

**Report on the First Independent Review of the
Metering Arrangements in the WESM
by Isla Lipana & Co., et al
(Project ID 2012-01)**

PEM Audit Committee

April 2013

Executive Summary

This report provides the objectives, scope and results of the first Independent Review of the Metering Arrangements in the WESM covering the period 26 December 2010 to 25 December 2012 (AP2012-01). The independent review was conducted by Isla Lipana & Co. (a Pricewaterhouse Cooper Member Firm) in partnership with Intelligent Energy System Pty Ltd. (IES), Australia and Alliance of Power & Energy Xponents Inc. (APEX), Philippines ("Review Team").

The review team was chosen as the independent reviewers after being ranked as the winning bidder during the open and competitive selection process. The quality-cost based selection process, which was approved by the PEM Board on 23 February 2012, was conducted by the PEM Audit Committee (PAC) under the supervision of the Department of Energy (DOE) and with the assistance of the Metering Arrangements Review Technical Working Group (TWG). The selection process involved the publication of Expressions of Interest (EOI), short listing of received EOI, release of Requests for Proposals (RFP) to shortlisted firms, and conduct of the preliminary bidding conference, and technical and financial evaluation.

As provided in the Terms of Reference ("TOR"), the general objective of this project is to assess the adequacy of the metering standards, security systems and metering processes of NGCP and PEMC. Further, the metering review was conducted to confirm that the metering arrangements comply with the WESM Rules and associated manuals and to identify and report any non-compliance. The review of the Metering Arrangements under the WESM Rules and associated WESM Manuals included the relevant provisions of the PGC, whenever referred to by the WESM Rules.

The review team reported to the PAC for the duration of the project which commenced on 17 July 2012. As adopted by the review team, the project was conducted according to the following areas:

1. **Documentation Audit** – covers the review of relevant documents, records and reports being used in the metering process (i.e. actual Meter Trouble Reports, Metering Installation Registration Form, etc.).
2. **IT General Controls Audit** – focuses on reviewing the reliability of the data collection capabilities of the communication links and the different software or application programs being used in the metering process.
3. **Meter Process Audit** – covers the different test procedures to primarily ensure the reliability and accuracy of metering registration, installations, calibration, maintenance and other related processes.
4. **Meter Integrity Audit** – covers the review of the identified 36 critical and significant sites. This includes actual on-site testing and verification of the meter's performance using widely-accepted procedures and utilization of Energy Regulatory Commission (ERC)-certified meter testing devices and equipments.
5. **Best Practices Recommendation** – This cover recommendations and perspectives of best practices on other competitive electricity markets (i.e. Australia).

Pursuant to the TOR, the review team, together with the concerned NGCP- Meter Testing Division (MTD) Engineers, PEMC/TWG or PAC Representatives, conducted physical inspections on 216 sample metering sites and accuracy testing on 36 metering sites located in Luzon and Visayas.

As part of the review process, the review team discussed issues relating to the metering arrangements' conformance with the WESM Rules, WESM Manuals and applicable policies and regulations with the auditees (NGCP and PEMC) and PAC/TWG prior to the finalization of the Final Review Report.

In response to the review team's findings and recommendations, the auditees furnished the review team with their responses, which were duly incorporated in the final review report which the review team submitted to the PAC for further review and comment. Accordingly, the PAC thoroughly reviewed the final report and suggested enhancements to the same. Upon submission by the review team of the revised final report, the PAC/TWG reviewed the same and thereafter deemed that the final review report has substantially met all the requirements of the contract and thus, accepted the said report.

Table of Contents

I. About this Report	1
II. Background.....	1
III. The Auditees	1
IV. Objectives of the Review	2
V. Scope of the Review	2
VI. Review Team Selection Process	3
VII. Review Implementation	3
VIII. Summary of Review Results.....	4
IX. Auditees' Response	11
X. Conclusion	11
XI. Next Steps	11
XII. Endorsement to the PEM Board.....	12
Attachment A: Pre-Review Activities	13
Attachment B: Review Implementation – Timeline/Activities	15

I. About this Report

In compliance with Section 3.7.2¹ of the PEM Audit Market Manual ("Manual"), this report provides the objectives, scope and results of the independent review of the metering arrangements in the WESM covering the period 26 December 2010 to 25 December 2011 (AP2012-01).

