

PUBLIC

WESM Manual

Management of Must-Run And Must-Stop Units Issue 8.0

Abstract	This document sets the dispatch criteria of Must-Run Units based on pre-defined categories under the WESM regime and the manner of settlement of Must Run Units and Displaced Generators.
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Document Change History

Issue No.	Proponent	Reason for Amendment
0.0	SOSubcom	New Document. New Draft Format
0.0	SOSubcom	Major revisions were introduced based on consolidated SO-MO Sub-Committees' comments
1.0	PEMC Market Operations	Included a provision on settlement of must run units, and revised title of document to Management of Must Run Units
3.0	PEMC Market Operations	Included additional criteria for designation of must run units added as Section 6.14 and Section 6.1.5
4.0	PEMC Market Operations	Revised compensation and settlement mechanism and included criteria for selection of must run units to comply with ERC Orders in ERC Case No. 2006-007 RC dated 20 June 2006 and 6 December 2006. Revisions in Sections 1, 5, 7 and 9.
5.0	PEMC	Revised to include the following: new criteria for selection of MRUs, regional allocation of compensation in each grid, either Luzon or Visayas for all MRUs, and new compensation mechanism for Displaced Generators pursuant to the DOE Directives to the RCC relative to the management of MRUs and consistent with the approval by the DOE through DOE Circular No. DC2014-10-0021 dated 24 October 2014.
	RCC	
6.0	PEMC	Revised Sections 9.1 and 9.3 to address ERC's order for PEMC to incorporate the detailed procedure in the calculation of the Generation Price Index, as approved by the ERC, for better clarity.
7.0	RCC	Revised to comply with PEM Board directives for the inclusion of 2 week prescriptive period for Generators to verify MRU data contained in the System Operator's Dispatch Deviation Report, otherwise, the report relative to the Generator shall be deemed as final.
		Revised to clarify the settlement for Displaced Generators and allocation of the settlement amount to must-stop units; introduced the factor "b" in the settlement formula for Displaced Generators to account for the difference in meter and RTU.

8.0	RCC	Amendments regarding the filing for additional compensation
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Document Approval

Issue No.	RCC Approval	RCC Resolution No.	PEM Board Approval	PEM Board Resolution No.	DOE Approval	DOE DC No.
1			07 April 2005	2005-07		
2	05 January 2006		19 January 2006	2006-02		
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Related Documents

Document ID	Document Title
	WESM Rules
	Philippine Grid Code
	WESM System Security and Reliability Guidelines
	WESM Dispatch Protocol
	Administered Price Determination Methodology
	NPC-TRANSCO Dispatch Planning Protocol
	ERC Case No. 2006-007 RC Decision (20 June 2006), Order (6 December 2006), and Order (09 June 2008) In the Matter of the Approval of the Application for Approval of the Price Determination Methodology for the Philippine Wholesale Electricity Spot Market
	DOE Directive to the RCC relative to the Management of Must Run Units

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1.0 Introduction

In Section 6.6.1 of the WESM Rules, the System Operator was mandated to develop and periodically update the system security and reliability guidelines in consultation with WESM participants and the Market Operator. Part of this guideline is the introduction of Must-Run Units (MRUs) and nomination of MRUs by the System Operator whether scheduled or on real-time basis to address the system security aspect of the grid. Likewise, to address system security and reliability of the grid, the use of Must Stop Units (MSU) was also introduced to tag certain generator/s for the non-conformity to dispatch instructions as issued by the System Operator. This document discusses the criteria used in designating MRUs during scheduling and dispatch. It also discusses the manner of settlement or compensation of MRUs.

WESM Rules clause 3.5.13.1, as amended, permits the System Operator in coordination with the Market Operator to impose constraints on the power flow, energy generation of a specific facility in the Grid to address system security and reliability of the Grid. On the other hand, relaxation of constraints on power flows, energy generation and reserves may also be implemented if the Market Operator is unable to generate a feasible dispatch schedule. For this purpose, the System Operator, in consultation with the Market Operator, is directed to develop the criteria and procedures for dispatch of generating units that are required to run as a result of the imposition or relaxation of constraints.

2.0 Objective

This document is intended to -

- 2.1. Provide the criteria for designating Must-Run Units and define the procedures for their treatment during scheduling and dispatch.
- 2.2. Provide the methodology to be used for the settlement and compensation of Must Run Units.
- 2.3. Introduce the concept of Must-Stop Units and Displaced Generators and the procedures for their treatment and settlement.

