

**Report on the 4th
Independent Operational Audit of the Systems
and Procedures on Market Operations**
for the period 26 June 2012 to 25 June 2013
by PA Consulting Services Ltd.
(AP 2013-01)

PEM Audit Committee

May 2014

Executive Summary

This report provides the objectives, scope and results of the 4th Independent Operational Audit of the Systems and Procedures on Market Operations (4th MO Audit) covering the period 26 June 2012 to 25 June 2013 (AP2013-01) conducted by PA Consulting Services Ltd. (PA) of New Zealand.

Following the approval of the PEM Board on 11 October 2011, the PA was reappointed as the External Auditor for the 4th MO Audit.

The Project seeks to accomplish the following:

- a. Conduct of more efficient and expeditious yearly market audit, as required under the Wholesale Electricity Spot Market (WESM) Rules and the PEM Audit Market Manual (Manual);
- b. Continuity in the market operations audit process and timely follow-up on Client's actions to address audit findings and recommendations;
- c. Conduct of software and special audits, as soon as necessary; and
- d. Provision of real time support requirements of the PEM Audit Committee (PAC), PAC Technical Working Group (TWG) and the Client.

PA reported to the PAC for the duration of the audit, which commenced on 09 July 2013. As identified by PA, the audit was conducted according to the following areas:

1. **Market Software Testing** covered the compliance and accuracy of key algorithms and calculations within the suite of market software;
2. **Market Documentation Review** assessed whether the Market Operator and the Market Assessment manuals and procedures are aligned with WESM Rules and meet best practice standards as assessed by the PA procedure evaluation framework;
3. **Process and Compliance Review** assessed whether selected Market Operator and Market Assessment processes are in compliance with the WESM Rules and consistent with best practice standards defined by the PA process evaluation framework;
4. **IT Systems Review** provided an assessment against international best practice standards with respect to software management, operations and security. It also provided software validation for selected interfaces and systems beyond those included in the Market Software Testing; and
5. **Bid-to-bill Analysis** provided an assessment of compliance and risks at a system and process level. In doing so, the Bid-to-Bill Analysis focuses on a single Trading Interval at a time, and covers a small number of intervals that include both common and unusual market situations.

As part of the audit process, PA discussed issues relating to the market operation's conformance with the WESM Rules, WESM Manuals and applicable policies and regulations with the auditees, PAC/TWG and PEMC management prior to and during the finalization of the Final Audit Report.

In response to PA's audit findings and recommendations, PEMC furnished PA with Responses, which were duly incorporated in PA's final audit reports.

In accordance with its mandate under the WESM Rules, the PAC fully accepts the findings and recommendations of PA as provided in the following documents submitted on various dates:

1. Market Audit Summary Report;
2. Certification of the following-
 - i. Market Dispatch Optimization Model Software;
 - ii. Market Settlements Software
 - iii. Metering Software
 - iv. Trading Operations Department's Software; and
 - v. Price Substitution Methodology Software
3. Internal reports.

As provided for under the PEM Audit Manual, the PAC will monitor the MO's compliance to the Action Plan, through an assessment of the development and implementation of the audit recommendations.

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I. About this Report

In compliance with Section 3.7.2 of the PEM Audit Market Manual ("Manual"), this report provides the objectives, scope and results of the 4th Independent Operational Audit of the Systems and Procedures on Market Operations covering the period 26 June 2012 to 25 June 2013 (AP2013-01).

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 audits of the operations of the spot market and of the MO to reinforce Trading Participants' confidence in the transparency and adequacy of the operation of the Wholesale Electricity Spot Market (WESM).¹

In line with this mandate and under the supervision of the Department of Energy (DOE), the PAC administers independent operational audits of the systems and procedures on market operations through external auditors.

Since 2009, the PAC has administered the conduct of the following audits-

- i. First market operations audit, for the period 26 June 2007 to 25 June 2009, conducted in 2009 (AP2009-01) by Deloitte Touche Tohmatsu of Australia, in cooperation with the Intelligent Energy Systems (IES) and Manabat Delgado and Amper (Deloitte Philippines);
- ii. Second market operations audit for the period 26 June 2009 to 25 June 2011;
- iii. Third market operations audit for the period 26 June 2011 to 25 June 2012; and
- iv. Recently concluded fourth market operations audit for the period 26 June 2012 to 25 June 2013.

The second to fourth market operations audits were conducted by PA Consulting Group Ltd. (PA) of New Zealand.

III. Audit Objectives

The general objectives of the Audit Project (AP 2013-01)² as required under the PEM Audit Market Manual, are consistent with those of the 1st, 2nd and 3rd Independent Operational Audit of the Systems and Procedures on Market Operations, as follows:

¹ WESM Rules, Clause 1.5 and PEM Audit Market Manual, Section 3.1

² PEM Audit Market Manual, Section 7.2.2

1. Review and assess the procedures and working processes of the Market Operator (MO);
2. Review and assess the usefulness and appropriateness of systems settlement system, data management and other procedures and working processes used by the MO to administer the WESM, in order to:
 - a. identify the appropriate steps and measures to help the MO effectively and efficiently perform its responsibilities in time and form in accordance with the WESM Rules;
 - b. assess if the MO practices and work processes ensure the necessary transparency, independence, predictability and non-discrimination, and are in compliance with the WESM Rules and best international practices; and
 - c. assess if the systems, calculations, information flows and data management to protect the accuracy and quality of the data and results in generation scheduling, dispatch, prices and settlement, as well as evaluate if internal controls exist and are sufficient to guarantee security and confidentiality where appropriate; and to propose recommendations to improve the: (1) procedures to collect and process the information and, (2) controls of quality and security of data in the WESM.
3. Review and assess the usefulness and appropriateness of the interfaces and exchange of information among the MO, System Operator (SO), Metering Service Provider (MSP) and other service providers in relation to generation scheduling, constraints, dispatch, prices and settlement, and metering;
4. Review and assess the compliance by the MO with the WESM Rules and WESM Manuals;
5. Review and assess the effectiveness of the Market Assessment System (MAS); and
6. Certify that the following are adequate and in full compliance with the Market Rules: any new software or associated systems, or modified existing software or their associated systems for generation, scheduling, dispatch or settlement or price calculation relevant to the WESM.

