLCOMSP	4			4
24	Pangasinan III Electric Cooperative	PNLCO3MSP	4		1	5
25	Subic Enerzone Corporation	SEZMSP	17			17
26	San Fernando Electric Light & Power Co., Inc.	SFELAPMSP	16			16
27	Tarlac Electric, Inc.	TEIMSP	8	3	1	12

¹ BTLC2MSP with three (3) Directly Connected Contestable Customer (WESM metering sites)

² During the period in review, ISECOMSP no longer served Contestable Customers within its franchise area.

No	RMSP	Short Name	No. of Metering Sites			
			CC	EG	GEOP	Total
28	Tarlac I Electric Cooperative, Inc.	TRLCO1MSP	3		1	4
29	Tarlac II Electric Cooperative, Inc.	TRLCO2MSP	3			3
30	Cagayan II Electric Cooperative, Inc.	CGLCO2MSP	1			1
31	Isabela II Electric Cooperative MSP	ISLCO2MSP	1	1		2
32	La Union Electric Company, Inc.	LUECOMSP	1			1
33	Nueva Ecija II Area 1 Electric Cooperative, Inc.	NEEC21MSP	1			1
34	Sorsogon II Electric Cooperative, Inc.	SOREC2MSP	1			1
Total			224	22	13	

Table 2: RMSPs for Visayas

No	RMSP	Short Name	No. of Metering Sites			
			CC	EG	GEOP	Total
1	Aklan Electric Cooperative, Inc.	AKELCOMSP	3			3
2	Antique Electric Cooperative, Inc.	ANTECOMSP	1			1
3	Balamban Enerzone Corporation	BEZMSP	6			6
4	Bohol I Electric Cooperative, Inc.	BHCO1MSP	2			2
5	Bohol Light Company, Inc.	BLCIMSP	2			2
6	Cebu I Electric Cooperative, Inc.	CEBEC1MSP	1			1
7	Cebu II Electric Cooperative, Inc.	CEBEC2MSP	6			6
8	Cebu III Electric Cooperative, Inc.	CEBEC3MSP	1			1
9	Don Orestes Romualdez Electric Cooperative, Inc.	DRLCOMSP	1			1
10	Iloilo I Electric Cooperative, Inc.	ILECO1MSP	1			1
11	Leyte II Electric Cooperative, Inc.	LEYCO2MSP	2			2
12	Leyte V Electric Cooperative, Inc.	LEYCOVMSP	2			2
13	Mactan Electric Company, Inc.	MECMSP	8			8
14	Mactan Enerzone Corporation	MEZMSP	6		2	8
15	Negros Oriental II Electric Cooperative, Inc.	NRECO2MSP	1			1
16	Samar I Electric Cooperative, Inc.	SMLCO1MSP	1			1
17	Visayan Electric Company, Inc.	VECOMSP	37		3	40
18	Capiz Electric Cooperative, Inc.	CAPELCMSP	1			1
19	Central Negros Electric Cooperative, Inc.	CENECOMSP	2			2
20	Iloilo II Electric Cooperative, Inc.	ILECO2MSP	1			1
21	MORE Electric and Power Corporation	MOREMSP	2			2
22	Negros Occidental Electric Cooperative, Inc.	NOCECOMSP	1			1
23	Northern Negros Electric Cooperative, Inc.	NONECOMSP	2			2
Total			90		5	

Similarly, for the sole WMSP, i.e. NGCPMSP, the audit activities covered two types of sites:

1. The NGCPMSP Metering Facilities Maintenance offices located in Luzon and Visayas;
2. The WESM Load, Generators, and Directly-connected Customer (DCC) metering sites selected via sampling by the PEM Audit Committee

The Review required visit to the offices to check arrangements, record keeping and other procedures for testing and maintaining meters, and site inspection of each selected metering facility.

Table 3: NGCP Metering Facilities Maintenance Offices in Luzon and Visayas

No	NGCPMSP	Short Name	No. of Metering Sites ³			
			Load	Generator	DCC	Total
1	MFM-North Luzon A - San Fernando, La Union	MFM-NLA	8	28	5	41
2	MFM-North Luzon B - Mexico, Pampanga	MFM-NLB	13	61	15	89
3	MFM-South Luzon A - Calamba, Laguna	MFM-SLA	19	44	8	71
4	MFM-South Luzon B - Daraga, Albay	MFM-SLB	2	8	2	12
5	MFM-Visayas A - Cebu City, Cebu	MFM-VISA	13	33	1	47
6	MFM-Visayas B - Bacolod City, Negros Occidental	MFM-VISB	2	36	1	39
7	Meter Data Center	NGCP-Greenhills	Office Review Only			
8	Central Calibration Laboratory	NGCP-Binan	Office Review Only			
Total			57	210	31	

5.0 APPLICABLE RULES

The primary references used were the following:

- WESM Rules and Retail Rules (Market Rules);
- Philippine Grid Code 2016 Edition;
- WESM Manual on Metering Standards and Procedures Issue 15.0;
- Philippine Distribution Code 2017 Edition;
- Retail Manual on Metering Standards and Procedures Issue 5.1;
- For Embedded Generators in the Distribution Facilities, WESM Manual on Metering Standards and Procedures Issue 15.0 was used particularly Appendix M, P and Q, as these embedded generators are also trading in the WESM;
- ERC Rules and Procedures for the Test and Maintenance of the Electric Meters of Distribution Utilities;
- Documented Policies and Internal Business Procedures of the MSP; and
- Relevant Circulars, Orders and other Issuances of the DOE and ERC applicable to the MSP.

³ 7 metering sites were already de-registered

In case of inconsistency between the Market Rules and Manuals and the PGC and PDC, the latter two documents prevailed and were used.

6.0 CLASSIFICATION OF FINDINGS

6.1 Materiality

The materiality levels for the tests of transactions and significant findings were set and disclosed by APEX, subject to review and inputs from the Auditee, and approval of the PAC. However, it was recognized that there may have been qualitative aspects in determining the significance of any issue. APEX reported and evaluated the impact of the issues that it believed to be significant for some other reason/s.

6.2 Common Risk and Compliance Framework

Having been involved in the previous 1st and 2nd Metering Arrangement Review and 3rd Review of Metering Installations and Arrangements (3RMIA), APEX learned many lessons in relation to the organization of findings, its classification, and the communication of the same to management and stakeholders in general.

For 4RMIA, APEX adopted a common compliance and risk framework to organize and uniformly apply all findings from the Review. The framework is similar to that which has been used in previous Metering Review findings.

6.3 Risk Ratings

The audit criteria rating in the following tables had at times needed to be adjusted or adapted to the context, depending on considerations of the real impact of consequence and likelihoods. APEX documented the assumptions that underpin any risk rating, and noted if they have applied professional judgment or whether it was based on a quantitative assessment. In relationship to likelihood ratings, the history of the equipment records was also considered. Findings from the previous Reviews were revisited and checked for any changes and improvement.

Table 4: Risk Assignment Based on Likelihood & Consequence

		Consequence				
		Immaterial	Minor	Moderate	Major	Extreme
Likelihood	Almost Certain	Low	Medium	Significant	Critical	Critical
	Likely	Low	Medium	Significant	Critical	Critical
	Possible	Low	Medium	Significant	Significant	Critical
	Unlikely	Low	Low	Medium	Medium	Critical
	Rare	Low	Low	Medium	Medium	Significant

Table 5: Likelihood Classification Guidelines

Likelihood	Annual Probability	Frequency of Event	Qualitative Description
Almost Certain	> 70%	3 in 4-year event	Will occur in most circumstances; statistical record of several occurrences.
Likely	41% to 70%	1 in 2-year event	Can be expected to occur in most circumstances; statistical record of some occurrence.
Possible	21% to 40%	1 in 3-year event	May occur but not expected in most circumstances; statistical record of at least one occurrence.
Unlikely	1% to 20%	1 in 10-year event	Conceivable but unlikely to occur in any given year; no history of occurrence.
Rare	< 1%	1 in 100-year event	Will only occur in exceptional circumstances; no history of occurrence.

