



PEM Audit Committee Report on the Market Readiness Assessment (MRA)

**For the implementation of enhanced WESM design and operations in
Luzon and Visayas, and WESM in Mindanao**

August 2019

This Report is prepared by the
Philippine Electricity Market Corporation –
Market Assessment Group for the
PEM Audit Committee

PEMC *Go*

EXECUTIVE SUMMARY

This report by the PEM Audit Committee (PAC) provides updates on the Market Readiness Assessment (MRA) activity as of 20 August 2019 and discussion on the Final MRA Report for Luzon and Visayas. This augments the 1st MRA Report in May 2019 and 2nd Report in June 2019.

The MRA activity is being conducted to ensure the effective transition to and implementation of the enhanced WESM design and operations in Luzon and Visayas, and WESM in Mindanao. It includes the conduct of a Parallel Operations Program (POP) by the Market Operator (MO), wherein the MO, System Operator (SO), PEMC, and Market Participants are able to try out for themselves the revised WESM processes, specifically the trading, dispatch, and settlement (i.e. bid to bill) processes with 5-minute dispatch intervals. During the initial month of POP, several operational issues were identified arising from the corresponding changes in market systems, processes, and paradigms.

The Sapere Research Group Limited (Sapere), the third-party expert engaged to conduct the MRA activity, has submitted its Final Market Readiness Report for the implementation of the enhanced WESM design and operations in Luzon and Visayas. Sapere deemed that the market will be ready once it collectively satisfies Go-Live Conditions, which are broadly classified as follows:

1. Approval of the Price Determination Methodology (PDM)
2. MO systems to demonstrate a sustained period of stability and reliability
3. Improve Market Participant connectivity and access to data
4. Confirmation of system security following the SO's detailed assessment of the real-time dispatch (RTD), hour-ahead projection (HAP), and day-ahead projection (DAP)
5. Metering Services Providers (MSPs) are able to submit 5-minute meter data (or the MO able to receive 15-minute meter data and convert as a transitional measure)
6. Forecast accuracy of the new Market Management System (NMMS) to meet operational targets.
7. A policy decision on how reserves will be managed/traded in the market
8. Confirmation that the audit certification of core NMMS systems remains valid following the subsequent production system changes made by IEMOP (e.g. patches and bug fixes). In its absence, a supplemental audit is conducted, and systems are re-certified.

9. A policy decision on how to proceed with the low levels of Mindanao participation levels and WESM registration

The PAC agrees with Sapere's recommendation for the said conditions to be resolved and supports the Market Readiness Steering Committee (MRSC) that is tasked to address said conditions and POP concerns.

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INTRODUCTION

This report by the PEM Audit Committee (PAC) provides updates on the Market Readiness Assessment (MRA) activity from 29 June 2019 to 20 August 2019, including results of the Parallel Operations Program for the period 17 May 2019 to 25 July 2019.

This report augments the 1st MRA Report in May 2019 and 2nd MRA Report in June 2019, which identified matters for close monitoring to ensure the effective transition to the enhanced Wholesale Electricity Spot Market (WESM) design and operations in Luzon and Visayas, and WESM in Mindanao.

The PAC likewise discusses herein its views regarding the recommendations of the Sapere Research Group Limited (Sapere) in its Final MRA Report for Luzon and Visayas.

Background

As approved by the PEM Board, the Philippine Electricity Market Corporation (PEMC) engaged the Sapere to conduct the MRA under the oversight of the PAC. The MRA activity is being conducted to assess the readiness of the PEMC, Market Operator (MO), System Operator (SO), Metering Services Providers (MSPs) and WESM participants, identify issues for resolution as well as to provide necessary recommendations to ensure the effective transition to and implementation of the enhanced WESM design and operations in Luzon and Visayas, and WESM in Mindanao.

The MRA covered the conduct of a Parallel Operations Program (POP) by the Independent Electricity Market Operator of the Philippines (IEMOP), under the supervision of Sapere. The POP enabled the MO, SO, PEMC, and Market Participants to try out for themselves the revised WESM operations, specifically the trading, dispatch, and settlement (i.e. bid to bill) systems and processes with 5-minute dispatch intervals.

