



PUBLIC

WESM Manual

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# MANAGEMENT PROCEDURE ON EXCESS GENERATION

## Issue 2.0

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Abstract	This document covers the mechanism and policies to be employed to manage expected periods with excess generation.
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	MO Subcom	7/23/05	Incorporation of MO Subcom Comment
	MO Subcom	7/15/05	Grammatical changes in Sections 1.6 and 9.
	MO Subcom	7/19/05	NPC member comments incorporated in 5.1.3 and 6.1.6
	MO Subcom	7/20/05	Revised to consider SO Subcom comments and Emergency Procedure Documentation and RCC comments during 3 <sup>rd</sup> RCC meeting.
1.0	MO Subcom	8/17/05	Revised to incorporate comments of RCC
2.0	RCC	9/29/14	Revised to harmonize the provisions of this Manual with the changes in the MRU Manual as well as in other affected Manuals arising from the DOE Directive to the RCC relative to Must Run Units.

## Document Approval

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## Related Document

Document ID	Document Title
	WESM Rules
	PGC
	MMS Design Specifications
	Management of Must-Run and Must-Stop Units
	System Security and Reliability Guidelines
	Emergency Procedures
	DOE Directive to the RCC relative to the Management of Must Run Units



## Table of Contents

<b>Section</b>	<b>Description</b>	<b>Page</b>
1	Introduction	1
1.1	About this Manual	1
1.2	Purpose	1
1.3	Scope	1
1.4	Intended Audience	1
1.5	Conventions	1
1.6	Background	2
2	Definition of Terms	4
3	Responsibilities	5
4	Criteria and Pre-Conditions for impending and existing Excess Generation	5
5	Responsibilities Pertaining to the Mitigation and Arrest of Excess Generation in the Power System.	5
6	Management Procedures	7
7	Flowchart	10
8	Market and Intervention Reports	12
9	Provision for Must Run Dispatch Auction	12



## 1.0 Introduction

### 1.1 About this Manual

This document describes the methodology and processes of managing excess generation in the WESM. This document takes into account the requirements of Philippine Wholesale Electricity Spot Market (WESM) Rules. Where there is discrepancy between the requirements in this document and the “WESM Rules”, the “WESM Rules” will prevail. Standards and policies appended to, or referenced in, these procedures will provide a supporting framework.

### 1.2 Purpose

- 1.2.1 To provide the mechanism for mitigating excess generation condition in the power system.
- 1.2.2 To provide mechanism for selecting generating plants to be shut down if excess generation condition cannot be mitigated.

### 1.3 Scope

These procedures will be implemented for imminent excess generation condition in the Luzon, Visayas and Mindanao power system in coordination with the System Security, Supply Adequacy and Emergency Procedures of the SO.

### 1.4 Intended Audience

This document is intended for use by the Market Operator, System Operator, and the Trading Participants.

### 1.5 Conventions

The standard conventions to be followed in this *manual* are as follows:

- Terms and acronyms used in this *market manual* including all Parts thereto that are italicized have the meanings ascribed thereto in “WESM Rules” and/or “PGC”;
- Double quotation marks are used to indicate titles of publications, legislation, forms and other documents.
- Any procedure-specific convention(s) will be identified within the specific document itself.



## 1.6 Background

The WESM Rules require that the MO and SO, in consultation with *WESM Participants*, shall adopt procedures regarding the management of all aspects of *dispatch* and pricing should it be necessary to shut down *generating systems* in the event the *dispatch optimization*, or any *market projection*, indicate *excess generation* at any *node*.

Excess generation is a situation where system or regional demand has reached a critical low level that selected generating plants may be forced to shut-down by the SO to avoid exceeding the allowable limit in system frequency deviation which can result to inadvertent power flow, system stability issues and transmission constraints. Excess generation is clearly a threat to the security and reliability of the power system.

Excess generation can be encountered in the power system in real-time considering two scenarios:

1. Instantaneous or sudden loss of significant amount of load demand in the power system.
2. The power system reaches off-peak condition whereby demand is so low that it is still below the minimum generating level of the generators synchronized in the power system.