Table 6: Risk Rating Definitions

Risk Rating		Definition
Critical	C	Issues that may have a severe or catastrophic technical, security, safety, or financial impact. Finding could also have a direct impact on the reliability and efficiency of service to a customer. Findings should be addressed immediately.
Significant	S	Issues which may have a major long-term impact on the operation of WESM/Retail market systems or metering systems if they are not addressed with high priority.
Medium	M	Issues with a moderate short-term impact on WESM/Retail market system operations and metering systems and can easily be reversed when corrective action is applied.
Low	L	Issues have no impact on the reliability and efficiency of the WESM/Retail market system and / or operations and metering systems.
Opportunity	O	<p>An opportunity for improvement. Typically, would apply to internal controls or procedures. It may be relevant in situations where no written requirement in the regulations, rules, or procedures.</p> <p>It may also pertain to improving the operation of systems and WESM/Retail market systems and/or metering system processes to adhere to international best practices more closely.</p> <p>Auditees are encouraged to consider recommendations for improvement if they are the most effective and efficient manner of addressing a finding. Housekeeping matters and opportunities for improving internal controls and procedures relating to financial processes are to be addressed as soon as practicable.</p>

6.4 Compliance Ratings

In addition to the risk rating, each finding / observation was provided with a compliance rating. The adopted compliance ratings are listed in Table 7. These are standard and have been applied to other international electricity markets by a range of different auditing firms. APEX also recognizes that these are similar with the compliance ratings that were used in the previous market audits and are therefore consistent with previous audit work/s.

Table 7: Compliance Ratings

Compliance Rating		Definition
Level 1	1	Evidence of frequent non-compliance with a Rule or Manual. These should be addressed as a matter of high priority. Examples include violation of requirements for WESM or Retail Market.
Level 2	2	Findings which could possibly result in non-compliance with a Rule or Manual but where there was no evidence of actual non-compliance found. No actions being taken to mitigate the impact of the problem. The issue should generally be addressed within one to two months.
Level 3	3	Evidence of non-frequent or isolated non-compliance with assurance criteria. These should be addressed within two to three months.
Level 4	4	Housekeeping matters and opportunities for improving internal controls and procedures relating to financial processes. These should be addressed as soon as practicable.

6.5 Assessment of Previous Audit / Review Finding Results

Following previous Reviews, Auditees typically formulate an implementation plan to address issues that were found. APEX conducted review of the action plan and the extent to which previous audit and review findings have been addressed. For each of the areas, APEX used the following approach to classify the status of addressing each past audit findings:

- **(A) Issue has been addressed.** This means that the necessary actions to address a previous audit finding have been taken and the issue has been adequately resolved.
- **(P) Action to address issue is pending completion.** The issue is in the process of being addressed and is pending completion. This level means that work has commenced on addressing the issue but it has not yet been completed and the date of expected completion has not yet been exceeded.
- **(O) Issue remains open.** Actions that have been agreed to be addressed have not been completed and the timeframe for the issue to be addressed has elapsed.

7.0 Task 1 Process / Procedures and Compliance Review

7.1 Scope and Methodology

The scope of Task 1 are as follows:

1. Assess the compliance of the WESM and Retail MSPs with their obligations under the applicable rules;
2. Assess the consistency of MSP's Internal Business Processes with the WESM Rules, Retail Rules, relevant Market Manuals and other relevant laws and issuances of the DOE and ERC;
3. Review the adequacy of and assess the compliance of the MSPs with their documented internal procedures/protocols, including but not limited to, the processes for meter data collection/retrieval of data, secured metered quantity and its daily and monthly transmission to the Market Operator/CRB, specifically for manual retrieval of meter data in times of remote communication failure. In the absence of internal procedures, recommend necessary procedures;
4. Check the availability of recovery plan and procedures in case of erased or corrupted metering data and of an off-site data storage location;
5. Assess the adequacy and conformance of MSPs with the applicable rules and standards, for preventive maintenance performed on metering equipment, including completeness of maintenance programs, test results and sealing records;
6. Check the timeliness of the MSPs in addressing Meter Trouble Reports (MTRs) and verify the causes of MTRs and corrective actions taken;
7. Check the availability of information dissemination to the Market Operator during meter trouble;
8. Assess the adequacy of metering data adjustment process and variables with respect to the metering installation's physical configuration;
9. Review the validity and completeness of meter test results conducted during the metering review period;
10. Review the MSP's compliance with the testing schedules to be conducted on metering components in accordance with the applicable Rules and Manuals;
11. Review and assess the adequacy of actions undertaken by the Market Operator and MSPs to address previous metering audit findings;

12. Conduct random sampling covering the six-year period. For the metering points listed in the TOR, all records will be checked for conformance with the applicable requirements - from registration, maintenance to de-registration;
13. Review maintenance records covering the 1-hour market and 5-minute market (6-year period) to ensure compliance to scheduled testing of revenue meters and its associated Instrument transformers. Note that DSOAR's requirement of a 5-year retention period will be considered for RMSPs;
14. Review the MSP and IEMOP transition from the 1-hour market to the 5-minute market (6-year period) and how they managed it especially the revenue meter, meter data collection system and data warehousing. Technical data sheets of revenue meters installed in the field must be presented by the MSP. For those transitioning to the 5-minute market whereby CRB is currently converting metering data to a dispatch interval basis within the duration of the interval of the metering data (e.g., 15-minute metering data will be divided by three), this will be noted accordingly for monitoring purposes only;
15. Request the MSP to present proof of capabilities of the meter data collection system to store data for both 1-hour market and 5-minute data as well as the data warehousing;
16. For Retail MSP, check whether they are now performing at least Condition-Based Maintenance, like thermal scanning of instrument transformers which is a minimum requirement during the 1-hour market and now required in the 5-minute market, again covering 6 years of records; and
17. Verify information on revenue meters and their associated accessories and instrument transformers (such as make, model, serial numbers, seal numbers, etc.) during on-site visits and inspections.

The Review Team sent out the review agenda to the offices to be reviewed prior to the scheduled visit, to inform Auditees of the scope, criteria, and requirements for the audit. Field review forms were developed which served as guide for the Auditors and for recording the data gathered during the audit.

The office Review Team spent time with the different process owners to review their procedures and practices. Records of all the selected metering facilities were reviewed for compliance with the applicable rules, regulations and internal business process and procedures. Actual activities were observed to ascertain proper implementation and execution of processes. The Auditors also assessed the effective linkages between the processes to ensure that their outputs are properly received and used in the next process and vice versa.

Other requirements essential to the effective implementation of the Market Rules were also checked, such as the training and awareness of the personnel as well as warehousing and inventory management of materials and equipment.

If inconsistencies were identified, APEX requested action plans for the improvement of process and procedures from the process owners.

The MSPs' documented procedures were reviewed to determine adequacy and appropriateness of the procedures in addressing the requirements defined in the Market Rules. Also, the controls including criteria for ensuring compliance with the regulatory requirements were validated. Validation of the implementation of these procedures was conducted to ensure that they are properly communicated and consistently implemented throughout the organization.

7.2 NGCPMSP Task 1 Findings and Observations

The NGCPMSP has only Opportunities for Improvement for Task 1.

The NGCPMSP was able to display consistency in their procedures and processes relative to 3RMIA. Documentations of MIRFs, test results and other relevant records were well organized. Test Reports showed the timeliness of the scheduled maintenance tests and calibration of revenue meters. They showed full cooperation and support in the 4RMIA office review activities.

7.3 RMSP Task 1 Findings and Observations

The following are the most prevalent findings for Task 1:

7.3.1 29 RMSPs have no established BCP

Observation

There were 29 RMSPs with no established BCP. There is no evidence of any document, IBP, or work instructions pertaining to the BCP.

Applicable Rule

Retail Manual on Metering Standards and Procedures 5.1, Section 5.4. Emergency Procedures. This clause provides the procedural steps to be followed in case of a failure of the Meter Data Retrieval System of the Retail Metering Services Provider or an emergency that requires the transfer of the metering data processing operations of the Central Registration Body from the Main Server to the Emergency Back-up System (EBS).

Risk Rating Assessment

Medium. Findings might impact retail metering operations specially in case of data loss due to disrupted communication problems, power interruptions or the occurrence of catastrophic event.

