

Independent Review of the System Operations of the National Grid Corporation of the Philippines (SO)

DRAFT

I. INTRODUCTION

The PEM Audit Committee, through Independent Reviewer, has conducted four (4) Independent Operational Audit of the Systems and Procedures on Market Operations since 2009 up to 2013.

To ensure consistency in the evaluation of data and reconciliation of the MO audit findings and considering the significance of the System Operator's (SO) operations, processes and input data to the over-all efficiency and effectiveness of the Wholesale Electricity Spot Market (WESM), there is a need to conduct an independent review of the SO's functions and responsibilities under the WESM Rules.

Therefore, in accordance with ERC Resolution __, Series of 2014 dated December 18, 2014, the PEM Audit Committee (PAC) is authorized to conduct an Independent Review of the Operations of the National Grid Corporation of the Philippines vis-a-vis their responsibilities under the WESM Rules as SO.

The Independent Review of the Operations of the SO (the "SO Review") shall be conducted by the PAC, under the supervision of the Department of Energy (DOE) and the Energy Regulatory Commission (ERC), through an independent third party audit.

The National Grid Corporation of the Philippines

Incorporated in 2008, the National Grid Corporation of the Philippines (NGCP), is a private corporation awarded with the franchise to "operate, manage and maintain, and in connection therewith, to engage in the business of conveying or transmitting electricity through high voltage back-bone system of interconnected transmission lines, substations and related facilities, system operations, and other activities that are necessary to support the safe and reliable operation of the transmission system and to construct, install, finance,

manage, improve, expand, operate, maintain, rehabilitate repair and refurbish the present nationwide transmission system of the Republic of the Philippines.”¹ It was further mandated to “continue to operate and maintain the sub-transmission system which have not been disposed by TRANSCO”² and “authorized to engage in construct, install, finance, improve, expand, rehabilitate and repair the nationwide transmission system and the grid of the Republic of the Philippines, ancillary business and any related business which maximizes utilization of its assets such as, but not limited to, telecommunications system, pursuant to Section 20 of Republic Act No. 9136.”³

The privatization of the transmission business and the scope of the franchise granted to NGCP was made further to the mandate of Republic Act No. 9136 otherwise known as the Electric Power Industry Reform Act, or the EPIRA, Section 21 of which states:

SECTION 21. TRANSCO Privatization. — Within six (6) months from the effectivity of this Act, the PSALM Corp. shall submit a plan for the endorsement by the Joint Power Commission and the approval of the President of the Philippines. The President of the Philippines thereafter shall direct PSALM Corp. to award, in open competitive bidding, the transmission facilities, including grid interconnections and ancillary services to a qualified party either through an outright sale or a concession contract. The buyer/concessionaire shall be responsible for the improvement, expansion, operation, and/or maintenance of its transmission assets and the operation of any related business. The award shall result in maximum present value of proceeds to the national government. In case a concession contract is awarded, the concessionaire shall have a contract period of twenty-five (25) years, subject to review and renewal for a maximum period of another twenty-five (25) years.

In any case, the awardees shall comply with the Grid Code and the TDP as approved. The sale agreement/concession contract shall

¹ Section 1, Republic Act No. 9511

² Ibid.

³ Ibid.

include, but not limited to, the provision for performance and financial guarantees or any other covenants which the national government may require. Failure to comply with such obligations shall result in the imposition of appropriate sanctions or penalties by the ERC.

The awardee shall be financially and technically capable, with proven domestic and/or international experience and expertise as a leading transmission system operator. Such experience must be with a transmission system of comparable capacity and coverage as the Philippines.”

Having been given the mandate for the operations, management and maintenance of system operations, the SO balances the supply and demand of electricity to efficiently serve all of its customers —both in generation and utilization. It is responsible for dispatching generation facilities and Ancillary Service Providers and transmitting this to the various distribution utilities which, in turn, deliver the electricity at a lower voltage rating to households and other end-users. SO also operates and maintains metering facilities and provides technical services, particularly system studies, and operation and maintenance of customer facilities.

SO operates in all of the three major Philippine islands: Luzon, Visayas, and Mindanao (“LVM”, collectively). Luzon is the region with the largest grid in SO’s network, composed of Metro Manila, Northern Luzon, and Southern Luzon. It is the country’s main industrial and commercial region, which accounts for 74% of the country’s total power demand in 2012. Visayas is composed of separate but interconnected island grids of Cebu, Negros, Panay, Leyte, Samar, and Bohol, which accounts for 14% of the country’s power demand. Situated in the southernmost section of the Philippine archipelago, Mindanao is the second largest island group in the Philippines, which accounts for 12% of total power demand in the country.