IV. Audit Scope

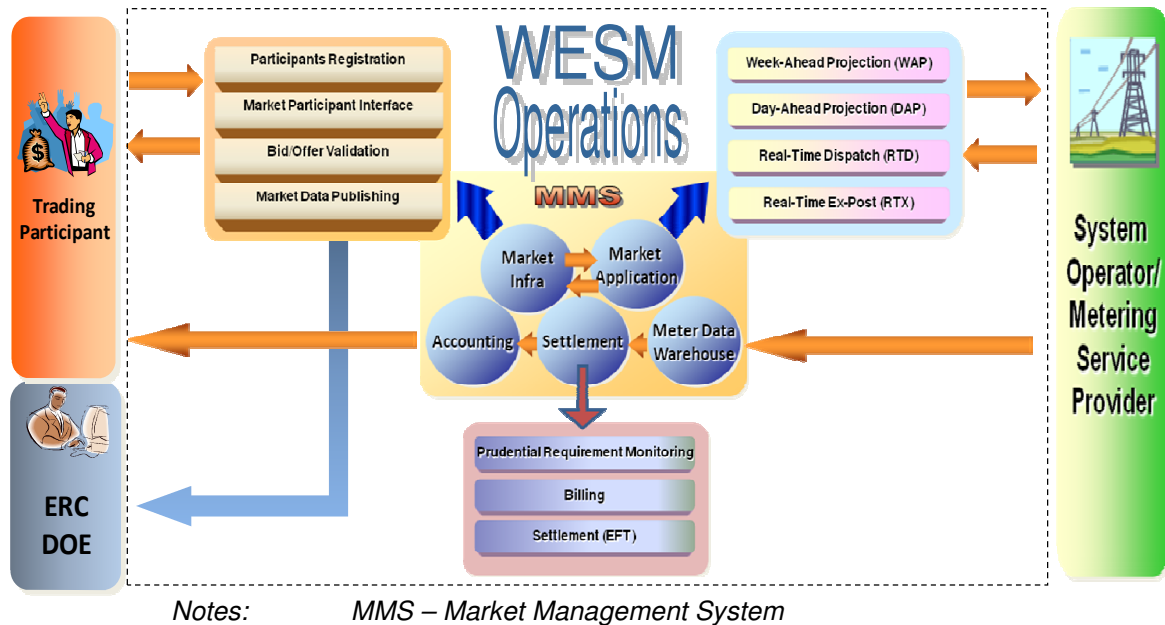
The Audit Project covered and reviewed the MO's compliance with its procedures and the effectiveness and appropriateness of systems utilized in the operation of the spot market, which included but were not limited to:

1. Valid audit certificates for the current versions of all numeric software;
2. The calculations and allocations performed by the metering and settlements systems;
3. Billing and information systems;
4. The scheduling and dispatch processes;
5. The processes for software management; and
6. The MO's compliance with the WESM Rules.³

³ PEM Audit Market Manual, Section 5.2.6.2

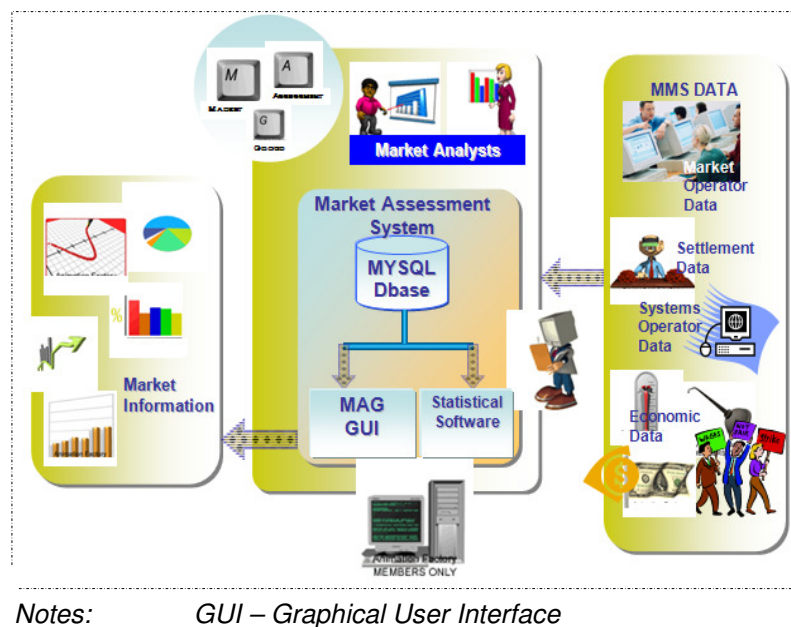
The Audit Project covered the market operations as shown in Figure 1.

Figure 1. WESM Operations



In addition, the audit covered the review of the Market Assessment System (MAS) and any procedures and working processes used in the collection, validation and processing of market monitoring data, and calculation of monitoring indices, as shown in Figure 2.

Figure 2. Market Assessment System



In addition to the above, PA focused on the key changes and developments made by PEMC on its processes and systems since the 2012 MO Audit. PA also conducted a full back to basic review of all market operations' related internal business procedures.

V. External Auditor Selection Process

PA was retained as the External Auditor for the 4th MO Audit based on its satisfactory work during the 3rd MO Audit. Its retention has been recommended by the PAC and thereafter approved by the PEM Board on 11 October 2011.

PA is an international management, systems and technology consulting company operating worldwide in some 20 countries. PA has its Corporate Headquarters at 123 Buckingham Palace Road, London, SW1W 9SR, United Kingdom and has now been in business for over sixty years, having been established during World War II to optimize production of the Hurricane fighter. PA has been involved in auditing and certifying market operations and settlement software for a wide range of clients in varying geographies including the New York ISO, ISO New England, Ontario IESO, Transpower New Zealand, West Australia IMO and the California Power Exchange. PA was the certifying auditor of the WESM MMS in 2006.

VI. Audit Implementation

The External Auditor reported to the PAC for the duration of the audit, which commenced on 09 July 2013. The audit service contract (Contract) was signed by the PEMC President Melinda Ocampo and PA Director Stephen Thornton as counterparty on 05 September 2013.

All audit activities were coordinated by the PAC, through the MAG which served as the linkage for PA to PEMC and other relevant parties.⁴

As identified by PA, the audit was conducted according to the following areas:

1. **Market Software Testing** covered the compliance and accuracy of key algorithms and calculations within the suite of market software. Software testing focused on mathematical accuracy and appropriateness, and on compliance of the implementation with the WESM Rules and Manuals.
2. **Market Documentation Review** assessed whether the Market Operator and the Market Assessment manuals and procedures are aligned with WESM Rules and meet best practice standards as assessed by the PA procedure evaluation framework. Procedures were reviewed and scored against six criteria (i.e. compliance, context, process, timeline, accountability and governance) and allocated a summary Red-Amber-Green (RAG) score that indicated how well each procedure performed overall (i.e. Red-will not ensure compliance; Amber-may ensure compliance; Green-should ensure compliance).