Review Recommendation/Auditor Comment

The MSPs should create and develop their BCP in accordance with Retail Metering Standards and Procedures 5.1 Section 5.4 on Emergency Procedures. This is to prevent meter data loss in case of power interruptions or any catastrophic event. The BCP should also include procedures to be performed during emergencies and restoration of metering services after an emergency or disaster.

7.3.2 35 RMSPs have no established policy on inventory of meters and/or seals**Observation**

There were 35 RMSPs with no established policy for inventory of meter and/or seals.

Applicable Rule

Philippine Distribution Code 2017 Edition, Clause 7.2.10.3. The ERC (or its certified party/authorized representative) in the presence of the duly authorized representatives of the Distribution Utility or the MSP and the User shall seal meters. All seals placed or removed on metering system shall be recorded and the record signed by both parties and the ERC or its duly authorized representative.

Risk Rating Assessment

Medium. The consequence of lack of policy on issuance and disposal of meters and seals is that it can be re-used especially with the intention of meter tampering.

Review Recommendation/Auditor Comment

The RMSPs should develop policies to control the issuance and disposal of meters and seals in compliance with Philippine Distribution Code 2017 Edition, Clause 7.2.10.3. If not monitored properly, especially the meters and seals for disposal, these can be used for illegal activities such as tampering or scamming of unauthorized personnel posing as employees of distribution utilities or electric cooperatives. The usual activities for disposal are to destroy and crush these meters and seals to bits and pieces so that they cannot be reused anymore.

7.3.3 32 RMSPs have no established procedure for metering services, i.e., Registration Procedure, Maintenance Procedure, and/or Calibration Procedure**Observation**

There were 32 RMSPs with no established procedure for metering services such as Registration Procedure, Maintenance Procedure, and/or Calibration Procedure.

Applicable Rule

Department of Energy (DOE) Department Circular No. DC2016-05-0007. Providing policies for further improvements of the operations and metering installations of the metering service providers (MSPs) in the Wholesale Electric Spot Market (WESM) and Retail Market. Section 3. Metering Service Providers Internal Business Procedures. All MSPs in the WESM and Retail Market shall develop and update an Internal Business Procedures with regard to their obligations on the WESM Rules, Retail Rules, Market Manuals and other related DOE and ERC issuances. The said internal procedures shall cover, as minimum, the following categories:

- a) Meter installation, registration, and maintenance;
- b) Meter data collection and uploading, including management of Meter Trouble Report (MTR);
- c) Internal performance monitoring and improvement; and
- d) Enforcement of the requirements of the Rules and Codes on non-owned metering.

All MSPs are hereby encouraged to collaborate with each other for the development or enhancement of their Internal Business Procedures.

Risk Rating Assessment

Low. The finding may impact on the operations of retail metering, specifically in terms of equipment maintenance. If proper policies and procedures are not established and implemented for these activities, the practices that may be put in place may not be sufficient to support the objectives of RMSP, as well as the rules and regulations that govern its retail metering operations.

Review Recommendation/Auditor Comment

The RMSPs should create documentation based on the DOE Department Circular No. DC2016-05-0007. This DOE Department Circular came about after the 1st Metering Arrangement Review and 2nd Metering Arrangement Review. The department circular was issued so that the RMSPs could develop and update their Internal Business Procedures regarding their obligations on the WESM Rules, Retail Rules, Market Manuals and other related DOE and ERC issuances like the PDC 2017 Edition, Clause 7.3 which covers registration, maintenance and calibration procedures for revenue meters and their associated instrument transformers.

7.3.4 35 RMSPs have no training program for calibration personnel

Observation

There were 35 RMSPs that were not able to present proof of training of meter calibration personnel.

Applicable Rule

ERC Resolution 12 Series of 2009, Article III Meter Shop Accreditation Requirement and Procedures Clause 3.2.5. A DU or a consortium of DUs or Third-Party Test Facilities that file an Application or Renewal of CA shall submit the following information/documents including its personnel and training:

- a) The name of the Meter Shop head which should be a Licensed Electrical Engineer and has an adequate relevant experience in the area of metering analysis.
- b) The names of meter shop technicians who have at least one (1) year relevant experience or training.
- c) The system of imparting training to technical staff at various levels before assigning them to any testing work.
- d) Any replacement of personnel during the term of the CA shall be reported to the ERC annually.

Risk Rating Assessment

Medium. Without the proof of training of the calibration personnel, there is no assurance of competency in the handling of meter services.

Review Recommendation/Auditor Comment

The RMSPs should develop training plan for metering personnel. The training certificates will serve as proof of training which can be presented to the retail customer when needed. The training of meter personnel handling the calibration process ensures their competency in the metering process. In-house trainings for meter calibration may be created through the RMSPs' human resources group. They can also request meter calibration training through their meter suppliers. Calibration is an integral part of revenue metering services so the personnel handling the meter calibration should display their competency in handling this.

7.3.5 27 RMSPs have no established maintenance plan/program for metering facilities**Observation**

There were 27 RMSPs with no established maintenance plan/program for the metering facilities of the contestable customers. Likewise, there were no records of activities conducted during maintenance.

Applicable Rule

Philippine Distribution Code 2017 Edition, Clause 7.3.4.1 Operation and Maintenance of Metering Facilities and Equipment. The Distribution Utility or the MSP shall maintain all Metering Equipment. Distribution Utility or the MSP shall keep all test results, Maintenance Programs, and sealing

records for at least 5 years. The Equipment data and test records shall be furnished by the Distribution Utility or the MSP to the User upon request, subject to the Distribution Utility's policies in relation to record confidentiality.

Risk Rating Assessment

Significant. Without a structured maintenance plan, there is no clear schedule for when maintenance activities such as calibration, inspections, or repairs should occur. This can lead to unpredictable performance of metering equipment, including inaccurate readings or unexpected failures.

Review Recommendation/Auditor Comment

The RMSPs should establish maintenance plans for contestable customer metering equipment. The implementation of this plan/program ensures the contestable customer that the MSP is providing quality revenue metering service.

7.3.6 Nine (9) RMSPs have no calibration procedure for test equipment

Observation

There were 9 RMSPs that were unable to present their calibration procedure to clearly identify status of test equipment and frequency of calibration. This resulted in expired calibration validity of meter test equipment and other calibration issues.

Applicable Rule

Philippine Distribution Code 2017 Edition, Clause 7.3.5. Traceability of Metering Standard. Distribution Utility or the MSP shall ensure that all equipment used in the measurement of meter accuracy or in the establishment of test condition for the determination of meter accuracy shall be calibrated and traceable to the standards set by the National Institute of Standards and Technology or to any reputable international standard body.

Risk Rating Assessment

Medium (for first time Auditees)/Significant (for second time Auditees)⁴. Without calibration procedures, the MSPs have no guide in the testing of equipment used for meters and instrument transformers. If test equipment with expired calibration validity is used for testing, meter accuracy and integrity will be compromised and subjected to validation.

⁴ The risk rating of audit finding from the 3RMIA that remain unresolved or are found to be recurring during the 4RMIA were elevated to the next level rating.

Review Recommendation/Auditor Comment

Equipment calibration must be performed regularly to ensure the accuracy of the meter and its associated equipment. Accordingly, the MSPs should develop calibration procedures and plans to ensure timely conduct of calibration. Calibration of test equipment is an integral part of meter processes and procedures to ensure accuracy of meter data. This should be included in their internal business plan.

7.3.7 16 RMSPs have MTRs that were not resolved within the allowed time frame**Observation**

There were 16 RMSPs that were unable to resolve their MTRs within the allowed time frame due to non-responsiveness of the MSP, communication media problems, no access to Central Registration and Settlement System (CRSS), and/or unfamiliarity with CRSS.

Applicable Rule

Retail Manual on Metering Standards and Procedures 5.1, Section 7.4 Resolution Clause 7.4.1 Timeline. Upon receipt of the Meter Trouble Report, a Retail Metering Services Provider shall submit the correct metering data to the Central Registration Body within two (2) business days.

