

Notice of Market Rules Modification

Paper No.:	EMC/RCP/38/2008/272
Rule Reference:	Chapter 3 Sec 3.3.1, Sec 3.11.1 Chapter 5 Sec 9.8.2 Chapter 6 Sec 3.3.1, Sec 9.26, Sec 9.3, Sec 10.2, Sec 10.3.3, Appendix 6D Sec 16.4, Sec 21.2, Sec 22.5, Appendix 6H, Appendix 6K Chapter 8 Sec 1.1
Proposer:	Market Admin, EMC
Date Received by EMC:	16 Jan 2008
Category Allocated:	2
Status:	Not Approved by EMA
Effective Date:	N/A

Summary of Proposed Rule Modification:

Following an earlier review of price revision in the Singapore Wholesale Electricity Market, this paper proposes the rule changes to remove Type 4 reruns, which occur when the MCE has applied a constraint violation penalty (CVP) for line constraint for a dispatch period, and the PSO subsequently confirmed that there was no load shed in that period. This proposal stems from the principle that many MCE constraints are precautionary in nature, and it is inappropriate to ignore them ex-post just because nothing untoward had actually occur.

This paper also proposes rule changes to clarify the scope of erroneous inputs to the MCE that would trigger off price revision under Type 2 reruns, and includes rewrites of selected sections in Chapters 6 and 8 for greater clarity.

The above rule changes were supported by RCP at the 38th RCP Meeting.

The paper proposes a compensation arrangement when generators are affected by a downward price revision. To ensure that they do not suffer financial losses, the paper proposes that generators be compensated based on the excess of offer prices(s) above the revised MEP for the affected energy quantities.

As the RCP could not reach a decision by majority vote on this rule change proposal on compensation, no changes to the Market Rules are proposed to award compensation to affected generators when prices are revised.

Date considered by Rules Change Panel:	1 July 2008
Date considered by EMC Board:	31 July 2008
Date considered by Energy Market Authority:	15 April 2009

Proposed rule modification:

See attached paper.

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

EMA is of the view that:

Type 4 re-run does not compromise the ex-ante pricing philosophy of the market, as it is meant to address a problem caused by modeling imperfections, not energy shortfall. Useful price signals should be differentiated from 'noise' and Type 4 re-run was intended to remove the 'noise'. In other words, if price separation is due to real constraints resulting in load shedding, we should not use Type 4 re-run to mute the price signal. However, if price separation is due to modeling imperfection we should then be prepared to use Type 4 re-runs.

The 19 Jan 08 price separation incident resulted in consumers having to bear a higher weighted average USEP of \$590/MWh before Type 4 re-run. After Type 4 re-runs, price separation was reduced and the average USEP fell to \$401/MWh for the day. The outcome of paying a higher weighted average USEP is not justifiable and would undermine the interests of consumers.

PAPER NO. : **EMC/BD/04/2008/**

RCP PAPER NO. : **EMC/RCP/38/2008/272**

SUBJECT : **CHANGES ARISING FROM THE REVIEW OF PRICE
REVISION IN THE SINGAPORE WHOLESALE
ELECTRICITY MARKET**

FOR : **DECISION**

PREPARED BY : **TAN LIANG CHING
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REVIEWED BY : **PAUL POH LEE KONG
SVP, MARKET ADMINISTRATION**

DATE OF MEETING : **31 July 08**

Executive Summary

Following the decision made at the 33rd RCP meeting in July 07, this paper proposes the rule changes to remove Type 4 price revisions, and clarify the scope of erroneous inputs to the MCE that would trigger off price revision under Type 2 reruns.

As part of the continual efforts to enhance readability of the Market Rules by all stakeholders and reduce inconsistencies, EMC also took the opportunity to redraft selected sections in Chapters 6 and 8 for greater clarity.

Finally, to ensure that generators are not adversely affected when the MEP is revised downwards, the paper proposes a compensation arrangement where generators are compensated based on the difference between the revised MEP and the offer price(s) for affected energy quantities. This arrangement strikes a balance between ensuring that generators are not penalised for reacting to high price signals, without over-burdening load/consumers who were not responsible for the price revision in the first place. The paper also proposes implementation procedures, whereby affected gencos would submit compensation claims to EMC for consideration.

The proposals were put to a vote at the 38th RCP and by majority vote, the Panel recommended that the EMC Board adopt the proposal to remove Type 4 price revision and redraft the existing market rules for greater clarity. There was a split vote on the

amount of compensation for generators affected by price revision and in accordance with the Market Rules, no decision was taken; thus no changes to the Market Rules are proposed to awarded compensation to affected generators when prices are revised.

1. Introduction

This paper implements RCP's decisions arising from the review of price revision in the SWEM, and proposes a compensation arrangement for generators adversely impacted for consideration. It also rewrites selected sections of the market rules in plain English for greater clarity.

