Notice of Market Rules Modification

Paper No.:	EMC/RCP/67/2013/316
Rule Reference:	Chap 6 Sec 7.7, 9.2
Proposer:	Diamond Energy, Dallon Kay
Date Received by EMC:	1 April 2012
Category Allocated:	3
Status:	Not Approved by EMA
Effective Date:	NA

This paper evaluates a proposal to publish total energy offers, total reserve offers and total regulation offers for each dispatch period in the Real-time Dispatch Schedule, Short-term Schedule, Pre-dispatch Schedule and Market Outlook Scenario.

Based on the EMC Information Policy, benefits from publishing Total Available Energy Offer Capacity data may arise from transparency and credibility, while costs may arise from market power issues and implementation costs. While it is hard to quantify the benefits, they are not likely to be compelling.

EMC examined tests used in other jurisdictions to identify market power and in turn, potential capacity withholding. It was found that most jurisdictions employ the Pivotal Supplier Test to identify locational market power and resultantly, apply real-time mitigation measures to avoid potential capacity withholding. Incidentally, this test uses total supply offers, which is analogous to Total Available Offer Capacity in the SWEM.

EMC applied the Pivotal Supplier Test to energy and regulation data in the SWEM (1 June 2012 to 31 August 2012). Reserve was excluded in the simulation because there is low likelihood of capacity withholding for this product. It was found that pivotal suppliers do exist in the SWEM for selected dispatch periods. While one may argue that in the instance of energy, the relatively high retail contracted levels in the SWEM may discourage such market power issues, it must be noted that the gentailers have control over these contract levels. Thus, they could reduce their respective retail contract levels at their discretion, increasing the likelihood of having a pivotal supplier. The simulation thus indicates that the publication of Total Available Offer Capacity for energy and for regulation may facilitate capacity withholding.

EMC **recommends** that the RCP **do not support** this proposal. Nevertheless, EMC recognises that the market power concerns raised in this proposal may reduce in future. As such, EMC suggests reviewing this proposal upon the removal of vesting contracts in the SWEM.

At the 66th RCP Meeting, the Panel, by majority vote, **supported** the proposal **to publish** Total Available Offer Capacity for all products across all schedules for the following reasons:

a. Market power risk likely to reduce with new capacity entering the SWEM in 2013
b. Publication of data will enhance efficiencies in Futures Market and Demand

Response initiatives

The RCP then tasked EMC to draft the relevant rule changes to implement their decision.

The RCP unanimously recommends that the EMC Board support the rule modification proposal as set out in Annex 3.

Date considered by Rules Change Panel: 07 May 2013

Date considered by EMC Board: 23 May 2013

Date considered by Energy Market Authority: 25 February 2015

Proposed Rule Modification:

Refer to attached paper.

Reasons for EMA's Decision Not to Approve the Rule Change:

EMA cited that it has conducted a review of market information to facilitate efficient electricity spot and futures trading ("Review") and issued a Decision Paper dated 22 Jul 2014. In its Review, EMA had taken into account the Rules Change proposal to publish Total Available Offer Capacity ("Proposal") and decided not to accept the Proposal.

In accordance with EMA's decision, EMC has since 1 Sep 2014 made available aggregated energy offer information to all spot market participants and market data subscribers of EMC with a 4-week time-lag to mitigate strategic bidding by generation companies ("gencos") especially during tight supply situations. EMA will continue to monitor all gencos' bids closely and will not hesitate to take swift enforcement actions against any genco exhibiting anti-competitive behaviours.

Energy Market Company

PAPER NO.	:	**EMC/BD/XX/2013/316**
PAPER NO.	:	**EMC/RCP/67/2013/316**
SUBJECT	:	**PUBLICATION OF TOTAL AVAILABLE OFFER CAPACITY**
FOR	:	**DECISION**
PREPARED BY	:	**NERINE TEO** **SENIOR ECONOMIST**
REVIEWED BY	:	**PAUL POH LEE KONG** **SVP, MARKET ADMINISTRATION**
DATE OF MEETING	:	**7 MAY 2013**

Executive Summary

EMC currently releases Total Available Energy Offer Capacity for a given real-time dispatch period to Market Participants (MPs). This paper evaluates a proposal to publish this data and that for reserve and regulation in the Real-time Dispatch Schedule, Short-term Schedule, Pre-dispatch Schedule and Market Outlook Scenario.

Based on the EMC Information Policy, benefits from publishing Total Available Energy Offer Capacity data may arise from transparency and credibility, while costs may arise from market power issues and implementation costs. While it is hard to quantify the benefits, they are not likely to be compelling.

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EMC applied the Pivotal Supplier Test to energy and regulation data in the SWEM (1 June 2012 to 31 August 2012). Reserve was excluded in the simulation because there is low likelihood of capacity withholding for this product. It was found that pivotal suppliers do exist in the SWEM for selected dispatch periods. While one may argue that in the instance of energy, the relatively high retail contracted levels in the SWEM may discourage such market power issues, it must be noted that the gentailers have control over these contract levels. Thus, they could reduce their respective retail contract levels at their discretion, increasing the likelihood of having a pivotal supplier. The simulation thus indicates that the publication of Total Available Offer Capacity for energy and for regulation may facilitate capacity withholding.

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At the 66th RCP Meeting, the Panel, by majority vote, **supported** the proposal **to publish** Total Available Offer Capacity for all products across all schedules for the following reasons:

a. Market power risk likely to reduce with new capacity entering the SWEM in 2013
b. Publication of data will enhance efficiencies in Futures Market and Demand Response initiatives

The RCP then tasked EMC to draft the relevant rule changes to implement their decision. These were presented at the 67th RCP Meeting.

The RCP unanimously **recommends** that the EMC Board support the rule modification proposal as set out in **Annex 3**.

1. Introduction

EMC currently releases the total available energy offer capacity for a given real-time dispatch period to Market Participants (MPs). This paper evaluates a proposal in the 2012/2013 Rules Change Panel Workplan to publish this data and that for reserve and regulation in the Real-time Dispatch Schedule, Short-term Schedule, Pre-dispatch Schedule and Market Outlook Scenario.

2.1 Background

Total available energy offer capacity refers to the sum of all energy offers from all facilities submitted into the Market Clearing Engine (MCE) for a given dispatch period. MPs are currently able to download total available energy offer capacity for a real-time dispatch run through EMC's web services shortly after the real-time dispatch run. The proposal suggests publishing this data and that for reserve and regulation in the Real-time Dispatch Schedule, Short-term Schedule, Pre-dispatch Schedule and Market Outlook Scenario, as represented in Table 1 below.

