



**WHOLESALE ELECTRICITY SPOT MARKET
RULES CHANGE COMMITTEE**

RESOLUTION NO. 2014-07

**Proposed Amendments to the Dispatch Protocol Manual (Issue 8.0) and
Constraint Violation Coefficients Manual (Issue 2.0) in Relation to the Reserve
Market**

WHEREAS, on 19 February 2014, the RCC received from the Philippine Electricity Market Corporation (PEMC) the Proposal for urgent amendments to the Dispatch Protocol Manual (Issue 8.0) and Constraint Violation Coefficients (CVC) Manual (Issue 2.0), herein attached as Annexes A and B respectively;

WHEREAS, the proposal aims to amend the subject Manuals in view of the operational priorities once the reserve market is integrated into the commercial operations of the Wholesale Electricity Spot Market (WESM);

WHEREAS, the proposal calls for urgent amendments to the subject WESM Manuals to facilitate the compliance with the target timeline of the commercial operation of the Reserve Market set on 26 March 2014 pursuant to Department of Energy Circular DC No. 2013-12-0027;

WHEREAS, on 21 February 2014, the RCC convened for its 84th (Special) Meeting to deliberate upon the proposed changes to the Dispatch Protocol Manual (Issue 8.0) and Constraint Violation Coefficients Manual (CVC) (Issue 2.0);

WHEREAS, during the same meeting, PEMC presented to the RCC its proposed amendments to the said Manuals and responded to the queries and clarifications on the subject manuals;

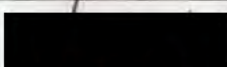
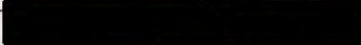
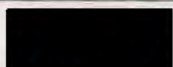
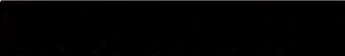
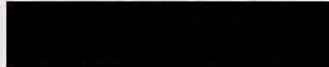
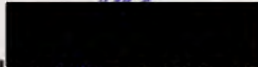
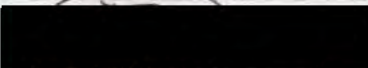
WHEREAS, during the same meeting, the RCC, deliberated on the subject urgent amendments and approved the proposal as revised;

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

RESOLVED, that the Proposed Amendments to the Dispatch Protocol Manual (Issue 8.0) and Constraint Violation Coefficients Manual (CVC) (Issue 2.0) are hereby adopted and approved;

RESOLVED FURTHER, that the attached Proposed Amendments (Annexes C and D) to the subject Manuals are hereby endorsed to the PEM Board for its approval.

Done this 21 February 2014, Pasig City.

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



REQUEST FOR AMENDMENTS OR CHANGES TO THE WESM MANUALS

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

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

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

I. Proposer's Information

Name	MELINDA L. OCAMPO	
Designation	President	
Company	Philippine Electricity Market Corporation	
Company Address	18/F Robinsons Equitable Tower, ADB Avenue, Ortigas Center, Pasig City	
Telephone No.	631 8734	
Fax. No.	636 0802	
Email Address	helpdesk@wesm.ph	

II. WESM Manual Amendments Information

Title of WESM Manual being commented:

Dispatch Protocol

Nature of Request (please indicate with x)

☐ Addition ☒ Alteration ☐ Deletion ☐ Clarification ☐ Clerical Correction

III. Proposed Amendment

Title	Section	Provision	Proposed Amendment	Rationale
Dispatch Protocol Issue 8.0	Appendix	New Appendix	<u>APPENDIX A.12 SCHEDULING AND DISPATCH OF RESERVES</u> 1. <u>Background</u> <u>Upon the commencement of the trading of reserves in the WESM, the scheduling and dispatch of reserves that are traded in the WESM shall be in accordance with the requirements and procedures set out in the WESM Rules.</u> <u>WESM Rules clause 3.3.7.4 requires the System Operator to continuously adjust the quantum of reserve to be scheduled to meet each locationally specific</u>	The proposed amendments intend to provide the procedures related to the scheduling and dispatch of reserves. This is an essential part of the Dispatch Protocol for the implementation of the Reserve Market. The procedures herein will guide the Market Operator and the System Operator in the efficient operation of the reserve market by setting a procedure in determining the reserve requirements and monitoring of reserves through the implementation of the reserve effectiveness factors.

			<u>reserve requirement by the Market Dispatch Optimization Model, so as to accurately reflect the power system under existing or future conditions, within the relevant market time frames.</u> <u>The reserve effectiveness factor (REF) is defined in the WESM Rules as a factor to define the effectiveness of reserve from a particular type of reserve provider in meeting requirements for particular reserve categories. WESM Rules clause 3.3.7.4 requires the System Operator to continuously adjust the reserve effectiveness factors for each reserve facility category.</u> <u>The REF to be implemented in the WESM</u>	
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			is based on the applicable and measurable response characteristics of providing reserve service, including adequacy, timeliness, and accuracy based on the generator's actual operating parameters. 2. <u>Scope and Purpose</u> <u>This Section describes the criteria for determining required reserve levels by the System Operator which will be the basis of the Market Operator as input to the Market Management System.</u> <u>This Section sets out the criteria of the reserve effectiveness factors that will be applied to reserve providers in the WESM, either a generator or load. The procedures for the</u>	
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			<u>provision and validation of reserve provider data and for submission of the REF data for each reserve provider is also set out in this Section.</u> <u>The criteria, procedures and formulae set out in this Section cover only the requirements for the types of reserves that are to be traded in the WESM. Procedures for procurement, monitoring and settlement of other types of ancillary services are not within the scope of this Section or this Dispatch Protocol.</u> <u>The criteria, procedures and formulae set out in this Section shall apply to the determination and submission of reserve requirements and monitoring and settlement of reserve providers in the</u>	
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			<u>reserve zones in the regions where the WESM is in operation.</u> 3. <u>Responsibilities</u> 3.1 <u>System Operator. The System Operator is responsible for –</u> a) <u>Determining the required reserve levels for each type of reserves that are to be traded in the WESM in accordance with its Ancillary Services Procurement Plan, and informing these required levels to the Market Operator.</u> b) <u>Preparing and assessing the REFs of each reserve provider in the WESM, and continuously monitoring and</u>	
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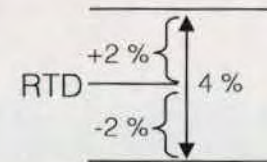
			<u>adjusting the REF of a reserve provider within such period as may be required from time to time. The System Operator is also responsible for providing the REFs for each reserve provider to the Market Operator.</u> <u>3.2 Market Operator. The Market Operator is responsible for –</u> a) <u>Ensuring that the required reserve levels per System Operator are used as inputs in pre-dispatch market projections and real time dispatch scheduling processes in the WESM. It is also responsible for providing and maintaining the facility</u>	
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			<u>for timely receipt of submissions from the System Operator;</u> b) <u>Using the REF determined by the System Operator in the calculation of the settlement amounts due to reserve providers in the WESM.</u> 4. <u>Determination of Reserve Requirements</u> <u>Criteria for Determining Reserve Requirements. In determining reserve requirements for each reserve type in accordance with its Ancillary Services Procurement Plan, the System Operator shall ensure compliance with the power quality and reliability performance standards set out in the</u>	
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			<u>Philippine Grid Code.</u> <u>The System Operator, in coordination with the Market Operator, shall formulate and maintain its procedures for determining reserve requirements.</u> <u>4.1 Determination of Regulating Reserve requirement</u> <u>As per ASPP, the regulating reserve requirement is equivalent to 4% of the hourly demand forecast. Taking into account that the WESM Regulating Reserve design considers the upward and downward provision of reserve, this will be translated to 2% upward</u>	
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and 2% downward requirement.

Figure 1. Regulation Reserve Requirement Illustration



2% of the DAP Forecast of the previous day shall be MO's Input to MMS for

4.2 Determination of Contingency and Dispatchable Reserve requirement

As per ASPP, the level of contingency and dispatchable reserve is based on the largest unit and second largest unit

			online respectively. Thus, to ensure a more accurate determination of Contingency (CON) and Dispatchable (DIS) reserve requirement, it is proposed that the level of CON and DIS be based on the second latest DAP run as illustrated below.	
The diagram shows a horizontal timeline for Day D from 0400H to 1400H in one-hour increments. An arrow points from the 0400H mark down to a box labeled 'DAP_{0400H} Results'. From this box, an arrow points to a green box containing the text: 'MO will base Reserve Requirements for these intervals based on DAP_{0400H}'.				
			5. <u>Submission of Reserve Requirements</u> 5.1 Reserve Levels. The reserve requirements based on the reserve levels determined by the System Operator shall be	

			used by the Market Operator. The latest DAP results shall be used as reference by the Market Operator for the determination of the hourly reserve requirements of Contingency Reserve and Dispatchable Reserve per Section 4.2 while the DAP of the previous day shall be used for the hourly reserve requirements of Regulating Reserve per Section 4.1. 5.2 Format of Reserve Requirement. The reserve requirement data based on the reserve levels determined by the the System Operator shall be inputted by the Market Operator in the format specified in Attachment A5 of this Dispatch Protocol to the Market Management System.	
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			<u>Each data shall contain all previous data and is not an incremental update of the previous submission.</u> <u>5.3 Schedule of submission. The reserve requirements for a trading interval or trading day shall be transmitted in accordance with the WESM Timetable set out in this Dispatch Protocol.</u> <u>5.4 Revision of reserve requirements. Prior to the execution of the market runs as set out in the WESM Timetable, the System Operator may revise the reserve requirements earlier submitted. Revision may be done by submitting the revised data, following the same format as stated in the previous paragraph, within the time frame for</u>	
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			<u>submission as set out in the WESM Timetable.</u> <u>5.5 Change in timeframe for submission. The specific timeframe for submission of the reserve requirements or any revision thereof may be changed by the Market Operator without need of amending this Dispatch Protocol. Such change can be made to accommodate actual capabilities of the market infrastructure. The Market Operator shall duly notify the System Operator of the change.</u> 6. <u>Reserve Effectiveness Factors</u> <u>6.1 Gathering of Reserve Provider Data.</u> <u>The System Operator shall gather the following</u>	
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			<u>data that it will use in determining the REF of each reserve provider –</u> <u>a) Energy schedule</u> <u>b) Reserve schedule</u> <u>c) SCADA-EMS real time data (i.e., MW readings)</u> <u>d) Circuit breaker status</u> <u>e) ADC command/status</u> <u>f) System frequency</u> <u>g) Dispatch instructions issued</u> <u>6.2 Validation of Reserve Provider Data. Using the data gathered, the System Operator shall confirm whether (a) the reserve schedule of the reserve provider is available; and (b) that the reserve provider is operating within the declared and certified parameters. The System Operator shall then validate the</u>	
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			<u>response characteristics of the reserve provider in providing reserve services using the SCADA-EMS real time data.</u> 6.3 Calculation of Reserve Effectiveness Factor. The System Operator shall calculate the hourly, daily and monthly REFs of each reserve provider. a) <u>The System Operator shall formulate and maintain procedures for the calculation of the hourly REFs.</u> b) <u>The daily REF of each reserve provider is the average of all the hourly REFs of that reserve provider for the trading day, as represented in the following formula –</u>	
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$$\text{REF}_{\text{DAILY}} = \frac{\sum_{i=1}^n \text{REF}_i}{n}$$

**Where: $\text{REF}_i = \text{REF}$
for interval i**

**$n = \text{number}$
of scheduled intervals**

c) The monthly REF is the average of the daily REF of the reserve provider for each billing month.

6.4 Submission of Reserve Effectiveness Factor Data. The System Operator shall provide the Market Operator with the monthly data on the REF of each reserve provider not later than 3 days prior to the preliminary settlement run.

Note: For convenience, please underline and put in bold letters the proposed changes to the WESM Manual.

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

V. Referral

MAG Date Received: 19 February 2014

Proposed Amendment: ☒ Urgent ☐ Minor ☐ General

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

Date Referred to PEMC President	☒ Yes	☐ No
Certifies as urgent	☒ Yes	☐ No
Convene the RCC within 48 hrs.	~~Not~~	

Remarks:

To facilitate compliance to DOE directive to operate the Reserve Market by 26 March 2014 (as per DOE DC-2013-12-0027)

B. For Minor and General Amendment (For the use of RCC only)	
Date Referred to RCC:	
Remarks:	
Action taken:	
Request for comments:	☐ Yes ☐ No
	Request written comments from: ☐ DRG ☐ MSC ☐ PA ☐ MO ☐ ECO ☐ RCC ☐ TC ☐ Other PEM Board Committees ☐ Other Interested Parties
For further review of the Technical Sub-Committee:	☐ Yes Assigned to: ☐ SO Sub-Committee ☐ MO Sub-Committee ☐ Metering Sub-Committee ☐ Billing and Settlement Sub-Committee ☐ Legal and Regulatory Sub-Committee ☐ No
For public consultation:	☐ Yes ☐ No
RCC Resolution:	☒ Approved ☐ Disapproved
RCC Resolution No.:	RCC-Reso-2014-07
Date of Resolution:	21 Feb 2014
RCC Meeting No.	84th RCC meeting
Date of endorsement to the PEM Board:	26 Feb. 2014



**Wholesale Electricity
Spot Market**

ANNEX A
Rec/OREP-WM-14-01

PROPOSED REVISIONS TO THE DISPATCH PROTOCOL ISSUE 8.0

Philippine Electricity Market Corporation

18 February 2014

I. SUMMARY OF THE PROPOSED AMENDMENTS

The proposed amendments to the WESM Manual on the Dispatch Protocol Issue 8.0 is the addition of Appendix A.12 Scheduling and Dispatch of Reserves which is intended to provide the procedures related to the operation of the Reserve Market.