2. Background

On 11 Dec 2005, a price revision occurred for period 26, which resulted in a Senoko power station (PPB GT1) experiencing a fall in MEP from \$3,068.41 to \$128.13. In addition to foregone profits, the generator incurred financial losses as the revised MEP of \$128.13 was below the bid offer price of \$600, and allegedly unable to cover the costs for fuel and plant damage due to the start-up.

Given the obvious financial impact of the price revision and other similar incidents on Market Participants, EMC was tasked to carry out a comprehensive review of price revision in the SWEM. The Terms of Reference for the review were to:

- Study the price revision practices in other jurisdictions
- Study EMC's internal procedures for price revision, and examine their circumstances, frequency and market impact
- Review the rationale for price revision in the SWEM, and associated price revision arrangements
- Propose measures to mitigate any adverse impact on stakeholders (e.g. compensation)

To address the above issues, EMC first tabled the paper "*Review of Price Revision in the Singapore Wholesale Electricity Market*" at the 29th RCP Meeting in November 2006. The report underwent a few revisions before it was finalized in Dec 2006 for RCP discussion. The final paper concluded that price revision had no impact on short term economic efficiency, and only a weak impact on long term economic efficiency. The issue of price revision thus boiled down to one of (i) ensuring fairness and equity through the revision of prices to the correct level reflective of prevailing economic conditions, versus (ii) instilling confidence in market participants by not revising prices ex-ante.

The final paper considered fairness to be a crucial factor and thus, proposed to retain the price revision process in SWEM. However, to ensure that generators do not suffer financial losses when they respond to high price signals, there should be a corresponding compensation arrangement that does not overly burden consumers.

The review also reviewed the circumstances under which price revision should be allowed to take place. The five types of reruns that are currently applicable are:

- Type 1:** Cases where the MCE has failed to produce a real-time schedule (RTS) for a dispatch period for any reason other than a real-time market suspension
- Type 2:** Cases where the MCE has used input data that are not entirely what should have been supplied to it at the time the RTS for a dispatch period would normally have been produced

- Type 3:** Cases where the MCE has used the adjusted nodal load forecasts which take into account the energy shortfall specified by the PSO for a dispatch period
- Type 4:** Cases where the MCE has applied constraint violation penalty (CVP) for line constraint for a dispatch period and the PSO has subsequently confirmed that there was no load shed in that period.
- Type 5:** Cases where the MCE has produced prices which do not reflect their respective locational system marginal price(s) (LSMP)

EMC affirmed the relevance of Types 1, 2, 3 and 5 reruns, but proposed the removal of Type 4 price revisions (ex-post removal of CVPs). This is because many constraints in the MCE are precautionary in nature, and they should not be removed ex-post in determining prices just because no untoward circumstances occurred. In addition, EMC recommended clarifying the definition of Erroneous Input Data to the MCE, which would trigger off price revision under Type 2 reruns.

By majority vote, the RCP agreed to EMC's recommendations, specifically to:

- Retain price revision in the SWEM
- Remove Type 4 reruns, and
- Clarify the definition of erroneous inputs to the MCE, which would trigger off price revision under Type 2 reruns

The final report incorporating RCP's discussion and decision is attached as **Annex 1**.

The subsequent sections 3.1, 3.2 and 3.3, will discuss the proposed market rule changes to implement the RCP's decisions, a rewrite of selected sections for greater clarity, and the proposed compensation arrangement respectively.

3. Analysis

3.1 Market Rule Changes for Price Revision Review

This section reviews the rules changes associated with RCP's decisions arising from the price revision process.

3.1.1 Removal of Type 4 Price Reruns

EMC proposed for Type 4 reruns to be removed, so as to respect the ex-ante precautionary constraints imposed by the MCE. Currently, Type 4 price reruns are carried out for a dispatch period if constraint violation costs had been applied by the MCE in accordance with section D.16 of Appendix 6D of the Market Rules, and the PSO confirms that no load has been shed in that dispatch period. To remove Type 4 reruns, the following rules are proposed to be deleted:

Table 1: Proposed Rule Changes to Remove Type 4 Reruns

Sections of the Rules	Purpose of Rule	Proposed Changes and Reasons
Section 9.3.2C, Chapter 6	- allows prices to be provisional where constraint violation costs have applied by the MCE in accordance with section D.16 of Appendix 6D	Delete rules Reason: It is inappropriate for the current price revision process to allow for relaxation of line constraints in the MCE re-run where a CVP for line constraint has been incurred (ex-ante) but there is no load shed (ex-post).
Section 9.3.2B, Chapter 6	- spells out procedures relating to issuance of price revision advisory notice where prices have been confirmed to be subjected to revision	Delete reference to section 9.3.2C
Section 9.3.2D, Chapter 6	- allows EMC to request the PSO to confirm whether or not load shedding has occurred, and provide to EMC the maximum actual line flow values of identified lines	Delete rules Reason: Same as Section 9.3.2C above.
Section 9.3.2E, Chapter 6	- allows EMC to revise prices if PSO confirms no load shedding	Delete rules Reason: Same as Section 9.3.2C above.
Section 9.8.2, Chapter 5	- PSO to confirm with EMC within one business day of request whether or not load shedding has occurred in the affected dispatch period, and the maximum actual line flow values of the identified lines.	Delete rules Reason: Same as Section 9.3.2C above.
Section 10.2.2, Chapter 6	- stipulates what prices to be used for settlement, dependent on the issuance of the price revision advisory notice	Delete reference to section 9.3.2C
Sections 10.2.3A, 10.2.4A, 10.2.5A and 10.2.5B of Chapter 6	- spell out the procedures on how EMC should perform price revision relating to cases where constraint violation costs have applied by the MCE for line constraints but PSO has confirmed there is no load shedding	Delete rules Reason: Same as Section 9.3.2C above.
Appendix 6D, D3 Parameters:	- definition of parameters included to provide for	Delete rules Reasons: Same as Section

Sections of the Rules	Purpose of Rule	Proposed Changes and Reasons
AdditionalNumPoints _k RevisedMaxLineRating _k	relaxation of line constraints if there is a re-run of the MCE under section 10.2.3A.2 and section 10.2.5B of Chapter 6	9.3.2C above.
Appendix 6D.16.4, Chapter 6	- provides for relaxation of line constraints if there is a re-run of the MCE under section 10.2.3A.2 and section 10.2.5B of Chapter 6	Delete rules Reasons: Same as Section 9.3.2C above.
Appendix 6D 21.2	- required by the existing section D.16.4.3 so that line flows exceeding line capacities do not incur violation penalties in the said case of a re-run of the market clearing engine.	Delete rules Reasons: Same as Section 9.3.2C above.

Please refer to **Annexes 2 and 3** for the detailed proposal of rules to be deleted.

3.1.2 Definition of Erroneous Input Data

The review also sought to establish i) the scope of erroneous inputs to the MCE, which would trigger off price revision under Type 2 reruns, and ii) whether these inputs are reflective of market conditions at that particular point in time (currently, inputs used for MCE runs for RTS are taken at T-5 minutes).

Scope of Erroneous Inputs

The MCE uses a broad range of inputs, including market participants' bids/offers and the current/future status of the power system (e.g., NWSF, demand forecasts, system constraints and requirements and others). EMC is not in a position to assess if a market participant's bid or offer is correct, as the bid or offer is up to the market participant's sole discretion¹.

However, EMC could identify errors in input data derived from other sources, such as manually entered information on system constraints, and the standing data of generators, load forecasts, NWSF, etc. As such, EMC recommends that erroneous inputs to the MCE that can trigger price revision should include all inputs used by the MCE in determining the RTS, but exclude bids and offers from market participants that have been validated and accepted by the MCE.

Inputs Reflective of Market Conditions

In theory, one could argue that input data is always "wrong" in retrospect, due to variations in supply (e.g. unexpected outage during dispatch period) and demand (load variations) over the dispatch period. Thus, if the MCE were to be re-run to revise prices each time such an

¹ We refer to cases whereby the latest valid offers/bids have been validated and used by the MCE in the determination of the RTS, but subsequently, a market participant claims that these offers/bids were 'wrong'.

“error” occurred, it would have re-run every period, effectively shifting the SWEM to an ex-post pricing regime (as in the NZEM, for example).

While prices should be based on the most current market conditions as far as possible, with ex-post pricing being the ultimate expression of this philosophy, this would be inconsistent with an ex-ante pricing regime. Hence, we need to set a consistent time reference for input data to the MCE, with any changes to data occurring after that to be ignored. This data will then be taken to be reflective of the prevailing market conditions, for the dispatch period if a MCE re-run is required.

In the limit, one may reasonably argue that the appropriate reference time should be “T”, if the objective of price revision is to ensure that prices accurately reflect the prevailing market conditions. However, if we accept this principle, then it should be applied consistently to all periods, not just for price reruns.

Practically, that would mean re-running the MCE to re-determine prices for each dispatch period, immediately after dispatch schedules have been delivered in SWEM (since the MCE runs at “T-5 minutes” to determine the RTS). Although this is feasible and could result in marginally more accurate prices, there is little to be gained as prices are not expected to change much, and it is impossible to disclose real time prices to market participants before “T”.

An alternative to ensure that prices accurately reflect prevailing market conditions is to set the reference time after ‘T’. Some possibilities include i) ‘T+15 minutes’, since it is the mid-point of the dispatch period or ii) ‘T+ 30minutes’, since generators are supposed to meet their scheduled energy by the end of a dispatch period. Again, for consistency, the MCE should be re-run with this new time reference for all periods, even when there is no price revision.

To reiterate, any MCE re-runs for price revision should adopt the same input data as what would have been used by the MCE to produce the RTS for a dispatch period (currently ‘T-5 minutes’). Since there is no strong case for one time reference over another, and the variation is likely to be small, we recommend using back the current time reference of ‘T-5’ minutes for MCE re-runs.