II. Background

Under the WESM Rules, the PEM Board established the PEM Audit Committee (PAC), which is mandated, on its own or through appointment of external auditors, to conduct, coordinate and supervise effective and independent audits of the operations of the spot market and of the Market Operator in order to reinforce Trading Participants' confidence in the transparency and adequacy of the operation of the WESM. This mandate is provided under Clause 1.5 of the WESM Rules, as amended, and under Section 3.1 of the Manual.

In accordance with 4.5.5.4 of the WESM Rules, the PAC, in consultation with PEMC and Metering Service Provider (MSP), is mandated to review the security arrangements and requirement of metering installations, i.e. Review of Metering Arrangements. This requirement is further detailed in Section 11 of the Manual.

In line with this mandate and under the supervision of the Department of Energy (DOE), the PAC administers the independent review of metering arrangements through external auditors.

III. The Auditees

The subjects of the review were the National Grid Corporation of the Philippines- Metering Services Division (NGCP-MSD) and PEMC- Billing, Settlement and Metering Division (BSMD).

The NGCP is responsible for the operation, improvement, expansion and maintenance of the nationwide transmission system. These functions include the centralized operation and control of high-voltage transmission facilities, grid interconnections and ancillary services, i.e. system operations.

Additionally, NGCP operates and maintains the metering facilities of generators, distribution utilities and other load customers as the metering services provider. On 23 May 2011, the Energy Regulatory Commission (ERC) granted authority to NGCP to be a 'Wholesale Electricity Spot Market Metering Services Provider'. Currently, NGCP is the sole Metering Services Provider (MSP) of the WESM.

¹ Within fifteen (15) days after an audit is finalized by the PEM Auditor or by a designated expert or expert team contracted to act as auditor(s), the PEM Auditor shall prepare and submit to the PEM Board an Audit Report which specifies details of the said report.

In accordance with the Philippine Grid Code, MSPs have the responsibility to supply, install, connect, own, test, calibrate, place in service, operate, check, and maintain the metering system for settlement, ensuring the accuracy and traceability of calibration and test results. Additionally, each MSP shall take all reasonable steps to prevent unauthorized interference with the metering equipment.

On the other hand, the PEMC operates the Wholesale Electricity Market Corp. (WESM), where the trading of electricity as a commodity takes place. The PEMC ensures the optimal dispatch of generation based on the submitted offers from generators and bids from customers, and from which a spot price for electricity throughout the grid is set. It is also in charge of the handling and validation of the meter data received daily from NGCP, settlement of financial accounts of the trading participants, issuance of WESM Bills and addresses settlement issues and inquiries.

IV. Objectives of the Review

In accordance with Section 11.2.2 of the PEM Audit Manual, the general objective of the metering review is to assess the adequacy of the metering standards and security systems and processes in the WESM. Further, the metering review is conducted to confirm that the metering arrangements comply with the WESM Rules and associated manuals and to identify and report any non-compliance. The review of the Metering Arrangements under the WESM Rules and associated WESM Manuals also included relevant provisions of the PGC, whenever referred to by the WESM Rules.

V. Scope of the Review

The main task of the review team is to assess whether the security arrangements and requirement of metering installations, i.e. Review of Metering Arrangements are adequate and compliant with the requirements of metering installations under the WESM Rules, related Manuals and relevant provisions of the PGC taking into consideration the following:

- a. Best practices in other competitive electricity markets;
- b. Available technology and its costs; and
- c. Actual performance in relation to:
 - i. Timeliness in addressing Meter Trouble Reports (MTRs);
 - ii. Adequacy and conformance to good utility practice of preventive maintenance performed on metering equipment, including completeness of maintenance programs, test results and sealing records;
 - iii. Availability and reliability of the meter communication links and interfaces to the meter data collection of system of MSP;
 - iv. Adequacy of the software and programs used by the MSP in meter data collection, metering database and data validation;
 - v. Adequacy of the process used by the Market Operator in estimating and editing of meter data;
 - vi. Reliability of communication link and interfaces between MSP and Market Operator;
 - vii. Adequacy of internal procedures/protocols of the MSP in meter data collection, including but not limited to, manual retrieval of meter data in times remote communication failure;