Table 1: Currently Released Offer Capacity Data and Proposed Data for Publication

Product/ Schedules	Real-Time Dispatch Schedule	Forecasts		
		Short-Term Schedule	Pre-Dispatch Schedule	Market Outlook Scenario
Energy	Currently Released under Web Services Proposed to be published[1]	Proposed to be published		
Reserve (Primary, Secondary, Contingency)	Proposed to be published			
Regulation	Proposed to be published			

2.2 Guiding Principles to Evaluate Impact of Releasing Information in the Singapore Wholesale Electricity Market (SWEM)

Prior to evaluating the merits and demerits of releasing this information, there is a need to establish the guiding principles that will be adopted to carry out this evaluation. This section summarises EMC's information policy endorsed by the RCP in 2003.

The EMC Information Policy provides a guideline on factors to consider from a cost-benefit perspective when determining if a piece of information should be released, as summarised in Table 2 below.

Table 2: Summary of Factors for Consideration

Benefits	Costs
1. Facilitation of Investment Decisions and Use of Resources as assessed through: • Market Efficiencies (Static and Dynamic) a. Demand and supply interaction b. Price discovery c. Price signals (short and long-term)	1. Costs Arising from Impact Test[2]: • Financial Impact • Commercial Impact • Legal Impact • National Security Impact

[1] This was not part of the proposal. However, this data will be published if the RCP decides that it should be published.
[2] Please refer to Annex 2 for details of the test.

Benefits	Costs
• Transparency • Credibility 2. Cost Reduction 3. Strengthening of Market Design Principles (e.g. Market Power Issues)	2. Adverse Impact on Market Efficiency • Market Power Issues 3. Cost of releasing the information

2.3 Competitiveness of the SWEM

The assumption that complete and perfect information supports a competitive environment in economic theory predicates on a perfectly competitive market in which individuals are unable to influence prices with this information. However, in practice, there is general consensus that information availability may facilitate tacit collusion, particularly in highly concentrated markets[3]. It is thus imperative to assess the current state of competitiveness of the SWEM, which would then play a role in determining the impact of releasing any type of information.

Herfindahl-Hirschman Index (HHI)
The Herfindahl–Hirschman Index (HHI) is commonly used to determine the degree of concentration and in turn, competitiveness in an industry. It is measured by the sum of squares of firms' market shares in the industry. Based on US Merger Guidelines, an industry with an HHI of more than 1800 is considered to be highly concentrated.

The SWEM currently has 12 Generation Licensees with 3 dominant market players. This translates to a HHI of 2521 (as at Nov 2012) and is indicative of a highly concentrated market.

Vesting Contracts
Vesting contracts were introduced in 2004 to reduce market power in the SWEM. This arrangement requires gencos to sell a fixed quantity of energy at a specific price. As such, beyond using HHI, the existence of such contracts also reflects a concentrated energy market.

Regulation Price Cap
Between late 2006 and early 2007, the SWEM was characterised by a prolonged period of high regulation prices. The consultant tasked to examine this incident concluded that the market for regulation had become more concentrated because of increased migration to combined cycle plants (CCP). These plants need to run through the night at levels below the minimum operating level at which they can provide regulation (Regulation Min), thus resulting in fewer regulation providers. The Energy Market Authority (EMA) then reduced the regulation price cap from $2750/MWh to $300/MWh in response to the high prices. This revision also alludes to the possibility of a concentrated regulation market.

3. Analysis

Using factors described in Table 2, Tables 3 and 4 identify qualitative benefits and costs arising from the publication of Total Available Offer Capacity in all dispatch runs and across all products.

[3] Hooper, Liz, Twomey, Paul and Newbery, David (2009) "Transparency and Confidentiality in Competitive Electricity Markets" USAID

Table 3: Benefits Arising from the Publication of Total Available Offer Capacity

No	Benefit		Benefit Arising From Releasing Information In			Reasons
			Product Type	Run-Type		
				Real-Time	Forecast	
1	Facilitating Investment Decision and Use of Resources	Market Efficiencies (Static and Dynamic)	None	×	×	Static Efficiency (Short-term) If published in forecast schedules, gencos may be more informed to ramp-up output ahead of a dispatch period that has insufficient total offered capacity relative to forecast demand. However, forecast prices that are currently published would already indicate a tight supply condition.
			None	×	×	Dynamic Efficiency (Long-term) One may argue that knowledge of total available offer capacity enables a potential investor to understand daily market conditions, and in turn, aid entry and investment decisions e.g. planning for plant size. However, investment decisions in facilities are usually based on longer-term trends. Thus, the relevant information will more likely be each facility's registered capacity for each product, historical prices and the historical requirements, all of which are already published.
		Transparency	All	✓	✓	Facilitate Market Monitoring Even though this data is already available to the authorities and the Market Surveillance and Compliance Panel (MSCP)/ Market Assessment Unit (MAU) for market monitoring, publishing it facilitates monitoring of the market by other stakeholders such as other Market Participants or consumers. Publishing such data in forecasts may help stakeholders identify potential capacity withholding opportunities if total available offer capacity is close to total demand.
		Credibility	All	✓	✓	Credibility is enhanced as stakeholders can now observe offer patterns and correspondingly, expected price outcomes instead of relying entirely on the Market Clearing Engine's published prices.
2.	Cost Reduction		None	×	×	Implementation costs will be incurred, rather than reduced in the release of such data.
3.	Strengthening of Market Design Principles		All	✓	✓	Market design principle of transparency may be enhanced, but may also lead to market power issues.

Table 4: Costs Arising From Publication of Total Available Offer Capacity

No.	Cost		Cost Arising From Publication In			Reasons
			Product Type	Run-Type		
				Real-Time	Forecast	
1	Impact Test	Financial	None	×	×	There is little financial impact as the release of Total Available Offer Capacity cannot be linked to an individual company's identity.
		Commercial	None	×	×	No trade secret will be revealed as it is hard to attribute Total Available Offer Capacity to an individual genco.
		Legal	None	×	×	Releasing this information will not impact any existing contractual arrangements in which either EMC or the identified entity is a party to.
		National Security	None	×	×	EMA has verified that releasing Total Available Offer Capacity will not lead to the identification of a critical power installation in the Singapore power system network
2.	Adverse Impact on Market Efficiency • Market Power Issues		Energy, Regulation	✓	✓	<u>Facilitating Potential Exercise of Market Power</u> Without real-time market power mitigation measures[4], Total Available Offer Capacity may be used to facilitate the exercise of market power in the highly concentrated SWEM through capacity withholding. For Energy and Regulation, this could be a particular concern given that their demand is inelastic (i.e. the required quantities for Energy and Regulation are predetermined by PSO for a given period). This implies that in a scenario where system demand in a given dispatch period is, for example, 5000 MW and total available offer capacity is 6000MW, a dominant genco can drive prices up by withdrawing capacity totalling more than 1000 MW.[5] For Reserve, the effect could be ameliorated since the required quantity is endogenously determined rather than fixed. For example, if a provider tries to drive Reserve prices up, the MCE may just schedule energy in a different manner (e.g. reducing largest risk setter) such that the Reserve requirements are reduced. Furthermore, there is also less incentive for a genco to exercise market power for reserve since reserve costs are borne by generators[6].

