



Republic of the Philippines
DEPARTMENT OF ENERGY

DEPARTMENT CIRCULAR NO. _____

ADOPTING FURTHER AMENDMENTS TO THE WHOLESALE ELECTRICITY SPOT MARKET (WESM) RULES AND MARKET MANUALS ON THE IMPLEMENTATION OF RESERVE MARKET

WHEREAS, Sections 30 and 37(f) of the Electric Power Industry Reform Act (EPIRA) provides that the DOE, jointly with the electric power industry participants, shall establish the Wholesale Electricity Spot Market (WESM) and formulate the detailed rules governing the operations thereof;

WHEREAS, on 28 June 2002, the DOE, with the endorsement of the electric power industry participants, promulgated the WESM Rules through Department Circular No. DC2002-06-003;

WHEREAS, any changes, amendments, and modifications to the WESM Rules, Retail Rules and their Market Manuals shall be undertaken in accordance with the provisions of Chapter 8 of the WESM Rules;

WHEREAS, Clause 3.3.3.2 of the WESM Rules requires the System Operator to provide adequate ancillary services for each region by entering into contracts with Ancillary Services Provider and/or competitive spot market trading;

WHEREAS, the Department of Energy (DOE) on 23 October 2015 adopted enhancements to WESM design and operations which includes among others the change from a 1-hour dispatch interval to a 5-minute dispatch interval and implementation of the co-optimization of energy and reserves;

WHEREAS, the DOE issued a general policy framework governing the provision and utilization of ancillary services in the grid under DOE Department Circular DC2019-12-0018 dated 04 December 2019, which provided the criteria for the commercial operation of the WESM reserve market, among others;

WHEREAS, on 29 December 2020, the Energy Regulatory Commission (ERC) promulgated its Decision on the application filed by the Philippine Electricity Market Corporation (PEMC) on the DOE-approved Price Determination Methodology (PDM) containing provisions on reserve pricing and settlement for the enhanced WESM design and operations. In said Decision, the ERC ordered that reserve related features of the PDM shall be subject to the DOE's pending policy issuance on ancillary services, which deferred the provisions on reserve pricing and settlement;

WHEREAS, on 13 May 2021, the DOE issued a policy framework for the operationalization of the Reserve Market and tasked IEMOP to submit rules changes for its implementation under DOE Department Circular DC2021-03-0009 dated 27 March 2021, which supplemented the earlier DOE policy and provided the features of the reserve market;

WHEREAS, on 06 September 2021, the Independent Electricity Market Operator of the Philippines (IEMOP) submitted proposed general amendments to comply with the policy of the DOE with regards to the implementation of the Reserve Market, with part of the proposal reverting to the reserve pricing and settlement provisions that were previously approved by the DOE.

WHEREAS, the RCC took up the proposal during its 184th Regular Meeting last 17 September 2021, and approved the same for publication to solicit comments from the stakeholders;

WHEREAS, during its 187th Regular Meeting on 19 November 2021, the RCC deliberated on the proposal, giving due consideration to the comments received, including those submitted beyond the commenting period, and the corresponding responses by the proponent;

WHEREAS, on 02 December 2021, the PEM Board formally endorsed the proposal to the DOE for its approval;

NOW THEREFORE, pursuant to its authority under the EPIRA and the WESM Rules, the DOE hereby adopts, issues, and promulgates the following amendments to the WESM Rules and its Market Manuals:

Section 1. Amendments to the WESM Rules on the Implementation of the Reserve Market. The following provisions in the WESM Rules is hereby amended.

a. Clause 1.3.4 is amended to read as:

“1.3.4 Responsibilities of the System Operator

Under these Rules, the System Operator shall have the following functions and responsibilities:

(a) xxx xxx xxx

(b) xxx xxx xxx

(c) Procure reserves through the Ancillary Service Procurement Agreement and WESM for the settlement of such transactions pursuant to prevailing rules, regulations and issuances promulgated by the DOE or the ERC.

(d)(e) Contribute towards the development of procedures, processes or systems, or to assist with any aspect of the operation of the spot market, in coordination with the Market Operator.

(e)(d) Implement the transitory provisions specified in Chapter 10; and

(f)(e) Perform those actions that are required to be taken prior to the spot market commencement date as specified in the WESM Rules and clause 10.4.”

- b. Sub-clauses under Clause 2.3.5. Registration – Ancillary Services Provider are amended to read as:

“2.3.5.1 xxx xxx xxx

(a) xxx xxx xxx

(1) xxx xxx xxx

(2) xxx xxx xxx

(3) The reserve facility category ies applicable to the reserves intended to be provided by each of the reserve facilities registered under clause 2.3.5.1 (a) (1) and as authorized by the System operator under clause 2.3.5.3.

2.3.5.3 xxx xxx xxx

(a) Certify that the relevant reserve facility is capable of providing the reserve category ies individually and/or simultaneously for which registration is sought, in accordance with the Grid Code and Distribution Code;

xxx xxx xxx

2.3.5.5 Ancillary Services Providers shall comply with the dispatch conformance standards developed pursuant to Clause 3.8.5 and the reserve conformance standards developed pursuant to Clause 3.8.7.”

- c. Clause 3.3.4.2 Reserve Categories is amended to read as:

“3.3.4.2 xxx xxx xxx

(a) *Regulating reserve*, readily available and dispatchable generating capacity that is allocated exclusively to correct deviations from the acceptable nominal frequency caused by unpredicted variations in demand or generation output; ~~being the ability to respond to small fluctuations in system frequency including but not limited to fluctuations caused by load fluctuations;~~

(b) *Contingency reserve*, synchronized generation capacity from Qualified Generating Units and Qualified Interruptible Loads allocated to cover the loss or failure of a synchronized generating unit or a transmission element or the power import from a circuit interconnection; ~~being the ability to respond to a significant decrease in system frequency including but not limited to a decrease in system frequency in an interconnected AC network as a result of a credible contingency affecting one (or~~

~~more) Generation Companies within that network, or transmission flows into that network;~~

(c) Dispatchable Reserves, generating capacity that are readily available for dispatch in order to replenish the Contingency Reserves whenever a generating unit trips or a loss of a single transmission interconnection occurs; and

~~(e)~~ **(d) Such other reserve categories as may, from time to time, be proposed by the Market Operator, in consultation with the System operator, and with WESM members, and approved by the PEM Board, and subsequently ratified or prescribed by the DOE or the ERC.”**

d. Clause 3.3.5.2 Ancillary Services Cost Recovery is amended to read as:

“3.3.5.2 The costs of reserves are to be recovered **from the System Operator** through the ~~settlement~~ **reserve trading** amounts calculated by the Market Operator under clause 3.13.8 in accordance with the cost recovery formula **under clause 3.13.9** to be developed by the Market Operator for each reserve category.”

e. Clauses 3.3.5.3 and 3.3.5.4 under Ancillary Services Cost Recovery are hereby deleted.

f. Clauses 3.3.7.3 and 3.3.7.4 under Approval, Periodic Review and Evaluation of Reserve Market Arrangements is amended to read as:

“3.3.7.3 Any proposed changes to the *ancillary service* categories, *ancillary services* arrangements, *ancillary services cost recovery formula*, *reserve categories*, *reserve regions* or locationally specific *reserve* requirements that will affect the fees of *ancillary services* shall be filed by the System operator of ~~TRANSCO~~ with the ERC for approval.

3.3.7.4 The System operator shall continuously ~~adjust~~ **update** the reserve effectiveness factors for each *reserve facility category*, and 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, as advised by the System operator under clause 3.5.3.1.”

g. Clause 3.5.8.1 under Customer Reserve Offers is amended to read as:

“This section shall apply only upon commencement of the *spot market* for ~~ancillary services~~ **reserves** established under clause 3.3.4 with the *ancillary service* certification by the System Operator **or any qualified third party** and upon **promulgation of accreditation guidelines by ERC.**”

h. New Clause 3.8.7 is added to read as:

“3.8.7. Reserve Conformance Standards

3.8.7.1 The Market Operator shall develop reserve conformance standards to be set forth in the relevant Market Manual which shall be consistent with the Grid Code and Distribution Code.

3.8.7.2 The Market Manual under Clause 3.8.7.1 shall set out the following:

- (a) reserve conformance standards that will apply to Ancillary Service Providers;**
- (b) procedures for monitoring and notifying Ancillary Service Providers of the non-compliance by their generating units or interruptible load facilities with their reserve schedules; and**
- (c) Procedures for identifying and checking non-conformance with the reserve conformance standards taking into consideration any emergency directions issued to dispatched Ancillary Service Providers.**

3.8.7.3. The Market Operator shall implement the procedures in Clauses 3.8.7.1 and 3.8.7.2 through a system to automatically check for non-conformance.

3.8.7.4 The Market Operator, in consultation with the System Operator and the Trading Participants, shall periodically review the reserve conformance standards and the procedures set out in Clause 3.8.7.1 and 3.8.7.2.

