Philippine Electricity Market Corporation

WHOLESALE ELECTRICITY SPOT MARKET
RULES CHANGE COMMITTEE

RESOLUTION NO. 2014-03

Proposed Amendments to the Manual on Market Network Model Development and Maintenance--Criteria and Procedures

WHEREAS, on 06 November 2013, the Rules Change Committee (RCC) received the Philippine Electricity Market Corporation's (PEMC) Proposed Amendments to the Manual Market Network Model Development and Maintenance--Criteria and Procedures (attached as ANNEX A);

WHEREAS, the Proposal is aimed at addressing specific audit findings and recommendations relative to the subject Manual, and likewise, to improve the document with regard to context, accountability, and publication;

WHEREAS, the Proposal was presented by PEMC to the RCC during the 80th RCC Meeting held on 06 November 2013;

WHEREAS, during the same meeting, the RCC approved the posting of the Proposal in the WESM Market Information Website, to solicit comments from Market Participants and other interested parties;

WHEREAS, the Proposal was posted in the public information website on 12 November 2013, with the notification-email requesting comments from interested parties issued the following day;

WHEREAS, on 13 December 2013, the RCC received comments from the SN Aboitiz Power (SNAP) in relation to the proposal (attached as ANNEX B) and the PEMC's corresponding comments thereto (attached as ANNEX C);

WHEREAS, during the 82nd RCC Meeting held on 08 January 2014, the RCC deliberated on the matter, including the comments received from SNAP (attached as ANNEX D);

WHEREAS, during the same meeting and after due deliberation on the matter, the RCC passed a Resolution approving the Proposed Amendments to the Manual Market Network Model Development and Maintenance--Criteria and Procedures, as discussed and thereafter revised, and its endorsement to the PEM Board;

NOW THEREFORE, we, the undersigned and in behalf of the sector we represent, hereby resolve as follows:

RESOLVED, that the Proposed Amendments to the Manual Market Network Model Development and Maintenance--Criteria and Procedures (attached as ANNEX E) are hereby adopted and approved;

RESOLVED FURTHER, that the attached Proposed Amendments to the Manual Market Network Model Development and Maintenance--Criteria and Procedures be endorsed to the PEM Board for its approval.

Done this 08 January 2014, Pasig City.

Approved by: RULES CHANGE COMMITTEE [redacted] **Rowena Cristina L. Guevara** Chairperson University of the Philippines (UP)	
Members:	
[redacted] **Concepcion I. Tanglao** Independent	[redacted] **Francisco L.R. Castro, Jr.** Independent Tensaiken Consulting
[redacted] **Maila Lourdes G. de Castro** Independent	[redacted] **Jose Ferlino P. Raymundo** Generation Sector SMC Global
Theo Cruz Sunico Generation Sector 1590 Energy Corporation (1590 EC)	[redacted] **Joselyn D. Carabuena** Generation Sector Power Sector Assets and Liabilities Management Corporation (PSALM)
Gilbert A. Pagobo Distribution Sector (PDU) Mactan Electric Company (MECO)	**Ciprinilo C. Meneses** Distribution Sector (PDU) Manila Electric Company (MERALCO)
[redacted] **Jose P. Santos** Distribution Sector (EC) Ilocos Norte Electric Cooperative, Inc. (INEC)	[redacted] **Sulpicio C. Lagarde Jr.** Distribution Sector (EC) Central Negros Electric Cooperative, Inc. (CENECO)
[redacted] **Loreto H.Rivera** Supply Sector Team Energy	[redacted] **Isidro E. Cacho Jr.** Market Operator Philippine Electricity Market Corporation (PEMC).

[redacted]

[redacted] **Ambrocio R. Rosales** Transmission Sector National Grid Corporation of the Philippines (NGCP)	
	Certified True and Correct: [redacted] **Elaine D. Gonzales** RCC Secretary PEMC

[redacted]

Wholesale Electricity Spot Market

ANNEX A

WESM-WM-(Manual)-CN - RCC / ORCP - WM-13-12

REQUEST FOR AMENDMENTS OR CHANGES TO THE WESM MANUALS

Proposals made only under this prescribed form shall be accepted and considered as submitted:

This request for amendments to the WESM Rules can be submitted to:

PEM Board
Attention: **PEM Committee Secretariat**
Philippine Electricity Market Corporation
18/F Robinsons Equitable Tower
ADB Avenue, Ortigas Center
Pasig City, 1605 Philippines
Email address: rcc@wesm.ph
Fax Number: (+632) 395-2704

I. Proposer's Information

Name	**Melinda L. Ocampo**
Designation	President
Signature	[redacted]
Company	Philippine Electricity Market Corporation
Company Address	9th and 18th floors Robinsons Equitable Tower
	ADB Avenue, Ortigas Center
	Pasig City
Telephone No.	631-8734 loc 225 or 297
Fax. No.	
Email Address	

II.WESM Manual Amendments Information

Title of WESM Manual being commented:

Market Network Model Development and Maintenance – Criteria and Procedures

Nature of Request (please indicate with x)
☒ Addition ☒ Alteration ☒ Deletion ☒ Clarification ☐ Clerical Correction

[redacted]

III. Proposed Amendment

The proposed revisions aim to incorporate in the MNM Development and Maintenance Manual the internal and external processes involved in updating the MNM that were not captured in the original version, and also to incorporate changes that will address the operational audit findings.

The arrangement of the Sections and subsections were also revised, according to the recommended format by the TWG on Harmonization of Market Manuals.

The major changes to the document are described in the succeeding paragraphs.

Section 4: Market Network Development

This section is the gist of the entire MNM Manual, and therefore it should contain more descriptions of the various activities relevant to the development and maintenance of the MNM based on the current procedures approved internally and externally. The major changes to the section are summarized as follows:

- The portions that detail the development of the network model prior to the commercial operations were removed.
- Inclusion of a section providing the responsibilities of the MO, SO, and TPs in the development and maintenance of the MNM.
- Inclusion of a timetable, which is in a tabular format, containing the activities related to the development and maintenance of the MNM. It also lists the parties responsible for each activity.
- Deletion of all the appendices that describe the development of the MNM prior to commercial operations. The only attachment retained is the exhaustive list of power flow components required by the MMS. The format of this attachment was also changed into a tabular format.
- Removed the portion describing the metering point as part of the MNM components since the metering point is not modeled in the MNM based on the current practice.

Section 5: Market Network Model Maintenance

This section describes the maintenance of the documentation of the MNM. Instead of maintaining hard copies of MNM documents for each MNM revision, it is proposed that hard copies of the documents will be generated quarterly. Maintaining a load flow save case in PSSE format for each MNM revision will also be removed as it is no longer applicable necessary.

One recommendation of the TWG was to include a provision that will require the System Operator to regularly provide the Market Operator with an updated Single Line Diagram, and PSSE files. This is a recommendation of the TWG, since it was declared by the ERC (ERC resolution 2009-180) that these data are not considered confidential. This will aid the Market Operator in conducting annual operations audit.

The section title was also revised and renumbered to "Section 6 Market Network Model Maintenance and Publication". This revised section will now contain the contents that were

originally under Sections 6: MNM Publication, Section 9: Auditing of MNM, Section10: Regulatory Filing, Section 11: Dispute Resolution, and Section 12: Continuing Obligations and Responsibilities.

Section 7: Market Trading Node

This section was originally under Section 8, now renumbered to be "Section 7 Market Trading Node."

Definitions of generator nodes and customer nodes were provided with additional descriptions to be more understandable to the reader. Generator Trading Participants shall also be modeled as a load resource, to account for their station service use. That trading participant shall have a generating resource and a load resource registered to it, to be able to monitor its injection and withdrawal from the grid. This additional clarification is included in section 7.4.2.

The description of the modeling of the dispatchable generators was revised to provide additional clarification on how the embedded generators are modeled in the MNM. The revised provision will be found in section 7.5.6.

Section 8: Revision, Publication, and Effectivity

This is a new section, to comply with the recommended new format of the WESM Manuals. This section contains descriptions of the events that may prompt future revisions to the MNM Manual. It is proposed that the following occasion will trigger the amendments:

1. Results recommended by the auditor through the conduct of the Annual Operations Audit
2. Directives and Policy changes issued by the Department of Energy that relates to the treatment and modeling of power system components

The publication and effectivity of the revised manual will be subject to existing provisions in the Rules Change Manual.

Appendices and Attachments

The following attachments/appendices were removed since they are no longer relevant to the operations:

- Appendix 2: MNM Procedural Timeline
- Appendix 2A: Procedural Steps for Market Network Model
- Appendix 3: Work Flow-Market Network Model Prior to Market Trials
- Appendix 4: Work Flow-Prior to Commercial Operation
- Appendix 5: Data for Submission Prior to Market Trial

Appendix 1 was retained since it contains the complete list information that is provided by the System Operator in order to develop and update the Market Network Model. However the original exhaustive list was revised, to include only those data that are regularly provided by the System Operator along with their official notification of network changes.

[redacted]

IV. Proposed Scheme to Monitor the Effectiveness of the Proposed Changes to the WESM Manual

V. Referral

MAG Date Received: 06 November 2013

Proposed Amendment: ☐ Urgent ☐ Minor ☐ General

A. For Urgent Amendment (For the use of PEMC President only)

Date Referred to PEMC President	☐ Yes	☐ No
Certifies as urgent	☐ Yes	☐ No
Convene the RCC within 48 hrs.		
Remarks:		

B. For Minor and General Amendment (For the use of RCC only)

Date Referred to RCC:	06 November 2013
Remarks:	

Action taken:	
Request for comments:	☐ Yes ☐ No
	Request written comments from: ☐ DRG ☐ MSC ☐ PA ☐ MO ☐ ECO ☐ RCC ☐ TC ☐ Other PEM Board Committees ☐ Other Interested Parties
For further review of the Technical Sub-Committee:	☐ Yes Assigned to: ☐ SO Sub-Committee ☐ MO Sub-Committee ☐ Metering Sub-Committee ☐ Billing and Settlement Sub-Committee ☐ Legal and Regulatory Sub-Committee
	☐ No
For public consultation:	☐ Yes ☐ No
RCC Resolution:	☐ Approved ☐ Disapproved
RCC Resolution No.:	
Date of Resolution:	
RCC Meeting No.	
Date of endorsement to the PEM Board:	

REC / ORCP-WM-15-12

PUBLIC

WESM Manual

Market Network Model Development and Maintenance – Criteria and Procedures
Issue 3

Abstract	This document describes the processes involved in the development, approval, publication and revision of the WESM market network model.

Document Identity: WESM-MNMCP-003
Issue: 3
Reason for Issue: Compliance to Audit Findings
Approval Date:
Publication Date:
Effective Date:

[redacted]

Document Change History

Issue No.	Proponent	Date of Effectivity	Reason for Amendment
0.0	MOSubcom	5/21/04	New Document New Draft Format
0.1	MOSubcom	6/8/04	New Document Incorporating Subcom Comments
0.2	MOSubcom	6/16/04	Revision Incorporating Initial TWG Comments
0.3	TWG	8/17/04	As approved by the WESMTWG
2.0	MOSubcom	8/11/06	To clarify the audit provision in Section 9 stating the Grid Management Committee as the technical body to audit the MNM Incorporate provisions on aggregated/disaggregated representation of generators and loads in Section 7.0 Alteration and Revision to the MNM Revise provision on the approval process in Section 7.0
3	PEMC	June 2013	Revised for consistency with the WESM Rules and compliance to the market operation audit findings.