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

3. **Process and Compliance Review** assessed whether selected Market Operator and Market Assessment processes are in compliance with the WESM Rules; and consistent with best practice standards defined by the PA process evaluation framework. PA adopted a four stage approach as follows:
 - a. Short-listed the Market Operations, Settlement and Market Assessment processes to audit based on risk and materiality;
 - b. For the short-listed processes:
 - i. Identified Rules obligations to be tested for compliance based on risk and materiality; and
 - ii. Identified controls and measures to be used to determine non-compliance against the Rules.
 - c. Having developed the control measures to be used to test compliance, undertook the compliance review by analysing PEMC data and interviewing relevant teams; and
 - d. PA assessed the short-listed processes for compliance risk, by reviewing each process against process management, process scale and complexity, resourcing and the results of the compliance review.

4. **IT Systems Review** provided an assessment against international best practice standards with respect to software management, operations and security. It also provided software validation for selected interfaces and systems beyond those included in the Market Software Testing. The review included an assessment of both PEMC's policies and practices including a verification of current practice against recommendations made in the previous audit.

In accordance with the Contract, PA submitted reports, as follows:

Report	Date of Submission of Final Version
Inception Report	05 September 2013
IT Systems Review Report	15 January 2014
Market Software Testing Report	16 February 2014
Bid-to-Bill Report	02 May 2014
Process and Compliance Report	14 March 2014
Market Documentation Report	14 March 2014
Audit Summary Report (Public)	27 March 2014

Further, PA discussed issues relating to the market operation's conformance with the WESM Rules, WESM Manuals and applicable policies and regulations have been discussed in multiple meetings with the auditees, PAC/TWG and PEMC management prior and during the finalization of the Final Audit Report.

VII. Summary of Audit Results

Considering that this is the 4th MO Audit, the PA focused on key changes and developments since the 2012 audit. PA reiterated some of its findings and recommendations in its previous audit and raised additional recommendations in the 4th MO Audit.

The table below provides the statistical summary of findings PA found per audit area.

Area of Review	New Findings	Repeat Findings (noted in the past audits)	Total Number of Findings
Market Software Testing	12	4	16
IT Systems Testing	5	9	14
Process and Compliance Review	2	3	5
Market Documentation Review	6	9	15
Bid-to-Bill Analysis	7	0	7
Total	32	25	57

As per PA, the Market Operator has made good progress against most recommendations made as part of the 2012 Market Audit. Specifically, they have noted the improvements in following areas:

- Market Documentation
 - There is a significant improvement in the governance and quality of the Market Operator's Internal Business Procedures (IBPs). Overall (with the exception of those IBPs scoring red overall or red on process), PA noted that the Market Operator's suite of IBPs is generally of high quality and appropriately documents its obligations under WESM Rules and Manuals.
- Market clearing and pricing software
 - There is a good progress with the addition of a patch which successfully addresses PA's Audit Findings related to erratic pricing under severe congestion and TCG constraint violations during the 2012-02 Market Audit.
- Process and Compliance review
 - There is an improvement in the business process and compliance scores for registration and market operations.

On the other hand, PA pointed out specific areas that need to be addressed in a timely manner and be given high priority and importance as follows:

- a) *Calculation of settlements* – currently the calculation of settlements is performed in spreadsheet programs and a new system will not be in place for some time. The use of Excel/VBA tools for this task is not appropriate by international best practice standards and the tools are error-prone and do not produce an adequate audit trail. This audit recommends improvements that can be made to the spreadsheet programs to mitigate the risk of errors while they continue to be used.

- b) *Enforcing participant compliance with collection and payments and Prudential Requirements obligations* – these continue to cause significant problems for PEMC as some trading participants fail to meet their payment obligations. PA recommends that the PEMC, ERC and DOE implement the Auditor's proposed measures to mitigate the risk of late and non-payment as much as possible while having an effective means of enforcing compliance with collection and payment obligations and prudential requirements.
- c) *Review of System Operator compliance with WESM Rules and Manuals* – As noted in our findings relating to load forecasting accuracy, poor forecasting accuracy on the part of the Market Operator is often driven by poor quality SCADA data provided by the System Operator. Although we have recommended that the System Operator (i.e. NGCP) should initiate a review of their SCADA systems and the process used to update real-time information (see Section 2.5), we further recommend that the System Operator be subject to an audit/review similar to the one for the Market Operator. In addition to covering the System Operator's compliance with the WESM Rules and Manuals, such an audit/review should examine the System Operator's IT systems (including SCADA) and also their business processes. Such a scope would provide the System Operator with practical means to improve their systems and processes so as to not only better their own compliance, but positively impact on the Market Operator's compliance as well.

Overall, PEMC has again demonstrated a clear commitment to addressing the findings and recommendations of previous audits. PA emphasized that it is apparent that PEMC has cultivated a culture of self-improvement and cooperation to improve both the WESM itself and the manner in which PEMC fulfils its role as the Market Operator.

VIII. Auditee Response and Actions Taken

In response to PA's audit findings and recommendations, PEMC furnished PA with Responses, which were duly incorporated in PA's final audit reports.

The report on the status of PEMC's implementation of its action plan to address the audit findings and recommendations is provided in Attachment A.

IX. Conclusion

The PAC fully accepts the findings and recommendations of PA as provided in the following documents:

Report	Date of Submission of Final Version
Inception Report	05 September 2013
IT Systems Review Report	15 January 2014
Market Software Testing Report	16 February 2014
Bid-to-Bill Report	02 May 2014
Process and Compliance Report	14 March 2014
Market Documentation Report	14 March 2014
Audit Summary Report (Public)	27 March 2014

X. Next Steps

In view of the Audit Project results, the PAC, in coordination with the Office of the President of PEMC, will monitor the MO's compliance to the Action Plan, through an assessment of the development and implementation of the audit recommendations.

Further, in coordination with the DOE and NGCP, the PAC will continue its efforts to realize the plan to conduct the independent review of the Systems Operations expectantly within 2014.

XI. Endorsement to the PEM Board

Prepared and Submitted By:
PEM AUDIT COMMITTEE

(signed)

Felixberto U. Bustos, Jr.
Chairperson / PEM Auditor

(signed)

Eduardo Alejandro O. Santos
Member

(signed)

Christian M. Orias
Member

Certified By:
PAC SECRETARIAT

(signed)

Chrysanthus S. Heruela
Vice President, Market Assessment Group

4th MARKET OPERATIONS (MO) AUDIT ACTION PLAN

This audit action plan is intended to address the findings and recommendations made by PA Consulting Group during the Fourth (4th) Annual Market Operations Audit, covering the period 26 June 2012 to 25 June 2013. This plan was prepared by the WESM Compliance Officer (WCO) in coordination with the Market Assessment Group (MAG) and all concerned PEMC departments and process owners, and was presented to PEMC Management in March 2014.