To clarify this point, EMC proposes the inclusion of an explanatory note in the market rules under section 10.2.5 as follows:

Explanatory Note: Section 10.2.5 contemplates that one of the possible causes of price revision/MCE re-run is where erroneous inputs have been used in the production of real-time schedules. The MCE currently commences production of the real-time schedules at 'T-5 minutes' before the desired dispatch period.

Such erroneous inputs are inputs used by the MCE in determining the real-time dispatch schedule which are deemed not reflective of the prevailing market conditions existing at the time when the MCE was run to produce the real-time schedule for a dispatch period. Offers, which have been validated at the time the MCE was run, will not be considered to be erroneous inputs.

The EMC will re-run the MCE by using all inputs that should have been supplied to the MCE at the time when the MCE was run to produce the real-time schedules for that dispatch period.

Please refer to **Annex 3** for the inclusion of this explanatory note.

3.2 Rules Rewrite in Plain English for Greater Clarity

To enhance readability of the Market Rules by all stakeholders and reduce inconsistencies, EMC took the opportunity to redraft selected sections in Chapters 6 and 8 in plain English. The following table summarizes the proposed changes, with the detailed revisions attached in **Annexes 2 and 3**.

Table 2: Proposed Rule Changes for Greater Clarity

Chapter	Revised Sections	Reason for Change
Chapter 6	9.3.1, 9.3.2, 9.3.3, 9.3.4, 9.3.7, 9.3.8	To set out the manner and means of issuing advisory notices/confirmations in the new section 9.3.7 for greater readability. The required contents of such advisory notices are now set out in the new section 9.3.8.
Chapter 6	9.3.2	To clarify that the advisory notices issued under section 9.3.2.1 and section 9.3.2.2 may be issued in respect of more than one dispatch.
Chapter 6	9.3.2B	Price revision advisory notices are issued in respect of a given dispatch period and not for a dispatch day
Chapter 6	9.3.4	Price revision advisory notices are issued in respect of a given dispatch period and not for a dispatch day.
Chapter 6	9.3.5	Remove references to "a dispatch period"

Chapter	Revised Sections	Reason for Change
		since the advisory notices issued under sections 9.3.2.1 and 9.3.2.2 may apply to more than one dispatch period.
Chapter 6	9.3.6	The reference to "section 9.3.2.3" is changed to a reference to section "9.3.2.2" to correct a cross-referencing error in the existing section 9.3.6.
Chapter 6	Appendix 6H, H.1.2, H.1.3, H.1.4, H.1.5, H.1.6, H.1.9, H.1.10	To clarify that the advisory notices issued under section 9.3.2.1 and section 9.3.2.2 may be issued in respect of more than one dispatch period.
Chapter 6	Appendix 6H, H.1.7	The text indicated in bold fonts to be italicised.
Chapter 6	Appendix 6H, H.1.8	The expression "the information referred to in section H.1.8.1" (as used in the existing section (H.1.8.2) is inappropriate since it would refer to information relating to "an existing communication problem" under section H.1.8.1, rather than "an anticipated communications problem" for the purposes of H.1.8.1.
Chapter 6	9.2.6, 10.2.2, 10.2.3, 10.3.3, Appendix 6D, 22.5	To update a cross-reference change, due to the renumbering of section 9.3.2B, and deletion of rules relating to Type 4 reruns
Chapter 6	3.3.1, Appendix 6H, H1.10	To change "price schedule" to "pricing schedule" for consistency across other market rules.
Chapter 8	1.1.189, 1.1.204, 1.1.205	To change "price schedule" to "pricing schedule" for consistency across other market rules.
Chapter 8	1.1.139	To correct a cross-referencing error.

3.3 Compensation to Generators

This section reviews the need for compensation, and EMC's proposed compensation arrangement for generators that suffer financial losses arising from a downward revision of MEP.

3.3.1 Why is Compensation Required?

A generator has a variety of options to supply electricity, ranging from lower cost gas turbines to higher cost diesel generators. In situations of supply tightness in the market, higher prices serve as important economic signals to encourage generators to provide higher-cost supply options.