Governing Rules and Regulations

As the SO of the power grid, its primary responsibility is to balance the demand and supply of electricity to efficiently serve all of its customers which include generators, private distribution utilities, electric cooperatives,

government-owned utilities, ecozones, industries, and directly connected companies in accordance with the following rules and guidelines (the “Governing Rules and Regulations”), among others:

- 1.1. Electric Power Industry Reform Act of 2001 (EPIRA) and its Implementing Rules and Regulations;
- 1.2. WESM Rules and Manuals;
- 1.3. Philippine Grid Code (PGC);
- 1.4. Open Access Transmission Service (OATS),
- 1.5. Ancillary Services Procurement Plan (ASPP);
- 1.6. Procedures on Dispatching, Operations Planning, Ancillary Services, Grid Protection, Supervisory Control and Data Acquisition (SCADA), Energy Management System (EMS), Grid Security, and other protocols covering SO;
- 1.7. ERC Rules and Regulations;
- 1.8. Republic Act No. 9511 (NGCP Franchise Act); and
- 1.9. DOE Circulars.

Capitalized terms used in this Terms of Reference not otherwise defined herein shall have the same meaning as defined in the relevant Governing Rules and Regulations.

PEMC and SO Coordination in the WESM

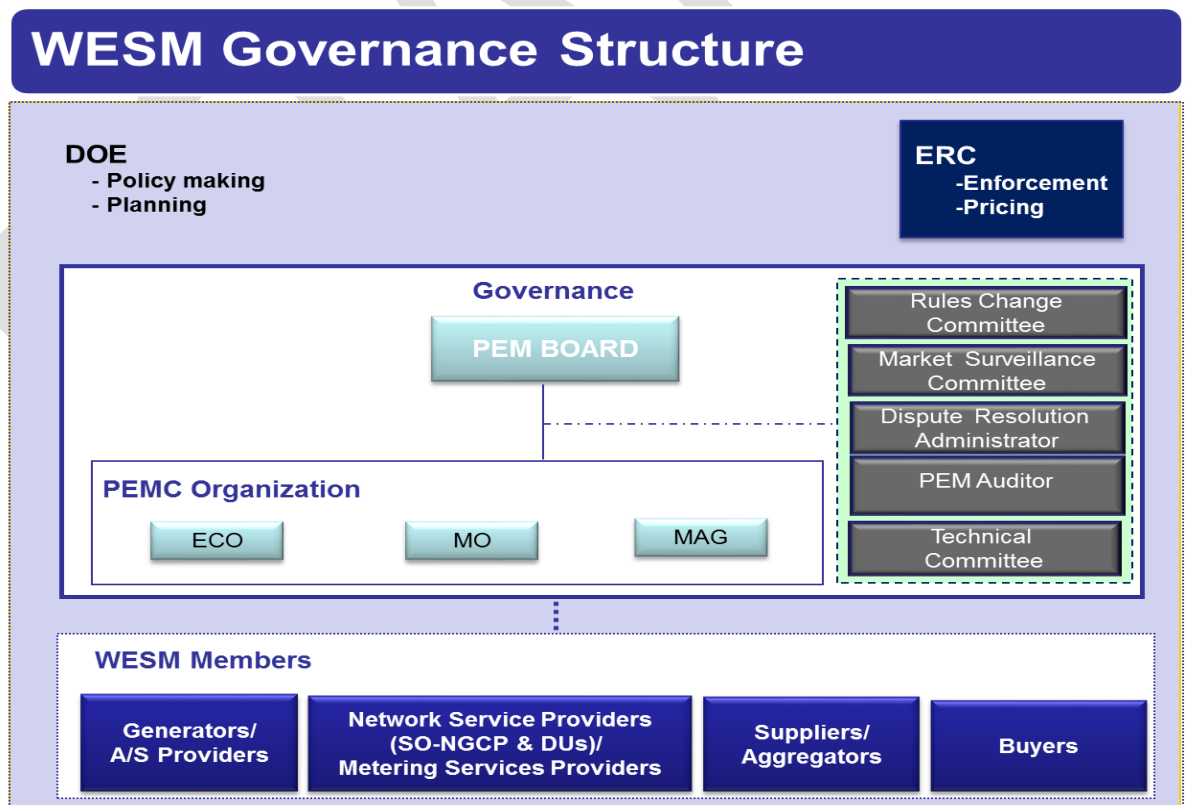
In accordance with the EPIRA, the WESM was established by the DOE to facilitate a competitive market environment in the Philippine electricity industry. The PEMC as the Autonomous Group Market Operator (AGMO), is a non-stock and non-profit organization with equitable representation from electric power industry participants, was constituted by the DOE in November 2003 to operate the WESM in the interim.