3.0 Scope

This Manual sets out the procedures of the System Operator and the Market Operator for the preparation of the Dispatch Schedules for Luzon, Visayas and Mindanao Power Systems, and for the settlement of generation units designated as MRUs following the criteria and procedures in this manual.

4.0 Definition of Terms

- 4.1 Constrain-on.** In respect of a *generating unit*, the output of that *generating unit* is re-dispatched by the System Operator above its Real-Time Dispatch schedule in accordance with the WESM Merit Order Table.
- 4.2 Constrain-off.** In respect of a generating unit the output of that *generating unit* is re-dispatched by the System Operator below its Real-Time Dispatch schedule in accordance with the WESM Merit Order Table.
- 4.3 Constraint.** A limitation on the capability of any combination of *network elements, loads, generating units or Ancillary Service Providers* such that it is, or is deemed by the *System Operator* to be unacceptable to adopt the pattern of transfer, consumption, generation or production of electrical power or other services that would be most desirable if the limitation were removed.
- 4.4 Displaced Generator** - a generating unit identified and instructed by the System Operator in an Out of Merit Dispatch to reduce the provision of energy specified in its Real-Time Dispatch instruction exclusively caused by excess generation due to non-compliance of other generators to dispatch instructions.
- 4.5 Must-Run Unit (MRU)** – a generating unit identified and instructed, on real time or scheduled basis, by the System Operator to either a) come_on-line, or b) provide additional energy on a particular *Trading Interval* but the dispatch of which is said to be Out of Merit, to address System Security requirements. For clarity, MRUs shall be utilized only after the System Operator has exhausted all available *Ancillary Services*. MRUs are classified as follows:
- 4.5.1 Scheduled MRU** – MRU designated by the System Operator before the trading interval and included in the Real Time Dispatch schedule through the imposition of Security Limit as defined in the WESM Dispatch Protocol Manual.
- 4.5.2 Real Time MRU** – MRU designated by the System Operator during the trading interval.
- A Non-Exhaustive List of Criteria for the Designation of MRUs is listed in Appendix A.
- 4.6 Must-Stop Unit (MSU)** – a generating unit identified and instructed by the System Operator to reduce the provision of energy due to its non-compliance of the Dispatch Schedule to address or prevent possible threat to the System Security requirements of the Grid.
- 4.7 Out of Merit Dispatch** - Dispatch instructions issued by the System Operator that is not in accordance with the WESM Merit Order Table to address System Security.

- 4.8 System Security** – the safe scheduling, operation and control of the power system on a continuous basis in accordance with the system security and reliability guidelines established under the Grid Code.
- 4.9 System Security and Reliability Guidelines** – the standards governing system security and reliability of the power system, which may include but are not limited to standards for the frequency of the power system in operation and ancillary services (including guidelines for assessing requirements and utilization), developed by the Market Operator and System Operator in accordance with the Grid Code.
- 4.10 System Test** – the set of tests which involve simulating conditions or the controlled application of unusual or extreme conditions that may have an impact on the Grid or the User System.
- 4.11 WESM Merit Order Table (WMOT)** – for purposes of dispatch protocol under the WESM, defined based on the Grid Code with an addition of unscheduled generating units arranged based on price offers; the WMOT is based on a single market.

5.0 Responsibilities

- 5.1** The Market Operator shall prepare hour-ahead, day-ahead and week-ahead Dispatch Schedule based on net load forecast, current system condition, accepted plant/unit bid nomination for MRU/s and either/both Ancillary Services and Energy (as applicable), and required reserve level.
- 5.2** The System Operator shall issue dispatch instructions to Must Run Unit/s (MRUs) to a) come on-line or b) provide additional energy, on real-time or scheduled basis on a particular Trading Interval whenever all applicable Ancillary Services are exhausted in order to maintain system security requirements of the Grid.
- 5.3** The System Operator shall issue re-dispatch instructions to generators to constrain-on (i.e. increase the output in excess of RTD or from shutdown to be on-line or) or to constrain-off (i.e. decrease the output to Pmin or from on-line to be shutdown) with due consideration to power quality, reliability and security of the Grid.
- 5.4** The System Operator shall officially notify Market Operation the reason for re-dispatch instruction.
- 5.5** The System Operator shall be responsible for monitoring and submitting the necessary information in the Dispatch Discrepancy Report to the Market Operator for purposes of the settlement amount of MRUs and Displaced Generators. The Market Operator shall publish the same information in the WESM website after one week.

