

Sector Readiness Assessment—Luzon and Visayas

Report prepared for Philippine Electricity Market Corporation (PEMC)

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Executive summary

Considerable progress has been made by PEMC, IEMOP, the System Operator, Metering Service Providers, and Market Participants in readying market systems and processes to implement the new enhanced market for Luzon and Visayas. A number of key indicators of readiness remain to be completed as at the date of writing this report, 24 July 2019. Until these remaining criteria are satisfied, we consider that the market systems and processes are not yet ready to implement the enhanced market.

The criteria remaining to be satisfied include the readiness of market systems and non-market systems processes. In total, we consider 16 criteria have yet to be satisfied. The criteria remaining to be satisfied are:¹

1. The System Operator has identified concerns with the dispatch schedules and has not signed-off on secure operations under the enhanced WESM.
2. 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.
3. Interface reliability with the SO following:
 - a. their transfer to new systems (eDNA)
 - b. using the new IEMOP webservices.
4. HVDC data is still missing in transfer of off-line data between the SOs and IEMOP
5. 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.
6. 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.
7. Modify CRSS to process 15-minute metering data for those MSP's yet to reprogram their meters
8. Confirm that nodal prices correctly reflect marginal costs and adequately model transmission losses.

¹ These criteria are not ranked as in our view all the criteria would need to be satisfied before the market systems and processes could be declared ready.

9. Audit and certification of 2 remaining NMMS modules needs to be completed.
10. 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.
11. More generally, DR failover documentation should be modified into broader document(s) that includes related IEMOP process (e.g., communication with market participants about IT changes).
12. Some Market Manuals still require revision and approval by RCC and DOE (see 6.Appendix C:)
13. 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).
14. Follow up training to market participants.
15. ERC approval of Price Determination Methodology (PDM).
16. 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.

In our view, the matters listed above should all be addressed before go-live. As discussed in the body of the report, we identify an additional 12 issues that should be tackled soon after enhanced market commencement.

As part of our market readiness support work, we advised on the formation of a Steering Committee and readiness workstreams to take ownership of addressing remaining 'go-live' issues. The readiness workstreams overseen by the Steering Committee are:

1. MO system Readiness:
 - a. NMMS system readiness
 - b. CRSS system readiness
 - c. MO process readiness
2. SO Readiness
3. MSP and Customer Readiness
4. Mindanao Participation
5. PDM approval
6. Co-optimization energy and reserves
7. Generation Readiness

Each of these workstreams has a 'champion' who sits on the Steering Committee, and the Steering Committee has been monitoring an overall project plan. We recommend that 16 issues we list above continue to be progressed by the Steering Committee until resolved.

1. Introduction

1.1 Market readiness

The Philippine Electricity Market Corporation (PEMC) is overseeing an assessment of market readiness for an enhanced design and operation of the Wholesale Electricity Spot Market (WESM) in Luzon and Visayas, and the introduction of WESM in Mindanao. PEMC's program in preparation for the market changes includes a Parallel Operation (POP) of the new Market Management System (NMMS) for the dispatch scheduling and pricing of energy and reserves, and the Central Registration and Settlement System (CRSS) to integrate registration and settlement for the wholesale and retail markets.

We were commissioned by PEMC to:

- conduct an assessment of the readiness of the systems, awareness, manpower, and processes of the Independent Electricity Market Operator (IEMOP), the System Operators (SO), PEMC, Metering Service Providers (MSPs), and Market Participants
- to supervise the conduct of parallel operations by the IEMOP
- report to the PEM Audit Committee (PAC) and PEMC on the conduct of the parallel operations and readiness assessment.

This report sets out our findings on the readiness of market systems and processes to implement the new enhanced market for Luzon and Visayas. We report separately on the readiness of market systems and processes to roll out WESM in Mindanao.

We structure our report into sections as follows:

- this introduction section outlines our role and our approach to fulfilling our brief
- section 2 describes the parallel operations
- section 3 sets out our assessment of the parallel operations against the agreed assessment criteria and identifies matters yet to be resolved
- section 4 provides our assessment of market readiness of IEMOP, the SOs, PEMC, MSPs, and Market Participants
- section 5 discusses the issues that need to be managed to achieve market readiness.

1.2 Our approach

On 1 April, we provided PEMC with draft market readiness criteria and workshop questionnaires for discussion with stakeholders during market participant workshops in Cagayan de Oro during the week of 8 April 2019. The criteria were amended to take in the responses from market participants and other key stakeholders. In our report titled ***Market Readiness Criteria and Initial Assessment ahead of Parallel Operations***, dated 16 April 2019, we:

- Provided our proposed assessment criteria for market preparedness ahead of the enhanced WESM (Luzon and Visayas) and introduction of WESM (Mindanao). These criteria have been applied during Parallel Operations.
- Provided an initial view of readiness for the enhanced WESM and its introduction in Mindanao informed by feedback from the workshops and initial questionnaires sent to stakeholders.

The assessment criteria set out in our 16 April report forms the basis of our assessment of market readiness during parallel operations. As anticipated in that 16 April report, some minor refinements were made to some criteria during the period of parallel operations to improve their effectiveness as measures of readiness.

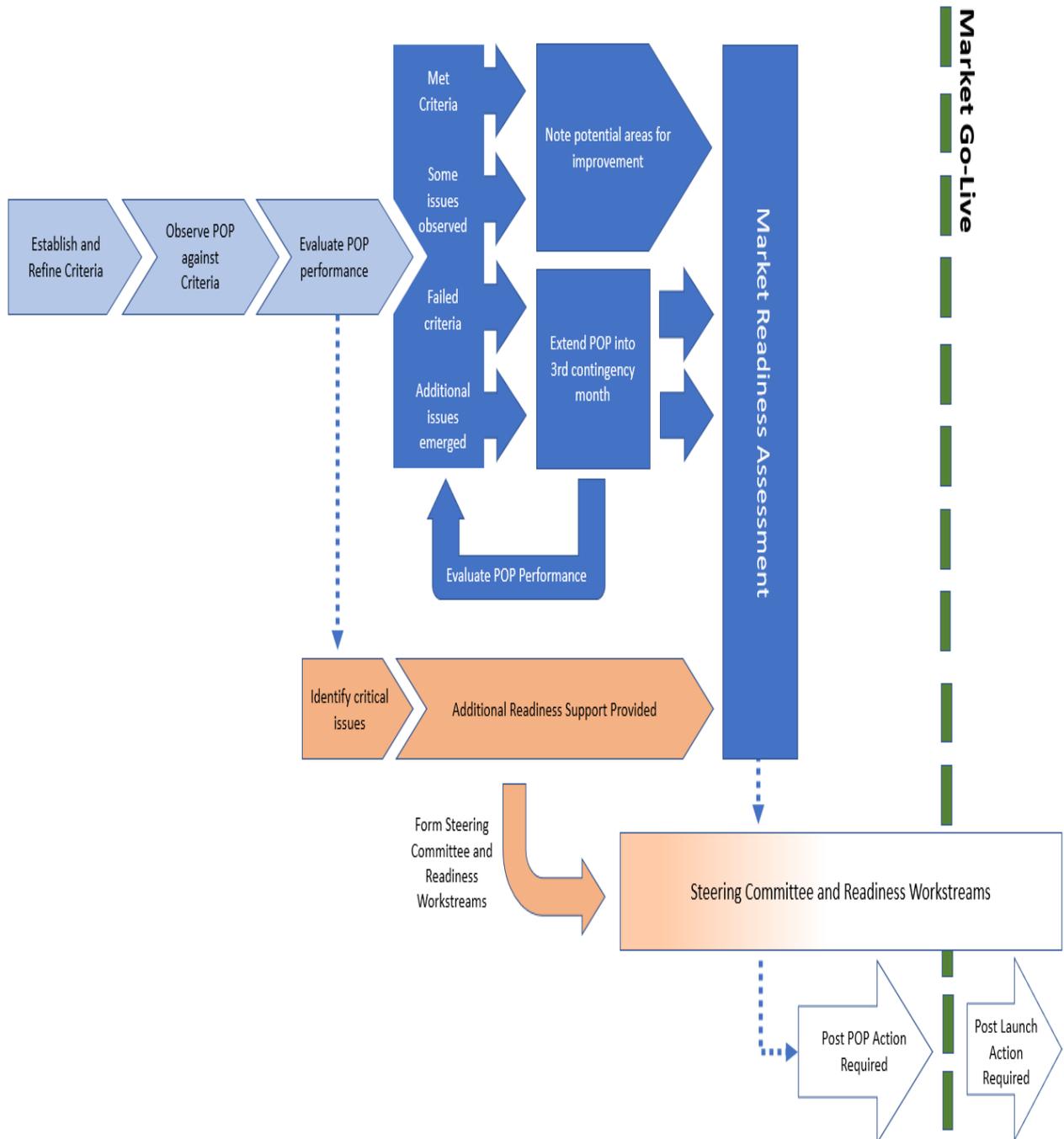
As discussed in our initial reports, we assess whether the market is ready for the changes “as a whole”. That is, there may be individual criteria that are not met or are met weakly, without undermining the readiness of the market for the changes. In particular, we do not want to impose individual requirements and standards on IEMOP for evaluating market readiness that are more onerous than the standards currently used to monitor their performance in the current WESM design.

During parallel operations, where we identified situations that meant assessment criteria were not being met, we made recommendations to address those situations. We assessed whether any identified shortcomings had the potential to be ‘show-stoppers’, in the sense that they would undermine a finding that the market was sufficiently ready to proceed. We raised such issues immediately with PEMC as “go live” conditions. In this report, we advise on whether all “go live” conditions have been resolved sufficiently to enable the new market arrangements to commence; where we consider the conditions have not been met, we provide recommendations for how the unresolved issues might be addressed.

Our report reflects the information provided to us as at the date of writing, 24 July 2019. We recognise that some issues are being addressed as we write; our report is necessarily limited to reporting on the state of readiness as at 24 July.

Our overall approach to Market Readiness Assessment has been as follows:

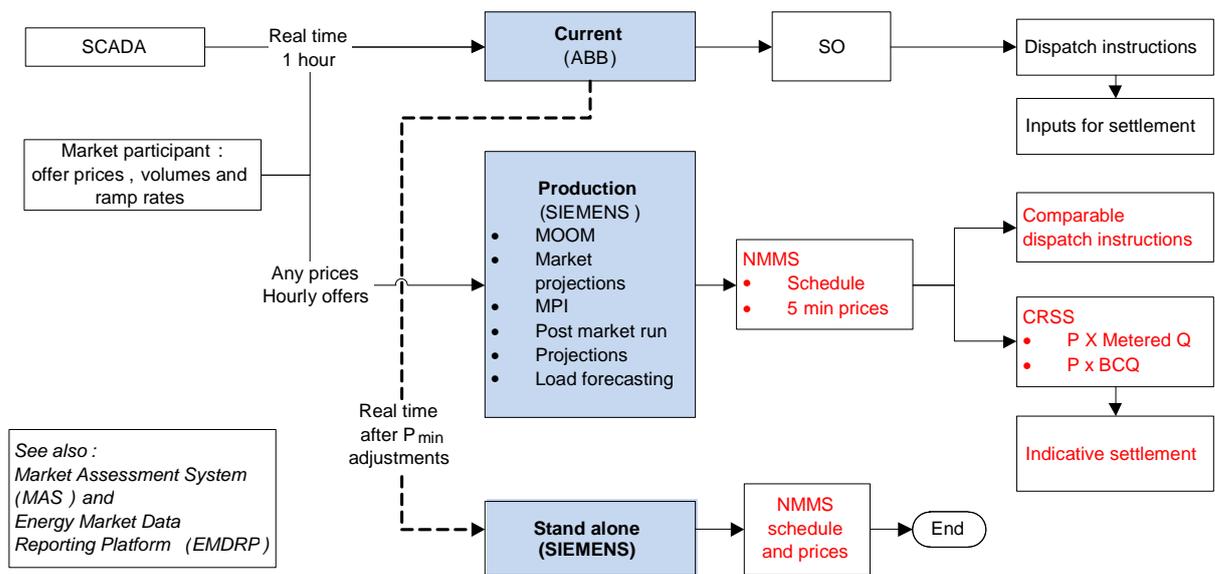
Figure 1: Sapere Market Readiness Assessment Approach



2. Parallel Operations

Parallel operations (POP) tests the operational functionality of the NMMS, CRSS and EMDRP; that is, from **bid to bill**. It aims to assess the working of the systems from the point of taking up participant bids through the creation of dispatch instructions, the publication of prices and to the composition of resulting settlements. Figure 2 below shows the data flows from bid to 5-minute dispatch instructions and bills for 5-minute operations. A distinction is drawn between the production model of NMMS and the standalone model compared with the current MMS and settlement platform.