Currently, the WESM is operational in Luzon and Visayas whereas the Interim Mindanao Electricity Market commenced operations in December 2013.

As the AGMO, PEMC ensures the optimal dispatch of generation based on the submitted offers from generators, bids from customers and conditions of the grid from SO, wherefrom a spot price for electricity throughout the grid is set. It facilitates the settlement of financial accounts of the trading participants based on the same sources of information.

SO provides the central dispatch to all generation facilities and Ancillary Service Providers to the transmission system, in accordance with the dispatch schedule submitted by the Market Operator (MO). The SO, in coordination with the MO, significantly contributes in the development of procedures, processes or systems of the WESM operations.

Figure 1 Governance Structure of the Philippine WESM



II. OBJECTIVES OF THE REVIEW

The SO Review shall be conducted to accomplish the following objectives:

1. Review and assess the compliance by the SO with the Governing Rules and Regulations as defined above;
2. Evaluate and confirm if the actions taken or responses by the SO are in accordance with the Governing Rules and Regulations;
3. Identify the appropriate steps and measures to help the SO effectively and efficiently perform its responsibilities in time and form in accordance with the WESM Rules;
4. Validate the completeness and accuracy of the data and information given by the SO during the audit of MO for the years 2009 to 2013;
5. Review and assess the sufficiency and effectiveness of the systems, procedures and other work processes used by the SO in complying with its functions and responsibilities under the Governing Rules and Regulations, including, but not limited to, an assessment on whether the SO practices and work processes ensure the necessary transparency, independence, predictability and non-discrimination required of the SO, and whether these systems and processes are in compliance with the WESM Rules and best international practices;
6. Review and assess the sufficiency of the infrastructure used by the SO in carrying out its functions and responsibilities under the Governing Rules and Regulations;
7. Propose recommendations to improve the procedures to collect and process the information and controls of quality and security of data for the WESM;
8. Review and assess the accuracy and appropriateness of the interfaces and exchange of information among the MO, System Operator (SO), Generator-Trading Participants and other service providers in relation to system operations;

9. Review and assess the accuracy, reliability and availability of SO generated data and information in accordance with its duties and responsibilities under the Governing Rules and Regulations;
10. Propose measures to harmonize any conflicting provision in and/or recommend measures for the consistent implementation of the Governing Rules and Regulations; and
11. Review and assess the competencies (licensure and professional requirements) of SO staff to operate or perform functions relative to SO (i.e., those assigned to dispatch centers).

III. REVIEW REQUIREMENTS

General Scope of Work and Period Covered

The SO Review shall cover **[insert start of MO audit] 2009 to June 2015** involving a thorough examination and evaluation of SO function, systems, data, processes, infrastructure, interface, compliance and conduct as mandated by the Governing Rules and Regulations and guided by Section II (Objectives of the Review). The audit should include a review of all activities of the SO as they are performed through its organizational units such as, but not limited to:

1. Network Operations Division (NOD);
2. Power Network Planning Division (PNPD);
3. Grid Security Management Division (GSMD);
4. Network Protection Division (NPD);
5. SCADA/EMS Division;
6. Telecom; and
7. Technical Services Division.

The audit shall cover SO's operations for Luzon, Visayas and Mindanao.

Independent Reviewer Tasks

Prior to the start of audit work the Independent Reviewer is required to consult with the market participants and stakeholders. The initial consultation aims to aid the Independent Reviewer in drafting the Inception Report. Further, upon completion of the significant issues report and final report, the Independent Reviewer is required to meet with market participants and stakeholders to brief them on its major findings from the audit and its recommendations for future improvements as well as to seek their feedback thereon.