All information related to the use and designation of MRUs and MSUs are contained in the Dispatch Discrepancy Report which shall contain the following information as the minimum:

- Trading Date and interval concerned
- Criteria used for the designation of the MRU/MSU
- Short description of the issue being addressed (e.g. frequency breached x Hz)
- Loading of scheduled Ancillary Services

- 5.6** The Market Operator shall be responsible for implementing the procedures on the settlement of MRUs and Displaced Generators.

6.0 Must-Run Unit Criteria

6.1 System Security

In an event where all available Ancillary Services have been exhausted to address the threat in system security, the System Operator shall make use of the MRUs to ensure the reliability and security of the grid. The following operating criteria shall be observed:

- 6.1.1 System Voltage Requirement** – this refers to the required voltage control and reactive power which the System Operator may need to take into account for the reliability of the Grid.
- 6.1.2 Thermal Limits of Transmission Line and Power Equipment** – this refers to the dispatch limitations of generators affected by
The actual condition of the transmission lines and/or power equipment.
- 6.1.3 Real-power Balancing and Frequency Control** – this refers to the energy requirement to maintain supply-demand balance.

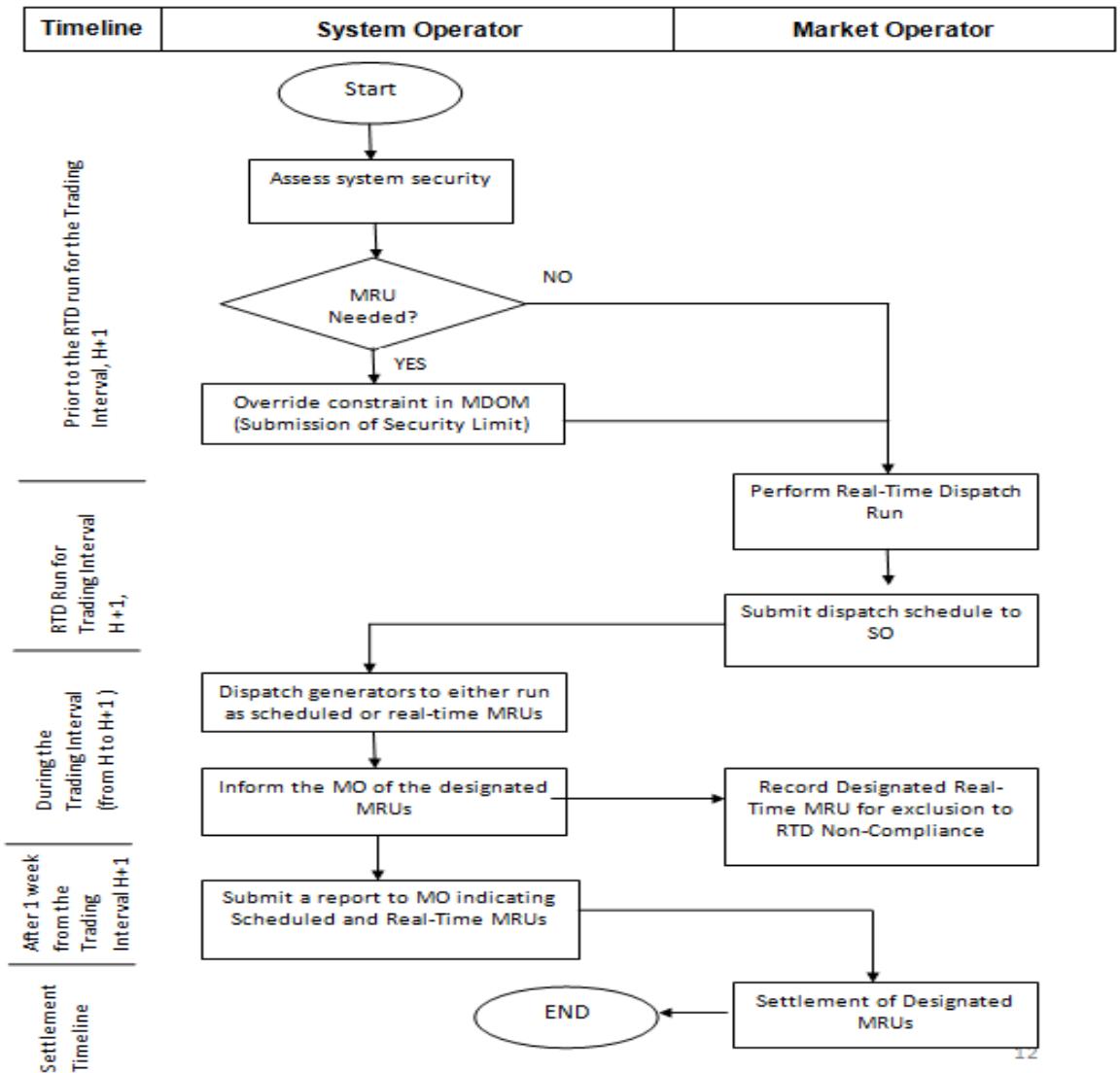
7.0 Considerations and Criteria for Selection of Must Run Units