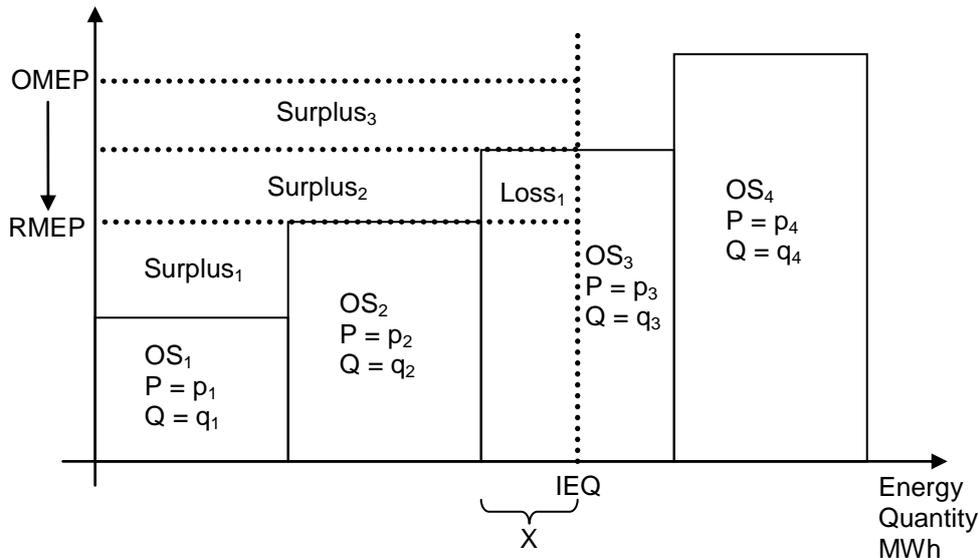
When prices are revised downwards due to price revision, the lowered MEP may not cover the generator's cost of providing the higher-cost supply options, leading to financial losses. In the long run, this will affect their confidence in high price signals, and they may choose to curtail their higher cost supply in future supply tightness situations, which is economically inefficient. A compensation arrangement is thus necessary to remedy this, and ensure that generators are not penalized when responding with higher-cost supply.

Concomitant with the SWEM market design are two key principles central to the discussion on compensation arrangements, namely:

- A) **Generator's offers are best proxies for their marginal production costs** – The SWEM market adopts the principle of uniform marginal pricing, whereby all quantities are paid the price of the last cleared unit. This compels all logical, profit-maximizing firms to offer based on their marginal cost of production; if cleared prices exceed their marginal cost, they enjoy producer surplus but if cleared prices are lower, they are better off not supplying. The subsequent discussion on the financial impact to generators assumes this principle to hold.
- B) **Compensation should not overly burden loads (consumers)** – In a price revision situation, it is often difficult to pinpoint the error-causer, or apportion culpability in cases involving multiple parties. As such, the current compensation mechanism does not penalize the error causer but rather, involves transfer payments from **loads (consumers)** to generators, even though **loads (consumers)** are equally innocent of causing the price revision. Therefore, the compensation amount should be moderated and not overly burden **loads (consumers)**.

3.3.2 How Much Should Generators be Compensated?

Figure 1: Analysis of Profits/Losses based on Offer Stacks



The figure above shows the offer bids and profits for a generator before and after a price revision.

Before the price revision, the prevailing price is the original MEP (OMEP), which the generator receives for the whole injection quantity (IEQ). Using its offer bids to proxy for marginal costs, the generator makes profits of Surplus₁, Surplus₂ and Surplus₃.

When prices are revised downwards due to a price revision, the generator receives RMEP (revised market energy price) for its injection quantity (IEQ). The generator's revenue is reduced by $(OMEP - RMEP) \times IEQ$, which can be broken down into two components: i) forgone surplus (labelled Surplus₂ and Surplus₃) and ii) loss because RMEP may not cover the cost (approximately p_3) of supplying marginal quantity X (labelled "Loss₁").

It is unfair for generators to incur losses by responding to price signals, which were erroneous through no fault of their own. Therefore, market rules should provide compensation to the generators, so as to ensure equity and future confidence in the market. There are three possible compensation options, namely:

- **Compensation (A)** - paying the generators "Surplus₂ and Surplus₃" and "Loss₁", or
- **Compensation (B)** - paying the generators "Surplus₂" and "Loss₁", or
- **Compensation (C)** - paying the generators just "Loss₁"

Deciding which compensation arrangement above is appropriate boils down to an issue of fairness. Since the need for compensation stems from price revision **ex-post**, it is insightful to analyze what would have been if the price revision had happened **ex-ante** (e.g. the erroneous inputs were spotted and corrected before the RTS was issued).

Based on the figure, if the price revision had occurred ex-ante, the generator would supply (IEQ – X), receive RMEP and earn profits Surplus₁. The compensation regime which ensures that the generator would earn exactly Surplus₁ is Compensation C. Under Compensations A and B, the generator would earn excess profits of Surplus₂ and/or Surplus₃.

If compensation were recovered from the error causers, it would be reasonable to compensate gencos for the forgone profits. However, as compensation comes from loads/consumers, whom also did not cause the need for re-run, compensation to gencos should be limited to cost. As such, EMC proposes Compensation C, whereby the generator is compensated only for the difference between the offer price and the RMEP, for the supplied quantity in excess of the RTS (labeled X).