[4] Real-time market power mitigation measures such as the Pivotal Supplier Test or 3-Pivotal Supplier Test are employed in PJM, CAISO and ISO-NE. These are discussed in Section 3.2.1.
[5] Refer to Pivotal Supplier Test results in section 3.2.3 for further discussion
[6] Refer to (4) under Section 3.2.2 for further explanation.

3.	Cost of releasing the information	All	✓	✓	Implementation costs arising from system and reporting changes are estimated at $57,000.

Table 3 shows benefits from providing information on Total Available Offer Capacity. These are:

- **Transparency** – Facilitates market monitoring by other stakeholders
- **Credibility** – Enables stakeholders to observe offer patterns and predict price outcomes

Table 4 indicates that costs can be attributed to:

- **Market Power Issues** – Facilitates potential capacity withholding in the energy and regulation markets.
- **Implementation costs** - System and reporting changes are estimated at $57,000

The decision to release the information rests on whether the above benefits outweigh the costs. While it is hard to quantify these benefits, they are not likely to be compelling. The crux of the issue thus boils down to verifying the likelihood of capacity withholding in the SWEM and how the publication of such data may facilitate such behaviour.

3.2 Market Power Issues in the SWEM

3.2.1 Tests Applied in Other Jurisdictions to Identify Potential Capacity Withholding

It would be advantageous to first examine real-time market mitigation tests used in other jurisdictions to identify market power and in turn, potential capacity withholding. These tests may then be applied in our analysis.

Table 5: Jurisdictions that Use Locational Market Power Tests

Jurisdictions	Type of Offer Data Published	Time Lag	Degree of Competitiveness		Locational Market Power Test
			System-wide (Energy)	Local areas	
Pennsylvania -Jersey Maryland	Total zonal offer	180 days	Competitive[7]	Market power exists in constrained areas	<u>Three Pivotal Supplier (TPS) Test (Energy and Regulation)</u> The TPS Test identifies conditions where supply may be concentrated among a few owners (2 or more) relative to demand in a constrained area. The test is applied to the energy and regulation market. • The real-time dispatch software automatically runs the TPS Test if a transmission constraint exists. • The TPS Test is applied to all suppliers
	Unit-specific offer (Masked identity)	180 days			

[7] 2012 State of Market Report, PJM

Jurisdictions	Type of Offer Data Published	Time Lag	Degree of Competitiveness		Locational Market Power Test
			System-wide (Energy)	Local areas	
					individually. • If Suppliers 1, 2 (Top 2 largest Suppliers) and Supplier X[8] (Supplier under test) fail to provide enough MW to relief the constraint, then the 3 suppliers (1,2 & X) are jointly pivotal.[9] • 3 suppliers' offers are then capped at cost schedules
California ISO	Unit-specific offer (Masked identity)	180 days	Competitive [10]	Market power exists in constrained areas[11]	<u>Competitive Path Assessment (Energy)</u> • To determine if 1 or more suppliers can influence prices through capacity withholding • 2-step Process: 1. Dispatch software first checks if transmission constraint is binding 2. For binding constraints, a 3-Pivotal Supplier Test is applied **3-Pivotal Supplier Test** • If a binding constraint exists, the

[8] The test is triggered whenever a transmission constraint in a region is detected. The test is then individually applied on suppliers in that region. Thus, the Supplier X refers to each of the owner that is placed under the TPS. Refer to example in footnote 10.

[9] Suppose 6 suppliers, A to F, submitted offers of: A-100MW, B-400MW, C- 500MW, D-750MW, E-50MW, F-80MW in a constrained area with a demand of 1600 MW. To alleviate the constraint, there has to be enough supply to meet 1600MW of demand.

Under TPS, these 6 suppliers are ranked from the largest to smallest based on their effective supply, resulting in the order D, C, B, A, F and E. The TPS will then run separation iterations with each adding a supplier's effective offer to D and C (the 2 largest suppliers). For example, in an iteration testing for B's pivotal supplier status, the TPS first sums the supply of B (400 MW- Supplier X), C and D (1250 MW), which total 1650 MW. It then evaluates if demand can be met if this 1650 MW is removed. In this example, there is insufficient remaining supply (630MW) to meet the demand of 1600MW. Since demand cannot be met without the joint supply of B, C and D, these 3 suppliers are deemed to be jointly-pivotal.

[10] Inferred from Residual Supply Index in 2011 Annual Report on Market Issues & Performance, Department of Market Monitoring

[11] Ibid

Jurisdictions	Type of Offer Data Published	Time Lag	Degree of Competitiveness		Locational Market Power Test
			System-wide (Energy)	Local areas	
					system will simulate withdrawing the total capacities of the top 3 potentially pivotal suppliers (net sellers in the market) • If system demand cannot be met without these 3 suppliers, they are deemed pivotal and their bids are mitigated to the higher of the supplier's default energy bid or the derived competitive LMP
Australian Energy Market Operator	Unit-specific offer (with identity)	1 day	Limited ability for a genco to exercise market power[12]	Limited ability for a genco to exercise market power[13]	AEMO does not use any real-time locational market power test.
ISO New England	Unit-specific offers (Masked Identity)	180 days	Not concentrated [14]	Limited local market power[15]	Mitigation thresholds are applied if a supplier is pivotal. Pivotal Supplier Test (Energy) An MP is pivotal if its aggregate Energy Supply Offers exceeds the Supply Margin where: Supply Margin = Total System Capacity – Total System Load

Two main trends can be inferred from Table 5:

a. Common use of Pivotal Supplier Test to identify locational market power

While most jurisdictions use HHI as a measure of market power, they recognise that it indicates competiveness only at a system-wide basis. Locational market power may still exist in constrained areas, in the presence of transmission constraints, as seen in PJM, CAISO and

[12] Australian Energy Market Commission 2012, Potential Generator Market Power in the NEM, Rule Determination, AEMC, 7 June 2012 , Sydney
[13] Ibid
[14] ISO New England 2011 Annual Market Report
[15] Ibid

ISO-NE. As such, all of these markets supplement HHI with the use of the Pivotal Supplier Test to identify locational market power. Incidentally, both CAISO and PJM use a Three Pivotal Supplier (TPS) test, which is a relatively more stringent variant of the Pivotal Supplier Test.

b. Markets release offer data only if they are either deemed competitive or have real-time market power mitigation measures

Table 5 also reflects that all the markets surveyed release unit-specific and total available offer data, with time lags ranging from 1-day (AEMO) to 180-days (PJM, ISONE and CAISO). Any potential anti-competitive effects of this data release are managed because these markets are either competitive even at the zonal basis (AEMO), or there are real-time mitigation measures (i.e. Pivotal Supplier Test) in place (PJM, ISO-NE and CAISO).