The audit action plan includes the following key information:

- The audit findings and recommendations
- The specific action/s to be undertaken to address the audit finding or recommendation, the specific target date of completion, and the accountable party/ies
- Any external parties involved
- Any required resources or constraints foreseen

The implementation of this audit action plan shall be monitored by the WCO on a quarterly basis, and updates on the progress of all action items shall be reported to PEMC Management.

I. AUDIT WORK AREA: MARKET SOFTWARE

Ref No.	Type	Findings	Recommendations	PEMC Response and Action Plans	Target Date of Completion	Accountable Party	External Party Involved	Resources / Constraints
PA. 1	Key; Repeat	The impact of the inclusion of the Meralco sub-transmission system can have a significant impact on dispatch and market prices	a) Continue to seek cooperation from Meralco in providing relevant information and data in order to carry out any additional scenarios required, particularly the provision of accurate load data	Necessary data have been provided by Meralco already. Studies have been completed and presented to Management <u>Measure of completion:</u> presentation of studies to the Office of the President (OP)	N/A (Done item) <i>Date of completion:</i> 14 February 2014	Trading Operations Department (TOD)	MERALCO	Delay in receiving response from External Parties. Availability of real-time information and WESM Infrastructure
			b) By the end of April 2014, report to the DOE and the ERC on the issues that need to be resolved in order to add Meralco assets to the MNM. Request that the matters be decided upon promptly	TOD will present the results in the MAG-ERC-ECO Meeting Note: TOD presented the results of the studies on 07 April 2014, with both ERC and DOE representatives in attendance. <u>Measure of completion:</u> conduct of	N/A (Done item) <i>Date of completion:</i> 07 April 2014	TOD	Department of Energy (DOE); Energy Regulatory Commission (ERC)	

Ref No.	Type	Findings	Recommendations	PEMC Response and Action Plans	Target Date of Completion	Accountable Party	External Party Involved	Resources / Constraints
			to enable PEMC to implement the MNM additions by the end of 2014	presentation in the MAG-ERC-ECO meeting				
			c) Provide MERALCO study document to the DOE	TOD will officially transmit the MERALCO study document to the DOE <u>Measure of completion:</u> Document officially transmitted to DOE	May 2014	TOD	Department of Energy (DOE)	
			d) Determine, by the end of Q2 2014, whether the other cases where distribution utilities are able to link Market Trading Nodes are able to influence the market dispatch and pricing, given that ownership and operation of the 115 kV facilities has been transferred from NGCP to the distribution utilities	As an initial step on this, proposed changes to the MNM Manual have been submitted to the RCC as part of the Manuals audit compliance wherein submission of relevant DU network data is reiterated and also the requirement for the MO to conduct market impact study on DU system for pricing and scheduling in the WESM. TOD shall also prepare an assessment report identifying other DUs which can have significant power flow effect in terms of withdrawal thru looped lines or injection of embedded generators. <u>Measure of completion:</u> Completion of assessment report	Q4 2014	TOD	Other Distribution Utilities, the National Grid Corporation of the Phils. (NGCP), DOE and ERC	Availability of manpower to conduct assessment report owing to the multiple tasks related to RM, IMEM, RE and other internal tasks related to ISMS,QMS and ERM
PA. 14	Key; Repeat	• Settlement programs have a lack of audit trail	a. Ensure that the results of the existing project to resolve the issues found with the settlements	A project to enhance the following settlement tools commenced in June 2013 (RFICF-1310-069): 1. PSM	30 June 2014	Information Systems and Technology (IST) and		Manpower constraints and prioritization

Ref No.	Type	Findings	Recommendations	PEMC Response and Action Plans	Target Date of Completion	Accountable Party	External Party Involved	Resources / Constraints
		<ul style="list-style-type: none"> Settlement programs have a lack of error checking Settlement programs use hard-coded input data Settlement programs use unnecessary and redundant input data Settlement programs have unnecessary potential for user error Settlement programs have poorly labelled inputs 	<p>programs in the previous audit are implemented no later than June 30 2014.</p>	<ol style="list-style-type: none"> MRU VAT/GMR Administered Prices Market Fees Line Rental <p>With reference to the 3rd MO Audit (PA 14,15,17,18,31), settlement tools above should contain the following:</p> <ol style="list-style-type: none"> Creation of Audit Trails Fixing Settlement Calculations Create Error Checking Remove Hard coded variable data <p><u>Measure of completion:</u> Deployment of all enhanced settlement programs</p> <p>Note: Items 1 (PSM) and 2 (MRU) are currently undergoing User Acceptance test (UAT) c/o BSM. Items 3, 4, 5, and 6 are done.</p>		Billing, Settlement, and Metering Division (BSMD)		of other projects
			<p>b. This project should then be extended to encompass all settlements spreadsheet tools, and to address the issues of:</p> <ul style="list-style-type: none"> Unnecessary and redundant input data 	<p>While UAT is on-going, BSM shall analyze the additional three items listed in the Recommendations column, then submit an ICT Change request.</p> <p><u>Measure of completion:</u> Deployment of enhanced</p>	TBD by BSMD	BSMD IST		

Ref No.	Type	Findings	Recommendations	PEMC Response and Action Plans	Target Date of Completion	Accountable Party	External Party Involved	Resources / Constraints
			<ul style="list-style-type: none"> – Unnecessary potential for user error – Poorly labelled inputs 	programs based on the new recommendations				
PA. 27	General; Repeat	MRU Program: Unhandled input data scenario results in material error (repeat of previous year's finding): The macro produces zero EAETA and EPETA results for the condition EAQ = MRU when both EAQ and MRU are non-zero.	a. Investigate and fix the problem with the MRU program that incorrectly results in zero trading amounts under certain conditions. The extent to which this has affected market participants in past billing periods will also need to be investigated.	<p>A request for ICT Change to address the issue was deferred, while awaiting the DOE decision on the MRU Manual. In the meantime, when errors occur due to this case, filing requests for additional compensation is recommended.</p> <p>PEMC shall also follow up with the DOE on this matter.</p> <p><u>Measure of completion:</u> deployment of enhanced MRU program</p>	Dependent on the approval of the MRU Manual by the DOE	BSMD		
PA. MS. 1	Key; New	The MDOM has not had a valid audit certificate since the deployment of patch MA 1.5.13 on November 16, 2012. This is not in line with international best practice standards and undermines the value of having software	a. Before implementing any future MMS patches, a new independent software certificate should be obtained for the new MDOM version. For major changes this will require retesting of the MDOM, while minor changes may only require the independent certifier to review the change documentation and reissue	This is a best practice recommendation. With the established ICT Change process of PEMC, new or changes to the systems/software and programs have been thoroughly reviewed and tested. There is also a quality assessment to ensure that the modified software/systems and programs work in accordance with its specifications and with the WESM Rules and Manuals. No action required at the moment.	N/A	N/A	N/A	N/A