Document Approval

Issue No.	RCC Approval	RCC Resolution No.	PEM Board Approval	PEM Board Resolution No.
1				
2				
3				

Reference Documents

Document ID	Document Title
	WESM Rules
	Philippine Grid Code (PGC)
	Philippine Distribution Code (PDC)
WESM-PDM	Price Determination Methodology
WESM-RSDCP	WESM Market Manual on Registration, Suspension And De-Registration Criteria And Procedures
WESM-DRM	Dispute Resolution Market Manual
WESM-MSDM-MM	WESM Metering Market Manual
WESM-RCM	Market Manual of Procedures for Changes to the WESM Rules

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SECTION 1 INTRODUCTION

1.1 BACKGROUND

1.1.1 Pursuant to *WESM Rules* 3.2.1 and 3.2.2, this *Market Manual* consolidates the market procedures and associated forms, standards, and policies that define the *Market Network Model* (MNM) that shall be used in the operation of the Wholesale Electricity Spot Market (WESM). The documentation related to the MNM, which is published in the Market Information Website[1], provides more detailed descriptions of the requirements for the network model as specified in the *WESM Rules*. Where there is a discrepancy between the requirements in this document and the *WESM Rules*, the *WESM Rules* shall prevail. Standards and policies referenced or appended shall provide a supporting framework.

1.2 PURPOSE

The purpose of this Manual is to provide:

1.2.1 The methodology and criteria for the development, alteration and maintenance of the MNM that shall represent fairly, and in a manner that facilitate the consistent and reliable operation of the *power system:*

a) The *transmission network* under the control of the *System Operator,* and

b) Such other aspects of the *power system* which, when *connected,* may be capable of materially affecting *dispatch* of *scheduled generating units* or pricing within the *spot market.*

1.2.2 Procedure for the approval and publication of the MNM.

1.2.3 The responsibilities of the *Market Operator, the System Operator,* and the *Trading Participants* in the development, revision and maintenance of the MNM.

1.3 SCOPE

1.3.1 This *WESM Manual* implements the relevant provisions of Chapter 3 of the *WESM Rules* related to the *Market Network Model.*

1.4 APPROVAL OF THE MNM

1.4.1 Consistent *with WESM Rules* 3.2.1.5, any alteration recommended under Clause 3.2.1.4 shall be approved by the *PEM Board.*

[1] http://www.wesm.ph

1.4.2 Prior to the integration of a region in the commercial operations of the WESM, the development of the MNM incorporating the *power system* of such region shall be facilitated by the *Market Operator* in consultation with electric power industry participants prior to commencement of the spot market and shall be subject to approval by the *Philippine Electricity Market Board (PEM Board)*.

SECTION 2 DEFINITIONS, REFERENCES AND INTERPRETATION

2.1 DEFINITIONS

2.1.1 ***Generator Interconnection Lines*** refers to the lines connecting generating plants to the transmission system.

2.1.2 ***Load flow*** refers to the process for calculating currents, voltages, and real and reactive power flows at every *node* in a given *power system* condition.

2.1.3 ***Substation*** refers to the physical representation of *nodes* in the *power system*. They may be composed of several *nodes* corresponding to the low voltage and high voltage busses.

2.1.4 ***Sub-transmission Lines*** refers to the *power system* lines directly under the control of power distributors and cooperatives.

Other terms used in this document shall conform to the definition of terms under the *WESM Rules* and the *Philippine Grid Code (PGC)*.

2.2 INTERPRETATION

This *Market Manual* is intended for use of the *Market Operator, the System Operator, Network Service Providers*, the *Trading Participants* and their representatives, and other parties as appropriate. The standard conventions to be followed in this *Market Manual* are as follows:

2.2.1 The word "shall' denotes a mandatory requirement;

2.2.2 Terms and acronyms used in this *Market Manual* including all Parts thereto that are italicized have the meanings ascribed thereto in *WESM Rules*;

2.2.3 Any procedure-specific convention(s) shall be identified within the specific document itself.

SECTION 3 RESPONSIBILITIES

3.1 *MARKET OPERATOR*

3.1.1 The *Market Operator* shall be responsible for the development, validation, maintenance, publication and revision of this document in coordination with *Trading Participants* and the *System Operator*.

3.2 *SYSTEM OPERATOR* AND TRADING PARTICIPANTS

3.2.1 The *System Operator* and the *Trading Participants* shall provide the *Market Operator* with necessary information *and references for* subsequent *revisions and* validation of this document.

3.3 *NETWORK SERVICE PROVIDERS*

3.3.1 Pursuant to *WESM Rules* 3.5.2 and in accordance with the *Philippine Grid Code* and the *Philippine Distribution Code*, each *Network Service Provider* shall submit to the *System Operator* network data, and any revisions thereafter, under the *Network Service Provider's* control that is included in the MNM.

SECTION 4 MARKET NEWORK MODEL DEVELOPMENT

4.1 DEFINITION

4.1.1 The MNM is a mathematical representation of the *power system* that shall be used for the purpose of determining *dispatch schedules* and *energy* prices, and preparing market projections. It contains the technical characteristics of the *transmission network*, particularly its connectivity, and the capacities of each network element. It also represents the *node* assignments and size of each generator and load. The *node* assignments indicate where each generator injects power to the transmission network, and where each load withdraws power from the *transmission network*.

4.1.2 The MNM also identifies the *Market Trading Node* on which the transactions for *Trading Participants* shall be referenced.

4.1.3 The components of the MNM interacts with one another in accordance with *dispatch schedule* of the generation units, customer demand and the physical laws that govern the operation of the network components. These interactions are complex by nature but should be balanced to maintain the reliable and secure

operation of the *power system* by the *System Operator*, as well as for the generation of fair and economic market *dispatch schedules* and *nodal energy price*.

4.2 Responsibilities in Market Network Development

4.2.1 The *System Operator*, the *Network Service Providers*, and the *Trading Participants* shall provide the *Market Operator* with documents pertaining to *power system* changes that could trigger any change to the MNM topology and connectivity or parameter.

4.2.2 Specific responsibilities in the development of the MNM are highlighted in Section 4.5 of this document.

4.3 Criteria for the Market Network Model Development

The following outlines the criteria necessary to develop the MNM as provided in the *WESM Rules*:

4.3.1 Representation of the physical *Transmission System* of the Luzon, Visayas, and Mindanao grids using an alternating current (AC) and direct current (DC) load flow network model

4.3.2 Network data that accurately reflects the conditions prevailing on the network, including losses, constraints and contingencies, at any trading interval

4.3.3 Necessary simplifications based on the current best international industry practice

4.3.4 Pursuant to *WESM Rules* 3.2.1.2 (b), it shall include "other aspects of the *power system* which, when connected, may be capable of materially affecting dispatch of scheduled generating units or pricing within the spot market".

4.3.5 The MNM shall have adequate detail to be able to capture the dynamism of the *power system* and shall be robust enough to reflect the dynamic behavior of the *power system* to determine the most optimal prices and schedules, and for the efficient and viable technical performance of the Market Management System (MMS) and the Energy Management System (EMS).

4.4 MNM COMPONENTS AND MODELING

The components of the MNM are as follows.

4.4.1 *Market Trading Nodes (MTN)*

These are *nodes* in the load flow model designated as the reckoning *node* for Trading Participant bids or offers and corresponding settlement of *energy* and reserves. MTN shall be modeled as the trading point of a Generator or a Load where the appropriate real-time monitoring facility can be associated. Where the MTN and the metering point are of different location, site-specific loss adjustment (SSLA) provided in the WESM Metering *Market Manual* shall apply. Further details on MTN can be observed in SECTION 6 of this *Market Manual*.

4.4.2 Generator plant/unit representations

These are numerical representations of generating units and its characteristics corresponding to power injection to the network. Generating units shall be modeled as the positive power injection with linear monotonically increasing cost function.

4.4.3 Load representations

These are numerical representations of the customer demand corresponding to power withdrawal from the network. Loads shall be modeled as constant power withdrawal points.

4.4.4 Transmission and Sub-transmission lines

These are numerical representations of wires connecting different *nodes*.

Transmission lines shall be modeled as constant lumped impedance and shunt capacitance. Thermal and Contingency limits shall be based on the requirements of the *Philippine Grid Code* and *Philippine Distribution Code*.

4.4.5 Transshipment *Node*

A *node* in the network model that has neither a generator nor customer associated to it. A transshipment *node* connects at least two equipments together.

4.4.6 Power Transformer

Equipment used to transform the voltage from one level to another. Transformers shall be modeled as impedance. It shall also include if available, the no-load loss and nominal and off-nominal turns ratio including step-size. Two-winding

transformers shall be modeled as two-winding transformers, while three-winding transformers shall be modeled as either a three-winding transformer or translated to three two-winding transformers.

4.4.7 Shunt and Series Devices

Network elements used to ensure the reliability and security of the *power system*. Shunt devices shall be modeled as MVAR injection to the *power system* and identified whether this is Fixed, Regulating or Static Var Compensator (SVC). Its nominal reactive power shall be indicated including upper limit and lower limit voltage control range. Series devices shall be modeled as series resistance.

4.4.8 Power Circuit Breakers and Disconnect Switches

Network switches that enable the *System Operator* to connect and disconnect network elements from each other.

Power circuit breakers are represented as switch points in the breaker oriented model or single line diagram.

4.5 MNM DEVELOPMENT TIMETABLE

4.5.1 The following changes on the *power system* from the *System Operator* shall trigger a revision to the MNM:

a) Addition of new generators, lines, transformers, and other equipment;
b) Reconfiguration of substation;
c) Changes in connection points of equipment;
d) Change in impedance parameters of transformers and lines;
e) Decommissioning of lines, transformer, generators, and feeders, and other equipment; and
f) Change in equipment and station names

4.5.2 *Network Service Providers* shall also submit pertinent information relevant to Section 4.5.1 of this *Market Manual* to the *System Operator*, particularly the equipment that should be included, or those already included, in the MNM, considering the MNM Development Timetable in Table 1 of this *Market Manual*. The *Market Operator* shall determine if the distribution network equipment should be included in the MNM based on the results of market impact study emanating from Section 0 of this *Market Manual*.

4.5.3 The official notification from the *System Operator* should contain the date of energization, along with the details of the changes to the *transmission system*. The list of required information from the *System Operator* is described in 0.

4.5.4 After the receipt of the official notification from the *System Operator*, the *Market Operator* shall initiate the approval process for the MNM uploading to facilitate the implementation of the notified change. Minor changes (such as but not limited to, change in equipment/resources naming conventions, additional bays for future expansions) to the *transmission network* that has no impact to the market operations may be implemented at a later time.

4.5.5 The table below describes the timeline of activities involved in updating the MNM. The variable "D" stands for the target date of uploading of the new MNM. This date is set by the *Market Operator* upon its assessment, and is based on energization date or commissioning date of a new or upgraded equipment.