The former scenario requires the immediate implementation of the SO *Emergency Procedure*<sup>1</sup> for over-frequency while the latter scenario can be anticipated through the indication of a downtrend demand and generation level in the power system. A mechanism therefore can be employed to mitigate possible excess generation incident to the power system and minimize (or avoided entirely) possible intervention of SO in the dispatch scheduling process in the WESM. However, if it cannot be avoided, then the SO may ultimately trip a generating unit to maintain control and preserve the security of the power system. In which case, the mechanism for selecting which generating plant or unit to shutdown should be transparent to maintain the level playing field for all Trading Participants.

The MO prepares Market Projections, in particular the Day-Ahead Projections, which incorporates the latest system requirements and demand forecasts, bids and offers in the market, system condition and generation level and is prepared every four (4) hours.<sup>2</sup> Utilizing the information inputted in the DAP, possibility of excess generation condition can be identified by both SO and MO. Further, should

<sup>1</sup> Please see WESM-EP-002 for complete information on emergency procedures.

<sup>2</sup> Please see WESM-TT-000 for DAP process timeline.



excess generation be encountered in a DAP interval, the nodal prices would reflect constraint violation penalty prices<sup>3</sup> corresponding to the constraint violation coefficient for excess generation. Resulting DAP information is published after each DAP run which is available to all Trading participants. The DAP processes therefore can provide information to SO for assessing projected system security, MO to review demand forecast and security constraints provided by SO, and for TP adjust their offer in the spot WESM to mitigate possible excess generation incident in the power system.

Excess Generation is normally encountered during off-peak condition in the power system. Off-Peak conditions are normally between 0000 hours (12 midnight) and 0800 hours (8 AM) of the day for Luzon. However, excess generation maybe encountered also during peak conditions in the power system if a considerable amount of demand is tripped due to adverse weather condition or abnormal sub-transmission system condition.

Therefore, to minimize distortion in market prices and schedules excess generation should be mitigated from the moment it is indicated in the day-ahead market projections. Effective mitigation process requires close coordination between MO, SO and Trading Participants.

Related to the mitigation process of excess generation is the system security and reliability requirement for *Must-Run* units. Reliability must-run units are the units that need to be dispatched if the system demand is to be met even if the demand is very low. They are overriding security constraints provided by the SO and applied in the *Market Dispatch Optimization Model*. They are to be provided prior to any market projections run<sup>4</sup>.

The excess generation condition signaled in the DAP and advised by the MO provides appropriate lead-time for all Trading Participants to modify their bids/offers in the spot market. On the other hand, given the must-run units and the low demand in the power system, all the generators synchronized in the power system may still opt to run (the generating plants may see the need to generate in which case the necessity comes from their self-commitment and not from the necessity to supply the demand in the system and thus maintain sufficient offers in the market during off-peak intervals). Given this condition, the SO would have to shut down non-MRU generators which are not necessary for local or regional protection (system security) while considering plant limitations for downtime and re-

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<sup>3</sup> Please see WESM-CVC-004 for complete details on constraint violation coefficients.

<sup>4</sup> Please see WESM-MRU-005 for the criteria and procedure for reliability must-run units.

synchronization to the power system for the succeeding intervals wherein demand is increasing (supply adequacy).

To provide a transparent and level playing field for all generators, should it really be necessary to shut down a generator, during imminent and existing excess generation condition, the MO will provide a generator merit order to the SO based on the offered price of their first block offer used in the last DAP run prior to the interval with possible and indicated excess generation condition.

## 2.0 Definition of Terms

- 2.1 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.
- 2.2 Constraint Violation Coefficients – coefficients set by the Market Operator in accordance with clause 3.6.2 of the WESM Rules. The Market Operator is to ensure that, if constraints will be violated, such violation will occur in appropriate order.
- 2.3 Excess Generation – Generation which may be scheduled to occur in excess of load requirements, even though market energy prices have fallen to the market price floor and which are dealt with in accordance with clause 3.9.8 of the WESM Rules.
- 2.4 Market Advisories – Market Operator notices or alerts to Trading Participants and System Operator on WESM and other emergencies.
- 2.5 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.
- 2.6 Over Riding Constraints – constraints imposed in the Market Dispatch Optimization Model by the Market Operator, in coordination with the System Operator, with the intention of over-riding the effect of a Trading Participant's offers or demand bids in accordance with WESM Rules clause 3.5.13.
- 2.7 System Advisories – System Operator notices or alerts to Trading Participants and Market Operator on System Condition and Emergencies.