- viii. Adequacy of remote monitoring facilities to alert the Market Operator of any failure of any components of the metering installation;
- ix. Adequacy of physical security provided to the metering equipment;
- x. Adequacy of physical and logical access security provided to metering data held in metering installations and to the metering installation database;
- xi. Availability of recovery plan and procedures in case of erased or corrupted metering data and of an off-site data storage location;
- xii. Adequacy of cyber security;
- xiii. Accuracy of metering installation test results;
- xiv. Availability of spare parts (e.g. meters, Current Transformers and Potential Transformers) in case of defective metering installations that needs immediate replacement;
- xv. Availability of check meters for WESM main meters²;
- xvi. Appropriateness of the revenue metering and market trading node location³; and
- xvii. Accuracy of the results of the Site-Specific Loss Adjustments (SSLA) calculations.

Further, in accordance with the Section 11.4.2 of the Manual, the review team inspected the 216 sample metering sites, where at least thirty percent (30%) of which corresponded to the metering points with largest volume within the WESM and where metering errors or inadequacy created the biggest impact and volume error in Luzon and Visayas.

VI. Review Team Selection Process

Isla Lipana and its partner firms were chosen as the independent auditors after being ranked as the winning bidder during the open and competitive selection.

The quality-cost based selection process, which was approved by the PEM Board on 23 February 2012, was conducted by the PAC under the supervision of the DOE and with the assistance of the Metering Review TWG. The selection process involved the publication of Expressions of Interest (EOI), short listing of received EOI, release of Requests for Proposals (RFP) to shortlisted firms, technical and preliminary bidding conferences, and technical and financial evaluation.

A summary of the selection process activities is provided in Attachment A.

VII. Review Implementation

The review team reported to the PAC for the duration of the project, which commenced on 23 July 2012. The audit service contract (Contract) was signed by the PEMC President Melinda Ocampo and Isla Lipana Partner Ms. Rosanna S. Javier on 17 July 2012.

All activities were coordinated by the PAC, through the MAG which served as the linkage for Isla Lipana to PEMC and NGCP.⁴

² The availability of check meter is optional depending on the Customer.

³ WESM Rules 3.2.2.2 (b) and 4.5.2.1

As identified by the review team, the review was conducted according to the following areas:

1. **Documentation Audit** – covers the review of relevant documents, records and reports being used in the metering process (i.e. actual Meter Trouble Reports, Metering Installation Registration Form, etc.).
2. **IT General Controls Audit** – focuses on reviewing the reliability of the data collection capabilities of the communication links and the different software or application programs being used in the metering process
3. **Meter Process Audit** – covers the different test procedures to primarily ensure the reliability and accuracy of metering registration, installations, calibration, maintenance and other related processes
4. **Meter Integrity Audit** – covers the review of the identified 36 critical and significant sites. This includes actual on-site testing and verification of the meter's performance using widely-accepted procedures and utilization of Energy Regulatory Commission (ERC)-certified meter testing devices and equipments
5. **Best Practices Recommendation** –covers recommendations and perspectives of best practices on other competitive electricity markets (i.e. Australia).

In accordance with the Contract, Isla Lipana submitted reports on schedule, as follows:

Deliverables	Target Date	Status
Inception Report	30 July 2012	Completed
1 st Progress Report	05 September 2012	Completed
2 nd Progress Report	14 September 2012	Completed
3 rd Progress Report	28 September 2012	Completed
4 th Progress Report	12 October 2012	Completed
5th Progress Report	30 October 2012	Completed
6th Progress Report	09 November 2012	Completed
Final Progress Reports	07 December 2012	Completed
Final Review Report	20 March 2013	Completed

A summary of the review activities and timeline is provided in Attachment B.

VIII. Summary of Review Results

The major areas reviewed by the review team, are as follows:

⁴ The MAG provides technical and administrative support to the PAC in accordance with WESM Rule 1.4.7.1.