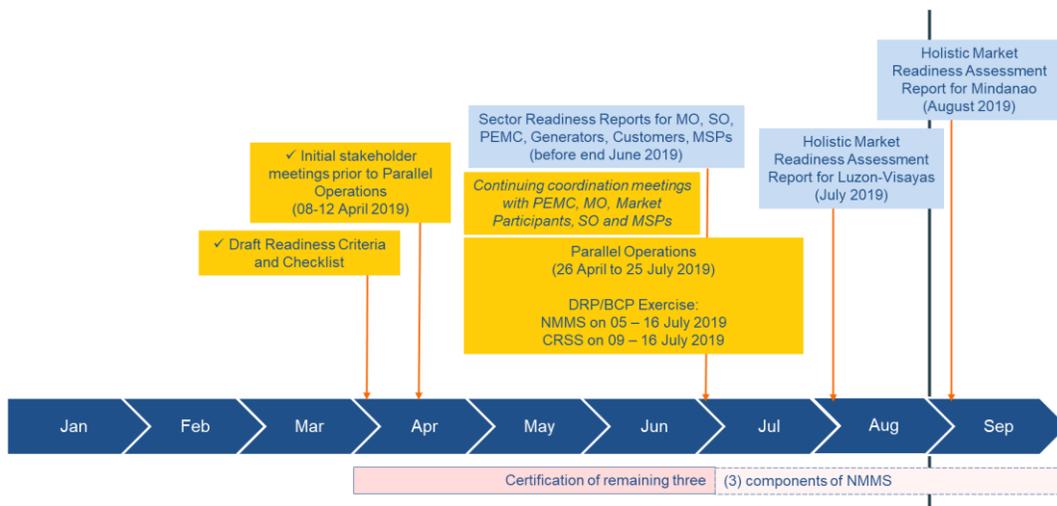
The POP tested the operational functionality and interfaces of the new Market Management System (NMMS) and Central Registration and Settlement System (CRSS). That is, it assessed

the reliability of the systems from the point of taking up participant bids, creation of dispatch instructions, the publication of prices, and preparation of settlements.

With the results of the POP and consultations with the concerned parties, the MRA also identified issues arising from the corresponding changes in their systems, processes, and paradigms.

MRA TIMELINE AND ACTIVITIES

Key deliverables of the MRA activity are the submission of reports by Sapere and the conduct of consultation meetings as shown in the timeline below.



Noteworthy is the extended certification audit of the NMMS to complete the testing of the Load Forecasting and Compliance Monitoring (CMON) modules. On 06 August 2019, the audit of the CMON was completed with the submission of the audit report and software certificate by the third-party auditor, Intelligent Energy Systems (IES). As of 20 August 2019, the audit of the Load Forecasting is still ongoing with the completion date tentatively in September 2019.

For the period 03 July 2019 to 20 August 2019, the following key MRA activities were conducted:

1. Continuing POP, which includes the MO’s preliminary settlement runs for the May and June billing periods on 05 July and 03 July, respectively, and conduct of fail-over

exercise, covering the disaster recovery plan (DRP) and business continuity plan (BCP) as follows:

| Activity | Plan | Actual |
|---|-----------------------------|--|
| Operations of the NMMS at the main site (Pasig City) | 26 April 2019 – 25 May 2019 | 26 April 2019 – 05 July 2019 |
| Operations of the NMMS at the back-up site (Cebu City), with fail-over exercise | 26 May 2019 – 25 June 2019 | 05 July 2019 – 16 July 2019 <ul style="list-style-type: none"> • 05 July 2019: Switch-over of NMMS • 09 July 2019: Switch-over of CRSS |
| Continuation of the POP subject to the results of the first two (2) months | 26 June 2019 – 25 July 2019 | 16 July 2019 – 25 July 2019 |

2. Hand-over of Action Plans by Sapere to the Market Readiness Steering Committee (MRSC) Work Stream Champions to resolve the critical issues identified by Sapere, as well as to ensure that all of the required Go-Live conditions for the 5-minute market are met through action plans and responsibilities are allocated for the delivery by each Work Stream.