3.8.7.5 The Market Operator shall publish the Market Manual setting out the reserve conformance standards.”

- i. Clause 3.10.6 Determination of Reserve Price is amended to read as:

“3.10.6 Determination **of** Reserve Price

~~(a) When applicable, the *reserve price* for a *reserve category* in a particular *reserve zone* for each *dispatch interval* shall be determined as the *shadow price* on the relevant *reserve requirement constraint*, defined in accordance with Clause 3.6.1.4 (e), in the *dispatch* optimization for that *dispatch interval* and *published* by the *Market Operator* before the start of that *dispatch interval*.~~

~~(b) When applicable, the *reserve settlement price* for each *reserve zone* and *reserve category* in each *settlement interval* shall be determined as the schedule-weighted average of the corresponding *reserve prices* for that *reserve category*.”~~

- j. Clause 3.13.8.2. under Determining the Reserve Trading Amount is hereby deleted.
- k. Clause 3.13.9 under Determining the Reserve Cost Recovery Charge is amended to read as follows:

“3.13.9 Determining the Reserve Cost Recovery ~~Charge~~ Amount

For settlement purposes, the reserve cost recovery charge amount for every reserve category and reserve region settlement purposes will shall be determined as the negative of the aggregate sum of the reserve trading amounts of the Trading Participants who supplied for that reserve category and reserve region for each Trading Participant in each settlement interval in accordance with the procedures developed under clause 3.3.5. ”

- l. Clause 3.13.11 Settlement Amounts for Trading Participants is amended to read as:

“3.13.11.1 Subject to the ~~WESM Rules Clause 3.13.11.4~~, for each *billing period*, the *Market Operator* shall determine the *settlement amount* for each *Trading Participant* as the sum of the aggregate *trading amounts* for the *settlement intervals* in that *billing period*, determined in accordance with clause 3.13.11.2: plus

(a) xxx xxx xxx

(b) xxx xxx xxx

(c) Any other amounts payable by that Trading Participant to the Market Operator in respect of that billing period.”

- m. Clause 3.13.11.2 Settlement Amounts for Trading Participants is amended to read as:

“3.13.11.2 The aggregate *trading amount* for a *Trading Participant* for a *settlement interval* equals the sum of:

a. The *energy trading amounts* for that *Trading Participant* calculated in accordance with Clause 3.13.8 (which may be positive or negative for any *Trading Participant*);

b. The *reserve trading amounts* for each *reserve region* into which that *Trading Participant* contributes *reserve* calculated in accordance with Clause 3.13.8 (which will always be positive for both *Generation Companies* and *Customers*); plus

c. The *transmission right trading amounts* for each *transmission right* held by the *WESM Participant* calculated in accordance with Clause 3.13.10

(which will typically be positive for any *Trading Participant*); less the sum of

~~d. The *reserve cost recovery charge* determined for that *Trading Participant* with respect to any *reserve cost recovery zone* within which it has any *facility connected* calculated in accordance with the procedures developed under clause 3.3.5 (which will be positive for any *Trading Participant*); and~~

~~f. Any other *reserve cost recovery charges* determined for that *Trading Participant* in accordance with the procedures developed under clause 3.3.5 (which will be positive for any *Trading Participant*).~~

n. New Clause 3.13.11.4 is added to read as:

“3.13.11.4 For each billing period, the Market Operator shall determine the settlement amount for the System Operator as the sum of the aggregate reserve recovery amounts for the settlement intervals in that billing period.”

o. Some definitions of terms under Glossary are amended to read as:

“Dispatchable Reserve. Generating capacity that is not scheduled for regular energy supply, regulating reserve, contingency reserve, or interruptible loads not scheduled for contingency reserve, and that are readily available for dispatch in order to replenish the ~~e~~**C**ontingency ~~r~~**R**eserves service whenever a generating unit trips or a loss of a single transmission interconnection occurs.”

“Qualified Generating Unit. A Generating Unit tested, certified and monitored by the System Operator to provide specific types of Ancillary Services.”

“Qualified Interruptible Load. A Load that is tested, certified and monitored by the System Operator to provide Tertiary Reserve Ancillary Service.”

p. The Reserve Facility Category definition under Glossary is hereby deleted, and new terms are added and defined as follows:

“Reserve Conformance Standards. Standards that set the criteria and procedures for determining whether the Ancillary Service Providers comply with their reserve schedules, and which are required to be set out in a Market Manual in accordance with Clause 3.8.7.”;

“Reserve Cost Recovery Amount. The amount to be recovered from the System Operator pertaining to the negative of the aggregate sum of the reserve trading amounts of the Trading Participants who supplied for reserves.”;

“Reserve Effectiveness Factor. A performance indicator that measures the reserve facility’s adequacy, accuracy, and timeliness in its actual reserve response with respect to the expected operating parameters set for a specific type of reserve.”

Section 2. Amendments to the Market Manual on Price Determination Methodology. The following provisions in the Market Manual on Price Determination Methodology are hereby amended.

a. Original Section 1.3 (Scope) is amended to read as:

“This *Market Manual* provides the following:

- a. Methodology by which *energy* **and reserves** shall be priced and settled in accordance with the market design principles as issued by the *DOE*;
- b. Methodology by which *energy* **and reserves** in the *WESM* shall be priced, including the determination of prices when there is extreme price separation due to *network congestion*, and determination of *administered prices* during *market suspension* and *market intervention*;
- c. Methodology by which *energy* **and reserves** shall be settled in the *WESM*, the determination of additional compensation, as applicable, and the determination and allocation of *net settlement surplus*; and

Computational formula that will enable the *WESM participants* to verify the correctness of the charges being imposed.”

a. Original Section 4.11.1 under Section 4.11 (Reserves) is amended to read as:

“4.11.1 Reserve and energy dispatch schedules shall be determined in a co-optimized manner in the market dispatch optimization model. An illustrative example on the co-optimization of energy and reserve is provided for in Appendix F of this Market Manual.”

b. New Sections 4.11.2 and 4.11.3 under Section 4.11 (Reserves) are added to read as:

“4.11.2 The reserve regions shall initially consist of the Luzon, Visayas, and Mindanao Grids.

4.11.3 The reserve price for each reserve region and reserve category shall be determined as the shadow price on the relevant reserve requirement constraint in the dispatch optimization for that dispatch interval.”

c. Original Section 4.12.1 (Application of WESM Prices) is amended to read as:

“In general, the nodal prices resulting from the *real-time dispatch market run* as determined in Section 4.4.4, and, as applicable, Section 4.4.5, shall be used as *final nodal energy prices and reserve prices* in the calculation of *settlements* except if there are non-zero constraint violation variable values or pricing error notices:

(a) xxx xxx xxx

(b) xxx xxx xxx”

d. Original Section 5.2.1 (Automatic Pricing Re-run) is amended to read as:\

“5.2.1 *Automatic pricing reruns for market projections and real-time dispatch* shall ensure that the *energy prices and reserve prices* reflect the marginal costs of supplying *energy* at each *node*, regional, or island level; **and the marginal costs of supplying reserves.**”

e. Original Sections 5.2.2 and 5.2.5 (Automatic Pricing Re-run) are amended to read as:

“5.2.2 The *automatic pricing re-run of the market dispatch optimization model* shall determine the prices for *energy and reserves* with relaxed *constraints* and shall have approximately the same *dispatch schedules*.

xxx xxx xxx

5.2.5 The following table shows each type of *constraints* with their corresponding *constraint* relaxation formulas during pricing re-runs:

Soft Constraint	Violation	Constraint Relaxation during Pricing Re-Run	Re-run Price ²
Thermal Base Case	X	x + delta	EDP <u>and RP</u>
Transmission Group	X	x + delta	EDP <u>and RP</u>
Self-Scheduled Generation Constraint	X	x + delta	EDP <u>and RP</u>
System Energy Balance (Over-generation and under-generation)	X	x + delta	EDP <u>and RP</u>
<i>Nodal Value of Lost Load or Nodal Energy Balance</i>	X	x + delta	EDP <u>and RP</u>
Thermal Contingency	X	x + delta	EDP <u>and RP</u>
Reserve Requirement	X	x + delta	EDP <u>and RP</u>

f. New Section 6.5 (Price Substitution for Reserve Prices) are added to read as:

“6.5 Price Substitution Methodology for Reserve Prices

In cases where price substitution methodology is applied, the *reserve price* for a certain *reserve category* in a *reserve region* shall be calculated as the sum of the *constrained solution’s marginal reserve offer price* and the *opportunity cost* calculated based on the *unconstrained solution*. It shall be determined as the shadow price calculated based on the unconstrained solution.”