Risk Rating Assessment

Significant. Findings will impact retail metering operations in terms of MSPs' MTR resolution performance. The resulting metering data will just be an estimation and does not reflect the actual data. This may result in disputes in billing settlements between the RMSP and the Retail Customer due to possible discrepancies in metering data.

Review Recommendation/Auditor Comment

The RMSPs should regularly log in to the CRSS to review and investigate the causes of meter trouble reports, after which, appropriate corrective action should be taken and corrected data should also be submitted within the allowed time-frame.

Regarding issues on CRSS, the RMSP should inform IEMOP for immediate resolution. For communication media problems, the RMSP should coordinate with their Telecom service provider to improve the signal of the GSM modem. They can also explore other communication media options like IP radio or fiber optic media. Unresolved MTRs will also affect their MSP performance.

7.3.8 16 RMSPs have expired ERC Certificates of Authority for their calibration laboratories

Observation

There were 16 RMSPs with expired ERC Certificates of Authority. Some MSPs already submitted applications for renewal to the ERC.

Applicable Rule

ERC Resolution 12 Series of 2009 Article III Meter Shop Accreditation Requirement and Procedures Section 3.1 Certificate of Authority. All individual or consortium of DUs and Third-Party Test Facilities shall be required to apply for a Certificate of Authority (CA) to maintain a Meter Shop. Upon showing that all the requirements have been complied with, the ERC shall issue a CA with a validity period of three (3) years, renewable upon the filing of the pertinent CA Renewal at least ninety (90) days prior to expiration of the CA, but subject to the ERC's assessment of the Meter Shop's performance for the preceding three (3) years.

Risk Rating Assessment

Significant. The absence of a valid Certificates of Authority for the Meter Calibration Laboratory could potentially disrupt retail metering operations since no calibration activities can be performed unless the laboratory is authorized by ERC. This could result to shortage of calibrated meters and delay installations or replacements needed at meter sites.

Review Recommendation/Auditor Comment

For the RMSPs that already submitted application for renewal to the ERC, they should make follow-ups and secure their accreditation from ERC. In the meantime, the RMSPs can send out their meter and test equipment to ERC for calibration.

To avoid this non-compliance in the future, the RMSPs should ensure that they process the renewal of their Certificates of Authority from the ERC at least three (3) to four (4) months before its expiry.

7.3.9 11 RMSPs have no in-service sampling plans or their in-service action plans have not been implemented/conducted

Observation

There were 11 RMSPs with no in-service sampling plans implemented for contestable customers.

Applicable Rule

ERC Resolution 12 Series of 2009, Article VI In-Service Testing Section 6.1 Statistical Sampling Program for In-service Meters. A statistical sampling program shall be used to comply with the

regulatory requirement of conducting periodic testing of all individual meters in service. The sample testing shall start on every first month of a scheduled sample testing year, as shown in Table-4.

Table 8: ERC Resolution 12-09 Table-4 on Sample Testing Schedule

Table-4: *Sample Testing Schedule*

Year of meter's last test	Sample testing year	Remarks
Year of effectivity of these Rules, and below	3rd Calendar Year from effectivity of these Rules	To be retested every two (2) years thereafter
Meters installed after the year of the effectivity of these Rules shall be scheduled for retesting two (2) years after installation and every two (2) years thereafter.		

The statistical sampling program shall conform to the following criteria:

- The plan shall use ANSI Z1.4-1993, "Sampling Procedures and Tables for Inspection by Attributes" as the basis for random statistical quality control and random sample selection of meters as simplified in Table-5;
- Inspection level "General II — Normal"; and
- Acceptability Quality Level (AQL) of 2.5% must be achieved.

Risk Rating Assessment

Significant. Without in-service testing, meters may not provide precise real-time data on energy consumption. This can lead to meter data inaccuracies resulting to billing settlement issues between the MSP and contestable customer. The other risk is meter malfunction due to storage duration in the warehouse.

Review Recommendation/Auditor Comment

The RMSPs must ensure that they have in-service sampling plan and that the same is conducted on schedule. In-service testing ensures the accuracy of the batch of meters and meter data integrity.

7.4 IEMOP Task 1 Observations

IEMOP has only opportunities for improvement, for Task 1.

7.4.1 MSPs are having difficulty accessing the CRSS

Observation

During the audit of various MSPs, most of them were having difficulty accessing the CRSS. As discussed with IEMOP, they also experience issues like lagging and system slow down when using the system simultaneously. Though there are plans to upgrade the system, this is deferred due to budget constraints.

Risk Rating Assessment

Opportunity. The CRSS is already in place and currently used by the MSPs regularly. But access problems in the CRSS can lead to the following consequences:

1. Decline in the MSP performance in terms of timeliness of MTR resolution. A slow system can cause delays in the submission of MTRs.
2. Data throughput problems especially when MSPs are simultaneously connected to the CRSS. This can significantly slow down the network connection to the CRSS during peak periods of meter data transactions (both retrieval and transmission).
3. The occurrence of meter data loss especially if the transactions are disrupted by slow network connections. For this reason, meter data may have to be re-transmitted.

Review Recommendation/Auditor Comment

CRSS is the system that connects the MSP and the MO. The most common causes of access issues and system slowdowns can be attributed to the following:

1. Network Latency

Network latency can significantly degrade application performance, especially in the case of the CRSS where the MSPs perform numerous services that communicate with MO. Every request that traverses a network introduces some delay, and these delays can add up quickly if not optimized.

2. Slow Servers

Underpowered servers or inefficiently configured environments can lead to slow response times and can impact the performance of the entire application stack. Applications such as the CRSS with high traffic, like transmission of meter data, and any application that handles intensive backend processing are prone to issues caused by slow servers.

3. Database Issues

Poorly optimized queries, inadequate indexing, and database misconfigurations can significantly slow down the application, leading to slow page loads and delayed Application Programming Interface (API) responses. Applications with complex queries, high write/read operations, or a large user base, such as metering data retrieval, meter trouble reports, and document storage applications, are highly impacted by database performance issues.

APEX recommends that the CRSS and other systems/applications related to the MO undergo system enhancements especially with the expansion of Market Operations with the inclusion of the Mindanao grid. IEMOP must immediately seek the advice from their IT experts or services outside of the organization on how to resolve these issues while waiting for the opportunity to upgrade the

system. These system enhancements and upgrades need intensive planning and design. It also takes time for system upgrades to be implemented and integrated to IEMOP's present system.

7.4.2 MSPs lack training on their role as MSP

Observation

During the audit of the various RMSPs, there were manifestations that some of them do not fully understand the rules and processes as RMSPs. For instance, some MSPs are not fully familiar with the process and requirements for MQ submission and MTR resolution.

Risk Rating Assessment

Opportunity. The lack of training on MSPs' roles may affect the MSP performance in metering services such as MTR resolution, MQ submission, and other meter data processes.

Review Recommendation/Auditor Comment

IEMOP already conducted trainings/IECs and advisories/reminders regarding MSPs' tasks in the CRSS which include the MQ submission and MTR resolution. However, APEX recommends IEMOP's regular conduct of trainings as well as enhancing the modules provided to the MSPs with more emphasis on the MQ submission and MTR resolution so that MSPs can improve their performances.

7.4.3 Performance measurement does not clearly define requirements to compel underperforming MSPs to improve

Observation

Performance measurement is conducted regularly; however, it does not clearly define requirements to compel underperforming MSPs to improve. This observation covers both specific periods when PEMC and the MO were conducting the performance monitoring (see explanation below).

Risk Rating Assessment

Opportunity. Without clearly defined requirements, the MSPs have no guide on how to further improve their performance measurement.

Review Recommendation/Auditor Comment

From 26 June 2016 to 25 September 2018 of the audit period, PEMC functioned as both the MO and WESM Governance Arm. On 26 September 2018, IEMOP assumed the MO functions while PEMC retained its Governance Arm functions. The amendments on the WESM Manual on Metering

Standards and Procedures, which became effective on 06 November 2021, clarified that the PEMC shall have the responsibility to monitor the MSPs as part of its governance functions.

The audit finding is retained in this report since it was the MO that conducted the MSP performance monitoring for majority of the audit period. However, noting that the MSP performance monitoring function is now under the mandate of PEMC, APEX recommended for PEMC to propose amendments to the rules on Performance Management Measurement/Management to clearly define the requirements to compel underperforming MSPs to improve.