Table 1. MNM Development Timetable

ITEM	DAY	ACTIVITY	DESCRIPTION	RESPONSIBLE PARTY
1	Before D – 8	Changes in the Distribution Network	-- For *Network Service Providers* whose equipment should be included, or are already included in the MNM	*Network Service Providers*
2	Before D – 9	Approval of Registration of *WESM Trading Participant*	-- Required for changes involving new *Market Trading Nodes*[2] New WESM Trading Participants that will initiate new *Market Trading Nodes* (MTNs) need to have their registration approved at least nine (9) days prior to their energization	Trading Participant and *Market Operator*
3	D – 8	Registration of *Market Trading Node* in the Market Management System (MMS)	-- Required for changes involving new *Market Trading Nodes* Upon approval of registration of new *Trading Participants* that initiated a new MTN, the *Market Operator* shall then register the MTN in the MMS at least eight (8) days prior to their energization	*Market Operator*
4	D – 7	Changes Initiated by the either the *System Operator* or the *Market Operator*	Consistent with *WESM Rules* 3.2.1.4, "Where appropriate, the *Market Operator* or the *System Operator* may recommend alterations to the market network model, so as to maintain: (a) The relationship between the *market network model* and the *transmission network*; and (b) Consistency with market requirements". Should the changes come from the *System Operator*, it should include the network diagram, real-time monitoring points and the relevant network parameters affected by the change.	*System Operator or Market Operator*
5	D – 7	Initiate Approval Process for MNM	The *Market Operator* shall initiate the internal approval process on the MNM uploading for network changes that has a material effect to the system operations	*Market Operator*

[2] For MNM updates that involve new *Market Trading Nodes* (new generator or load representation points from the grid)

ITEM	DAY	ACTIVITY	DESCRIPTION	RESPONSIBLE PARTY
		Uploading	and market operations as appropriately assessed by the *Market Operator*.	
6	Before D – 2	Updating of MNM	The *Market Operator* shall effect changes to the MNM through the updating of relevant data files recognized by the MMS.	*Market Operator*
7	Before D – 2	Confirm schedule of energization	The *System Operator* shall inform the *Market Operator* of the final schedule of energization.	*System Operator*
8	Before D – 1	Testing of Updated MNM	The *Market Operator* shall perform functional and technical tests on the updated network model to ensure its consistency with the updated *power system*. Note: It shall involve the testing system of the *Market Operator*	*Market Operator*
9	Before D – 1	Provision of Relevant MNM Information to *System Operator*	The Market Operator shall provide the System Operator with relevant MNM information to ensure reliable operation between the two entities	*Market Operator*
10	Before D – 1	Notice to the DOE, ERC and Trading Participants	The *Market Operator* shall inform the *Department of Energy (DOE), Energy Regulatory Commission (ERC)*, and *Trading Participants* of the planned date of uploading the updated MNM in the production system of the MMS	*Market Operator*
11	D	Uploading of the updated MNM in the production system	The *Market Operator* shall upload the updated MNM in the production system	Market Operator
12	D	Notice of uploading status of MNM in the production system	The *Market Operator* shall immediately inform the DOE, the ERC, and the Trading Participants of the status (successful or failed) of the MNM uploading in the production system. Should the uploading fail, the Market Operator shall immediately revert back to	Market Operator

ITEM	DAY	ACTIVITY	DESCRIPTION	RESPONSIBLE PARTY
			the most recent issue of the MNM. The *Market Operator* shall then provide a notice containing the reason for such a failure	
13	D to D+7	Consistency monitoring of the updated MNM	The *Market Operator* shall continuously monitor the status of the recently updated MNM in the production system for the next seven days	Market Operator
14	D + 7 onwards	PEM Board ratification	After successful uploading and the completion of MNM consistency monitoring, PEMC shall seek ratification of the PEM Board for the MNM.	Market Operator

4.5.6 All MNM revisions uploaded to the production system should be ratified by the *PEM Board*. Ratification of the said network model shall be done upon completion of the seven-day consistency monitoring.

4.5.7 Additional Considerations in the MNM Development are as follows:

a) *Network Service Providers* shall ensure that they provide ample information regarding their planned activities to the *System Operator*
b) All planned activities should involve proper coordination between the *Market Operator* and the *System Operator* (including affected *Trading Participants* if necessary).
c) The target date of uploading (Day 'D') by the *Market Operator* may be moved further depending on justifiable reasons from either the *Market Operator* or the *System Operator*. In such cases, the *Market Operator* in coordination with the *System Operator* should decide on the new target date of uploading.
d) Should the target uploading of a new MNM issue be cancelled, and then other changes to the MNM were put into effect after its cancellation, the System Operator shall notify the Market Operator of its new scheduled energization date seven days prior.

4.6 Market Impact Study

4.6.1 The *Market Operator* shall conduct market impact studies relating to changes in the transmission and sub-transmission system that may materially affect the scheduling and pricing in the WESM.

4.6.2 *Network Service Providers* shall provide relevant network data for the conduct of a market impact study that intends to determine if such aspects of the power system

may be capable of materially affecting the dispatch of scheduled generating units or pricing within the spot market.

4.6.3 The *Market Operator* shall publish the results of the market impact study as may be required by the *PEM Board*.

SECTION 5 ALTERATIONS TO THE MARKET NETWORK MODEL

WESM Rules 3.2.1.4 state that "Where appropriate, the *Market Operator* or the *System operator* may recommend alterations to the *market network model*, so as to maintain: (a) the relationship between the *market network model* and the *transmission network*; and (b) consistency with market requirements". Such alterations on the MNM shall be made by the *Market Operator* as a result of the following:

5.1 REAL-TIME MNM RECONFIGURATION

5.1.1 Real time reconfiguration refers to any changes in the MNM reconfiguration of any part of the transmission system that may affect the dispatch within any trading interval. These revisions shall be made automatically to the MNM based on the inputs and data provided by the *System Operator* through the EMS. This shall include, but may not be limited to, the following:

a) Change in Transmission and Sub-transmission Network topology;
b) Line, Generator and Customer Load outage;and
c) Reconfiguration as initiated by the *System Operator* or the *Network Service Providers* to maintain system security and reliability.

5.2 NETWORK DEVELOPMENT

5.2.1 Any reconfiguration of any part of the transmission or sub-transmission system notified to the *Market Operator* that may affect the dispatch and that are permanent in nature. This shall include the following:

a) Installation of new lines and equipment
b) Line/network connectivity switching
c) Line upgrading
d) Transformer upgrading
e) Transformer relocation
f) Installation of new substation
g) Replacement network element parameter change
h) Substation/Switchyard re-configuration
i) Power circuit breaker relocation

5.2.2 Changes in the MNM configuration as a result of network development or aggregation or disaggregation of Trading Nodes shall be published in accordance with MNM publication requirements set forth in Section 6.0 of this document.

5.3 SIMPLIFICATIONS ON THE MARKET NETWORK MODEL

5.3.1 *WESM Rules* Clause 3.2.1.3 state that the *market network model* may contain such simplifications, approximations, equivalencies or adaptations as may facilitate the dispatch, pricing, or settlement processes

5.3.2 The MNM may contain simplifications related to the representation of Generation and Customer Trading Nodes upon request of a *Trading Participant* and approved by the *Market Operator*, *System Operator*, and if necessary, the *Network Service Provider*. Such simplifications are listed, but not limited to the following conditions

a) Aggregated representation of multiple generating units;
b) Aggregated representation in the MNM may be applied to multiple generating units that are located in a single generating station;
c) Disaggregated representation of customer trading nodes;and
d) Single Customer Trading Nodes representing an aggregate of multiple customers maybe disaggregated into several Customer Trading Nodes corresponding to the customers represented in that Trading Node. It is provided, however, that such disaggregation shall be allowed only in cases where there are appropriate real-time monitoring points that can account for the real-time withdrawal of *energy* in each disaggregated individual customer trading node.

5.3.3 The *Market Operator*, in consultation with the *System Operator*, and if necessary, the *Network Service Provider*, may implement simplifications, approximations, equivalencies or adaptations of the transmission and sub-transmission system on the *market network model*

5.3.4 The *Market Operator* shall ensure the consistency and accuracy of such simplifications, approximations, equivalencies or adaptations on the *market network model* while considering its impact on dispatch, pricing, and settlement processes

MARKET NETWORK MODEL MAINTENANCE AND PUBLICATION

5.4 MARKET NETWORK MODEL MAINTENANCE

5.4.1 The *Market Operator* shall prepare a document containing a summary of all the changes implemented in the MNM.

5.4.2 The *Market Operator* shall maintain an electronic copy of the following for all market network model revisions:

a) Bus Oriented Single Line Diagram; and
b) Breaker Oriented Single Line Diagram
c) Network Parameters

5.4.3 The *System Operator* shall regularly provide the *Market Operator* the following documents on a quarterly basis whether or not there are updates:

a) Updated Single Line Diagram; and
b) PSS/E file of the transmission system

5.4.4 The *Market Operator* shall ensure that the MNM used in the MMS is the same as the ratified/approved MNM by the *PEM Board*.

5.5 MANNER OF PUBLICATION

5.5.1 Any changes or revision initiated by the *Market Operator* or *System Operator* shall trigger the publication of the revised and approved MNM.

5.5.2 The Market Operator shall regularly publish the relevant updated MNM documents within seven days after the completion of the MNM consistency monitoring in the MMS' production system. Every revision of the MNM shall have the following associated documents published in the Market Information Website:

a) MNM Revisions Manual;
b) Bus-Oriented Single Line Diagram; and
c) Information brief

5.5.3 All publication by the *Market Operator* regarding the MNM shall be in an un-editable electronic format. The MNM documents shall be published to the general public through the *Market Information Website*.

5.6 INFORMATION DISCLOSURE

5.6.1 Disclosure of information concerning the MNM, shall be subject to the provisions in the *Information Disclosure and Confidentiality Market Manual*, consistent with Chapter 5 of the *WESM Rules*.

5.7 AUDITING OF MNM

5.7.1 In accordance with *WESM Rules* 1.5 and 5.2.6, the appropriateness of the *Market Network Model* as a representation of the transmission system shall be subject to the annual Market Operations Audit

5.8 REGULATORY COMPLIANCE

5.8.1 In compliance with the application *of the WESM* Price Determination Methodology, the MNM shall be submitted to the *Energy* Regulatory Commission, on a quarterly basis regardless of whether revisions or alterations have been introduced thereto.

5.9 DISPUTE RESOLUTION

5.9.1 Any dispute arising from the application of the MNM shall be submitted for resolution in accordance with the dispute resolution procedures set in the *WESM Rules* and applicable WESM *Market Manuals*.

5.10 CONTINUING OBLIGATIONS AND RESPONSIBILITIES

5.10.1 The *Market Operator, System Operator, Network Service Providers, Metering Service Provider* and *Trading Participants* shall continuously coordinate with the *Market Operator* with regard to maintenance, revision, publication and other necessary action regarding the MNM based on the WESM Timetable.

SECTION 6 MARKET TRADING NODE

6.1 BACKGROUND

6.1.1 Each *node* in the MNM, in physical terms, represents *energy* injection or withdrawal through power transformers or switching equipment. The transformers and switching equipment connect the transmission network operated by the *System Operator* and generating equipment, distribution network operated by *Network Service Provider* and load customers.

6.2 DEFINITION

6.2.1 Pursuant to the definition of *WESM Rules* Clause 3.2.2.1, "A market trading *node* is a designated point in the *market network model* where *energy* is bought or sold based on the schedules and prices determined by the *Market Dispatch Optimization Model*. A *market trading node* where *energy* is primarily sold into the WESM is referred to as the *generator node* while *a market trading node* where *energy* is primarily bought from the WESM is referred to as a *customer node*".

6.2.2 In addition to this, *WESM Rules* Clause 3.2.2.2 state that "Each market trading *node* shall:

a) Be assigned to a *Trading Participant* that intends to buy or sell *energy* and is capable of complying with the *dispatch* and *settlement* requirements in the WESM;
b) Be associated with a revenue metering and *remote* telemetering facilities capable of measuring all relevant incoming and outgoing *energy* deliveries for the purpose of *dispatch* and *settlement* in the WESM; and
c) As much as possible, represent the *connection point* between the *Network Service Provider* and the *Trading Participant*

6.3 CLASSIFICATION OF MARKET TRADING NODES

6.3.1 MTN's can be classified as either *Generator Node* or *Customer Node*.

a) *Generator nodes* are *nodes* that represent a registered generating unit or generating system directly connected to a network operated by the *System Operator*. It is a *node* where power is injected into the *transmission network*.
b) *Customer nodes* are *nodes* that represent where power is withdrawn by *Trading Participants* from the grid.