- g. Original Section 7.1.2 (Administered Prices) is amended to read as:

“7.1.2 The *administered price* shall be established by the *Market Operator* in accordance with the following *guiding principles*:

a. The *administered price* shall be fair and reasonable to both the suppliers and consumers of electricity.

b. *Administered prices* shall be determined and shall replace *market prices* for energy, *i.e. energy administered prices* shall replace the *nodal energy dispatch prices*, **and reserves, i.e. reserve administered prices shall replace the reserve prices.**

c. xxx xxx xxx

d. xxx xxx xxx

e. xxx xxx xxx

f. xxx xxx xxx

g. xxx xxx xxx

h. xxx xxx xxx”

- h. New Sections 7.4, 7.4.1, 7.4.2, 7.4.3 and 7.4.4 (Reserve Administered Price) are added to read as:

“7.4 Reserve Administered Price

7.4.1 In case two (2) or more of the four (4) most recent similar *trading days* and similar *dispatch intervals* have not been administered, the *reserve administered price* for each *reserve category* in every *reserve region* shall be computed as follows:

a. The aggregate *reserve dispatch schedule-weighted average* of the *reserve prices* for each *reserve category* in every *reserve region* of the four (4) most recent similar *trading days* and similar *dispatch intervals* that have not been administered, as set out in the following formula:

$$RAP_{r,a,D,i} = \frac{\sum_{d=D-1}^{D-n} \left(RP_{r,a,d,i} * \sum_{k \in K_{r,a,d,i}} RDS_{k,r,a,d,i} \right)}{\sum_{d=D-1}^{D-n} \sum_{k \in K_{r,a,d,i}} RDS_{k,r,a,d,i}}$$

Where:

$RAP_{r,a,D,i}$ refers to the reserve administered price for reserve category r in reserve region a at dispatch interval i within trading day D

$RP_{r,a,d,i}$ refers to the reserve price for reserve category r in reserve region a at dispatch interval i within trading day d

$RDS_{k,r,a,d,i}$ refers to the reserve dispatch schedule for reserve provider resource k for reserve category r in reserve region a at dispatch interval i within trading day d

D refers to the trading day with dispatch interval under market intervention or market suspension

$d = D - n$ refers to the n^{th} most recent non-administered similar trading day and similar dispatch interval

n refers to the number of similar trading days and dispatch intervals that have not been administered from the four (4) most recent similar trading days and dispatch intervals

7.4.2 In case three (3) or all of the four (4) most recent similar trading days and similar dispatch intervals have been administered, the reserve administered price for each reserve category in every reserve region shall be computed as follows:

a. The aggregate reserve dispatch schedule-weighted average of the reserve administered prices of the similar trading days and similar dispatch intervals as set out in the following formula:

$$RAP_{k,D,i} = \frac{\sum_{d=D-n}^{D-1} (RAP_{k,d,i} * \sum_{k \in K_{r,a,d,i}} RDS_{k,r,a,d,i})}{\sum_{k \in K_{r,a,d,i}} RDS_{k,r,a,d,i}}$$

Where:

$RAP_{k,D,i}$ refers to the reserve administered price for reserve provider resource k at dispatch interval i within trading day D

$RAP_{k,d,i}$ refers to the reserve administered price for reserve provider resource k for dispatch interval i within trading day d

$RDS_{k,r,a,d,i}$ refers to the reserve dispatch schedule for reserve provider resource k for reserve category r in reserve region a at dispatch interval i within trading day d

D refers to the current trading day

$d = D - n$ refers to the n^{th} most recent similar trading day of D

n refers to the number of similar trading days and dispatch intervals that have not been administered from the four (4) most recent similar trading days and dispatch intervals

7.4.3 For each reserve provider resource, the reserve dispatch schedule shall be set to the reserve schedules determined by the System Operator for the dispatch interval under market suspension or market intervention.

7.4.4 Similar trading days refer to each day of the week (i.e., Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday) while similar dispatch intervals refer to the same period within the same settlement interval.”

- i. New Sections 8.2.2 (Reserve Trading amount) is added to read as:

“8.2.2 Reserve Trading Amount¹

a. The reserve quantity for any reserve provider resource in any dispatch interval shall be determined by the Market Operator as the reserve dispatch schedule less reserve contracted quantities, as shown in the following formula:

$$RQ_{j,r,a,i} = (RDS_{j,r,a,i} - RBCQ_{j,r,a,i})$$

Where:

$RQ_{j,r,a,i}$ refers to the reserve quantity of reserve provider resource j for reserve category r and reserve region a at dispatch interval i

$RDS_{j,r,a,i}$ refers to the reserve dispatch schedule of reserve provider resource j for reserve category r and reserve region a at dispatch interval i

$RBCQ_{j,r,a,i}$ refers to the bilateral contract quantity for reserve provider resource j for reserve category r and reserve region a at dispatch interval i

a. The reserve trading amount for each trading participant that supplies reserve to a particular reserve region in a settlement interval shall be determined as the reserve prices for that reserve region multiplied by the reserve quantities for that trading participant in that reserve region for the dispatch intervals of the relevant settlement interval.

$$RTA_{p,r,a,h} = \sum_{i \in h} \left[\frac{1}{n} \sum_{j \in Jp} (RP_{r,a,i} * RQ_{j,r,a,i}) \right]$$

Where:

$RTA_{p,r,a,h}$ refers to the reserve trading amount of trading participant p for reserve category r and reserve region a at settlement interval h

$RP_{r,a,i}$ refers to the reserve price for reserve category r and reserve region a at dispatch interval i in settlement interval h

$RQ_{j,r,a,i}$ refers to the reserve quantity of reserve provider resource j for reserve category r and reserve region a at dispatch interval i in settlement interval h

¹ WESM Rules Clause 3.13

J_p refers to the set of *reserve provider resources under trading participant p*
 n refers to the number of dispatch intervals within a settlement interval, which is 12 for a five-minute market

j. New Sections 8.2.3 (Reserve Cost Recovery Amount) is added to read as:

8.2.3 Reserve Cost Recovery Amount

- a. **The reserve cost shall be recovered from the System Operator.**
- b. **The reserve cost recovery amount for every reserve category and reserve region shall be determined as the negative of the aggregate sum of the reserve trading amounts of the trading participants who supplied for that reserve category and reserve region, using the formula represented as:**

$$RRCost_{r, a, h} = (-1) \sum_{p \in P} RTA_{p, r, a, h}$$

Where:

$RRCost_{r, a, h}$ refers to the reserve cost for reserve category r in reserve region a at settlement interval h
 $RTA_{p, r, a, h}$ refers to the reserve trading amount of trading participant p for reserve category r and reserve region a at settlement interval h
 P refers to the set of trading participants

k. Original Section 8.2.2 (Aggregate Trading Amount) is amended to read as:

8.2.24 Aggregate Trading Amount

- a. The aggregate *trading amount* for a *Trading Participant* for a *settlement interval* is determined shall be determined as follows: ⁴

- (1) Energy trading amounts**, which may be positive or negative for any *Trading Participant*.
- (2) Reserve trading Amounts**

b. This is provided in the following formula:

$$TA_{p,h} = ETA_{p,h} + RTA_{p,h}$$

Where:

$TA_{p,h}$ refers to the aggregate *trading amount* of *trading participant p* for *settlement interval h*

$ETA_{p,h}$ refers to the energy trading amount of trading participant p at settlement interval h

$RTA_{p,h}$ refers to the reserve trading amount of trading participant p at settlement interval h

- I. New Section 8.4.3 (Settlement Amounts) is added to read as:

8.4.3 For each billing period, the Market Operator shall determine the settlement amount for the System Operator as the sum of the aggregate reserve recovery amounts for the settlement intervals in that billing period. This is provided in the following formula:

$$SA_{so,r,a,m} = \sum_{h \in H_m} \sum_{a \in A} \sum_{r \in R} RRCost_{r,a,h}$$

Where:

$SA_{so,m}$ refers to the settlement amount of the System Operator for billing period m

$RRCost_{r,a,h}$ refers to the reserve cost for reserve category r in reserve region a at settlement interval h

H_m refers to the settlement interval under billing period m

R refers to the set of reserve categories

A refers to the set of reserve regions

- m. Original Appendix A Section 2.2 (Reserve Requirement) is amended to read as:

Contingency, **Dispatchable and other** Reserve Requirements

2.2.5 Analogously to Regulating Reserve Raise and Regulating Reserve Lower minimal requirements, regional minimum requirements can be specified for other ancillary services (AS) and for each time interval:

$$Res_{ASreq}^t \leq \sum_{unit \in AS} Res_{unit}^t$$

- n. Original Appendix A Section 4.3.1 (Generating/Load Resource Constraints – Reserve Model) is amended to read as:

4.3.1 Core parts of the Reserve model are:

- a. Reserve capacity limits
- b. Reserve ramping
- c. Combined Energy and reserve capacity limits
- d. Combined Energy and reserve ramping
- e. Independent model for Raise and Lower service in each reserve category

f. **Constraints on Simultaneous Provisions of reserve**

- o. Original Appendix A Section 4.3.2 (Generating/Load Resource Constraints – Reserve Model) is amended to read as:

4.3.2 Resource Reserve capacity limits

4.3.2.1 In addition to limits imposed by *reserve offer* limits, there are physical unit limits that affect *reserve award*. One example is for ~~fast and slow~~ **contingency and dispatchable** reserves limitation by Governor response. While Governor response also depends on frequency deviation, it is usually one curve provided for Market purpose, where response is given as function of *energy* output only. Typical Governor response curve is provided below:

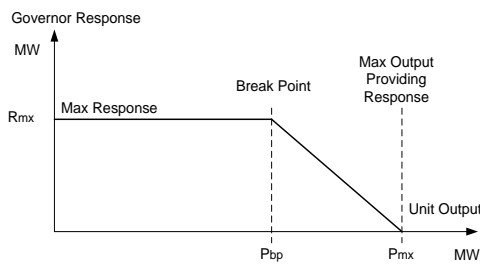


Figure 1: Governor *n* second raise droop characteristic

4.3.3.2.2 Each two-piece characteristic comprises:

xxx

4.3.4.2.3 The mathematical formulation using the variable designation from Figure 2 are as follows:

$$Res_{unit}^t = R_{mx} * (P_{mx} - P^t) / (P_{mx} - P_{bp}) \quad \forall P \geq P_{bp}$$

$$Res_{unit}^t = P_{mx} \quad \forall P < P_{bp}$$

4.3.5.2.4 In addition to maximum quantity, contracted generators might be subject to mandatory governor response, which is modeled as *reserve self-schedule* and protected with penalty in Scheduling Run (i.e. treated as price taker). Such self-schedule also contributes to regional *reserve requirements*.