This appendix describes the process for:

1. Determining the required reserve levels for to be used as input to the Market Management System in determining the Reserve schedules;
2. Providing the Reserve Effectiveness Factors for each reserve provider that will be applied to reserve providers in the WESM, either a generator or load.

The mechanisms set out in this appendix cover only the requirements for the types of reserves that are to be traded in the WESM. Procedures for procurement, monitoring and settlement of other types of ancillary services are not within the scope of this proposed amendment.

II. BACKGROUND

Upon the commencement of the trading of reserves in the WESM, the scheduling and dispatch of reserves that are traded in the WESM shall be in accordance with the requirements and procedures set out in the WESM Rules.

On the other hand, WESM Rules clause 3.3.7.4 requires the System Operator to continuously adjust the quantum of reserve to be scheduled to meet each locationally specific reserve requirement by the Market Dispatch Optimization Model, so as to accurately reflect the power system under existing or future conditions, within the relevant market time frames.

The reserve effectiveness factor (REF) is defined in the WESM Rules as a factor to define the effectiveness of reserve from a particular type of reserve provider in meeting requirements for particular reserve categories. WESM Rules clause 3.3.7.4 requires the System Operator to continuously adjust the reserve effectiveness factors for each reserve facility category.

The REF process to be implemented in the WESM is based on the applicable and measurable response characteristics of providing reserve service, including adequacy, timeliness, and accuracy based on the generator's actual operating parameters. The specific details and procedures for the determination of REF¹ for each reserve provider has been submitted to the Energy Regulatory Commission as part of the PEMC compliance to the regulatory directives for the approval of the Pricing and Cost Recovery Mechanism for Reserves in the WESM.

¹ PEMC-NGCP Joint Study: Implementation of Reserve Effectiveness Factors in the WESM

This proposal is an urgent amendment to the WESM Manual to facilitate the compliance with the target timeline of the commercial operation of the Reserve Market on 26 March 2014 per Department of Energy Department Circular (DC No 2013-12-0027). We also note that such changes were only finalized during the Focused Group Discussion on the implementation of the Reserve Market between PEMC-NGCP last 14 February 2014.

III. THE PROPOSED AMENDMENTS

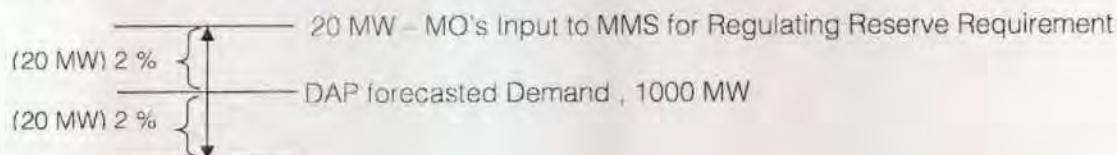
The proposed amendments intend to provide the procedures related to the scheduling and dispatch of reserves. This is an essential part of the Dispatch Protocol for the implementation of the Reserve Market. The procedures herein will guide the Market Operator and the System Operator in the efficient operation of the reserve market by setting a procedure in determining the reserve requirements and monitoring of reserves through the implementation of the reserve effectiveness factors.

1. Determination of Regulating Reserve requirement

Presently the SO determines the regulating reserve requirement based on the demand forecast for the 1200H DAP run of MO for the following day. As per ASPP, the regulating reserve requirement is equivalent to 4% of the hourly demand forecast. However, since it is the MO that determines the DAP forecast demand, the regulating reserve requirement can be determined by the MO in a more efficient manner. In determining the contracted reserve under the ASPA of NGCP, however, the contracted regulating reserve will also be determined by the SO based on the 1200H DAP run to ensure that the same forecast demand is used by both the MO and SO.

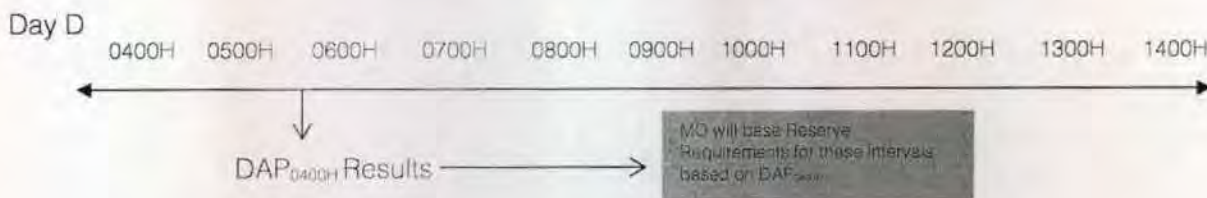
For the 4% regulation requirement, considering that the WESM Regulating Reserve design considers the upward and downward provision of reserve this will be translated to 2% upward and 2% downward requirement.

Figure 1. Regulation Reserve Requirement Illustration



2. Determination of Contingency and Dispatchable Reserve requirement

To ensure a more accurate determination of Contingency (CON) and Dispatchable (DIS) reserve requirement, it is proposed that the level of CON and DIS be based on the second latest DAP run as illustrated below.



3. Determination of Reserve Effectiveness Factors

The REF shall be determined by the SO based on the data acquired from the SCADA-EMS system of the NGCP. Using the information from the SCADA-EMS, the SO shall confirm whether a) the reserve provider is available and b) that reserve provider is operating within the declared and certified parameters. The SO shall then validate the response characteristics of the reserve provider and determine the REF based on the criteria set forth in the Implementation of Reserve Effectiveness Factor in the WESM.

IV. BACKGROUND AND DESCRIPTION OF THE PROPONENT

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

Top Officers:

M. L. Ocampo – President

C. C. Claudio – VP, Trading Operations

C. S. Huelala – VP, Market Assessment

R. P. Descanzo – VP, Corporate Planning & Communications

C. S. Martin-Funelas – VP, Legal

V. CONCLUSIONS AND RECOMMENDATIONS

The proposed amendments to the Dispatch Protocol Issue 8.0 are necessary for the commercial operation of the Reserve Market which is scheduled to commence on 26 March 2014. The revised manual is envisioned to provide guidance Market Operator and System Operator for the efficient implementation Reserve Market

VI. REFERENCES

- A.** Dispatch Protocol Issue 8.0
- B.** Department of Energy Department Circular (DC No 2013-12-0027)
- C.** Energy Regulatory Commission Order (ERC CASE NO. 2007-004 RC)
- D.** WESM Rules

APPENDIX A.12

SCHEDULING AND DISPATCH OF RESERVES

1. Background

Upon the commencement of the trading of reserves in the WESM, the scheduling and dispatch of reserves that are traded in the WESM shall be in accordance with the requirements and procedures set out in the WESM Rules.

WESM Rules clause 3.3.7.4 requires the System Operator to continuously adjust the quantum of reserve to be scheduled to meet each locationally specific reserve requirement by the Market Dispatch Optimization Model, so as to accurately reflect the power system under existing or future conditions, within the relevant market time frames.

The reserve effectiveness factor (REF) is defined in the WESM Rules as a factor to define the effectiveness of reserve from a particular type of reserve provider in meeting requirements for particular reserve categories. WESM Rules clause 3.3.7.4 requires the System Operator to continuously adjust the reserve effectiveness factors for each reserve facility category.

The REF to be implemented in the WESM is based on the applicable and measurable response characteristics of providing reserve service, including adequacy, timeliness, and accuracy based on the generator's actual operating parameters.

2. Scope and Purpose

This Section describes the criteria for determining required reserve levels by the System Operator which will be the basis of the Market Operator as input to the Market Management System.

This Section sets out the criteria of the reserve effectiveness factors that will be applied to reserve providers in the WESM, either a generator or load. The procedures for the provision and validation of reserve provider data and for submission of the REF data for each reserve provider is also set out in this Section.

The criteria, procedures and formulae set out in this Section cover only the requirements for the types of reserves that are to be traded in the WESM. Procedures for procurement, monitoring and settlement of other types of ancillary services are not within the scope of this Section or this Dispatch Protocol.

The criteria, procedures and formulae set out in this Section shall apply to the determination and submission of reserve requirements and monitoring and

settlement of reserve providers in the reserve zones in the regions where the WESM is in operation.

3. Responsibilities

3.1 System Operator. The System Operator is responsible for –

- a) Determining the required reserve levels for each type of reserves that are to be traded in the WESM in accordance with its Ancillary Services Procurement Plan, and informing these required levels to the Market Operator.
- b) Preparing and assessing the REFs of each reserve provider in the WESM, and continuously monitoring and adjusting the REF of a reserve provider within such period as may be required from time to time. The System Operator is also responsible for providing the REFs for each reserve provider to the Market Operator.

3.2 Market Operator. The Market Operator is responsible for –

- a) Ensuring that the required reserve levels per System Operator are used as inputs in pre-dispatch market projections and real time dispatch scheduling processes in the WESM. It is also responsible for providing and maintaining the facility for timely receipt of submissions from the System Operator;
- b) Using the REF determined by the System Operator in the calculation of the settlement amounts due to reserve providers in the WESM.

4. Determination of Reserve Requirements

Criteria for Determining Reserve Requirements. In determining reserve requirements for each reserve type in accordance with its Ancillary Services Procurement Plan, the System Operator shall ensure compliance with the power quality and reliability performance standards set out in the Philippine Grid Code.

The System Operator, in coordination with the Market Operator, shall formulate and maintain its procedures for determining reserve requirements.

4.1 Determination of Regulating Reserve requirement

As per ASPP, the regulating reserve requirement is equivalent to 4% of the hourly demand forecast. Taking into account that the WESM Regulating Reserve

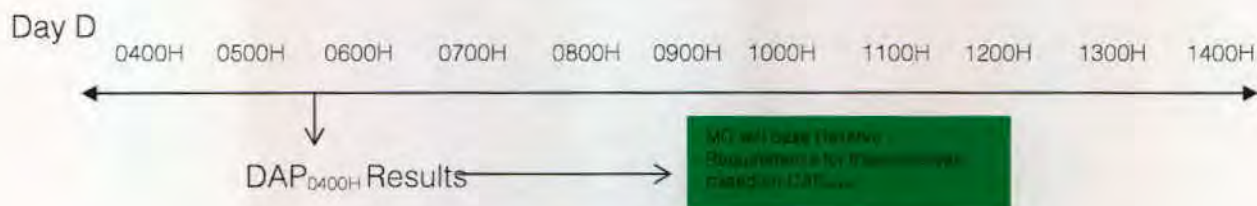
design considers the upward and downward provision of reserve, this will be translated to 2% upward and 2% downward requirement.

Figure 1. Regulation Reserve Requirement Illustration



4.2 Determination of Contingency and Dispatchable Reserve requirement

As per ASPP, the level of contingency and dispatchable reserve is based on the largest unit and second largest unit online respectively. Thus, to ensure a more accurate determination of Contingency (CON) and Dispatchable (DIS) reserve requirement, it is proposed that the level of CON and DIS be based on the second latest DAP run as illustrated below.



5. Submission of Reserve Requirements

5.1 Reserve Levels. The reserve requirements based on the reserve levels determined by the System Operator shall be used by the Market Operator. The second latest DAP results shall be used as reference by the Market Operator for the determination of the hourly reserve requirements of Contingency Reserve and Dispatchable Reserve per Section 4.2 while the DAP of the previous day shall be used for the hourly reserve requirements of Regulating Reserve per Section 4.1.

5.2 Format of Reserve Requirement. The reserve requirement data based on the reserve levels determined by the the System Operator shall be inputted by the Market Operator in the format specified in Attachment A5 of this Dispatch Protocol to the Market Management System. Each data shall contain all previous data and is not an incremental update of the previous submission.

5.3 Schedule of submission. The reserve requirements for a trading interval or trading day shall be transmitted in accordance with the WESM Timetable set out in this Dispatch Protocol.

5.4 Revision of reserve requirements. Prior to the execution of the market runs as set out in the WESM Timetable, the System Operator may revise the reserve requirements earlier submitted. Revision may be done by submitting the revised data, following the same format as stated in the previous paragraph, within the time frame for submission as set out in the WESM Timetable.