6.3.2 There may be conditions wherein a *Trading Participant* has a generating facility whose remote telemetering facility is situated in a location where both its injection and withdrawal of power are monitored. In such cases, that *Trading Participant* shall have a generator and customer MTN registered in the WESM to dynamically

reflect its injection and withdrawal, respectively. These cases are applicable for the following conditions

a) Facility can act as a generator or load such as the Kalayaan hydro-electric facility, in which each of its facility can be run as a generator or a pump, or
b) Available remote telemetering facilities are situated at a location net of the station service or house load.

6.4 CRITERIA FOR THE DEFINITION OF MTN

The following are the general criteria for the definition of MTN:

6.4.1 MTN shall be defined for each *node* in the MNM that lies at the boundary between a network operated by the *System Operator* and any apparatus, network or equipment used to generate, convey or control the conveyance of *energy* and operated by a person other than the *System Operator*.

6.4.2 MTNs shall also be defined for each *node* in the MNM that lies at the boundary between a network operated by the *Network Service Provider* that is included in the MNM, and any apparatus, network or equipment used to generate, convey or control the conveyance of *energy* and operated by a person other than the *System Operator*.

6.4.3 Each MTN shall be associated with at least one Trading Participant registered in the WESM.

6.4.4 MTN shall be defined in a manner that calculation of relevant power flows and locational marginal prices shall not result to cross-subsidization of the *Trading Participant*.

6.4.5 If the interface of the network operated by the *System Operator* and the apparatus, network or equipment operated by the *Trading Participant* lies at the end of a radial transmission line or power transformer serving solely the *Trading Participant*, the MTN shall be defined at the take-off point of the radial transmission line or the power transformer from the main power network. Locational marginal prices shall be calculated at the MTN and dispatch of *energy* supplied or withdrawn by the Trading Participant shall be adjusted to account for the *energy* losses along the radial transmission line or power transformer. These *energy* losses shall be for the account of the *Trading Participant*.

6.4.6 If the *Trading Participant* interconnects to two or more transmission *nodes*, the MTN for that *Trading Participant* shall be the high voltage side of its step-up transformer.

6.4.7 If the *Trading Participant* is a dispatchable generator connected to a distribution system (embedded facility), then its MTN shall be assigned to the nearest *node* represented in the MNM. Adjustments to the real-time monitoring of the Customer MTN shall be made accordingly to reflect the total power consumed by that Customer MTN accounting for the power generated by the dispatchable generator situated downstream.

6.5 GENERATOR MTN

6.5.1 A MTN is considered a generator *node* if *energy* is supplied into that *node* and the direction of the power flow is from the apparatus or equipment (i.e. generator) operated by the Trading Participant to the network operated by the *Network Service Providers*, including the *System Operator*.

6.5.2 During the submission of offers to supply electricity, the participant generator shall specify the location of the connection point and the relevant market network *node*.

6.5.3 The information that should be submitted by the generators in their *energy* supply and *reserve offers* are enumerated in Appendix A.1 of the *WESM Rules*.

6.6 CUSTOMER MTN

6.6.1 A *customer node* is the point where *energy* is withdrawn by the *WESM participant* and the direction of the power flow is from the network operated by the *Network Service Providers*, including the *System Operator*, to the *energy* consuming apparatus or equipment (i.e. load) owned by or connected to the customer trading participant.

6.6.2 The information required from the customers during their submission of *demand bids* or *reserve offers* in the case of dispatchable loads are listed in Appendix A of the *WESM Rules*.

6.7 PROCEDURE FOR MTN IDENTIFICATION

6.7.1 During registration process, Trading Participants shall submit data requirements specified by the *Market Operator* pursuant to the WESM *Market Manual* on Registration, Suspension, and De-Registration Criteria and Procedures.

6.7.2 The *Market Operator* and the *System Operator*, in coordination with the *Trading Participant*, shall determine the MTN based on the criteria set out in Section **Error! Reference source not found.** of this document.

SECTION 7 AMENDMENTS, PUBLICATION, AND EFFECTIVITY

7.1 AMENDMENTS TO THIS MANUAL

Any amendment, or revision to this Manual shall be approved by the PEM Board.

7.2 PUBLICATION AND EFFECTIVITY

Upon approval of the *PEM Board*, this manual *Market Manual* shall take effect fifteen (15) days from its publication, or such later date as the PEM Board determines, in accordance with the provisions in the WESM Manual of Procedures for Changes to the WESM Rules (WESM-RCM)

SECTION 8 APPENDICES

Appendix A. List of Required Transmission Network Parameters

The table below lists all parameters needed by *Market Operator* in order to completely define the MNM:

A. Topology of the Network[3]
1. Bus Voltage (in kilovolts)
2. Transmission Line Name and Circuit Number
3. Transmission Line Name
4. Transmission "From Bus"
5. Transmission Line "To bus"
6. Transformer Name (designated by NSP)
7. Transformer "From Bus"
8. Transformer "To bus"
9. Generator Station Identification
10. Generator Bus name
11. Generator Unit Number/Identification
12. Generator Interconnection Bus Name
13. Load Name
14. Load Unit Number
15. Load Interconnection Bus Name
16. Zone/Area Identification Name (Control Area)
17. Zone/Area ID Number (any number from 1-99000)
18. Switched Shunt (capacitor, reactor) Name
19. Switched Shunt (capacitor, reactor) associated Bus name
20. HVDC Link Circuit Number

B. Impedances, Thermal Limits, Loss Functions	Provision
1. Transmission Line Circuit Branch Resistance, R	Mandatory
2. Transmission Line Circuit Branch Reactance, X	Mandatory
3. Transmission Line Circuit Total Branch Susceptance, B	Mandatory
4. Transmission Line Circuit Thermal Limit under Normal Operation, MVA or MW	Mandatory
5. Transformer Voltage, kV	Mandatory
6. Transformer Resistance, R[4]	As Available
7. Transformer reactance, X	Mandatory
8. Transformer Thermal limit under Normal Operation, MVA	Mandatory

[3] All are "Mandatory" requirements that shall be determined between the *Market Operator* and the *System Operator*
[4] Shall be "Mandatory" for network or non-radial transformers

9. Switched Shunt Capacitor, MVAR	Mandatory
10. Switched Shunt Reactor, MVAR	Mandatory
11. Core Loss, MW	As Available

C. Limits on the voltage of the HVDC Equipment[5]
1. HVDC Bus Voltage
2. HVDC Power Transfer Rating

D. Generator parameters[6]
1. Maximum generator Real Power Output MW
2. Minimum generator Real Power Output, MW
3. Generator Ramp Rates

[5] All are mandatory requirements
[6] All are mandatory requirements

RCC / ORCP-WM-13-12

ANNEX A

Wholesale Electricity Spot Market

Proposed Revisions to the WESM Manual on MNM Development and Maintenance – Criteria and Procedures

Trading Operations Department

October 2013

Version No. 1

Public

[redacted]

I. SUMMARY OF THE PROPOSED RULES CHANGE

The proposed revisions to the manual aims to establish the following:

- Revise the MNM Manual to keep it up-to-date with the various changes that have been implemented process-wise since its last update in 2007;
- Address the findings and recommendations of the market operations audit; and
- To implement the new format of the WESM Manuals.

II. BACKGROUND

Up-to-date MNM Manual

The contents of the existing manual focused on the process of developing the network model prior to the commercial operations of the WESM, which includes the approval processes from the GMC and the PEM board prior to launching it in production. Also, "MNM Development" primarily relates to the development of the MNM at the very beginning.

Seven years since the launch of the commercial operations of WESM, some of the contents similar to the one discussed above are no longer relevant to the current operations. Also, since the MNM Manual's last revision in 2007, there have been many process changes implemented from both the Market Operator and System Operator that should be incorporated in the MNM Manual, particularly in following a timeline to ensure a seamless exchange of information that is important in updating the MNM.

As such, it is proposed that major changes be applied to the existing manual, particularly to Section 4: Market Network Model Development, and Section 5: Market Network Model Maintenance since these two sections comprise the core of the MNM Manual as it will contain the processes involved in regularly updating the MNM.

Market Operations Audit Findings

In accordance with the WESM Rules, the operations of the spot market and the Market Operator (PEMC) are subject to an annual operations audit. In the 2011 Market Operations Audit by PA Consulting[1], several issues with the WESM Manual on MNM Development and Maintenance were identified. The auditor identified the following parts where improvement can be made.

1. Inclusion of the MNM Document Manual and Dispute Resolution in the list of Related Documents. The auditor identified that these documents were referenced within the MNM Development Manual, but are not included in the related documents table.
2. Addition of a narrative in the Introduction part describing the table for the Summary of Relevant Rules, so that the table which is found at the end of the document will not be overlooked.

[1] Procedure Review Report: Independent Operational Audit of the Systems and Procedures on Market Operations

3. Some sections and several of the appendices refer to market trials and the period prior to the commercial operations. Since they are already out of date, these portions will be omitted, as recommended by the auditor.
4. The overall structure of the procedure is very hard to follow. The Auditor recommends an outline summarising the contents.
5. Include an indicative timeline of the Market Operator's expectations of the SO, TPs, and MSPs, when it comes to receiving data to update the model.
6. The responsibilities section (section 3) is very general, and that it assigns responsibilities for the maintenance and revision of the procedure document only. The auditor recommends that the parties responsible for the various activities in maintaining/ updating the Market Network Model itself be specified.
7. Include a document control mechanism. The auditor noted that there are two dates of PEM Board approval, with no indication which document version the approval dates relate to.

This proposed new MNM Manual already addresses the audit issues listed above.

New Format for WESM Manuals

This revision of the MNM Manual will make use the new format that was designed by the TWG on Harmonization of Market Manuals, which was eventually approved by PEMC Management. In the new format, it was also recommended by the TWG for Manual Changes to include a section that describes the events that will trigger the amendments of the manual.

III. THE PROPOSED RULES CHANGE

The proposed revisions aim to incorporate in the MNM Development and Maintenance Manual the current internal and external processes involved in updating the MNM that were not captured in the original version, and address the operational audit findings.

The arrangement of the Sections and subsections were also revised, according to the recommended format by the TWG on Harmonization of Market Manuals.

The major changes to the document are described in the succeeding paragraphs.

Section 4: Market Network Development

This section is the gist of the entire MNM Manual, and therefore it should contain more descriptions of the various activities relevant to the development and maintenance of the MNM based on the current procedures approved internally and externally. The major changes to the section are summarized as follows:

- The portions that detail the development of the network model prior to the commercial operations were removed.
- Inclusion of a section providing the responsibilities of the MO, SO, and TPs in the development and maintenance of the MNM.

- Inclusion of a timetable, which is in a tabular format, containing the activities related to the development and maintenance of the MNM. It also lists the parties responsible for each activity.
- Deletion of all the appendices that describe the development of the MNM prior to commercial operations. The only attachment retained is the exhaustive list of power flow components required by the MMS. The format of this attachment was also changed into a tabular format.
- Removed the portion describing the metering point as part of the MNM components since the metering point is not modeled in the MNM based on the current practice.

Section 5: Market Network Model Maintenance

This section describes the maintenance of the documentation of the MNM. Instead of maintaining hard copies of MNM documents for each MNM revision, it is proposed that hard copies of the documents will be generated quarterly. Maintaining a load flow save case in PSSE format for each MNM revision will also be removed as it is no longer applicable necessary.