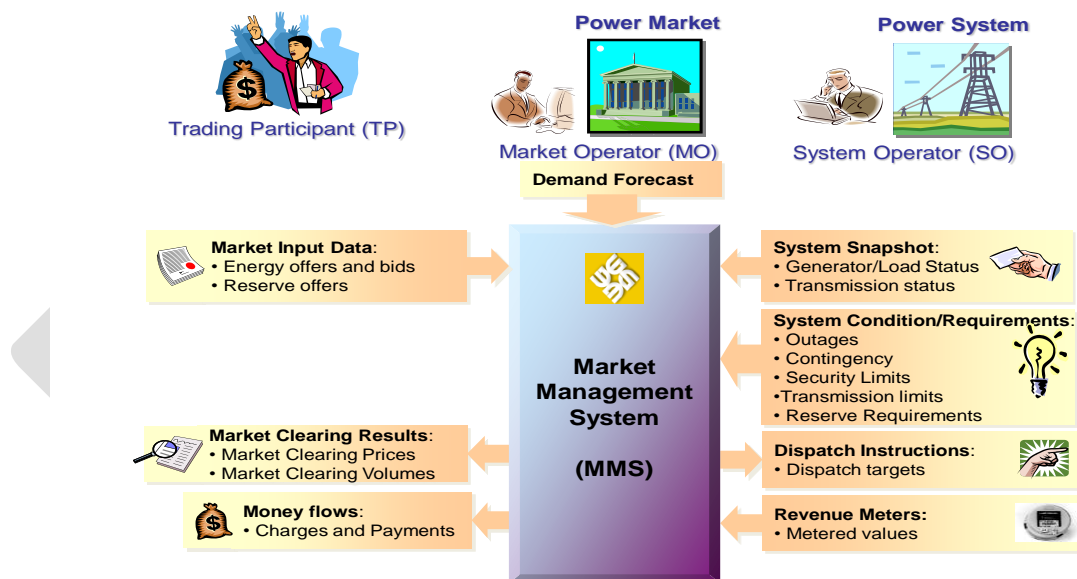
The Independent Reviewer is expected to conduct the following tasks, among others:

1. Perform complete audit in accordance with the Objectives outlined in Section II;
2. Continuous interface with stakeholders to identify significant issues including interface aspects outlined below;
3. To render Best Practice Recommendation, particularly:
 - 3.1 Recommend corrective measures and obtain SO's response and action plans to address identified non-compliance issues;
 - 3.2 Provide and propose enhancements to achieve better international practices where opportunities for improvements in processes are identified in the course of audit.
4. Identify inconsistencies in the Governing Rules and Regulations and in the conduct of SO and recommend corrective measures to harmonize implementation of the Governing Rules and Regulations.

Review of Interface Relationships

The SO Review shall cover the relevant interfaces [**specify the interfaces**] of the SO with the MO and its customers which include generators, private distribution utilities, electric cooperatives, government-owned utilities, economic zones, industries, and directly connected companies, as shown in the figure below.

Figure 2: Interfaces in the WESM



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Other interface aspects of the SO to be considered are: re-dispatch, significant incident report such as yellow alert, AS levels, ALDs/MLDs.

In relation to the WESM operations, the Independent Reviewer shall review the sufficiency of the information, processes, systems and procedures of the SO as required of the SO under the Governing Rules and Regulations and validate the correctness of market information and results being generated

from data acquired by the MO from the SO. Table 1 lists the vital information and inputs provided by SO to the MO.

Table 1: Data Coming From the SO

Input	MO Processes	Output
Energy Management System (EMS) Snapshot Load Pattern Data	Load Forecasting	Load forecasts (RTD, DAP, WAP)
	Scheduling and Pricing	RTD and RTX schedules
Outage schedules Contingency List Transmission and Security Limits Reserve requirements	Scheduling and Pricing	RTD and RTX schedules
System notices on network configuration	Updating of the Market Network Model (MNM)	MNM used in dispatch and scheduling
Daily Operations Report (DOR)	Market Monitoring	Market assessment reports; market monitoring indices

Input	MO Processes	Output
Redispatch instructions such as MRU, MOT, AS		
Other data or information required by the Governing Rules and Regulations		

1. Compliance Review

1.1 Assess and verify compliance with the WESM Rules and Manuals including but not limited to the following:

1. Dispatch Protocol;
2. System Security and Reliability Guidelines;
3. Management of Must Run Units;
4. Management Procedure for Load Shedding;
5. Emergency Procedures;
6. Management Procedure on Excess Generation; and
7. Ancillary Services Monitoring.