5.5 Change in timeframe for submission. The specific timeframe for submission of the reserve requirements or any revision thereof may be changed by the Market Operator without need of amending this Dispatch Protocol. Such change can be made to accommodate actual capabilities of the market infrastructure. The Market Operator shall duly notify the System Operator of the change.

6. Reserve Effectiveness Factors

6.1 Gathering of Reserve Provider Data.

The System Operator shall gather the following data that it will use in determining the REF of each reserve provider –

- a) Energy schedule
- b) Reserve schedule
- c) SCADA-EMS real time data (i.e., MW readings)
- d) Circuit breaker status
- e) ADC command/status
- f) System frequency
- g) Dispatch instructions issued

6.2 Validation of Reserve Provider Data. Using the data gathered, the System Operator shall confirm whether (a) the reserve schedule of the reserve provider is available; and (b) that the reserve provider is operating within the declared and certified parameters. The System Operator shall then validate the response characteristics of the reserve provider in providing reserve services using the SCADA-EMS real time data.

6.3 Calculation of Reserve Effectiveness Factor. The System Operator shall calculate the hourly, daily and monthly REFs of each reserve provider.

- a) The System Operator shall formulate and maintain procedures for the calculation of the hourly REFs.

- b) The daily REF of each reserve provider is the average of all the hourly REFs of that reserve provider for the trading day, as represented in the following formula –

$$REF_{DAILY} = \frac{\sum_{i=1}^n REF_i}{n}$$

Where: REF_i = REF for interval i
 n = number of scheduled intervals

- c) The monthly REF is the average of the daily REF of the reserve provider for each billing month.

6.4 Submission of Reserve Effectiveness Factor Data. The System Operator shall provide the Market Operator with the monthly data on the REF of each reserve provider not later than 3 days prior to the preliminary settlement run.



Wholesale Electricity Spot Market

WESM-WM-(Manual)-CN - RCC/CRCP-WM-14-02

REQUEST FOR AMENDMENTS OR CHANGES TO THE WESM MANUALS

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

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

PEM Board

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

I. Proposer's Information

Name	President <u>Melinda L. Ocampo</u>
Designation	President
Signature	
Company	Philippine Electricity Market Corporation
Company Address	18/F Robinsons Equitable Tower, ADB Avenue, Ortigas Center, Pasig City
Telephone No.	(02) 631-8734
Fax. No.	(02) 636-0802
Email Address	helpdesk@wesm.ph

II. WESM Manual Amendments Information

Title of WESM Manual being commented:

Constraint Violation Coefficient

Nature of Request (please indicate with x)

☐ Addition ☒ Alteration ☐ Deletion ☐ Clarification ☐ Clerical Correction

III. Proposed Amendment

Title	Section	Provision	Proposed Amendment	Rationale
Constraint Violation Coefficient	4.0 (c)	Deficit Regulating Reserve – This signals insufficient regulation reserve when the regulation reserve that may be scheduled is below the regulation requirements. Where there is a trade-off decision between interrupting supply though shedding load or shutting down generation, it would be better to accept lower reserve margins. Therefore, the constraint violation coefficient for deficit regulation reserve should be lower than that for nodal voll or deficit generation but higher than deficit interruptible load and dispatchable reserve.	Deficit Regulating Reserve – This signals insufficient regulation reserve when the regulation reserve that may be scheduled is below the regulation requirements. It is of utmost importance that this type of service be always available, even in cases of insufficient supply in compensating for the energy requirement ~~Where there is a trade-off decision between interrupting supply though shedding load or shutting down generation, it would be better to accept lower reserve margins. Therefore, the constraint violation coefficient for deficit regulation reserve should be lower~~ higher ~~than that for nodal voll or deficit generation but higher than deficit interruptible load and dispatchable reserve.~~	Redefined priority where Satisfying Regulation Reserve Requirement is higher than Satisfying the Energy Requirement
Constraint Violation Coefficient	4.0 (d)	Deficit Contingency reserve – This signals insufficient contingency reserve, when the contingency reserve that may be scheduled is below the contingency requirements. Similar to the deficient regulation reserve, the constraint violation coefficient for deficit contingency should be lower than that for deficit	Deficit Contingency reserve – This signals insufficient contingency reserve, when the contingency reserve that may be scheduled is below the contingency requirements. ~~Similar to the deficient regulation reserve,~~ The constraint violation coefficient for deficit contingency should be lower than that for deficit	Redefined priority where Satisfying Regulation Reserve Requirement is higher than Satisfying the Energy Requirement and Contingency Requirement

		generation however it is prioritized over deficit regulating reserve as contingency reserves are spinning reserves which can be used to support operational reserves	~~generation however it is prioritized over deficit regulating reserve as contingency reserves are spinning reserves which can be used to support operational reserves~~	
Constraint Violation Coefficient Development	6.1	Based on Section 4 above and in consultation with SO, the following will be the revised priority order of the CVCs in an ascending manner: 6.1.1 VoLL 6.1.2 TCG Constraint 6.1.3 Base Constraint 6.1.4 Under Generation 6.1.5 Contingency Constraint 6.1.6 Deficit Contingency Reserve 6.1.7 Deficit Regulating Reserve 6.1.8 Over Generation 6.1.9 Deficit Dispatchable Reserve 6.1.10 Deficit Interruptible Load	Based on Section 4 above and in consultation with SO, the following will be the revised priority order of the CVCs in an ascending manner: 6.1.1 Nodal VoLL 6.1.2 TCG Constraint 6.1.3 Base Case Constraint 6.1.4 Deficit Regulating Reserve ~~6.1.4~~6.1.5 Under Generation / Over Generation ~~6.1.5~~6.1.6 Contingency Constraint ~~6.1.6~~6.1.7 Deficit Contingency Reserve ~~6.1.7~~ Deficit Regulating Reserve ~~6.1.8~~ Over Generation ~~6.1.9~~6.1.8 Deficit Dispatchable Reserve ~~6.1.10~~6.1.9 Deficit Interruptible Load	Redefined priority where Satisfying Regulation Reserve Requirement is higher than Satisfying the Energy Requirement and Contingency Requirement
Constraint Violation Coefficient Development	6.2	Penalty Price Level The initial economic estimate used in the determination of VoLL for the WESM pegged the value of lost load at P100,000/MWh. However, considering the priority order on the application of CVC and to provide	Penalty Price Gradation Levels between CVCs The initial value of the Deficit Interruptible Load, which is of the lowest priority, was set at P100,000/MWh, an arbitrary value that is far from any reasonable price that may be derived in the WESM. As	New gradation levels were incorporated in the proposed CVC Manual considering the priority order on the application of CVC and to provide sufficient grading in between them so that the

		sufficient grading in between them so that the pre-defined order of violation priority is maintained and resolve possible dispatch conflicts between the different constraint types, it is proposed that this value (P100,000) be associated instead with deficit interruptible load which is the least priority. To provide sufficient grading between the penalty prices, it is proposed that a grading equivalent to P100,000 be also used. Section 8 details the priority order of the CVC and their corresponding penalty price.	such, the priority order shall start at the original value for Deficit Interruptible Load with P100,000/MWh. ~~The initial economic estimate used in the determination of VoLL for the WESM pegged the value of lost load at P100,000/MWh. However, considering~~ Considering the priority order on the application of CVC and to provide sufficient grading in between them so that the pre-defined order of violation priority is maintained and resolve possible dispatch conflicts between the different constraint types, it is proposed that this value (P100,000) be associated instead with deficit interruptible load which is the least priority. To provide sufficient grading between the penalty prices, it is proposed that a grading equivalent to P100,000 be also used. Section 8 details the priority order of the CVC and their corresponding penalty price.	pre-defined order of violation priority is maintained and resolve possible dispatch conflicts between the different constraint types.
Constraint Violation Coefficients Table	8.0	<i>See Table 1</i>	<i>See Table 2</i>	a. Redefined priority where Satisfying Regulation Reserve Requirement is higher than Satisfying the Energy Requirement and Contingency Requirement

				b. New gradation levels were incorporated in the proposed CVC Manual considering the priority order on the application of CVC and to provide sufficient grading in between them so that the pre-defined order of violation priority is maintained and resolve possible dispatch conflicts between the different constraint types.
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Table 1. Original CVC Table

Priority	Constraint Violation Coefficient Name	Price (P/MW)	Definition	SO Action
10	Deficit Interruptible Load Reserve	100,000	Insufficient Interruptible demand to meet Reserve Requirement	This is not a problem if Dispatchable reserve is met. Otherwise resort to mandatory load dropping.
9	Deficit Dispatchable Reserve	200,000	Insufficient capacity to meet Reserve Requirements (n-2)	This is not a problem if Interruptible reserve is met. Otherwise resort to mandatory load dropping.
8	Over Generation	(800,000)	the total minimum generation in the system exceeds the total demand	Identify "Must-Run Units" and shut down other units to eliminate excess capacity.
7	Deficit Regulating Reserve	400,000	Insufficient capacity to meet Reserve Requirements	Larger frequency excursions are expected without regulating reserve. Lower quality of service.
6	Deficit Contingency Reserve	500,000	Insufficient capacity to meet Reserve Requirements (n-1)	Automatic load dropping will cover for loss of generation if contingency reserve is insufficient.
5	Contingency	600,000	Violation in pre-defined contingency limits during single-outage conditions (n-1)	If risk involves system collapse or islanding, implement necessary re-dispatch and load dropping.

Priority	Constraint Violation Coefficient Name	Price (P/MW)	Definition	SO Action
	Under Generation	800,000	The demand exceeds the total maximum generation in the system	Immediately implement mandatory load dropping as necessary
3	Base Case Constraint	900,000	Thermal loading limit violations of lines or transformers	Marginal overloads (i.e., <10% for 1 hour) should be allowed. Re-dispatch generation and drop load.
2	TCG Constraint	1,000,000	Import/Export constraints between areas.	Immediately implement re-dispatch and/or load dropping as necessary.
1	Nodal Value of Lost Load	1,100,000	Localized deficiency in supply due to line or transformer loading limitations	Marginal overloads (i.e., <10% fr 1 hour) should be allowed. Otherwise drop local loads.

Table 2. Proposed Revisions to the CVC Table

Priority	Constraint Violation Coefficient Name	Price (P/MW)	Definition	SO Action
409	Deficit Interruptible Load Reserve	100,000	Insufficient Interruptible demand to meet Reserve Requirement	This is not a problem if Dispatchable reserve is met. Otherwise resort to mandatory load dropping.
98	Deficit Dispatchable Reserve	200,000	Insufficient capacity to meet Reserve Requirements (n-2)	This is not a problem if Interruptible reserve is met. Otherwise resort to mandatory load dropping.
8	Over-Generation	~~(800,000)~~	~~the total minimum generation in the system exceeds the total demand~~	~~Identify "Must-Run Units" and shut down other units to eliminate excess capacity.~~
7	Deficit Regulating Reserve	400,000	~~Insufficient capacity to meet Reserve Requirements~~	~~Larger frequency excursions are expected without regulating reserve. Lower quality of service.~~
67	Deficit Contingency Reserve	~~500,000~~ 300,000	Insufficient capacity to meet Reserve Requirements (n-1)	Automatic load dropping will cover for loss of generation if contingency reserve is insufficient.

Priority	Constraint Violation Coefficient Name	Price (P/MW)	Definition	SO Action
56	Contingency	~~600,000~~ 400,000	Violation in pre-defined contingency limits during single-outage conditions (n-1)	If risk involves system collapse or islanding, implement necessary re-dispatch and load dropping.
5	Over Generation	(800,000)	the total minimum generation in the system exceeds the total demand	Identify "Must-Run Units" and shut down other units to eliminate excess capacity.
	Under Generation	800,000	The demand exceeds the total maximum generation in the system	Immediately implement mandatory load dropping as necessary
4	Deficit Regulating Reserve	1,400,000	Insufficient capacity to meet Reserve Requirements	Larger frequency excursions are expected without regulating reserve. Lower quality of service.
3	Base Case Constraint	~~900,000~~ 1,600,000	Thermal loading limit violations of lines or transformers	Marginal overloads (i.e., <10% for 1 hour) should be allowed. Re-dispatch generation and drop load.

Priority	Constraint Violation Coefficient Name	Price (P/MW)	Definition	SO Action
2	TCG Constraint	~~1,000,000~~ 1,800,000	Import/Export constraints between areas.	Immediately implement re-dispatch and/or load dropping as necessary.
1	Nodal Value of Lost Load	~~1,100,000~~ 2,000,000	Localized deficiency in supply due to line or transformer loading limitations	Marginal overloads (i.e., <10% fr 1 hour) should be allowed. Otherwise drop local loads.

Note: For convenience, please underline and put in bold letters the proposed changes to the WESM Manual.