One recommendation of the TWG was to include a provision that will require the System Operator to regularly provide the Market Operator with an updated Single Line Diagram, and PSSE files. This is a recommendation of the TWG, since it was declared by the ERC (ERC resolution 2009-180) that these data are not considered confidential. This will aid the Market Operator in conducting annual operations audit.

The section title was also revised and renumbered to "Section 6 Market Network Model Maintenance and Publication". This revised section will now contain the contents that were originally under Sections 6: MNM Publication, Section 9: Auditing of MNM, Section10: Regulatory Filing, Section 11: Dispute Resolution, and Section 12: Continuing Obligations and Responsibilities.

Section 7: Market Trading Node

This section was originally under Section 8, now renumbered to be "Section 7 Market Trading Node."

Definitions of generator nodes and customer nodes were provided with additional descriptions to be more understandable to the reader. Generator Trading Participants shall also be modeled as a load resource, to account for their station service use. That trading participant shall have a generating resource and a load resource registered to it, to be able to monitor its injection and withdrawal from the grid. This additional clarification is included in section 7.4.2.

The description of the modeling of the dispatchable generators was revised to provide additional clarification on how the embedded generators are modeled in the MNM. The revised provision will be found in section 7.5.6.

Section 8 Revision, Publication, and Effectivity

This is a new section, to comply with the recommended new format of the WESM Manuals. This section contains descriptions of the events that may prompt future revisions to the MNM Manual. It is proposed that the following occasion will trigger the amendments:

1. Results recommended by the auditor through the conduct of the Annual Operations Audit.
2. Directives and Policy changes issued by the Department of Energy that relates to the treatment and modeling of power system components.

The publication and effectivity of the revised manual will be subject to existing provisions in the Rules Change Manual.

Appendices and Attachments

The following attachments/appendices were removed since they are no longer relevant to the operations:

- Appendix 2: MNM Procedural Timeline
- Appendix 2A: Procedural Steps for Market Network Model
- Appendix 3: Work Flow-Market Network Model Prior to Market Trials
- Appendix 4: Work Flow-Prior to Commercial Operation
- Appendix 5: Data for Submission Prior to Market Trial

Appendix 1 was retained since it contains the complete list information that is provided by the System Operator in order to develop and update the Market Network Model. However the original exhaustive list was revised, to include only those data that are regularly provided by the System Operator along with their official notification of network changes.

IV. BACKGROUND AND DESCRIPTION OF THE PROPONENT

The proponent is the Philippine Electricity Market Corporation. PEMC acts as both the governance arm and market operator of the WESM.

Top Officers:
M. L. Ocampo – President
C. S. Heruela – VP, MAG
R. P. Descanzo, VP, Corplan & CorComm
C. S. Martin-Funelas, VP-Legal

V. CONCLUSIONS AND RECOMMENDATIONS

This manual revision aims to revise the MNM Manual to keep it up-to-date with the current internal and external processes, which are not captured in the original version of the Market Manual anymore. By revising the Market Manual, it is expected that the 2011 MO audit findings shall be complied with.

It is recommended that the proposed changes be adopted as revisions to the WESM Rules.

VI. REFERENCES

1. Procedure Review Report: Independent Operational Audit of the Systems and Procedures on Market Operations.
2. WESM Rules
3. Market Operator Information Disclosure and Confidentiality Manual

[redacted]

SN ABOITIZ POWER (SNAP) COMMENTS ON MNMDC MANUAL

Proposed Amendments Title	Section	Provision	Proposed Amendments	Comment
MNM Development and Maintenance	1.2.3	The responsibilities of the Market Operator, the System Operator and the Trading Participants in the development, revision and maintenance of the MNM	The responsibilities of the Market Operator, the System Operator, **Network Service Providers**, and the Trading Participants in the development, revision and maintenance of the MNM	The Network Service Provider is not referred to in the Purpose section of the Manual, but they are assigned a major responsibility in section 4.5.2
	4.5.2	Network Service Providers shall .... On the results of market impact study emanating from section 0 of this Market Manual	Network Service Providers shall .... On the results of market impact study emanating from **section 0** of this Market Manual	Clarification, what is section 0 of this Market Manual?
	4.5.3	The official notification from the System Operator...The list of required information from from the System Operator is described in 0.	The official notification from the System Operator...The list of required information from from the System Operator is described in **0**.	Clarification, what does 0 of this Market Manual refer to?
	Section 4.5.5, table 1 MNM development table	Changes initiated by the either the System Operator or the Market Operator	Changes initiated by ~~the~~ either the System Operator or the Market Operator	For clarity of statement
	5.2.1	Any reconfiguration of any part of the transmission or sub-transmission system notified to the Market Operator that may affect the dispatch and that are permanent in nature.		Please re-phrase for clarity. Possible missing terms.

[redacted]

	5.10.1	The Market Operator, System Operator, Network Service Providers, Metering Service Provider and Trading Participants shall continuously coordinate with the market Operator with regard to maintenance, revision, publication, and other necesaary action regarding the MNM based on the WESM Timetable.	The ~~**Market Operator**~~, System Operator, Network Service Providers, Metering Service Provider and Trading Participants shall continuously coordinate with the market Operator with regards to maintenance, revision, publication, and other necesaary action regarding the MNM based on the WESM Timetable.	To eliminate redundancy with respect to mention of Market Operator.
	6.1.1	Each node in the MNM, in physical terms, ...and load customers		Please re-phrase for clarity. Possible missing terms, articles, and/or punctuation.
	6.7.2	The Market Operator and the System Operator, in coordination with the Trading Participant, shall determine the MTN based on the criteria set out in Section Error! Reference souce not found. of this document.	The Market Operator and the System Operator, in coordination with the Trading Participant, shall determine the MTN based on the criteria set out in Section ~~**Error! Reference souce not found.**~~ of this document.	Please replace with the correct section for reference.

Proposed Amendments: MNM Development and Maintenance

Section	Provision	Proposed Amendments	SNAP Comment	PEMC Response to Comment
1.2.3	The responsibilities of the Market Operator, the System Operator and the Trading Participants in the development, revision and maintenance of the MNM	The responsibilities of the Market Operator, the System Operator, **Network Service Providers**, and the Trading Participants in the development, revision and maintenance of the MNM	The Network Service Provider is not referred to in the Purpose section of the Manual, but they are assigned a major responsibility in section 4.5.2	Noted to include Network Service Provider as: *The responsibilities of the Market Operator, the System Operator, **Network Service Providers**, and the Trading Participants in the development, revision and maintenance of the MNM*
4.5.2	Network Service Providers shall .... On the results of market impact study emanating from section 0 of this Market Manual	Network Service Providers shall .... On the results of market impact study emanating from **section 0** of this Market Manual	Clarification, what is section 0 of this Market Manual?	Document Auto link feature - **Section 0** refers to **Section 4.6 – Market Impact Study**
4.5.3	The official notification from the System Operator...The list of required information from from the System Operator is described in 0.	The official notification from the System Operator...The list of required information from from the System Operator is described in **0**.	Clarification, what does 0 of this Market Manual refer to?	Document Auto link feature – **0** refers to **Appendix A**
Section 4.5.5, table 1 MNM development table	Changes initiated by the either the System Operator or the Market Operator	Changes initiated by ~~**the**~~ either the System Operator or the Market Operator	For clarity of statement	Noted
5.2.1	Any reconfiguration of any part of the transmission or sub-transmission system notified to the Market Operator that may affect the dispatch and that		Please re-phrase for clarity. Possible missing terms.	Proposed to be revised as: ***Network development refers to ~~Any~~ any** reconfiguration of any part of the transmission or sub-transmission system notified to the Market Operator*

	are permanent in nature.			*that may affect the dispatch and that are permanent in nature.*
5.10.1	The Market Operator, System Operator, Network Service Providers, Metering Service Provider and Trading Participants shall continuously coordinate with the market Operator with regard to maintenance, revision, publication, and other necesaary action regarding the MNM based on the WESM Timetable.	The ~~**Market Operator**~~, System Operator, Network Service Providers, Metering Service Provider and Trading Participants shall continuously coordinate with the market Operator with regard**s** to maintenance, revision, publication, and other necesaary action regarding the MNM based on the WESM Timetable.	To eliminate redundancy with respect to mention of Market Operator.	Noted to exclude **Market Operator**
7.1.1	Each node in the MNM, in physical terms, ...and load customers		Please re-phrase for clarity. Possible missing terms, articles, and/or punctuation.	Proposed to be revised as: ***The Market Trading Node*** *~~Each node~~ in the MNM, in physical terms, represents a* ***power substation onto which*** *energy* ***is*** *~~injection~~* ***injected*** *or ~~withdrawal~~* ***withdrawn*** *through power transformers or switching equipment. The transformers and switching equipment connect the transmission network operated by the System Operator and generating equipment, distribution network operated by*

				Network Service Provider and load customers.
7.7.2	The Market Operator and the System Operator, in coordination with the Trading Participant, shall determine the MTN based on the criteria set out in Section Error! Reference souce not found. of this document.	The Market Operator and the System Operator, in coordination with the Trading Participant, shall determine the MTN based on the criteria set out in Section **Error! Reference souce not found.** of this document.	Please replace with the correct section for reference.	Document Auto link feature – Section **Error! Reference source not found 0** refers to **Section 7.4 Criteria For Definition of MTN**

[redacted]

RCC Deliberation on SNAP Comments on Proposed Amendments: MNM Development and Maintenance

Section	Provision	SNAP Proposed Amendments	SNAP Comments	PEMC Response to SNAP Comments	RCC Deliberation on SNAP Comments and Proposed Revisions
1.2.3	The responsibilities of the Market Operator, the System Operator and the Trading Participants in the development, revision and maintenance of the MNM	The responsibilities of the Market Operator, the System Operator, **Network Service Providers**, and the Trading Participants in the development, revision and maintenance of the MNM	The Network Service Provider is not referred to in the Purpose section of the Manual, but they are assigned a major responsibility in section 4.5.2	Noted to include Network Service Provider as: *The responsibilities of the Market Operator, the System Operator, **Network Service Providers**, and the Trading Participants in the development, revision and maintenance of the MNM*	Agreed to include Network Service Provider. Provision to read as: The responsibilities of the Market Operator, the System Operator, **Network Service Providers**, and the Trading Participants in the development, revision and maintenance of the MNM
4.5.2	Network Service Providers shall .... On the results of market impact study emanating from section 0 of this Market Manual	Network Service Providers shall .... On the results of market impact study emanating from **section 0** of this Market Manual	Clarification, what is section 0 of this Market Manual?	Document Auto link feature - **Section 0** refers to **Section 4.6 – Market Impact Study**	Document Auto link feature - **Section 0** refers to **Section 4.6 – Market Impact Study**
4.5.3	The official notification from the System Operator...The list of required information from the System Operator is described in 0.	The official notification from the System Operator...The list of required information from from the System Operator is described in **0**.	Clarification, what does 0 of this Market Manual refer to?	Document Auto link feature – **0** refers to **Appendix A**	Document Auto link feature – **0** refers to **Appendix A**
Section 4.5.5, table 1 MNM development	Changes initiated by the either the System Operator or the Market Operator	Changes initiated by **the** either the System Operator or the Market Operator	For clarity of statement	Noted	Accepted – to be amended

[redacted]

RCC Deliberation on SNAP Comments on Proposed Amendments: MNM Development and Maintenance