- 7.1** The System Operator shall select and designate the generating unit that will run as an MRU or will be tagged as MSU for any relevant trading interval, in accordance with the criteria set forth in this Manual.
- 7.2** The criteria and considerations for selection of an MRU will depend on the reason for the designation of the MRU, as detailed in the table below.

Conditions Criteria for MRU	Considerations for Selection/ Qualification of Units
<p>System Voltage Requirement - this refers to the required voltage control and reactive power which the System Operator may need to take into account for the reliability of the Grid</p>	<ul style="list-style-type: none"> • Generating unit/s run as MRU shall provide/absorb reactive power support in accordance with its corresponding reactive power capability curve to address under/over voltage problem. • Power plants with reactive power generation/ absorption capability. • The use of MRU shall be based on the location where voltage problem exists.
<p>Thermal Limits of Transmission Line and Power Equipment - this refers to the dispatch limitations of generators affected by the actual condition of the transmission lines and/or power equipment.</p>	<ul style="list-style-type: none"> • Generating unit/s called to run as MRU to ensure the security and reliability of the grid.
<p>Real-power Balancing and Frequency Control – this refers to the energy requirement to maintain supply-demand balance.</p>	<ul style="list-style-type: none"> • The System Operator deviates from the WMOT and issues dispatch instruction to the Generating unit/s with fast ramp rate capability to constrain-on its output to immediately address threat in security and reliability of the grid. • During islanding operation or whenever a portion or part of the grid is isolated, the System Operator may require the Generator/s to come on-line to supply the corresponding demand of the localized portion of the isolated part of the grid

8.0 Scheduling and Dispatch Procedures

- 8.1** The Generating unit/s identified and instructed by the System Operator as MRUs or tagged as MSUs or displaced generators shall be based on the security assessment conducted by the System Operator. The MRU plants utilized by the System Operator shall be reported to the Market Operator for MRU settlement.
- 8.2** Generators whose generating plants are instructed as MRUs must immediately and strictly comply with the corresponding dispatch instructions of the System Operator.
- 8.3** The following flowchart outlines the treatment of Must-Run Units during the scheduling and dispatch:



9.0 Settlement of Must Run Units

Generating units that are instructed by the System Operator as Must Run Units shall be compensated based on the prevailing Generation Price Index (the “GPI”). GPI represents the blended price of bilateral and spot energy purchases. This approximates the generation charge component paid by the electricity end-consumers.

9.1 Calculation of Generation Price Index

- a) The Generation Price Index shall be calculated using the formula below –

$$GPI_{h,m} = \frac{\sum_{d=1}^n Payment_{bilateral,h,d,m-1} + \sum_{d=1}^n Payment_{spot,h,d,m-1}}{\sum_{d=1}^n Quantity_{metered,h,d,m-1}}$$

Where:

- $GPI_{h,m}$ – Generation Price Index (GPI) for every trading interval h for billing period m
- $Payment_{bilateral,h,d,m-1}$ – Total bilateral payments for trading interval h of trading day d in the billing period $m-1$
- $Payment_{spot,h,d,m-1}$ – Total spot payments for trading interval h of trading day d in the billing period $m-1$
- $Quantity_{metered,h,d,m-1}$ – Total generation metered quantity for trading interval h of trading day d in the billing period $m-1$
- n – number of trading days in the billing period $m-1$

b) The resulting GPI shall be the price at which designated MRUs are to be settled for the energy quantities at which they were called to run as MRUs.