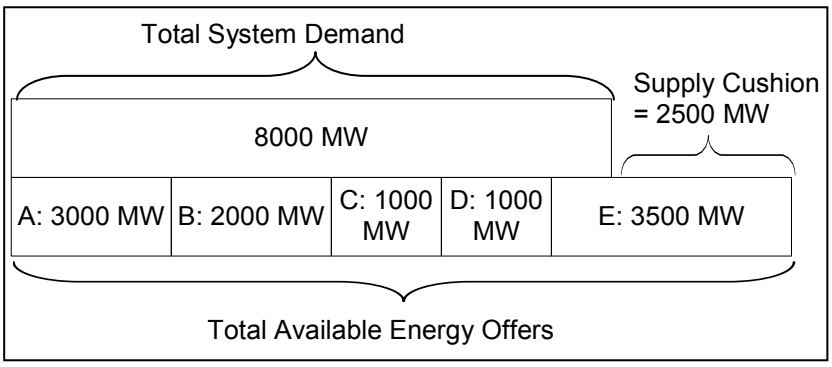
3.2.2 Pivotal Supplier in the SWEM

Section 3.2.1 showed that most jurisdictions employ the Pivotal Supplier Test to identify locational market power and resultantly, apply real-time mitigation measures to avoid potential capacity withholding. It can be seen this test uses total supply offers, which is analogous to the Total Available Offer Capacity in the SWEM. As such, it supports the argument in Section 3.1 that a dominant genco may use Total Available Offer Capacity, if published, to determine the tightness of supply and in turn, potentially exercise market power. Given the possibility of such a scenario, it is thus useful to evaluate if a pivotal supplier exists in Singapore. This section presents a simulation of potential pivotal suppliers in the SWEM.

Background on Pivotal Supplier Test

The Pivotal Supplier Test measures the existence of, and the extent to which suppliers' output, must be either individually or jointly (which is a more stringent check, as in the case of the PJM's TPS) scheduled to meet demand. With reference to Figure 1, suppose total system demand is 8000 MW and total offered capacity of 10500 MW from 5 gencos in a given period, resulting in a supply cushion of 2500 MW. Applying an individual Pivotal Supplier Test, if either Genco A or E withdraws more than 2500 MW of offered capacity, a supply shortfall will occur in the market. This implies that 2 pivotal suppliers exist in this given dispatch period.

Figure 1: Pivotal Supplier(s) Without Contracts

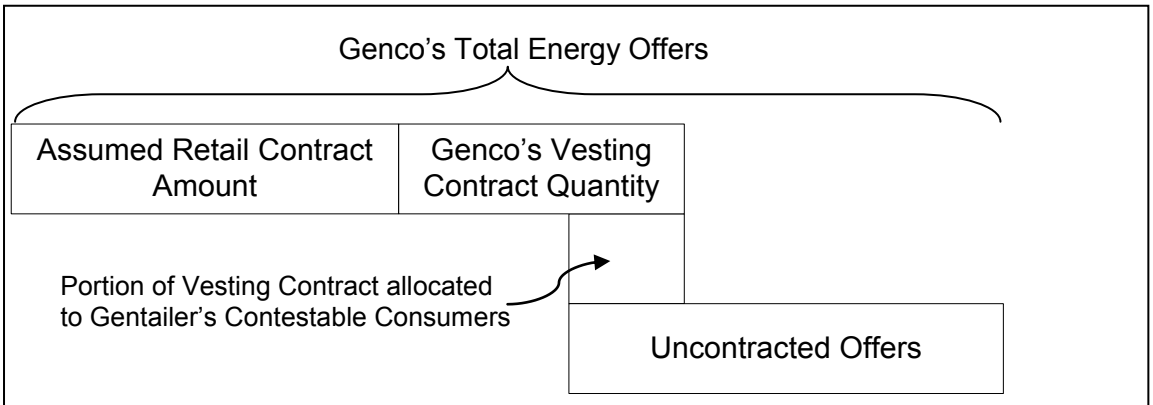


Steps used to Determine Existence of a Pivotal Supplier in the SWEM

The pivotal supplier test described in Figure 1 did not account for any contracted volumes. However, in the SWEM, gencos have vesting contracts and retail contracts obligations. As such, there is a need to net off these contracted levels when determining the existence of a pivotal supplier for energy. The approach used in our analysis is as follows:

1. For each period, compute each genco's uncontracted offer in the SWEM as reflected in Figure 2.

Figure 2: Computing a Genco's Uncontracted Offers



Uncontracted Offers =
Genco's Total Energy Offers – Estimated % of Retail Contracts not on Spot Prices – Vesting Contract Quantity + Portion of the Vesting Contract Allocated to Gentailer's Contestable Consumers

Where:

Vesting Contract Quantity = Quarterly Vesting Quantity Allocated to Genco (period-weighted)

Portion of the Vesting Contract Allocated to Gentailer's Contestable Consumers

$$= \frac{\text{Non-contestable Consumer's Load (Assumed)}}{\text{Total Withdrawal Energy Quantity (WEQ)}} \times \text{WEQ of Gentailer A}$$

$$= \frac{\text{Non-contestable Consumer's Load (Assumed)}}{\text{Total Withdrawal Energy Quantity (WEQ)}} \times \text{WEQ of Gentailer A}$$

Non-contestable Consumer's Load (Assumed) = 32% x Total Withdrawal Energy Quantity (WEQ)

Assumed Retail Contract Amount = X% of Gentailer's WEQ

The uncontracted offers in Figure 2 reflect the maximum energy offer a genco can withdraw once it has fulfilled its contract obligations. The percentage of Genco's Contestable Consumers Covered by Vesting Contracts will hedge a portion of a Genco's Retail non-spot contracts. Therefore, it increases the uncontracted offers available to this genco.

The analysis will evaluate non–spot price retail contracts levels at 70%, 80%[16] and 90%.

[16] EMA assumed an 80% retail contract level in its review of the 2013/2014 Vesting Contract Levels.

2. Compute Total System Demand

   Total System Demand = System-wide Energy Demand + Total Regulation Requirement + Contingency Reserve Requirement

   Regulation requirement and reserve requirement are considered part of total system demand as the Total Energy Offer that a genco submits usually indicates the maximum quantity it is willing to generate at. This maximum quantity includes the unit's regulation and the maximum of its primary, secondary or contingency reserve offers.