Section	Provision	SNAP Proposed Amendments	SNAP Comments	PEMC Response to SNAP Comments	RCC Deliberation on SNAP Comments and Proposed Revisions
table					
5.2.1	Any reconfiguration of any part of the transmission or sub-transmission system notified to the Market Operator that may affect the dispatch and that are permanent in nature.		Please re-phrase for clarity. Possible missing terms.	Proposed to be revised as: ***Network development refers to ~~Any~~ any*** *reconfiguration of any part of the transmission or sub-transmission system notified to the Market Operator that may affect the dispatch and that are permanent in nature.*	Proposed to be revised as: **Network development is Aany** reconfiguration of any part of the transmission or sub-transmission system system **~~notified to the Market Operator that may affect the dispatch and that are permanent in nature.~~** **The Market Operator should be notified as the network development may affect the dispatch and are permanent in nature.**
5.10.1	The Market Operator, System Operator, Network Service Providers, Metering Service Provider and Trading Participants shall continuously	The **~~Market Operator~~**, System Operator, Network Service Providers, Metering Service Provider and Trading Participants shall continuously coordinate with the market Operator with regards to	To eliminate redundancy with respect to mention of Market Operator.	Noted to exclude **Market Operator**	Agreed to exclude **Market Operator**

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RCC Deliberation on SNAP Comments on Proposed Amendments: MNM Development and Maintenance

Section	Provision	SNAP Proposed Amendments	SNAP Comments	PEMC Response to SNAP Comments	RCC Deliberation on SNAP Comments and Proposed Revisions
	coordinate with the market Operator with regard to maintenance, revision, publication, and other necesaary action regarding the MNM based on the WESM Timetable.	maintenance, revision, publication, and other necesaary action regarding the MNM based on the WESM Timetable.			
6.1.1	Each *node* in the MNM, in physical terms, represents *energy* injection or withdrawal through power transformers or switching equipment. The transformers and switching equipment connect the transmission network operated by the *System Operator* and generating equipment, distribution network operated by *Network Service Provider* and load customers.		Please re-phrase for clarity. Possible missing terms, articles, and/or punctuation.	Proposed to be revised as: ***The Market Trading Node*** *~~Each node~~ in the MNM, in physical terms, represents a* ***power substation onto which*** *energy* ***is*** *~~injection~~* ***injected*** *or ~~withdrawal~~* ***withdrawn*** *through power transformers or switching equipment. The transformers and switching equipment connect the transmission network operated*	Proposed to be revised as: **The Market Trading Node ~~Each node~~** in the MNM, in physical terms, represents a **power substation onto which** energy **is ~~injection~~ injected** or **~~withdrawal~~ withdrawn** through power transformers or switching equipment. **~~The transformers and switching equipment connect the transmission network, the generating equipment, the distribution network and load customers.~~**

RCC Deliberation on SNAP Comments on Proposed Amendments: MNM Development and Maintenance

Section	Provision	SNAP Proposed Amendments	SNAP Comments	PEMC Response to SNAP Comments	RCC Deliberation on SNAP Comments and Proposed Revisions
				by the System Operator and generating equipment, distribution network operated by Network Service Provider and load customers.	
6.7.2	The Market Operator and the System Operator, in coordination with the Trading Participant, shall determine the MTN based on the criteria set out in Section Error! Reference souce not found. of this document.	The Market Operator and the System Operator, in coordination with the Trading Participant, shall determine the MTN based on the criteria set out in Section **Error! Reference souce not found.** of this document.	Please replace with the correct section for reference.	Document Auto link feature – Section **Error! Reference source not found 0** refers to **Section 7.4 Criteria For Definition of MTN**	Document Auto link feature – Section **Error! Reference source not found 0** refers to **Section 6.4 Criteria For Definition of MTN**

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Wholesale Electricity Spot Market

PUBLIC

WESM Manual

Market Network Model Development and Maintenance – Criteria and Procedures Issue 3

Abstract	This document describes the processes involved in the development, approval, publication and revision of the WESM market network model.

Document Identity: WESM-MNMCP-003
Issue: 3
Reason for Issue: Compliance to Audit Findings
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Issue No.	Proponent	Date of Effectivity	Reason for Amendment
0.0	MOSubcom	5/21/04	New Document New Draft Format
0.1	MOSubcom	6/8/04	New Document Incorporating Subcom Comments
0.2	MOSubcom	6/16/04	Revision Incorporating Initial TWG Comments
0.3	TWG	8/17/04	As approved by the WESMTWG
2.0	MOSubcom	8/11/06	To clarify the audit provision in Section 9 stating the Grid Management Committee as the technical body to audit the MNM Incorporate provisions on aggregated/disaggregated representation of generators and loads in Section 7.0 Alteration and Revision to the MNM Revise provision on the approval process in Section 7.0
3	PEMC	June 2013	Revised for consistency with the WESM Rules and compliance to the market operation audit findings.

Document Approval

Issue No.	RCC Approval	RCC Resolution No.	PEM Board Approval	PEM Board Resolution No.
1				
2				
3				

Reference Documents

Document ID	Document Title
	WESM Rules
	Philippine Grid Code (PGC)
	Philippine Distribution Code (PDC)
WESM-PDM	Price Determination Methodology
WESM-RSDCP	WESM Market Manual on Registration, Suspension And De-Registration Criteria And Procedures
WESM-DRM	Dispute Resolution Market Manual
WESM-MSDM-MM	WESM Metering Market Manual
WESM-RCM	Market Manual of Procedures for Changes to the WESM Rules

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SECTION 1 INTRODUCTION

1.1 BACKGROUND

1.1.1 Pursuant to *WESM Rules* 3.2.1 and 3.2.2, this *Market Manual* consolidates the market procedures and associated forms, standards, and policies that define the *Market Network Model* (MNM) that shall be used in the operation of the Wholesale Electricity Spot Market (WESM). The documentation related to the MNM, which is published in the Market Information Website[1], provides more detailed descriptions of the requirements for the network model as specified in the *WESM Rules*. Where there is a discrepancy between the requirements in this document and the *WESM Rules*, the *WESM Rules* shall prevail. Standards and policies referenced or appended shall provide a supporting framework.

1.2 PURPOSE

The purpose of this Manual is to provide:

1.2.1 The methodology and criteria for the development, alteration and maintenance of the MNM that shall represent fairly, and in a manner that facilitate the consistent and reliable operation of the *power system:*

a) The *transmission network* under the control of the *System Operator*, and

b) Such other aspects of the *power system* which, when *connected,* may be capable of materially affecting *dispatch* of *scheduled generating units* or pricing within the *spot market.*

1.2.2 Procedure for the approval and publication of the MNM.

1.2.3 The responsibilities of the *Market Operator, the System Operator, Network Service Providers* and the *Trading Participants* in the development, revision and maintenance of the MNM.

1.3 SCOPE

1.3.1 This *WESM Manual* implements the relevant provisions of Chapter 3 of the *WESM Rules* related to the *Market Network Model.*

1.4 APPROVAL OF THE MNM

[1] http://www.wesm.ph

1.4.1 Consistent *with WESM Rules* 3.2.1.5, any alteration recommended under Clause 3.2.1.4 shall be approved by the *PEM Board*.

1.4.2 Prior to the integration of a region in the commercial operations of the WESM, the development of the MNM incorporating the *power system* of such region shall be facilitated by the *Market Operator* in consultation with electric power industry participants prior to commencement of the spot market and shall be subject to approval by the *Philippine Electricity Market Board (PEM Board)*.

SECTION 2 DEFINITIONS, REFERENCES AND INTERPRETATION

2.1 DEFINITIONS

2.1.1 ***Generator Interconnection Lines*** refers to the lines connecting generating plants to the transmission system.

2.1.2 ***Load flow*** refers to the process for calculating currents, voltages, and real and reactive power flows at every *node* in a given *power system* condition.

2.1.3 ***Substation*** refers to the physical representation of *nodes* in the *power system*. They may be composed of several *nodes* corresponding to the low voltage and high voltage busses.

2.1.4 ***Sub-transmission*** *Lines* refers to the *power system* lines directly under the control of power distributors and cooperatives.

Other terms used in this document shall conform to the definition of terms under the *WESM Rules* and the *Philippine Grid Code (PGC)*.

2.2 INTERPRETATION

This *Market Manual* is intended for use of the *Market Operator, the System Operator, Network Service Providers*, the *Trading Participants* and their representatives, and other parties as appropriate. The standard conventions to be followed in this *Market Manual* are as follows:

2.2.1 The word "shall' denotes a mandatory requirement;

2.2.2 Terms and acronyms used in this *Market Manual* including all Parts thereto that are italicized have the meanings ascribed thereto in *WESM Rules*;

2.2.3 Any procedure-specific convention(s) shall be identified within the specific document itself.

SECTION 3 RESPONSIBILITIES

3.1 *MARKET OPERATOR*

3.1.1 The *Market Operator* shall be responsible for the development, validation, maintenance, publication and revision of this document in coordination with *Trading Participants* and the *System Operator.*

3.2 *SYSTEM OPERATOR* AND TRADING PARTICIPANTS

3.2.1 The *System Operator* and the *Trading Participants* shall provide the *Market Operator* with necessary information *and references for* subsequent *revisions and* validation of this document.

3.3 *NETWORK SERVICE PROVIDERS*

3.3.1 Pursuant to *WESM Rules* 3.5.2 and in accordance with the *Philippine Grid Code* and the *Philippine Distribution Code*, each *Network Service Provider* shall submit to the *System Operator* network data, and any revisions thereafter, under the *Network Service Provider's* control that is included in the MNM.

SECTION 4 MARKET NEWORK MODEL DEVELOPMENT

4.1 DEFINITION

4.1.1 The MNM is a mathematical representation of the *power system* that shall be used for the purpose of determining *dispatch schedules* and *energy* prices, and preparing market projections. It contains the technical characteristics of the *transmission network*, particularly its connectivity, and the capacities of each network element. It also represents the *node* assignments and size of each generator and load. The *node* assignments indicate where each generator injects power to the transmission network, and where each load withdraws power from the *transmission network.*

4.1.2 The MNM also identifies the *Market Trading Node* on which the transactions for *Trading Participants* shall be referenced.

4.1.3 The components of the MNM interacts with one another in accordance with *dispatch schedule* of the generation units, customer demand and the physical laws

that govern the operation of the network components. These interactions are complex by nature but should be balanced to maintain the reliable and secure operation of the *power system* by the *System Operator*, as well as for the generation of fair and economic market *dispatch schedules* and *nodal energy price*.

4.2 RESPONSIBILITIES IN MARKET NETWORK DEVELOPMENT

4.2.1 The *System Operator*, the *Network Service Providers*, and the *Trading Participants* shall provide the *Market Operator* with documents pertaining to *power system* changes that could trigger any change to the MNM topology and connectivity or parameter.

4.2.2 Specific responsibilities in the development of the MNM are highlighted in Section 4.5 of this document.

4.3 CRITERIA FOR THE MARKET NETWORK MODEL DEVELOPMENT

The following outlines the criteria necessary to develop the MNM as provided in the *WESM Rules*:

4.3.1 Representation of the physical *Transmission System* of the Luzon, Visayas, and Mindanao grids using an alternating current (AC) and direct current (DC) load flow network model

4.3.2 Network data that accurately reflects the conditions prevailing on the network, including losses, constraints and contingencies, at any trading interval

4.3.3 Necessary simplifications based on the current best international industry practice

4.3.4 Pursuant to *WESM Rules* 3.2.1.2 (b), it shall include "other aspects of the *power system* which, when connected, may be capable of materially affecting dispatch of scheduled generating units or pricing within the spot market".

4.3.5 The MNM shall have adequate detail to be able to capture the dynamism of the *power system* and shall be robust enough to reflect the dynamic behavior of the *power system* to determine the most optimal prices and schedules, and for the efficient and viable technical performance of the Market Management System (MMS) and the Energy Management System (EMS).

4.4 MNM COMPONENTS AND MODELING

The components of the MNM are as follows.