Ref No.	Type	Findings	Recommendations	PEMC Response and Action Plans	Target Date of Completion	Accountable Party	External Party Involved	Resources / Constraints
		certificates which is to provide confidence to market participants by demonstrating that the market clearing software in use at all times has been independently verified by experts in the field	<p>the software certificate with the new version number.</p> <p>In determining the functional specifications for the New MMS, carefully consider all aspects of the MDOM formulation, particularly those aspects related to software limitations in the existing MMS, and make the most of the opportunity presented by the need for a new system.</p>					
PA. MS. 2 Related: DI.3 5	Key; Repeat	Nodal forecasts have performed poorly over the audit period with a significant proportion of nodal forecasts having absolute percentage errors outside the 3%, 10% and even 50% tolerance bands (even after stratifying for load). Additionally, the nodal load forecasts for both Luzon and Visayas are significantly negatively skewed,	a) Until the new MMS is implemented, TOD should continue their efforts to investigate means of mitigating the errors caused by the pro-rating methodology.	<p>TOD has already taken some actions to mitigate nodal forecast errors using the current methodology of pro-rating</p> <ol style="list-style-type: none"> 1. Discussion on the use of state-estimation with NGCP-SCADA 2. Proposed enhancement on translation of EMS Snapshot Data to MMS Snapshot Data so as to capture unaccounted (or unmonitored) consumption in the system (this is for deployment in May 2014) <p>The accuracy of nodal forecasts will be fully attained if:</p> <ul style="list-style-type: none"> • the new MMS is deployed; 	Subject to the following: availability of the new MMS, improvement of NGCP's real-time monitoring and state estimation, modeling of Meralco's sub-transmission system in the MNM	New MMS Project Team TOD	NGCP, Meralco	Availability of necessary information from MERALCO and NGCP and the establishment of the New MMS

Ref No.	Type	Findings	Recommendations	PEMC Response and Action Plans	Target Date of Completion	Accountable Party	External Party Involved	Resources / Constraints
		indicating that there is systemic overestimation of nodal loads.		<ul style="list-style-type: none"> the real- time monitoring system and state estimation of NGCP's SCADA system are improved and are available; the Meralco sub-transmission is modelled in the WESM; the snapshot data of Meralco's network is provided to MO 				
			b) The System Operator should be subject to an audit/review similar to the one for the Market Operator. In addition to covering the System Operator's compliance with the WESM Rules and Manuals, such an audit/review should examine the System Operator's IT systems (including SCADA) and also their business processes. The System Operator (NGCP) should initiate a review of their SCADA system and the process used to update real-time information with a view to investigating how the accuracy of their real-time data can be improved	PEMC is still awaiting the DOE's decision on the proposed rules changes submitted by the PEM Audit Committee (PAC) to the Rules Change Committee (RCC) in 2011 in relation to the conduct of the SO audit.	Dependent on DOE direction	PEMC Management	Tripartite Committee, PAC, NGCP	

Ref No.	Type	Findings	Recommendations	PEMC Response and Action Plans	Target Date of Completion	Accountable Party	External Party Involved	Resources / Constraints
PA. MS. 3	Key; New	Incorrect results from the Administered Price Cap Program: If a generator has a zero metered quantity in the corresponding period in each of the 4 previous weeks, the program computes the Administered Price for that generator as zero. While the correct price in this case is not defined by the formulation in the procedure manual, a price of zero is unlikely to be consistent with the intent of the markets rules and applicable ERC ruling	a) Clarify what the correct results should be and amend the Administered Price Cap program for the situations that result in zero administered prices. The extent to which this has affected market participants in past billing periods will also need to be investigated	<p>The suggested use of administered load price is not defined in the ERC ruling. Currently, if the TP has issues on the administered price, it can request or file adjustments following the process, as defined in the Administered Price Methodology Manual.</p> <p>PEMC shall propose WESM Manual changes to reflect this condition properly.</p> <p><u>Measure of completion:</u> Submission of a proposal to amend the Administered Price Determination Methodology to the RCC</p>	30 September 2014	BSMD		Prioritization of other BSMD issues, commitments and ERC orders regarding November and December 2013 Settlement Adjustments for Regulated Prices.
PA. MS. 4	Key; New	Incorrect results from the Administered Price Cap Program: Incorrect application of administered prices to single region: Sections 4.2.5.2 and 4.2.5.3 of the	a) Investigate and fix the problem in which the requirements of sections 4.2.5.2 and 4.2.5.3 of the WESM Administered Prices manual are not being implemented. The extent to which this has affected market participants in past billing	<p>BSMD will file an ICT Change Request to correct the program.</p> <p>For discussion in the next ITSC Meeting in March 2014.</p> <p><u>Measure of completion:</u> Deployment of the enhanced Administered Price Cap Program</p>	30 September 2014	BSMD		Prioritization of other BSMD issues, commitments and ERC orders regarding November and

Ref No.	Type	Findings	Recommendations	PEMC Response and Action Plans	Target Date of Completion	Accountable Party	External Party Involved	Resources / Constraints
		WESM Administered Prices manual (1.3 - WESM-AP-003_04282011) specify a re-allocation of trading amounts when administered prices are applied to one region only. The requirements of these sections are not implemented in this program or in any other program currently in use by BSMD. Therefore, BSMD are not in compliance with these requirements.	periods will also need to be investigated.					December 2013 Settlement Adjustments for Regulated Prices.
PA. MS. 5	Key; New	Error in Daily MTR program may lead to incorrect MTRs being issued	a) Fix the MTR summary error in the daily MTR program: Specifically the fix should ensure that all metering points classified as a "trouble point" in the GEN MTR DATA, LOAD MTR DATA and LOAD MTR DATA (DEL ONLY) sheets of the MTR_YYYY-MM-DD_(ALL DATA1) output files are correctly summarized in the summary sheet of the	BSMD filed an ICT Change Request to address this finding on 08 January 2014. Metering shall update the program to include the kVAR in the issuance of the daily MTR. Note: The program is currently undergoing testing activities and completion of document requirements. <u>Measure of completion:</u> Deployment of the updated Daily	31 July 2014	BSMD		