1.2 Assess and verify compliance with the provisions on Grid Operations, Scheduling and Dispatch provided under the PGC;

1.3 Assess and confirm if Grid Code Compliance Plan submitted to the ERC is being implemented as scheduled;

1.4 Assess and verify compliance with the OATS Rules;

1.5 Assess the compliance to provide Ancillary Services;

1.6 Assess and verify compliance with the ASPP approved by ERC;

1.7 Evaluate the technical requirements and the procedures for the testing and accreditation of ancillary services providers, such as but not limited to the following;

- 1.7.1 Governor characteristics (i.e.droop)

1.7.2 Automatic Generation Control information (i.e. frequency bias, response time)

1.8 Assess and verify if the required system reserve requirements are being satisfied at all times. If not, delve into the reasons for the non-compliance and the plans to address the problem; and

1.9 Validate suitability and effectiveness of mechanism/systems used by SO in monitoring compliance of ancillary services providers.

2. Process and Procedure Review

- 2.1 Assess and confirm if the actions taken or responses by the SO are in accordance with the Governing Rules and Regulations;
- 2.2 Assess if single outage (N-1) contingency criterion is being satisfied at all times. If not, look into the measures being undertaken to meet this PGC requirement;
- 2.3 Assess the measures being implemented to address credible multiple outage contingency events, such as the application of Special Protection Systems;
- 2.4 Assess SO's process in designating Must-Run Units;
- 2.5 Assess the adequacy of the Automatic Load Dropping procedures and execution;
- 2.6 Assess the adequacy of the System Operator's process in ensuring the reliability and security of the grid;
- 2.7 Assess the interfaces procedures, processes or system among the Market Operator and the System Operator;
- 2.8 Validate if network congestion problems as identified by the ERC, GMC and PEMC/MO are being properly addressed by transmission upgrade and expansion projects;
- 2.9 Assess if SO has internal operating guidelines and are in accordance with internationally accepted standards; and
- 2.10 Confirm if documented internal operating guidelines, standards, procedures and work instructions are being followed. Validate if these documents are aligned or harmonized with the PGC, WESM Rules and Manuals (e.g. manual operation of load tap changer).

3. IT Systems Review

- 3.1 Examine the System Operator's IT systems (including SCADA);

3.2 Assess the process used by SO in updating real-time information with a view to investigating how the accuracy of their real-time data can be improved;

3.3 Validate the correctness of market information and results being generated from data acquired by the MO from the SO;

3.4 Review the security of the systems used by the SO

4. Materiality

The materiality levels for the tests of transactions and significant findings shall be set and disclosed by the Independent Reviewer, subject to review and approval of the PAC and TWG to be constituted by the PAC composed of representatives from DOE, ERC and PAC.

Upon the discretion of the Independent Reviewer and review of the PAC and DOE, another threshold may be adopted for the reporting of significant issues identified during the course of the review, although it is recognized that there may be qualitative aspects in determining the significance of any issue. That is, the Independent Reviewer shall report and evaluate the impact of the issues that come to its attention that exceed this significant issues threshold, or that it believes to be significant for other reasons.

IV. IMPLEMENTATION ARRANGEMENTS

Indicative Schedule

The SO Review envisaged that the review would be undertaken for a maximum of 180 working days (roughly, 6 months) in accordance with the following schedule:

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|---|-----------|
| 1. Commencement of the review and submission of the Inception Report to the PAC and TC, | - |
| 2. Submission of Progress Report | - Monthly |
| 3. Submission of Significant Issues Report applicable | - as |
| 4. Submission of Draft Review Reports | - |
| 5. Submission of Final Reports | - |

Interfaces

The Independent Reviewer shall be reporting to the PAC for the duration of the audit.

All activities of the Independent Reviewer shall be accordingly coordinated with the PAC, through the PEMC-Market Assessment Group (MAG). The PAC, through the MAG, shall provide linkages of Independent Reviewer with the SO and SO Management and DOE. The SO, in coordination with the MAG, shall extend all reasonable support to the Independent Reviewer for the duration of services, which shall include, among others:

1. Facilitate access to the use of all relevant software;
2. Facilitate technical assistance from all relevant personnel;
3. Provide necessary office space;

4. Facilitate access to all data and information for the implementation of the audit; and
5. Arrange meetings with the PAC and other relevant group or personnel of SO to discuss schedule and methodology pertaining to the conduct of the audit.

Confidentiality

Except with the prior written consent of the PAC and TWG, the Independent Reviewer shall not, at any time, copy, reproduce, sell, assign, license, market, transfer or otherwise communicate to any person or entity any Confidential Information disclosed to them for the purpose of the audit service, or discovered by them in the course of the review nor shall the Independent Reviewer make public any information as to the recommendations formulated in the course of or as a result of the review.