As of 20 August 2019, the MRSC conducted four (4) meetings with the Work Stream Champions providing updates on their respective action plans. It is noted that while the PAC oversees the MRA activity, the action plans and activities of the MRSC to address issues arising from the MRA, including the POP, are independent from the PAC.

3. Review of the Final MRA Reports

Sapere submitted the draft MRA Report for Luzon and Viasyas, providing their holistic readiness assessment for all sectors, on 01 July 2019 and reformatted on 02 July 2019. After updating by Sapere on 26 July 2019, the report was provided to the System Operator (SO) and MO on 27 July 2019, for comments, and presented to the PEM Board on 31 July 2019. A revised draft was submitted by Sapere on 16 August 2019, which was reviewed and accepted by the PAC on 19 August 2019. On 30 August 2019, Sapere submitted the Final Report, with minor revisions.

On the other hand, the draft MRA Report for Mindanao was submitted by Sapere on 20 August 2019 and is currently for comments by the PAC, PEMC, SO, and MO.

HOLISTIC ASSESSMENT FOR LUZON AND VISAYAS

Sapere deemed that the market will be ready for the commercial operations of the enhanced WESM design when a number of key indicators or criteria of readiness are satisfied. These criteria are mapped out in the table below according to the Go-Live Conditions that were also identified by Sapere.

| Readiness Criteria that should be Met for the Market to be Ready for Go-Live | Go-Live Condition |
|---|---|
| ERC approval of Price Determination Methodology (PDM) | Approval of the Price Determination Methodology (PDM) |
| Ensure that the Market Operator systems are stable and reliable. A number of system issues have impacted on the operational performance of the systems, in particular those relating to the CRSS settlement runs and those relating to the DAP market runs. DAP stability and performance either needs to be improved and/or the operational performance targets for DAP relaxed by agreement with PEMC. Dispatch Protocols will need to be aligned also. While we initially noted that DAP timeliness in-itself was not market start critical, we remain concerned that the deteriorating trend in timeliness remains undiagnosed. | MO systems to demonstrate a sustained period of stability and reliability |
| Address Market Participant connectivity and constraints in accessing market data through a combination of remedial actions prior to market go-live, and clear post market launch enhancement plans. | Improve Market Participant connectivity and access to data |
| Follow up training to market participants | |
| The System Operator has identified concerns with the dispatch schedules and has not signed-off on secure operations under the enhanced WESM | Confirmation of system security following the SO's detailed assessment of the real-time dispatch (RTD), hour-ahead projection (HAP), and day-ahead projection (DAP) |
| Interface reliability with the SO following: <ul style="list-style-type: none"> • their transfer to new systems (eDNA) • using the new IEMOP web-services | |

| Readiness Criteria that should be Met for the Market to be Ready for Go-Live | Go-Live Condition |
|--|---|
| <ul style="list-style-type: none"> HVDC data is still missing in transfer of off-line data between the SOs and IEMOP | |
| Modify CRSS to process 15-minute metering data for those MSP's yet to reprogram their meters Some Market Manuals still require revision and approval by RCC and DOE | Metering Services Providers (MSPs) are able to submit 5-minute meter data (or the MO able to receive 15-minute meter data and convert as a transitional measure) |
| Resolve the conflict between DOE circular DC2018-04-0009 and the market manuals on MSP manipulation of meter data to remove ambiguity and avoid confusion | |
| Closely connect with the above criterion, forecast Accuracy needs to improve and will require IEMOP to investigate and implement actions to improve RTD MAPE levels for Visayas and Mindanao, and RTD FAR levels for Visayas | Forecast accuracy of the new Market Management System (NMMS) to meet operational targets |
| Audit and certification of 2 remaining NMMS modules needs to be completed | Confirmation that the audit certification of core NMMS systems remains valid following the subsequent production system changes made by IEMOP (e.g. patches and bug fixes). In its absence, a supplemental audit is conducted, and systems are re-certified |