Ref No.	Type	Findings	Recommendations	PEMC Response and Action Plans	Target Date of Completion	Accountable Party	External Party Involved	Resources / Constraints
			MTR_YYYY-MM-DD_(ALL DATA1) output file and in the MTR_YYYY-MM-DD_(1st issue) output file.	MTR program				
PA. MS. 6	Key; New	Monthly MTR program may not report all missing data	a) Implement a change to the monthly MTR program to pick up metering points with missing CD data: The change should ensure that where an MSP fails to submit CD data for a metering point, the metering point is flagged as a “trouble point”.	BSMD will file an ICT Change to address this finding. <u>Measure of completion:</u> Deployment of the monthly MTR Program	30 September 2014	BSMD IST		Prioritization of the revision of BSMD’s Internal Business Procedures.
PA. MS. 7	Key; New	Monthly MTR program relies on accuracy of daily metering data	a) Introduce enhance error-checking capability into the monthly MTR program: New functionality should ensure that where a daily meter value is incorrect (e.g. because the MSP has not responded to a previous MTR or because the Market Operator has failed to issue an MTR) the program correctly flags the data as an error.	Additional data check shall be included in the monthly MTR. BSMD (Metering) shall file an ICT change request for the updated program. <u>Measure of completion:</u> deployment of monthly MTR Program	30 September 2014	BSMD IST		Prioritization of the revision of BSMD’s Internal Business Procedures.
				Metering has already requested IT, during a meeting of the CRSS project team, to include the additional checking in the CRSS. <u>Measure of completion:</u> Inclusion of additional specification in the CRSS	N/A (Done item)	BSMD IST		
PA. MS. 8	Key; New	Unnecessary and redundant input data / Poor error	a) Introduce enhance error-checking capability into the monthly MTR program	This is already part of RFICF-1306-053. Details are as follows:	5/31/2014	BSMD IST		

Ref No.	Type	Findings	Recommendations	PEMC Response and Action Plans	Target Date of Completion	Accountable Party	External Party Involved	Resources / Constraints
		handling	b) Implement changes to the SSLA program to report input/output data errors	<ol style="list-style-type: none"> 1. <u>MDEF Converter</u>: A program which shall convert an MDEF (a binary file) into a readable PRN file. 2. <u>DAILY MQ RTU COMPARISON SSLA-RAW PROGRAM nnTH.xls</u>: A program which shall reformat the "MTR_YYY-MM-DD_(ALLDATA1).xls to RawMeterData_YYYYMMDD.xls. The reformatted file shall be the input to the SSLA Calculation module. The process shall run for 1 minute only. The program shall also graphically compare the aggregated meter data from "SSLA_All_Data_YYYYMMDD.xls" (load end) and "MTR_YYYY-MM-DD_ALL DATA1).xls" (generator) with the system snapshot data file "snapshot_area_YYYYMMDD.xls". Resulting files shall be "RTU_MQ_COMPARISON_Y YYY-MM-DD_GEN.xls" and "RTU_MQ_COMPARISON_Y YYY-MM-DD_LOAD.xls". This process shall run for 2 minutes only. For WESM level. 3. <u>Source Program</u>: A macro-based program which shall convert the monthly 15-minute meter data files into an hourly resolution. The converted 				

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				<p>hourly meter data shall be the input data to the SSLA Calculation module. The process shall run for 30minutes for one billing period. For WESM level.</p> <p>4. <u>macro_ssla_and_ae_21</u>: A program for SSLA run which uses as input the more direct hourly data file RawMeterData_YYYYMMDD.xls instead of every 15-minute reading. Running time for a trading day run which usually takes around four minutes before is now reduce to 2.5 minutes. For WESM level.</p> <p>5. <u>consolid5</u>: A program which consolidates the per hour data from the SSLS_All_Data_YYYYMMDD.xls from every masterile model, to produce the preliminary SSLA_All_Data_YYYYMMDD.xls. The manual consolidation which takes at least an hour-and-a-half is now reduce to around 10 minutes. For WESM level, to address one of the findings during the metering audit that the consolidation is done manually.</p> <p>6. <u>mini-consolid1</u>: Consolidates the SSLA_All_Data_YYYYMMDD.</p>				

Ref No.	Type	Findings	Recommendations	PEMC Response and Action Plans	Target Date of Completion	Accountable Party	External Party Involved	Resources / Constraints
				<p>xls by replacing the data from the preliminary SSLA_All_Data_YYYYMMDD.xls with the result from the SSLA_All_Data_YYYYMMDD.xls that needed to be corrected in the final. The manual consolidation which takes at least half-hour is now reduce to around 2 minutes. For WESM level, to address one of the findings during the metering audit that the consolidation is done manually.</p> <p>7. <u>New MTN with shared</u> 7: a new program that will update monthly the Historical Load Share(HLS) of load meters that are under a power transformer. For WESM level.</p> <p>8. <u>Hist Factor 11</u>: An MS excel VBA, a new program that will update monthly the RTU Historical Factor of generating plants whose mapping of MTN-to-meter are "N vs N" and "N vs 1" relationship (ex. Masinloc, Angat, LGBT, TMI). The program is flexible in selecting any number of desired months that the user wants to include as historical basis to determine the Factor. For WESM level.</p> <p>9. <u>Nth Result 7</u>: a new program</p>				

Ref No.	Type	Findings	Recommendations	PEMC Response and Action Plans	Target Date of Completion	Accountable Party	External Party Involved	Resources / Constraints
				<p>that sums the SSLA_All_Data_YYYYMMDD. xls into monthly total meter.</p> <p>Note: All items except for Item 1 (MDEF Converter) were already deployed on April 29, 2014.</p> <p><u>Measure of completion:</u> Deployment of the above programs</p>				
PA. MS. 9	Key; New	Poor Email data security (Metering's Auto Email program)	Implement a change to the Auto Email program to implement more secure method of protecting confidential participant data	<p>This is part of Item PA.MS.5.</p> <p>PEMC is considering the use of 7zip with password in the Daily MTR Program. This will be for deployment within September 2014.</p> <p>Reference ICT Change Request: RFICF-1401-005 (Daily MTR Email Program)</p> <p><u>Measure of completion:</u> Deployment of Daily MTR Program</p>	30 September 2014	BSMD IST		
PA.M S.10	Key; New	The monthly billing macro takes as input data from the Re-run_summary spreadsheet. This data has an Excel autofilter applied to	Implement changes to the Monthly Billing macro to avoid incorrect results when an auto-filter has been applied to the input file: the extent to which this has affected participants in past billing periods should also be investigated.	We have already filed an ICT Change for the Monthly Billing Macro and have presented the same during the April 2014 ITSC meeting. As for the status of the request, the new macro is ready for testing.	<p>N/A (Done Item)</p> <p>Completion Date: 2 April 2014</p>	TOD IST		

Ref No.	Type	Findings	Recommendations	PEMC Response and Action Plans	Target Date of Completion	Accountable Party	External Party Involved	Resources / Constraints
		it. If the data is left in a filtered state, then the Monthly billing macro will read in incomplete data, resulting in material errors in the PSM calculations performed by downstream programs. The Re_run_summary spreadsheet was supplied to us with such filters applied.		<u>Measure of completion:</u> Filing of an ICT Change Request Modular project (priority programs: PEN) <u>Measure of completion:</u> Deployment of modular application for PEN TOCMS				
PA.M S.12	N/A	N/A	We recommend that the MAS and associated Excel VBA pre-processing tools not be subject to full ICT change control in order to allow the MAG Market Monitoring Unit with the necessary freedom to investigate and trial new monitoring indices, respond quickly to one-off requests, and adapt to changes in data types and formats.	Updates to the database are coordinated by MAG with IST through the filing of work orders, since this has been identified as a standard change.	N/A (No action required)	IT Steering Committee (ITSC)		