The definition of terms used in this document will conform to the definition of terms under the WESM Rules, the Philippine Grid Code and the WESM Manuals.





## **3.0 Responsibilities**

- 3.1 The MO will be responsible for the development, maintenance, publication, revision of this document in coordination with Trading Participants and the System Operator.
- 3.2 The SO will be responsible for the validation of this document and coordinate with MO for subsequent revisions and issuances.
- 3.3 Trading participants will provide the necessary information and references for subsequent revisions and validation of this document.
- 3.4 The PEM Board will be responsible for the approval of this document and subsequent revisions and issuances.

## **4.0 Criteria and Pre-Conditions for impending and existing Excess Generation**

- 4.1 Demand bids, Energy and Reserve offers have been submitted by Trading Participants and received by the Market Operator in accordance with the WESM timetable.
- 4.2 Cancelled Bids and Offers for the Real-Time Dispatch are being observed by Trading participants unless otherwise provided by SO with re-dispatch instructions.
- 4.3 The results of the Week-Ahead and the Day-Ahead Projections manifest the occurrence of an Excess Generation. The System Operator and Trading Participants are notified on the Excess Generation event.
- 4.4 The Dispatch Schedule for the real-time dispatch has resulted to a solution with significant Constraint Violation Coefficient on Excess Generation.
- 4.5 The system or regional generation level is approaching the Regulating reserve requirement band of the minimum generating limit (Pmin) of synchronized generators.

## **5.0 Responsibilities Pertaining to the Mitigation and Arrest of Excess Generation in the Power System.**

- 5.1 The System Operator will:
  - 5.1.1 Determine the level of threat to System Security based on System Security and Reliability Guidelines approved by the PEM Board.

- 5.1.2 Coordinate with the Market Operator and provide necessary information which will be utilized in the hour-ahead Dispatch Schedule to mitigate or arrest possible excess generation condition as indicated in the day-ahead market projection schedule prepared by the Market Operator.
  - 5.1.3 Coordinate with the Market Operator for the imposition of over-riding constraint limit for a certain generating unit/s that would be required not to be shut down since it will still be needed during the peak period in case possible excess generation exists during off-peak period
  - 5.1.4 Implement *Emergency Procedures* and provide instructions to generating systems not elected as must-run to shutdown, as maybe necessary, based on the System Security and Reliability Guidelines and WESM Merit Order Table (WMOT) provided by the Market Operator.
- 5.2 The Market Operator will:
- 5.2.1 Prepare the Market Projections based on the WESM Timetable incorporating over-riding constraints, transmission limits and outage schedules provided by SO.
  - 5.2.2 Prepare the Real-Time Schedule and Prices based on the WESM Timetable incorporating over-riding constraints, transmission limits and outage schedules provided by SO.
  - 5.2.3 Coordinate and inform SO and TP of any indication of excess generation in the Market Projections results.
  - 5.2.4 Prepare offer based on WESM Merit Order Table and submit to the System Operator on an hourly basis. This will be the reference of the System Operator for the issuance of dispatch instruction whenever the generating unit/s will be constrained-on or if necessary, the System Operator may opt to shut down the generators during off-peak condition or whenever there is a loss of large loads that resulted in excess generation.
  - 5.2.5 Issue Pricing Error Notice to Trading Participants via market advisory should the Ex-Ante Real-Time Dispatch encounter the excess generation in the pricing and scheduling results.
- 5.3 Trading Participants will:

- 5.3.1 Review generation unit availability, maintenance schedule, energy and ramping limits in anticipation of the off-peak condition in the power system.
  - 5.3.2 Make prudent offers for intervals with expected low demand.
  - 5.3.3 Coordinate and implement re-dispatch instructions and generator tripping as instructed by SO.
- 5.4. In case of excess generation, the Generators shall be responsible for executing the dispatch instructions from the System Operator when required 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.