- p. Original Appendix A Section 4.3.6 (Generating/Load Resource Constraints – Reserve Model) is amended to read as:

4.3.3 Resource AS ramping limits

4.3.6.3.1 The individual *reserve* ramping constraint can be posted for each resource and each time interval. These *constraints* are expressed in

time domain as follows (equation is provided for Regulation Raise, but analogous equation applies for each *reserve*):

$$\frac{Reg_{unit}^{Raise:t}}{RR_{unit}^{RegUp}} \leq T^{AS}; \quad unit \in G; t \in T$$

meaning that the *Reserve* ramping cannot exceed the specified *reserve* ramping (default 5 minutes).

- q. Original Appendix A Sections 4.3.7, 4.3.8, 4.3.9, 4.3.10 and 4.3.11 (Generating/Load Resource Constraints – Reserve Model) are amended to read as:

4.3.4 Resource Combined Energy and Reserve Capacity Limits

4.3.74.1 xxx

4.3.84.2 xxx

4.3.94.3 xxx

4.3.104.4 xxx

4.3.114.5 xxx

- r. Original Appendix A Section 4.3.12 (Generating/Load Resource Constraints – Reserve Model) is amended to read as:

4.3.5 Resource Combined Energy and Reserve Ramping

4.3.125.1 xxx

- s. Original Appendix A Section 4.4 (Generating/Load Resource Constraints – Reserve Model) is amended to read as:

4.3.6 Other Operational Modes of Generators, Loads or Similar Facilities

4.4.3.6.1 xxx

4.4.3.6.2 xxx

- t. New Section 4.3.7, 4.3.7.1, 4.3.7.2, and 4.3.7.3 (Constraints on Simultaneous Provision of Reserve) are added to read as:

4.3.7 Constraints on Simultaneous Provision of Reserve


4.3.7.1 Limitations on the provision of reserve awards are also considered in the MDOM.

4.3.7.2 If it is defined in the MDOM where regulation and contingency reserve schedules cannot be awarded at the same time for a resource, then the MDOM will choose the most optimal reserve category the resource should be scheduled at, in consideration of the optimization objective defined in the MDOM.

4.3.7.3 Different ramping constraints when operating in different modes of operation (e.g., automatic generation control, governor control mode).

u. New Appendix F (Overview of Co-optimization of Energy and Reserve) is added to read as:

OVERVIEW ON THE CO-OPTIMIZATION OF ENERGY AND RESERVE




2

Decentralized Scheduling of Capacities

- Suppose we have four generators that have the following capacities
- The System Operator contracts some of these generators to provide reserve
- On a Day-Ahead, these generators nominate capacities for reserve (typically up to their contract)

Generator	Pmax, MW	Nomination, MW
A	400.0	-
B	300.0	100.0
C	250.0	250.0
D	300.0	300.0



Suppose the Reserve Requirement (RREQ) is 200 MW

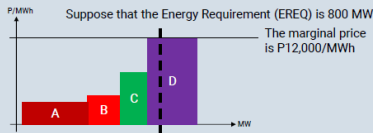
The System Operator then determines the reserve schedules based on the projected reserve requirement

Decentralized Scheduling of Capacities

After obtaining the reserve schedules a day ahead...

Generator	Pmax, MW	Reserve Schedule, MW	Energy Offer	
			Quantity, MW	Price, P/MWh
A	400.0	0.0	400.0	0.0
B	300.0	100.0	200.0	3,000.0
C	250.0	100.0	150.0	5,000.0
D	300.0	0.0	300.0	12,000.0

- Generators will then offer their remaining capacities in the real-time energy market
- Those with no bilateral contracts for energy would normally attempt to maximize their earnings in the energy market

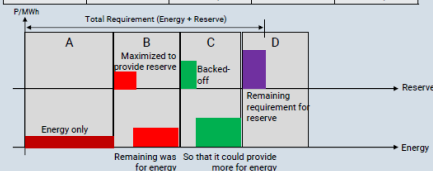


Co-Optimization: Simultaneous Scheduling

...and such capacities may be fully scheduled to provide energy
Generators should offer the capacity they are willing to set aside for reserve

All capacities should be reflected in a joint market

Generator	Pmax, MW	Energy Offer Price, P/MWh	Reserve Offer	
			Quantity, MW	Price, P/MWh
A	400.0	0.0	-	-
B	300.0	3,000.0	100.0	1,000.0
C	250.0	5,000.0	250.0	3,000.0
D	300.0	12,000.0	300.0	3,500.0



Co-Optimization: Simultaneous Scheduling

Sequential Clearing

Generator	Schedules, MW	
	Energy	Reserve
A	400.0	0.0
B	200.0	100.0
C	150.0	100.0
D	50.0	0.0

Resulted to a much more expensive marginal price of P12,000/MWh for energy

Simultaneous Clearing

Generator	Schedules, MW	
	Energy	Reserve
A	400.0	0.0
B	200.0	100.0
C	200.0	50.0
D	0.0	50.0

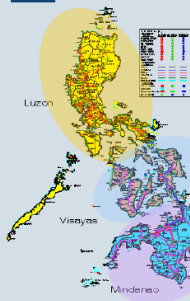
Energy Price = P5,500/MWh
Cost to Produce Cheapest Overall Cost

Reserve Price = P3,500/MWh

Even if the co-optimized solution scheduled a much more expensive resource for reserve (P3,500/MWh)

Overall however, the cost was lower as it resulted to a cheaper marginal price of P5,000/MWh for energy

Zonal Scheduling and Pricing



Scheduling

Region	Requirement	Reserve Offer	Reserve Schedule	Surplus/Deficit (+/-)
Luzon	647	1000	647	353
Visayas	100	80	80	-20
Mindanao	135	150	135	15

Although Luzon and Visayas are interconnected through the HVDC, the surplus of reserve providers in Luzon will not be scheduled above its requirement to provide the deficit in Visayas

Pricing

- For each reserve type in each reserve region, different zonal prices shall be obtained, which is already inclusive of the clearing price and the opportunity cost

Prioritization of Capacities (as of November 2021)

Priority	Constraint Violation Coefficient Name
1	Thermal Constraint of Equipment
2	Regulating Reserve
3	N-1 Contingency Constraint
4	Curtailment of Self-Scheduled Generators
5	System-wide Supply Surplus/Deficit
6	Nodal Load Shedding
7	Contingency Reserve
8	Dispatchable Reserve

Prioritization of Capacities

- In the previous CVC Priority Order, the non-violation of the nodal energy requirement constraint is of lower priority than having a deficit in regulation reserve
- Thus, the reserve offers shall be maximized to fulfil the reserve requirement
- Note that automatic pricing re-run shall be activated

Should the forecasted energy requirement be 1020 MW, while the regulation reserve requirement is 40 MW

GEN	P _{MAX} , MW	ENERGY OFFER PRICE, P/MWh	RESERVE OFFER		SCHEDULES, MW	
			QUANTITY, MW	PRICE, P/MWh	ENERGY	RESERVE
A	250	2,000	-	-	250	0
B	230	5,000	160	1,000	190	40
C	240	10,000	90	10,000	240	0
D	300	30,000	100	12,000	300	0
Total					980	40

Competing Generators and Loads

- Loads should be able to compete with generators in the provision of certain reserve types
- But for loads to be able to compete with generators in these reserve types, they must also submit bids in the energy market (i.e., demand-side bidding)
- The MMS is currently designed to accommodate demand-side bidding, but is not yet implemented in WESM
- The MMS design reflects a co-optimization of energy and reserve for both generators and loads

Competing Generators and Loads

Let us consider the following example:

Demand = 400 MW | Reserve Requirement = 55 MW

Generator Offer	P _{max} , MW	R _{max} , MW	Offer Prices, P/P/MWh	
			Energy	Reserve
GEN A	250.0	30.0	2,000.0	0.0
GEN B	400.0	160.0	5,000.0	4,000.0

Demand Bid	P _{max} , MW	R _{max} , MW	Offer Prices, P/P/MWh	
			Energy	Reserve
LOAD	50.0	50	8,000.0	1,000.0

Resource	P _{max} , MW	Schedules	
		Energy	Reserve
GEN A	250.0	220.0	30.0
GEN B	400.0	180.0	0.0
LOAD	50.0	50.0	25.0
OTHER LOADS	350.0	350.0	0.0

Section 3. Amendments to the Market Manual on Registration, Suspension and De-Registration Criteria and Procedures, Issue 10.0. The following provisions in the Market Manual on Registration, Suspension and De-Registration Criteria and Procedures, Issue 10.0 are hereby amended.