II.AUDIT WORK AREA: IT SYSTEMS

Ref No.	Type	Findings	Recommendations	PEMC Response and Action Plans	Target Date of Completion	Accountable Party	External Party Involved	Resources / Constraints
PA.46	Repeat	Server racks are still not fixed to the floor in any of the data centres:	Fix additional stabilizer kits to the racks to reduce risk of seismic damage. This should be completed by 30 June 2014.	<p>Given the design of our data center at the 9th floor which utilizes raised flooring, fixing the rack to the floor would not be very helpful since these (raised floor tiles) are also movable. Fixing them to the concrete floor will be difficult since this will require a major renovation of the raised flooring and cabling. Also, the building does not allow any boring on the concrete floor and thus fixing the rack to the concrete floor by bolt is not possible. In fact, the frame of the raised flooring are fastened to the floor with masonry glue.</p> <p>The same is true for the 18th floor corporate data center. Although there is no raised flooring, fixing the rack to the concrete floor by bolt is not possible since the building does not allow it.</p> <p>As an alternative, and in addition to the stabilizing bolt which has already been extended, we can install additional stabilizer kits for</p>	19 December 2014	IST		

Ref No.	Type	Findings	Recommendations	PEMC Response and Action Plans	Target Date of Completion	Accountable Party	External Party Involved	Resources / Constraints
				<p>each rack to increase stability but without fixing them to the floor.</p> <p>Note: With Purchase Request (PR) – for budget re-alignment</p>				
PA.IT.2	Key, New	Missing or incomplete project size and cost-benefit data	<p>Provide detailed guidance on calculating quantitative cost and benefit data for correctly completing the cost-benefit analysis section of the RFICFs.</p> <p>The quantitative cost-benefit analysis as suggested by PA, is difficult to do. For easier compliance with its documented procedure, PEMC may consider revising the procedure to conduct either a qualitative cost-benefit analysis. Further, as best practice recommendation, PEMC may revise its procedure to resolve that the quantitative cost-benefit analysis will be conducted only for major and/or new ICT changes. This requirement is no longer needed for minor changes or macro-tools changes.</p>	<p>Reword Section 4.18 of the ICT Change Management Procedure (as of August 2013) to read as follows:</p> <p><i>" Software changes will be evaluated based on (a) size and extent of the project (b) cost –benefit-applicable to major projects and the Project Information Sheet shall serve this requirement (c) technical feasibility for minor projects and (d) severity."</i></p> <p><u>Measure of completion:</u> Approval of revised ICT Change Management Procedure</p> <p>Note: The ICT Change Management Policy/procedure was updated and approved last 01 April 2014. ICMP awareness was conducted on 16 May 2014.</p>	<p>N/A (Done item)</p> <p>Completion date: 01 April 2014</p>	IST		

III. AUDIT WORK AREA: PROCESS AND COMPLIANCE

Ref No.	Type	Findings	Recommendations	PEMC Response and Action Plans	Target Date of Completion	Accountable Party	External Party Involved	Resources / Constraints
PA.84	Repeat, Material	The majority of breaches in the area of Prudential Requirements in previous audits continue to recur and participants continue to breach payment obligations as the Market Operator does not have any effective means of enforcement.	PEMC should, in collaboration with the ERC, the DOE, the NEA and any other relevant organizations, review policies to facilitate the immediate disconnection of participants who have been non-compliant with collection and payment obligations or prudential requirements	PEMC has collaborated with the ERC, DOE and NEA to resolve issues on PR and to enforce disconnection. As a result, the ERC issued an Order allowing ECs to recover the PR from their rates. In fact, PHILRECA has filed its application for the PR recovery mechanism for approval of the ERC. Meanwhile, the DOE issued a DC directing NEA to further study the PR	N/A (Done item) Date completed: 04 April 2014	Accounts Management Section (AMU)	NEA, ERC and DOE	
				<u>Measure of completion:</u> Issuance of ERC resolution on PR recovery, and issuance of DOE circular on the revised WESM Rules on PR Note: The ERC already issued Resolution 16 Series of 2012 dated 16 Dec 2012 for the recovery of PR. Meanwhile, the DOE DC on the Revised Rules on PR was published on 04 April 2014.				
			AMU (in collaboration	Not all EFT facilities are	N/A (Done	AMU	Compliance	

Ref No.	Type	Findings	Recommendations	PEMC Response and Action Plans	Target Date of Completion	Accountable Party	External Party Involved	Resources / Constraints
			with relevant PEMC teams) should enforce the use of real-time Electronic Fund Transfer (EFT) facilities.	<p>real-time fund transfer as there are interbank transfers which require clearing. Some participants opt to pay cheques with the same clearing days as the EFT. PEMC always reminds the TPs, via email, the instructions for bank transactions and also informs the TPs of the cheque requirements.</p> <p>PEMC also conducted a WESM Lecture Series that allowed Finance to remind TPs on payment/ collection. The Lecture Series was conducted on May 6 (Luzon) and May 9 (Visayas).</p> <p><u>Measure of completion:</u> Conduct of lecture series to remind TPs regarding EFT use.</p>	<p>item)</p> <p>Date completed: 09 May 2014</p>		of Participants	
			AMU should, as soon as the Centralised Registration and Settlement System (CRSS) is implemented, monitor exposure on a weekly basis (as opposed to monthly).	In the proposed changes in PR, the actual exposure shall be monitored based on the preliminary statement to ensure a more accurate basis of the amount of obligation that must be secured.	<p>N/A (Done item)</p> <p>Date completed: 9 May 2014</p>	AMU		

Ref No.	Type	Findings	Recommendations	PEMC Response and Action Plans	Target Date of Completion	Accountable Party	External Party Involved	Resources / Constraints
				<p>Upon approval by the DOE of the PEM Board approved Rules Change proposals to PR, PEMC conducted a lecture series on Prudential Requirements. The lecture series was conducted on May 6 (Luzon) and May 9 (Visayas).</p> <p><u>Measure of completion:</u> Conduct of lecture series on the revised rules on PR</p>				
PA.88	Repeat	AMU continues to use error-prone spreadsheets due to the delay in the launch of the WBSS Accounts Management Module.	<p>1) AMU, ISTD and any other relevant PEMC teams should:</p> <p>Continue with their plan to automate collection and payment and related processes as soon as possible no later than end of February 2014.</p>	<p>1) Comply with the recommendation</p> <p><u>Measure of completion:</u> Full deployment of the Accounts Management System (AMS)</p>	Dependent on BIR approval of CAS	AMU	BIR	<p>1.New Requirements from the BIR</p> <p>2. Approval of the CAS by the BIR</p> <p>3. Testing and Parallel Run which may be delayed due to lack of personnel</p>
			<p>2) If the above automation is delayed (e.g. due to issues uncovered during the parallel runs) then more robust</p>	<p>2) AMU has started developing an interim system that will be used pending the implementation of the AMS which is expected to be</p>	<p>N/A (Done item)</p> <p>Date completed: February 2014</p>	AMU		