- a. Validation, Estimation and Editing (VEE) process
- b. Site Specific Loss Adjustment (SSLA) process
- c. IT General Controls testing on both PEMC and NGCP
- d. Systems and Business Process review on both PEMC and NGCP
- e. Physical inspection of the metering sites

In addition, applicable industry best practices both locally and in other similar electricity markets (i.e. Australia, Singapore) were considered in the review team's recommendations.

In its report, the review team highlighted the critical observations, exceptions and control gaps that must be addressed immediately. These observations are further detailed below:

I. Major Non-Compliances

a) Absence of meter seals on meter components (MI-PI12)

- 10 out of 216 (**4.62%**) main meters and 6 out of 216 (**2.77%**) alternate meters have no seal on the meter terminal
- 4 out of 216 (**1.85%**) main meters and 3 out of 216 (**1.38%**) alternate meters have no seal on the demand reset
- 4 out of 216 (**1.85%**) main meters have no seal on the test block
- 55 out of 216 (**25.46%**) current transformers and 65 out of 216 (**30.09%**) potential transformer have no seal on the secondary terminal boxes

Auditee's Response:

We noted the recommendation but we want to emphasize that there are other security controls in place.

b) Non-compliances on the perimeter security requirements (MI – PI17, MI – PI18, MI – PI19 & MI – PI20)

- 4 out of 216 (**1.08%**) metering installation have no perimeter fence while 2 out of 216 (**0.92%**) are broken down.
- 9 out of 216 (**4.19%**) metering installation uses Bermuda grass or concrete instead of gravel.
- 19 out of 216 (**8.8%**) metering installation are not well-lighted.
- 38 out of 216 (**17.59%**) has uncontrolled vegetation.

Auditee's Response:

We noted the recommendation but we want to emphasize that there are other security measures that will prevent tampering of the meter installation.

II. Incidental Non-Compliances

a) Adjusted Loads vs. Site Specific Loss Factors (PEMC-SSLA02)

In the monthly SSLA results provided, the review team has identified a number of meters which follows a different expression as compared to current practices of BSMD. The list of IDs for these meters is as follows:

- MF3MBOHBLCI03
- MF3MBOHBOH104
- MF3MGARPMSC01
- MF3MUBABOH201
- MF3MUBABOH205
- MF3MUBAMARC01

Auditee's Response:

PEMC reviewed the specific cases identified and acknowledged that there is an error in the spreadsheet master files. The error has now been corrected. Further, this is the case of BOHECO where there are several meters modelled to one market trading node which is the sum of several RTU units. PEMC does a work around to settle every metering point assigned in the market trading node. The ultimate solution for this case is to provide an RTU for each metering point.

b) Non-functional Display (MI-PI03)

During the physical site inspection, it was discovered that **27 out of 216 (12.50%)** main meter installations and **5 out of 216 (2.31%)** of the alternate meters have non-functional displays (burnt-out, blurred, or flickering). Also, for main revenue meters, the brand that encounters the display functionality issues is EIG Nexus 1272.

Auditee's Response:

The meter display fades due to usage and age and not because of extremely high temperature. Also, since the observation is related to a particular brand of meter, this cannot be addressed by preventive maintenance alone. Note that all Nexus batch observed to have non-functional displays are currently being replaced.

b) Meter Time vs. System Time (MI-PI04)

It was noted during the physical site inspection that out of 216 metering installations, **79 or 36.57%** have time discrepancies of less than five (5) minutes in the main meter while **9 or 4.17%** metering points were noted to have time discrepancies of more than five (5) minutes.

For the alternate meters, **71 or 32.87%** metering points were noted to have time discrepancies of less than five (5) minutes and **26 or 12.04%** metering points were noted to have time discrepancies of more than five (5) minutes. Among the exceptions with large time differences are the following:

- a. MNORTRAN02 (Main Meter) - 7 hours and 54 minutes
- b. QTUVECO13 (Alternate Meter) - More than one 1 year

- c. MNORTRAN01 (Alternate Meter) – 20 days, 4 hours and 46 minutes
- d. MBTNBTNG02 (Alternate Meter) - 5 hours and 51 minutes

Auditee's Response:

