

## RULES CHANGE COMMITTEE

### Addendum to RCC Resolution No. 2021-15 entitled Proposed Amendments to Various WESM Manuals for Improvements to Market Resource Modelling and Monitoring



Effective Date : 18 February 2022

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**WHEREAS**, the WESM Manuals on 1) Market Network Model Development and Maintenance – Criteria and Procedures Issue 4.2 (MNMCP Manual) and 2) Registration, Suspension and De-Registration Criteria and Procedures Issue 5.3 (RSDCP Manual) provide the procedures for registration of market resources and corresponding changes to the market network model (MNM);

**WHEREAS**, on 23 March 2021, the Independent Electricity Market Operator of the Philippines (IEMOP) submitted proposed amendments to the MNMCP and RSDCP Manuals to refine and clarify the procedures for modelling market resources in the MNM and to provide details on the features of modelling generators;

**WHEREAS**, comments received from the PEMC, WESM Technical Committee (TC), Millennium Energy Inc. (MEI), Panasia Energy Inc. (PEI), Aboitiz Power Corporation (APC), Manila Electric Company (MERALCO) and National Grid Corporation of the Philippines (NGCP) were responded to by the proponent and was taken up by the RCC during its several meetings<sup>1</sup>;

**WHEREAS**, the RCC, during its 185<sup>th</sup> meeting on 15 October 2021, finalized the proposal and approved its endorsement to the PEM Board, noting the following:

1. The objections of Mr. Ambrocio R. Rosales (SO) and Prof. Jordan P. Orillaza (Technical Committee (TC) Chairperson) on the illustration of Simplified Model for Embedded Generators. Mr. Rosales opined that the illustration appears to be radial which is not equivalent to the actual network that is being simplified and suggested using a pseudo-line in looping the substations for such network connection. Meanwhile, Prof. Orillaza posited that the proposed provision on simplifying the network is not technically sound as it should be illustrated using power flows; and
2. IEMOP's submission of another proposal by December 2021 enhancing the market network simplification process to address the issues raised by the SO and Technical Committee Chairperson, including issues on the modelling of embedded generators;

**WHEREAS**, the PEM Board, during its 41<sup>st</sup> meeting held on 27 October 2021, remanded the proposal to the RCC to address the concerns raised by the SO and TC Chairperson regarding looped networks;

**WHEREAS**, on 14 December 2021, the IEMOP submitted its additional proposal providing 1) a revised Appendix A of Section 5.3.2 (Simplifications on the Market Network Model) of the MNMCP Manual with an illustration of approximating network model with limited real-time data, and 2) new provision in the

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<sup>1</sup> The proposal was discussed during the 177<sup>th</sup>, 180<sup>th</sup>, 181<sup>st</sup>, 182<sup>nd</sup>, 183<sup>rd</sup> and 184<sup>th</sup> RCC Meetings held on 16 April 2021, 18 June 2021, 16 July 2021, 23 July 2021, 20 August 2021 and 17 September 2021, respectively.

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WESM Load Forecasting Methodology Manual on the basis of projected loads, including metered quantities and data from network service providers, to be used in the process of determining net load forecasts;

**WHEREAS**, during its 188<sup>th</sup> meeting on 17 December 2021, the RCC noted the following information and discussion made by the IEMOP following the latter's submission of an additional proposal on 14 December 2021:

1. A coordination meeting with the Technical Committee was initiated by IEMOP on 09 November 2021 to discuss the additional proposal's conceptual framework;
2. Ideally, the market network should be modelled up to the connection point or co-located at the revenue meter. However, due to the absence of real-time monitoring facilities to measure the consumption of loads downstream, at least located at the connection point, simplification and approximations are being implemented;
3. The distance of the real-time monitoring and revenue meter is not included in the market network model, thus, Metered Quantities (MQs) are adjusted, which is the sum of the MQ and site-specific loss adjustment (SSLA), to co-locate the energy withdrawn/injected with the pricing location for purposes of market settlements. The revised market network model approximation in the additional proposal will use historical MQ. The same modelling is being proposed to be used for cases that the revenue meter is not co-located with the real-time monitoring;
4. Currently, nodal load distribution profiles being used are primarily based on real-time data. But due to the absence/insufficiency of real-time data up to the connection point, it is proposed that changes to the Load Forecasting Manual be made to establish the use of other available data to estimate loads at withdrawal points where there is no real-time facility available;
5. The additional proposal will require the Network Service Providers (NSPs) to inform the Market Operator of the activities that will impact the representation of the real-time configuration of the market network model; and
6. The additional proposal is consistent with IEMOP's discussion with MERALCO regarding the possible inclusion of the distribution network in the market network model.

**WHEREAS**, during the same 188<sup>th</sup> meeting, the RCC agreed to solicit further comments from the stakeholders, who submitted comments to the original proposal, and to provide them with the minutes/highlights of the IEMOP-TC coordination meeting and results of the MO's simulation of the proposed network model approximation as applied to non-MERALCO customers;

**WHEREAS**, during its 189<sup>th</sup> meeting held on 21 January 2022, the RCC focused its deliberations on the additional proposal covering the WESM Manual on Load Forecasting Methodology Issue 4.0 and the corresponding comments received from the TC, MERALCO and NGCP, noting the following:

1. The original simplification process was made due to the limitations on the availability of real-time data downstream. The revised approximation model will address the concerns in the looped network through forecasting of nodal loads under the newly proposed Section 6.2.8 of the Load Forecasting Manual;
2. The revised simplification illustration will model the market network up to the connection point (or co-located at the revenue meter) for looped connections. In the current model, some generators are modelled at the nearest substation that they are operationally connected to which requires the



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continuous use of the SSLA. In the revised model, there will be no need for the metered quantity to be adjusted through the SSLA, and changes to the grid connection can be captured at any time;

3. In the absence of real-time distribution network data, the proposal focused on how to at least reflect the loop configurations in the market network model, using historical information. While this may be a temporary solution, the proposal will result to a market network model that better reflects the physical electricity network than the current market network modeling process.
4. The Market Operator deems the unavailability of distribution network data, which results to the Market Operator's inability to accurately model the distribution system, as a compliance issue that is beyond its control. While this has been elevated to the DOE since 2006, the Market Operator has been engaging with the relevant distribution utilities since 2019 to come up with ways on how to address network modelling concerns. Part of the agreement with the relevant distribution utilities is to treat their network data used in the impact study as confidential until the Market Operator and the distribution utilities agree on the modelling of their network.
5. The NGCP has an existing project providing the distribution utilities a monitoring unit at the connection point, which may partially resolve or improve the estimation of loads made by IEMOP.
6. The sample impact assessment of modelling scheduling points for non-MERALCO customers are provided in Annex A;

**NOW THEREFORE**, we, the undersigned, on behalf of the sectors we represent, hereby resolve *via* electronic communication platform, as follows:

**RESOLVED**, that the RCC approves the additional proposed amendments to the WESM Manual on Load Forecasting Issue 16.0 and the revised simplification model (Annex B) to be attached as Appendix A of Section 5.3.2 (Simplifications on the Market Network Model) of the WESM Manual on Market Network Model Development and Maintenance - Criteria and Procedures Issue 4.2;

**RESOLVED FURTHER**, that the said Proposed Amendments to the following WESM Manuals are hereby endorsed to the PEM Board for approval and subsequent transmittal to the DOE for promulgation:

1. WESM Manual on Load Forecasting Issue 16.0;
2. WESM Manual on Registration, Suspension and De-Registration Criteria and Procedures Issue 10.0 (Annex C); and
3. WESM Manuals on Market Network Model Development and Maintenance – Criteria and Procedures Issue 4.2 (Annex D).