Figure 2: Simplified parallel operations schematic compared with current operations



Note: The above is a simplified representation of the POP environment. More accurate representations were developed and used during our POP engagement. These are shown in Appendix A: and Appendix B:.

During parallel operations, generators were asked to input into the new Siemens system the same bids as they enter into the current ABB system. It was intended that dispatch instructions from the NMMS be:

- sent to generators (where they could assess how they could have complied with 5-minute dispatch instructions)
- sent to the System Operator (where the System Operators for each of Luzon, Visayas and Mindanao could apply their real-time security tools to assess how comfortable they would have been had these instructions been used for dispatch)
- inputs to the CRSS system (where participants can upload BCQ quantities and observe the settlement statements that would have resulted).

To the extent that all generators did not match their live market bids into the Parallel Operations system this would have created a deviation that would impact the reliability of comparing dispatch instructions and prices under the two parallel scenarios (existing and new systems). To counter this concern, IEMOP implemented a stand-alone NMMS system that directly replicated the bids from the current ABB system to produce dispatch instructions and prices. This allowed near-comparable

dispatch instructions to be produced (at 5-minute intervals) and a more reliable comparison of prices under the old and new parallel scenarios.

Before POP began we advised IEMOP to:

- Move monthly co-ordination meetings with the SO to weekly during the period of parallel operations.
- (Re)send out market readiness guides to each participant with a checklist of what they needed to have in place to participate in the parallel operations.
- Call each participant to run through the above checklist and help close any outstanding matters.
- Advise on the availability of 24x7 helpdesk support.
- Extend their contact list for market advisories to include all participants who attended our stakeholder workshops.
- Urgently trouble-shoot market system connectivity issues raised.
- Accept the support offered by MinDA to encourage Mindanao stakeholders to participate in parallel operations.

We also advised PEMC to:

- Support IEMOP through reinforcing key messaging to stakeholders.
- Clarify the situation with reserve co-optimisation to Market Participants as soon as possible to remove this uncertainty (and remove the potential excuse for participants to delay their readiness).
- Confirm compliance approach during parallel operations (i.e. no requirement to comply with 5-minute despatch instructions) and also clarify compliance approach when enhanced market is launched (i.e. initial focus on education to ensure all participants are afforded every opportunity to comply before further action is taken).
- Co-ordinate with ERC and DOE to ensure all necessary market governance documents are approved (e.g. PDM) or where delays are likely (e.g. grid code) that interim clarity is provided (e.g. through DOE departmental circulars).

The above actions were intended to help maximise the value of POP.

3. Assessment of POP against criteria

3.1 IEMOP System Performance

We tracked IEMOP System Performance from the start of POP to the end of week 12 (18 July 2019). The charts below show the weekly results, for the period over which information was provided. In the tables following the charts, we assess performance against the assessment criteria:

Figure 3: System Availability

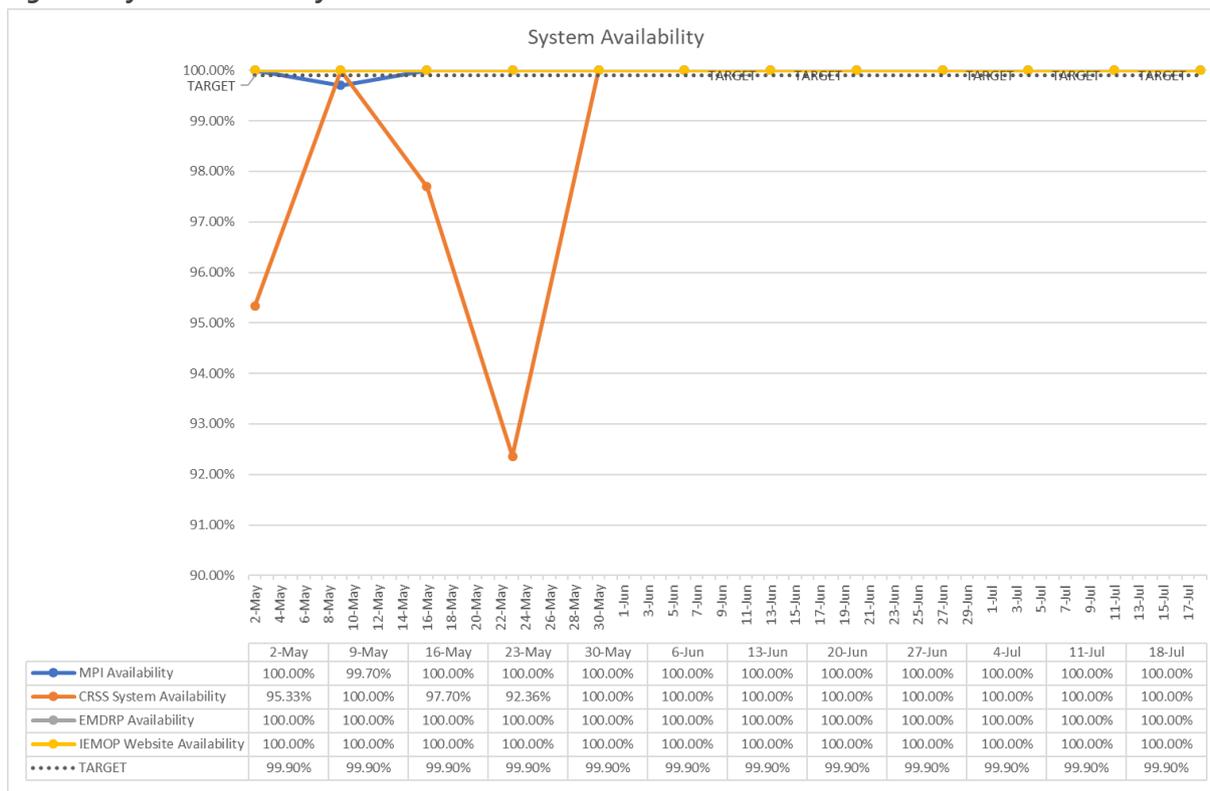


Figure 4: Completeness of Market Runs (Weekly Averages)

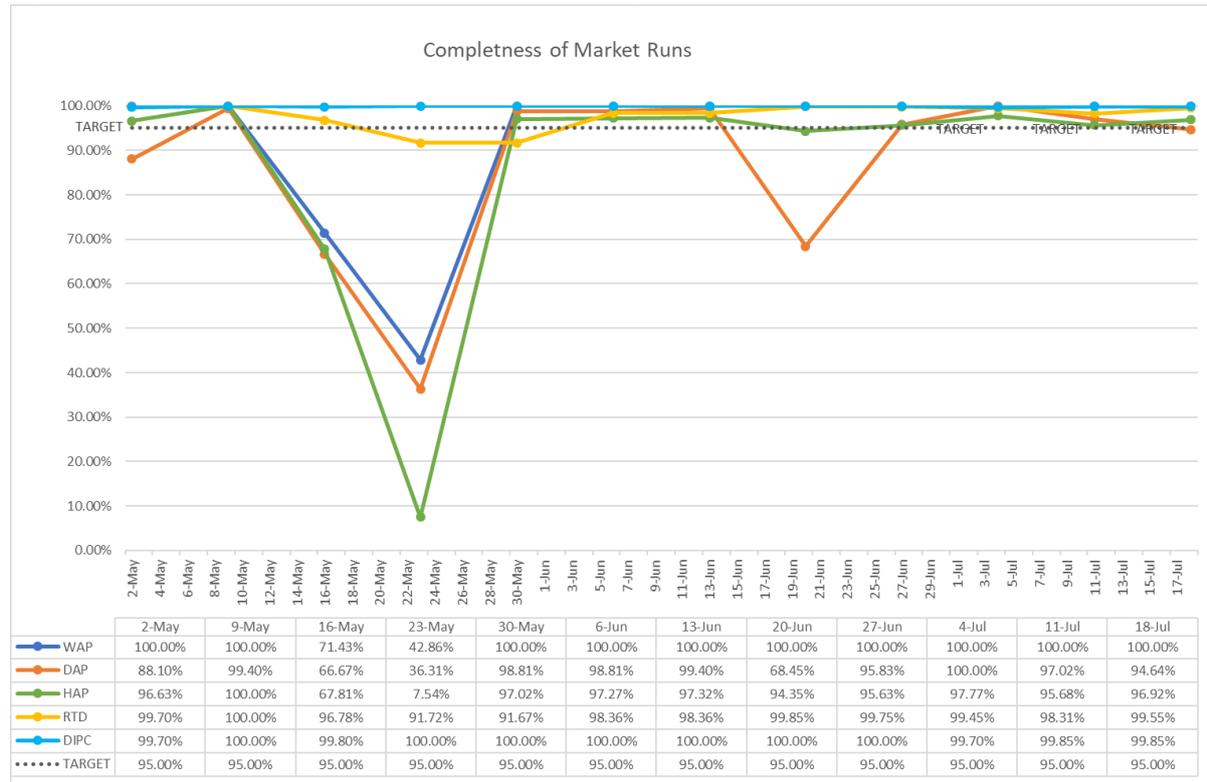


Figure 5: Timeliness of Market Run Publication (Weekly Averages)