The power of the meters is connected to the PTs and when the site is deenergized, the meter will also shut-down. This is one of the reasons why there are large meter time discrepancies. MSP believes that signal strength has no direct impact on this observation. MSP does not agree with the level of non-compliance since discrepancies are mainly caused by deenergization of the substation rather than negligence on time synchronization.

c) Cabinet Housing (MI-PI05)

It was discovered that **20 out of 216** meter enclosures are inadequate (**17 out of 216 (7.87%)** meter installations are corroded, rusted or needs repainting, **1 out of 216 (0.46%)** has ill-fitting doors and **2 out of 216 (0.93%)** need immediate replacement.). Furthermore, the ingress of animals such as lizards and water, were also observed to exist in some meter enclosures.

Auditee's Response:

The meter installations that need replacement are already scheduled to be replaced. However, replacement of meter cabinet would require deenergization of sub-stations, thus needs planning and time.

d) Enclosure Security (MI-PI08)

It was observed during the physical site inspection that **27 out of 216 (12.50%)** sites did not use padlocks as a security measure for the meter enclosure. Moreover, some meter enclosures did not have provisions (hasp) for the installation of padlocks while others were designed using keyed (or cabinet) locks that are loose and easy to be picked.

Auditee's Response:

We noted the recommendation but we want to emphasize that padlock and enclosure lock provide the same level of security.

III. Observations Requiring Immediate Corrective Action

a) Market Operator's highly manual business process (PEMC – VEE01)

The review team noted four (4) control gaps (e.g. unprotected data files, manual copy-paste activities and manual updating of masterfiles) that were constantly present in various processes of BSMD. These control gaps occurred sixty-two (62) times through-out the VEE and SLA Processes.

Auditee's Response:

To implement this recommendation, BSMD should undergo a change management process. There is a pending project called Central Registration and Settlement System (CRSS) in which the automation of various manual processes will be covered.

b) Manual elements in the issuance of the Monthly Metering Validation Report (PEMC – VEE08)

To effectively carry out the VEE process, error flags for the discrepancies in the "SSLA Raw vs. CD Validation Report" and "WESM-MET MF Validation Report" are manually removed for special cases where multiple MTNs share one metering installation.

Auditee's Response:

The special cases or all the SEINs indicated are Generator meters and BSMD/Metering does not apply SSLA for generator meters as this will only increase the registered meter data including the station service consumption of the generator. Metering has already integrated the special cases into the macro program.

c) Results of the analysis between reconciled Site Specific Loss Adjustment vs. SSLA Model (PEMC – SSLA01)

The review team has observed instances of days where changes in shifting configuration occurred while the reconciled results did not reflect a sequence of SSLA models consistent with the sequence of shifting configurations. Thus, there have been instances where the adjustment methodology referred to in clause 3.2.2.3 of the WESM Rules was not correctly implemented by the Market Operator.

Auditee's Response:

Since PEMC was not provided daily by the net service provider with shifting of meters from different market trading node, PEMC manually reviewed the daily/monthly shifting configuration of all customer meters. Any discrepancies in the configuration between the market trading node and the assigned meters is corrected before the final settlement run.

d) Observations on the output of the SSLA Data (PEMC – SSLA03, PEMC-SSLA04 & PEMC – SSLA05)

- Presence of unusually large line losses in SSLA Data (SSLA03) of **Sun Power metering sites** (MF3MCLNMECO01 and MF3MCLNMECO0e) due to the treatment of an unmetered embedded load, and where BSMD has no knowledge of the switching configuration.
- Presence of large negative line losses in SSLA data of **BENECO metering site** (MF3MITOBENE08) due to a complex arrangement of incompletely metered embedded generation and loads, and where BSMD has no single line diagram.
- Presence of large line losses in SSLA data of **CEPZA metering site** (MF3MROSCEPZ03) due to the presence of a virtually embedded meter having

multiple supplier, and where the BCQ (the quantity agreed by the TP and their customer) of the virtual meter is deducted from the adjusted MQ.