Done this 18<sup>th</sup> day of February 2022 *via* Microsoft Teams.



Addendum to RCC Resolution No. 2021-15 entitled Proposed Amendments to Various WESM Manuals for Improvements to Market Resource Modelling and Monitoring

Approved by: <b>THE RULES CHANGE COMMITTEE</b>	
Independent Members:	
 <b>Concepcion I. Tanglao</b>	 <b>Jesusito G. Morallos</b>
Generation Sector Members:	
 <b>Dixie Anthony R. Banzon</b> Masinloc Power Partners Co. Ltd. (MPPCL)	 <b>Cherry A. Javier</b> Aboitiz Power Corp. (APC)
 <b>Carlito C. Claudio</b> Millennium Energy, Inc./ Pansia Energy, Inc. (MEI/PEI)	 <b>Mark D. Habana</b> Vivant Corporation - Philippines (Vivant)
Distribution Sector Members:	
 <b>Virgilio C. Fortich, Jr.</b> Cebu III Electric Cooperative, Inc. (CEBECO III)	 <b>Ryan S. Morales</b> Manila Electric Company (MERALCO)
 <b>Ricardo G. Gumalal</b> Iligan Light and Power, Inc. (ILPI)	 <b>Nelson M. Dela Cruz</b> Nueva Ecija II Area 1 Electric Cooperative, Inc. (NEECO II – Area 1)

Supply Sector Member:



**Lorreto H. Rivera**  
TeaM (Philippines) Energy Corporation  
(TPEC)

Market Operator Member:



**Isidro E. Cacho, Jr.**  
Independent Electricity Market Operator of the Philippines  
(IEMOP)

System Operator Member:



**Ambrocio R. Rosales**  
National Grid Corporation of the Philippines  
(NGCP)

## ANNEX A - Sample Impact Assessment of Modelling Scheduling Points

### Understanding Loss Factors in the WESM

- ❑ Loss Factors provide a locational indicator of the amount of MW losses contributed (added or reduced) to the system
  - → Key component for providing “pricing signals”
- ❑ Around the value of unity or 1:
  - If the loss factor is lower than 1, it indicates that there are too many loads in that area/location, thus suggesting more generation is needed
    - Means area/location contributes more MW losses
  - If the loss factor is greater than 1, it indicates that the area/location is “generation-rich”
    - Means area/location contributes less MW losses in the system

### Locational Marginal Price (LMP)

$$\text{LMP} = \text{SMP} + \text{Cost of Losses} + \text{Cost of Congestion}$$

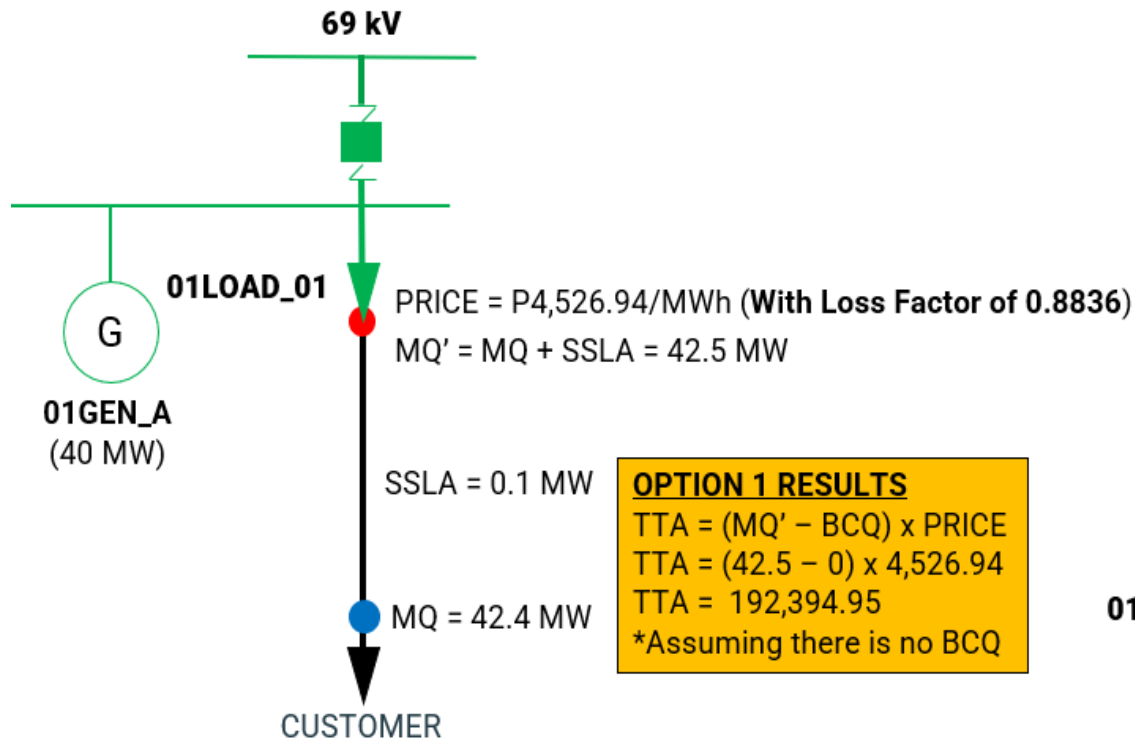
$$\text{LMP} = \lambda + \left( \frac{1}{\text{Loss Factor}} - 1 \right) \lambda + \sum_{\alpha} \mu_{\alpha}$$

Loss Factors are determined during the execution of the power flow analysis module of the MDOM