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

V. Referral

MAG Date Received: 19 February

Proposed Amendment: ☒ Urgent ☐ Minor ☐ General

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

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

Remarks:

To facilitate compliance to DOE directive to operate the Reserve Market by 26 March 2014.
(DOE Department Circular 2013-12-0027)

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

Date Referred to RCC:	
Remarks:	
Action taken:	
Request for comments:	☐ Yes ☐ No
	Request written comments from: ☐ DRG ☐ MSC ☐ PA ☐ MO ☐ ECO ☐ RCC ☐ TC ☐ Other PEM Board Committees ☐ Other Interested Parties
For further review of the Technical Sub-Committee:	☐ Yes Assigned to: ☐ SO Sub-Committee ☐ MO Sub-Committee ☐ Metering Sub-Committee ☐ Billing and Settlement Sub-Committee ☐ Legal and Regulatory Sub-Committee ☐ No
For public consultation:	☒ Yes ☐ No
RCC Resolution:	☒ Approved ☐ Disapproved
RCC Resolution No.:	RCC-Reso-2014-07
Date of Resolution:	21 Feb 2014
RCC Meeting No.	84th RCC Meeting
Date of endorsement to the PEM Board:	26 Feb. 2014

PROPOSED REVISIONS TO THE CONSTRAINT VIOLATION COEFFICIENTS ISSUE 2.0

Philippine Electricity Market Corporation

18 February 2014

I. SUMMARY OF THE PROPOSED RULES CHANGE

PEMC proposes revisions to the WESM Manual on the Constraint Violation Coefficient in view of the operational priorities once the reserve market is integrated into the commercial operations of the WESM.

II. BACKGROUND

The Market Operator shall develop and publish constraint violation coefficients or procedures for calculating constraint violation coefficients for each constraint detailed in WESM Rules clause 3.6.1.4, to be used in the market dispatch optimization model prior to the commercial operations of the spot market pursuant to the WESM Rules Clause 10.4.11.

Initially, the Constraint Violation Coefficients were formulated prioritizing the constraints related to energy, whereas the constraints relating to deficits in reserve were of least priority.

However during the discussions between the System Operator and the Market Operator for the preparation of the integration of the Reserve Market into the commercial operations of the WESM, the System Operator noted that the Deficit Regulation Requirement should be of higher priority than the energy requirement. This means that the regulation requirement should be fulfilled first by the regulation reserve providers before completing the generation schedules to meet the energy requirement. In line with this, there should always be enough regulation reserve capacities even if there is insufficient supply to meet the energy requirement.

Such a new priority is considered so that the schedules produced by the Market Dispatch Optimization Model (MDOM) shall be operationally feasible for implementation of the System Operator.

This proposal is an urgent amendment to the WESM Manual to facilitate the compliance with the target timeline of the commercial operation of the Reserve Market on 26 March 2014 per Department of Energy Department Circular (DC No 2013-12-0027).

III. THE PROPOSED RULES CHANGE

The proposed changes on the Constraint Violation Coefficient Market Manual intend to reflect the operational priorities in the grid so that it could properly reflect energy and reserve schedules that are operationally feasible for implementation of the System Operator during cases of supply deficits for energy and regulation reserve.

The proposed changes mainly involve the re-ordering of priorities where the Deficit Regulation Reserve should be of higher priority in comparison with the Deficit in Energy Requirement (Under Generation). Given such a proposal, the MDOM shall satisfy the regulation reserve requirement prior to satisfying the energy requirement.

Also, new gradation levels were incorporated in the proposed CVC Manual considering the priority order on the application of CVC and to provide sufficient grading in between them so that the pre-defined order of violation priority is maintained and resolve possible dispatch conflicts between the different constraint types.

IV. BACKGROUND AND DESCRIPTION OF THE PROPONENT

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

Top Officers:

M. L. Ocampo – President

C. C. Claudio – VP, Trading Operations

C. S. Heruela – VP, Market Assessment

R. P. Descanzo – VP, Corporate Planning & Communications

C. S. Martin-Funelas – VP, Legal

V. CONCLUSIONS AND RECOMMENDATIONS

The proposed revisions on the Constraint Violation Coefficient Market Manual amply consider the operational feasibility of producing energy and reserve schedules once the Reserve Market is integrated into the commercial operations of the WESM. Hence, it is recommended that the proposed revised Market Manual be adopted.

VI. REFERENCES

1. WESM Rules



Philippine Wholesale Electricity Spot Market

Constraint Violation Coefficients

WESM-CVC-0032

PUBLIC

WESM Manual

CONSTRAINT VIOLATION COEFFICIENTS (CVC)

Issue **23.0**

Abstract	This document covers the determination of the Constraint Violation Coefficient to be used by the Market Dispatch Optimization Model and the corresponding procedures and policies to be applied in the WESM.
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Document Identity:	WESM-CVC-002003
Revision:	0.0
Issue:	23.0
Reason for Issue:	~~At~~ To reflect the amendments in the prioritization of CVC as approved by the PEM Board
Effective Date:	~~17 November 2006~~ 18 February 2014



Philippine Wholesale Electricity Spot Market

Constraint Violation Coefficients

WESM-CVC-0032

Document Approval

Author:	MO Subcommittee	Date:	16 June 2005
Technical Review:		Date:	
Quality Review:		Date:	
RCC Approval:	Interim Rules Change Committee	Date:	04 August 2005 06 July 2006 14 November 2006
PEM Board Approval:		Date:	17 August 2005 06 July 2006 17 November 2006

Document Change History

Issue No.	Revision No.	Modifier	Date	Synopsis/Reason for Change
0.0	0.0	MO Subcom	06/16/2005	New Document
	0.1	MO Subcom	07/25/2005	Revised/deleted some sections. Change over-generation CVC price to be the same as under generation.
1.0	0.0	MO Subcom	08/04/05	Revised to incorporate comments of RCC
2.0	0.0	MO Subcom	07/06/06	To reflect the PEM Board approved amendments in the CVC prioritization order that will enable the Market Operator and the Trading Participants to readily and effectively address under generation scenario and/or transmission line overloading encountered in the system.
3.0	=			To reflect the amendments in the CVC prioritization order that is consistent with the operational priorities of system operations in cases of insufficient supply prior to the integration of the reserves in the commercial operations of the WESM.



Related Document

Document ID	Document Title
	WESM Rules
	Price Determination Methodology
	Compliance to ERC Directives document
WESM-SSRG-000	System Security and Reliability Guidelines
WESM-EP-000	Emergency Procedures (Draft)
WESM-DP-001	MO-SO Dispatch Protocol
	MCo Issue Paper - VoLL and CVC

Distribution List

Copy Number	Organization	Name of Recipient



Table of Contents

1.0	Introduction	1
1.1	About this Document	1
1.2	Purpose	1
1.3	Scope	1
1.4	Intended Audience	1
1.5	Conventions	1
1.6	Background	2
2.0	Definition of Terms	3
3.0	Responsibilities	4
4.0	Constraint Violation Coefficient in the MDOM	4
5.0	Constraint Violation Coefficient for Nodal Energy Balance Equations (Nodal VoLL)	6
6.0	Constraint Violation Coefficient Development	6
7.0	Constraint Violation Coefficient Application Strategy in the WESM	7
8.0	Constraint Violation Coefficients Table	8
9.0	Constraint Violation Coefficient Review and Audit	~~11~~ 10
10.	Constraint Violation Coefficient Publication and Application	~~11~~ 10



1.0 Introduction

1.1 About this Document

This document provides the market procedures and associated penalty values to be used as constraint violation coefficients in the WESM Market Dispatch Optimization Model (MDOM). This documentation provides more detailed descriptions of the requirements for Constraint Violations Coefficients (CVC) specified in the "WESM Rules". Where there is discrepancy between the provisions in this document, Market Manuals and the "WESM Rules", the "WESM Rules" will prevail. Standards and policies referenced or appended will provide a supporting framework.

1.2 Purpose

This document aim to:

- 1.2.1 Provide the criteria in determining CVC.
- 1.2.2 Provide the mechanism in the revision, publication and approval of the CVC penalty price values.
- 1.2.3 Define the responsibilities of the Market Operator (MO), System Operator (SO) and Trading Participants in relation to the CVC to be used in the MDOM.

1.3 Scope

This document covers the determination of the CVC and the basic procedures and policies to be applied regarding the CVC's.

1.4 Intended Audience

This manual is intended for use by the MO, SO, the Trading Participants and their representatives and other parties, as appropriate.

1.5 Conventions

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

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



1.6 Background

The MDOM determines the optimal dispatch schedule and nodal prices considering the different inputs from the MO (load forecast, network model, etc.), SO (snapshot, reserve requirement, etc.) and Trading Participants (offers, bids, etc.). In some instances, combination of these inputs does not allow the MDOM to produce a feasible solution.

Under WESM Rules 3.6.2.1, to allow the MDOM to find a solution which satisfies all constraints, if such a solution exists, constraint violation coefficients (CVCs) will be incorporated in the MDOM. As provided for in the objective of the MDOM (WESM Rules 3.6.1.3), CVCs are the basis for the cost of constraint violation.

To enable the MDOM to find a solution, it will treat system/nodal energy balance requirement constraint, regional energy import/export constraint, regional reserve constraint and transmission line limit constraint as soft constraints (i.e. constraints that maybe violated) which are associated with prices (P/MWh) corresponding to the cost of constraint violation and thereby signal risks to the power system.

To ensure that the constraint violation is prioritized, the associated prices of the CVCs must be set in an appropriate manner such that constraints resulting in the lowest reduction in the capability of the network, load or generating units will occur first. It is also important that the CVC prices have sufficient grading in between them so that the violation priority is maintained and resolve possible conflicts between the different constraint types.

Further, as provided in WESM Rules section 3.6.2.3, CVC for the nodal energy balance constraint will be known as the nodal value of lost load and *may* vary from node to node, *and/or* be set so as to reflect load shedding priorities.

It should also be noted, as provided for in WESM Rules Section 3.6.2.1 (c), CVCs should be set so as to ensure that the prices produced by the MDOM will be appropriate in all the circumstances, taking into consideration the processes defined in WESM Rules section 3.10. As provided for in WESM Rules Section 3.10.5, if the prices are believed to be in error, as a result of load shedding or for any other reason (as obviously in the case where the CVC prices were applied by the MDOM in the nodal prices), the MO may issue a pricing error notice, in which case the *ex post* prices determined will also serve as *ex-ante* prices.



2.0 Definition of Terms

- 2.1 Constraint Violation Coefficient – Coefficients set by the *Market Operator* in accordance with clause 3.6.2. The *Market Operator* is to ensure that, if constraints will be violated, such violation will occur in appropriate priority order.
- 2.2 CVC Price – Amount in Pesos/MWh associated with a particular Constraint Violation Coefficient.
- 2.3 Deficit Interruptible Load Reserve – CVC for insufficient Interruptible demand to meet the Interruptible Load Reserve Requirement. It also corresponds to regional reserve constraint.
- 2.4 Deficit Dispatchable Reserve – CVC for insufficient capacity to meet Dispatchable Reserve Requirements. It also corresponds to regional reserve constraint.
- 2.5 Over Generation – CVC for system condition whereby the generation in the system exceeds the total demand. Also known as excess generation. It also corresponds to system energy balance constraint.
- 2.6 Deficit Regulating Reserve – CVC for insufficient capacity to meet Regulating Reserve Requirements. It also corresponds to regional reserve constraint.
- 2.7 Deficit Contingency Reserve – CVC for insufficient capacity to meet Contingency Reserve Requirements. It also corresponds to regional reserve constraint.
- 2.8 Contingency Constraint – CVC for violating pre-defined contingency limits during single-outage conditions. It also corresponds to transmission limit constraint.
- 2.9 Value of Lost Load – CVC for nodal energy balance equation or localized deficiency in supply due to line or transformer loading limitations.
- 2.10 Under Generation – CVC for system condition where the demand exceeds the total maximum generation in the system. Also known as deficit generation. It also corresponds to system energy balance constraint.
- 2.11 Base Case Constraint – CVC for violating the thermal loading limit of lines and/or transformers. It also corresponds to transmission limit constraint.
- 2.12 TCG Constraint – CVC power transfer limits. It corresponds to regional energy import/export constraint.
- 2.13 Soft Constraints – constraints pertaining to system and nodal energy balance requirement, regional energy import/export, regional reserve and transmission line limit which are allowed to be violated in the



Philippine Wholesale Electricity Spot Market

Constraint Violation Coefficients

WESM-CVC-0032

market dispatch optimization model such that the optimization process will produce a solution.