a. Original Section 2.5.1.2 b) (Categories and Qualifications - Customers) is amended to read as:

“b) The following are qualified to register as *Customer* –

- ***Distribution Utilities***, including private *distribution utilities*, *electric cooperatives* and local government utilities undertaking distribution of electricity.
- **xxx**
- **xxx**
- **System Operator in its capacity as the entity designated for the procurement of reserves through the Ancillary Service Procurement Agreement and WESM for settlement of such transactions pursuant to prevailing rules, regulations and issuances promulgated by the DOE or the ERC. It is provided that the registration of the System Operator as single buyer of reserves traded in the WESM shall be in accordance with the prevailing rules, regulations and issuances of the DOE or the ERC and that not all the technical and legal requirements for registration of Trading Participants as set out in this Section may apply.**

b. Original Section 2.6.1.1 (Registration of Ancillary Services) is amended to read as:

“2.6.1.1 Persons or entities wishing to register as *WESM member* under this category must –

- a) **Be registered as a Generation Company or a Customer.**
- a) **b) Be certified by the System Operator or any qualified third party ancillary services capability testing entity accredited by the ERC** as qualified to provide ancillary services in accordance with WESM Rules clause 2.3.5.3.–
- b) **c) Comply with the membership criteria required of Trading Participants** and shall be subject to the same requirements set forth in this Manual.
- e) **d) Comply with the same technical and commercial requirements required of Trading Participants.**
- e) **e) Comply with the technical requirements for Ancillary Service Providers set forth in the Philippine Grid Code and any other relevant documents that the ERC or DOE will promulgate on the provision of Ancillary Services.**

f) For Generation Companies, only scheduled generating units, battery energy storage systems, and pumped-storage units can be registered as a reserve facility.

- c. New Sections 2.6.1.2 and 2.6.1.3 (Registration of Ancillary Services Providers – Qualifications and Requirements) are added to read as:

“2.6.1.2 The application for registration of a Generation Company as Ancillary Services Provider shall specify the following information for each of its reserve facility which has been issued a valid certification to provide ancillary services:

- a) **Reserve category or categories which said generating unit intends to trade in the WESM;**
- b) **Maximum reserve capability as determined in the ancillary services capability tests conducted by the System Operator or the third-party testing entity accredited by the ERC. The maximum reserve capability should not exceed the WESM registered maximum capacity (Pmax); and**
- c) **Validity period for providing ancillary service for each reserve category.**

2.6.1.3 Customers with load facilities which intend to register in the WESM as Ancillary Services Provider shall be accredited and comply with the requirements set out in relevant procedures for accreditation promulgated by the ERC. They must submit the following information:

- a) **Projected Maximum Energy Load Requirement**
- b) **Reserve category or categories which said load facility intends to trade in the WESM;**
- c) **Maximum reserve capability as determined in the ancillary services capability tests conducted by System Operator or the third-party testing entity accredited by the ERC; and**
- d) **Validity period for providing ancillary service for each reserve category.”**

- d. Original Section 3.3.1 (Facility Related Changes – Registered Capacity) is amended to read as:

“3.3.1 Registered Capacities and Reserve Capabilities

Changes in the registered capacities (i.e., Pmin or Pmax) of a generating unit **and its maximum reserve capabilities, if there is any,** shall require confirmation by the *Market Operator* before such change can be considered in the WESM scheduling and dispatch processes.”

- e. New Sections 3.3.8, 3.3.8.1, 3.3.8.2, 3.3.8.3 and 3.3.8.4 (Facility Related Changes – Ancillary Services Capability) are added to read as:

“3.3.8 Ancillary Services Category and Capability

3.3.8.1 A WESM Member that is registered as an Ancillary Services Provider may update the registered capability or reserve category of any of its registered reserve facility.

3.3.8.2 The WESM Member shall comply with the technical requirements set out in Section 2.6.1, including but not limited to the submission of the certification of the result of the ancillary services capability test carried out by the System Operator or a third-party entity duly accredited by the ERC.

3.3.8.3 The Market Operator shall assess and approve the request for the change in registered capability or reserve category in accordance with the procedures under Section 2.6.2.

3.3.8.4 If a reserve facility’s validity period for providing ancillary service in a specific reserve category is about to expire, then the Market Operator shall inform the Ancillary Services Provider and the System Operator that the relevant reserve facility shall be de-registered for the affected specific reserve category at least ninety (90) calendar days prior to the expiration of its validity period. Updated certification may include a letter of extension from the System Operator.

a) The Market Operator shall not proceed with the de-registration of the reserve category if the Ancillary Services Provider is able to provide an updated certification of the result of the ancillary services capability test carried out by the System Operator or a third-party entity duly accredited by the ERC at least seven (7) calendar days prior to the original expiration of its validity period. The Market Operator shall inform the System Operator if the de-registration shall not proceed.

b) Should the Ancillary Services Provider is unable to provide an updated certification of the result of the ancillary services capability test carried out by the System Operator or a third-party entity duly accredited by the ERC within the aforementioned timeline, the Market Operator shall effectively de-register the specific reserve category for that reserve facility effective on the original expiration of its validity period. The Market Operator shall inform the System Operator of the de-registration.”

f. New clause under Appendix A (Glossary of Terms) is added to read as:

“Maximum reserve capability – The maximum demand in MW that a facility can provide with respect to reserves based on ancillary service capability tests.”

Section 4. Amendments to the Market Manual on Billing and Settlement, Issue 8.0. The following provisions in the Market Manual on Billing and Settlement, Issue 8.0 are hereby amended.

- a. Original Section 3.2 (Responsibilities – Trading Participants) is amended to read as:

“3.2 TRADING PARTICIPANTS WESM MEMBERS

WESM Members, including ~~The Trading Participants~~ **and the System Operator,** shall be responsible for complying with the requirements set forth in this Market Manual and in the WESM Rules, as follows:

- a) Retrieve and review settlement statement files and supporting data issued by ~~the~~ the Market Operator. The Trading Participants or the System Operator shall notify the Market Operator if files are not accessible or received within the timetable and if there are discrepancies or errors;
- b) xxx
- c) xxx
- d) xxx
- e) xxx”
- b. Original Section 4.1.1 b), 4.1.1 c) and 4.1.1 d) (Contents of Settlement Statements and Data – Settlement Quantity and Amounts) is deleted.
- c. Original Sections 4.1.1 e) (Contents of Settlement Statements and Data – Settlement Quantity and Amounts) is amended to read as:
- e) **b)** The aggregate trading amount for a Trading Participant for a trading interval equals the sum of:

xxx

~~iv. The reserve cost recovery charge determined for that Trading Participant with respect to any reserve cost recovery zone within which it has any facility connected calculated in accordance with the procedures developed under WESM Rules Clause 3.3.5 (which will be positive for any Trading Participant); and~~

~~v. Any other ancillary service cost recovery charges determined for that Trading Participant in accordance with the procedures developed under WESM Rules Clause 3.3.5.~~

- d. Original Section 4.1.1 f) (Contents of Settlement Statements and Data – Settlement Quantity and Amounts) is amended to read as:

f) **c)** For each billing period, the Market Operator shall determine the settlement amount for each Trading Participant as the sum of the aggregate trading amounts for the settlement intervals in that billing period, determined in accordance with WESM Rules 3.13.11.2 plus:

xxx

iii. Any other amounts payable by that Trading Participant to the Market Operator in respect of that billing period, ~~including any reserves recovery charges.~~

iv. It is provided, however, that the Market Operator may issue a separate settlement statement for the reserve trading amounts, if applicable, for that Trading Participant.

e. New Clauses 4.1.1 d) and 4.1.1 e) (Contents of Settlement Statements and Data – Settlement Quantity and Amounts) are added to read as:

“d) The aggregate trading amount for the System Operator for a settlement interval equals the total reserve cost recovery amount with respect to every reserve category and reserve region in accordance with WESM Rules Clause 3.13.9.

e) For each billing period, the Market Operator shall determine the settlement amount for the System Operator as the sum of the aggregate reserve cost recovery amounts for the settlement intervals in that billing period, determined in accordance with WESM Rules Clause 3.13.11.5.”

f. Original Section 4.1.4 (Contents of Settlement Statements and Data) is amended to read as:

“The Market Operator shall provide by electronic means to the Trading Participants their respective settlement data that are being transmitted to the Trading Participants along with the preliminary and final statements, which settlement data shall include, as may be applicable, including the market fee statements, which includes the energy trading amounts, final nodal energy dispatch prices, energy settlement quantity, line rental trading amount of participants with bilateral contract quantity and each of the participants’ bilateral contract quantity, final reserve prices, reserve trading amount, reserve recovery amount net settlement surplus rebated, and line loss and congestion charges. These set of information are being transmitted to the Trading Participants via email and CD copy mailed along with the Participant’s Statements.”

g. New Clauses 4.1.5 (Contents of Settlement Statements and Data) are added to read as:

4.1.5 The Market Operator shall provide by electronic means to the System Operator its settlement data, along with the preliminary and final statements,

which settlement data shall include, as applicable, the market fee statements, reserve cost recovery amounts, final reserve prices, reserve quantities and reserve bilateral contract quantities.