8.0 Task 2 Review of Systems Used by MSPs

8.1 Scope and Methodology

The scope of Task 2 are as follows:

1. Assess the reliability of the meter communication links and interfaces to the meter data collection system of MSPs, considering current levels of third-party telecommunications services and program of MSPs to improve said reliability;
2. Review the availability, accuracy and reliability of software, tools and programs used by MSPs in meter data collection, processing, and database (e. g. MV-90);
3. Assess the reliability of communication link and interfaces between MSPs and the Market Operator;
4. Check the availability of back-up systems in the event of power failures as well as the Business Continuity Plan (BCP) and Disaster Recovery Plan (DRP);
5. Assess the adequacy of Meter Data Retrieval System of the MSP to alert the Market Operator of the occurrence of any failure thereof including a review of the Incident, Problem and Change Management process;
6. Check the adequacy of physical and logical access security of metering data held in metering installations and metering database. The task will only involve the review of the Access Control List, Authentication and Auditing to ensure the security of the system is protected from unauthorized access. No special tools will be needed to perform the task; and
7. Review the adequacy of the Availability Plan and Capacity Plan of the metering infrastructure.

Review of systems used by RMSPs were conducted to ensure that systems availability, accuracy, and reliability are achieved and that systems are compliant to all applicable rules. This Section focuses on the central systems used for meter data uploading, management, processing, and communication with the Market Operator. Review of meter communication facilities are included in the on-site inspection, in the following Section.

8.2 NGCPMSP Task 2 Findings and Observations

NGCP has conformed with the applicable rules and manuals for Task 2.

MFM-NLA was able to display the following:

- Reliable communication links for MV90 meter data collection system and interfaces between metering sites
- Quick resolution of communication failure with the use of reset button for the GSM modem which occasionally hangs due to heat in the meter cabinet. NGCP started introducing these reset buttons since MAR2.
- Aside from the reset button, “auto-reboot” feature was added to the GSM Modem. Now there are two (2) ways to resolve the hanging issue of the GSM modem. This minimizes the downtime in the communication between metering sites and the MV90.
- Efficient and reliable systems resulted to on-time submissions of meter data and resolution of MTRs to MO

NGCP Meter Data Center was able to display consistency in their procedures and processes relative to 3RMIA. A high level of conformance was observed during the office review in their new office in Bonaventure Plaza in Greenhills, San Juan, in which said office started operations around April 2023. This is the new home of the MV90 meter data collection system.

NGCP Central Calibration Laboratory systems are all compliant and displayed consistency in their procedures and processes.

8.3 RMSP Task 2 Findings and Observations

The following are the prevalent findings for Task 2 of RMSPs:

8.3.1 21 RMSPs have no established policy for meter data management

Observation

The RMSPs were not able to present any established policy for meter data management to clearly define repository of original, corrected and back-up meter data.

Applicable Rule

Retail Manual Metering Standards and Procedures 5.1, Section 5.2.2 Installation Database. Pursuant to Retail Rules Clause 4.5.1.1, a Retail Metering Services Provider shall create, maintain, and administer an installation database in relation to all its metering installations. Clause 5.2.2.1

Data Inclusions. The installation database shall include metering data, energy data, and, if necessary, data substituted.

Risk Rating Assessment

Medium. Without defined policies and procedures implemented over backup and recovery, practices that may be implemented may not be adequate to support backup and recovery objectives of the RMSP as well as rules and regulation that cover its operations. Inadequate backup and recovery implementation may lead to data loss in case of disasters.

Review Recommendation/Auditor Comment

The MSPs should develop policies and procedures in their IBP that thoroughly cover storage, backup, and recovery of meter data for contestable customers. This guarantees that in the event of a disaster, proper backup and recovery practices are put in place, and that all rules and regulations are strictly followed. The MSPs should also regularly perform complete backup of metering data of contestable customers. This is to ensure that there is adequate protection against data loss.

8.3.2 14 RMSPs do not comply with the required 8am deadline submission of meter data

Observation

The required 8am deadline for submission of meter data is not complied with. The RMSPs have issues with meeting the deadline for submitting meter data consistently.

Applicable Rule

Retail Manual on Metering Standards and Procedures 5.1, Section 5 Metering Data Collection. Pursuant to Retail Rules Clause 4.4.2.1, the Retail Metering Services Provider, on behalf of its associated Supplier or Retail Customer, shall retrieve the metering data from the meter and transmit the metering data to the Central Registration Body.

The Retail Metering Services Provider shall use all reasonable endeavours to ensure that metering data will be transmitted to the metering database of the Central Registration Body from its metering installation.

The Retail Manual on Metering Standards and Procedures also provides the procedures to be followed by the Central Registration Body, Retail Customers, Suppliers, and Retail Metering Services Providers in the collection and submission of metering data to the Central Registration Body.

Risk Rating Assessment

Significant. Timely submission of meter data is crucial for monitoring of data profile of the MSPs. Delays could compromise the data used for analysis and market modelling.

Review Recommendation/Auditor Comment

The MSPs should assign or designate personnel whose duties and responsibilities are the uploading, processing, and submission of daily meter data. If communication medium is the problem, the RMSPs must coordinate with their telecommunication service provider to address the GSM signal problems they are encountering.

8.3.3 Nine (9) RMSPs perform manual download of meter data**Observation**

The RMSPs are performing meter data download manually. The common cause is communication media problem due to weak signal or damaged links due to typhoon.

Applicable Rule

Retail Manual on Metering Standards and Procedures 5.1, Section 5.3.2.1 Collection. At an interval basis, the meter at the metering point of a Retail Customer continuously records metering data. Immediately at the end of the trading day, the RMSP shall collect the metering data and event log of the whole trading day from each meter, identified by its Recorder ID (SEIN) and Device ID (Serial Number), of all its associated Retail Customers registered under Chapter 2 of the Retail Rules.

Risk Rating Assessment

Medium. This finding has implications for retail metering data collection, like late submission of meter data to IEMOP. Manual downloading of data can also have security issues and prone to errors.

Review Recommendation/Auditor Comment

The MSPs should resolve the communication problem on their meters to allow remote connection and automatically download meter data.

For metering sites with GSM modem communication link, the RMSPs must coordinate with the telecommunication service providers to improve the GSM signal at the metering site location. For damaged communication links, the RMSPs must already have a plan of action on how to restore the fiber optic cables that were cut during the typhoon. They should also be exploring other communication medium like IP radios or provide backups for their fiber optic cable.

8.3.4 One (1) RMSP has contracted its metering services to a 3rd party service provider

Observation

AFABMSP, being a registered RMSP, has contracted its metering services to Greencore Power Solutions 1 (GPS1). AFAB and GPS1 have an existing Contract for Operation, Maintenance, Rehabilitation and Expansion of the Power Distribution System in the Freeport Area of Bataan. The RMSP's access on the CRSS system is shared with contractor GPS1 but there is no record showing that this was communicated with IEMOP.

Applicable Rule

NA

Risk Rating Assessment

Opportunity. Without clear communication with IEMOP regarding access-sharing arrangements, it becomes challenging to establish confidentiality, accountability, and responsibility in case of data breaches or other security incidents. This lack of clarity may lead to disputes between the RMSP and IEMOP regarding who is responsible for any security lapses.

Review Recommendation/Auditor Comment

The RMSP should establish clear communication with IEMOP on document access-sharing agreements in formal contracts or non-disclosure agreement and implement robust security measures to protect sensitive data. The RMSP should ensure confidentiality of meter data.

8.4 IEMOP Task 2 Observations

8.4.1 Dependency of some MSPs on IEMOP's interim 5-minute load profile converter

Observation

IEMOP provides Metered Quantity uploader, an interim 5-minute load profile converter for those MSPs not yet capable of downloading 5-minute profile data. The interim program, however, is being used by some MSPs as work around and they displayed too much dependency on its utilization.