Auditee's Response:

PEMC have no control on the above SSLA issues. In the case of SSLA03 and SSLA05, the trading participants provide us the figure and PEMC only substitutes the values provided. This is in agreement with the trading participants. To address the issue on SSLA04, the trading participant should install a physical meters in their franchise.

e) Insufficient MIRF record keeping and maintenance (MI – PI01)

There is no formal policy that governs the monitoring of updates made to any installations in the metering sites. As such the following discrepancies were noted between the results of the physical inspection and the details in MIRF:

- An average of **63%** discrepancy between the main meter details
- An average of **54%** discrepancy between the alternate meter details
- An average of **51%** discrepancy between the potential transformer – phase A
- An average of **25%** discrepancy between the potential transformer – phase B
- An average of **30%** discrepancy between the potential transformer – phase C
- An average of **52%** discrepancy between the current transformer – phase A
- An average of **53%** discrepancy between the current transformer – phase B
- An average of **53%** discrepancy between the current transformer – phase C

Auditee's Response:

This observation will only be critical if the multiplier and the PT/CT Ratio have discrepancies between MIRF and Actual Inspection. MSP thinks that this can be mitigated through a review of the procedures laid down in WESM Rules/Manual regarding the updates/revisions of the Metering Installation Information.

Also, some of the substations use a form called Notice of Metering Installation Changes (NMIC) whenever there are changes to be made to the components installed in the sites.

f) Insufficient meter seals inventory and log (MI – PI11)

- The amount/volume of meter seal provisions distributed / issued to each staff and the range of serial numbers it contains were not traceable to any transfer document for accountability.
- The serial numbers of seals pulled out from / returned to the stock room, and removed from / installed to the meter sites were not recorded and/or monitored for inventory purposes.
- The serial numbers of the seals installed to the secondary terminals and instrument transformers were not recorded / monitored in any documents.

Auditee's Response:

Agree with the recommendation.

g) High Grounding Resistance in Instrument Transformers (MI – PI16)

60 out of 216 (**27.78%**) sites visited have resistance measurement of more than 5 Ohms. Please note that due to the complexity of determining the Earth Fault factor per metering site location as required by Philippine Grid Code, Section 4.2.8 – Grounding Requirements, a spot check on the grounding installation was conducted instead. A maximum limit of 5 Ohms was used in determining the acceptable resistance level which is found suitable for industrial plant substations, buildings and large commercial installations.

Auditee's Response:

As per MSP, these issues warrant further investigation because the results may be an indication of poor grounding resistance but are not conclusive.

The manner of measurement used by the auditors is foreign to the MSP. They believe that the testing performed by the team was just a "quick check" and therefore not conclusive.

h) Inconsistencies on the structure of Instrument Transformers (MI – PI15)

The review team noted some inconsistencies against the industry standard in the metering installation structure components (e.g. terminal, tank casing, primary wires and cables, secondary wires and cables, material on secondary conduit, mounting structure and bushing). Also, some of these components are:

- Corroded
- Rusted
- Heavily oxidized with signs of fraying and discoloration
- Mounted on an elevated platform with rotten wood
- With traces of oil leak at the bottom/tank flange
- With exposed secondary leads.
- Have contaminated bushing (salt accumulation)
- Conduits found with breaks
- Wires are somewhat accessible
- Apparent exposure (outside conduit) of the secondary wires from box (sec term) to splicing box.

Auditee's Response:

This is a matter of the physical condition of PT/CT and just a maintenance issue.

In summary, the observations noted by the review team are detailed in the table below:

Area of Review	Critical non-compliance	Major non-compliance	Incidental non-compliance	Non-compliance to internal procedures	Total non-compliances
Validation, Estimation and Editing Process Review and Data Accuracy Testing	0	0	0	0	0
Site-Specific Loss Adjustment Process Review and Data Accuracy Testing	0	0	1	0	1
Appropriateness of Revenue Metering and Market Trading Node Location	0	0	0	0	0
MO - IT General Controls	0	0	0	4	4
MSP - Business Process Review	0	0	0	0	0
MSP - IT General Controls	0	0	0	0	0
Physical Site Inspection	0	2	4	0	6
Meter Integrity Testing	0	0	0	0	0
Total non-compliances					11

IX. Auditees' Response

In response to Isla Lipana's findings and recommendations, the auditees (PEMC and NGCP) discussed with the review team their responses through meetings and email communications. The auditees' responses were duly incorporated in the final review report.