## **6.0 Management Procedures**

### **6.1 Occurrence of Excess Generation condition in the Day-Ahead Projection**

- 6.1.1 The Market Operator shall verify if there is any indication of excess generation in the Day Ahead Projections (from the 1200H run and in the succeeding DAP run) and shall advise Trading Participants through system advisories of expected excess generation based on the specified period and shall publish the market reports in the WESM website.
- 6.1.2 Prior to the 1600H DAP run, the Market Operator in coordination with the System Operator shall agree on the generating unit/s to be retained in case of excess generation identified in the day ahead projection or on real-time condition. The inclusion of over-riding constraint limit as agreed by the Market Operator and the System Operator shall be imposed to ensure that the generating unit/s will be reflected in the dispatch schedule.
- 6.1.3 The objectives of the imposition of over-riding constraint limit in the dispatch scheduling process are as follows:
  - 6.1.3.1 Assure that system security is not compromised in the trading interval with excess generation
  - 6.1.3.2 Assure adequacy of supply in the succeeding trading intervals



- 6.1.4 Prior to the 1600 DAP run, Trading Participants shall consider the projected off-peak system condition and assess their market offers for the periods where imminent and excess generation conditions are indicated. Likewise, the Generators, in coordination with the System Operator, may opt to conduct maintenance activities during the period where excess generation exists as identified by the Market Operator.
- 6.1.5 Trading participants may exercise prudence on their bids and offers with regard to market integrity and power system security for intervals with indicated excess generation periods by:
  - 6.1.5.1 Customers – Assessing their electricity consumption, if possible, increase their electricity consumption in view of the surplus in electricity supply.
  - 6.1.5.2 Generators – Assessing the capacity and mode of operation of their generating units in view of the stiff competition for a very limited demand for electricity.
- 6.1.6 The Market Operator will confirm and inform the Trading Participants and the System Operator, if excess generation is indicated in the 1600H DAP run.
- 6.1.7 Prior to the 8 PM DAP run, Trading Participants will make final adjustment to their market bids/offers for intervals indicated with imminent or excess generation condition so that these offers maybe accepted for the 12 midnight DAP run.
- 6.1.8 If the Real-Time Dispatch indicates the application of Excess Generation penalty price, then the MO will issue a Pricing Error notice to Trading Participants as soon as possible.

## **6.2 Real-Time Dispatch (with Excess Generation Intervals)**

- 6.2.1. If excess generation is encountered in the real-time dispatch, then the System Operator shall issue Dispatch Instructions to generators to constrain-off their MW output based on the WESM Merit-Order Table provided by the Market Operator if the scheduled regulating reserve has been depleted (i.e. at Pmin) and the grid frequency breached the 60.3Hz. However, if over-frequency exists (i.e. grid frequency is greater than 60.6Hz), the following corrective actions, in the order of priority, shall be followed until the frequency returns to normal:
  - a. “Constrain-off” generator/s with fast ramp rate.
  - b. Effect shutdown of generator/s under test.
  - c. Effect shutdown of generator/s with fast start capability.
  - d. Require gas turbine generator/s at combined cycle to operate at simple cycle mode.