$$\text{Loss Factor} = \frac{1}{1 - \frac{\delta P_{\text{LOSS}}}{\delta P_I}}$$

## Scenario 2: Extension Of Model With Embedded Generator

### OPTION 1: MODELLING AT AVAILABLE REAL-TIME DATA



#### OPTION 1 RESULTS

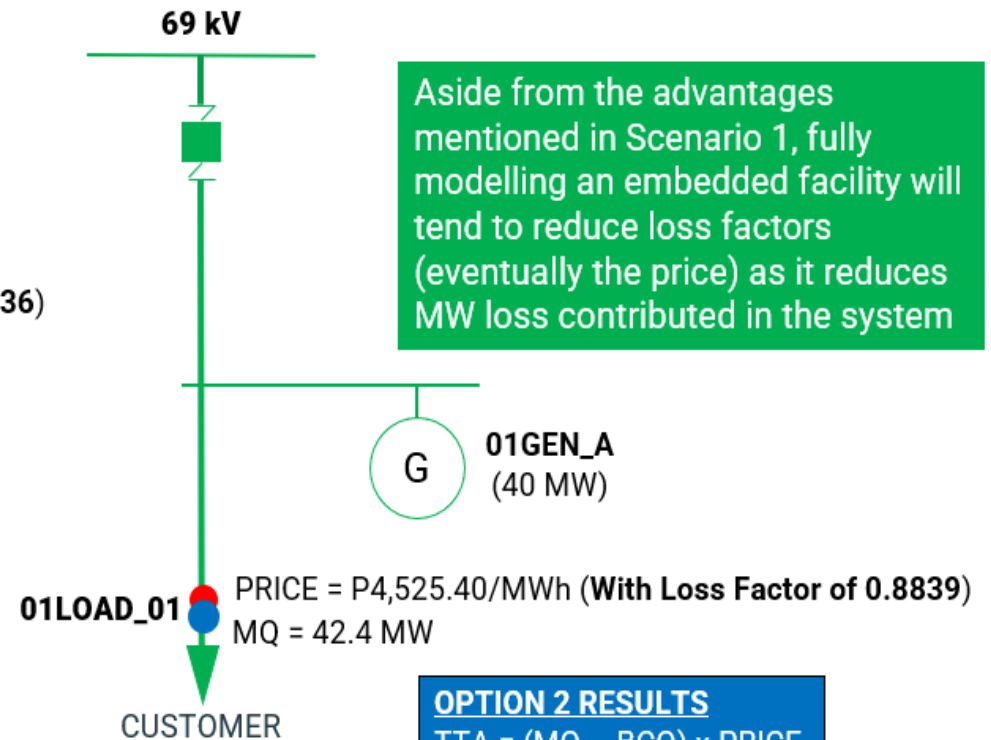
$$TTA = (MQ' - BCQ) \times PRICE$$

$$TTA = (42.5 - 0) \times 4,526.94$$

$$TTA = 192,394.95$$

\*Assuming there is no BCQ

### OPTION 2: MODELLING AT SCHEDULING POINT



Aside from the advantages mentioned in Scenario 1, fully modelling an embedded facility will tend to reduce loss factors (eventually the price) as it reduces MW loss contributed in the system

#### OPTION 2 RESULTS

$$TTA = (MQ - BCQ) \times PRICE$$

$$TTA = (42.4 - 0) \times 4,525.40$$

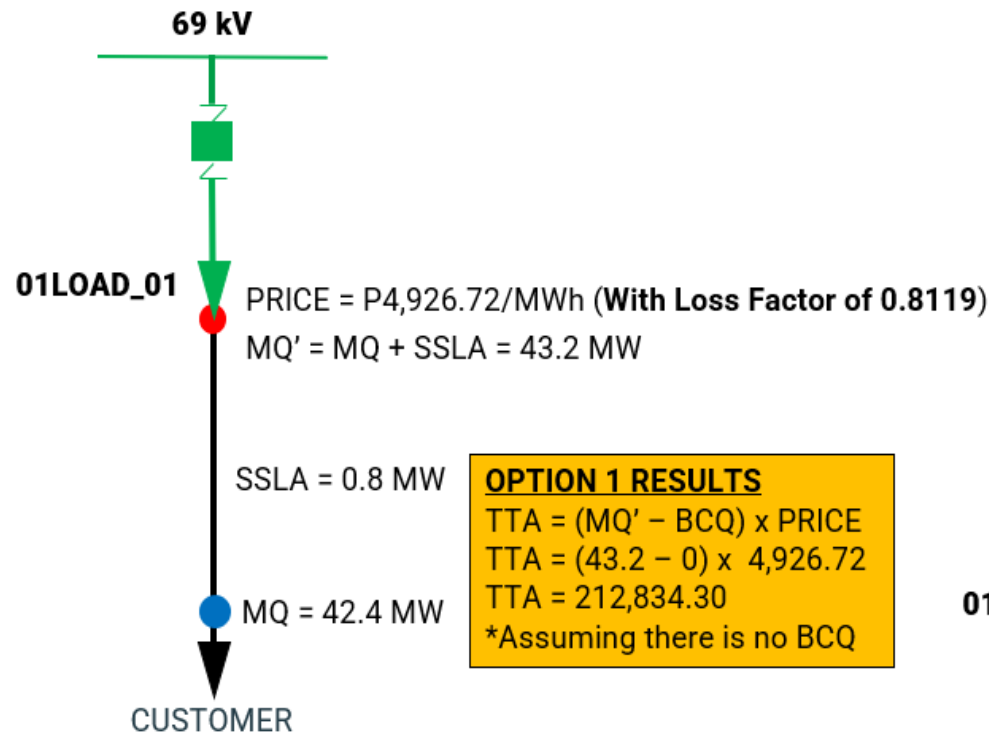
$$TTA = 191,876.96$$

\*Assuming there is no BCQ



## Scenario 1: Extension Of Model With **No** Embedded Generator

### OPTION 1: MODELLING AT AVAILABLE REAL-TIME DATA



#### OPTION 1 RESULTS

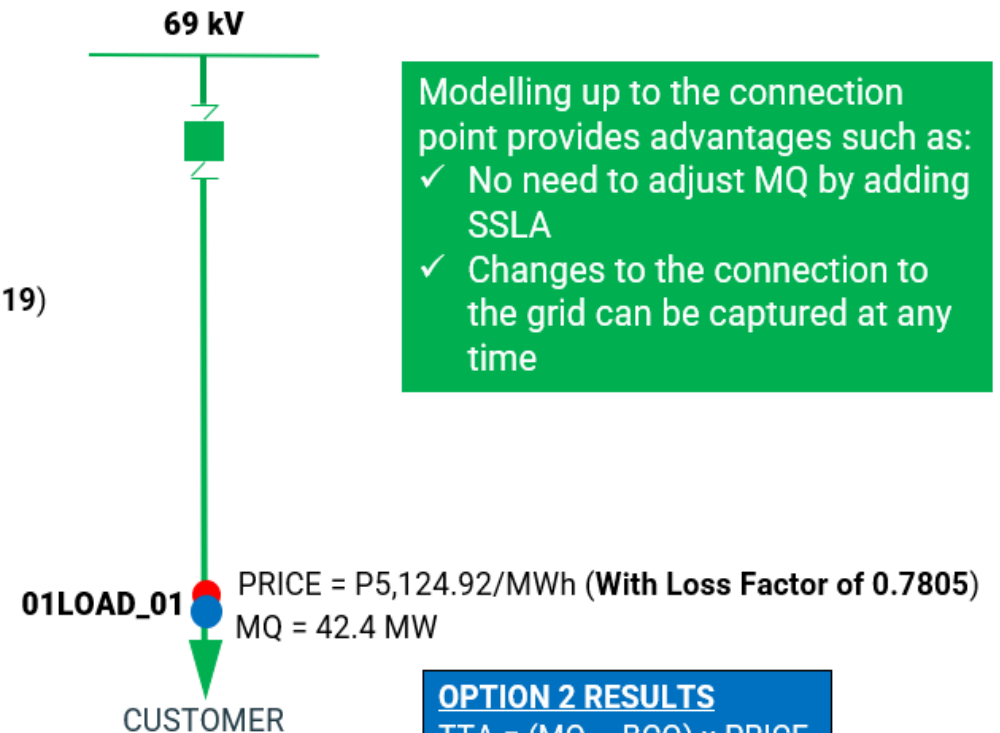
$$TTA = (MQ' - BCQ) \times \text{PRICE}$$

$$TTA = (43.2 - 0) \times 4,926.72$$

$$TTA = 212,834.30$$

\*Assuming there is no BCQ

### OPTION 2: MODELLING AT SCHEDULING POINT



Modelling up to the connection point provides advantages such as:

- ✓ No need to adjust MQ by adding SSLA
- ✓ Changes to the connection to the grid can be captured at any time