3.3.3 Exemption Cases from Compensation

Notwithstanding the proposed compensation arrangement, it is proposed that the following cases be ineligible for compensation even in a price revision situation:

- A) **No Compensation for Reserve / Regulation** – The compensation regime should be simple and cost-effective to administer. As the frequency of price revision is low, it is not cost effective to develop and administer a compensation regime which caters for all scenarios, especially where the financial impact is insignificant². Thus we propose compensation for energy only.
- B) **No Clawback from Generators or Compensation to Loads if MEP is Revised Upwards** – As a result of price revision, it is possible that the revised MEP turns out higher than the original MEP, which would have a favorable financial impact on the generators. In such cases, we do not propose clawing back the economic profits from these generators, nor entitle loads to compensation. This is because the revised MEP is the correct price that should be used to pay the generators.
- C) **No Compensation to Generators Scheduled to Produce more Energy based on Revised Dispatch Schedule** – The proposed compensation arrangement seeks to compensate generators for energy they would not have otherwise produced based on the revised RTS ($Qty_{Original\ RTS} > Qty_{Revised\ RTS}$). When the reverse occurs and a generator is scheduled more under the revised dispatch schedule than the original dispatch schedule ($Qty_{Revised\ RTS} > Qty_{Original\ RTS}$), the generator is actually 'better-off' in that it is subjected to the lower revised MEP for a smaller quantity. As such, the generator would not be entitled to any compensation.
- D) **No Compensation to Generators for any Scheduled Energy Quantities in the Revised Dispatch Schedule offered at prices above the revised MEP** – In the absence of price reruns, there are occasions where energy offer quantities are cleared at MEPs below their offer prices. Since generators are not entitled to

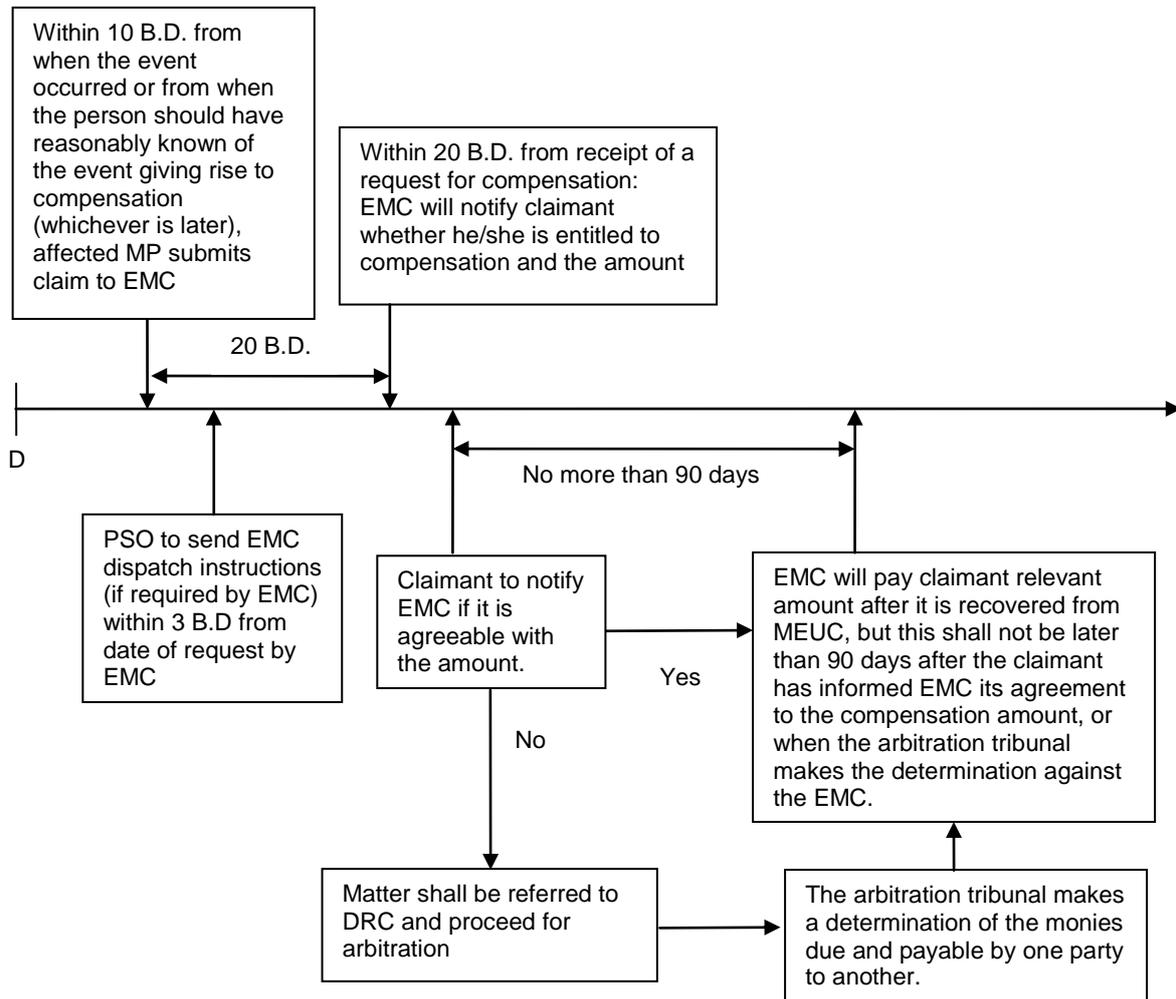
² The RCP had earlier considered a paper (EMC/RCP/14/2004/02), which assessed the impact of payment discrepancies when re-run quantities of reserve and regulation are used for settlement. While it is not appropriate to settle the reserve and regulation payments based on MCE re-run quantities (instead of the PSO dispatch quantities or the original RTS), the paper concluded that the net financial impact on the MPs was small (the gross overpayments and underpayments from Jan to Mar 2004 period were \$1,080.05 and \$1,200.79 respectively). The paper further showed that this conclusion holds even if the prices for reserve and regulation were to increase 4 times. Hence, the RCP decided that the cost of investigating changes needed in the IT systems to rectify this problem would be much higher than its financial impact. Therefore, it did not recommend any modification to the market rules and the IT systems to address this problem. However, EMC continues to monitor this issue and report its monitoring to the RCP.