- h. Original Section 5.3.1 (PROCEDURES-Payment by Trading Participant) is amended to read as:

“Payment by Trading Participant **WESM Member**

xxx”

- i. Original Section 5.3.1 (PROCEDURES-Payment by Trading Participant) is amended to read as:

“Payment to the Trading Participant **WESM Member**

xxx”

- j. Original Sections 6.2.1 e) and 6.2.1 f) (PROCEDURES-Payment by Trading Participant) are amended to read as:

“e) The Trading Participant **WESM Member** shall remit the overdue amount to the Market Operator. Such overdue amount shall bear the default interest rate reckoned from the first day such amount is due and payable, up to and including the date on which payment is made, with interest computed based on a 360-day year. The default interest rate is equivalent to the BSP lending rate on date of payment plus 3% will accrue to the remaining unpaid amount until the full payment is received.”

f) The amount collected from the defaulting **WESM Member** Trading Participant, including the default interest, shall be paid by the Market Operator to the **WESM Members** Trading Participants in accordance with Section 5.3.2 of this Manual.”

- k. Original Section 7.2.4 (PROVISION OF SECURITY) is amended to read as:

“7.2.4 If, under Section 7.2.2 of this Manual, the Market Operator has exempted a Trading Participant **WESM Member** from the requirement to provide a security for a period; then the Market Operator shall not set a Trading Limit for that WESM Member for that period during which that exemption applies.”

- l. Original Section 7.4.1 b) (Initial Assessment of Prudential Requirements) is amended to read as:

“b) The projected *settlement amount* for each *billing period* of a *WESM Member* shall be calculated using the following formula:

$$\begin{aligned}
\text{PSA} &= \sum_{i \in I} (\text{PGESQ}_i \times \text{PFEDP}_i) \\
&\quad - \sum_{i \in I} \sum_{c \in C} (\text{PBCQ}_{c,i} \times \text{PFEDP}_{c,i}) \\
\text{PSA} &= \sum_{i \in I} (\text{PQ}_i \times \text{P}_i) \\
&\quad - \sum_{i \in I} \sum_{c \in C} (\text{PBCQ}_{c,i} \times \text{P}_{c,i})
\end{aligned}$$

Where:

- PSA projected *settlement amount* in PhP
PGESQ_i **PQ_i** either projected *gross energy settlement quantity* for energy, in MWh, **or projected reserve quantity** for dispatch interval *i*
PFEDP_i **P_i** either projected *final energy dispatch price* for energy, **or projected reserve price** in PhP/MWh, for dispatch interval *i*
PBCQ_{c,i} either projected *bilateral contract quantity* for energy **or projected reserve bilateral contract quantity**, in MWh, from counterparty *c* for dispatch interval *i*
PFEDP_{c,i} **P_{c,i}** either projected *final energy dispatch price* for energy **or projected reserve price**, in PhP/MWh, associated with the *bilateral contract* with counterparty *c* for dispatch interval *i*
I set of *dispatch intervals* within the billing period
C set of counterparty”

m. New Clause under Section 7.4.1 c) (Initial Assessment of Prudential Requirements) is added to read as:

“c) The System Operator’s compliance on prudential requirement shall be subject to ERC approval.”

n. Original Section 12 Appendix A (BILLING AND SETTLEMENT TIMETABLE) is amended to read as:

Payment by Trading Participants WESM Members	No later than 3.00 pm on the twenty-fifth day of the calendar month following the billing period. If the twenty-fifth day of the calendar month following the billing period falls on a <i>Non-Working Day</i> , the payment due date shall be moved to the next immediate <i>Working Day</i> .
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Payment to Trading Participants WESM Members	On the following <i>Working Day</i> after the <i>Market Operator</i> is to be paid by Trading Participants <u>WESM Members</u> .
Payment of Adjustments by Trading Participants WESM Members	By no later than the time and date specified by <i>the Market Operator</i> , which date shall be not less than ten <i>business days</i> and not more than fifteen <i>business days</i> after the issue of that revised statement
Payment of Adjustments to Trading Participants WESM Members	On the following <i>Working Day</i> on which the <i>Market Operator</i> is to be paid by the Trading Participants <u>WESM Members</u> of the adjustments.

Section 5. Amendments to the Market Manual on Dispatch Protocol, Issue 16.0.

The following provisions in the Market Manual on Dispatch Protocol, Issue 16.0 are hereby amended.

- a. Original Sections 1.1.1 (Overview of WESM Operations) is amended to read as:

“In the *WESM*, the *Market Operator* provides the *System Operator* with **energy dispatch and reserve schedules** to be implemented by the *System Operator* **and the Trading Participants** for each *dispatch interval* using various inputs such as *load forecasts* and state-estimated data from the *Market Operator*, **reserve requirements**, real-time data and *security constraints* from the *System Operator*, and *demand bids*, *market offers*, and *self-scheduled nominations* submitted by the *Trading Participants*.”

- b. Original Sections 1.1.6 (Overview of WESM Operations) is amended to read as:

“The scheduling process starts with the *week-ahead projection* (WAP) which gives the indicative hourly *dispatch schedules* and spot prices for the next seven (7) days. This projection takes into consideration all available information including nomination of *loading levels*, *projected outputs*, *bids* and *offers* from participants, demand forecasts, **reserve requirements**, *outage* schedules and the current status of the *grid*.”

- c. Original Sections 1.1.11 (Overview of WESM Operations) is amended to read as:

“The *System Operator* **and the Trading Participants** implements the RTD schedules for the *dispatch interval*, **The System Operator** issues **re-dispatch instructions** to and ensures compliance by the *Trading Participants* with such instructions, and maintains overall *security of the power system*.”

- d. Original Section 3.1.1 (Responsibilities-Market Operator) is amended to read as:

“The *System Operator* **and the *Trading Participants*** implements the RTD schedules for the *dispatch interval*. **The *System Operator*** issues ***re-dispatch instructions*** to and ensures compliance by the *Trading Participants* with such instructions, and maintains overall *security* of the *power system*.”

- e. Original Section 5.2.3 (Overview of Energy Management Applications) is amended to read as:

“The *System Operator* shall also submit its *over-riding constraint* **and *reserve requirements*** inputs to the MDOM via the Current Operating Plan using the most efficient facility in transferring data to *Market Operator*.”

- f. New Section 6.1.6 (Bids, Offers and Data Submissions and Processing – Background) is added to read as:

“6.1.6 *Trading Participants* shall also indicate their expected mode of operations (e.g. *automatic generation control*, *governor control mode*) for each reserve category when submitting their *reserve offer*.”

- g. Original Sections 6.1.6, 6.1.7, 6.1.8 and 6.1.9 (Bids, Offers and Data Submissions and Processing – Background) is amended to read as:

“6.1.7 ~~6.1.6~~–WESM Rules Clause 3.5.11.2 directs *Generation Companies* that have submitted *self-scheduled nomination* of their *non-scheduled generating units* to revise the same if it reasonably expects that any of its anticipated *loading levels* will differ materially from those previously submitted.

6.1.8 ~~6.1.7~~–WESM Rules Clause 3.5.11.5 requires *Trading Participants* to revise their *bids* or *offers* if they no longer represent a reasonable estimate of either the expected *availability* for the *dispatch interval* of the relevant *generating unit* or *scheduled load* or the *demand bids* or *offers* likely to apply in the *real-time dispatch* optimization for the *dispatch interval*.

6.1.9 ~~6.1.8~~–Pursuant to WESM Rules Clause 3.5.11.6, *Trading Participants* that cancel their *bids* or *offers*, or submit *bids* or *offers* less than the registered capacity or *maximum available capacity* of their *facility* or *generating unit* are required to provide information on the reasons or circumstances of such cancellation or submission.

6.1.10 ~~6.1.9~~–*Trading Participants* are also required to immediately notify the *System Operator* and the *Market Operator* of any circumstances which threaten a significant probability of material adverse change in the state of their facilities. A non-exhaustive list of events that will be deemed to be or to cause material adverse change is required to be published. In compliance with the foregoing, a non-exhaustive list is provided under Section 6.14 of this *Market Manual* pursuant to WESM Rules Clause 3.5.11.8.”

- h. Original Section 6.9.4 (Bids, Offers and Data Submissions and Processing – Formats and Contents of Submission) is amended to read as:

“6.9.4 *Trading Participants* shall provide the following information when submitting *reserve offers*:

a. A maximum response level for the relevant *reserve category* (MW);

b. Control mode of operations

~~b~~c. A maximum proportion of the forecast/*scheduled load*, which may be interrupted;

~~e~~d. Up to three (3) *reserve offer* blocks (MW/block);

~~d~~e. A minimum block size of one (1) MW; and

~~f~~. Monotonically increasing prices.”