Sapere likewise identified other readiness criteria that the PAC deems should not necessarily hinder the implementation of the enhanced WESM design. These are the following:

| Readiness Criteria that should be Met for the Market to be Ready for Go-Live | PAC Comments |
|--|---|
| Nodal prices correctly reflect marginal costs and adequately model transmission losses | This is an audit finding, which was also found in the current MMS, that is brought about by using a single linear loss equation in the linear programming optimization part of MDOM. The MO committed to continue monitoring the occurrences when the modelling of losses affects the optimal dispatch of MDOM. |
| CRSS Disaster Recovery (DR) process documentation has only been provided by IEMOP for the database, not the other components of the application; it is therefore insufficient to document the failover process | The PAC notes that the IEMOP has acquired certification for Information Security Management System (ISMS), which requires sufficient back-up procedures and process to be in place. While this documentation is important, it is not necessary for the market to commence the enhanced WESM design. |
| More generally, DR failover documentation should be modified into broader document(s) that includes related IEMOP process (e.g., | |

| Readiness Criteria that should be Met for the Market to be Ready for Go-Live | PAC Comments |
|--|---|
| communication with market participants about IT changes). | |
| Completed annexes to the Operating Agreement between PEMC and IEMOP—completing the annexes will help to ensure clarity of requirements between PEMC and IEMOP on inter-party services required to enable PEMC to meet its obligations under the new market arrangements (this mainly affects the compliance function). | The PAC notes that this is not a readiness issue. Both PEMC and IEMOP are able to meet their obligations and fulfil their functions under the WESM Rules. |
| A policy decision on how to proceed with the low levels of Mindanao participation levels and WESM registration | The PAC notes that this is not a readiness issue for Luzon and Visayas, and this is being addressed by the MRSC. |

In view of the foregoing, the PAC agrees with Sapere’s recommendation for certain criteria to be resolved and supports the MRSC that is tasked to address said conditions and POP concerns.

MRSC WORK STREAM ACTION PLAN UPDATES

As of the MRSC Meeting 4 held on 08 August 2019, updates on the Action Plans by Work Streams addressing the Go-Live Conditions are provided below.

A. MO Readiness

| Status | Action Plans | Timeframe | Update as of 08 August |
|---------------|--|------------------|---|
| Ongoing | IEMOP to work with NMMS vendor on patch to resolve performance and/or reliability issues | August 2019 | <ul style="list-style-type: none"> Major variances already escalated to Siemens, including priority list (i.e., which to resolve first). Fixes are covered by change orders or maintenance agreement with Siemens. Activities for completion: <ol style="list-style-type: none"> System Configurations to improve System Performance Fixes on issues related to MDOM and MPI |

| Status | Action Plans | Timeframe | Update as of 08 August |
|---------------------|---|--|---|
| Ongoing | <p>IEMOP to remediate failed settlement server hardware and re-run month-end settlement process.</p> <p>IEMOP to remediate CRSS performance and storage issues, and complete settlement runs.</p> | August 2019 | <ul style="list-style-type: none"> • Performed database clean up in order to complete the May and June settlement runs. • Performed indexing of metering and settlement data tables to improve performance. • Ongoing process optimization by data caching (i.e., metering and settlements). Successfully deployed process optimizations for core settlement processes last July 16 2019; Meter process optimization enhancements commenced on July 17, 2019. • Will expand storage capacity of CRSS (for procurement, target to be in place before “go live”). |
| Ongoing | <p>IEMOP to resolve forecast accuracy issues, by coordinating with SO for the immediate resolution of the e-DNA data transmission issues.</p> <p>Forecast accuracy issue has been assessed as attributable to reliability of SO ICCP data transmission using SO’s e-DNA system.</p> | NGCP target to use e-DNA (for LVM) by EO July 2019 | <ul style="list-style-type: none"> • Performed reconfiguration and database clean-up on 05 July 2019 for the forecasting module to improve data quality of historical actual load • Meetings between IEMOP & NGCP 2x a week. • IEMOP presented updates on RTD, HAP, DAP provision to SO and their analysis on quality as provided in their Week 11 POP Report. |
| Continuing activity | Work with participants to ensure connectivity, access and functionality issues are resolved. | Issues are being addressed as they are reported to IEMOP | <ul style="list-style-type: none"> • IEMOP is still getting feedback through the Help Desk and working with individual market participants on these issues. • IEMOP is conducting regular survey of participants regarding their access to the NMMS and CRSS. • IEMOP made available an API tool for the MPI to market participants subject to an end-user license agreement (EULA) |
| Ongoing | Confirm that the NMMS system changes have not | July 2019 | <ul style="list-style-type: none"> • PAC deemed that the enhancements should undergo pre-audit, subject to the |