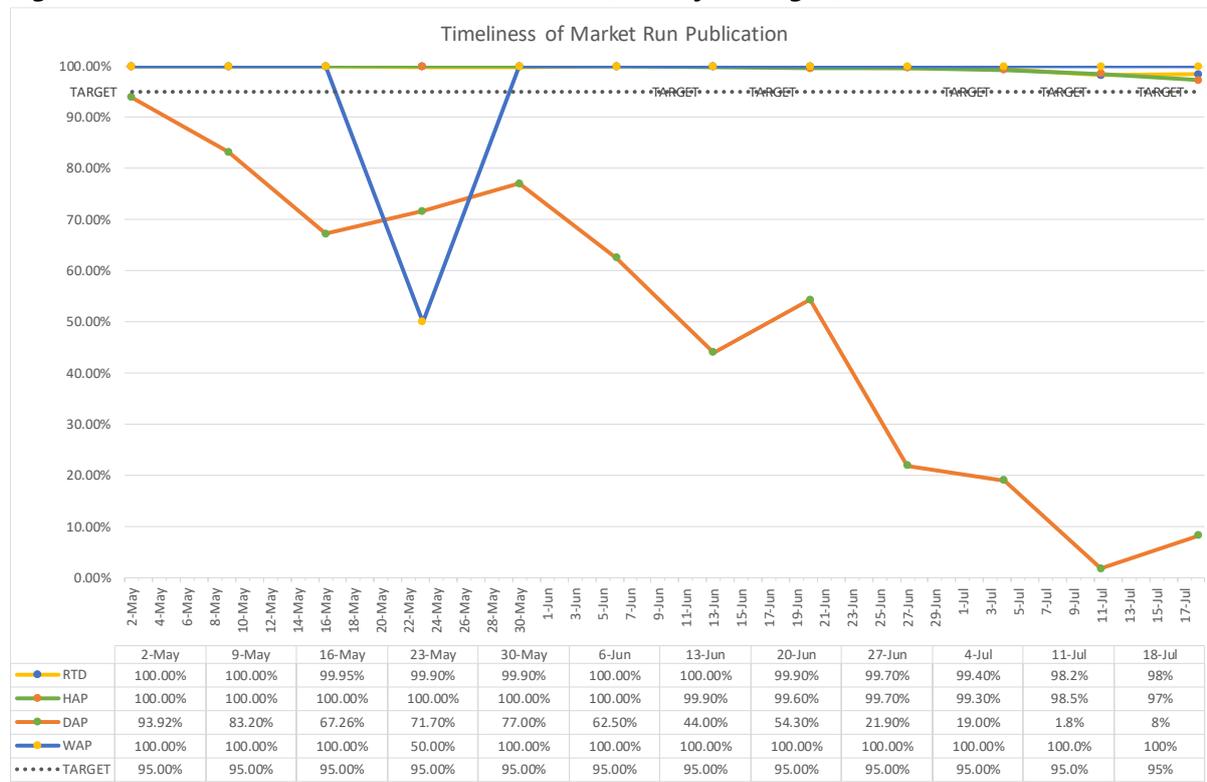


Figure 6: RTD Mean Absolute Percentage Error

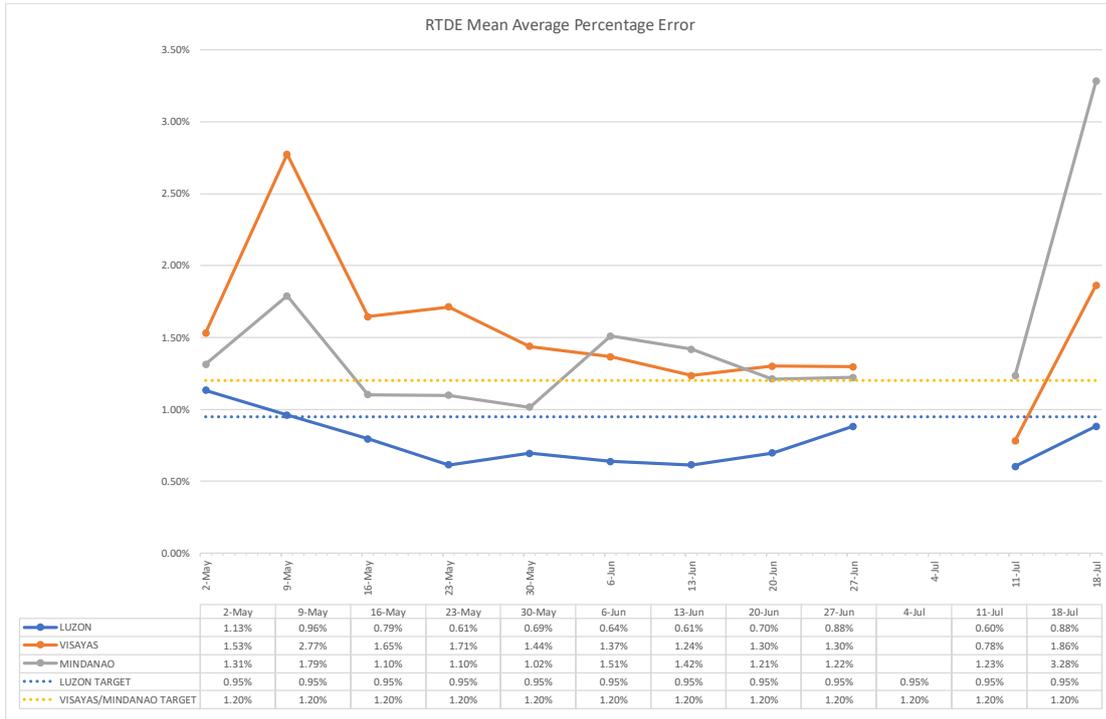
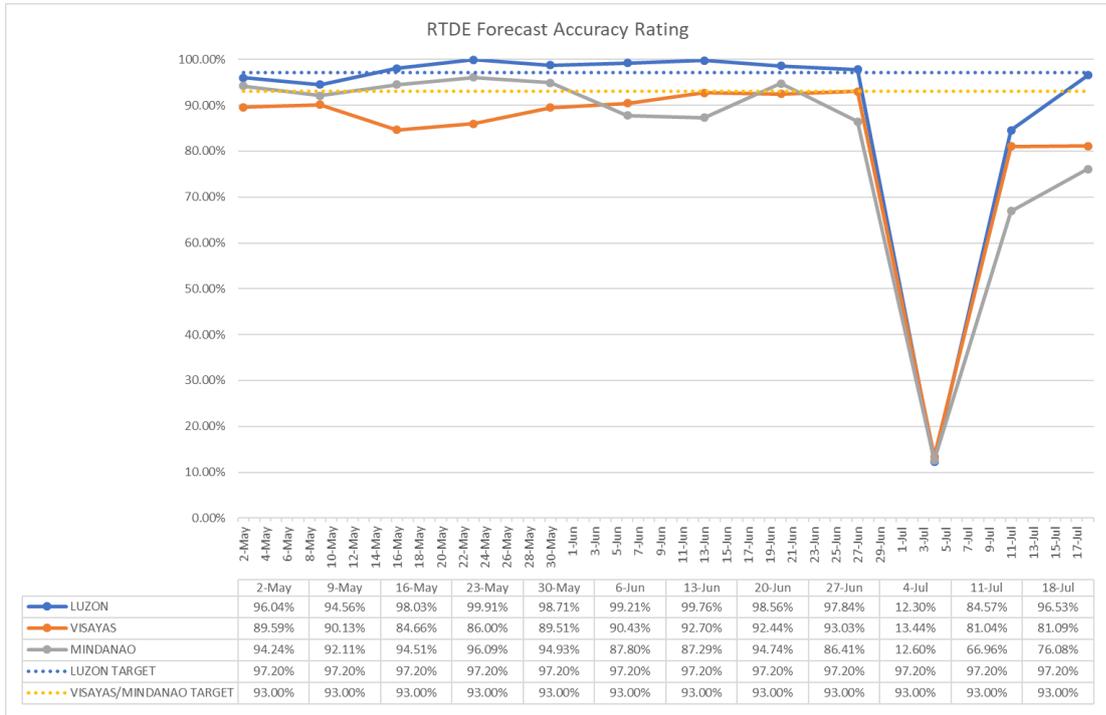


Figure 7: RTD Forecast Accuracy Rating²



² No accuracy figures were provided during week 10. IEMOP advises that this was due to their deletion of the historic demand database. We are unsure why this was necessary and what underlying performance issues were masked as a result

Criteria	POP Performance
<p>a. 100% achievement of operational performance targets, such as:</p> <ul style="list-style-type: none"> • 99.90% system availability of a fully functional and responsive NMMS, EMDRP and CRSS. • 99.50% availability of a fully functional and responsive IEMOP website • NOTE: subject to exemptions, consider current MOPs for parallel ops • 95% timeliness of publications in the MMS Market Participant Interface (MPI) and IEMOP website, as follows, among others: <ol style="list-style-type: none"> 1. real-time dispatch (RTD) 2. hour-ahead projection (HAP) 3. day-ahead projection (DAP) with sensitivities 4. week-ahead projection (WAP) 5. Dispatch Interval Pricing (DIPC) 	<ul style="list-style-type: none"> • System availability for the NMMS, EMDRP and CRSS exceeded operational performance targets. • IEMOP website availability exceeded availability targets, at 100%. • Timeliness of publication of Market Runs exceeded operational performance standards for the RTD, HAP, WAP and DIPC processes. • Timeliness of the DAP projections was significantly lower than target, however we do not consider this a critical issue for market start, though we are concerned that the deteriorating trend in timeliness remains undiagnosed. • Performance of market runs have been impacted by performance tuning and functionality tests being performed in the POP environment by the Market Operator.
<ul style="list-style-type: none"> • RTD mean absolute percentage error (MAPE) <ol style="list-style-type: none"> 1. Luzon: 0.95% 6. Visayas: 1.20% 7. Mindanao: 1.20% • RTD forecast accuracy rating (FAR) <ol style="list-style-type: none"> 2. Luzon: 97.20% 8. Visayas: 93% 9. Mindanao: 93% 	<ul style="list-style-type: none"> • RTD mean absolute percentage error for Luzon has exceeded target, however Visayas and Mindanao did not meet operational targets. • RTD forecast accuracy rate for Luzon and Mindanao has exceeded targets, however Visayas has not met operational targets. • Following a review with IEMOP in the first week of POP, we agreed to remove the performance criteria relating to the DAP MAPE and focus on RTD.

Criteria	POP Performance
<ul style="list-style-type: none"> DAP MAPE <ul style="list-style-type: none"> 3. Luzon: 1.60% 10. Visayas: 2.20% 11. Mindanao: 2.20% 	
<ul style="list-style-type: none"> 99.75% RTD workflow successful run 	<ul style="list-style-type: none"> Following a review with IEMOP in the first week of POP, we agreed to remove this performance criteria as the RTD workflow will be measured by the success and timeliness of the RTD market run.
<ul style="list-style-type: none"> 99.75% Post-market run calculation successful run 	<ul style="list-style-type: none"> Following a review with IEMOP in the first week of POP, we agreed to remove this performance criteria as this will be measured by the success and timeliness of the Dispatch Interval Pricing Calculation (DIPC).
<ul style="list-style-type: none"> 4 market interventions attributable to the MO 	<ul style="list-style-type: none"> Following a review with IEMOP in the first week of POP, we agreed to remove this performance criteria because market interventions only relate to live production systems.
<ul style="list-style-type: none"> 98% timeliness of settlement statements for prelim and final statements 	<ul style="list-style-type: none"> The original May settlement run failed to meet the operational performance targets due to system issues. The May settlement was completed on 4 July to the satisfaction of the MRSC (we did not directly check this highly delayed settlement process for May which clearly failed to meet timeliness requirements). The June settlement was completed to the satisfaction of the MRSC. We do not have further information on whether this run was completed within normal operating parameters or whether multiple forced re-reruns were required as was the case with the May process. We are thus left to conclude that the settlements statements failed to meet operational performance standards.
<p>b. IT performance parameters:</p> <ul style="list-style-type: none"> Successful conduct of switch-over from main site to back-up site and vice-versa, without major or critical issues and within 	<ul style="list-style-type: none"> Failover of NMMS, CRSS and EMDRP were successfully completed in the third month.