#### OPTION 2 RESULTS

$$TTA = (MQ - BCQ) \times \text{PRICE}$$

$$TTA = (42.4 - 0) \times 5,124.92$$

$$TTA = 217,296.61$$

\*Assuming there is no BCQ

● MODELLED LOAD RESOURCE ● REVENUE METER

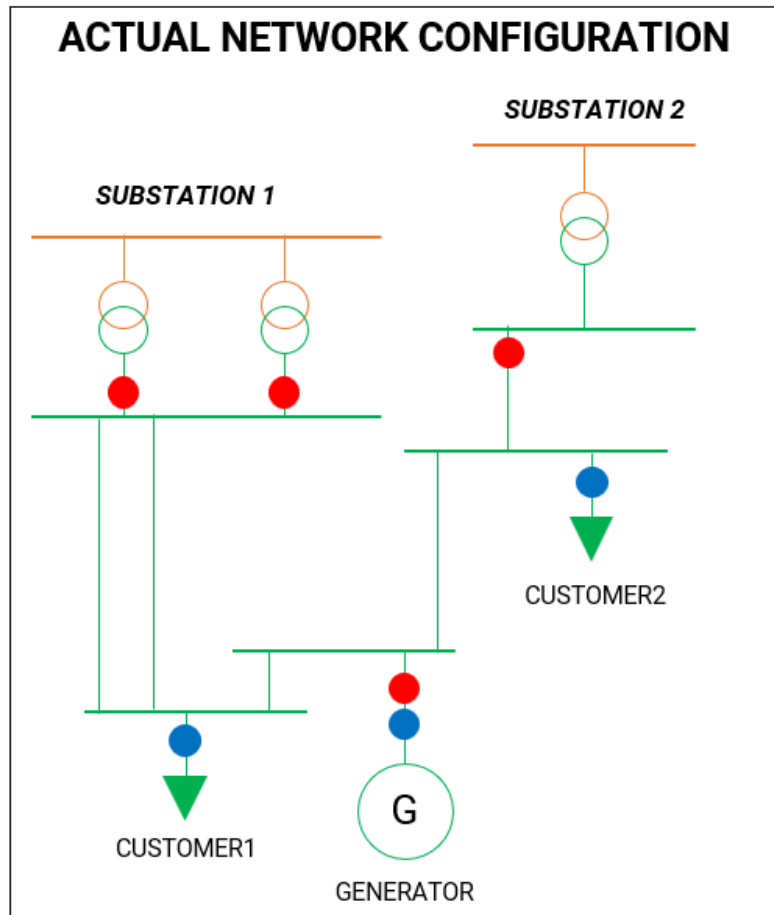


## ANNEX B - WESM Manual on Load Forecasting Methodology Issue 16.0

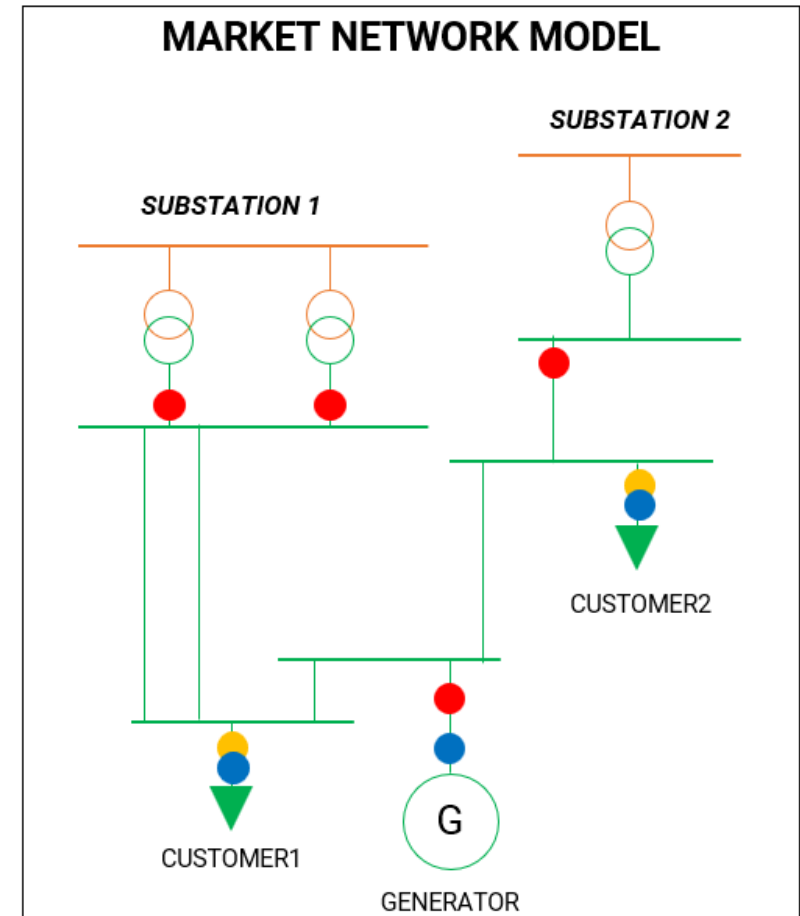
Title	Clause	Provision	Proposed Amendment	Rationale
Load Forecasting Methodology	<b><u>6.2.8</u></b>	(NEW)	<p><b><u>The projected load used in clause 6.2.4 may be based on the following information.</u></b></p> <ul style="list-style-type: none"> <li>a. <b><u>Real-time data</u></b></li> <li>b. <b><u>Historical load profiles from real-time data</u></b></li> <li>c. <b><u>Historical metered quantity profiles</u></b></li> <li>d. <b><u>Load profiles from <i>network service providers</i> that shall be regularly updated at least every month</u></b></li> </ul>	<p>Due to insufficient real-time monitoring needed to measure the consumption of some downstream loads, there are cases that the network model is simplified up to the location where the real-time data is available. With this new provision, it will address the current real-time monitoring limitations by the new process of estimating the real-time data for loads (with no RTU) using the historical data such as the metered quantities (MQ).</p> <p>Item (d) on load profiles from NSPs is being proposed in cases where distribution systems are included in the market network model. The updates shall include activities that will impact the representation of the real-time configuration of the market network model and updated load profiles at the scheduling points.</p>



**Appendix A of Section 5.3.2 (Simplifications on the Market Network Model) of the WESM Manual on Market Network Model Development and Maintenance - Criteria and Procedures Issue 4.2: Illustration of Approximating Network Model with Limited Real-Time Data**



● REAL-TIME MONITORING      ● REVENUE METER



● REAL-TIME MONITORING      ● REVENUE METER  
● ESTIMATED REAL-TIME DATA

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## Annex C – WESM Manual on Registration, Suspension and De-Registration Criteria and Procedures Issue 10.0