Confidential Information includes, without limitation, papers, programs, trade secrets, plans, participant information, billing and settlement information, metering data, and personnel records related to the business activities, research or development of the SO, PEMC and/or the WESM. All SO/PEMC-developed or delivered protocols, software (in any media) and software documentation, and all Work Product as subsequently defined below, are likewise deemed Confidential Information.

Work Product is defined as all notes, information, data, reports, and memoranda pertaining to market participants submitted to the WESM or to the SO.

Notwithstanding the above, the Independent Reviewer shall comply with the rules of confidentiality as prescribed under the Philippine Grid Code, the WESM Rules and the relevant Governing Rules and Regulations. The Independent Reviewer shall keep the confidentiality of any disaggregated information or data pertaining to a market participant and shall communicate or publish the same without prior written consent of the market participant concerned.

V. Deliverables

The Independent Reviewer shall submit two (2) original hard copies and soft copies of the reports, which will include the following:

5.1 Inception Report

Within the first two weeks of the audit implementation, the Independent Reviewer shall clearly explain its Audit Plan and Methodology through the Inception Report, which shall be submitted in soft copies and two (2) hard copies.

Among others, the report shall provide the audit process, indicative schedule of client interaction during the duration of audit work and submission of deliverables. The report shall be agreed upon by the Independent Reviewer, PAC and DOE.

5.2 Progress Reports

The Independent Reviewer shall regularly inform the PAC of the status and relevant developments of the audit activity through Progress Reports which shall be submitted monthly from the start up to the conclusion of the audit in soft copy and two (2) hard copies.

The Progress Report shall provide highlights of document reviews and interviews of relevant SO personnel and other parties. An inventory of outstanding issues, recommendations and status of all identified issues shall also be provided.

5.3 Significant Issues Report

The Independent Reviewer shall immediately inform the PAC of any identified inconsistencies or non-compliance of the systems and procedures under the relevant rules and guidelines through a Significant Issues Report which shall be submitted in soft copy and two (2) hard copies.

The Independent Reviewer shall discuss with the PAC, SO, DOE, and other entities as may be determined by the PAC, if necessary, its draft findings before submitting the Review Reports.

5.4 Final Report

As the end-product of the SO Review, the Independent Reviewer shall submit the following Review Reports:

- 4.1 Independent Review Report on Luzon Operations;
- 4.2 Independent Review Report on Visayas Operations;
- 4.3 Independent Review Report on Mindanao Operations; and
- 4.4 Public Summary Report.

A Review Report contains the complete findings of the Independent Reviewer specifically addressing all the components of audit identified in this Terms of Reference.

The Review Report shall provide, among others, the following:

1. Audit Opinion on the SO's compliance with and actions taken in relation to the rules and guidelines which are covered in the scope;
2. Audit methodology;
3. Main findings; and
4. Recommendations, such as possible improvements, amendments, harmonization with the relevant rules and guidelines, operating procedures, control objectives, specific controls, practices and processes, to address non-compliance and other issues such as quality control and best practices, among others.

The Independent Reviewer shall discuss the draft Review Reports with the PAC and SO Management and other entities as may be determined by the PAC, if necessary.

The Independent Reviewer shall present its findings to the PAC, SO, PEM Board, DOE, WESM Participants and other entities as may be determined by the PAC, if necessary.

The final and complete Review Report shall be made available to the PAC, SO, PEM Board, DOE, ERC and the WESM Participants.

5.4 General Qualification of External Audit Team Members

The Independent Reviewer's Audit Team shall have competent professionals that have adequate experience and capability of understanding the business, information technology (IT), controls and processes that are adopted by similar system operators in other electricity networks and electricity markets which are applicable to the WESM.

The composition of the team shall have the following qualifications:

1. The Team Leader shall have project management skills and strong background in system operations in electricity networks;
2. The members of the Audit Team shall include, but are not limited to, the following:
 - 2.1. Audit expert (operations);
 - 2.2. Information and communications technology expert;
 - 2.3. System operations expert;
 - 2.4. Electricity market operations expert; and
 - 2.5. Regulatory expert (Legal, Finance, Economics).
- 3.1 Audit Team members shall have one of the following qualifications, or their equivalent:
 - 3.1.1 Certified Information Systems Auditor (CISA);
 - 3.1.2 Certified Information Systems Security Professional (CISSP);
 - 3.1.3 ISO 27001 Auditor Certification for Information Security Management Systems (ISMS); and

3.1.4 Certified Internal Auditor (CIA).

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