Criteria	POP Performance
agreed timeframes. This includes the NMMS, CRSS, and electricity market database and reporting platform (EMDRP)	
<ul style="list-style-type: none"> Compliance to the required performance targets identified under section 10.1.2 of the Business Requirements Document (BRD) 	<ul style="list-style-type: none"> Following a review with IEMOP in the first week of POP, we agreed to remove these performance criteria as system performance will be measured by timeliness of the RTD and market projections.
<p>c. Monitoring of market dispatch optimization model (MDOM) losses</p> <ul style="list-style-type: none"> Review and sanity check instances of significant price differences between the existing ABB MMS and the Siemens NMMS Review and sanity check constraint violation incidents, detailing the differences between the ABB MMS and the Siemens NMMS Review and sanity difference between RTD losses in the NMMS optimisation model and the power flow model of the NMMS 	<ul style="list-style-type: none"> IEMOP provided reviews as per these criteria in their weekly reports. IEMOP provided graphical comparisons of the ABB and Siemens's systems prices using the same inputs in each of their weekly reports for weeks 5 - 9. Where significant differences arose, they provided reasons for this. Similarly, IEMOP compare the pricing errors for both the ABS MMS and the Siemens NMMS and provide graphical comparisons on the raw and corrected prices. Where significant differences arose, they provided reasons. In their weekly reports, IEMOP provide a comprehensive explanation of the sensitivity check on loss oscillations and the use of the AC or DC power flow model for Network Analysis. Where problems are indicated IEMOP investigates further and gives reasons.

Unresolved issues (IEMOP System Performance)

Issue	Comments and Impact	Recommendation
1	DAP publication performance did not meet operational performance targets	DAP projection performance either needs to be improved through performance tuning and/or the operational performance targets for DAP relaxed by agreement with PEMC. Dispatch Protocols will need be aligned accordingly.
2	RTD MAPE levels for Visayas and Mindanao did not meet operational targets	IEMOP to investigate and put in actions to improve RTD MAPE levels for Visayas and Mindanao, and RTD FAR levels for Visayas.

Issue	Comments and Impact	Recommendation
		Remediation should include:
3	RTD FAR levels for Visayas did not meet operational targets	a) working with the SO to eliminate missed real-time SCADA feeds; b) working with the SO to converge solutions for missing SCADA data in the state estimator and reintroduce; c) patches have been implemented to address the missing data but performance remains an issue.
4	Two critical CRSS system bugs are outstanding	IEMOP to test bug fixes (introduced to correctly match all meter points to participants, and to optimise calculations to prevent batch runs from exceeding system timing-out settings)and confirm that the settlement runs can be completed within normal operating parameters (i.e. without multiple forced re-runs).
5	IEMOP are yet to conduct a successful Settlements run within operational performance targets	Based on feedback from the MRSC settlement runs have been completed for May and June. The May run was delayed by a month and we have not been provided with sufficient information to verify whether the June run was completed within normal operating parameters and within market rules required timeliness requirements.
6	Implementable RTD schedules have not been produced, which means SOs have not yet been able to commence a security analysis of 5-minute dispatch; and generators have not yet been able to assess the feasibility of dispatching at 5-minute intervals	Based on feedback from the MRSC RTD schedules appear to be sufficiently implementable that security assessments have begun with the SO. However, there still seems to be many periods occurring without implementable dispatch schedules.
7	Interface reliability with the SOs following a) their transfer to new systems (eDNA), and b) using the new IEMOP webservices.	IEMOP to stabilise their systems and interfaces with the SOs.
8	Delay in establishing transfer of off-line data between the Luzon and Visayas SO and IEMOP (relating to HVDC data)	SO to support with: a) full and stable migration to eDNA; b) submission of HVDC offline data.
9	Nodal prices may not be correctly reflecting marginal costs and not adequately modelling transmission losses. During POP SCDO-NA observations failed to optimally solve within the parameters agreed between IEMOP and IES. This issue	IEMOP are providing more detail on loss oscillation in their weekly reports for MRSC consideration. If the MRSC have concerns, then the issue may have to be escalated to PAC for their review in consideration of the earlier

Issue	Comments and Impact	Recommendation
	<p>was identified by IES - "In conclusion, for this test case MDOM is not producing the nodal prices that correctly reflect marginal costs and it is not adequately modelling transmission losses. Further, we have found in other test cases where the modelling of losses has been an issue MDOM's dispatches can be suboptimal. Whether this will be a material problem in practice we are not sure, though we suspect the MDOM may be at risk of not accurately finding the optimal solution at times."</p>	<p>IES audit observations. It is not within our scope to advise on this matter further.</p>

3.2 IEMOP Processes

Criteria	POP Performance
<p>1. NMMS and CRSS have been fully certified to be compliant to Market Rules by independent third-party auditors</p>	<ul style="list-style-type: none"> • 2 out of 5 modules have been audited by IES. The remaining 3 are scheduled for audit 1 year after deployment. The audited and unaudited modules are as follows: <ol style="list-style-type: none"> 1. Settlement (audited) 2. Metering (audited) 3. Registration 4. Prudential requirements 5. Data exchange • 8 Modules exist in the NMMS. 5 modules have been audited and certified (MDOM, MPI, MOAR, PMRC and MPS) • 2 further NMMS modules are undergoing audit (CMON and Forecast) but this has yet to be completed. Certificates are yet to be issued. • The final NMMS module, FTR, will not be audited at this stage as FTR is not intended to be implemented into WESM at this time.

Criteria	POP Performance
	<ul style="list-style-type: none"> We raised the additional consideration of whether the original audit certificates remain valid given that there have been a number of system modifications since they were issued. PAC has since reviewed the list of enhancements and has given their decision to subject those to post-audit.
<p>2. Network links and data interfaces between MO and SO infrastructure for the main and back-up sites have been fully established and tested</p>	<ul style="list-style-type: none"> MO primary site to SO back up site tested successfully. SO are not able to test the primary site until the market is live, however IEMOP have assured us that they are confident it will work. Issue in first week with failure to auto transfer network traffic to back-up lease line upon failure of the primary line. MO has since put in automated failover across all interfaces, however this is yet to be tested. eDNA not yet used in Luzon so hasn't been tested yet. Offline data has been submitted to MO from Luzon SO and Visayas SO, although HVDC information is still missing from Visayas. Mindanao SO has not yet transferred any data.
<p>3. Data provision from the MO main and backup facilities to PEMC, DOE, SO, Market Participants, and ERC and receipt of data from these parties (where appropriate) have been fully established and tested</p>	<ul style="list-style-type: none"> PEMC are able to access MO primary facilities, however automation of data uploads is still ongoing - refer Section 4.4 (4). Market Participants and other stakeholders are able to access MO's primary systems and IEMOP website via the internet. Failovers have been performed but we are unaware of the status of testing
<p>4. Agreements with service providers (including internal IT providers) are in place with appropriate service management processes and service levels that ensure stable and uninterrupted market operations. Processes are in place to select robust providers, manage service provider relationships, monitor service levels and conduct regular reviews</p>	<ul style="list-style-type: none"> Ongoing support agreements are in place with specific service performance levels for essential service providers (hardware and applications) for the new NMMS and CRSS applications, hardware and network equipment.
<p>5. Business processes to implement obligations for the enhanced WESM design and operations under the Market Rules and</p>	<ul style="list-style-type: none"> 26 Market Manuals have been sited.

Criteria	POP Performance
Manuals and contingency plans have been documented and approved. Processes are robust, are understood, are being followed and a mechanism for review and updating is present.	<ul style="list-style-type: none"> WESM Manual - Forecast Accuracy (VRE) is subject to PEM Board approval. WESM Manual - Significant Variations – awaiting DOE approval. Further 5 Manuals awaiting DOE Approval—see Appendix C Internal Business Processes (IBPs) are being written by IEMOP but have not yet been made available.
6. Disaster Recovery and Business Continuity plans are in place, are suitably robust, have been tested, with results documented.	<ul style="list-style-type: none"> BCP documentation is comprehensive, has been recently reviewed/updated and a BCP officer is in place. DR failover documentation received from IEMOP, which is technically focussed and generally acceptable. Further work required to include IEMOP processes within documents, including communication plans with Market Participants. Further DR documentation required for the CRSS application.
7. All key operations staff are in place, are aware of new business processes and procedures.	<ul style="list-style-type: none"> Staff are in place including an additional 4 headcount approved for the new arrangements. Most staff are still fully occupied with operating the live market and will not be experienced in new market arrangements.
8. An appropriate culture for rule compliance is present.	<ul style="list-style-type: none"> IEMOP has a track record (currently and as part of PEMC) of complying with rule obligations and performance standards (MOPS).
9. Key person risk has been identified and is being managed, appropriate training and succession planning is in place.	<ul style="list-style-type: none"> We have noted during our time on site for POP that knowledge of the new NMMS and CRSS systems is currently concentrated around a few individuals.

Unresolved issues (IEMOP Processes)

Issue	Comments and Impact	Recommendation
1	Audit and certification of 2 remaining NMMS modules needs to be completed. PAC have approved draft reports for the two modules. IES needs to issue software certification and final reports need to be approved by PAC. This needs to be completed before market go-live	Complete process already underway.

Issue	Comments and Impact	Recommendation
2	<p>Since the NMMS and CRSS systems were certified a number of subsequent changes have been introduced. These have been:</p> <ul style="list-style-type: none"> • SCADA bypass of state estimator • Adding pricing zone for Mindanao • RTD failover to HAP • CRSS acceptance of 15-minute meter data (and using ÷3) • Net Settlement Surplus (reflecting ERC decision to allocate only to customers – the prior system audit used the NSS methodology contained in the PDM application) • 2 settlement bug fixes (mapping all meters to participants, optimizing code to stop batch calculation time-outs) <p>Confirmation is required that the audit certification of core NMMS and CRSS systems remain valid following these subsequent production system changes made by IEMOP (e.g. patches and bug fixes). In the absence of confirmation, a supplemental audit should be conducted, and systems re-certified.</p>	<p>We note that after raising our concerns with IEMOP and PAC members that IEMOP has brought a paper to the PAC to explain the post audit changes they have made.</p> <p>PAC has since reviewed the list of enhancements and has given their decision to subject those to post-audit.</p>
4	<p>Some Market Manuals still require revision and approval (by RCC and DOE). These need to be approved before market go-live. Internal Business Processes still need to be completed. While not go-live critical they should be completed as soon as possible to assist staff training, key person management and guide staff compliance.</p>	<p>Follow up with RCC on revisions and DOE on approval. Complete internal business processes.</p>
5	<p>DR failover documentation and subsequent testing of DR processes</p>	<p>IEMOP has conducted a DR failover and failback exercise. We were not able to review the scope or results from DR testing within the POP period</p>
6	<p>Key person risk exists presently with knowledge of the new NMMS and CRSS systems currently concentrated around a few individuals.</p>	<p>As the new arrangements become operational, thereby replacing the current ABB based markets, we expect that this will largely alleviate key person risk present at this transitional stage. Further staff training should be undertaken, such as in conjunction with the request by PEMC for IEMOP to supply non-technical training on the new WESM arrangements.</p>

3.3 System Operations

Criteria	POP Performance
<p>1. Data provision from the SO main and backup facilities to IEMOP and receipt of data from IEMOP have been fully established and tested</p>	<ul style="list-style-type: none"> There have been numerous problems with the data provision from SO main and backup facilities to IEMOP. Problems have occurred both at the SO end and IEMOP's end of the system.
<p>a) Supervisory Control and Data Acquisition (SCADA) data completeness and quality are within acceptable levels</p>	<ul style="list-style-type: none"> The SCADA data is complete and accurate as designed. For most of POP, and our market readiness assessment, meaningful dispatch schedules were not produced and the market systems were not stable. We were concerned that gaps and problems may be discovered during live testing. As the SO and IEMOP have embarked on a period of explicitly assessing the SO's ability to coordinate security we are comfortable that any SCADA data problems would have been identified and addressed.
<p>b) Capability and processes to update off-line data (e.g. security limits, outage, contingency list) to the NMMS is in place</p> <p>i) Business processes in place to consider:</p> <ul style="list-style-type: none"> co-optimised reserve and speed to respond to 5-minute dispatch and emergencies in the setting of security limits, or speed to issue non-optimised dispatch instructions for reserve to respond to 5-minute dispatch and emergencies, with the appropriate setting of security limits for optimal energy dispatch. <p>ii) Security review of the Mindanao power system to assess contingencies and security limits for the start of new WESM rules</p>	<ul style="list-style-type: none"> There have been problems in providing this data during POP from Visayas SO. Luzon and Visayas are now providing regular off-line data except for the HVDC (Visayas). It is critical that the SO is able to assess its ability to securely manage the network under the new rules. Security assessments are proceeding but the reliability of schedules is still an issue. The SO is yet to sign off on its ability to coordinate security. Ancillary service providers to the SO need to either arm/disarm frequency response characteristics or activate/deactivate Automatic Generator Control (AGC) to provide primary or secondary reserve. Currently these services are provided on an hourly dispatch planned a day ahead. Neither the SO nor the generators have tested these facilities for arming/disarming/activating/deactivating every 5 minutes. As such, the market is not ready for 5-minute reserve dispatch. We understand that the SO will not prepare for 5-minute reserve dispatch until the issue of energy/reserve co-optimisation in the Price Determination Methodology (PDM) has been settled.
<p>2. Receipt and processing of market results data (i.e. WAP, DAP, HAP, RTD, MOT files).</p>	<ul style="list-style-type: none"> SO is working with IEMOP to review the quality of market results and perform security assessments.