c) The GPI will be calculated for each billing month as defined in the WESM Rules or in the WESM Billing and Settlements Manual. The GPI will be computed per trading interval per month; thus, there should be twenty-four (24) GPIs per month.

d) Quantities

- i. $Quantity_{metered,h,d,m-1}$ refers to the metered quantity used by the Market Operator for settlement of the transactions for the relevant trading interval.
- ii. $Quantity_{bilateral,h,d,m-1}$ refers to the bilateral contract quantities (the “BCQ”) declared to and used by the Market Operator for settlements for the relevant trading interval.
- iii. $Quantity_{spot,h,d,m-1}$ refers to the total metered quantities for the relevant trading interval minus the BCQ declared to the Market Operator.

e) $\text{Payment}_{\text{bilateral,h,d,m-1}}$ will be calculated as follows -

- i. Basic Charges will be calculated by multiplying the BCQ with the applicable time of use (the "TOU") rate for the relevant trading interval. The applicable TOU rate will be hourly TOU rate approved for and as published by the National Power Corporation (the "NPC").
- ii. Other Charges will be calculated by multiplying the BCQ with the total applicable adjustments on the NPC-TOU approved by the ERC and as published by the NPC, including but not limited to the deferred accounting adjustments for the Generation Rate Adjustment Mechanism (GRAM), Incremental Currency Exchange Rate Adjustment (ICERA), and benefits to local host communities and other approved adjustments. These may be positive or negative amounts.
- iii. Applicable Discounts will be calculated by multiplying the BCQ with the amount of all applicable discounts on the NPC-TOU rate as published by the NPC.

f) $\text{Payment}_{\text{spot,h,d,m-1}}$ will be calculated as follows –

- i. Trading amounts is the total trading amounts (ex-ante and ex-post) for the relevant hour of all customers of the WESM, including direct members as well as indirect members and unregistered customers covered by the Default Wholesale Supply or other arrangements in accordance with the WESM Rules clause 3.13.14 and 3.13.17.
- ii. Line rental amount refer to the line rental adjustments charged on bilateral contract quantities scheduled through the WESM and which are included in the trading amounts of WESM trading participants in accordance with the WESM Rules clause 3.13.12.
- iii. Settlement adjustments refer to adjustments on the WESM trading amounts of WESM customers, including but not limited to the net settlement surplus. The net settlement surplus is the difference between the payments by customers and payments to generators for the relevant trading interval in accordance with the WESM Rules clause 3.13.16.

9.2 Verification of MRU Data

9.2.1 The System Operator shall submit all reports of MRU events to the Market Operator for purposes of MRU settlement.

9.2.2 Each Generator shall validate all the data related to MRU contained in the Dispatch Deviation Report and System Operator Report of MRU events, as published by the Market Operator in the Market Information Website. Any discrepancy in these reports shall be reported by the Generator to the Market Operator within two weeks after the Market Operator's publication of these reports. Failure by the Generator to report to the Market Operator any discrepancy within the period defined herein shall render the MRU data relative to the Generator final.

9.3 Calculation of MRU Settlement Amounts

For every billing period, the Market Operator will calculate the payments to be made to each designated MRU that complied with the dispatch instructions as such by multiplying the applicable GPI with the energy quantities for the relevant trading hour at which that MRU was designated as MRU.

The applicable GPI for a given billing period shall be that calculated using data from the immediately preceding billing period. The billing period shall be as defined in the WESM Rules.

9.3.1 Calculation of MRU Volume

The MRU quantity is the total metered quantity of that generating unit minus the higher between the Ex-ante Quantity and the bilateral contract quantity (BCQ) declared for that unit.

$$\text{MRU Volume} = \text{MQ} - \max(\text{BCQ}, \text{EAQ}), \text{ MWh}$$

Additional Considerations in the Determination of MRU Volume

- ☐ With no offer and no security (Overriding Constraint) limit

$$\text{MRU Volume} = \text{MQ} - \text{BCQ}$$

- ☐ With Overriding Constraint limit and $\text{RTD} = \text{Smin}$

$$\text{MRU Volume} = \text{MQ} - \text{BCQ}$$

- ☐ With Overriding Constraint limit and $\text{RTD} > \text{Smin}$

$$\text{MRU Volume} = 0$$

Where:

RTD = target schedule at ex-ante

Smin = minimum loading in the SO-submitted security limit

In cases where the calculated MRU Volume is less than zero, then the MRU Volume is equal to zero.