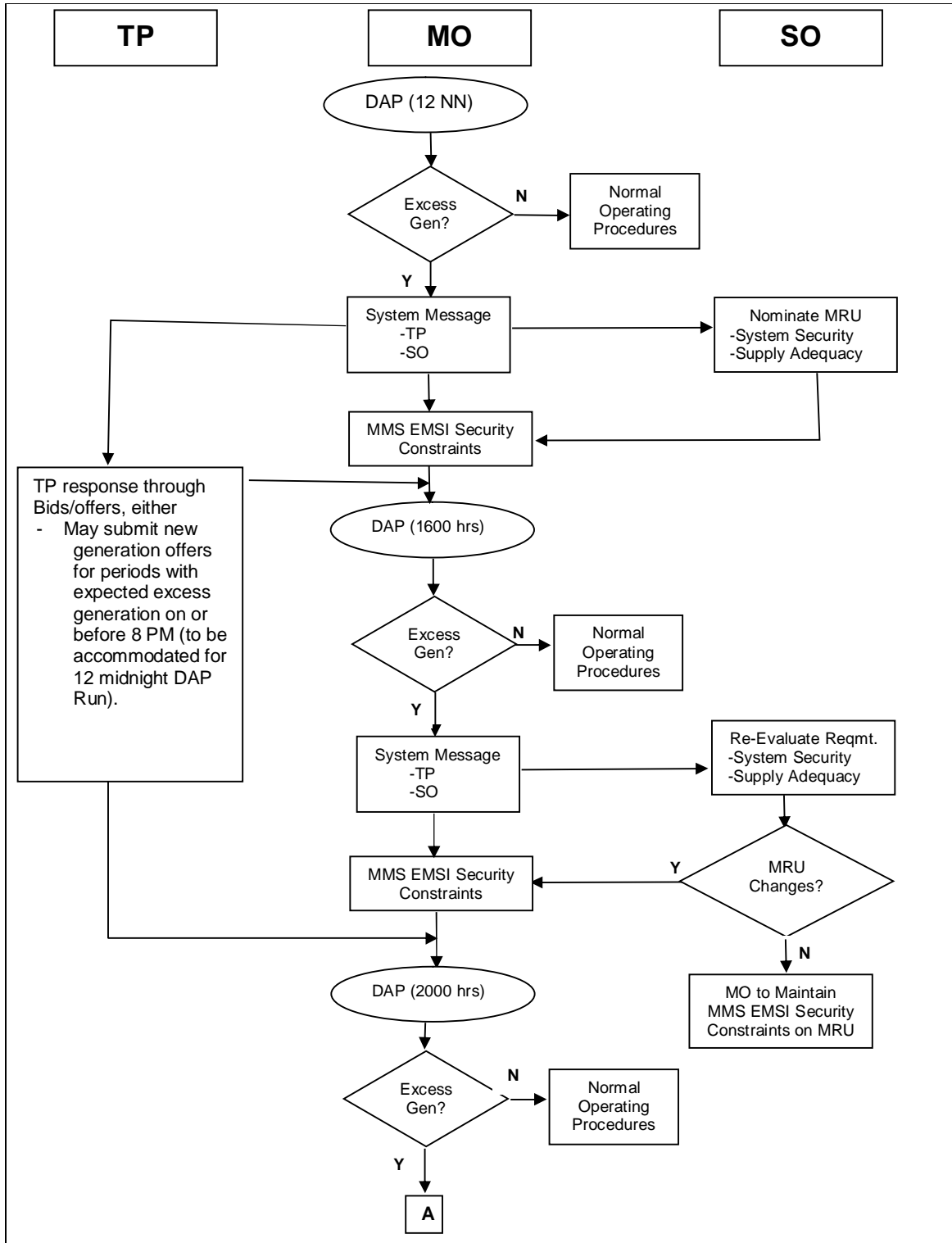


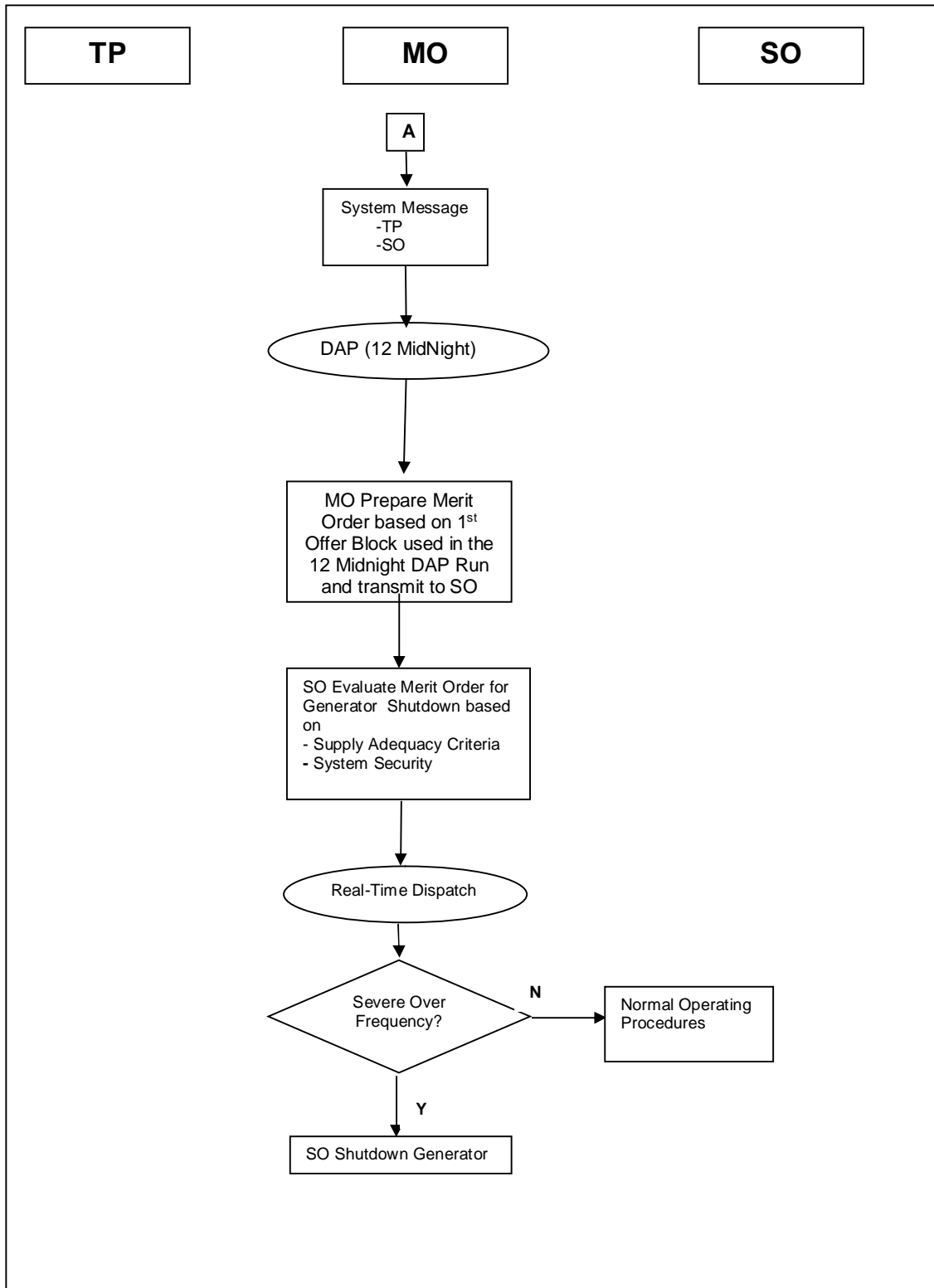
- e. Require coal fired thermal power plants to operate on oil support mode.
- f. Require generator/s to operate on house load.

6.2.2. In such cases where the grid frequency breached the normal range due to excess generation as a result of loss of large load or over supply capacity in real time, the System Operator shall issue dispatch instructions to generators to constrain-off their output to mitigate the effect of the imbalance in supply and demand. However, if the generator/s failed to comply to the dispatch instructions issued by System Operator, the System Operator shall tag the generator as Must Stop Unit and shall report the non-conformance to dispatch instruction to the Market Surveillance Committee, Grid Management Committee and the Department of Energy. The System Operator may ultimately remote- trip a certain generating unit tagged as Must Stop Unit if the high risk is at stake that would eventually affect the security and reliability of the grid.



## 7.0 Flow Chart







## **8.0 Market and Intervention Reports**

- 8.1 The SO will be responsible for preparing intervention reports as regards to the technical implication of the imminent excess generation event and/or excess generation incident.
- 8.2 The MO will be responsible for preparing impact of the imminent excess generation event and/or excess generation incident to the wholesale electricity spot market.
- 8.3 Market and Intervention reports pertaining to excess generation will be prepared and submitted to the PEM Board within one week from the occurrence of the incident.

## **9.0 Provision for Non-Reliability Must Run Dispatch Auction**

The WESM Rules at present has no provision for any auctioning process to be applied for managing excess generation. In this regard, the following will be taken into consideration by the WESM:

- 9.1 The MO and SO will coordinate with the Market Surveillance Committee in assessing the following:
  - 9.1.1 Occurrence of trading intervals with excess generation.
  - 9.1.2 Impact of occurrence of excess generation to Trading Participants and the application of the above procedures to mitigate excess generation condition.
  - 9.1.3 Nomination of generating plants for reliability must-run.
  - 9.1.4 Applicability of Dispatch Auction for generating plants not declared as reliability must run for periods where there is imminent threat of excess generation.
- 9.2 The assessment will make recommendation as to the feasibility and viability of incorporating Must Run Dispatch Auction in the WESM.