Criteria	POP Performance
3. Agreements with service providers (including internal IT service providers) are in place with appropriate service management processes and service levels that ensure stable and uninterrupted system operations. Processes are in place to select robust providers, manage service provider relationships, monitor service levels and conducting regular reviews	<ul style="list-style-type: none"> In discussions with the SO, the only two service provider relationships that seemed critical for market readiness were with the supplier of the new SCADA/EMS system and the supplier of the data links between SO and IEMOP. Both sets of arrangements were declared adequate by the SO. We note the SCADA/EMS provider has an agreement to respond to any modifications to the new system to meet the enhanced WESM requirements from April 2019 to April 2020.
4. Data provision from the SO main and backup facilities to PEMC have been fully established and tested	<ul style="list-style-type: none"> In discussion with SO it was identified that there is no critical operational requirement for data transfer between SOs and PEMC.
5. Business processes to implement obligations for the enhanced WESM design and operations under the Market Rules and Manuals have been documented and approved	<ul style="list-style-type: none"> Business process cannot be completed until SO has evaluated and modified its procedures to manage security.

Unresolved issues (System Operations)

Issue	Comments and Impact	Recommendation
1	SOs have not signed off on secure operation under the enhanced WESM - until the SOs have signed off on their ability to manage security under the enhanced WESM arrangements the SOs are not ready. This is a critical issue for market readiness and the enhanced WESM should not go-live until SO sign off has been secured.	The SO is assessing its ability to manage security. Communications with the SO should continue at Steering Group, management and operations levels to quickly address any issues that arise while security is being assessed.
2	The market is not ready for 5-minute reserve dispatch - until an end to end test (from NMMS to SO to all ancillary service providers) has been completed on the reliable arming/disarming of frequency characteristics and/or activation/deactivation of AGC at 5-minute resolution then the market is not ready for 5-minute reserve dispatch.	Settle the issue of energy/reserve co-optimisation. If a decision is made to proceed with co-optimisation, IEMOP and SO should jointly manage project to test 5-minute reserve dispatch.

3	Co-optimisation uncertainty - this issue must be settled before the issue of 5-minute reserve dispatch can be addressed.	Covered under co-optimisation section - refer Section 3.7.
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3.4 PEMC

Criteria	POP Performance
<p>1. Agreements with service providers (including internal IT service providers) are in place with appropriate service management processes and service levels that ensure stable and uninterrupted operations</p>	<ul style="list-style-type: none"> The principle service provider to PEMC market governance operations is IEMOP. These services are provided for in the Operations Agreement between PEMC and IEMOP (see point 3 below). For other essential external providers (hardware and applications) we note that ongoing support agreements are in place.
<p>2. Attendance to trainings on the enhanced WESM design and operations, including the revised Market Rules and Manuals</p>	<ul style="list-style-type: none"> In our interviews with PEMC Managers we were advised that IEMOP will be asked to conduct general training for PEMC non-technical people on the new WESM design. This training will then be assessed by PEMC and then rolled out to the market. To our knowledge this has yet to take place.
<p>3. Service levels agreements for IT systems are in place for market monitoring, assessment, and compliance monitoring of 5-minute dispatch interval and are met</p>	<ul style="list-style-type: none"> One of the key service providers to PEMC is IEMOP (e.g. automated data downloads for the compliance software). While an Operations Agreement between PEMC and IEMOP is in place the intended specific annexes to the agreement have yet to be developed. These annexes are intended to outline the specific services required and the required performance standards.
<p>4. Network links and data interfaces between MO and PEMC infrastructure for the main and back-up sites of the electricity market database (EMDB) have been fully established and tested</p>	<ul style="list-style-type: none"> Interfaces between PEMC and IEMOP are not real-time critical for the enhanced WESM. A delayed feed is required to populate to the compliance software. CPEMS (the compliance monitoring tool used by PEMC) is dependent on the inputs coming from NMMS-Compliance Monitoring Module (CMON). CMON provides for the initial flagging of probable breach, while CPEMS would facilitate a more comprehensive assessment of non-compliances and a determination of the breach, as well as, the penalty to be imposed. We understand that this feed is operational but is not yet fully automated i.e. we understand PEMC are still required to manually upload the data into their systems.

Criteria	POP Performance
5. Market rules and manuals for the enhanced WESM design and operations are approved by the DOE and ERC, as applicable	<ul style="list-style-type: none"> • Amended market rules and manuals have been fully developed for the enhanced market. DOE have yet to approve all manuals – refer Section 4.2 (5). • However, the ERC are yet to approve the Price Determination Methodology (PDM). This is covered in Section 3.7.
6. Business processes to implement obligations for the enhanced WESM design and operations under the Market Rules and Manuals have been documented and approved	<ul style="list-style-type: none"> • The core PEMC governance teams, MAG, ECO, CPC are drafting internal business processes. This was planned to be completed by the end of June but to our knowledge is still underway.
7. Participants have been provided training on new market rule obligations	<ul style="list-style-type: none"> • Compliance to the new 5-minute arrangements were not part of POP (as parallel dispatch was not binding). However, training schedules have been developed to help ensure generators in Luzon, Visayas and Mindanao are aware of their new obligations under the enhanced market design. Planned rollout over August and September is planned as follows: <ul style="list-style-type: none"> ○ Concepts (new rules on compliance monitoring of offered capacity compliance and dispatch conformance standards) ○ Hands-on training on CPEMS (the compliance monitoring and reporting software). • We also note that a 'grace' period will be introduced for the initial post go-live period to assist generators to become fully familiar with how to comply with new arrangements.
8. Market assessment procedures and tools have been updated accordingly. Plans to manage additional case load are in place (we would recommend that an initial shift in focus towards participant education be applied while participants become accustomed to new rule compliance obligations)	<ul style="list-style-type: none"> • In respect of new market monitoring, assessment, and compliance monitoring systems for 5-minute dispatch intervals are in place, and staff have been handling data in MySQL since March. • For Market Monitoring and Assessment System this required: <ul style="list-style-type: none"> ○ Real-time Market Monitoring – new development ○ Post-monitoring and analysis – reconfiguration from 1-hour to 5-minute resolution • For Compliance Monitoring: <ul style="list-style-type: none"> ○ Compliance Post-Evaluation Monitoring Systems (CPEMS) – new development.

Criteria	POP Performance
	<ul style="list-style-type: none"> In the development of the tool (CPMS), PEMC already considers the new sets of data under the 5-minute dispatch interval regime. To manage the additional case load, ECO formed a cluster or group of accounts which will be handled by each ECO personnel in charge with the monitoring. PEMC included in its annual plan a continuing education or orientation regarding the new rules and systems. Particular attention is given to the potential new entrants in the WESM, i.e., Mindanao participants who are most likely not familiar yet with the compliance-related rules. We also note that a 'grace' period will be introduced for the initial post go-live period to assist generators to become fully familiar with how to comply with new arrangements.
9. Additional Criteria – Manpower	<ul style="list-style-type: none"> In our interviews with PEMC Managers and based on our multiple interactions and observations throughout POP, we have no critical manpower related issues to raise. We note that roles are well documented and that subject to budget availability there are plans to upgrade the database management system (ongoing process for full digitalisation). Core policies are present and are in the process of being updated. A number of further steps are proposed to strengthen the organisational structure but will need to be prioritised as budget is made available. These include establishing an audit and risk subcommittee and creating the role of chief risk officer. PEMC Management raised with us that there is a DOE report pending on the effectiveness of PEMC, IEMOP and WESM following the separation of PEMC last year between market governance and operation roles (thus creating IEMOP).

Unresolved issues (PEMC)

Issue	Comments and Impact	Recommendation
1	WESM Training – plans are in place for training staff in the new enhanced WESM design. Provided plans are followed there will be no adverse impact on market readiness.	Implement training plans.

Issue	Comments and Impact	Recommendation
2	Annexes to Operating Agreement – completing the annexes will help to ensure clarity of requirements between PEMC and IEMOP on inter-party services required to enable PEMC to meet their obligations under the new market arrangements (this mainly affects the compliance function). This is not critical to market go-live but the sooner it is addressed the better.	Develop Operational Agreement Annexes with IEMOP prior to market go-live.
3	Automate interface with IEMOP for compliance software data – the compliance software relies on a delayed (near real-time) feed from IEMOP systems. Manual uploads are taking place until automation is in place (as planned). This is not critical to market go-live but the sooner it is addressed the better.	Automate interface (but retain manual upload as a backup procedure).
4	DOE have yet to approve all market manuals. This is required before market go-live.	Follow up with DOE to approve Market Manuals.
5	Document business processes - documenting business processes will help to ensure that new arrangements are understood and followed (as well as being a partial mitigation of key person risk). However, this is not critical to market go-live.	Finalise documentation.
6	Participant training on new compliance requirements - plans are in place to train generators. Also, a compliance 'grace' period has been provided once new market starts. Thus, no impact in market go-live.	Implement training rollout as scheduled. Follow up on DOE approval of compliance grace period.
7	DOE report on effectiveness of PEMC/IEMOP/WESM - provided the pending DOE report does not recommend any material changes to the organisational structures or roles of PEMC and IEMOP there should be no impact on market readiness. To the extent that any further organisational change is introduced this has the potential to delay market readiness.	Advise DOE of the need for continuity in market structures during the introduction of the enhanced market arrangements and rollout of WESM to Mindanao.