Applicable Rule

NA

Risk Rating Assessment

Opportunity. The concerned MSPs should not be too dependent on the MQ uploader of IEMOP. The consequence of this is they may not be able to create their own capability to download 5-minute load profiles when the time comes for its implementation. The MSP might find it difficult to transition from 15-minute to 5-minute load profiling especially if they do not have a prepared system when DOE finally decides to discontinue the use of the MQ uploader.

Review Recommendation/Auditor Comment

IEMOP through their guidance, should encourage concerned MSPs to start using the 5-minute load profile format. Other MSPs are already using the 5-minute load profile format in the transmission of meter data to IEMOP using the software provided by the revenue meter supplier.

Pending further directives from the DOE, IEMOP is not in a position to disallow 15-minute submissions as this is a policy sanctioned by a DOE issuance.

9.0 Task 3: Review of Metering Installation

9.1 Scope and Methodology

The scope of Task 3 are as follows:

1. Assessment of whether the design, technical specifications, operation, maintenance, safety, and security of the metering installations comply with the standards set forth in the applicable Rules and Manuals;
2. Determination of the appropriateness of the revenue metering and market trading node location;
3. Check MSP's compliance program on the upgrading of the contestable customer's metering installation for the implementation of the 5-minute dispatch interval in the WESM and Retail Market (DOE Department Circular No. DC2018-04-0009⁵), as amended by DOE Circular No. DC2021-06-0012⁶;
4. Check on the consistency of metering installation components with the corresponding Metering Installation Registration Form (MIRF) and applicable Notice of Metering Equipment Replacement (NMER);
5. Check on the availability of spare parts (e.g., meters, Current Transformers and Potential Transformers) in case of defective metering installations that need immediate replacement;
6. Check on the availability of check meters for main revenue meters, if deemed applicable;
7. Conduct thermal scanning to determine the loose and/or hotspot connection; and
8. Provide best practice recommendations based on other competitive electricity markets in relation to the tasks mentioned above.

⁵ Department Circular No. DC2018-04-0009 Adopting Further Amendments to the Retail Rules and Its Market Manual on Metering Standards and Procedures for the Implementation of Enhancements to WESM Design and Operations

⁶ Department Circular No. DC2021-06-0012 Adopting Further Amendments to the Wholesale Electricity Spot Market (WESM) Rules, Retail Rules, and Various Market Manuals for the Implementation of Enhancements to WESM Design and Operations (Provisions to Promote Participation in the Retail Competition)

9.1.1 Key Areas

For Task 3, the following Key Areas were reviewed based on the Audit Checklist:

- Metering Accuracy
- Metering Security
- Metering Protection
- Metering Maintenance
- Safety

APEX also performed spot checks on the following:

- Global System for Mobile communication (GSM) Signal Strength
- Thermal Imaging

9.1.2 Documentation

- Inspection of actual equipment nameplates and verify accuracy with listed documents and records. (MIRF and RMSP records, Commissioning and Preventive Maintenance (PM) test results, etc.)
- Review of existing equipment connection and verify compliance to code requirements.
- Review of existing preventive maintenance policies and validation of adherence to the stated schedule.

9.1.3 Equipment

- Ocular inspection to verify physical condition of existing equipment (current/potential transformers, main and back-up revenue meters, etc.) and equipment accessories (meter enclosure, support structures, conduits, meter test blocks, grounding).
- Review of existing equipment specifications (e.g., instrument transformer construction, revenue meter class, etc.)
- Ocular inspection of meter display and verify accuracy of readings of meter parameters.
- Ocular inspection of equipment wiring connection and condition (e.g., loose terminals, frayed wires and conductors, grounded wires, etc.)
- Thermographic inspection of the metering facility equipment, using a Quantitative Approach with both Objective and Subjective Evaluation of thermal anomalies.

9.1.4 Communications

- Ocular inspection of GSM modem and peripherals, such as antenna, coaxial cables, etc.
- Propagation Test of the following:
 - Check site Signal Strength (in dBm) of each service provider to determine the best signal.
 - Check Arbitrary Strength (in ASU) to determine the presence of possible dead spots.

9.1.5 Metering Facility

- Ocular inspection of the metering installation facility, including the facility enclosure/fence, general ground condition and upkeep (Good Housekeeping).
- Inspection and review of existing security set-up and procedures, including presence of meter seals, keyed meter enclosure, limited and recorded access to the metering facility, etc.

9.2 NGCPMSP Task 3 Findings and Observations

246 Metering sites are compliant and have no findings:

- All metering facilities are well maintained and maintenance was performed on schedule.
- Tidy meter cabinets and secured with padlocks.
- No signs of corrosion build-up for steel structures
- WESM metering standard is used even with Directly-connected Contestable Customers (DCC).
- Some WESM Loads have instrument transformers' specifications for Generators.
- Almost all metering site perimeters are free from vegetation and unwanted materials.
- No observed backlog in periodic meter testing, VT, and CT testing.
- Almost all meter clocks are synchronized with Philippine Standard Time.
- Testing of surge arresters and thermal scanning are included in the periodic maintenance program by the MSP.

9.2.1 Nine (9) metering sites have CT primary tap changer facility without security seals

Observation

Out of the 37 metering sites that were initially reviewed having CTs with Primary Tap Changer Facility without seals, only nine (9) metering sites have primary tap change facilities. The rest have primary single ratio transformers with secondary tap-change facility based on the physical markings on the primary terminal, Nameplate and Routine Test Reports.

Applicable Rule

WESM Manual Metering Standards and Procedures Issue 15.0, Section 2.9.1.1 Instrument transformer connections. Primary and secondary cablings and connections shall be secure, tamper-resistant, and compliant with the requirements of the prevailing PGC on security of registered revenue metering installations and metering data. Any ratio-tap changing facility which cannot be secured using a security seal or its equivalent shall not be permitted.

Risk Rating Assessment

Low. Although the primary tap change facility is located near high voltage lines, APEX does not discount the possibility of tampering. A significant amount of meter data may be lost or be compromised if the primary tap change facility is tampered with.

Review Recommendation/Auditor Comment

Physical security measures, tamper-evident features, and regular inspections can help create a comprehensive and effective strategy for securing instrument transformers connections in metering installations. It is recommended to use tamper-evident seals on metering instruments and critical components. The seals should secure the mechanical settings of the CT Ratio applied. These seals should be designed to break or show clear signs of tampering if someone tries to open or manipulate the instrumentation mechanical settings. It is also recommended to regularly inspect seals to ensure that they are intact and have not been tampered with. Should there be tampering in the primary tap changer, below is a comparison of primary tap change as against secondary tap change:

Primary Tap Tampering	Secondary Tap Tampering
Needs power interruption to perform it	No need for power interruption
Needs large conductor or metal bar to implement it	Small conductor can be used to implement it
Easy to detect through physical inspection	Harder to detect
Installation of security seal is a challenge	Easy to install security seals

APEX recommends the following solutions to prevent the tampering of CTs with Primary Tap Provisions:

- CT primary tap change facility to be included in the inspection checklist. The inspector must have the previous diagram or picture of CT primary tap connections as reference.
- Regularly review RTU meter data logs vs. revenue meter data logs monthly.
- Other NGCP suggestion is to purchase in the future CTs with single primary tap facility. But the advantage of CTs with Primary Tap Change is that the power plant/directly-connected customer is ready if there is planned expansion in the future.

The applicable rule specifically provides that any ratio-tap changing facility which cannot be secured using a security seal or its equivalent shall not be permitted. Hence, even if it is a primary tap-changing facility, it should be secured using a security seal or its equivalent. Being well-represented in the RCC, it is recommended that NGCP initiates proposed amendments to the WESM Manual on Metering Standards and Procedures to reflect sealing procedures for primary tap changing CT and the materials and method of installation of security seals. For the meantime, APEX supports NGCP's statement that while the standard procedures for sealing the primary terminals have not yet been established, the recommended solutions above to prevent the possible tampering of CTs with primary tap provisions should be undertaken.

9.2.2 12 metering sites have capacitive-type VTs instead of inductive-type VTs

Observation

12 metering sites have capacitive-type VTs instead of inductive-type VTs. These metering sites are under Energy Conversion Agreement (ECA) contracts.