4.4.1 *Market Trading Nodes (MTN)*

These are *nodes* in the load flow model designated as the reckoning *node* for Trading Participant bids or offers and corresponding settlement of *energy* and reserves. MTN shall be modeled as the trading point of a Generator or a Load where the appropriate real-time monitoring facility can be associated. Where the MTN and the metering point are of different location, site-specific loss adjustment (SSLA) provided in the WESM Metering *Market Manual* shall apply. Further details on MTN can be observed in SECTION 6 of this *Market Manual*.

4.4.2 Generator plant/unit representations

These are numerical representations of generating units and its characteristics corresponding to power injection to the network. Generating units shall be modeled as the positive power injection with linear monotonically increasing cost function.

4.4.3 Load representations

These are numerical representations of the customer demand corresponding to power withdrawal from the network. Loads shall be modeled as constant power withdrawal points.

4.4.4 Transmission and Sub-transmission lines

These are numerical representations of wires connecting different *nodes*.

Transmission lines shall be modeled as constant lumped impedance and shunt capacitance. Thermal and Contingency limits shall be based on the requirements of the *Philippine Grid Code* and *Philippine Distribution Code*.

4.4.5 Transshipment *Node*

A *node* in the network model that has neither a generator nor customer associated to it. A transshipment *node* connects at least two equipments together.

4.4.6 Power Transformer

[redacted]

Equipment used to transform the voltage from one level to another. Transformers shall be modeled as impedance. It shall also include if available, the no-load loss and nominal and off-nominal turns ratio including step-size. Two-winding transformers shall be modeled as two-winding transformers, while three-winding transformers shall be modeled as either a three-winding transformer or translated to three two-winding transformers.

4.4.7 Shunt and Series Devices

Network elements used to ensure the reliability and security of the *power system*. Shunt devices shall be modeled as MVAR injection to the *power system* and identified whether this is Fixed, Regulating or Static Var Compensator (SVC). Its nominal reactive power shall be indicated including upper limit and lower limit voltage control range. Series devices shall be modeled as series resistance.

4.4.8 Power Circuit Breakers and Disconnect Switches

Network switches that enable the *System Operator* to connect and disconnect network elements from each other.

Power circuit breakers are represented as switch points in the breaker oriented model or single line diagram.

4.5 MNM DEVELOPMENT TIMETABLE

4.5.1 The following changes on the *power system* from the *System Operator* shall trigger a revision to the MNM:

a) Addition of new generators, lines, transformers, and other equipment;
b) Reconfiguration of substation;
c) Changes in connection points of equipment;
d) Change in impedance parameters of transformers and lines;
e) Decommissioning of lines, transformer, generators, and feeders, and other equipment; and
f) Change in equipment and station names

4.5.2 *Network Service Providers* shall also submit pertinent information relevant to Section 4.5.1 of this *Market Manual* to the *System Operator*, particularly the equipment that should be included, or those already included, in the MNM, considering the MNM Development Timetable in Table 1 of this *Market Manual*. The *Market Operator* shall determine if the distribution network equipment should be included in the MNM based on the results of market impact study emanating from Section 4.6 - Market Impact Study of this *Market Manual*.

4.5.3 The official notification from the *System Operator* should contain the date of energization, along with the details of the changes to the *transmission system*. The list of required information from the *System Operator* is described in Appendix A.

4.5.4 After the receipt of the official notification from the *System Operator*, the *Market Operator* shall initiate the approval process for the MNM uploading to facilitate the implementation of the notified change. Minor changes (such as but not limited to, change in equipment/resources naming conventions, additional bays for future expansions) to the *transmission network* that has no impact to the market operations may be implemented at a later time.

4.5.5 The table below describes the timeline of activities involved in updating the MNM. The variable "D" stands for the target date of uploading of the new MNM. This date is set by the *Market Operator* upon its assessment, and is based on energization date or commissioning date of a new or upgraded equipment.

[redacted]

Table 1. MNM Development Timetable

ITEM	DAY	ACTIVITY	DESCRIPTION	RESPONSIBLE PARTY
1	Before D – 8	Changes in the Distribution Network	-- For *Network Service Providers* whose equipment should be included, or are already included in the MNM	*Network Service Providers*
2	Before D – 9	Approval of Registration of *WESM Trading Participant*	-- Required for changes involving new *Market Trading Nodes*[2] New WESM Trading Participants that will initiate new *Market Trading Nodes* (MTNs) need to have their registration approved at least nine (9) days prior to their energization	Trading Participant and *Market Operator*
3	D – 8	Registration of *Market Trading Node* in the Market Management System (MMS)	-- Required for changes involving new *Market Trading Nodes* Upon approval of registration of new *Trading Participants* that initiated a new MTN, the *Market Operator* shall then register the MTN in the MMS at least eight (8) days prior to their energization	*Market Operator*
4	D – 7	Changes Initiated by either the *System Operator* or the *Market Operator*	Consistent with *WESM Rules* 3.2.1.4, "Where appropriate, the *Market Operator* or the *System Operator* may recommend alterations to the market network model, so as to maintain: (a) The relationship between the *market network model* and the *transmission network*; and (b) Consistency with market requirements". Should the changes come from the *System Operator*, it should include the network diagram, real-time monitoring points and the relevant network parameters affected by the change.	*System Operator or Market Operator*
5	D – 7	Initiate Approval Process for MNM	The *Market Operator* shall initiate the internal approval process on the MNM uploading for network changes that has a material effect to the system operations	*Market Operator*

[2] For MNM updates that involve new *Market Trading Nodes* (new generator or load representation points from the grid)

ITEM	DAY	ACTIVITY	DESCRIPTION	RESPONSIBLE PARTY
		Uploading	and market operations as appropriately assessed by the *Market Operator*.	
6	Before D – 2	Updating of MNM	The *Market Operator* shall effect changes to the MNM through the updating of relevant data files recognized by the MMS.	*Market Operator*
7	Before D – 2	Confirm schedule of energization	The *System Operator* shall inform the *Market Operator* of the final schedule of energization.	*System Operator*
8	Before D – 1	Testing of Updated MNM	The *Market Operator* shall perform functional and technical tests on the updated network model to ensure its consistency with the updated *power system*. Note: It shall involve the testing system of the *Market Operator*	*Market Operator*
9	Before D – 1	Provision of Relevant MNM Information to *System Operator*	The Market Operator shall provide the System Operator with relevant MNM information to ensure reliable operation between the two entities	*Market Operator*
10	Before D – 1	Notice to the DOE, ERC and Trading Participants	The *Market Operator* shall inform the *Department of Energy (DOE), Energy Regulatory Commission (ERC)*, and *Trading Participants* of the planned date of uploading the updated MNM in the production system of the MMS	*Market Operator*
11	D	Uploading of the updated MNM in the production system	The *Market Operator* shall upload the updated MNM in the production system	Market Operator
12	D	Notice of uploading status of MNM in the production system	The *Market Operator* shall immediately inform the DOE, the ERC, and the Trading Participants of the status (successful or failed) of the MNM uploading in the production system. Should the uploading fail, the Market Operator shall immediately revert back to	Market Operator

ITEM	DAY	ACTIVITY	DESCRIPTION	RESPONSIBLE PARTY
			the most recent issue of the MNM. The *Market Operator* shall then provide a notice containing the reason for such a failure	
13	D to D+7	Consistency monitoring of the updated MNM	The *Market Operator* shall continuously monitor the status of the recently updated MNM in the production system for the next seven days	Market Operator
14	D + 7 onwards	PEM Board ratification	After successful uploading and the completion of MNM consistency monitoring, PEMC shall seek ratification of the PEM Board for the MNM.	Market Operator

4.5.6 All MNM revisions uploaded to the production system should be ratified by the *PEM Board*. Ratification of the said network model shall be done upon completion of the seven-day consistency monitoring.

4.5.7 Additional Considerations in the MNM Development are as follows:

a) *Network Service Providers* shall ensure that they provide ample information regarding their planned activities to the *System Operator*
b) All planned activities should involve proper coordination between the *Market Operator* and the *System Operator* (including affected *Trading Participants* if necessary).
c) The target date of uploading (Day 'D') by the *Market Operator* may be moved further depending on justifiable reasons from either the *Market Operator* or the *System Operator*. In such cases, the *Market Operator* in coordination with the *System Operator* should decide on the new target date of uploading.
d) Should the target uploading of a new MNM issue be cancelled, and then other changes to the MNM were put into effect after its cancellation, the System Operator shall notify the Market Operator of its new scheduled energization date seven days prior.

4.6 MARKET IMPACT STUDY

4.6.1 The *Market Operator* shall conduct market impact studies relating to changes in the transmission and sub-transmission system that may materially affect the scheduling and pricing in the WESM.

4.6.2 *Network Service Providers* shall provide relevant network data for the conduct of a market impact study that intends to determine if such aspects of the power system

may be capable of materially affecting the dispatch of scheduled generating units or pricing within the spot market.

4.6.3 The *Market Operator* shall publish the results of the market impact study as may be required by the *PEM Board*.

SECTION 5 ALTERATIONS TO THE MARKET NETWORK MODEL

WESM Rules 3.2.1.4 state that "Where appropriate, the *Market Operator* or the *System operator* may recommend alterations to the *market network model*, so as to maintain: (a) the relationship between the *market network model* and the *transmission network*; and (b) consistency with market requirements". Such alterations on the MNM shall be made by the *Market Operator* as a result of the following:

5.1 REAL-TIME MNM RECONFIGURATION

5.1.1 Real time reconfiguration refers to any changes in the MNM reconfiguration of any part of the transmission system that may affect the dispatch within any trading interval. These revisions shall be made automatically to the MNM based on the inputs and data provided by the *System Operator* through the EMS. This shall include, but may not be limited to, the following:

a) Change in Transmission and Sub-transmission Network topology;
b) Line, Generator and Customer Load outage;and
c) Reconfiguration as initiated by the *System Operator* or the *Network Service Providers* to maintain system security and reliability.

5.2 NETWORK DEVELOPMENT

5.2.1 Network development is any reconfiguration of any part of the transmission or sub-transmission system. The Market Operator should be notified as the network development may affect the dispatch and are permanent in nature. This shall include the following:

a) Installation of new lines and equipment
b) Line/network connectivity switching
c) Line upgrading
d) Transformer upgrading
e) Transformer relocation
f) Installation of new substation
g) Replacement network element parameter change
h) Substation/Switchyard re-configuration
i) Power circuit breaker relocation

5.2.2 Changes in the MNM configuration as a result of network development or aggregation or disaggregation of Trading Nodes shall be published in accordance with MNM publication requirements set forth in Section 6.0 of this document.

5.3 SIMPLIFICATIONS ON THE MARKET NETWORK MODEL

5.3.1 *WESM Rules* Clause 3.2.1.3 state that the *market network model* may contain such simplifications, approximations, equivalencies or adaptations as may facilitate the dispatch, pricing, or settlement processes

5.3.2 The MNM may contain simplifications related to the representation of Generation and Customer Trading Nodes upon request of a *Trading Participant* and approved by the *Market Operator*, *System Operator*, and if necessary, the *Network Service Provider*. Such simplifications are listed, but not limited to the following conditions

a) Aggregated representation of multiple generating units;
b) Aggregated representation in the MNM may be applied to multiple generating units that are located in a single generating station;
c) Disaggregated representation of customer trading nodes;and
d) Single Customer Trading Nodes representing an aggregate of multiple customers maybe disaggregated into several Customer Trading Nodes corresponding to the customers represented in that Trading Node. It is provided, however, that such disaggregation shall be allowed only in cases where there are appropriate real-time monitoring points that can account for the real-time withdrawal of *energy* in each disaggregated individual customer trading node.