3. Compute the supply cushion for Energy and Regulation

   Supply Cushion for Energy for each period = Total Available Energy Offers – Total System Demand

   Supply Cushion for Regulation for each period = Total Regulation Offers – Total Regulation Requirement

4. For energy, compare the supply cushion for energy with each genco's uncontracted offer. If a genco has uncontracted offers that exceed the supply cushion, then this genco is considered a pivotal supplier for **energy**.

   For regulation, compare the supply cushion for regulation with each genco's total regulation offer. If a genco has a total regulation offer that exceeds the supply cushion, then this genco is considered to be a pivotal supplier for **regulation**.

   The pivotal supplier test will not be applied to reserve for two reasons:

   a. Reserve costs are allocated to gencos

   Reserve costs are currently allocated to gencos as a function of their scheduled energy and standing probability of failure. To avoid paying high reserve charges and to hedge their reserve exposure, gencos will usually offer a certain proportion of their unit's capacity to reduce reserve price risk. They thus have less incentive to withhold reserve capacity in this market.

   b. Reserve requirements are endogenously determined

   To withhold capacity, a genco must be aware of the actual total system reserve requirement and its own reserve requirement. However, these are not known ex-ante because:

   i. System-Wide Reserve Requirement depends on largest scheduled generator

   The current reserve requirements (Primary, Secondary and Contingency) are derived from the largest generator scheduled for a given dispatch period. However, this information will only be released in the real-time dispatch schedule (less than 5 minutes prior to the start of the dispatch period), together with reserve required. Gencos are thus unable to accurately predict the reserve requirement until then and resultantly, unable to reduce reserve capacity ahead of the dispatch period.

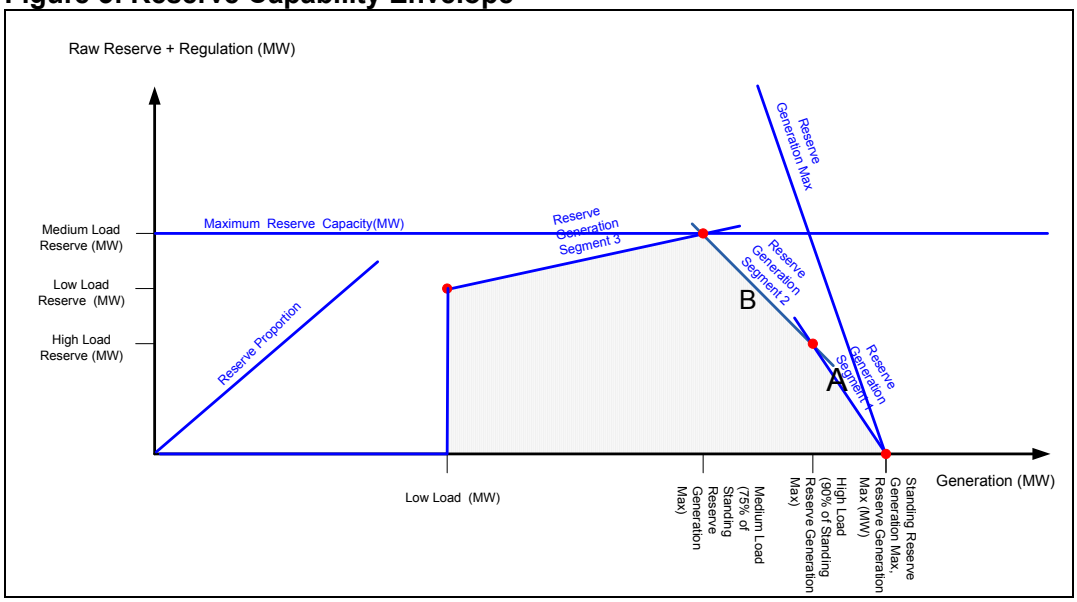
Even if forecast schedules give gencos an insight of the largest unit that may potentially be scheduled, offers are subject to changes before gate closure. After gate closure, gencos that try to withhold capacity cannot do so without reasonable justification. Thus, there remains an element of uncertainty.

ii. A generator's scheduled reserve depends on its scheduled energy

The Market Clearing Engine (MCE) currently models each generator's ability to provide reserve using the reserve capability envelope as shown in Figure 3. This envelope shows a generator's scheduled energy (x-axis) and its corresponding reserve capability at that generation level (y-axis). For example, if the MCE chooses to schedule a generating unit at High Load, the unit can only provide a level of reserve at the High Load Reserve point, marked Point A in Figure 3. This level is much lower than if the unit had been scheduled at its Medium Load, indicated by Point B.

Thus, for a genco to be certain of its scheduled reserve and resultantly, excess reserve capacity that it may withhold, it must have certainty over its level of scheduled energy. However, as stated, a genco will not know its actual scheduled energy until less than 5 minutes prior to the dispatch period. As such, it is hard for a genco to accurately withhold reserve capacity to drive up prices or create a reserve shortfall.

Figure 3: Reserve Capability Envelope



3.2.3 Discussion on Pivotal Suppliers in the SWEM

Table 6 below shows the results of the pivotal supplier test applied on data for the dispatch period **1 June 2012 to 31 August 2012 (4416 Periods)**.

Table 6: Results of Pivotal Supplier Test in the SWEM

Product	Assumed Retail Contract Level	Total No of Periods with Pivotal Supplier	No of Periods with 1 Pivotal Supplier	No of Periods with 2 Pivotal Suppliers
Energy	70%	215 (4.87%)	134 (3.03%)	81 (1.83%)
	80%	110 (2.49%)	71(1.61%)	39 (0.88%)
	90%	42 (0.95%)	38 (0.86%)	4 (0.09%)
Regulation	N.A	396 (8.96%)	396 (8.96%)	0

The percentage of dispatch periods with pivotal suppliers fell from 4.87% to 0.95% as estimated retail contract levels for energy was increased from 70% to 90%. Energy also had dispatch periods where there were 2 distinct pivotal suppliers. Similarly, these numbers decreased as contracting levels increased. Only 1 pivotal supplier was observed in regulation, but this was seen in 8.96% of the dispatch periods.

The simulation above shows that pivotal suppliers do exist in the SWEM for selected dispatch periods. As such, the publication of Total Available Offer Capacity for energy may facilitate capacity withholding during such periods. While one may argue that in the instance of energy, the relatively high retail contracted levels in the SWEM may discourage such market power issues, it must be noted that the gentailers have control over these contract levels. Thus, they could reduce their respective retail contract levels at their discretion, increasing the likelihood of having a pivotal supplier.

Similarly, in the instance of regulation, information on Total Offer Capacity for regulation is also likely to facilitate capacity withholding during periods of tight regulation supply.

4. Industry Consultation

We published the concept paper for industry consultation on 15 January 2013 and received comments from Senoko Energy and Sembcorp Cogen.