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

3.0 Responsibilities

- 3.1 The MO will be responsible for the development, validation, maintenance, publication and revision of this document in coordination with Trading Participants and the System Operator.
- 3.2 The SO will provide the necessary information and references for subsequent revisions and validation of this document.
- 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 Constraint Violation Coefficient in the MDOM

The following will constitute the CVC in the MDOM:

- (a) Deficit Interruptible Load Reserve - This signals insufficient Interruptible Load reserve, when the Interruptible Load reserve that may be scheduled is below the Interruptible Load requirements. Operationally interruptible loads can be compensated by sufficient dispatchable reserves and hence will not provide significant risk in the power system even if the interruptible load requirement is not met. In this case, it should be least prioritized than deficient regulation, contingency and dispatchable reserves.
- (b) Deficit Dispatchable Reserve - This signals insufficient dispatchable reserve, when the dispatchable reserve that may be scheduled is below the dispatchable reserve requirements. Deficit dispatchable reserve may be compensated by sufficient interruptible load. However, as dispatchable reserves are more flexible than interruptible load reserve, deficit dispatchable reserve should be prioritized over deficit interruptible load reserve.
- (c) Deficit Regulating Reserve - This signals insufficient regulation reserve when the regulation reserve that may be scheduled is below the regulation requirements. It is of utmost importance that this type of service be always available, even in cases of insufficient supply in compensating for the energy requirement. Where there is a trade-off decision between interrupting supply through shedding load or shutting down generation, it would be better to accept lower reserve margins. Therefore, the constraint violation coefficient for deficit regulation reserve should be lower higher than that for nodal voll or deficit generation but higher than deficit interruptible load and dispatchable reserve.



Philippine Wholesale Electricity Spot Market

Constraint Violation Coefficients

WESM-CVC-0032

- (d) Deficit Contingency reserve – This signals insufficient contingency reserve, when the contingency reserve that may be scheduled is below the contingency requirements. ~~Similar to the deficient regulation reserve, the constraint violation coefficient for deficit contingency should be lower than that for deficit generation however it is prioritized over deficit regulating reserve as contingency reserves are spinning reserves which can be used to support operational reserves.~~
- (e) Contingency Constraint - This signals the risk resulting from transmission line overflow during single outage conditions. Similar to Base Case Constraint, deficiency leading to a line flow violation could alternatively result in an artificial nodal violation. To avoid artificial nodal violation, the constraint violation coefficient for contingency constraint should be lower than the value of Nodal VoLL.
- (f) Over Generation – This signals the risk of shutting down generators to avoid system over frequency. WESM defines excess generation as 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 will be dealt with in accordance with clause 3.9.8 of the WESM Rules. Over_generation is the opposite of deficit or under generation.
- (g) Under Generation – This signals the risk of load shedding in the system, as this signifies load is greater than the amount of energy injected to the system. In this case, it is prioritized over deficit reserves and contingency constraint.
- (h) Base Case Constraint – This signals the security risk resulting from transmission line or transformer overflow. Generally the deficiency leading to a line flow violation could alternatively result in a nodal violation – load could be shed at the receiving end rather than violating the flow limits. In reality, the best way to manage this risk is for load to be shed at the receiving end of the line rather than risking overloading the lines to a point where it is burnt out, resulting in greater disruption to the transmission system and the economy. However, from the operational viewpoint if this is prioritized over the nodal violation, artificial load shedding may be encountered in the market. To prevent this, Base Case Constraint should be of lesser priority than Nodal VoLL CVC.
- (i) Transmission Constraint Group (TCG) Constraint – This signals risks to the power transfer capability between regions in the transmission system. TCGs pertain branch groups or interconnection between regions in the power system. As this CVC signals possible violation to import/export or power transfer between areas in the grid which impacts on the security and reliability of the whole transmission system, it should be of higher priority than deficit reserves, deficit generation/excess generation, contingency and base case constraint.
- (j) Nodal VoLL - This signals risks to localized shedding of load due to line or transformer loading limitations. As it is more appropriate to violate reserve margins than shed load, Nodal VoLL should be higher than reserve CVCs.



In order also to prevent the occurrence of artificial load shedding as a result of artificial deficit generation/excess generation, contingency, base case and TCG constraints, Nodal VoLL is prioritized over these CVCs.

5.0 Constraint Violation Coefficient for Nodal Energy Balance Equations (Nodal VoLL)

As provided for by the WESM Rules, the CVC for nodal energy balance equations will be represented by the Nodal Value of Lost Load. Nodal VoLL can be defined for each resource node in the Market Network Model as per WESM Rules Section 3.6.2.3 (b). As such this can be varied from node to node, depending on the appropriate Value of Lost Load or the price that customers associate with unsupplied unit of energy for a particular node considering the nature of their load and duration of interruption of energy supply.

In other electricity markets, VoLL is commonly used for specifying the price bounds and constraint violation coefficients. Therefore, to apply VoLL pricing, the value of lost load must be determined. In determining an appropriate value for VoLL, two conditions must be met:

- The value of VoLL must not be so low to discourage investment in capacity
- The value of VoLL must not be so high that customers would prefer to be curtailed rather than pay for the VoLL price

It is highly apparent that pricing energy based on VoLL in the WESM, at present, is difficult due to lack of market-based information and a lack of an efficient demand side response. In this regard, it is recommended that pending acquisition of sufficient market based information and demand side response, nodal VoLL be fixed, initially, for all the market trading nodes and be subject to further study by MO together with the MSC.

6.0 Constraint Violation Coefficient Development

6.1 Based on Section 4 above and in consultation with SO, the following will be the revised priority order of the CVCs in an ascending manner:

6.1.1 Nodal VoLL

6.1.2 TCG Constraint

6.1.3 Base Case Constraint

6.1.4 Deficit Regulating Reserve

6.1.46.1.5 Under Generation / Over Generation

6.1.56.1.6 Contingency Constraint

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1" + Indent at: 1"



Philippine Wholesale Electricity Spot Market

Constraint Violation Coefficients

WESM-CVC-0032

~~6.1.66.1.7~~ Deficit Contingency Reserve

~~6.1.7~~ Deficit Regulating Reserve

~~6.1.8~~ Over Generation

~~6.1.96.1.8~~ Deficit Dispatchable Reserve

~~6.1.106.1.9~~ Deficit Interruptible Load

6.2 ~~Penalty Price Gradation Levels between CVCs~~

~~The initial value of the Deficit Interruptible Load, which is of the lowest priority, was set at P100,000/MWh, an arbitrary value that is far from any reasonable price that may be derived in the WESM. As such, the priority order shall start at the original value for Deficit Interruptible Load with P100,000/MWh. The initial economic estimate used in the determination of VoLL for the WESM pegged the value of lost load at P100,000/MWh. However,~~

~~considering~~ Considering the priority order on the application of CVC and to provide sufficient grading in between them so that the pre-defined order of violation priority is maintained and resolve possible dispatch conflicts between the different constraint types, ~~it is proposed that this value (P100,000) be associated instead with deficit interruptible load which is the least priority. To provide sufficient grading between the penalty prices, it is proposed that a grading equivalent to P100,000 be also used.~~ Section 8 details the priority order of the CVC and their corresponding penalty price.

7.0 Constraint Violation Coefficient Application Strategy in the WESM

- 7.1 During Market Trial and prior to commercial operation of the WESM, the MO will utilize the recommended CVC prices.
- 7.2 The MO will continuously endeavor to verify the robustness and applicability of the CVC price levels and provide appropriate revisions to this document. Including the applicability of multi level CVCs in coordination with SO and Trading Participants to facilitate marginal overloads, as maybe necessary.
- 7.3 Prior to the start of the Commercial Operation, the MO will recommend the final CVC price levels subject to the approval of the PEM Board.
- 7.4 During the start of the commercial operation, the Nodal Value of Lost Load for all resource nodes maybe uniform for each reserve region or transmission system pending the build up of market based information from which relevant analysis and studies pertaining to the level of VoLL for each trading node can be established.



8.0 Constraint Violation Coefficients Table

The following table lists the Constraint Violation Coefficient names and their ~~corresponding price~~corresponding price and order of priority. The corresponding action by SO regarding the CVC is also indicated.

Priority	Constraint Violation Coefficient Name	Price (P/MW)	Definition	SO Action
~~109~~	Deficit Interruptible Load Reserve	100,000	Insufficient Interruptible demand to meet Reserve Requirement	This is not a problem if Dispatchable reserve is met. Otherwise resort to mandatory load dropping.
~~98~~	Deficit Dispatchable Reserve	200,000	Insufficient capacity to meet Reserve Requirements (n-2)	This is not a problem if Interruptible reserve is met. Otherwise resort to mandatory load dropping.
8	~~Over-Generation~~	~~(800,000)~~	~~the total minimum generation in the system exceeds the total demand~~	~~Identify "Must-Run Units" and shut down other units to eliminate excess capacity.~~
7	~~Deficit Regulating Reserve~~	400,000	~~Insufficient capacity to meet Reserve Requirements~~	~~Larger frequency excursions are expected without regulating reserve. Lower quality of service.~~
~~67~~	Deficit Contingency Reserve	~~5300,000~~	Insufficient capacity to meet Reserve Requirements (n-1)	Automatic load dropping will cover for loss of generation if contingency reserve is insufficient.



Wholesale Electricity Spot Market

Constraint Violation Coefficients

WESM-CVC-002

Priority	Constraint Violation Coefficient Name	Price (P/MW)	Definition	SO Action
<u>56</u>	Contingency	<u>600400,000</u>	Violation in pre-defined contingency limits during single-outage conditions (n-1)	If risk involves system collapse or islanding, implement necessary re-dispatch and load dropping.
<u>5</u>	<u>Over Generation</u>	<u>(800,000)</u>	<u>the total minimum generation in the system exceeds the total demand</u>	<u>Identify "Must-Run Units" and shut down other units to eliminate excess capacity.</u>
	Under Generation	800,000	The demand exceeds the total maximum generation in the system	Immediately implement mandatory load dropping as necessary
<u>4</u>	<u>Deficit Regulating Reserve</u>	<u>1,400,000</u>	<u>Insufficient capacity to meet Reserve Requirements</u>	<u>Larger frequency excursions are expected without regulating reserve. Lower quality of service.</u>
3	Base Case Constraint	<u>9991,600,000</u>	Thermal loading limit violations of lines or transformers	Marginal overloads (i.e., <10% for 1 hour) should be allowed. Re-dispatch generation and drop load.
2	TCG Constraint	<u>1,000800,000</u>	Import/Export constraints between areas.	Immediately implement re-dispatch and/or load dropping as necessary.



Wholesale Electricity Spot Market

Constraint Violation Coefficients

WESM-CVC-002

Priority	Constraint Violation Coefficient Name	Price (P/MW)	Definition	SO Action
1	Nodal Value of Lost Load	~~12,100,000~~ ,000	Localized deficiency in supply due to line or transformer loading limitations	Marginal overloads (i.e., <10% fr 1 hour) should be allowed. Otherwise drop local loads.



9.0 Constraint Violation Coefficient Review and Audit

- 9.1 The Market Operator in coordination with the WESM Technical and Market Surveillance Committees will review the CVC penalty costs values and the order of prioritization in the MDOM, including the nodal value of Lost Load (VoLL) every 6 months from the start of the commercial operations. The review will take into consideration the build-up of market based transaction information.
- 9.2 The Market Operator in coordination with the WESM Technical and Market Surveillance Committees will prepare the necessary report and provide recommendation to the PEM Board for any changes that should be made on the penalty cost values and order of prioritization.
- 9.3 During Market Trials and prior to the start of the commercial operations of the WESM, an independent auditor elected by the PEM Board will verify the correctness and applicability of the constraint violation coefficient prices and order of prioritization.

10. Constraint Violation Coefficient Publication and Application

- 10.1 During the Market Trials and Prior to the start of the commercial operation of the WESM, the MO will notify all participants of the CVCs used in the MDOM and publish the CVCs in the WESM website.
- 10.2 Reports pertaining to the review and audit of the CVCs will be published in the WESM website upon completion.
- 10.3 Should the PEM Board approve any changes in the CVCs, the MO will publish the approval and resolution of the PEM Board in the WESM website.
- 10.4 Any revision or changes pertaining to the CVCs in the MDOM will take effect 7 days after its publication in the WESM website.