3.5 Market Participants

We have received surveys and, in some cases, completed market assessment for 73 out of a total of 99 generation companies. That is a response rate of 73.7%. This includes companies 11 who have generation solely in Mindanao and 6 who have generation in Mindanao and Luzon or Visayas out of a total of 23 generators operating in Mindanao. The response rate for Mindanao generators is 65.4%

Response themes from Market Participant self-assessment of market readiness

Criteria	POP Performance
1. Agreements with service providers (including internal IT service providers) are in place with appropriate service management processes and service levels that ensure stable and uninterrupted operations	Most respondents answered yes.
2. Attendance to trainings on the enhanced WESM design and operations, including the revised Market Rules and Manuals	Many generators seek training on the enhanced WESM design and operations for their traders especially the revised rules and manuals and especially now they have had a look the schedules and contemplated the implications of the new rules
3. Complete registration in the WESM with updated software certificates and access to the NMMS MPI and CRSS in place, with credentials and connections tested	Mostly yes. The actual statistics are available. (This is more of an issue for Mindanao.)
4. Submission of standing and working offers for energy and ancillary services in the NMMS, as applicable	Most respondents answered yes but a few made comments along the lines: not user friendly, takes a lot of steps. Login in problematic.
5. Timely submission of standing and working bids for energy and ancillary services in the NMMS, as applicable	The actual statistics by generation unit are available. Amongst the respondent companies there was a high level of participants seeking to submit offers into the NMMS. A number highlighted the reliability and user interface issues experienced submitting offers into NMMS and these are discussed below.
6. Submission of standing and working demand bids for energy and ancillary service in the NMMS	This remained in the surveys but does not apply for any respondent.
7. Systems (e.g. automatic generation control or AGC) and procedures are in place to ensure timely compliance to 5-minute dispatch targets	The readiness question on AGC highlights the fact that there is a high level of AGC present in Mindanao but there are quite a few in Luzon and Visayas who do not. Several large generators without AGC commented that they were resistant to introducing AGC because of the cost, the need for major re-modification and the inability to recover the cost. That being said a number of generators without AGC are worried about their ability to manually dispatch, remain compliant and not incur higher maintenance cost.
8. Timely and regular submission of bilateral contract quantities and other settlement-related inputs in the CRSS	There is a low level of submission of BCQs. The comment is that this is a second order priority. It will be done when RTD is more reliable, systems are better and the incentive to submit this information is greater.
9. Duly designated WESM Compliance Officer (WCO)	Yes, in all cases.
10. Communications interface with SO, MO and own internal financial system databases in place, enhanced and tested.	Mostly yes but ongoing work for some.

Criteria	POP Performance
11. Up to date and fit for purpose analytics. For example, co-optimising energy and reserve can significantly increase the number of binding constraints that can affect prices increasing complexity.	Few organisations have started thinking about the analytics of offer strategies and risk management. When this question was set originally it referred to the uncertainties created by the move to co optimisation, but this is unlikely to be the case on day 1.
12. Internal documentation and training to understand new capabilities and new requirements. (For traders and other internal functions who will need to understand the implications of the changes	This question scored poorly. As referred to in question 2 many respondents have raised the need to more training in the workings of NMMS, the realities of the new market and better manuals.
13. Documentation and authorities in place (where applicable).	Mostly yes but still a work in progress for some.
14. Confirmation that (new) rule obligations are understood	This question scored poorly.

Results from the surveys

The self-assessment questionnaires were supplemented by a series of survey questions shown below.

Figure 8: Generator Survey Questions

Survey questions asked of generators	
1.	What generation do you have in Luzon?
1.	What generation do you have in Visayas?
2.	What generation do you have in Mindanao?
3.	Have you been uploading your offers into NMMS during parallel operations?
4.	If no, why not and what are your plans in this regard?
5.	If yes, do you have any issues to report?
6.	Have you been down loading your RTD schedules?
7.	If no why not and what are your plans in this regard?
8.	If yes, do you have any issues to report?
9.	Did you have any issues registering? If so please elaborate
10.	Has training been adequate? If not please advise what training you still require
11.	Do you have AGC for your plant? If not do you have any plans for AGC or any issues with the fact that others do have AGC?
12.	Have you got any issues complying with five minutes dispatch instructions? What are your comments about complying with 5-minute dispatch?
13.	Do you provide ancillary services? If so what categories?
14.	Do you have any concerns about the provision of ancillary services under the enhanced WESM arrangements?
15.	Are there any other matters you wish to raise in relation to the enhanced WESM arrangements?

As a result of the answers to the assessment criteria, the IEMOP pop reports and the themes from the survey questions we are able to make some comments about the market participant's state of readiness. These are set out in the following section.

Unresolved issues (Market Participants)

Critically, the main recurring theme from the market readiness assessment, the surveys and IEMOP pop statistics is that the main inhibitors to market participant market readiness lie at the interface between market participants and IEMOP. This raises the question of whether the fault, and as a result the remedy, lies with participant systems or IEMOP systems.

Below we reproduce some passages from a survey response from a PIPPA member and a significant scale generator in Luzon and Visayas. These comments by one generator summarise the issues that are raised repeatedly.

Issue	Comments and Impact
1. Uploading offers into NMMS	<p>Log-in. There are times user can't log-in to any of the three servers. Multiple log-in attempts must be done by the user.</p> <p>Offers. During submission and revision of offers, user experienced slow response from UI. Working bids, which the submission source is from Standing, of xxx, xxx and xxx are still not editable for revision.</p> <p>Interface. User Interface is good but not that user-friendly. Old bids were compiled at the top of the bid section. Latest bids should at least prompt at the top of the bid section.</p> <p>User timeout. User needs to log-in again after idling the system for a while.</p>
2. Downloading RTD schedules	<p>Quality of schedules. Market result is not yet reliable. RTD schedule is not reflective with the bid especially if the bids have ancillary service.</p> <p>Ability to download information</p> <ul style="list-style-type: none"> • Retrieving Market result via web service is not yet available. Our third-party platform provider encounters several issues in the web service and we are still waiting for IEMOP's response on the identified issues. • Downloading of market results every 5-minute is very tedious. • User interface does not automatically refresh • MPI goes idle after some time <p>Plan Request MO to have a better way of downloading RTD schedule through their webservice</p> <p>Issues</p> <ul style="list-style-type: none"> • Retrieving RTD prices and schedule via UI takes a lot of time and effort. • Cannot retrieve by batch, it would be nice at least 12 5-minute market result for both DIPC and RTD. • Loading time of DIPC result is longer than retrieving price in the old MMS. Tried to use the filter feature but it can only filter 1 generator. It would take a lot of time for a company that has more than 1 generator with more than 1 location.
3. Training	IEMOP gives a lot of time and effort to discuss NMMS with generators. However, there are some follow-up questions/emails that have not yet been answered.
4. Ancillary services	Uncertain direction from IEMOP regarding with implementation of Reserve Market. MO and SO should be aligned.

In section 5.5 we draw on the responses to the survey and self-assessments of market readiness and the IEMOP POP data to establish the state of market participant readiness, the work that has to be done between now and “go live” and the criticality of those yet to be resolved issues.

Our recommendation is that IEMOP and market participants work together to confirm the issues that have to be resolved and resolve them so that market participants are only limited by their own efforts in getting market ready. To this end, through the steering committee we have engaged with PIPPA to provide a pan industry forum for this initiative. We recommend that PEMC continue this initiative.

3.6 MSPs

Criteria	POP Performance
1. Agreements with service providers (including internal IT service providers) are in place with appropriate service management processes and service levels that ensure stable and uninterrupted operations	<ul style="list-style-type: none"> In discussions with MSPs we could not identify service provider requirements that would be materially different under the enhanced WESM from the current; except for meter replacement/reprogramming, which is covered under a separate criterion.
2. Attendance to trainings on the enhanced WESM design and operations, including the revised Market Rules and Manuals	<ul style="list-style-type: none"> Training has been a problem. Some participants haven't been trained and many MSPs feel that their training was inadequate, although many MSPs had good training. There is a strong correlation between training and the outcomes of other MSP readiness criteria. In addition to claims of poor training many MSPs who had good training would like regular refreshers. There have also been some changes in the CRSS and in the detail of metering operations.
3. Complete registration in the WESM with updated software certificates and access to the CRSS in place, with credentials and connections tested	<ul style="list-style-type: none"> There is strong correlation between performance under this criterion and training. At this point, this criterion has not been met but we believe is likely to be with further robust training.
4. Timely and regular submission of metering-related information in the CRSS successfully tested	<ul style="list-style-type: none"> Again, there is a strong correlation between performance under this criterion and training. At this point the criterion is not met but we believe is likely to be with further robust training. However, technical problems have also occurred and some MSPs report that the CRSS process is significantly more onerous than the current process. There is a need for a Metering Operating Protocol to provide the next level of detailed guidance below the Metering Manuals.
5. Existing meters have been reprogrammed from 15-minute to 5-minute interval configuration or compliance programs are in place for those with meters that are still for reprogramming	<ul style="list-style-type: none"> Most MSPs have completed the 5-minute metering replacement/reprogramming. Of those that haven't, most have target dates for completion before the end of the year (although the response rate to our survey was low). A significant exception to this is Meralco, who have over 1,000 contestable metering accounts. Meralco need to replace all these meters and have a capital approval request with ERC for this. If ERC approves Meralco's request it will take around 2.5 years to complete the meter replacement.

Criteria	POP Performance
	<ul style="list-style-type: none"> We don't consider the 15-minute meter replacement to be a critical market readiness issue. It affects price efficiency as the settlement price weighting will be based on 15-minute data rather than 5-minute data, but this is still an improvement over the current hourly price.
<p>6. Business processes in place to manage the transition from 15-minute to 5-minute data for retrieval and transmission to the MO for meters yet to be reprogrammed.</p>	<ul style="list-style-type: none"> DOE issued a circular requiring MSPs with 15-minute contestable metering data to divide the readings by three and submit as 5-minute data. This directly contravenes the Metering Manual which requires that MSPs do not edit metering data in any way. In our view the DOE circular instruction is poor practice and MSPs should not edit metering data. The requirements of the DOE circular are not well understood by all MSPs. In our view, the best solution is for IEMOP to modify CRSS so that it can accept 5- and 15-minute data, but this needs to be approved by DOE (in light of their previous circular on this) and ERC; and then be clearly and comprehensively communicated to MSPs.

Unresolved issues (MSPs)

Issue	Comments and Impact	Recommendation
1	<p>Further robust training is desirable - we don't regard this as a critical market readiness issue but the correlation between adequate training and MSP performance is so strong that another round of training before market go-live is highly desirable.</p>	<p>We recommend that IEMOP plan a comprehensive round of robust training before or shortly after market go-live. By comprehensive and robust we mean that the training sessions are held at accessible times and places. Training is supported by CRSS and other system manuals; and registration, attendance and achievement is reported to the Steering Committee. Feedback should also be sought on the training quality.</p>
2	<p>The technical problems have so far been solvable but IEMOP needs to work with MSPs to improve the process -we don't believe this is a critical market readiness issue as MSPs can email the data to IEMOP as a back-up, providing they are aware of this. Nevertheless, as</p>	<p>Once critical and urgent issues have been attended to IEMOP should consider convening a CRSS working group to seek improvements in the usability of CRSS.</p>

Issue	Comments and Impact	Recommendation
	soon as critical and urgent issues are addressed the user experience with CRSS should be improved.	
3	A Metering Operating Protocol is required - this is not a critical market readiness issue but codifying the detailed requirements below the level of Metering Manuals would be helpful.	IEMOP to publish a Metering Operating Protocol giving detailed guidance on metering below the level of Metering Manual.
4	ERC approval needed for 5-minute metering and Meralco's capital metering project - a decision by ERC on 5-minute metering is critical to market readiness, but this issue is part and parcel of the PDM approval process. While undesirable, the significant delay to Meralco installing 5-minute meters is not a critical market readiness issue.	A decision by ERC on the PDM should be sought urgently. If approved, Meralco should submit a detailed project plan for the capital metering project and target dates for completion should be declared.
5	The enhanced WESM will need to be able to process 15-minute metering data for some time - this is a critical market readiness issue. The most robust way of including both 5-minute and 15-minute metering data under the enhanced WESM and ensuring the integrity of settlement should be urgently implemented.	IEMOP to modify CRSS to accept 5- and 15- minute meter data.
6	In our view the DOE circular requiring MSPs to provide 5-minute metering data by dividing 15-minute metering data by three is not good process and directly contradicts the Metering Manuals.	We understand that the DOE will consider its circular superseded when the metering market manual is approved. Approval of the manual will therefore resolve this issue, provided that the correction is clearly communicated to MSPs.
7	There is some confusion between MSPs on the meter data submission requirements - as a few processes are still changing (i.e. the modification of CRSS to accept 5- and 15-minute data) then there will be a need to clearly communicate the finalised requirements for them.	Once the issues described above have been resolved a final clear and comprehensive communication should be made to all MSPs, seeking response acknowledgement with responses reported to the Steering Committee.