Applicable Rule

WESM Manual on Metering Standards and Procedures Issue 15, Appendix O - SPECIFICATIONS FOR VOLTAGE TRANSFORMERS

- Type: Outdoor Type; Minimum oil filled, Dry Type or Gas-filled
- Construction: Single phase, Inductive type, single bushing
- Accuracy Class: 0.2
- Burden: 75 VA

Risk Rating Assessment

Significant. Use of Capacitive-type Voltage Transformer (CVT) is not recommended because accuracy is affected by temperature. Among its disadvantage are variations in frequency and temperature that can impact the accuracy of voltage readings. CVT can also introduce ferro-resonance in power systems. Ferro-resonance is a phenomenon that may occur in electrical systems. It can lead to overvoltage that can damage system components and cause power outages. This the reason why NGCP recommended the type of voltage transformer as inductive-type, resulting to DOE's issuance of the revised WMMSP Issue 14.0 through DOE DC2021-07-0021 dated 25 June 2021.

Review Recommendation

Even though the capacitive-type VTs are TP-owned, the MSP should insist with the TP that the standard metering equipment specifications required by the WESM Rules should be installed.

9.2.3 19 metering sites have VT/CT secondary wirings that are not traceable

Observation

19 metering sites have VT/CT secondary wirings that are not traceable and/or concealed underground. These metering sites are under Energy Conversion Agreement (ECA) contracts.

Applicable Rule

WESM Manual on Metering Standards and Procedures Issue 15.0, Section 2.7.3.6. Secondary Connections for Instrument Transformers. Cabling from the instrument transformers to the meter enclosure shall be routed in dedicated conduit, and the route shall be visually traceable.

Risk Rating Assessment

Significant. Concealed cabling can pose safety risks. Over time, cables may degrade, and faults may occur. If cables are buried without proper documentation or access points, tracing, and repairing these issues becomes challenging. This can result in extended downtime and increased costs for troubleshooting and repairs. These are the same findings since MAR2 and 3RMIA.

Review Recommendation/Auditor Comment

APEX recommends the revision of secondary wirings where the RMC and cables are visible and traceable. If there is a need for maintenance, repairs, tracing and identifying the cables for any reason, these can create complications and delays. Non-compliance could be addressed during customer maintenance shutdown so as not to affect customer operation.

9.2.4 Nine (9) metering sites secondary wirings have flexible liquid-tight metallic conduits used for VT/CT instead of RMC

Observation

Nine (9) metering sites have flexible liquid-tight metallic conduits used for VT/CT secondary wiring instead of RMC.

Applicable Rule

WESM Manual Metering Standards and Procedures Issue 15.0, Clause 2.9.1.2 Conduit Systems. All wiring from the instrument transformers' secondary terminal box to the meter installation enclosure (meter box) shall be placed in a rigid conduit to ensure that the connections to cabling are secure and tamper-resistant. Conduit joints (elbow, T-connector) shall be properly sealed and secured. No secondary cabling shall be exposed and accessible to unauthorized personnel. Rigid conduit used for the instrument transformer shall be surface mounted.

Risk Rating Assessment

Medium. If the installation method or implementation of flexible liquid-tight metallic conduit is not done correctly, it will not be as sturdy as RMC and could be easily detached, possibly for meter tampering.

Review Recommendation/Auditor Comment

Replace flexible liquid-tight metallic conduits with RMC. RMC is durable and harder to tamper with. Another advantage of metal conduit is that it acts as ground bonding between the instrument transformer and metal cabinet. It also provides magnetic shielding of the conductor wirings.

9.2.5 Other Findings

Observation

The metering sites of the findings below are also covered by Energy Conversion Agreement (ECA) contracts:

- Six (6) metering sites have non-standard VT-CT-LA arrangements. These findings are being cited because of the ruling for VT-CT-LA Arrangement as seen in Appendix H of the WESM Manual on Metering Standards and Procedures. Nevertheless, it has a low-risk rating and the VT core loss is negligible compared with the generation/load MW. Besides, the metering could not be easily interrupted because of critical loads that will be affected.
- Four (4) metering sites have no alternate meters. Compliance to the Philippine Grid Code 2016 Edition, GRM 9.2.2.1(e) ruling on redundant meters is important to enhance the overall reliability and integrity of the meter data measurement process. It provides a means of cross-verification, helping to identify and correct any discrepancies that may arise due to primary meter malfunctions, should one occur.

9.3 RMSP Task 3 Findings and Observations

The following are the prevalent findings for Task 3 of RMSPs:

9.3.1 30 RMSPs have meter clocks not synchronized with PST

Observation

There are 30 RMSPs with meter clocks not synchronized with PST.

Applicable Rule

Retail Manual on Metering Standards and Procedures 5.1, Section 5.3.1.3 Timing. Pursuant to Retail Rules Clause 4.3.8, all meter clocks shall be synchronized by the RMSP to PST to ensure accuracy of accounting and settlements as applicable.

Risk Rating Assessment

Medium. Unsynchronized meter time will not accurately match energy use at a particular time especially now that we are in the 5-minute market. There have been several incidents where the difference between meter time and PST was the source of disputes between the contestable customer and the RMSP on settlement of billing.

Review Recommendation/Auditor Comment

In addition, Philippine Distribution Code Section 7.3.4.2.b provides that the metering equipment at the connection point shall be operated and maintained in accordance with the latest ERC issued rules and procedures for the test and maintenance of electric meters. The regular maintenance activities shall include as a minimum: The periodic check of the meter clock, if applicable, for deviations against the PST. The MSP should also develop a regular schedule for the time syncing of meter clocks to PST.

9.3.2 One (1) RMSP has meter cabinets with padlock-type seals / 23 RMSPs have meter cabinets with no padlocks

Observation

One (1) RMSP has meter cabinets with “padlock-type seals” instead of the conventional padlocks. 23 RMSPs have meter cabinets with no padlocks.

Applicable Rule

Philippine Distribution Code 2017 Edition, Clause 7.4.7.2 The metering facility shall be provided with metal security enclosure, or other applicable material, as well as locks (when applicable) to the Meter security enclosures, and seals at all access points to the Metering Equipment terminals and interconnecting electrical cables. The Distribution Utility or the MSP shall provide the security locks (when applicable) and/or seals and periodically inspect the integrity of the same.

Risk Rating Assessment

Significant. One (1) RMSP uses “padlock seals” instead of the usual conventional padlock. Though the padlock seal was described to be heavy duty and tamper-proof, it is not equivalent to the mechanical protection of a traditional padlock (e.g. Abloy padlock or any brand equivalent which cannot be broken/tampered with using steel hacksaw, grinder, or bolt-cutter). Also, upon APEX’s own assessment, the padlock seals can be opened in minutes using ordinary pliers and there is a video to prove this.

For the other metering sites of RMSPs that have meter cabinets with no padlock, the meter including the secondary wirings are already accessible to anyone who wishes to tamper or vandalize the meter including its associated secondary wirings.

Review Recommendation/Auditor Comment

For the RMSP that uses “padlock-type seals,” APEX still recommends to provide meter cabinet padlock to prevent possible tampering of metering facility. Installation of meter cabinet padlock should be done immediately. From the beginning of APEX’s engagement in conducting metering arrangement reviews since 2012, as to the applicable rule on security of metering facilities, equipment and data, the term lock is interpreted as padlock on meter enclosures while seals are used for securing of all access points to the metering equipment terminals and interconnecting electrical cables, which is interpreted as security seals for the meter front cover, the meter test block/switch, and the secondary wire boxes which connects the meter to the instrument transformers (VT and CT).

For the other RMSPs, APEX recommends that they provide meter cabinet padlocks to prevent possible tampering of metering facility.

9.3.3 28 RMSPs have VT/CT secondary wiring that use PVC / Liquid-tight conduits / flexible plastic conduits instead of RMC**Observation**

28 RMSPs have Polyvinyl Chloride (PVC) type conduits/ liquid-tight conduits / flexible plastic conduits instead of the prescribed RMC or equivalent.

Applicable Rule

Philippine Distribution Code 2017 Edition, Clause 7.2.10. Other Accessories. All wiring from the instrument transformers’ secondary terminal box to the metering equipment cubicle shall be placed in a rigid metal conduit (RMC) or its equivalent.