compensation under these circumstances, they should similarly not be given compensation in the event of a price revision.

3.3.4 Process for Claiming Compensation

For generators seeking compensation under the proposed arrangement, the following procedure is proposed:

Figure 2: Flowchart for Claiming Compensation



Abbreviations:

- D: Trading day D relating to the affected dispatch period
- B.D.: Business Day
- MP: Market Participant
- DRC: Dispute Resolution Counselor
- MEUC: Monthly Energy Uplift Charge

As shown in the timeline above, the affected Gencos have to submit their compensation claims to EMC within 10 business days of the date that (i) the events giving rise to the potential entitlement to compensation occurred; or (ii) the claimant knew or should have

reasonably known of the events giving rise to the potential entitlement to compensation, whichever is later.

Following that, the PSO will submit relevant dispatch instructions used for the affected dispatch periods (if required by EMC) within 3 business days upon request by EMC. After investigation, EMC will notify the claimant about its entitlement for compensation, and the amount within 20 business days from the receipt of a request for compensation.

If the claimant is agreeable to the amount, EMC will proceed to recover the amount from loads via the Monthly Energy Uplift Charge (MEUC). Following this but not later than 90 days from when the claimant has informed EMC of its agreement to the amount, the amount will be paid to the applicable MP(s).

If the claimant is not agreeable to the amount, the matter shall then be referred to the Dispute Resolution Counselor (DRC) for arbitration. The arbitration tribunal will then make a determination of the monies due and payable by one party to another under the market rules, which is binding and not subject to appeal except under the Arbitration Act (Cap 10). If the arbitration tribunal makes a determination against EMC, then EMC shall pay the claimant the relevant amount after it is recovered from the MEUC, but no later than 90 days after the determination.

3.3.5 Proposed Rule Changes

The following table summarizes the proposed rules to enable eligible generators to claim compensation, and the manner in which compensation would be computed by EMC. The detailed rule amendment proposal is given in **Annex 4**.

Table 3: Proposed Rule Changes to Implement Compensation Arrangement

Chapter	Section	Reason for Change
Chapter 3	3.3.1	To allow for the compensation arrangement to be resolved by the dispute resolution process if required.
Chapter 3	3.11.1	To indicate that the claimant need not specify in its request the amount of compensation, which would be calculated based on Appendix 6K.
Chapter 6	10.2.10	To allow market participants with GRF(s) (if eligible) to seek compensation if price revision occurs.
Chapter 6	Appendix 6K, K.1.1, K.1.2, K.1.3, K.1.4 and Explanatory Note	New appendix to outline the amount of compensation, and procedure for claiming and disbursement of compensation

4. Conclusion

This paper implements the RCP's decisions on the review of price revision in the SWEM, specifically to retain price revision, remove Type 4 re-run cases (ex-post removal of CVPs), and clarify the scope of erroneous inputs to the MCE that would trigger off price revision under Type 2 reruns.

To enhance readability and consistency in the SWEM market rules, EMC proposes a set of rule changes in Chapters 6 and 8.

Finally, to ensure that generators are not adversely affected when the MEP is revised downwards, the paper proposes a compensation arrangement where generators are compensated based on the difference between the revised MEP and the offer price(s) for affected energy quantities. This arrangement strikes a balance between ensuring that generators are not penalised for reacting to high price signals, without over-burdening loads (consumers) who were not responsible for the price revision in the first place. The paper also proposes an implementation procedure, whereby affected gencos would submit claims to EMC for consideration.

5. Impact on Market Systems

If the proposed compensation arrangement is implemented, there will be no changes required to EMC's production system. EMC (Market Operations) will develop a standalone compensation calculator to calculate the compensation amount payable to eligible generators after receiving their compensation claims.