3.7 Other Criteria (not accounted for in the above)

Criteria	POP Performance
1. Price Determination Methodology (PDM) approved	<ul style="list-style-type: none"> The PDM has yet to be approved by the ERC. ERC have advised us that they will approve 'before the end of the year'. DOE have advised that they have transmitted letters requesting that ERC fast track all actions relating to the approval of the PDM for WESM.

Criteria	POP Performance
2. Decision made on the level of reserve co-optimisation required for day-1 of the new market	<ul style="list-style-type: none"> According to PEMC the MRSC's recommendation to not start reserve co-optimisation on day 1 has been presented to DOE and approved.

Unresolved issues (Other)

Issue	Comments and Impact	Recommendation
1	<p>ERC have yet to approve the PDM. They have requested:</p> <ul style="list-style-type: none"> One month of price comparisons Audit of the remaining 2 active NMMS modules (5 have already been audited and one, the FTR module, is yet to be introduced into WESM so is unable to be audited at this time) 90% market participation requirement in POP. <p>Based on ERC confirming to us that their mandate with respect to the enhanced market design is the price impact on consumers, their 90% market participation should only relate to requiring that the price comparisons are representative of a high proportion of participants so as to improve the validity of results. To this extent IEMOP have set up a stand-alone POP environment to capture actual market bids from the live market (and for Mindanao to approximate bids based on actual generation output).</p> <p>The PDM application is aligned with prior DOE circular and market rules. However, a number of differing submissions have been made opposing components of the PDM. The PDM also is not fully consistent with the grid code (as it relates to ancillary service raise and lower movement) and the proposed draft DOE circular on ancillary services. Given the recent supreme court precedent relating to ERC not following DOE circulars, some DOE assistance may be required to assist the ERC harmonise the above inconsistencies.</p>	<p>IEMOP to complete the outstanding ERC requests for one month of price comparisons and audit of the remaining two NMMS modules (we accept IEMOP's view that the FTR module does not need to be audited at this time as it is not intended to use FTRs in WESM market design in the near future).</p> <p>ERC to be convinced that their request for 90% market participation should only relate to the price comparison requested and, in this regard, it has been met through the way IEMOP configured the standalone POP environment.</p> <p>DOE to support ERC in harmonising the conflicting applications, submissions, market governance documents and policy statements in play.</p>

Issue	Comments and Impact	Recommendation
	<p>Approval of the PDM is an absolute necessity before the enhanced market can proceed.</p>	
2	<p>A decision needs to be made on the level of reserve co-optimisation required for day-1 of the new market level. An earlier decision was taken that the enhanced WESM design will include co-optimisation of energy and reserve and this decision has been captured in the DOE circular, revised Market Rules and PDM application.</p> <p>However, 2 sets of constraints have since emerged in respect of whether the WESM is ready to move to a co-optimised design:</p> <ul style="list-style-type: none"> • Technical readiness issues (SO and Generator ability for 5-minute arming and dispatch of reserves). • Market readiness issues - current capacity shortage would potentially lead to higher prices and increased price volatility. However, the counter argument is that higher prices will be necessary to signal the new investment required (especially in light of recent system red alert status). <p>Clarity is required on what is expected for day 1 of the new market</p> <p>Following this a clear timeline needs to be determined to achieve the co-optimisation agreed in the enhanced WESM design. This timeline should be informed by a number of key studies:</p> <ul style="list-style-type: none"> • What would be the impact on prices under a range of available capacity (supply cushion) scenarios. • System security considerations that would need to be considered. • Technical readiness requirements (e.g. 5-minute arming and dispatch). • What market design changes are appropriate to deliver the dynamically efficient prices required for future capacity investment. <p>The DOE are presently consulting on forming an AS working group and the proposed wording of a DOE circular. We believe the current proposed wording is not sufficiently forward looking and may merely capture the current view of NGCP.</p>	<p>DOE to make a policy decision in respect of the day-1 market start design. IEMOP, PEMC and SO to support with studies after the enhanced market has started. We understand that DOE has approved the MRSC recommendation to not co-optimize reserve on day 1 market start.</p>

Issue	Comments and Impact	Recommendation
	This decision needs to be made well ahead of the market go live date as all parties need to know what it is they are preparing for and to have time to prepare.	

4. Market Assessment Readiness

4.1 IEMOP System Performance

- System availability - the NMMS, EMDRP, CRSS and IEMOP website have been assessed as ready, in the context of system availability.
- Timeliness of publication – The NMMS has proven to be capable of producing and publishing RTD schedules, as well as HAP and WAP projections in accordance with operational performance targets. Performance of DAP projections are far below targets, however this is not a critical issue that affects market start (although we are concerned that the deteriorating trend in timeliness remains undiagnosed).
- Reliability - Performance and reliability has been significantly impacted by a number of system issues during POP. In addition, there have been a number of system patches, workarounds, performance tuning activities and other tweaks. Additional observation is recommended to demonstrate reliability of publication, ideally during a period of system stability, where IEMOP do not make any system changes or perform testing.
- RTD forecast accuracy – RTD MAPE and FAR accuracy for Luzon has been assessed as ready, as well as RTD FAR for Mindanao. RTD FAR accuracy for Visayas and RTD MAPE accuracy for Visayas and Mindanao has been below operational targets and have been assessed as not ready at this time. Work is needed to work with SOs and remediate issues.
- Confirmation needed that nodal prices correctly reflect marginal costs and adequately model transmission losses. During POP SCDO-NA observations failed to optimally solve within the parameters agreed between IEMOP and IES. This matter was initially observed by IES, but as this falls outside of our scope we leave this to PAC to consider whether referral back to IES is required.

4.2 IEMOP Processes

IEMOP still have several outstanding matters that they need to address with respect to their processes before they can be considered ready for the new market arrangements. As was elaborated in Section 3.2 these are:

- Audit and certification of 2 remaining NMMS modules.
- Ensuring DR procedures and checklists are up to date.
- Gaining the remaining approvals for a number of Market Manuals.
- Complete the writing of their internal business processes.
- Conduct further staff training, such as in conjunction with the request by PEMC for IEMOP to supply non-technical training on the new WESM arrangements.

4.3 System Operations

Currently the System Operator is not satisfied the dispatch schedules would achieve system security. The interface between IEMOP and the SO has had problems on both sides and the systems have not been stable. The System Operator and IEMOP have agreed security assessment can be completed in 3

weeks if the requirements are met. However, as the requirement is certainty that the SO can manage security in the enhanced WESM, there may yet be significant issues to work through.

The SOs have worked willingly to try to get systems working but we think the process could have been managed better by both PEMC and IEMOP. The SOs have been treated too much like service providers rather than stakeholders. As they have the primary accountability for a secure Philippines power system, they are a key stakeholder in WESM. If security issues arise during the SOs security assessment, then greater cooperation will help address any issues expediently. This cooperation and communication should occur at executive, management and operational levels.

One of the consequences of the disconnect between the SO's and the industry policy setters is the disagreement about co-optimisation of energy and reserve. As a result, ERC has been asked to decide on the matter. As the SOs consider the matter yet to be settled they have not pursued 5-minute reserve dispatch except to the extent required in system implementation. Without tested end-to-end reserve dispatch the market is not ready for co-optimisation.

4.4 PEMC

PEMC is on target to be ready for the new enhanced market arrangements. As noted in Section 3.4 there are a few areas that still need to be fully completed and plans are in place to address this. None of these are considered critical to impact market go-live.

The only issue noted that could impact market readiness is the DOE report on effectiveness of PEMC/IEMOP/WESM that was raised with us. This is largely outside of PEMC to control other than to ensure that DOE are made aware of the potential impact of introducing any further institutional changes concurrent with plans to roll out new market arrangements.

4.5 Market Participants

We have received surveys and some completed market assessments for 73 out of a total of 99 generation companies in the which is a return rate of 73.7%.

We received a high response to surveys and request for self-assessment of market readiness. Some of the surveys were light in content and some did not complete self-assessment of market readiness at all.

We have met with a sample of generators to hear first-hand the nature of the issues reflected in the survey and self-assessment of market readiness.

Some of the issues raised by generator market participants are market design issues. The fact that some scheduled generators do not have AGC and may struggle, initially at least, to manage their offer and plant in the face of possible intermittent dispatch instructions does not impede the enhanced WESM going live. The fact that some generators worry that they may have to adjust to the prospect of an instruction that would see them required to reduce load below P_{\min} does not impede the enhanced WESM going live.

Generators need clarity over how the policy issues will be resolved and implemented at day 1. The two critical (and related) issues are approving the PDM and confirming the regime for procurement of and provision of all forms of reserve on day one of the enhanced market.

If it is the case that more training is done, but some market participants do not avail themselves of it, that does not create a reason to hold back the start of the market.

If the market were to commence without the connectivity and functionality at the interface being improved for the bulk of market participants from where it is today there is a risk that the ensuing disruption could destabilise the system. Between now and “go live” it is imperative that more participants have access to functionality at the interface between participants and IEMOP that allows traders to upload and download in a timely manner. Traders should not have data and connectivity issues outweigh the business of producing offers, processing schedules and ensuring plant is available to be dispatched as per the market schedules.

IEMOP needs to work with all market participants so the number of participants with these issues is significantly reduced before the market goes live.

In the meanwhile, the generator representative organisation, PIPPA, and the renewable generator representative organisation, DREAM, will work with the bulk of generators and IEMOP to give the issues a wider audience. The issues framework they will take to members is below. They will clarify the state of the issues, identify whether solutions lie with participants or IEMOP and work with IEMOP to make significant improvement. Progress will be reported into the Implementation Steering Committee.

Figure 9: Issue list for PIPPA and DREAM collaboration

ISSUES LIST FOR MARKET PIPPA AND DREAM PARTICIPANTS TO COLLABORATE ON
<ul style="list-style-type: none"> • Registration • Logging in • Downloading offers <ul style="list-style-type: none"> - No confirmation - Sometimes doesn't download - Time consuming and a lot of manual effort using MPI • Uploading schedules <ul style="list-style-type: none"> - MPI UI - API <ul style="list-style-type: none"> ○ Software development ○ Waiver • Bilateral nominations • Training

4.6 MSPs

At present MSPs in aggregate are not ready for the enhanced WESM rules as there will still be 15-minute metering data and there are still problems submitting data to CRSS. These problems are not insurmountable. They can be addressed by:

- Modifying CRSS to accept 5- and 15-minute metering data
- Clarifying and clearly communicating the expected metering data submission process
- Clearing the connection faults raised by MSPs.

Providing this can be done then settlement is secure and market ready.

In addition to the above we also recommend that:

- Another round of comprehensive and robust training be done before, or shortly after, market go-live. Registration and attendance to this training should be monitored by senior representatives of the industry.
- A CRSS metering working group be established to work through the usability concerns MSPs have with CRSS.
- That MSPs with ongoing 15-minute replacement/reprogramming projects be appropriately monitored and held to target due dates.