Ref No.	Type	Findings	Recommendations	PEMC Response and Action Plans	Target Date of Completion	Accountable Party	External Party Involved	Resources / Constraints
			interim spreadsheets with automated functionality should be developed no later than February 2014.	<p>deployed before July 2014.</p> <p><u>Measure of completion:</u> Deployment of the interim spreadsheets with validation of the amounts to ensure correctness of values.</p>				

IV. AUDIT WORK AREA: MARKET DOCUMENTATION

Ref No.	WESM Manual / Internal Procedure	Findings / Recommendations	PEMC Response and Action Plans	Target Date of Completion	Accountable Party	External Party Involved	Resources / Constraints
PA.76	Registration Manual Issue 1	Review the newly published Market Manual covering Registration procedures to ensure it addresses the procedural gaps identified by PA	<p><i>Same as recommendation</i></p> <p><u>Measure of completion:</u> Submission of proposal to amend the Registration Manual to the RCC</p>	Q3 2014	CPC	RCC	
WM.02	Billing and Settlement Manual Issue 1	<ul style="list-style-type: none"> Undocumented Rules obligations Inconsistency between Rule and Procedure wording Poor contextual referencing to Rules 	<p>Comply with the recommendations</p> <p><u>Measure of completion:</u> Submission of proposal to the RCC</p>	5/30/2014	HTWG	RCC	
WM.03	WESM Metering Standards and Procedures Issue 6.0	<ul style="list-style-type: none"> Undocumented Rules obligations Poor contextual referencing to Rules 	<p>Comply with the recommendations</p> <p><u>Measure of completion:</u> Submission of proposal to the RCC</p>	5/30/2014	HTWG	RCC	

Ref No.	WESM Manual / Internal Procedure	Findings / Recommendations	PEMC Response and Action Plans	Target Date of Completion	Accountable Party	External Party Involved	Resources / Constraints
WM.06	WESM Price Determination Methodology	<ul style="list-style-type: none"> Scored lowest on governance 	<p>Comply with the recommendations</p> <p><u>Measure of completion:</u> Submission of proposal to the RCC</p>	5/30/2014	HTWG	RCC	
WM.07	Management of the Net Settlement Surplus Issue 1.0	<ul style="list-style-type: none"> Scored lowest on compliance, context, process and governance 	<p>Comply with the recommendations</p> <p><u>Measure of completion:</u> submission of proposal to the RCC</p> <p>Status: The proposed amendments to the NSS Manual were already submitted to the RCC in April 2014</p>	<p>N/A (Done iem)</p> <p>Completion date: April 2014</p>	HTWG	RCC	
WM.08	Pricing and Cost Recovery Mechanism for Reserves in the Philippine WESM Issue 1.0	<ul style="list-style-type: none"> Scored lowest on compliance, context, and governance 	<p>Comply with the recommendations</p> <p><u>Measure of completion:</u> Submission of proposal to the RCC</p>	Dependent on ERC approval of application re Reserve Market	HTWG	RCC	
WM.09	Dispatch Protocol Manual Issue 6.0	<ul style="list-style-type: none"> Scored lowest on context 	<p>Comply with the recommendations</p> <p><u>Measure of completion:</u> Submission of proposal to the RCC</p>	5/30/2014	HTWG	RCC	
WM.10	Management of Must-Run Units Issue	<ul style="list-style-type: none"> Scored lowest on timeline and governance 	Comply with the recommendations. The RCC is currently discussing the		HTWG	RCC	Dependent on RCC's discussion.

Ref No.	WESM Manual / Internal Procedure	Findings / Recommendations	PEMC Response and Action Plans	Target Date of Completion	Accountable Party	External Party Involved	Resources / Constraints
	4.0		proposed MRU Manual Issue 5.0. The HTWG suggested that the recommendations of PA be considered in the deliberation of the RCC. <u>Measure of completion:</u> Consideration of RCC of PA's recommendations.				
WM.11	Procedures for Start Up and Shutdown of Generators Issue 1.0	<ul style="list-style-type: none"> Scored lowest on timeline 	Comply with the recommendations <u>Measure of completion:</u> Submission of proposal to the RCC	5/30/2014	HTWG	RCC	
WM.13	Guidelines on Significant Variations in and between Trading Periods	<ul style="list-style-type: none"> Scored lowest on process 	Comply with the recommendations <u>Measure of completion:</u> Submission of proposal to the RCC	5/30/2014	HTWG	RCC	

V. AUDIT WORK AREA: BID-TO-BILL ANALYSIS

Ref No.	Type	Findings	Recommendations	PEMC Response and Action Plans	Target Date of Completion	Accountable Party	External Party Involved	Resources / Constraints
PA.BB.3	Key, New	Effective prices paid by customers vary from market prices. The combination of ex-ante and ex-post pricing in the WESM can at times result in effective energy prices that have	We note that the recent Market Design Study has made recommendations that are under consideration which involve shortening of the Trading Interval	For consideration in the WDS recommendations. For further comment of the		WDS TWG		

Ref No.	Type	Findings	Recommendations	PEMC Response and Action Plans	Target Date of Completion	Accountable Party	External Party Involved	Resources / Constraints
		little relation to market prices	and corresponding changes to the pricing principles. Such changes to the market would remove this issue.	WDS TWG.				
PA.BB.4	Key, New	<p>The calculation of the Line Rental Trading Amounts has some issues:</p> <ul style="list-style-type: none"> • LRTAs calculated ex-ante may not reflect actual market costs when the BCQ is greater than the forecast. • LRTAs calculated on BCQs pro-rated to the Customer's Market Trading Nodes (MTNs) can differ from the Customer's actual BCQ allocations. • Inclusion of the Metered Quantities of an aggregator's indirect participants may be inappropriate 	<p>Improve calculation and communication of Line Rental Trading Amounts</p> <p>Communicate LRTAs as being for informational purposes only and investigate options to improve the calculation of LRTAs to meet participants' requirements.</p>	<p>For further study.</p> <p>For further comment of BSMD.</p>	TBD by BSMD	BSMD		