- i. Original Section 7.8.2 (System Operator Input and Data and Reports – Reserve Requirements Real-time Dispatch Scheduling - Background) is amended to read as:

“The level of *reserve requirement* shall be based on the provisions of the *Grid Code* and the relevant ~~ERC~~ issuances on *ancillary services* **from the DOE and the ERC.**”

- j. Original Sections 9.1.1 and 9.1.2 (Real-time Dispatch Scheduling - Background) are amended to read as:

“9.1.1 *WESM Rules* Clause 3.8 sets out the responsibilities of the *Market Operator* in the scheduling of *generation* and *load* in the *WESM*. Among other responsibilities, *WESM Rules* Clause 3.8.1 directs that prior to the commencement of each *dispatch interval*, the *Market Operator* shall use the *market dispatch optimization model* (MDOM) to determine the target *loading level* in MW for each *non-scheduled generating unit*, *must dispatch generating unit*, *priority dispatch generating unit*, *scheduled generating unit* or each *scheduled load* and for each ~~reserve~~ *facility* for the end of the *dispatch interval* using the latest data from the *System Operator* and the *Trading Participants*.

9.1.2 The *Market Operator* shall submit to the *System Operator* **and the Trading Participants** the *dispatch schedule* containing the *target loading levels* to be achieved at the end of the *dispatch interval*.

9.1.3 ~~9.1.2~~—The *WESM Rules* defines *loading level* as the instantaneous level of output or consumption in MW of a *generating unit* or *load*. The *target loading level* of a *generator* or *load* is the *loading level* determined as an end-of-period target for that scheduled *generator* or *load*.”

- k. New Section 9.1.4 (Real-time Dispatch Scheduling - Background) is added to read as:

“9.1.4 The Market Operator shall submit to the System Operator and the Trading Participants the reserve schedule containing the capacity that can

be used by the System Operator to maintain the frequency of the grid within the limits prescribed by the Grid Code for the entire dispatch interval.”

- l. Original Section 9.1.3 (Real-time Dispatch Scheduling – Background) is amended to read as:

“9.1.5 ~~9.1.3~~ Additionally, the *Market Operator* is required under *WESM Rules* Clause 3.10 to calculate and publish the RTD prices.”

- m. Original Section 9.3.1.c (Real-time Dispatch Scheduling – Responsibilities) is amended to read as:

“Preparing and ensuring timely submission to the *System Operator* of the *real-time dispatch schedule*, including the **reserve schedules and WMOT**, in preparation for the *dispatch* implementation as set out in the *WESM Rules* and this Dispatch Protocol; and”

- n. Original Section 9.3.3 (Real-time Dispatch Scheduling – Responsibilities) is amended to read as:

“*Trading Participants* shall be responsible for:

- a. Ensuring submission of *market offers* and *reserve offers* as set out in the *WESM Rules* and in accordance with the *WESM timetable* and the procedures and requirements set forth in this Dispatch Protocol.
- b. For *scheduled generating units* and *priority dispatch generating units* who are *dispatched*, generating in accordance with the *dispatch schedule* communicated and within **the dispatch conformance** ~~the standards~~ set forth in this *Market Manual*.
- c. **For ancillary service providers who are scheduled, ensure reserve schedules are available and respond in accordance with the technical requirements expected for each reserve category and within the reserve conformance standards set forth in this Market Manual.**

ed. Maintaining their respective infrastructure to ensure access to the Market Participant Interface of the *MMS*.”

- o. Original Section 9.6.1 (Real-time Dispatch Scheduling – Outputs/ Results of Real-time Scheduling) is amended to read as:

“The MDOM simultaneously determines the following:

- a. *Target loading levels* in MW for the end of a *dispatch interval*, identified as the RTD schedule
- b. *Reserve ~~allocations~~ schedules* for the **entire** *dispatch interval*;
- c. Associated *energy prices* at all *market trading nodes*, and

- d. When applicable, *reserve prices* for all *reserve regions*."
- p. New Section 11.1.7 (Dispatch Implementation - Background) is added to read as:

“11.1.7 Dispatch of scheduled reserves shall be in accordance with Section 23 of this Manual.”

- q. Original Section 15.3.1 (Scheduling and Dispatch of Reserves - Responsibilities) is amended to read as:

“The *System Operator* is responsible for monitoring the compliance of each *reserve provider* in the *WESM*. This compliance monitoring report shall be submitted to the *Market Operator* **based on the provisions of Section 23 of this Manual.**”

- r. Original Section 15.3.2 (Scheduling and Dispatch of Reserves - Responsibilities) is amended to read as:

“The *Market Operator* is responsible for ensuring that the required *reserve levels* **(or reserve requirements)** per **from the** *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 **data exchange** facility for timely receipt of submissions from the *System Operator*.”

- s. New Section 15.3.3 (Scheduling and Dispatch of Reserves - Responsibilities) is added to read as:

“15.3.3 Ancillary Service Providers are responsible for ensuring that their reserve schedules are available to respond to the frequency control requirements of the Grid.”

- t. Original Section 15.4 (Scheduling and Dispatch of Reserves – Determination of Requirements) is amended to read as:

“15.4 Determination of *Reserve Requirements*

15.4.1 Criteria for Determining Reserve Requirements. In determining *reserve requirements* for each *reserve type* in accordance with the relevant **DOE and ERC** issuances on the procurement of *ancillary services*, the *System Operator* shall ensure compliance with the power quality and reliability performance standards set out in **those issuances and/or** the Philippine *Grid Code*.

15.4.2 The level of *reserve requirement* for regulating *reserve service* shall be based on the latest issuances on the procurement of *ancillary services* by the **DOE and the ERC**, and shall be used as reference by the *Market Operator* for the *market projections* and *real-time dispatch schedule*.

15.4.3 For *contingency reserve* service and *dispatchable reserve*, the *System Operator* shall determine the level of *reserve* requirement in accordance with the latest issuances on the procurement of *ancillary services* by the **DOE and the ERC**.

15.4.4 The *Market Operator*, in coordination with the *System Operator*, shall formulate and maintain its procedures for determining the MW level of the *reserve* requirements.”

- u. New Section 15.6 (Scheduling and Dispatch of Reserves – Deadband Setting) is added to read as:

“15.6 Deadband Settings

15.6.1 Reserve facilities scheduled to provide regulating reserve shall ensure that their deadband is set within +/- 0.15 Hz.

15.6.2 Reserve facilities scheduled to provide contingency reserve shall ensure that their deadband is set greater than – 0.30 Hz but less than - 0.15 Hz.”

- v. New Section 15.7 (Scheduling and Dispatch of Reserves – Dispatching Ancillary Service Providers through Automatic Generation Control) is added to read as:

“15.7 Dispatching Ancillary Service Providers through Automatic Generation Control

15.7.1 Reserve facilities operating on automatic generation control (AGC) shall receive commands from the System Operator’s Energy Management System (EMS)”

- w. New Section 15.8 (Scheduling and Dispatch of Reserves – Dispatching Ancillary Service Providers through Governor Control Mode) is added to read as:

“15.8 Dispatching Ancillary Service Providers through Governor Control Mode

15.8.1 Reserve facilities operating on governor control mode (GCM) shall ensure that their deadband setting is configured based on the requirements of Section 15.6 of this Manual to ensure that they respond to requirements of the Grid for frequency control.”

- x. New Section 23 (Monitoring the Effective Provision of Ancillary Services) is added to read as:

SECTION 23 MONITORING THE EFFECTIVE PROVISION OF ANCILLARY SERVICES

23.1 Overview

23.1.1 WESM Rules Clause 3.3.7.4 states that the *System Operator* shall continuously update the reserve effectiveness factors for each reserve facility category, and the capacity of reserve for each category according to regions to be scheduled by the market dispatch optimization model, to accurately reflect the power system.

23.1.2 The reserve effectiveness factor (REF) measures the reserve facility's adequacy, accuracy, and timeliness in its actual reserve response with respect to the expected operating parameters set for a specific type of reserve.

23.1.3 The technical and operational data to measure the REF shall be acquired from the System Operator's SCADA-EMS.

23.2 Responsibilities

23.2.1 The System Operator shall continuously monitor the reserve facility's REF for each dispatch interval.

23.3 Measuring the Reserve Effectiveness Factor of Regulating Reserves on AGC

23.3.1 The REF for a regulating reserve facility on AGC shall be based on the following criteria:

- a. Response Time: At least 75% of the desired generation adjustment is reached at a maximum of 25 seconds
- b. Regulating Capacity: At least 1% of the scheduled regulating reserve capacity

23.3.2 Measuring REF based on Response Time

23.3.2.1 The REF for a regulating reserve facility on AGC with respect to its response time shall be based on the reserve facility's ability to comply with the AGC command sent by the SCADA-EMS within the required time.

23.3.2.2 The following table shows the REFs for each range of time the regulating reserve facility was able to provide at least 75% of the generation output instructed as AGC command.