Title	Clause	Provision	Proposed Amendment	Rationale
Other Considerations	2.5.4.2.	<p>Aggregation of Generating Units</p> <p><i>A Generation Company</i> that owns multiple <i>generating units</i> located in a single generating station shall, upon application, inform the <i>Market Operator</i> if it wishes to have an aggregated representation for such <i>generating units</i> in the <i>market network model</i>. The <i>Applicant</i>, the <i>Network Services Provider</i>, <i>Metering Services Provider</i>, <i>System Operator</i> and the <i>Market Operator</i> shall agree on the manner of aggregated representation in accordance with the procedures set forth in relevant <i>Market Manuals</i>.<sup>16</sup></p>	<p>Aggregation of Generating Units</p> <p><i>A Generation Company</i> that owns multiple <i>generating units</i> located in a single generating station shall, upon application, inform the <i>Market Operator</i> if it wishes to have an aggregated representation for such <i>generating units</i> in the <i>market network model</i>.</p> <p>The <i>Applicant</i>, the <i>Network Services Provider</i>, <i>Metering Services Provider</i>, <i>System Operator</i> and the <i>Market Operator</i> shall agree on the manner of aggregated representation in accordance with the procedures set forth in relevant <i>Market Manuals</i>.<sup>16</sup></p> <p><b><u>Should the technical information contained in the Certificate of Compliance or Provisional Authority to Operate (PAO) or ERC Certificate with appropriate exhibit issued by the ERC indicate details per generating unit, the following shall be observed when reflecting the aggregated facility's registered capacity:</u></b></p>	To clarify how Pmin and Pmax are determined for aggregated generating units



Title	Clause	Provision	Proposed Amendment	Rationale
			<p>a. <u>Maximum Stable Load (or <math>P_{max}</math>) shall be based on the sum of the individual generating unit's maximum capacity; and</u></p> <p>b. <u>Minimum Stable Load (or <math>P_{min}</math>) shall be based on the smallest <math>P_{min}</math> among the individual generating units.</u></p>	
Other Considerations	2.5.4.7	(NEW)	<p><b><u>2.5.4.8 Real-Time Monitoring Location</u></b></p> <p><b><u>During the registration of the generating unit, the Generation Company shall specify if its real-time monitoring will be at the gross MW output of the generating unit or at the same location as its market trading node, which is at its connection point and net of its station use, in accordance with the guidelines set forth in the WESM Manual on Market Network Model Development and Maintenance – Criteria and Procedures.</u></b></p>	To require the generation company to provide the Market Operator information on the location of its real-time monitoring facilities to more efficiently facilitate its accurate inclusion in the MNM



## Annex D – WESM Manual on Market Network Model Development and Maintenance - Criteria and Procedures Issue 4.2

Title	Clause	Provision	Proposed Amendment	Rationale
Definitions	2.1.5	(NEW)	<b><u>2.1.5 Market Resource refers to the objects defined in the Market Network Model to represent generators, battery energy storage systems, pumped-storage units, and loads.</u></b>	To provide general term used in MNM for all objects representing generators, BESS, pumped-storage units, and loads  The market resource is the actual objects being modelled in the system.
Responsibilities	3.2.2	(NEW)	<b><u>3.2.2 The System Operator and the Generation Companies shall ensure that their facilities for real-time monitoring are available and that they accurately reflect the state of their generation (i.e., MW/MVAR output and generator breaker status).</u></b>	To include Generator Companies in the responsibility to maintain real-time facilities to cover cases when the Generation Company owns or manages its own real-time monitoring facilities
Responsibilities	3.2.3	(NEW)	<b><u>3.2.3 The Market Operator shall immediately inform the System Operator of any observed discrepancies in the real-time data.</u></b>	To provide separate responsibility for IEMOP to report any observed discrepancies in the real-time data from SO
Criteria for The Market Network Model Development	4.3.2	Network data that accurately reflects the conditions prevailing on the network, including losses, constraints and contingencies, at any trading interval	Network data that accurately reflects the conditions prevailing on the network, including losses, constraints and contingencies, at any trading <b>dispatch</b> interval	Revised the term “trading interval” to “dispatch interval” for consistency with the use of dispatch intervals

Title	Clause	Provision	Proposed Amendment	Rationale
MNM Components and Modeling	4.4.2	<p>Generator plant/unit representations</p> <p>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.</p>	<p><b><u>Representations of</u></b> Generator plant/unit representations <b><u>Market Resources</u></b></p> <p>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.</p>	To reflect the general term for representations of generators, battery energy storage systems, pumped-storage unit, and loads
MNM Components and Modeling	4.4.3	<p>Load representations</p> <p>These are numerical representations of the customer demand corresponding to power withdrawal from the network. Loads shall be modeled as constant power withdrawal points.</p>	<p><b><u>Representations of</u></b> Load representations <b><u>Market Resources</u></b></p> <p>These are numerical representations of the customer demand corresponding to power withdrawal from the network. Loads shall be modeled as constant power withdrawal points.</p>	To reflect the general term for representations of generators, battery energy storage systems, pumped-storage unit, and loads
MNM Components and Modeling	4.4.4	<p><i>Battery Energy Storage System</i> representation</p> <p>This is the mathematical model of a <i>battery energy storage system</i> with its dual capability of injecting or withdrawing power through the network.</p>	<p><b><u>Representations of</u></b> <i>Battery Energy Storage System</i> representation <b><u>Market Resources</u></b></p> <p>This is the mathematical model of a <i>battery energy storage system</i> with its dual capability of injecting or withdrawing power through the network.</p>	To reflect the general term for representations of generators, battery energy storage systems, pumped-storage unit, and loads
MNM Components and Modeling	4.4.5	<p><i>Pumped-Storage Unit</i> representation</p> <p>This is the mathematical model of a <i>pumped-storage unit</i> with its dual capability of injecting or withdrawing power through the network.</p>	<p><b><u>Representations of</u></b> <i>Pumped-Storage Unit</i> representation <b><u>Market Resources</u></b></p> <p>This is the mathematical model of a <i>pumped-storage unit</i> with its dual capability of injecting or withdrawing power through the network.</p>	To reflect the general term for representations of generators, battery energy storage systems, pumped-storage unit, and loads

Title	Clause	Provision	Proposed Amendment	Rationale
MNM Components and Modeling	4.4.7	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.	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.	Clerical correction for equipment
Market Impact Study	4.6.3	The Market Operator shall publish the results of the market impact study as may be required by the PEM Board.	The <i>Market Operator</i> shall <del>publish</del> <b>submit</b> the results of the market impact study <del>as may be required by</del> <b>to the DOE, ERC, and the PEM Board.</b>  <b><u>The Market Operator shall publish a public copy of the same in the market information website, if required by the DOE, ERC, or the PEM Board.</u></b>	To include the DOE, ERC and PEM Board as recipient of the study  For transparency
MNM	5	ALTERATIONS TO THE MARKET NETWORK MODEL	<del>ALTERATIONS TO THE MARKET NETWORK MODEL</del> <b><u>UPDATING AND MAINTENANCE OF</u></b> TO THE MARKET NETWORK MODEL	Revised for clarity
Network Development	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.	Changes <b><u>Updates</u></b> in the MNM configuration as a result of <del>the</del> network development or aggregation or disaggregation of <del>Trading Nodes</del> <b><u>market resources</u></b> shall be <del>made</del> published in accordance with <del>the</del> MNM publication requirements set forth in Section <del>6.0</del> <b><u>5.5</u></b> of this document <b><u>Market Manual.</u></b>	Revised for clarity  To correct the reference on the manner of publication in case of changes/updates in the MNM
Simplifications on the Market Network Model	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	The MNM may contain simplifications related to the representation of <del>Generation and Customer Trading Nodes</del> <b><u>market resources</u></b> upon request of a <i>Trading Participant</i> . <b><u>It should be</u></b> and	Revised for clarity  Included provision on the treatment of Generators (e.g.