| Status | Action Plans | Timeframe | Update as of 08 August |
|--------|--------------------------------|-----------|--|
| | invalidated IES audit results. | | completion of the NMMS/CRSS enhancements. <ul style="list-style-type: none"> • Pre-certification audit of the NMMS is still ongoing for the Load Forecasting module until August 2019 |

B. SO Readiness

| Status | Action Plans | Timeframe | Update as of 08 August |
|---------|------------------------------------|-------------|---|
| Ongoing | SO to complete security assessment | August 2019 | <ul style="list-style-type: none"> • Awaiting MO to complete NMMS enhancement that will address issues on data transfer |
| Ongoing | NGCP to use e-DNA (for LVM) | August 2019 | <ul style="list-style-type: none"> • SO is working out with the eDNA supplier regarding the break status not being transmitted to IEMOP via ICCP |

C. MSP/Customer Readiness

| Status | Action Plans | Timeframe | Update as of 08 August |
|-------------------------------|--|-------------|--|
| Continuing follow-up with DOE | Impress on DOE importance of an early decision about 5- and 15-minute data submission at “Go live”. Follow up status on approval of proposed amendments to Retail Metering Manual allowing MSPs to submit 15-minute meter data to CRSS | August 2019 | <ul style="list-style-type: none"> • PEMC presented to the DOE on 05 July the list of pending Circulars¹ while IEMOP discussed the necessary rules for the CRSS enhancement to convert 15-minute MQ to 5-minute. |
| Done | IEMOP to enhance CRSS to provide 15-minute meter read inputs for MSPs that have yet to convert to 5-minute reads | July 2019 | <ul style="list-style-type: none"> • Enhancement deployed on 31 July 2019. |
| Ongoing | IEMOP to document suggested training | August 2019 | <ul style="list-style-type: none"> • IEMOP will conduct trainings for MSPs on 22 and 23 August. |

¹ See Annex A: List of Proposed Changes to Market Rules and Manuals for DOE approval for Go-Live

| Status | Action Plans | Timeframe | Update as of 08 August |
|---------|---|----------------|--|
| | modules and criteria for accomplishment and communicate to MSPs | | |
| Ongoing | Develop a follow up survey to clarify any aspects of this issue if required | September 2019 | <ul style="list-style-type: none"> • IEMOP is currently conducting survey. Request results to be presented in MRSC meeting in September 2019. • Per IEMOP, Mindanao participants are not accessing the CRSS and there is a need to conduct hands-on training on a regular basis. • On MERALCO, they have agreed with IEMOP that they will participate in the POP and submit 5-minute and 15-minute MQ data. |

D. Mindanao Readiness

| Status | Action Plans | Timeframe | Update as of 08 August |
|---------|---|-------------|--|
| Done | PEMC and DOE to agree on messaging for Mindanao | August 2019 | <ul style="list-style-type: none"> • DOE approved proposed Go-Live date for Mindanao (26 January 2020) on 05 July 2019 |
| Ongoing | PEMC to work with SO to establish whether some of the DUs with embedded generation could be allowed to operate autonomously within its franchise area (along the lines of a DSO type arrangement) | August 2019 | <ul style="list-style-type: none"> • PEMC/TC is conducting a study on the technical issues of embedded generation in Mindanao (3Q 2019 - 2Q 2020) |