Senoko Energy's Comments
Senoko is supportive of increasing transparency in SWEM.

We note the EMC's concerns regarding potential misuse of the offer capacity information to facilitate the exercise of market power.

We refer to the EMA's final determination paper on the review of 2013-14 Vesting Contract levels which acknowledges that the Gencos' ability to exercise market power is declining: "With expected keener competition among the Gencos following the start of commercial operations of the LNG terminal in Q2 2013 and additions of new/repowered CCGT capacity, TLG recommends reducing the Vesting Contract level .... The recommendations of TLG are consistent with the policy objective of Vesting Contracts and EMA's plan to reduce the Vesting Contract level over time contingent on dilution of Genco's market power in the wholesale electricity market".

We have no objection to the proposed release of Total Available Offer Capacity for all products and schedules.

EMC's Response
We note Senoko Energy's view on the proposal and recognise EMA's recommendations to gradually reduce Vesting Contract levels over the next 2 years. However, even with the anticipated declining ability for gencos to exercise market power, the vesting contract levels will still be set at 40% come 2014, indicating the existence of market power.

We suggest reviewing this proposal upon the removal of vesting contracts in the SWEM.

Sembcorp Cogen's Comments

We do not support this rule change of additional publishing of the Total Available Energy Offer Capacity (and that for reserve and regulation) due to the highly concentrated nature of our Singapore Electricity Market.

EMC's Response
We note Sembcorp Cogen's comments.

5. Conclusion

While publishing Total Offer Capacity for all 3 products may enhance market efficiencies, there are other currently available data which can also guide stakeholders in evaluating the same production and investment decisions. Additionally, releasing such data for energy and regulation may also facilitate the exercise of market power.

Although there is a lower likelihood for gencos to exercise market power using Total Offer Capacity for reserve, there is no clear benefit to releasing this data without releasing similar data for energy and regulation. Moreover, implementation costs will have to be incurred to incorporate this data into real-time and forecast schedules.

Thus, the costs of releasing Total Available Offer Capacity for energy, regulation and reserve for all schedules outweigh the benefits.

EMC recommends that the RCP **do not support** the proposal to publish Total Available Offer Capacity for all products across all schedules.

Nevertheless, we recognise that the market power concerns raised in this proposal may be alleviated in future with additional capacity coming on board. As such, there is merit in reviewing this proposal upon the removal of vesting contracts in the SWEM.

6. Decision at the 66th RCP Meeting

At the 66th RCP Meeting, the Panel, by majority vote, **supported** the proposal **to publish** Total Available Offer Capacity for all products across all schedules for reasons described below.

a. Market power risk likely to reduce with new capacity entering the SWEM in 2013

While the RCP acknowledged the market power concerns in the SWEM at this juncture, they believe that the market will become more competitive with new entrants/capacity coming on board by end 2013. Thus, the benefit of transparency may override the risk of market power.

b. Publication of data will enhance efficiencies in Futures Market and Demand Response initiatives

The RCP also commented that releasing the data will support and enhance efficiencies in EMA's Futures Market and Demand Response initiatives.

The details of the voting results are as follows:

Those who voted to publish Total Available Offer Capacity for all products across all schedules:

- Philip Tan Person experienced in Financial Matters in Singapore
- Kng Meng Hwee Representative of the PSO
- Toh Mun Heng Representative for the interests of consumers of Electricity
- Pak-Juan Koe Representative of Generation Licensee
- Luke Peacocke Representative of Generation Licensee
- Dallon Kay Representative of the Wholesale Electricity Market Trader
- Toh Seong Wah Representative of the EMC
- Lawrence Lee Representative of Market Support Services Licensee

Those who abstained:

- Mr. Michael Wong Representative of Retail Electricity Licensee
- Mr. Sean Chan Representative of Retail Electricity Licensee

The RCP then **tasked** EMC to draft the relevant Market Rules to implement their decision.

7. Implementation Process

The breakdown of the estimated implementation time and costs are set out in Table 7 below.

Table 7: Estimated Implementation Time and Costs

Time Estimates	Effort Estimates	Lapse Time
1. Change Development in SEW Trading Portal, MP API and WebService, and SEW Public Website	10 man-weeks	12 calendar-weeks
2. System Tests and Performance	4 man-weeks	5 calendar-weeks
3. User Acceptance Testing (UAT)	5 man-weeks	6 calendar-weeks
Total Time Required	19 man-weeks	23 calendar-weeks
Cost		
1. Internal Cost (Codes and UAT review)	$9,000	
2. External Cost (System development and UAT)	$48,000	
Total Cost Required	**$57,000 (EMC's Budget – RCP Contingency Budget)**	

8. Proposed Rule Changes

Table 8 summarises the proposed rule modifications required to implement the RCP's decision.

Table 8: Proposed Rule Changes

Section	Proposed Changes	Reasons for Change
Chapter 6, New sections 7.7.3.5, 7.7.3.6 and 7.7.3.7	Include the total offer quantity for energy, for each class of reserve and for regulation for each dispatch period as part of the scenario information in the short-term schedule, pre-dispatch schedule and market outlook scenario.	To require EMC to publish the total quantity offered for all products in all forecast schedules.
Chapter 6, New sections 9.2.4.5, 9.2.4.6 and 9.2.4.7	Include the total offer quantity for energy, for each class of reserve and for regulation in each real-time dispatch schedule.	To require EMC to publish the total quantity offered for all products in the real-time dispatch schedule.
Chapter 6, Sections 7.7.3.5-7.7.3.12 and Sections 9.2.4.5-9.2.4.12	Re-numbering of sections	To introduce the new sections described above.

9. Legal sign-off

The text of the rule modifications has been vetted by EMC's external legal counsel, whose opinion is that the modifications reflect the intent of the rule modification proposal as expressed in the third column of the table in **Annex 3**.

10. Industry Consultation for Proposed Rule Modification

We published the proposed rule modification for industry comments on 3 April 2013. No comments were received.

11. Recommendations

The RCP unanimously **recommends** that the EMC Board:

a. support the rule modification proposal as set out in **Annex 3**;

b. seek the Authority's approval of the rule modifications as set out in **Annex 3**; and

c. **recommend** that the proposed rule modification come into force **6 calendar months** after the date on which the approval of the Authority is published by the EMC.