The imbalance shall be initially paid at ex-post (EPETA). After obtaining the MRU price, the MRU Trading Amount shall then be computed. Adjustments shall be made given the discrepancy between the EPETA and the MRU Trading Amount.

9.3.2 Additional Compensation

A Trading Participant which has complied with dispatch instructions as MRU may be entitled to additional compensation. Additional compensation is allowed in cases where the Trading Participant submits sufficient proof that the MRU settlement amount calculated in accordance with this Manual is not sufficient to cover the following costs that are incurred in complying with the MRU call –

- a) fuel costs
- b) variable operating and maintenance costs, which may include start-up cost and shut-down costs

The additional compensation will not be more than the aggregate of the above costs less the amount of the MRU settlement amount already paid or payable, subject to the determination and approval of the Market Operator.

The affected Trading Participant will submit to the Market Operator a claim for additional compensation with supporting documents justifying the requested additional compensation. The claim for additional compensation shall be filed within one (1) year from the time the affected Trading Participant complied with dispatch instructions as MRU. Any claims not filed within such period shall be deemed waived.

The Market Operator shall inform the requesting Trading Participant of the approval or disapproval of the claim within fourteen (14) working days from receipt of the complete documents from the Trading Participant. Any claim not decided within fourteen (14) working days shall be deemed approved and shall be allocated and billed immediately in the succeeding billing period.

A non-exhaustive list of required documents to be submitted by Trading Participants to support the claim for additional payment as MRU is herein provided in Appendix B.

9.4 Allocation of MRU Settlement Amounts to Customers

The amount to be allocated to each Customer will be the Total Settlement Amounts in each grid, either Luzon or Visayas for all MRUs, including the amount paid as additional compensation, pro-rated to the Customers either within Luzon grid or Visayas grid based on their metered quantities.

9.5 Submission of WESM Customer Information

To compute the compute GPI on a regular basis, all WESM Customers shall submit to the Market Operator the relevant data on their total bilateral and spot energy purchases with their corresponding payments for each billing period.

9.6 Publication of the Generation Price Index

The applicable GPI will be published in the Market Information Website every end of the month.

10.0 Settlement of Displaced Generators

Generating plants that do not follow the instructions of the System Operator to reduce their target loading for a particular trading interval and continue to generate shall be tagged as MSUs and shall pay the displaced Generators, if any during the said interval. A list of displaced plants shall be generated by the Market Operator from the Dispatch Deviation Report provided by the System Operator. Displaced plants will be identified using the WMOT in the interval where an MSU was tagged by the System Operator. The Market Operator will facilitate the process of payment to the Displaced Generators by the corresponding MSUs in accordance with the formula stated in this Manual. Any adjustment in the settlement shall be included in the final billing statement.

10.1 Calculation of Amounts due to Displaced Generator/s

The payment shall be made to the Displaced Generator, through the WESM's settlement processes, equivalent to the difference between the Ex-Ante Quantity and the Metered Quantity (considering the meter's location with respect to the Remote Terminal Unit) of the Displaced Generator for the trading interval, net of the approved dispatch tolerance, in accordance with the *WESM Rules*, multiplied by the ex-post price, provided ex-post price is positive. If the ex-post price is negative, there will be no settlement due to the Displaced Generators and correspondingly, no amount will be collected from the Must-Stop Units.

Furthermore, there will be no payment to Displaced Generator if the difference between the Ex-Ante Quantity and the adjusted Metered Quantity is less than the approved dispatch tolerance, in accordance with the *WESM Rules*, of its Ex-Ante Quantity.

In formula:

$$DG_{TA_i} = \begin{cases} [(EAQ_i - b_i * MQ_i) - t * (EAQ_i)] * EPP_i, & \text{if } EAQ_i - b_i * MQ_i > t * EAQ_i \\ 0, & \text{if } EAQ_i - b_i * MQ_i \leq t * EAQ_i \end{cases}$$

Where,

DG_{TA_i}	Total amount that will be received by the Displaced Generator i
EAQ_i	Ex-Ante Quantity of the Displaced Generator i
MQ_i	Metered Quantity of the Displaced Generator i
EPP_i	Ex-Post Price at the node of the Displaced Generator i
t	Dispatch Tolerance
b_i	is the factor multiplied to the metered quantity of the Generator i to account the difference between location of RTU and Meter.