E. Price Determination Methodology

| Status | Action Plans | Timeframe | Update as of 08 August |
|--------|--|-----------|---|
| Done | Ensure all price outcome reports contain transparency and explanation on | July 2019 | <ul style="list-style-type: none"> • IEMOP submitted pricing analysis report to the ERC in July 2019 |

| Status | Action Plans | Timeframe | Update as of 08 August |
|---------|--|-------------|--|
| | which inputs are being used | | |
| Ongoing | Audit remaining modules (especially forecast tool) and clear through ERC hearing process | August 2019 | <ul style="list-style-type: none"> • CMON report and software certificates finalized on 07 August 2019 • Load Forecasting audit is still ongoing |

F. Reserves

| Status | Action Plans | Timeframe | Update as of 08 August |
|---------|--|-------------|--|
| Done | Steering committee to communicate the steering committee's recommendation (energy only market on Go-Live) | July 2019 | <ul style="list-style-type: none"> • Done. PEMC presented to the DOE on 05 July the MRSC's recommendations, which the DOE approved. |
| Ongoing | Make the day 1 scenario clear to the market (energy only market; A/S are centrally scheduled by the IEMOP, in accordance with the central scheduling approved by the DOE for the current market) | August 2019 | <ul style="list-style-type: none"> • IEMOP and NGCP to draft an A/S Protocol |

G. Generator Readiness

| Status | Action Plans | Timeframe | Update as of 08 August |
|---------|------------------------------------|---------------------|---|
| Ongoing | Ensure participation of generators | Continuing activity | <ul style="list-style-type: none"> • PIPPA conducted a generator forum on 01 August 2019 to discuss issues on participation and compliance |

Annex A: List of Proposed Changes to Rules and Manuals for DOE Approval for Go-Live as of 20 August 2019

| Proposal | Description | Approved by PEM Board | Status | Documents for Amendments |
|--|---|------------------------------|--|--|
| Proposed Amendments to WESM Rules and Proposed ECO Manual | Amendments to WESM Rules and proposed ECO Manual for consistency with amendments to WESM Penalty Manual | 30-Aug-18 | <ul style="list-style-type: none"> • 03 Sep 2018 – endorsed to DOE • Jan & Feb 2019 – DOE pubcon • 03 Jun 2019 – DOE-PEMC meeting regarding comments received | WESM Rules |
| | | | | New ECO Manual |
| Proposed Amendments to WESM Rules and WESM Manual on Market Surveillance, Compliance and Enforcement | Further amendments to WESM Rules and various Manuals regarding market surveillance | 30-Aug-18 | <ul style="list-style-type: none"> • 03 Sep 2018 – endorsed to DOE • Jan & Feb 2019 – DOE pubcon • 03 Jun 2019 – DOE-PEMC meeting regarding comments received | WESM Rules |
| | | | | MSC Manual |
| Proposed Amendments to the WESM Penalty Manual | | 10-Sep-18 | <ul style="list-style-type: none"> • 03 Sep 2018 – endorsed to DOE • Jan & Feb 2019 – DOE pubcon • 03 Jun 2019 – DOE-PEMC meeting regarding comments received | WESM Penalty Manual |
| Proposed Amendments to the WESM and Retail Rules and Various Manuals to Reduce Barriers to Entry and Participation in Retail Competition | | 23-Apr-19 | <ul style="list-style-type: none"> • 14 May 2019 – endorsed to DOE | WESM Rules |
| | | | | Retail Rules |
| | | | | Retail Registration Manual |
| | | | | Retail Metering Manual |
| | | | | Retail Market Transactions Manual |
| | | | | Retail Information Disclosure and Confidentiality Manual |
| | | | | WESM Billing and Settlement Manual |
| WESM Registration Manual | | | | |

| | | | | |
|---|---|-----------|---|--------------------------|
| Proposed Amendments to the WESM Manual on Registration, Suspension, and De-Registration Criteria and Procedures | <ul style="list-style-type: none"> • include additional modelling requirements for registering new facilities • harmonize timelines • clarify basis of MO for changes in registered capacities | 29-May-19 | <ul style="list-style-type: none"> • 06 Jun 2019 – endorsed to DOE | WESM Registration Manual |
|---|---|-----------|---|--------------------------|