X. Conclusion

The PAC, together with the TWG, reviewed the final review report and deemed that the final review report has substantially met all the requirements of the contract for the engagement of the review team and thus accepted the said report.

XI. Next Steps


In view of the results, the PAC in consultation with PEMC shall develop an action plan to monitor the PEMC's compliance to the findings and recommendations raised by the review team.

On the other hand, the PAC shall request the assistance of the ERC, being the regulatory/oversight agency over NGCP, in ensuring the commitment of NGCP to address the findings and observations concerning the latter's compliance to the WESM Rules, PGC and other relevant market manuals.

Lastly, the PAC in consultation with NGCP, PEMC and TWG, will discuss the conduct of the next metering arrangements review covering the period 26 December 2011 to 25 June 2013.

XII. Endorsement to the PEM Board

Prepared and Submitted By:
PEM AUDIT COMMITTEE



Felixberto U. Bustos, Jr.
Chairperson / PEM Auditor

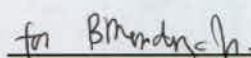


Eduardo Alejandro O. Santos
Member



Christian M. Orias
Member

Certified By:
PAC SECRETARIAT



Chrysanthus S. Heruela *for*
Vice President, Market Assessment Group

Attachment A: Pre-Review Activities

Date	Activity
26-Oct-11	Coordination Meeting with ERC, DOE, PAC, TransCo, PSALM and NGCP for the initial discussions of the project.
10-Nov-11	Consultation Meeting with the Technical Committee, ERC (thru GMC and DMC), DOE, PAC, NGCP and TransCo for the discussion on the metering requirements as stated in the Phil. Grid Code (PGC), Phil. Distribution Code (PDC) and WESM Rules
12-Dec-11	Presentation on the proposed metering review scope to the ERC Commissioners
09-Jan-12	Drafting of the Memorandum of Agreement (MOA) between NGCP and PEMC for the conduct of the metering review
07-Feb-12	<ul style="list-style-type: none"> PAC coordination meeting with NGCP and PEMC Metering Group for the identification of sample metering points PAC-TWG's approval of the Terms of Reference and Request for Proposal
23-Feb-12	Presentation of the Metering Arrangement Review Project to the PEM Board, for the approval of the following: <ol style="list-style-type: none"> MOA Authority of Pres. Mel or Mr. Nunez to sign the MOA Budget ;and Selection and Implementation Process
24-Feb to 16-Mar 2012	Publication of the Terms of Reference (TOR), for comments of the WESM Participants , including NGCP
02-Mar-12	Release of DOE Order No.2012-03-002 creating the Technical Working Group for the Metering Arrangements Review
14-Mar-12	Submission of Letters of Interest to potential auditing firms
20-Mar-12	Deadline for the submission of Letters of Interest
21-23 Mar-12	Evaluation of the Firms who submitted their interest to conduct the review, as follows: <ol style="list-style-type: none"> PA Consulting Group, in association with Electrix Services and Transfield Services, New Zealand; Manabat Sanagustin & Co., CPAs, Philippines; Isla Lipana & Co., in partnership with PricewaterhouseCoopers USA and India, Intelligent Energy System Pty Ltd(IES) Australia and Alliance of Power & Energy Xponents Inc. (APEX), Philippines; and Punongbayan and Araullo, Philippines
26-Mar-12	PAC's approval of the Short Listed Firms and Request for Proposals (RFP)
30-Mar-12	Release of Request for Proposals to Short Listed Firms
12-Apr-12	Deadline of submission of queries and requests for clarification to the PAC for the Preliminary Bidding Conference
17-Apr-12	Counterparty signing of the MOA by PEMC and NGCP President
16-Apr-12	Pre-Bid Conference
17-20 Apr-12	Conduct of Due Diligence
03-May-12	<ul style="list-style-type: none"> Deadline for the submission of Technical and Financial Proposals and; Opening of Technical Proposals, including Required Documents
03-04 May-12	Evaluation of Technical Proposals