5.3.3 The *Market Operator*, in consultation with the *System Operator*, and if necessary, the *Network Service Provider*, may implement simplifications, approximations, equivalencies or adaptations of the transmission and sub-transmission system on the *market network model*

5.3.4 The *Market Operator* shall ensure the consistency and accuracy of such simplifications, approximations, equivalencies or adaptations on the *market network model* while considering its impact on dispatch, pricing, and settlement processes

[redacted]

MARKET NETWORK MODEL MAINTENANCE AND PUBLICATION

5.4 MARKET NETWORK MODEL MAINTENANCE

5.4.1 The *Market Operator* shall prepare a document containing a summary of all the changes implemented in the MNM.

5.4.2 The *Market Operator* shall maintain an electronic copy of the following for all market network model revisions:

a) Bus Oriented Single Line Diagram; and
b) Breaker Oriented Single Line Diagram
c) Network Parameters

5.4.3 The *System Operator* shall regularly provide the *Market Operator* the following documents on a quarterly basis whether or not there are updates:

a) Updated Single Line Diagram; and
b) PSS/E file of the transmission system

5.4.4 The *Market Operator* shall ensure that the MNM used in the MMS is the same as the ratified/approved MNM by the *PEM Board*.

5.5 MANNER OF PUBLICATION

5.5.1 Any changes or revision initiated by the *Market Operator* or *System Operator* shall trigger the publication of the revised and approved MNM.

5.5.2 The Market Operator shall regularly publish the relevant updated MNM documents within seven days after the completion of the MNM consistency monitoring in the MMS' production system. Every revision of the MNM shall have the following associated documents published in the Market Information Website:

a) MNM Revisions Manual;
b) Bus-Oriented Single Line Diagram; and
c) Information brief

5.5.3 All publication by the *Market Operator* regarding the MNM shall be in an un-editable electronic format. The MNM documents shall be published to the general public through the *Market Information Website*.

5.6 INFORMATION DISCLOSURE

5.6.1 Disclosure of information concerning the MNM, shall be subject to the provisions in the *Information Disclosure and Confidentiality Market Manual*, consistent with Chapter 5 of the *WESM Rules*.

5.7 AUDITING OF MNM

5.7.1 In accordance with *WESM Rules* 1.5 and 5.2.6, the appropriateness of the *Market Network Model* as a representation of the transmission system shall be subject to the annual Market Operations Audit

5.8 REGULATORY COMPLIANCE

5.8.1 In compliance with the application *of the WESM* Price Determination Methodology, the MNM shall be submitted to the *Energy* Regulatory Commission, on a quarterly basis regardless of whether revisions or alterations have been introduced thereto.

5.9 DISPUTE RESOLUTION

5.9.1 Any dispute arising from the application of the MNM shall be submitted for resolution in accordance with the dispute resolution procedures set in the *WESM Rules* and applicable WESM *Market Manuals*.

5.10 CONTINUING OBLIGATIONS AND RESPONSIBILITIES

5.10.1 The *System Operator, Network Service Providers, Metering Service Provider* and *Trading Participants* shall continuously coordinate with the *Market Operator* with regard to maintenance, revision, publication and other necessary action regarding the MNM based on the WESM Timetable.

[redacted]

SECTION 6 MARKET TRADING NODE

6.1 BACKGROUND

6.1.1 The *Market Trading Node* in the MNM, in physical terms, represents a power substation onto which *energy* is injected or withdrawn through power transformers or switching equipment. The transformers and switching equipment connect the transmission network operated by the *System Operator* and generating equipment, distribution network operated by *Network Service Provider* and load customers.

6.2 DEFINITION

6.2.1 Pursuant to the definition of *WESM Rules* Clause 3.2.2.1, "A market trading *node* is a designated point in the *market network model* where *energy* is bought or sold based on the schedules and prices determined by the *Market Dispatch Optimization Model*. A *market trading node* where *energy* is primarily sold into the WESM is referred to as the *generator node* while *a market trading node* where *energy* is primarily bought from the WESM is referred to as a *customer node*".

6.2.2 In addition to this, *WESM Rules* Clause 3.2.2.2 state that "Each market trading *node* shall:

a) Be assigned to a *Trading Participant* that intends to buy or sell *energy* and is capable of complying with the *dispatch* and *settlement* requirements in the WESM;
b) Be associated with a revenue metering and *remote* telemetering facilities capable of measuring all relevant incoming and outgoing *energy* deliveries for the purpose of *dispatch* and *settlement* in the WESM; and
c) As much as possible, represent the *connection point* between the *Network Service Provider* and the *Trading Participant*

6.3 CLASSIFICATION OF MARKET TRADING NODES

6.3.1 MTN's can be classified as either *Generator Node* or *Customer Node*.

a) *Generator nodes* are *nodes* that represent a registered generating unit or generating system directly connected to a network operated by the *System Operator*. It is a *node* where power is injected into the *transmission network*.
b) *Customer nodes* are *nodes* that represent where power is withdrawn by *Trading Participants* from the grid.

6.3.2 There may be conditions wherein a *Trading Participant* has a generating facility whose remote telemetering facility is situated in a location where both its injection and withdrawal of power are monitored. In such cases, that *Trading Participant*

shall have a generator and customer MTN registered in the WESM to dynamically reflect its injection and withdrawal, respectively. These cases are applicable for the following conditions

a) Facility can act as a generator or load such as the Kalayaan hydro-electric facility, in which each of its facility can be run as a generator or a pump, or
b) Available remote telemetering facilities are situated at a location net of the station service or house load.

6.4 CRITERIA FOR THE DEFINITION OF MTN

The following are the general criteria for the definition of MTN:

6.4.1 MTN shall be defined for each *node* in the MNM that lies at the boundary between a network operated by the *System Operator* and any apparatus, network or equipment used to generate, convey or control the conveyance of *energy* and operated by a person other than the *System Operator.*

6.4.2 MTNs shall also be defined for each *node* in the MNM that lies at the boundary between a network operated by the *Network Service Provider* that is included in the MNM, and any apparatus, network or equipment used to generate, convey or control the conveyance of *energy* and operated by a person other than the *System Operator.*

6.4.3 Each MTN shall be associated with at least one Trading Participant registered in the WESM.

6.4.4 MTN shall be defined in a manner that calculation of relevant power flows and locational marginal prices shall not result to cross-subsidization of the *Trading Participant.*

6.4.5 If the interface of the network operated by the *System Operator* and the apparatus, network or equipment operated by the *Trading Participant* lies at the end of a radial transmission line or power transformer serving solely the *Trading Participant*, the MTN shall be defined at the take-off point of the radial transmission line or the power transformer from the main power network. Locational marginal prices shall be calculated at the MTN and dispatch of *energy* supplied or withdrawn by the Trading Participant shall be adjusted to account for the *energy* losses along the radial transmission line or power transformer. These *energy* losses shall be for the account of the *Trading Participant.*

6.4.6 If the *Trading Participant* interconnects to two or more transmission *nodes*, the MTN for that *Trading Participant* shall be the high voltage side of its step-up transformer.

6.4.7 If the *Trading Participant* is a dispatchable generator connected to a distribution system (embedded facility), then its MTN shall be assigned to the nearest *node* represented in the MNM. Adjustments to the real-time monitoring of the Customer MTN shall be made accordingly to reflect the total power consumed by that Customer MTN accounting for the power generated by the dispatchable generator situated downstream.

6.5 GENERATOR MTN

6.5.1 A MTN is considered a generator *node* if *energy* is supplied into that *node* and the direction of the power flow is from the apparatus or equipment (i.e. generator) operated by the Trading Participant to the network operated by the *Network Service Providers*, including the *System Operator*.

6.5.2 During the submission of offers to supply electricity, the participant generator shall specify the location of the connection point and the relevant market network *node*.

6.5.3 The information that should be submitted by the generators in their *energy* supply and *reserve offers* are enumerated in Appendix A.1 of the *WESM Rules*.

6.6 CUSTOMER MTN

6.6.1 A *customer node* is the point where *energy* is withdrawn by the *WESM participant* and the direction of the power flow is from the network operated by the *Network Service Providers*, including the *System Operator*, to the *energy* consuming apparatus or equipment (i.e. load) owned by or connected to the customer trading participant.

6.6.2 The information required from the customers during their submission of *demand bids* or *reserve offers* in the case of dispatchable loads are listed in Appendix A of the *WESM Rules*.

6.7 PROCEDURE FOR MTN IDENTIFICATION

6.7.1 During registration process, Trading Participants shall submit data requirements specified by the *Market Operator* pursuant to the WESM *Market Manual* on Registration, Suspension, and De-Registration Criteria and Procedures.

6.7.2 The *Market Operator* and the *System Operator*, in coordination with the *Trading Participant*, shall determine the MTN based on the criteria set out in Section 6.4 - Criteria For Definition of MTN of this document.

[redacted]

SECTION 7 AMENDMENTS, PUBLICATION, AND EFFECTIVITY

7.1 AMENDMENTS TO THIS MANUAL

Any amendment, or revision to this Manual shall be approved by the PEM Board.

7.2 PUBLICATION AND EFFECTIVITY

Upon approval of the *PEM Board*, this manual *Market Manual* shall take effect fifteen (15) days from its publication, or such later date as the PEM Board determines, in accordance with the provisions in the WESM Manual of Procedures for Changes to the WESM Rules (WESM-RCM)

SECTION 8 APPENDICES

Appendix A. List of Required Transmission Network Parameters

The table below lists all parameters needed by *Market Operator* in order to completely define the MNM:

A. Topology of the Network[3]
1. Bus Voltage (in kilovolts)
2. Transmission Line Name and Circuit Number
3. Transmission Line Name
4. Transmission "From Bus"
5. Transmission Line "To bus"
6. Transformer Name (designated by NSP)
7. Transformer "From Bus"
8. Transformer "To bus"
9. Generator Station Identification
10. Generator Bus name
11. Generator-Unit Number/Identification
12. Generator Interconnection Bus Name.
13. Load Name
14. Load Unit Number
15. Load Interconnection Bus Name
16. Zone/Area Identification Name (Control Area)
17. Zone/Area ID Number (any number from 1-99000)
18. Switched Shunt (capacitor, reactor) Name
19. Switched Shunt (capacitor, reactor) associated Bus name
20. HVDC Link Circuit Number

B. Impedances, Thermal Limits, Loss Functions	**Provision**
1. Transmission Line Circuit Branch Resistance, R	Mandatory
2. Transmission Line Circuit Branch Reactance, X	Mandatory
3. Transmission Line Circuit Total Branch Susceptance, B	Mandatory
4. Transmission Line Circuit Thermal Limit under Normal Operation, MVA or MW	Mandatory
5. Transformer Voltage, kV	Mandatory
6. Transformer Resistance, R[4]	As Available
7. Transformer reactance, X	Mandatory
8. Transformer Thermal limit under Normal Operation, MVA	Mandatory

[3] All are "Mandatory" requirements that shall be determined between the *Market Operator* and the *System Operator*

[4] Shall be "Mandatory" for network or non-radial transformers

9. Switched Shunt Capacitor, MVAR	Mandatory
10. Switched Shunt Reactor, MVAR	Mandatory
11. Core Loss, MW	As Available

C. Limits on the voltage of the HVDC Equipment[5]
1. HVDC Bus Voltage
2. HVDC Power Transfer Rating

D. Generator parameters[6]
1. Maximum generator Real Power Output MW
2. Minimum generator Real Power Output, MW
3. Generator Ramp Rates

[5] All are mandatory requirements
[6] All are mandatory requirements