Annex 1: Consultation on Impact Test

Tests (Details in section 3)	Energy		Regulation		Reserve		Additional Comments from your company's perspective. (Please include the pros and cons)
	Real-Time	Forecast	Real-Time	Forecast	Real-Time	Forecast	
National Security Test i.e. enables identification of critical installations and its location such that it facilitates a terrorists attack	(Yes/No/No comments)	(Yes/No/No comments)	(Yes/No/No comments)	(Yes/No/No comments)	(Yes/No/No comments)	(Yes/No/No comments)	
Financial Test i.e. causing an identified party to be financially or competitively disadvantaged	(Yes/No/No comments)	(Yes/No/No comments)	(Yes/No/No comments)	(Yes/No/No comments)	(Yes/No/No comments)	(Yes/No/No comments)	
Commercial Test i.e. whether such information is a trade secret by its nature	(Yes/No/No comments)	(Yes/No/No comments)	(Yes/No/No comments)	(Yes/No/No comments)	(Yes/No/No comments)	(Yes/No/No comments)	

Tests (Details in section 3)	Energy		Regulation		Reserve		Additional Comments from your company's perspective. (Please include the pros and cons)
	Real-Time	Forecast	Real-Time	Forecast	Real-Time	Forecast	
Legal Test i.e legal to be released by Singapore law? Does it have an adverse impact on existing contractual agreement to which an identified party is a party	(Yes/No/No comments)	(Yes/No/No comments)	(Yes/No/No comments)	(Yes/No/No comments)	(Yes/No/No comments)	(Yes/No/No comments)	
Market Efficiency Test i.e. does it adversely affect market efficiency or weaken the NEMS Market Design Principles (Uniform Marginal Pricing)	(Yes/No/No comments)	(Yes/No/No comments)	(Yes/No/No comments)	(Yes/No/No comments)	(Yes/No/No comments)	(Yes/No/No comments)	
Cost Test i.e. The cost of making the data available	(Amount if any or N.A.)	(Amount if any or N.A.)	(Amount if any or N.A.)	(Amount if any or N.A.)	(Amount if any or N.A.)	(Amount if any or N.A.)	

ANNEX 2: TEST GUIDELINES

1) IDENTITY TEST

Information or data is considered to be connected to an individual, a firm or a company if any of the following applies:

a) The name of the individual, firm or company is unequivocally revealed.
b) Unique attribute(s) of the individual/firm/company is/are revealed such that its identity can reasonably be deduced or derived therefrom.
c) The information/data relates to a class of person/firm/company that is sufficiently small in number such that identity can reasonably be inferred from such information/data.
d) Presence of other forms of revelation that the EMC feels can reasonably lead to the identification of the party to whom the information/data relates.

Where identified, the individual, firm or company will be consulted on the potential impact of disclosing the information or data.

2) IMPACT TEST

The Impact Test considers 4 types of adverse impact the disclosure of information or data may result in:

2.1 Financial

Information or data will be deemed to cause adverse financial impact if it:

a) Causes the trading behavior of other market participants to alter in a manner that the identified party is financially disadvantaged;
b) Causes the electricity market to behave in a way that financially disadvantages the identified party; and/or
c) Causes the competitive position of the identified party to be disadvantaged vis-à-vis other parties.

2.2 Commercial

If the information or data is a trade secret by its nature, it will be considered to have adverse commercial impact.

"Trade secrets" are defined as (but are not limited to) any formula, plan, pattern, process, tool, mechanism, compound, procedure, production data, or compilation of information which is not patented, which is known only to certain individuals within a commercial concern who are using it to fabricate, produce, or compound an article of trade or a service having commercial value and which gives its user an opportunity to obtain a business advantage over competitors who do not know or use it.

2.3 Legal

a) Whether the release is prohibited by any applicable Singapore law.
b) Whether the release would adversely cause an impact on any contractual arrangement to which EMC is a party.
c) Whether the release would adversely cause an impact on any contractual arrangement to which the identified party is a party.

2.4 NATIONAL SECURITY TEST

Information will be considered to have adverse impact on national security if it:

1. enables the identification of a critical power installation in the Singapore power system network; and

2. is key to locating a critical power installation and useful to a person planning an attack on the installation that can cause disruption or serious interference with public utilities.

Such information shall be kept confidential.

Where EMC cannot reasonably ascertain the above, it shall consult the EMA. The EMA's decision on the impact on national security of disclosing such information shall be final. Information deemed to have adverse impact on national security will be kept confidential.

3. COST-BENEFIT TEST

A qualitative analysis of cost and benefits will be conducted based on these factors:

Benefits	Costs
• **Facilitation of investment decisions and use of resources:** - Market efficiencies (static and dynamic) including: *(a) demand and supply interaction* *(b) price discovery* *(c) price signals (long and short term)* - Transparency - Credibility • **Cost reduction** • **Strengthening of Market Design Principles (eg. Market Power Issues)**	• **Associated costs identified under the Impact Test:** Financial Commercial Legal National Security • **Adverse impact on market efficiency**

Annex 3: Proposed Market Rules Modification

Existing Rules (Release 1 Jan 2013)	**Proposed Rules** (Deletions represented by strikethrough text and addition underlined)	**Reason for Modification**
CHAPTER 6	**CHAPTER 6**	
7.7 RELEASE OF SCENARIO INFORMATION	**7.7 RELEASE OF SCENARIO INFORMATION**	
7.7.3 In accordance with sections 7.7.1, 7.7.2 and 7.7.2A, the *EMC* shall *publish* the following information for each *dispatch period* and for each *market outlook scenario, pre-dispatch schedule scenario* and *short-term schedule*:	7.7.3 In accordance with sections 7.7.1, 7.7.2 and 7.7.2A, the *EMC* shall *publish* the following information for each *dispatch period* and for each *market outlook scenario, pre-dispatch schedule scenario* and *short-term schedule*:	
7.7.3.1 the projected total *load*;	7.7.3.1 the projected total *load*;	
7.7.3.2 the projected total transmission losses;	7.7.3.2 the projected total transmission losses;	
7.7.3.3 total *reserve* requirements by *reserve class*;	7.7.3.3 total *reserve* requirements by *reserve class*;	
7.7.3.4 total *regulation* requirements;	7.7.3.4 total *regulation* requirements;	
7.7.3.5 projected *energy* prices associated with each *market network node* at which a *generation registered facility* or *generation settlement facility* is located, determined in accordance with sections D.24.1 and D.24.5 of Appendix 6D;	7.7.3.5 total of the quantities in all the *price-quantity pairs* of all *energy offers* accepted as valid by the *EMC* and required to be used by the *EMC* for the purposes of section 5.8;	To state that the EMC shall publish the aggregate quantities of all energy offers accepted as valid by the EMC for each dispatch period and for each market outlook scenario, pre-dispatch
7.7.3.6 the projected *uniform Singapore energy price,* determined in accordance with section D.24.6 of Appendix 6D;	7.7.3.6 total of the quantities in all the *price-quantity pairs* of all *reserve offers* for each *reserve class* accepted as valid by the *EMC* and required to be used by the *EMC* for the purposes of section 5.8;	
7.7.3.7 projected *reserve prices* for each *reserve class*		