Attachment A: Pre-Review Activities

Date	Activity
21-May-12	TWG Meeting for the finalization of the technical evaluation results
06-June-12	PAC/TWG Meeting for the discussion of the technical evaluation results
18-June-12	Opening of Financial Proposals
28-June-12	The PEM Board approved the results of the technical and financial evaluation of the External Auditor for the Metering Arrangements Review (Audit Project 2012-01) in favor of Isla Lipana (PwC Manila) [in partnership with IES, PwC India and APEX, Phil.
04-05 Jul-12	Contract Negotiation with the first-ranked bidder, Isla Lipana ,et al
17-Jul-12	Contract Signing
26-Jul-12	The PAC informed the Board of the favorable results of the negotiation with the first-ranked bidder for the Metering Arrangements Review (PAC Project 2012-01)

Attachment B: Review Implementation – Timeline/Activities

Date	Activities
30-Jul-12	Review Team's Presentation of the Inception Report and Review Process Workshop
02-Aug-12	Meeting of review team with NGCP- Meter Testing Division Heads
06-Aug-12	Submission of Inspection Checklist Version 1
13-Aug-12	Submission of Inspection Checklist Version 2
17-Aug-12	<ul style="list-style-type: none"> Submission and approval of the Final Physical Inspection Checklist Submission of Revised Inception Report
04-Sep-12	Meeting of review team with NGCP- Meter Testing Division Heads, PAC and TWG regarding Meter Testing. The agreements of the body are as follows: <ul style="list-style-type: none"> The Portable Working Standard shall be used whenever the selected Meters have already been tested within the year. Energy Based Standard-for meters which have not been tested within the year.
05-Sep-12	<ul style="list-style-type: none"> Submission of Final Inception Report 05 September 2012 Submission of 1st Progress Report
06-Sep-12	PAC-TWG's acceptance of the Final Inception Report
14-Sep-12	<ul style="list-style-type: none"> DOE sent a letter to NGCP regarding the conduct of meter testing Submission of 2nd Progress Report Start of Metering Installations Physical Inspection and Testing(36 sites only)
24-Sep-12	Amendment to Contract to change the currency used from US Dollars to Philippine Peso
27-Sep-12	NGCP-Review Team's meeting on initial findings
28-Sep-12	<ul style="list-style-type: none"> Submission of 3rd Progress Report Meeting at ERC regarding the scope and objectives of the Metering Arrangements Review
11-Oct-12	Release of fund for the payment of the Inception Report
15-Oct-12	Submission of 4 th Progress Report
19-Oct-12	Meeting with NGCP regarding Findings for the 5th Progress Report
30-Oct-12	Submission of 5 th Progress Report
5-Nov-12	Meeting with PAC-TWG, NGCP and PEMC
10-Nov-12	Submission of 6 th Progress Report
16-Nov-12	Meeting between the Review Team and PEMC
20-Nov-12	Review Team's Presentation of the 6 th Progress Report
23-Nov-12	PEMC Submission of Comments on the Progress Reports
26-Nov-12	PAC-TWG's Acceptance of the 2 nd , 3 rd , 4 th , 5 th and 6 th Progress Reports
7-Dec-12	<ul style="list-style-type: none"> Release of Payment for the 2nd Progress Report Submission of the Final Progress Report
08-Dec-12	End of Metering Installations Physical Inspection and Testing
13-Dec-12	PAC-TWG's Acceptance of the Final Progress Report
21-Dec-12	Submission of the draft final report
15-Jan-13	Release of Payment for the Final Progress Report
17-Jan-13	Meeting on Draft Final Audit Report (with NGCP)

Attachment B: Review Implementation – Timeline/Activities

Date	Activities
18-Jan-13	Meeting on Draft Final Audit Report (with PEMC)
22-Jan-13	Review Team and PAC Meeting (with TWG, PEMC and NGCP) for the Draft Final Audit Report
21-Feb-13	Submission of PAC-TWG's comments on the draft final report
07-Mar-13	Submission of the revised final report_v2
18-Mar-13	Submission of PAC-TWG's additional suggestions on the revised final report
20-Mar-13	Submission of revised final report_v3
21-Mar-13	PAC-TWG's acceptance of the Final Report
TBD	Release of Payment for the Final Report