10.2 Settlement of Amounts Due to Displaced Generators

Must-Stop Units will pay the Displaced Generators, on a pro-rata basis with respect to the quantity of energy they displaced considering their Meter and RTU locations.

In formula:

$$MSU_{TA_j} = \begin{cases} -\frac{MSU_{Q_j}}{\sum_{j=1}^n MSU_{Q_j}} \sum_{i=1}^m DG_{TA_i}, & \text{if } \sum_{j=1}^n MSU_{Q_j} \neq 0 \\ -\frac{b_j * MQ_j}{\sum_{j=1}^n (b_j * MQ_j)} \sum_{i=1}^m DG_{TA_i}, & \text{if } \sum_{j=1}^n MSU_{Q_j} = 0 \end{cases}$$

$$MSU_{Q_j} = \begin{cases} b_j * MQ_j - EAQ_j, & \text{if } b_j * MQ_j - EAQ_j \geq 0 \\ 0, & \text{if } b_j * MQ_j - EAQ_j < 0 \end{cases}$$

Where,

MSU_{TA_j}	Total amount to be paid by the Must Stop Unit j
EAQ_j	Ex-Ante Quantity of the Must Stop Unit j
MQ_j	Metered Quantity of the Must Stop Unit j
MSU_{Q_j}	The energy displaced of the Must Stop Unit j or Must Stop Unit Quantity
n	Number of Must Stop Units
m	Number of Displaced Generators
$\sum_{i=1}^m DG_{TA_i}$	Grand total of the amounts that will be paid to the Displaced Generators
b_j	is the factor multiplied to the metered quantity of the Generator j to account the difference between location of its RTU and Meter.

10.3 Settlement of Amounts due to Displaced Generators

To account for the difference of the location of RTU and Meter, the factor “b” is multiplied to the Metered Quantity of the Generator. This shall be calculated as the average ratio between the interpolated RTU readings and metered quantities of the Generator for one year when it is generating power or with positive values for both RTU and Meter. For new Generators without one year historical data, their factor “b” in the interim shall be equal to 1.00.

In formula,

$$b_j = \frac{\text{Average Interpolated RTU Reading}}{\text{Average Metered Quantity}}$$

where,

b_j	is the factor multiplied to the metered quantity of the Generator j to account the difference between location of its RTU and Meter.
Average Interpolated RTU Readings	is the average of the positive interpolated RTU readings or snapshots of the generator for one year
Average Metered Quantity	is the average of the positive Metered Quantity (MQ) of the generator for one year

11.0 Market Re-run

Should the SO re-dispatch a generator as an MRU and this is not captured in the MDOM or the prices are believed to be in error by the MO, then the MO shall perform a re-run of the MDOM to reflect the designation of the MRU. In such case, the MO shall issue a pricing error notice following the procedures set in clause 3.10.5 of the WESM Rules.

APPENDIX A. Non-Exhaustive List of Criteria for the Designation of MRU**A. Criteria for Security Related MRU****1. Thermal Limits**

- a. Violation of Single Outage contingency criterion upon receipt of the DAP (e.g. Outage of San Jose Transformer)
- b. Overloading of submarine cable/lines/transformers (e.g. Loading of Negros – Panay)
- c. Generator/Transmission Line/Transformer Outage
- d. Line/Transformer Capacity Limitation

2. System Voltage Requirement

- a. Voltage correction
 - i. Under-voltage Scenario
 - ii. Overvoltage Scenario
 - iii. Outage of reactive compensation (Capacitor/Shunt Reactor)
 - iv. Insufficient reactive support

3. Real Power Balancing and Frequency Control

- a. Forecast error
- b. Under-generation/Over-generation
- c. Intra-hour variation of demand
- d. Exhausted operating reserve

APPENDIX B. Non-Exhaustive List of Required Documents in Filing Claims for Additional Compensation

1. Certified correct Fuel Consumption and Inventory Report
2. Purchase Invoices, Official Receipts and other supporting documents
3. ERC approved rate or List of Variable Operation and Maintenance Costs supported by photocopies of invoices/receipts