**Proposed Amendment Dispatch Protocol Manual Issue 8.0 Relative to Reserve Market
per RCC Resolution No. 2014-07**

Title	Section	Original Provision	Proposed Amendment	Rationale	RCC-Approved Amendment 21 February 2014	Remarks
	Appendix	New Appendix	<u>APPENDIX A.12 SCHEDULING AND DISPATCH OF RESERVES</u>		<u>APPENDIX A.12 SCHEDULING AND DISPATCH OF RESERVES</u>	
			1. <u>Background</u> <u>Upon the commencement of the trading of reserves in the WESM, the scheduling and dispatch of reserves that are traded in the WESM shall be in accordance with the requirements and procedures set out in the WESM Rules.</u> <u>WESM Rules clause 3.3.7.4 requires the System Operator to continuously adjust the quantum of reserve to be scheduled to meet each locationally specific reserve requirement by the Market Dispatch Optimization Model, so as to accurately reflect the power system under existing or future conditions, within the relevant market time frames.</u> <u>The reserve effectiveness factor (REF) is defined in the WESM Rules as a factor to define the</u>	The proposed amendments intend to provide the procedures related to the scheduling and dispatch of reserves. This is an essential part of the Dispatch Protocol for the implementation of the Reserve Market. The procedures herein will guide the Market Operator and the System Operator in the efficient operation of the reserve market by setting a procedure in determining the reserve requirements and monitoring of reserves through the implementation of the reserve effectiveness factors.	1. <u>Background</u> <u>Upon the commencement of the trading of reserves in the WESM, the scheduling and dispatch of reserves that are traded in the WESM shall be in accordance with the requirements and procedures set out in the WESM Rules.</u> <u>WESM Rules clause 3.3.7.4 requires the System Operator to continuously adjust the quantum of reserve to be scheduled to meet each locationally specific reserve requirement by the Market Dispatch Optimization Model, so as to accurately reflect the power system under existing or future conditions, within the relevant market time frames.</u> <u>The reserve effectiveness factor (REF) is defined in the WESM Rules as a factor to define the</u>	Adopt PEMC Proposal

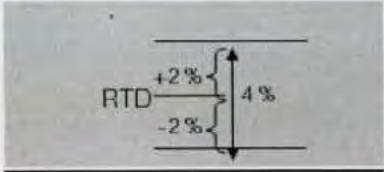
Title	Section	Original Provision	Proposed Amendment	Rationale	RCC-Approved Amendment 21 February 2014	Remarks
			<u>effectiveness of reserve from a particular type of reserve provider in meeting requirements for particular reserve categories. WESM Rules clause 3.3.7.4 requires the System Operator to continuously adjust the reserve effectiveness factors for each reserve facility category.</u> <u>The REF to be implemented in the WESM is based on the applicable and measurable response characteristics of providing reserve service, including adequacy, timeliness, and accuracy based on the generator's actual operating parameters.</u>		<u>effectiveness of reserve from a particular type of reserve provider in meeting requirements for particular reserve categories. WESM Rules clause 3.3.7.4 requires theSystem Operator tocontinuously adjust the reserve effectiveness factors for each reserve facility category.</u> <u>The REF to be implemented in the WESM is based on the applicable and measurable response characteristics of providing reserve service, including adequacy, timeliness, and accuracy based on the generator's actual operating parameters.</u>	
			2. <u>Scope and Purpose</u> <u>This Section describes the criteria for determining required reserve levels by the System Operator which will be the basis of the Market Operator as input to the Market Management System.</u> <u>This Section sets out the criteria of the reserve effectiveness factors that will be applied to reserve providers in the WESM, either a generator or load. The procedures for the provision and validation of</u>		2. <u>Scope and Purpose</u> <u>This Section describes the criteria for determining required reserve levels by the System Operator which will be the basis of the Market Operator as input to the Market Management System.</u> <u>This Section sets out the criteria of the reserve effectiveness factors that will be applied to reserve providers in the WESM, either a generator or load. The procedures for the provision and validation of</u>	Adopt PEMC Proposal

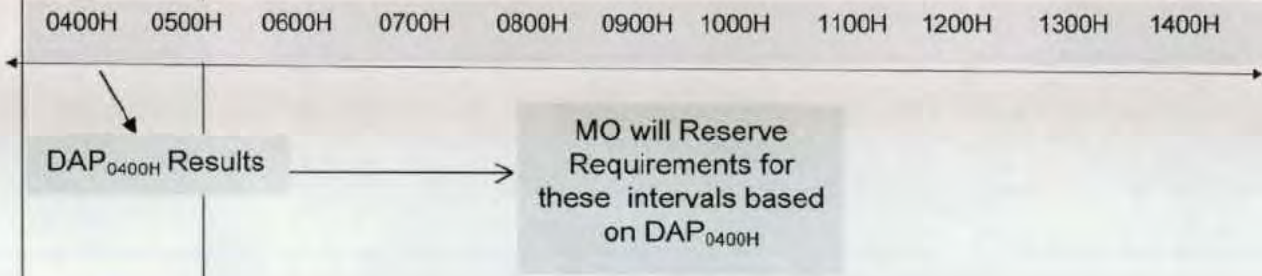
Title	Section	Original Provision	Proposed Amendment	Rationale	RCC-Approved Amendment 21 February 2014	Remarks
			<u>reserve provider data and for submission of the REF data for each reserve provider is also set out in this Section.</u> <u>The criteria, procedures and formulae set out in this Section cover only the requirements for the types of reserves that are to be traded in the WESM. Procedures for procurement, monitoring and settlement of other types of ancillary services are not within the scope of this Section or this Dispatch Protocol.</u> <u>The criteria, procedures and formulae set out in this Section shall apply to the determination and submission of reserve requirements and monitoring and settlement of reserve providers in the reserve zones in the regions where the WESM is in operation.</u>		<u>reserve provider data and for submission of the REF data for each reserve provider is also set out in this Section.</u> <u>The criteria, procedures and formulae set out in this Section cover only the requirements for the types of reserves that are to be traded in the WESM. Procedures for procurement, monitoring and settlement of other types of ancillary services are not within the scope of this Section or this Dispatch Protocol.</u> <u>The criteria, procedures and formulae set out in this Section shall apply to the determination and submission of reserve requirements and monitoring and settlement of reserve providers in the reserve zones in the regions where the WESM is in operation.</u>	
			3. Responsibilities <u>3.1 System Operator. The System Operator is responsible for -</u> a) <u>Determining the required reserve levels for each type of reserves that are to be traded in the WESM in accordance with its Ancillary</u>		3. Responsibilities <u>3.1 System Operator. The System Operator is responsible for -</u> a. <u>Determining the required reserve levels for each type of reserves that are to be traded in the WESM in accordance with</u>	<u>Adopt SO's recommended provisions under item 3.1. b) and 3.1. c) as discussed.</u>

Title	Section	Original Provision	Proposed Amendment	Rationale	RCC-Approved Amendment 21 February 2014	Remarks
			<u>Services Procurement Plan, and informing these required levels to the Market Operator.</u> b) <u>Preparing and assessing the REFs of each reserve provider in the WESM, and continuously monitoring and adjusting the REF of a reserve provider within such period as may be required from time to time. The System Operator is also responsible for providing the REFs for each reserve provider to the Market Operator.</u>		<u>its Ancillary Services Procurement Plan, and informing these required levels to the Market Operator.</u> b. <u>Implementing the Real-Time Reserve Dispatch Schedule upon receipt of the same from the Market Operator.</u> c. <u>Monitoring the compliance of each reserve provider in the WESM. This compliance monitoring report shall be submitted to the Market Operator for settlement purposes.</u> d. <u>Preparing and assessing the REFs of each reserve provider in the WESM, and continuously monitoring and adjusting the REF of a reserve provider within such period as may be required from time to time. The System Operator is also responsible for providing the REFs for each reserve provider to the Market Operator.</u>	
			<u>3.2 Market Operator. The Market Operator is responsible for -</u> a) <u>Ensuring that the required reserve levels per System</u>		<u>3.2 Market Operator. The Market Operator is responsible for -</u> a) <u>Ensuring that the required reserve levels per System</u>	Adopt PEMC Proposal

Title	Section	Original Provision	Proposed Amendment	Rationale	RCC-Approved Amendment 21 February 2014	Remarks
			<u>Operator are used as inputs in pre-dispatch market projections and real time dispatch scheduling processes in the WESM. It is also responsible for providing and maintaining the facility for timely receipt of submissions from the System Operator;</u> b) <u>Using the REF determined by the System Operator in the calculation of the settlement amounts due to reserve providers in the WESM.</u>		<u>Operator are used as inputs in pre-dispatch market projections and real time dispatch scheduling processes in the WESM. It is also responsible for providing and maintaining the facility for timely receipt of submissions from the System Operator;</u> b) <u>Using the REF determined by the System Operator in the calculation of the settlement amounts due to reserve providers in the WESM.</u>	
			4. <u>Determination of Reserve Requirements</u> <u>Criteria for Determining Reserve Requirements. In determining reserve requirements for each reserve type in accordance with its Ancillary Services Procurement Plan, the System Operator shall ensure compliance with the power quality and reliability performance standards set out in the Philippine Grid Code.</u> <u>The System Operator, in coordination with the Market Operator, shall formulate and</u>		4. <u>Determination of Reserve Requirements</u> 4.1<u>Criteria for Determining Reserve Requirements. In determining reserve requirements for each reserve type in accordance with its Ancillary Services Procurement Plan, the System Operator shall ensure compliance with the power quality and reliability performance standards set out in the Philippine Grid Code.</u> <u>The level of reserve requirement</u>	Adopt SO's proposal, with revisions based on RCC discussions.

Title	Section	Original Provision	Proposed Amendment	Rationale	RCC-Approved Amendment 21 February 2014	Remarks
			<u>maintain its procedures for determining reserve requirements.</u>		<u>for Regulating Reserve service shall be based on the latest ASPP duly approved by the ERC, and shall be used as reference by the Market Operator to come up with a Day Ahead or Hour Ahead Reserve dispatch schedule. The reserve requirement shall be equally distributed to provide upward and downward Regulating Reserve.</u> <u>For Contingency reserve service, the System Operator shall determine the level of reserve requirement in accordance with the latest ASPP duly approved by the ERC.</u> <u>For Dispatchable Reserve, the System Operator shall determine the level of reserve requirement in accordance with the latest ASPP duly approved by the ERC.</u> <u>The System Operator, in coordination with the Market Operator, shall formulate and maintain its procedures for determining reserve requirements.</u>	
			<u>4.1 Determination of Regulating Reserve requirement</u>			Delete 4.1 as proposed by PEMC

Title	Section	Original Provision	Proposed Amendment	Rationale	RCC-Approved Amendment 21 February 2014	Remarks
			<u>As per ASPP, The regulating reserve requirement is equivalent to 4% of the hourly demand forecast. Considering that the WESM Regulating Reserve design considers the upward and downward provision of reserve, this will be translated to 2% upward and 2% downward requirement.</u> <u>Figure 1. Regulation Reserve Requirement Illustration</u>  2% of the DAP Forecast of the previous day shall be the MO's input to the MMS			
			<u>4.2 Determination of Contingency and Dispatchable Reserve requirement</u> <u>To ensure a more accurate determination of Contingency (CON) and Dispatchable (DIS) reserve requirement, it is proposed</u>			

Title	Section	Original Provision	Proposed Amendment	Rationale	RCC-Approved Amendment 21 February 2014	Remarks
			<u>that the level of CON and DIS be based on the second latest DAP run as illustrated below.</u>			
Day D						Deleted and transposed after Section 5.3
			<u>5. Submission of Reserve Requirements</u> <u>5.1 Reserve Levels. The reserve requirements based on the reserve levels determined by the System Operator shall be used</u>		<u>5. Submission of Reserve Requirements</u> <u>5.1 Reserve Levels. The reserve requirements based on the reserve levels determined by the System Operator shall be used by</u>	

Title	Section	Original Provision	Proposed Amendment	Rationale	RCC-Approved Amendment 21 February 2014	Remarks
			<u>by the Market Operator. The latest DAP results shall be used as reference by the Market Operator for the determination of the hourly reserve requirements of Contingency Reserve and Dispatchable Reserve per Section 4.2 while the DAP of the previous day shall be used for the hourly reserve requirements of Regulating Reserve per Section 4.1.</u>		<u>the Market Operator in the preparation of the Reserve Dispatch scheduling. The second-latest DAP results shall be used as reference by the Market Operator for the determination of the hourly reserve requirements of Contingency Reserve and Dispatchable Reserve while the 1200H DAP of the previous day shall be used for the hourly reserve requirements of Regulating Reserve</u>	
			<u>5.2 Format of Reserve Requirement. The reserve requirement data based on the reserve levels determined by the the System Operator shall be inputted by the Market Operator in the format specified in Attachment A5 of this Dispatch Protocol to the Market Management System. Each data shall contain all previous data and is not an incremental update of the previous submission.</u>		<u>5..2Format of Reserve Requirement. The reserve requirement data based on the reserve levels determined by the System Operator shall be inputted by the Market Operator in the format specified in Attachment A5 of this Dispatch Protocol to the Market Management System. Each data shall contain all previous data and is not an incremental update of the previous submission</u>	Adopt PEMC Proposal
			<u>5.3 Schedule of submission. The reserve requirements for a trading interval or trading day shall be transmitted in accordance with the WESM Timetable set out in this Dispatch Protocol</u>		<u>5.3 Schedule of submission. The reserve requirements for a trading interval or trading day shall be transmitted in accordance with the WESM Timetable set out in this Dispatch Protocol.</u>	Adopt PEMC Proposal

Title	Section	Original Provision	Proposed Amendment	Rationale	RCC-Approved Amendment 21 February 2014	Remarks
					<u>The figure below shows the relevant timeline for the submission of reserve requirements with reference to item 5.1.</u>	
MO will use the 0400H DAP run as basis for the CON and DIS reserve requirements of intervals 0900H to 1200H MO will use the 1200H DAP run as basis for the REG reserve requirement of intervals 0100H to 2400H of Day D+1 DAY "D"						
			5.4 Revision of reserve requirements. <u>Prior to the execution of the market runs as set out in the WESM Timetable, the System Operator may revise the reserve requirements earlier submitted.</u> <u>Revision may be done by submitting the revised data,</u>			During the RCC discussion, SO already explained that such revision of reserve requirement is no longer necessary since the reserve dispatch