Summary of remaining issues

From our evaluation against the assessment criteria, we consider that there are 6 criteria that have yet to be satisfied and 10 that will need to be satisfied before the market systems and processes are ready to implement the enhanced market . Those 16 criteria are:

1. The System Operator has identified concerns with the dispatch schedules and has not signed-off on secure operations under the enhanced WESM.
2. Closely connected 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.
3. Interface reliability with the SO following:
 - a. their transfer to new systems (eDNA)
 - b. using the new IEMOP webservice.
4. HVDC data is still missing in transfer of off-line data between the SOs and IEMOP
5. 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.
6. 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.
7. Modify CRSS to process 15-minute metering data for those MSP's yet to reprogram their meters
8. Confirm that nodal prices correctly reflect marginal costs and adequately model transmission losses.
9. Audit and certification of 2 remaining NMMS modules needs to be completed.
10. 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.
11. More generally, DR failover documentation should be modified into broader document(s) that includes related IEMOP process (e.g., communication with market participants about IT changes).
12. Some Market Manuals still require revision and approval by RCC and DOE (see 6.Appendix C:)
13. 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).

14. Follow up training to market participants.
15. ERC approval of Price Determination Methodology (PDM).
16. 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.

In our view, the matters listed above should all be addressed before go-live.

In addition, we consider that a further 12 issues that should be tackled soon after enhanced market commencement for the market to operate smoothly. These 12 issues are:

1. IEMOP key person risk exists presently with knowledge of the new NMMS and CRSS systems currently concentrated around a few individuals
2. PEMC to conduct WESM training—plans are in place for training staff in the new enhanced WESM design (a general course for people not involved in technical or operational roles has been requested by IEMOP)
3. IEMOP to automate interface with PEMC for compliance software data—the compliance software relies on a delayed (near real-time) feed from IEMOP systems
4. IEMOP to document business processes—documenting business processes will help to ensure that new arrangements are understood and followed (as well as being a partial mitigation of key person risk)
5. Market Participant training on new compliance requirements
6. DOE report on effectiveness of PEMC/IEMOP/WESM needs to be concluded (undertaking further institution changes concurrent with plans to roll out new market arrangements would increase risk of disruption to the market)
7. Further robust training is desirable for all MSPs on CRSS and uploading MQ
8. CRSS workability—technical problems have so far been solvable but IEMOP needs to work with MSPs to improve the process
9. a Metering Operating Protocol would be helpful to codify the detailed requirements below the level of Metering Manuals
10. ERC approval needed for 5-minute metering and MSP capital metering projects
11. State of internet connectivity affects timeliness of metering data submission
12. Additional studies are required before introducing Reserve Co-optimisation into WESM.

5. About the Authors

Stephen Black is the General Manager for Onyx Services, specialising in energy systems and related applications services, providing strategic advice relating to the development, upgrade, integration and operation of off-the-shelf and custom developed IT and energy application solutions for the energy industry. Stephen oversees Onyx's market systems projects, which currently include specialist advisor to the Oman Power and Water Procurement (OPWP) company on the implementation of a new electricity market, the transition and remediation of System Management systems from Western Power to AEMO; and the development of Onyx's Horus Electricity and Gas Trading platform.

Stephen has over 21 years of experience working in IT, 19+ years of which has been spent in lead energy applications and market systems roles in the Australian, New Zealand, Philippine, Oman and Singapore energy markets.

Dave Carlson is experienced in electricity and gas market development and operation, with a strong emphasis on senior stakeholder management at corporate, regulatory and government levels. He was a Senior Vice President at SGX, responsible for new initiatives in the gas and power sectors. Prior to that he served for 10 years as the CEO of the Energy Market Company, EMC, the national electricity market operator for Singapore. During his 12 years in Singapore Dave was involved in the evolution and operation of NEMS, the development of electricity futures trading, and the development of secondary gas trading.

Since returning to New Zealand in 2016, Dave continues to work with a number of national utilities, regulators, market operators, private generator-retailers, and government clients in New Zealand, South East Asia, and the Middle East. He has a BSc in Mathematics from Victoria University in Wellington and passed the Associate Examinations of the Institute of Actuaries, London.

Kieran Murray provides expert evidence, testimony and reports in the fields of regulation, competition analysis and public-policy, including market design. He has served as an economic consultant on these matters for public agencies and private companies in over 15 countries in the Asia Pacific Region. Kieran co-founded and jointly leads Sapere. He is an expert lay member of the New Zealand High Court and serves as an International Arbitrator for the PNG Independent Consumer and Competition Commission.

David Reeve is a technical expert and risk manager specialising in renewable generation (hydro, geothermal and wind), electric power-system operation and electricity markets. He is experienced in resolving complex issues affecting value and risk in electricity, including renewable resource utilisation, energy and transmission pricing, electricity trading and operation, ancillary services, revenue metering and risk management integration.

David has extensive experience in the New Zealand power system and market and has also worked in Australia, Philippines and Singapore.

Toby Stevenson is an economist with 30 years' experience in strategic risk management mainly in the electricity industry. He is adept at managing assignments with high-stake outcomes and has worked in New Zealand, Australia, Philippines, Ireland, Tonga and Vietnam. The types of assignments Toby is engaged for include strategic advice to boards, developing forward contracting strategies, cost benefit

analysis of regulatory initiatives, evolution of smart grids and expert testimony in energy related markets.

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6. About Sapere

Sapere Research Group is one of the largest expert services firms in Australasia, and a leader in the provision of independent economic, forensic accounting and public policy services. We provide independent expert testimony, strategic advisory services, data analytics and other advice to Australasia’s private sector corporate clients, major law firms, government agencies, and regulatory bodies.

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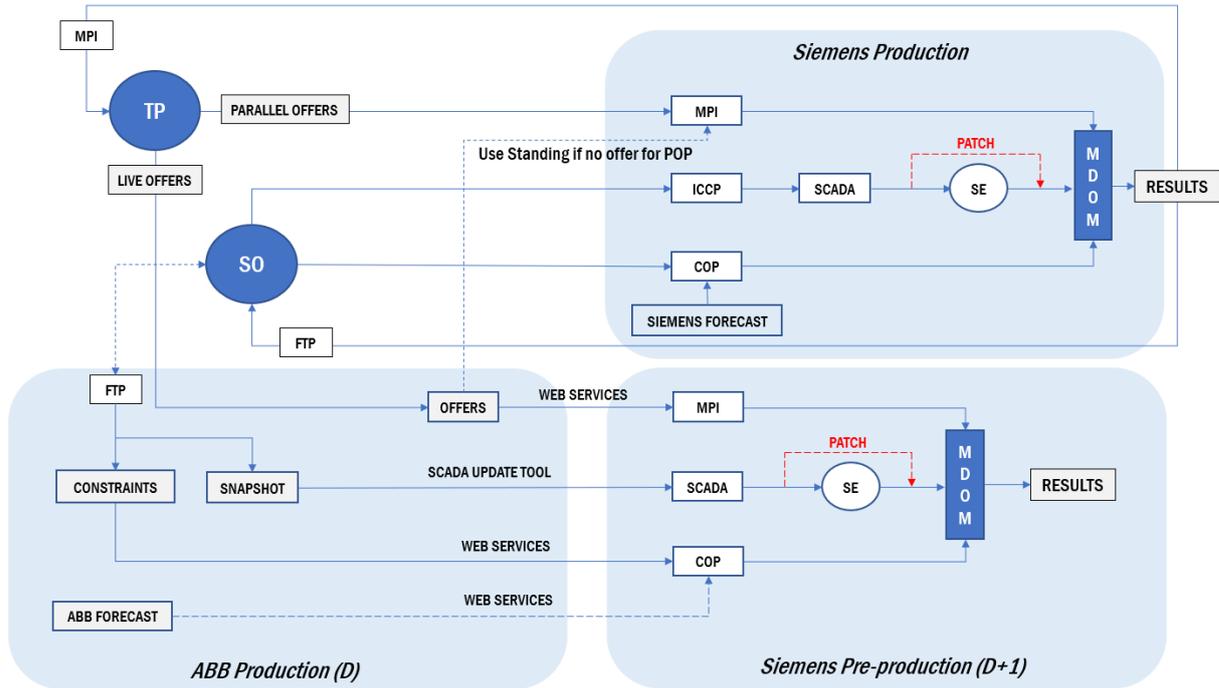
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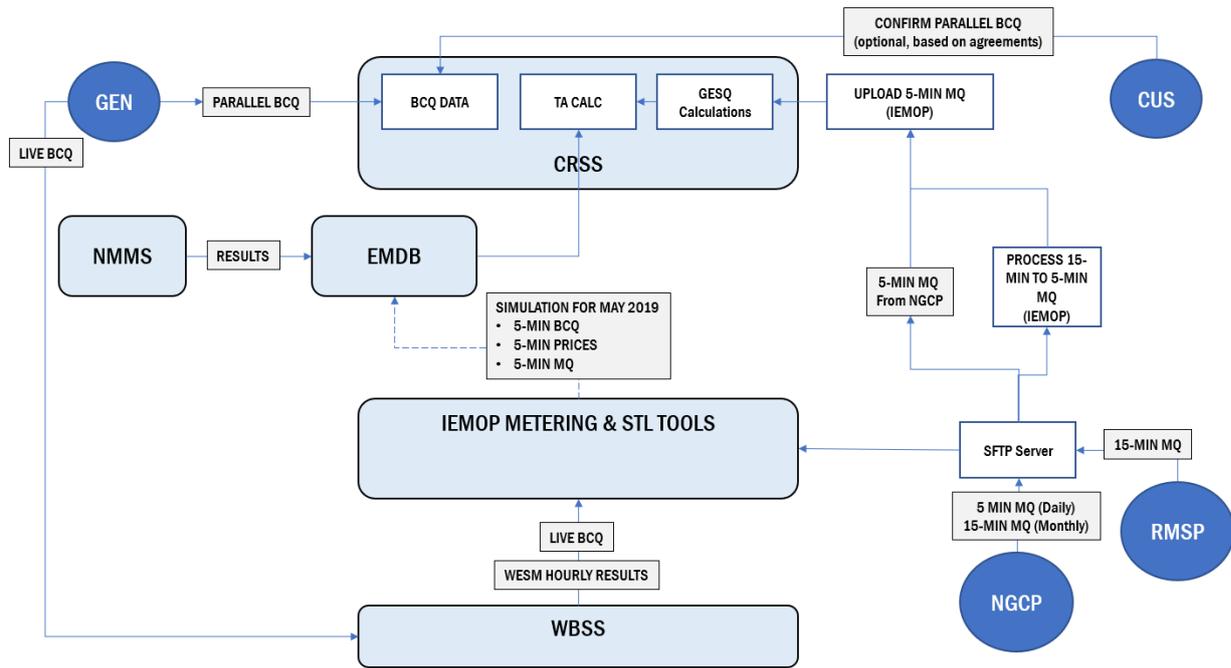
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Appendix A: POP Environment (NMMS)



Appendix B: POP Environment (CRSS)



Appendix C: **Proposed Amendments to WESM Manuals for DOE approval**

Proposed Amendments for DOE Approval

Item	Proposal	Date Received
1	Proposed Amendments to WESM Rules and Proposed ECO Manual	03 Sep 2018
2	Proposed Amendments to WESM Rules and WESM Manual on Market Surveillance, Compliance and Enforcement	
3	Proposed Amendments to the WESM Penalty Manual	
4	Proposed Amendments to the WESM and Retail Rules and Various Manuals to Reduce Barriers to Entry and Participation in Retail Competition	14 May 2019
5	Proposed Amendments to the WESM Manual on Registration, Suspension, and De-Registration Criteria and Procedures	06 Jun 2019