Existing Rules (Release 1 Jan 2013)	Proposed Rules (Deletions represented by strikethrough text and addition underlined)	Reason for Modification
and *reserve provider group*, determined in accordance with sections_D.24.3, D.24.5 and D.24.7 of Appendix 6D;	7.7.3.7 total of the quantities in all *price-quantity pairs* of all *regulation offers* accepted as valid by the *EMC* and required to be used by the *EMC* for the purposes of section 5.8;	schedule scenario and short-term schedule.
7.7.3.8 projected *regulation prices*, determined in accordance with sections D.24.4 and D.24.5 of Appendix 6D;	7.7.3.~~5~~ 8 projected *energy* prices associated with each *market network node* at which a *generation registered facility* or *generation settlement facility* is located, determined in accordance with sections D.24.1 and D.24.5 of Appendix 6D;	To state that the EMC shall publish the aggregate quantities of all reserve offers accepted as valid by the EMC for each reserve class for each dispatch period and for each market outlook scenario, pre-dispatch schedule scenario and short-term schedule.
7.7.3.9 any predicted system *energy* shortfalls;		
7.7.3.10 any predicted system *reserve* shortfalls, by *reserve class*;		
7.7.3.11 any predicted system *regulation* shortfalls; and	7.7.3.~~6~~ 9 the projected *uniform Singapore energy price,* determined in accordance with section D.24.6 of Appendix 6D;	
7.7.3.12 a list of *security constraints* and *generation fixing constraints* applied.	7.7.3.~~7~~10 projected *reserve prices* for each *reserve class* and *reserve provider group*, determined in accordance with sections_D.24.3, D.24.5 and D.24.7 of Appendix 6D;	To state that the EMC shall publish the aggregate quantities of all regulation offers accepted as valid by the EMC for each dispatch period and for each market outlook scenario,
	7.7.3.~~8~~11 projected *regulation prices*, determined in accordance with sections D.24.4 and D.24.5 of Appendix 6D;	
	7.7.3.~~9~~12 any predicted system *energy* shortfalls;	
	7.7.3.~~10~~13 any predicted system *reserve* shortfalls, by *reserve class*;	

Existing Rules (Release 1 Jan 2013)	Proposed Rules (Deletions represented by strikethrough text and addition underlined)	Reason for Modification
	7.7.3.~~11~~14 any predicted system *regulation* shortfalls; and 7.7.3.~~12~~15 a list of *security constraints* and *generation fixing constraints* applied.	pre-dispatch schedule scenario and short-term schedule. To state that, in respect of each of the foregoing, the relevant offers to be used shall be those required to be used by the EMC for the purposes of section 5.8 of Chapter 6.
9.2 THE REAL-TIME SCHEDULING PROCESS 9.2.4 The *EMC* shall, in accordance with the *market operations timetable*, *publish* the following information as it pertains to each *dispatch period:* 9.2.4.1 total *load;* 9.2.4.2 total transmission losses; 9.2.4.3 total *reserve* requirements by *reserve class*; 9.2.4.4 total *regulation* requirements; 9.2.4.5 *energy* prices associated with each *market*	**9.2 THE REAL-TIME SCHEDULING PROCESS** 9.2.4 The *EMC* shall, in accordance with the *market operations timetable*, *publish* the following information as it pertains to each *dispatch period:* 9.2.4.1 total *load;* 9.2.4.2 total transmission losses; 9.2.4.3 total *reserve* requirements by *reserve class*;	

Existing Rules (Release 1 Jan 2013)	Proposed Rules (Deletions represented by strikethrough text and addition underlined)	Reason for Modification
network node at which a *generation registered facility* or *generation settlement facility* is located, determined in accordance with sections D.24.1 and D.24.5 of Appendix 6D; 9.2.4.6 the *uniform Singapore energy price,* determined in accordance with section D.24.6 of Appendix 6D; 9.2.4.7 *reserve prices* for each *reserve class* and *reserve provider group*, determined in accordance with sections D.24.3, D.24.5 and D.24.7 of Appendix 6D; 9.2.4.8 *regulation prices,* determined in accordance with sections D.24.4 and D.24.5 of Appendix 6D; 9.2.4.9 any system *energy* shortfalls reported by the *market clearing engine*; 9.2.4.10 any system *reserve* shortfalls, by *reserve class,* reported by the *market clearing engine*; 9.2.4.11 any system *regulation* shortfalls reported by the *market clearing engine*; and 9.2.4.12 a list of *security constraints* and *generation fixing constraints* applied.	9.2.4.4 total *regulation* requirements; 9.2.4.5 total of the quantities in all *price-quantity pairs* of all *energy offers* accepted as valid by the *EMC* and required to be used by the *EMC* for the purposes of section 5.8; 9.2.4.6 total of the quantities in all the *price-quantity pairs* of all *reserve offers* for each *reserve class* accepted as valid by the *EMC* and required to be used by the *EMC* for the purposes of section 5.8; 9.2.4.7 total of the quantities in all *price-quantity pairs* of all *regulation offers* accepted as valid by the *EMC* and required to be used by the *EMC* for the purposes of section 5.8; 9.2.4.~~5~~8 *energy* prices associated with each *market network node* at which a *generation registered facility* or *generation settlement facility* is located, determined in accordance with sections D.24.1 and D.24.5 of Appendix 6D; 9.2.4.~~6~~9 the *uniform Singapore energy price,* determined in accordance with section D.24.6 of Appendix 6D;	To state that the EMC shall publish the aggregate quantities of all energy offers accepted as valid by the EMC for each dispatch period. To state that the EMC shall publish the aggregate quantities of all reserve offers for each reserve class accepted as valid by the EMC for each dispatch period. To state that the EMC shall publish the aggregate quantities of all regulation offers accepted as valid by the EMC for each dispatch period. To state that, in

Existing Rules (Release 1 Jan 2013)	**Proposed Rules** (Deletions represented by strikethrough text and addition underlined)	**Reason for Modification**
	9.2.4.~~7~~10 *reserve prices* for each *reserve class* and *reserve provider group*, determined in accordance with sections D.24.3, D.24.5 and D.24.7 of Appendix 6D; 9.2.4.~~8~~11 *regulation prices,* determined in accordance with sections D.24.4 and D.24.5 of Appendix 6D; 9.2.4.~~9~~12 any system *energy* shortfalls reported by the *market clearing engine*; 9.2.4.~~10~~13 any system *reserve* shortfalls, by *reserve class,* reported by the *market clearing engine*; 9.2.4.~~11~~14 any system *regulatio*n shortfalls reported by the *market clearing engine*; and 9.2.4.~~12~~15 a list of *security constraints* and *generation fixing constraints* applied.	respect of each of the foregoing, the relevant offers to be used shall be those required to be used by the EMC for the purposes of section 5.8 of Chapter 6.