Title	Section	Original Provision	Proposed Amendment	Rationale	RCC-Approved Amendment 21 February 2014	Remarks
			<u>following the same format as stated in the previous paragraph, within the time frame for submission as set out in the WESM Timetable.</u>			schedule was already established by the Market Operator beforehand.
			<u>5.5 Change in timeframe for submission. The specific timeframe for submission of the reserve requirements or any revision thereof may be changed by the Market Operator without need of amending this Dispatch Protocol. Such change can be made to accommodate actual capabilities of the market infrastructure. The Market Operator shall duly notify the System Operator of the change.</u>		<u>5.4 Change in timeframe for submission. The specific timeframe for submission of the reserve requirements or any revision thereof may be changed by the Market Operator without need of amending this Dispatch Protocol. Such change can be made to accommodate actual capabilities of the market infrastructure. The Market Operator shall duly notify the System Operator of the change.</u>	Adopt PEMC Proposal
					<u>5.5 Submission of Nominations and Offers for Ancillary Services</u> <u>The Submission of nominations and offers for Ancillary Services shall be based on per single unit per single type of reserve service.</u>	Adopt SO's proposal
			<u>6. Reserve Effectiveness Factors</u>		<u>6. Reserve Effectiveness Factors</u>	
			<u>6.1 Gathering of Reserve Provider Data.</u> <u>The System Operator shall gather</u>		<u>6.1 Gathering of Reserve Provider Data.</u> <u>The System Operator shall gather</u>	Adopt PEMC Proposal

Title	Section	Original Provision	Proposed Amendment	Rationale	RCC-Approved Amendment 21 February 2014	Remarks
			<u>the following data that it will use in determining the REF of each reserve provider -</u> a) <u>Energy schedule</u> b) <u>Reserve schedule</u> c) <u>SCADA-EMS real time data (i.e., MW readings)</u> d) <u>Circuit breaker status</u> e) <u>ADC command/status</u> f) <u>System frequency</u> g) <u>Dispatch instructions issued</u>		<u>the following data that it will use in determining the REF of each reserve provider -</u> a) <u>Energy schedule</u> b) <u>Reserve schedule</u> c) <u>SCADA-EMS real time data (i.e., MW readings)</u> d) <u>Circuit breaker status</u> e) <u>ADC command/status</u> f) <u>System frequency</u> g) <u>Dispatch instructions issued</u>	
			<u>6.2 Validation of Reserve Provider Data. Using the data gathered, the System Operator shall confirm whether (a) the reserve schedule of the reserve provider is available; and (b) that the reserve provider is operating within the declared and certified parameters. The System Operator shall then validate the response characteristics of the reserve provider in providing reserve services using the SCADA-EMS real time data.</u>		<u>6.2 Validation of Reserve Provider Data. Using the data gathered, the System Operator shall confirm whether (a) the reserve schedule of the reserve provider is available; and (b) that the reserve provider is operating within the declared and certified parameters. The System Operator shall then validate the response characteristics of the reserve provider in providing reserve services using the SCADA-EMS real time data.</u>	Adopt PEMC Proposal
			<u>6.3 Calculation of Reserve Effectiveness Factor. The System Operator shall calculate the hourly, daily and monthly REFs of each reserve provider.</u>		<u>6.3 Calculation of Reserve Effectiveness Factor. The System Operator shall calculate the hourly, daily and monthly REFs of each reserve provider.</u>	Adopt PEMC Proposal

Title	Section	Original Provision	Proposed Amendment	Rationale	RCC-Approved Amendment 21 February 2014	Remarks
			a) <u>The System Operator shall formulate and maintain procedures for the calculation of the hourly REFs.</u> b) <u>The daily REF of each reserve provider is the average of all the hourly REFs of that reserve provider for the trading day, as represented in the following formula -</u> $REF_{DAILY} = \frac{\sum_{i=1}^n REF_i}{n}$ Where: <u>REF_i = REF for interval i</u> <u>n = number of scheduled intervals</u> c) <u>The monthly REF is the average of the daily REF of the reserve provider for each billing month.</u>		a) <u>The System Operator shall formulate and maintain procedures for the calculation of the hourly REFs.</u> b) <u>The daily REF of each reserve provider is the average of all the hourly REFs of that reserve provider for the trading day, as represented in the following formula -</u> $REF_{DAILY} = \frac{\sum_{i=1}^n REF_i}{n}$ Where: <u>REF_i = REF for interval i</u> <u>n = number of scheduled intervals</u> c) <u>The monthly REF is the average of the daily REF of the reserve provider for each billing month.</u>	
			<u>6.4 Submission of Reserve Effectiveness Factor Data. The System Operator shall provide the Market Operator with the monthly data on the REF of each reserve</u>		<u>6.4 Submission of Reserve Effectiveness Factor Data. The System Operator shall provide the Market Operator with the weekly data on the REF. The System</u>	Adopt PEMC Proposal

Title	Section	Original Provision	Proposed Amendment	Rationale	RCC-Approved Amendment 21 February 2014	Remarks
			<u>provider not later than 3 days prior to the preliminary settlement run.</u>		<u>Operator shall also provide the monthly data on the REF of each reserve provider not later than 3 days prior to the preliminary settlement run.</u>	

**Urgent Proposed Amendment to the Constraint Violation Co-efficient Manual
per RCC Resolution No. 2014-07**

Constraint Violation Co-efficient Manual

Title	Section	Provision	Proposed Amendment	Rationale	RCC Discussion	Remarks
Constraint Violation Coefficient	4.0 (a)	Deficit Interruptible Load Reserve - This signals insufficient Interruptible Load reserve, when the Interruptible Load reserve that may be scheduled is below the Interruptible Load requirements. Operationally interruptible loads can be compensated by sufficient dispatchable reserves and hence will not provide significant risk in the power system even if the interruptible load requirement is not met. In this case, it should be least prioritized than deficient regulation, contingency and dispatchable reserves.			Deficit Interruptible Load Reserve - This signals insufficient Interruptible Load reserve, when the Interruptible Load reserve that may be scheduled is below the Interruptible Load requirements. Operationally interruptible loads can be compensated by sufficient dispatchable reserves and hence will not provide significant risk in the power system even if the interruptible load requirement is not met. <u>~~In this case, it should be least prioritized than deficient regulation, contingency and dispatchable reserves.~~</u>	Simplify description of CVCs

Title	Section	Provision	Proposed Amendment	Rationale	RCC Discussion	Remarks
Constraint Violation Coefficient	4.0 (b)	Deficit Dispatchable Reserve - This signals insufficient dispatchable reserve, when the dispatchable reserve that may be scheduled is below the dispatchable reserve requirements. Deficit dispatchable reserve may be compensated by sufficient interruptible load. However, as dispatchable reserves are more flexible than interruptible load reserve, deficit dispatchable reserve should be prioritized over deficit interruptible load reserve.			Deficit Dispatchable Reserve - This signals insufficient dispatchable reserve, when the dispatchable reserve that may be scheduled is below the dispatchable reserve requirements. Deficit dispatchable reserve may be compensated by sufficient interruptible load. <u>However, as dispatchable reserves are more flexible than interruptible load reserve, deficit dispatchable reserve should be prioritized over deficit interruptible load reserve.</u>	Simplify description of CVCs

Title	Section	Provision	Proposed Amendment	Rationale	RCC Discussion	Remarks
Constraint Violation Coefficient	4.0 (c)	Deficit Regulating Reserve - This signals insufficient regulation reserve when the regulation reserve that may be scheduled is below the regulation requirements. Where there is a trade-off decision between interrupting supply though shedding load or shutting down generation, it would be better to accept lower reserve margins. Therefore, the constraint violation coefficient for deficit regulation reserve should be lower than that for nodal voll or deficit generation but higher than deficit interruptible load and dispatchable reserve.	Deficit Regulating Reserve - This signals insufficient regulation reserve when the regulation reserve that may be scheduled is below the regulation requirements. It is of utmost importance that this type of service be always available, even in cases of insufficient supply in compensating for the energy requirement Where there is a trade-off decision between interrupting supply though shedding load or shutting down generation, it would be better to accept lower reserve margins. Therefore, the constraint violation coefficient for deficit regulation reserve should be lower higher than that for nodal voll or deficit generation but higher than deficit interruptible load and dispatchable reserve.	Redefined priority where Satisfying Regulation Reserve Requirement is higher than Satisfying the Energy Requirement -	Deficit Regulating Reserve - This signals insufficient regulation reserve when the regulation reserve that may be scheduled is below the regulation requirements. <u>It is of utmost importance that this type of service be always available, even in cases of insufficient supply in compensating for the energy requirement . Where there is a trade-off decision between interrupting supply though shedding load or shutting down generation, it would be better to accept lower reserve margins. Therefore, the constraint violation coefficient for deficit regulation reserve should be lower than that for nodal voll or deficit generation but higher than deficit interruptible load and dispatchable reserve.</u>	Simplify description of CVCs Adopt proposal as discussed and revised.

Title	Section	Provision	Proposed Amendment	Rationale	RCC Discussion	Remarks
Constraint Violation Coefficient	4.0 (d)	Deficit Contingency reserve - This signals insufficient contingency reserve, when the contingency reserve that may be scheduled is below the contingency requirements. Similar to the deficient regulation reserve, the constraint violation coefficient for deficit contingency should be lower than that for deficit generation however it is prioritized over deficit regulating reserve as contingency reserves are spinning reserves which can be used to support operational reserves.	Deficit Contingency reserve - This signals insufficient contingency reserve, when the contingency reserve that may be scheduled is below the contingency requirements. <u>Similar to the deficient regulation reserve, t</u> The constraint violation coefficient for deficit contingency should be lower than that for deficit generation however it is prioritized over deficit regulating reserve as contingency reserves are spinning reserves which can be used to support operational reserves	Redefined priority where Satisfying Regulation Reserve Requirement is higher than Satisfying the Energy Requirement and Contingency Requirement	Deficit Contingency reserve - This signals insufficient contingency reserve, when the contingency reserve that may be scheduled is below the contingency requirements. <u>Similar to the deficient regulation reserve, the constraint violation coefficient for deficit contingency should be lower than that for deficit generation however it is prioritized over deficit regulating reserve as contingency reserves are spinning reserves which can be used to support operational reserves.</u>	Simplify description of CVCs

Title	Section	Provision	Proposed Amendment	Rationale	RCC Discussion	Remarks
Constraint Violation Coefficient	4.0 (e)	Contingency Constraint - This signals the risk resulting from transmission line overflow during single outage conditions. Similar to Base Case Constraint, deficiency leading to a line flow violation could alternatively result in an artificial nodal violation. To avoid artificial nodal violation, the constraint violation coefficient for contingency constraint should be lower than the value of Nodal VoLL.			Contingency Constraint - This signals the risk resulting from transmission line overflow during single outage conditions. Similar to Base Case Constraint, deficiency leading to a line flow violation could alternatively result in an artificial nodal violation. <u>To avoid artificial nodal violation, the constraint violation coefficient for contingency constraint should be lower than the value of Nodal VoLL.</u>	Simplify description of CVCs
Constraint Violation Coefficient	4.0 (g)	Under Generation - This signals the risk of load shedding in the system, as this signifies load is greater than the amount of energy injected to the system. In this case, it is prioritized over deficit reserves and contingency constraint.			Under Generation - This signals the risk of load shedding in the system, as this signifies load is greater than the amount of energy injected to the system. <u>In this case, it is prioritized over deficit reserves and contingency constraint.</u>	Simplify description of CVCs

Title	Section	Provision	Proposed Amendment	Rationale	RCC Discussion	Remarks
Constraint Violation Coefficient	4.0 (h)	Base Case Constraint - This signals the security risk resulting from transmission line or transformer overflow. Generally the deficiency leading to a line flow violation could alternatively result in a nodal violation - load could be shed at the receiving end rather than violating the flow limits. In reality, the best way to manage this risk is for load to be shed at the receiving end of the line rather than risking overloading the lines to a point where it is burnt out, resulting in greater disruption to the transmission system and the economy. However, from the operational viewpoint if this is prioritized over the nodal violation, artificial load shedding may be encountered in the market. To prevent this, Base Case Constraint should be of lesser priority than Nodal VoLL CVC.			Base Case Constraint - This signals the security risk resulting from transmission line or transformer overflow. Generally the deficiency leading to a line flow violation could alternatively result in a nodal violation - load could be shed at the receiving end rather than violating the flow limits. In reality, the best way to manage this risk is for load to be shed at the receiving end of the line rather than risking overloading the lines to a point where it is burnt out, resulting in greater disruption to the transmission system and the economy. <u>However, from the operational viewpoint if this is prioritized over the nodal violation, artificial load shedding may be encountered in the market. To prevent this, Base Case Constraint should be of lesser priority than Nodal VoLL CVC.</u>	Simplify description of CVCs