Risk Rating Assessment

Significant. PVC / liquid-tight conduit / flexible plastic conduit is not as sturdy compared with RMC and could be easily detached for possible meter tampering. Also, it degrades over time if installed outdoors and exposed to harsh weather.

Review Recommendation/Auditor Comment

The RMSPs should act on replacing these PVC / liquid-tight conduit / flexible plastic conduit immediately. RMC is durable and harder to tamper. Another advantage of metal conduit is that it acts as ground bonding between the instrument transformer body and metal cabinet. It also provides magnetic shielding of the conductor wirings.

The RMSPs can replace these PVC / liquid-tight conduit / flexible plastic conduit during contestable customer shutdown or a scheduled maintenance activity.

9.3.4 22 RMSPs have VT/CT secondary boxes with no seals

Observation

22 RMSPs have VT and CT secondary boxes with no seals.

Applicable Rule

Philippine Distribution Code 2017 Edition Clause 7.2.3.1.g. The Distribution Utility or the MSP shall make arrangements to seal or secure all metering equipment, data collection equipment, and associated communication equipment.

Risk Rating Assessment

Significant. Meter tampering is possible through unauthorized access to secondary wirings.

Review Recommendation/Auditor Comment

The RMSPs should install secondary box seals to prevent possible tampering of the metering facility.

Installation of VT/CT secondary box seals can be performed during customer maintenance shutdown so as not to affect customer operation.

9.3.5 20 RMSPs have non-standard meter test blocks/switches or no meter test blocks/switches

Observation

20 RMSPs have non-standard or no meter test blocks or switches.

Applicable Rule

Philippine Distribution Code 2017 Section 7.2.9. Meter Test Block or Switch. Test block or switch shall be installed inside the meter enclosure to allow the current and voltage from each instrument transformer and each Meter to be individually determined. The installation shall also be in accordance but not limited to ANSI C12.8-1981 (R1997, R2002, R2012) or its equivalent standard.

Risk Rating Assessment

Significant. Without the standard test block, there are safety issues in case of emergencies or maintenance activities where the meter needs to be isolated. The metering facility cannot be

tested while energized. There is a need to shut down the metering facility to facilitate the preventive maintenance testing.

Review Recommendation/Auditor Comment

The MSPs must install meter test blocks with the ANSI C12.8 - 1981 standard or equivalent. The meter test block will facilitate online testing of meter and instrument transformers. Also, the test block should have an auto-shortening feature to provide safe operation by personnel during meter testing. Non-compliance could be addressed during customer maintenance shutdown so as not to affect customer operation.

9.3.6 14 RMSPs have VT/CT secondary wiring that use flexible liquid-tight metallic conduits instead of RMC

Observation

14 RMSPs have VT/CT secondary wiring that use flexible liquid-tight metallic conduits instead of the prescribed rigid metal conduits or equivalent.

Applicable Rule

Philippine Distribution Code 2017 Edition, Clause 7.2.10. Other Accessories. All wiring from the instrument transformers' secondary terminal box to the metering equipment cubicle shall be placed in a rigid metal conduit (RMC) or its equivalent.

Risk Rating Assessment

Medium. If the installation method or implementation of flexible liquid-tight metallic conduit is not done correctly, it will not be as sturdy as RMC and could be easily detached, possibly for meter tampering.

Review Recommendation/Auditor Comment

Replace flexible liquid-tight metallic conduit with RMC. RMC is durable and harder to tamper with. Another advantage of metal conduit is that it acts as ground bonding between the instrument transformer and metal cabinet. It also provides magnetic shielding of the conductor wirings. On the other hand, if installed and used correctly (using a Loctite glue for its fittings), flexible liquid-tight metallic conduit can be considered an equivalent to RMC. APEX thus recommends, as possible rules change proposal, considering flexible liquid-tight metallic conduit (FLMC) as an equivalent to rigid metal conduit (RMC) based on the following features, while still ensuring that the applicable rule is upheld:

1. **Flexibility:** FLMC is flexible and can be easily bent and routed to accommodate the specific layout and requirements of metering installations. This flexibility is particularly useful when navigating around obstacles or tight spaces.
2. **Corrosion Resistance:** Metering installations are often located in diverse environments, and FLMC is resistant to corrosion. This makes it suitable for both indoor and outdoor applications, protecting the secondary wiring and ensuring long-term reliability.
3. **Tamper Resistance:** Metering installations have secondary wiring running through areas where they could be subject to tampering. FLMC provides an extra layer of protection against tampering, preserving the physical security of the wiring.
4. **Wide Temperature Range:** FLMC is designed to withstand a broad temperature range, making it suitable for various climates and environmental conditions where metering installations may be located.

In summary, FLMC can serve as an equivalent to RMC and can be adapted in the PDC for installations with limited space, considering the interruption time typically ranging from five (5) to eight (8) hours at most, allotted to MSPs for the installation of metering facilities.

10.0 STATUS OF 3RMIA FINDINGS

During 3RMIA, 1 WMSP and 11 RMSPs were reviewed. The following are the status of 3RMIA findings:

10.1 Status of Implementation of NGCP MSP action plans on 3RMIA Findings

No.	Task	3RMIA Finding	Risk Rating	Compliance Rating	Status as of March 2025	NGCP MFM
1	Task 3	Use of Capacitive VTs	Critical	Level 3	Pending	SLA
2	Task 3	Revenue Meter Inside TP Control Room	Critical	Level 3	Pending	VISA

Findings for two (2) out of 10 metering sites were already addressed. Given the ECA contract expiration, correction of findings for the remaining eight (8) metering sites is pending completion.

10.2 Status of Implementation of RMSP action plans on 3RMIA Findings

No.	Task	3RMIA Finding	Risk Rating	Compliance Rating	Status as of March 2025	No. of RMSP
1	Task 1	Absence of MIRF records	Low	Level 2	Pending	1
2	Task 1	Incomplete equipment calibration procedures and records	Significant	Level 2	Pending	1

No.	Task	3RMIA Finding	Risk Rating	Compliance Rating	Status as of March 2025	No. of RMSP
3	Task 1	Environmental Condition at the Calibration Laboratory	Significant	Level 2	Open	1
4	Task 2	No database and back-up facility for meter data	Significant	Level 1	Open	1
5	Task 2	No meter data back-up and recovery policy	Opportunity	NA	Open / Pending	2
6	Task 2	No dedicated meter data backup media	Opportunity	Level 4	Open	1
7	Task 3	Meter clock not synchronized with PST	Critical	Level 1/ Level 3	Open	2
8	Task 3	No VT/CT secondary boxes security seals	Significant	Level 2/ Level 3	Open	2
9	Task 3	Non-standard meter test switch – no auto-short capability	Critical	Level 1	Open	1
10	Task 3	No VT/CT Accuracy Tests	Critical	Level 1	Open	1

All the findings for seven (7) out of 11 RMSPs audited during the 3RMIA were already addressed. The findings of four (4) other RMSPs remain open and/or pending completion.

11.0 AUDIT CONCLUSION

This 4RMIA covers the operations of one (1) WMSP, 57 RMSPs, and the MO. In comparison, the 3RMIA covered only one (1) WMSP and 11 RMSPs.

Overall, in the 4RMIA, the WMSP demonstrated a commendably high level of compliance with the PGC, WESM Rules and Manuals, and other applicable rules, with significant improvements noted compared to the 3RMIA. On the other hand, among the 11 RMSPs previously audited in the 3RMIA, the majority showed progress.

For RMSPs audited for the first time in the 4RMIA, several findings were identified that need to be addressed and need to be monitored in the next round of audit cycle. Nonetheless, it is worth highlighting that Cebu III Electric Cooperative, Inc. was the only first-time auditee to fully resolve all findings from the 4RMIA promptly.

Meanwhile, IEMOP's internal business processes are well-documented. However, enhancements to the Central Registration and Settlement System and other systems/applications are necessary. These improvements are particularly important in light of the expanded market operations, which now include Mindanao grid, to prevent access issues and system slowdowns. Additionally, there is a need to propose amendments to the rules on Performance Measurement/Management to incorporate measures that would strengthen the performance measures of the MSPs.