Title	Clause	Provision	Proposed Amendment	Rationale
		<p>Market Operator, System Operator, and if necessary, the Network Service Provider. Such simplifications are listed, but not limited to the following conditions</p> <p>a) Aggregated representation of multiple generating units;</p> <p>b) Aggregated representation in the MNM may be applied to multiple generating units that are located in a single generating station;</p> <p>c) Disaggregated representation of customer trading nodes; and</p> <p>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.</p>	<p><del>approved</del> <b><u>agreed upon</u></b> by the <i>Trading Participant, Market Operator, System Operator</i>, and if necessary, the <i>Network Service Provider</i>. Such simplifications are listed, but not limited to the following conditions:-;</p> <p>a) Aggregated representation of multiple generating units;</p> <p><del>b)</del> <b><u>(note: aggregated representation in the MNM may be applied to multiple <i>generating units</i> that are located in a single generating station);</u></b></p> <p><del>eb)</del> Disaggregated representation of customer trading nodes; and</p> <p><del>ec)</del> Single Customer Trading Nodes representing an aggregate of multiple customers <del>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.</del></p> <p><b><u>d) Representation of downstream <i>generating units</i> with limited real-time monitoring facilities such as in cases of embedded generators where there is limited availability</u></b></p>	<p>Embedded Generators) that are located far from the main substation of NGCP, and there is limited real-time monitoring facilities available, or when they are in distribution networks that are not modelled in the MNM.</p> <p>To reflect the current practice of IEMOP in simplifying actual network configurations</p>



Title	Clause	Provision	Proposed Amendment	Rationale
			<p><u>of real-time monitoring facilities between the transmission system's main substation and the generator, in which case, the <i>Market Operator</i> may provisionally model the <i>generating unit</i> at the nearest MNM substation to which it is indirectly connected. The following illustration shows an example of this case:</u></p> <p><i>[See Appendix A.]</i></p> <p><u>e) Representation of downstream <i>generating units</i> located in a <i>distribution network</i> that is not reflected in the <i>market network model</i>. The <i>Market Operator</i> may model the <i>generating unit</i> at the nearest MNM substation to which it is indirectly connected.</u></p>	
	5.5.2	5.5.2 The Market Operator shall regularly publish the relevant updated MNM documents within seven days after the completion of the	<del>The Market Operator shall regularly publish the relevant updated MNM documents within seven days after the completion of the MNM</del>	Redundant provision. Regular reporting is already covered in Section 5.5.1. <sup>2</sup>

<sup>2</sup> 5.5.1 Within two (2) working days from deployment, the Market Operator shall publish advisory on the MNM updates deployed in the production system. Consistent with the provisions of Clause 4.5.7 of this Market Manual, the Market Operator shall prepare a monthly report containing all MNM updates deployed in the production system. This report shall be provided to the DOE, ERC, and the PEM Board, and shall be similarly published in the market information website ten (10) working days after the end of the billing period. At the least, it shall contain the following:

- a) Summary of MNM Updates during the month
- b) Latest Bus-Oriented Single Line Diagram



Title	Clause	Provision	Proposed Amendment	Rationale
		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	<del>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</del>	
	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.	<b>5.5.3.</b> <del>5.5.2</del> 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.	Renumbering due to deletion of previous clause
MNM	--	MARKET NETWORK MODEL MAINTENANCE AND PUBLICATION	<del>MARKET NETWORK MODEL MAINTENANCE AND PUBLICATION</del>	Not necessary; clerical edit.
Continuing Obligations and Responsibilities	5.10.2	(NEW)	<b><u>5.10.2 The System Operator, in coordination with Network Service Providers and Trading Participants shall continuously ensure the completeness, availability, and accuracy of the required real-time data in the market network model.</u></b>	To highlight the responsibility of SO in ensuring reliability of real-time data  The Market Operator and the System Operator will develop a standard to determine the acceptable level of completeness, availability, and accuracy of data, which will be submitted as proposed amendments to the WESM Manual on Dispatch Protocol.

Title	Clause	Provision	Proposed Amendment	Rationale
Continuing Obligations and Responsibilities	5.10.3	(NEW)	<b><u>5.10.3 The System Operator shall report real-time monitoring facilities owned or managed by the Trading Participants or owned by the System Operator that have been persistently erroneous or non-updating for at least two (2) business days to the Market Operator and Enforcement and Compliance Office. The Trading Participant shall endeavor to resolve the issue within fifteen (15) calendar days from the time it was reported.</u></b>	To ensure that the TP and SO will correct real-time data errors in a timely manner
Continuing Obligations and Responsibilities	5.10.4	(NEW)	<b><u>5.10.4 The System Operator in coordination with the Market Operator and Trading Participant shall estimate shall be responsible for estimating real-time data that was reported to be erroneous or non-updating.</u></b>	To ensure accuracy of scheduling and pricing
Continuing Obligations and Responsibilities	5.10.5	(NEW)	<b><u>5.10.5 The Market Operator shall immediately inform the System Operator of any observed discrepancies in the real-time data.</u></b>	To provide separate responsibility for IEMOP to report any observed discrepancies in the real-time data from SO
MNM	6	MARKET TRADING NODE	<del>MARKET TRADING NODE</del> <b><u>MODELLING OF MARKET RESOURCES</u></b>	To reflect the general term for representations of generators, battery energy storage systems, pumped-storage unit, and loads
Market Trading Node	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	<del>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</del>	Revised for clarity

Title	Clause	Provision	Proposed Amendment	Rationale
		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.	<p>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.</p> <p><b><u>Market Resources shall be modelled in the market network model to represent a generator, battery energy storage system, pumped-storage unit, or load. Subject to Section 6.1.2, each market resource shall be classified as either a scheduling point or a market trading node of the generator, battery energy storage system, pumped-storage unit, or load.</u></b></p>	
Market Trading Node	6.1.2	(NEW)	<b><u>It is possible to define only one market resource to represent both the scheduling point and the market trading node.</u></b>	Added to clarify that some market resources can represent both scheduling point and market trading node.
Market Trading Nodes	6.3	CLASSIFICATION OF MARKET TRADING NODES	CLASSIFICATION <b><u>TYPES</u></b> OF MARKET TRADING NODES <b><u>RESOURCES</u></b>	Revised to use Market Resources as defined in proposed Section 2.1.5.
Classification of Market Trading Nodes	6.3.1	MTN's can be classified as: a) Generator nodes – nodes that represent a registered generating unit or generating system directly connected to a network operated by the System Operator. It is a node	MTN's <b><u>Market Resources</u></b> can be classified as: a) Generator nodes <b><u>resources</u></b> – nodes <b><u>resources</u></b> that represent a registered generating unit or generating system directly connected to a network operated by the System	Replaced nodes with resources as defined in proposed Section 2.1.5.