Title	Section	Provision	Proposed Amendment	Rationale	RCC Discussion	Remarks
Constraint Violation Coefficient	4.0 (i)	Transmission Constraint Group (TCG) Constraint - This signals risks to the power transfer capability between regions in the transmission system. TCGs pertain branch groups or interconnection between regions in the power system. As this CVC signals possible violation to import/export or power transfer between areas in the grid which impacts on the security and reliability of the whole transmission system, it should be of higher priority than deficit reserves, deficit generation/excess generation, contingency and base case constraint.			Transmission Constraint Group (TCG) Constraint - This signals risks to the power transfer capability between regions in the transmission system. TCGs pertain branch groups or interconnection between regions in the power system. <u>As this CVC signals possible violation to import/export or power transfer between areas in the grid which impacts on the security and reliability of the whole transmission system, it should be of higher priority than deficit reserves, deficit generation/excess generation, contingency and base case constraint.</u>	Simplify description of CVCs

Title	Section	Provision	Proposed Amendment	Rationale	RCC Discussion	Remarks
	4.0 (j)	Nodal VoLL - This signals risks to localized shedding of load due to line or transformer loading limitations. As it is more appropriate to violate reserve margins than shed load, Nodal VoLL should be higher than reserve CVCs. In order also to prevent the occurrence of artificial load shedding as a result of artificial deficit generation/ excess generation, contingency, base case and TCG constraints, Nodal VoLL is prioritized over these CVCs..			Nodal VoLL - This signals risks to localized shedding of load due to line or transformer loading limitations. ~~As it is more appropriate to violate reserve margins than shed load, Nodal VoLL should be higher than reserve CVCs. In order also to prevent the occurrence of artificial load shedding as a result of artificial deficit generation/excess generation, contingency, base case and TCG constraints, Nodal VoLL is prioritized over these CVCs.~~	Simplify description of CVCs
Constraint Violation Coefficient Development	6.1	Based on Section 4 above and in consultation with SO, the following will be the revised priority order of the CVCs in an ascending manner: 6.1.1 VoLL 6.1.2 TCG Constraint 6.1.3 Base Constraint 6.1.4 Under Generation 6.1.5 Contingency Constraint 6.1.6 Deficit Contingency Reserve 6.1.7 Deficit Regulating	Based on Section 4 above and in consultation with SO, the following will be the revised priority order of the CVCs in an ascending manner: 6.1.1 <u>Nodal</u> VoLL 6.1.2 TCG Constraint 6.1.3 Base <u>Case</u> Constraint 6.1.4 <u>Deficit Regulating Reserve Under-Generation</u> <u>6.1.4.6.1.5</u> Under Generation / <u>Over Generation</u>	Redefined priority where Satisfying Regulation Reserve Requirement is higher than Satisfying the Energy Requirement and Contingency Requirement	Based on Section 4 above and in consultation with SO, the following will be the revised priority order of the CVCs in an ascending manner: 6.1.1 <u>Base Case Constraint VoLL</u> 6.1.2 TCG Constraint 6.1.3 <u>Deficit Regulating Reserve Base-Constraint</u> 6.1.4 Under Generation / <u>Over Generation</u> 6.1.5 <u>Nodal VoLL</u>	revised based on RCC agreed prioritization

Title	Section	Provision	Proposed Amendment	Rationale	RCC Discussion	Remarks
		Reserve 6.1.8 Over Generation 6.1.9 Deficit Dispatchable Reserve 6.1.10 Deficit Interruptible Load	~~6.1.56.1.6~~ Contingency Constraint ~~6.1.66.1.7~~ Deficit Contingency Reserve ~~6.1.7~~ ~~Deficit Regulating Reserve~~ ~~6.1.8~~ ~~Over Generation~~ ~~6.1.96.1.8~~ Deficit Dispatchable Reserve ~~6.1.106.1.9~~ Deficit Interruptible Load		~~Contingency Constraint~~ ~~6.1.56.1.6~~ Contingency Constraint ~~6.1.66.1.7~~ Deficit Contingency Reserve ~~6.1.7~~ ~~Deficit Regulating Reserve~~ ~~6.1.8~~ ~~Over Generation~~ ~~6.1.96.1.8~~ Deficit Dispatchable Reserve ~~6.1.106.1.9~~ Deficit Interruptible Load	
Constraint Violation Coefficient Development	6.2	Penalty Price Level The initial economic estimate used in the determination of VoLL for the WESM pegged the value of lost load at P100,000/MWh. However, considering the priority order on the application of CVC and to provide sufficient grading in between them so that the pre-defined order of violation priority is maintained and resolve possible dispatch conflicts	~~Penalty Price Level~~ ~~Gradation Levels between CVCs~~ The initial value of the Deficit Interruptible Load, which is of the lowest priority, was set at P100,000/MWh; <u>an arbitrary value that is far from any reasonable price that may be derived in the WESM. As such, the priority order shall start at the original value for Deficit Interruptible Load with P100,000/MWh. However, considering</u> ~~Considering~~ the priority	New gradation levels were incorporated in the proposed CVC Manual considering the priority order on the application of CVC and to provide sufficient grading in between them so that the pre-defined order of violation priority is maintained and resolve possible dispatch conflicts between the different constraint types.	~~Penalty Price Level~~ ~~Gradation Levels between CVCs~~ The initial value of the Deficit Interruptible Load, which is of the lowest priority, was set at <u>CVC of P100,000/MWh, an assigned value that is far from any that may be derived in the WESM. As such, the priority order shall start at the original value for Deficit Interruptible Load with 100,000. However, considering the priority</u>	

Title	Section	Provision	Proposed Amendment	Rationale	RCC Discussion	Remarks
		between the different constraint types, it is proposed that this value (P100,000) be associated instead with deficit interruptible load which is the least priority. To provide sufficient grading between the penalty prices, it is proposed that a grading equivalent to P100,000 be also used. Section 8 details the priority order of the CVC and their corresponding penalty price.	order on the application of CVC and to provide sufficient grading in between them so that the pre-defined order of violation priority is maintained and resolve possible dispatch conflicts between the different constraint types, <u>it is proposed that this value (P100,000) be associated instead with deficit interruptible load which is the least priority. To provide sufficient grading between the penalty prices, it is proposed that a grading equivalent to P100,000 be also used.</u> Section 8 details the priority order of the CVC and their corresponding penalty price		<u>order on the application of CVC and to provide sufficient grading in between them so that the pre-defined order of violation priority is maintained and resolve possible dispatch conflicts between the different constraint types, it is proposed that this value (P100,000) be associated instead with deficit interruptible load which is the least priority. To provide sufficient grading between the penalty prices, it is proposed that a grading equivalent to P100,000 be also used.</u> Sufficient grading in between CVCs are made so that the pre-defined order of violation priority is maintained, and to resolve possible dispatch conflicts between the different constraint types should they occur simultaneously. Section 8 details the priority order of	

Title	Section	Provision	Proposed Amendment	Rationale	RCC Discussion	Remarks
					the CVC and their corresponding ~~penalty price~~ <u>CVC values</u> .	
Constraint Violation Coefficients Table	8.0	See Table 1	See Table 2	Redefined priority where Satisfying Regulation Reserve Requirement is higher than Satisfying the Energy Requirement and Contingency Requirement New gradation levels were incorporated in the proposed CVC Manual considering the priority order on the application of CVC and to provide sufficient grading in between them so that the pre-defined order of violation priority is maintained and resolve possible dispatch conflicts between the different constraint types.		

Table 1. Original CVC Table

Priority	Constraint Violation Coefficient Name	Price (P/MW)	Definition	SO Action
10	Deficit Interruptible Load Reserve	100,000	Insufficient Interruptible demand to meet Reserve Requirement	This is not a problem if Dispatchable reserve is met. Otherwise resort to mandatory load dropping.
9	Deficit Dispatchable Reserve	200,000	Insufficient capacity to meet Reserve Requirements (n-2)	This is not a problem if Interruptible reserve is met. Otherwise resort to mandatory load dropping.
8	Over Generation	(800,000)	the total minimum generation in the system exceeds the total demand	Identify "Must-Run Units" and shut down other units to eliminate excess capacity.
7	Deficit Regulating Reserve	400,000	Insufficient capacity to meet Reserve Requirements	Larger frequency excursions are expected without regulating reserve. Lower quality of service.
6	Deficit Contingency Reserve	500,000	Insufficient capacity to meet Reserve Requirements (n-1)	Automatic load dropping will cover for loss of generation if contingency reserve is insufficient.
5	Contingency	600,000	Violation in pre-defined contingency limits during single-outage conditions (n-1)	If risk involves system collapse or islanding, implement necessary re-dispatch and load dropping.

	Under Generation	800,000	The demand exceeds the total maximum generation in the system	Immediately implement mandatory load dropping as necessary
3	Base Case Constraint	900,000	Thermal loading limit violations of lines or transformers	Marginal overloads (i.e., <10% for 1 hour) should be allowed. Re-dispatch generation and drop load.
2	TCG Constraint	1,000,000	Import/Export constraints between areas.	Immediately implement re-dispatch and/or load dropping as necessary.
1	Nodal Value of Lost Load	1,100,000	Localized deficiency in supply due to line or transformer loading limitations	Marginal overloads (i.e., <10% for 1 hour) should be allowed. Otherwise drop local loads.

Table 2. Proposed Revisions to the CVC Table

Priority	Constraint Violation Coefficient Name	Price (P/MW) CVC	Definition	<u>SO Action to be Undertaken</u>
409	Deficit Interruptible Load Reserve	100,000	Insufficient ~~interruptible demand capacity~~ to meet the <u>Interruptible demand to meet</u> Reserve Requirement	~~This is not a problem if Dispatchable reserve is met. Otherwise resort to mandatory load dropping. Same function as Dispatchable reserve~~
98	Deficit Dispatchable Reserve	200,000	Insufficient capacity to meet <u>Dispatchable</u> Reserve Requirements ~~(n-2)~~	~~This is not a problem if Interruptible reserve is met. Otherwise resort to mandatory load dropping. The contingency reserve when depleted cannot be replenished by Dispatchable Reserve if not sufficient~~
8	<u>Over Generation</u>	~~(800,000)~~	~~the total minimum generation in the system exceeds the total demand~~	~~Identify "Must-Run Units" and shut down other units to eliminate excess capacity.~~
7	<u>Deficit Regulating Reserve</u>	<u>400,000</u>	<u>Insufficient capacity to meet Reserve Requirements</u>	<u>Larger frequency excursions are expected without regulating reserve. Lower quality of service.</u>
67	Deficit Contingency Reserve	<u>500,000</u> <u>300,000</u>	Insufficient capacity to meet <u>Contingency</u> Reserve Requirements ~~(n-1)~~	<u>Delayed restoration of affected automatic load dropping (ALD) feeders due to loss of generation if contingency reserve is insufficient. Automatic load dropping will cover for loss of generation if contingency</u>

				<u>reserve is insufficient.</u>
56	Contingency	<u>600,000</u> <u>400,000</u>	Violation in pre-defined contingency limits during single-outage conditions (n-1)	~~If risk involves system collapse or islanding.~~ Implement necessary re-dispatch and <u>possible manual</u> load dropping <u>to prevent overloading on the remaining lines or transformers</u>
5	Nodal Value of Lost Load	<u>1,100,000</u> <u>500,000</u>	<u>Localized</u> Deficiency in supply due to <u>localized violations on</u> line or transformer loading limitations	Marginal overloads (i.e., <110% for 1 hour) should be <u>addressed to eliminate possible overloading on the remaining lines or transformers during contingency occurrence. allowed</u> , otherwise, drop local loads.
4	Over Generation	<u>(800,000)</u> <u>(600,000)</u>	the total minimum generation in the system exceeds the total demand	Identify " <u>Must-Run Units</u> " and generating units to be shutdown <u>shut down other units</u> to eliminate excess capacity.
	Under Generation	<u>800,000</u> <u>600,000</u>	The demand exceeds the total maximum generation in the system	<u>Immediately</u> implement <u>mandatory Manual</u> load dropping <u>as necessary to ensure balance of supply and demand.</u>

3	Deficit Regulating Reserve	<u>400,000</u> <u>1,200,000</u>	Insufficient capacity to meet <u>Regulating Reserve Requirements</u>	Larger frequency excursions are expected without regulating reserve. Lower <u>power</u> quality of service.
2	TCG Constraint	<u>1,000,000</u> <u>1,300,000</u>	Import/Export constraints between areas.	<u>Immediately implement re-dispatch and/or load dropping as necessary. Possible overloading should be allowed addressed by Re-dispatch generation and drop load if necessary.</u>
1	Base Case Constraint	<u>900,000</u> <u>1,400,000</u>	Thermal loading limit violations of lines or transformers	<u>Marginal overloads (i.e., <110% for 1 hour) Possible overloading should be allowed addressed by Re-dispatch generation and drop load if necessary.</u>