Range of Response Time, seconds	REF
0 – 15	1.00
16 – 20	0.95
21 – 25	0.90
26 – 32	0.80
Greater Than 32	0.70
No Response	0.00

23.3.3 REF based on Regulating Capacity

23.3.3.1 The REF for a regulating reserve facility on AGC with respect to its regulating capacity shall be based on the reserve facility’s maximum actual generation output and highest generation output instructed as AGC command within a dispatch interval. It shall be computed as such:

$$Performance_{REG-AGC,RC,i} = \frac{Maximum\ Actual\ Generation_i}{Highest\ Generation\ from\ AGC\ Command_i}$$

Where:

Performance_{REG-AGC,RC,i}

refers to the performance of the regulating reserve facility on AGC with respect to its regulating capacity at dispatch interval i

Maximum Actual Generation_i

refers to the maximum actual generation output within dispatch interval i

Highest Generation from AGC Command_i

refers to the highest generation output instructed as AGC command within a dispatch interval i

23.3.3.2 The following table shows the REFs for each performance range calculated in the previous clause.

Performance, %	REF
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Greater Than 99%	1.00
95% < Performance ≤ 99%	0.97
90% < Performance ≤ 95%	0.95
85% < Performance ≤ 90%	0.90
80% < Performance ≤ 85%	0.85
75% < Performance ≤ 80%	0.80
0% < Performance ≤ 75%	0.70
0%	0.00

23.3.4 The overall REF for a regulating reserve facility on AGC shall be computed as such:

$$REF_{REG-AGC,i} = \frac{REF_{REG-AGC,RT,i} + REF_{REG-AGC,RC,i}}{2}$$

Where:

$REF_{REG-AGC,i}$ refers to the REF for regulating reserve facility on AGC at dispatch interval i

$REF_{REG-AGC,RT,i}$ refers to the REF for regulating reserve facility on AGC with respect to its response time at dispatch interval i

$REF_{REG-AGC,RC,i}$ refers to the REF for regulating reserve facility on AGC with respect to its regulating capacity at dispatch interval i

23.4 Measuring the Reserve Effectiveness Factor of Regulating Reserves on Governor Control Mode

23.4.1 The REF for a regulating reserve facility on Governor Control Mode (GCM) shall be based on the following criteria

- a. Accuracy: plant's ability to increase or decrease its generation when the power system frequency goes beyond the generating unit's dead-band setting, with respect to its static gain
- b. Response Time: plant's ability to increase or decrease its generation within the required response time

23.4.2 Measuring REF based on Accuracy

23.4.2.1 The REF for a regulating reserve facility on GCM with respect to its accuracy shall be based on its static gain. The static gain shall be computed as such:

$$\text{Static Gain}_{REG-GCM,i} = \frac{\text{Capacity of the Generating Unit}_i}{\text{Droop Setting} \times \text{Nominal Frequency}}$$

Where:

*Static Gain*_{REG-GCM,i} refers to the static gain of the regulating *reserve facility* on GCM at dispatch interval i

*Capacity of the Generating Unit*_i refers to the maximum available capacity of the *reserve facility* at dispatch interval i

Droop Setting refers to the reference setting to which a *reserve facility's* generation output changes with respect to the change in *frequency*.

Nominal Frequency is defined in the *Philippine Grid Code* to be at 60 Hz

23.4.2.2 The performance of a regulating reserve facility on GCM with respect to its accuracy shall be based on the reserve facility's actual MW response and its expected response based on its static gain. It shall be computed as such:

$$\text{Performance}_{REG-GCM,ACC} = \text{ABS} \left[\frac{\text{Actual Response}}{\text{Expected Response based on Static Gain}} \right] \times 100\%$$

$$\begin{aligned} \text{Expected Response based on Static Gain} \\ = \text{Static Gain} \times \text{Change in Frequency} \end{aligned}$$

23.4.2.3 The following table shows the REFs for each range of the performance calculated for its *reserve response accuracy*.

Performance, x	REF
Within 5%	1.00
5% < x ≤ 15%	0.95
15% < x ≤ 20%	0.90
20% < x ≤ 30%	0.85
x > 30%	0.00

23.4.3 Measuring REF based on Response Time

23.4.3.1 The REF for a regulating reserve facility on GCM with respect to its response time shall be based on the reserve facility’s ability to respond within the required time.

23.4.3.2 The following table shows the REFs for each range of time the regulating reserve facility was able to provide at least 75% of the generation output expected based on static gain, as prescribed in clause 23.4.2.2 of this *Manual*.

Range of Response Time, seconds	REF
0 – 15	1.00
16 – 20	0.95
21 – 25	0.90
26 – 32	0.80
Greater Than 32	0.70
No Response	0.00

23.4.4 The overall REF for a regulating reserve facility on GCM shall be computed as such:

$$REF_{REG-GCM,i} = \frac{REF_{REG-GCM,ACC,i} + REF_{REG-GCM,RT,i}}{2}$$

Where:

$REF_{REG-GCM,i}$ refers to the REF for regulating reserve facility on GCM at dispatch interval i

$REF_{REG-GCM,ACC,i}$ refers to the REF for regulating reserve facility on GCM with respect to its accuracy at dispatch interval i

$REF_{REG-GCM,RT,i}$ refers to the REF for regulating reserve facility on GCM with respect to its response time at dispatch interval i

23.5 Measuring the Reserve Effectiveness Factor of Contingency Reserves

23.5.1 The REF for a *contingency reserve* facility shall be based on the following criteria

- a. Reserve Capacity: At least 1% of the scheduled *contingency reserve* capacity

23.5.2 REF based on Reserve Capacity

23.5.2.1 The REF for a *contingency reserve facility* with respect to its reserve capacity shall be based on the *contingency reserve facility's* maximum actual generation output and the expected reserve response within a dispatch interval. It shall be computed as such:

$$Performance_{CON,RSC,i} = \frac{Maximum\ Actual\ Generation_i}{Expected\ Reserve\ Response_i}$$

Where:

Performance_{CON,RSC,i} refers to the performance of the *contingency reserve facility* with respect to its reserve capacity at dispatch interval *i*

Maximum Actual Generation_i refers to the maximum actual generation output within dispatch interval *i*

Expected Reserve Response_i refers to the expected response at dispatch interval *i*

23.5.2.2 The following table shows the REFs for each performance range calculated in the previous clause.

Performance, %	REF
Greater Than 99%	1.00
97% < Performance ≤ 99%	0.95
96% < Performance ≤ 97%	0.90
96% < Performance ≤ 95%	0.80
0%	0.00

23.5.3 The overall REF for a *contingency reserve facility* shall be computed as such:

$$REF_{CON,i} = REF_{CON,RSC,i}$$

Where:

- $REF_{CON,i}$ refers to the REF for *contingency reserve facility* at dispatch interval i
- $REF_{CON,RSC,i}$ refers to the REF for *contingency reserve facility* with respect to its reserve capacity at dispatch interval i

23.6 Measuring the Reserve Effectiveness Factor of Dispatchable Reserves

23.6.1 The REF for a *dispatchable reserve facility* shall be based on the following criteria:

- a. Synchronization Time: Should be synchronized to the *Grid* within 15 minutes from *dispatch instruction*
- b. Reserve Capacity: At least 1% of the scheduled *dispatchable reserve capacity*

23.6.2 Measuring REF based on Synchronization Time

23.6.2.1 The following table shows the REFs for each range of time the *dispatchable reserve facility* was able to synchronize upon issuance of *dispatch instruction*.

Range of Response Time, x , minutes	REF
$0 < x \leq 15$	1.00
$15 < x \leq 20$	0.90
$20 < x \leq 30$	0.80
$30 < x \leq 45$	0.70
No Response	0.00

23.6.3 REF based on Reserve Capacity

23.6.3.1 The REF for a *dispatchable reserve facility* with respect to its *reserve capacity* shall be based on the *dispatchable reserve facility's* maximum actual generation output and the expected *reserve response* within a dispatch interval. It shall be computed as such:

$$Performance_{DIS,RSC,i} = \frac{\text{Maximum Actual Generation}_i}{\text{Expected Reserve Response}_i}$$

Where:

<i>Performance</i> _{DIS,RSC,i}	refers to the performance of the <i>dispatchable reserve facility</i> with respect to its reserve capacity at dispatch interval i
<i>Maximum Actual Generation</i> _i	refers to the maximum actual generation output within dispatch interval i
<i>Expected Reserve Response</i> _i	refers to the <i>dispatch instruction</i> issued at dispatch interval i

23.6.3.2 The following table shows the REFs for each performance range calculated in the previous clause.

Performance, %	REF
Greater Than 99%	1.00
97% < Performance ≤ 99%	0.95
96% < Performance ≤ 97%	0.90
96% < Performance ≤ 95%	0.80
0%	0.00

23.6.4 The overall REF for a *dispatchable reserve facility* shall be computed as such:

$$REF_{DIS,i} = \frac{REF_{DIS,ST,i} + REF_{DIS,RSC,i}}{2}$$

Where:

<i>REF</i> _{DIS,i}	refers to the REF for <i>dispatchable reserve facility</i> at dispatch interval i
<i>REF</i> _{DIS,ST,i}	refers to the REF for <i>dispatchable reserve facility</i> with respect to its synchronization time at dispatch interval i
<i>REF</i> _{DIS,RSC,i}	refers to the REF for <i>dispatchable reserve facility</i> with respect to its reserve capacity at dispatch interval i”

Section 6. Separability Clause. If for any reason, any section or provision of this Circular is declared unconstitutional or invalid, such parts not affected shall remain valid and subsisting.

Section 6. Effectivity. This Circular shall take effect fifteen (15) days following its complete publication in at least two (2) newspapers of general circulation and shall remain in effect until otherwise revoked. Copies thereof shall be filed with the University of the Philippines Law Center – Office of National Administrative Register (UPLC-ONAR).

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