Title	Clause	Provision	Proposed Amendment	Rationale
		<p>where power is injected into the transmission network.</p> <p>b) Customer nodes – nodes that represent where power is withdrawn by Trading Participants from the grid.</p> <p>c) Battery Energy Storage System nodes – nodes that represent a registered battery energy storage system directly connected to a network operated by the System Operator. It is a node where power is injected or withdrawn through the transmission network.</p> <p>d) Pumped-Storage Unit nodes – nodes that represent a registered pumped-storage unit directly connected to a network operated by the System Operator. It is a node where power is injected or withdrawn through the transmission network.</p>	<p>Operator. It is a <del>node</del> <b>resource</b> where power is injected into the transmission network.</p> <p>b) Customer <del>nodes</del> <b>resources</b> – <del>nodes</del> <b>resources</b> that represent where power is withdrawn by Trading Participants from the grid.</p> <p>c) Battery Energy Storage System <del>nodes</del> <b>resources</b> – <del>nodes</del> <b>resources</b> that represent a registered battery energy storage system directly connected to a network operated by the System Operator. It is a <del>node</del> <b>resource</b> where power is injected or withdrawn through the transmission network.</p> <p>d) Pumped-Storage Unit <del>nodes</del> <b>resources</b> – <del>nodes</del> <b>resources</b> that represent a registered pumped-storage unit directly connected to a network operated by the System Operator. It is a <del>node</del> <b>resource</b> where power is injected or withdrawn through the transmission network.</p>	
Classification of Market Trading Nodes	6.3.2	Where available remote telemetering facilities are situated at a location net of the station service, the Trading Participant shall have a generator and a customer MTN registered in the WESM to accurately reflect the direction of power flow.	<b><u>For generating units registered and modelled net of its station use</u></b> <del>Where available remote telemetering facilities are situated at a location net of the station service, the Trading Participant shall have a generator and a customer MTN</del> <b>resource</b> registered in the WESM to accurately reflect the direction of power flow.	Revised for clarity
Market Trading Node	6.4	<p>CRITERIA FOR THE DEFINITION OF MTN</p> <p>The following are the general criteria for the definition of MTN:</p>	<b><u>CRITERIA FOR THE DEFINITION OF MTN GUIDELINES FOR MODELLING A MARKET RESOURCE</u></b>	Replaced MTN with Market Resource defined in proposed Section 2.1.5.

Title	Clause	Provision	Proposed Amendment	Rationale
			The following are the general criteria for the definition of MTN <b><u>guidelines in modelling the different market resources:</u></b>	
Criteria for the Definition of MTN	6.4.5	If the Trading Participant is a dispatchable generator connected to a distribution system (embedded facility), then its MTN and scheduling point shall be assigned to the nearest scheduling point represented in the MNM. Adjustments to the real-time monitoring of the Customer scheduling point shall be made accordingly to reflect the total power consumed by that Customer scheduling point accounting for the power generated by the dispatchable generator situated downstream.	<del>If the Trading Participant is a dispatchable generator connected to a distribution system (embedded facility), then its MTN and scheduling point shall be assigned to the nearest scheduling point represented in the MNM. Adjustments to the real-time monitoring of the Customer scheduling point shall be made accordingly to reflect the total power consumed by that Customer scheduling point accounting for the power generated by the dispatchable generator situated downstream.</del>	For deletion since Section 5.3.2 (d) <sup>3</sup> already covers this provision
Criteria for the Definition of MTN	6.4.6	A generating facility shall be modelled as a scheduling point.	<del>A generating facility shall be modelled as a scheduling point.</del>	For deletion since generating resources can have both MTNs and scheduling points
MNM	6.5	GENERATOR MTN	GENERATOR MTN <b><u>MARKET RESOURCE</u></b>	For consistency with the proposed new Section 2.1.5 (Definition of Market Resource)

<sup>3</sup> 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) xxx;
- b) xxx;
- c) xxx; 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. (emphasis supplied)



Title	Clause	Provision	Proposed Amendment	Rationale
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.	<del>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.</del>	For deletion since the definition is already indicated in Section 6.3.1
Generator MTN	6.5.2	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.	<del>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.</del> <b><u>6.5.1 During the registration of the generator resource, the Trading Participant shall specify if the scheduling point should represent the gross MW output of the generator or at the same location as the market trading node, which is at the connection point and net of its station use. The location of the scheduling point shall be the reference point for the registered capacity, submission of generation offers and self-scheduled nominations, scheduling, dispatch, and dispatch compliance monitoring.</u></b>	Re-numbered  Revised for clarity where the scheduling point shall be the reckoning or reference point capacity registration until dispatch compliance monitoring. Settlement is reckoned at the market trading node.
Generator MTN	6.5.3	6.5.3 xxx	<del>6.5.3</del> <b><u>6.5.2</u></b> xxx	Re-numbered
MNM	6.6	CUSTOMER MTN	CUSTOMER MTN <b><u>MARKET RESOURCE</u></b>	For consistency with the proposed new Section 2.1.5 (Definition of Market Resource)

Title	Clause	Provision	Proposed Amendment	Rationale
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.	<p><del>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.</del></p> <p><b><u>Should there be limitations for a customer resource to be modelled at the <i>connection point</i> (e.g. availability of real-time monitoring facilities), the <i>Market Operator</i> may implement simplifications and approximations to its representation in the <i>market network model</i> while still ensuring its consistency and accuracy with its actual connection to the grid.</u></b></p>	<p>For deletion since the definition is already indicated in Section 6.3.1</p> <p>To reflect current modelling practice for customer resources.</p>
MNM	6.7	BATTERY ENERGY STORAGE SYSTEM MTN	BATTERY ENERGY STORAGE SYSTEM MTN <b><u>MARKET RESOURCE</u></b>	For consistency with the proposed new Section 2.1.5 (Definition of Market Resource)
Battery Energy Storage System	6.7.1	A MTN is considered a battery energy storage system node if energy is injected or withdrawn through that node and the direction of the power flow is from the apparatus or equipment operated by the Trading Participant to the network operated by the Network Service Providers, including the System Operator.	<del>A MTN is considered a battery energy storage system node if energy is injected or withdrawn through that node and the direction of the power flow is from the apparatus or equipment operated by the Trading Participant to the network operated by the Network Service Providers, including the System Operator.</del>	Propose to delete original provision since definition is already indicated in section 6.3.1.

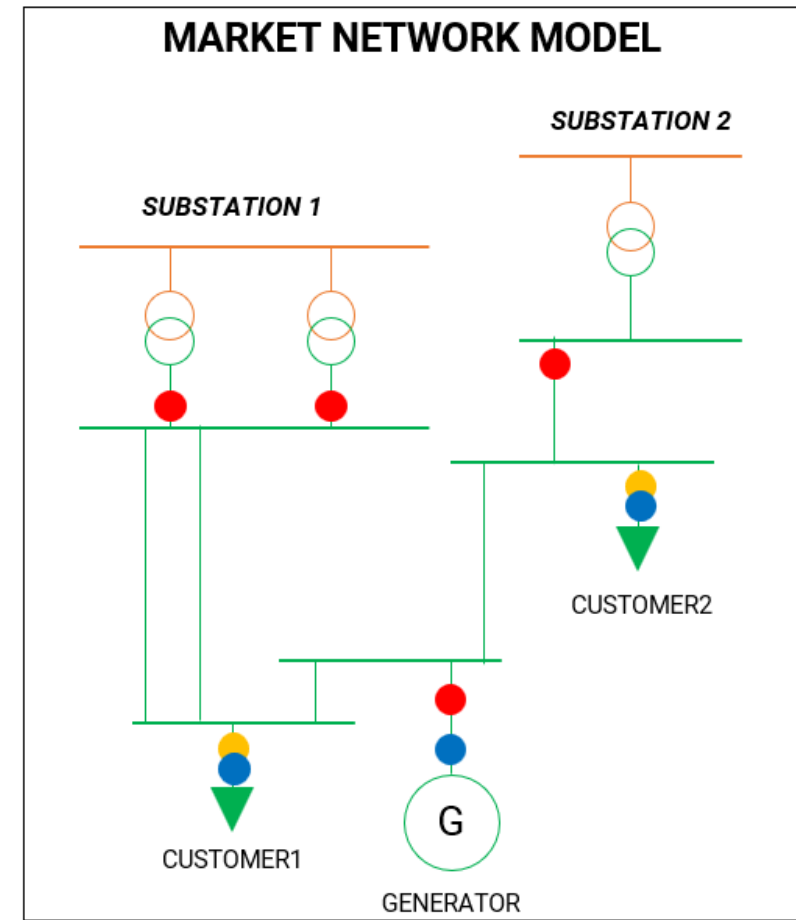
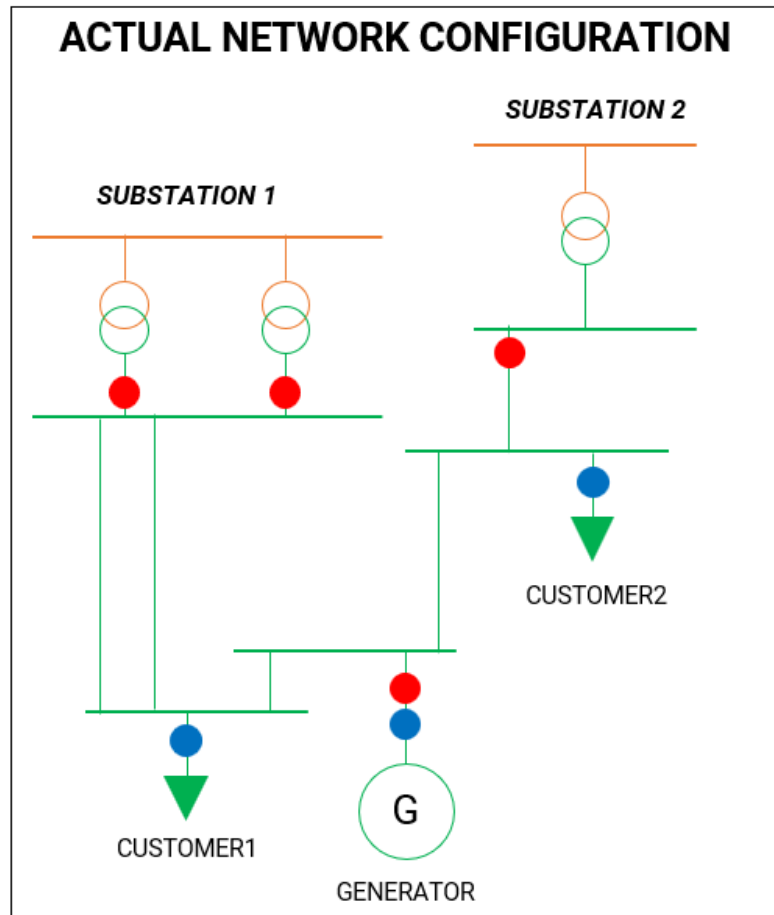
Title	Clause	Provision	Proposed Amendment	Rationale
Battery Energy Storage System	6.7.2	6.7.2 During the submission of offers to supply or consume electricity, the participant battery energy storage system shall specify the location of the connection point and the relevant market network node.	<del>6.7.2 During the submission of offers to supply or consume electricity, the participant battery energy storage system shall specify the location of the connection point and the relevant market network node.</del> <b><u>6.7.1 During the registration of the <i>battery energy storage system resource</i>, the <i>Trading Participant</i> shall specify if the <i>scheduling point</i> should represent the gross MW output of the generator or at the same location as the <i>market trading node</i>, which is at the connection point and net of its station use. The location of the <i>scheduling point</i> shall be the reference point for the <i>registered capacity</i>, submission of <i>generation offers</i> and <i>self-scheduled nominations</i>, <i>scheduling</i>, <i>dispatch</i>, and <i>dispatch compliance monitoring</i>.</u></b>	Re-numbered  Revised for clarity where the scheduling point shall be the reckoning or reference point capacity registration until dispatch compliance monitoring. Settlement is reckoned at the market trading node.
Battery Energy Storage System	6.7.3	6.7.3 xxx	<del>6.7.3</del> <b><u>6.7.2</u></b> xxx	Re-numbered
MNM	6.8	PUMPED-STORAGE UNIT MTN	PUMPED-STORAGE UNIT MTN <b><u>MARKET RESOURCE</u></b>	For consistency with the proposed new Section 2.1.5 (Definition of Market Resource)
Pumped-Storage Unit	6.8.1	A MTN is considered a pumped-storage unit node if the facility is a pumped-storage plant where energy can either be injected or	<del>A MTN is considered a pumped-storage unit node if the facility is a pumped-storage plant where energy can either be injected or</del>	For deletion since the definition is already indicated in Section 6.3.1

Title	Clause	Provision	Proposed Amendment	Rationale
		withdrawn through that node and the direction of the power flow is from the apparatus or equipment operated by the Trading Participant to the network operated by the Network Service Providers, including the System Operator.	<del>withdrawn through that node and the direction of the power flow is from the apparatus or equipment operated by the Trading Participant to the network operated by the Network Service Providers, including the System Operator.</del>	
Pumped-Storage Unit	6.8.2	6.8.2 During the submission of offers to supply or consume electricity, the participant battery energy storage system shall specify the location of the connection point and the relevant market network node.	<p><del>6.8.2 During the submission of offers during generation mode, the participant pumped-storage unit shall specify the location of the connection point and the relevant market network node</del></p> <p><b><u>6.8.1 During the registration of the <i>pumped-storage unit</i> resource, the <i>Trading Participant</i> shall specify if the <i>scheduling point</i> should represent the gross MW output of the generator or at the same location as the <i>market trading node</i> (i.e. at the <i>connection point</i>, which is at the connection point and net of its station use. The location of the <i>scheduling point</i> shall be the reference point for the <i>registered capacity</i>, submission of generation offers and self-scheduled nominations, scheduling, dispatch, and dispatch compliance monitoring.</u></b></p>	<p>Re-numbered</p> <p>Revised for clarity where the scheduling point shall be the reckoning or reference point capacity registration until dispatch compliance monitoring. Settlement is reckoned at the market trading node.</p>
Pumped-Storage Unit	6.8.3	6.8.3 xxx	<del>6.8.3</del> <b><u>6.8.2</u></b> xxx	Re-numbered
MNM	6.9	PROCEDURE FOR MTN IDENTIFICATION	<b>PROCEDURE FOR MTN IDENTIFICATION REGISTRATION OF MARKET RESOURCES</b>	Revised to better describe the section

Title	Clause	Provision	Proposed Amendment	Rationale
Procedure for MTN Identification	6.9.2	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.	The Market Operator and the System Operator, in coordination with the Trading Participant, shall determine the MTN <b><u>market resource model</u></b> based on the <del>criteria</del> <b><u>guidelines</u></b> set out in of Section 6.4 – <del>Criteria For Definition of MTN of</del> this document. <b><u>The agreed market resource model shall be determined in accordance with the procedures under the WESM Market Manual on Registration, Suspension, and De-Registration Criteria and Procedures.</u></b>	For consistency with the proposed new Section 2.1.5 (Definition of Market Resource)



# Appendix A. Illustration of Simplified Model for Embedded Generators



● REAL-TIME MONITORING    ● REVENUE METER

● REAL-TIME MONITORING    ● REVENUE METER  
● ESTIMATED REAL-TIME DATA

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