6. Implementation Process

The time required for implementation of the compensation proposal is estimated by the EMC (Market Operations) to be about 4 months after the EMA has approved the proposed rule changes. The implementation work can be done in-house, with an estimated internal resource costing of \$48,000. Please refer to **Annex 5** for details on the estimated resources.

7. Consultation

We have published the rule modification proposal on the EMC website for comments. Comments have been received as follows:

From PSO

PSO submitted its comments on 04 Feb 08. Below, we give PSO's comments and provide our responses to them.

Comment

"We noted that at the 31st RCP meeting not all the members supported price revision in the SWEM. We continue to maintain that price revision should not be allowed. In an ex-ante market, prices determined beforehand should not be changed after the goods have been consumed. There must be price certainty. If there is no price revision there would be no need for a compensation methodology."

Response

At the 31st RCP Meeting on 12 March 2007, the RCP voted in support of price revision/MCE re-runs in the SWEM (6 votes for, 2 votes against). This is to ensure fairness and equity, and to prevent the perpetuation of erroneous price signals in the market. The compensation arrangements discussed in this paper is meant to address the financial impact on generators, arising from such ex-post revisions to ex-ante pricing.

From Tuas Power

Tuas Power submitted its comments on 29 Jan 08. Below, we give Tuas Power's comments and provide our responses to them.

Comment

"We refer to the review of price revision in SWEM. In accordance to the minutes of 33rd RCP meeting, EMC reported that:

The price impact on consumers for most cases (Type 4) is not very significant. Even for the most severe case, no price revision would have resulted in an increase of about \$4.25/MWh for consumers for that half hour period.

With that, EMC recommended that re-run of MCE for Type 4 cases be removed from the rules.

From the latest price separation incidents since 19 Jan 08, the earlier assumption is no longer valid. For example, on 19 Jan 08, the price differences between the northern and southern nodes of the network were as high as \$3000/MWh, and averaged about \$1500/MWh for the whole day. The daily average USEP for 19 Jan 08 was about \$590/MWh.

As the current market rules had not abolished the Type 4 re-runs, re-runs for all 11 periods (with energy shortfalls) were conducted after confirming that no load-shedding occurred, which lowered the USEP from \$590/MWh to \$400/MWh.

Had the Type 4 re-run been abolished, the consumers would have paid \$190/MWh more for their total energy consumption on 19-Jan. In view of the above, we request EMC to re-visit the Rule Change Request for Review of Price Revision in SWEM in the next RCP meeting."

Response

Based on the RCP paper "Review of Price Revision in SWEM", EMC's recommendation to remove Type 4 price reruns was based solely on principles, rather than any analysis of possible financial impact (please refer to section 2.5.1 of paper). The discussion on financial data arose because at the 31st RCP meeting, one RCP member was concerned about the possible financial impact on consumers if Type 4 price reruns were removed, and requested for the price impact to be assessed. The historical data did show that the impact was minimal. Notwithstanding, EMC maintained its recommendation that Type 4 re-runs be removed based on principles and not because financial impact was minimal. The RCP voted to remove Type 4 price reruns (7 votes for, 2 votes against).

In principle, the recent price separation issues are distinct from the topic of Type 4 reruns. As such, we still maintain our proposal to remove type 4 reruns, as per RCP's earlier decision. The price separation issues are currently being looked at separately by the EMA.

From Sembcorp Utilities Singapore

Sembcorp Utilities submitted its comments on 04 Feb 08. Below, we give Sembcorp Utilities' comments and provide our responses to them.

Comment

"In view of the recent price separation problems, we urge the Rules Change Panel to revisit and reconsider the decision to remove the need for price revision under Type 4."

Response

In principle, the recent price separation issues are distinct from the topic of Type 4 reruns. As such, we still maintain our proposal to remove type 4 reruns, as per RCP's earlier decision. The price separation issues are currently being looked at separately by the EMA.

From Seraya Energy

Seraya Energy submitted its comments on 11 Feb 08. Below, we give Seraya Energy's comments and provide our responses to them.

Comment

"While we commend EMC's proposal to put forward a compensation scheme for generators who would be adversely affected by the price revisions, we find that there is still room to improve the proposed methodology that is more fair and equitable for generators.

The SWEM adheres to the Locational Marginal Prices for payment to generators. However, we note that compensation based on offer prices following a price revision is not consistent to LSMP and as such not equitable for generators. Thus, may we seek clarification on the rationale behind dispensing with that principle and paying at offer prices when a price revision occurs?

Alternatively, may we recommend that the equation in section K1.4.4 of appendix 6K be revised, replacing $P_{m,spq}$ with MEP^m , Where MEP^m is the original marginal price (before price revision) at market network node m."

Response

The principle of uniform marginal pricing holds even in the case of a downward price revision; generators are still paid uniform prices at the correct lower MEP, rather than the erroneous higher MEP. The payment of the difference between offer prices and the revised MEP for supplied quantities beyond the revised RTS should be viewed as a separate compensation amount to instill confidence in high price signals, rather than a deviation from the principle of uniform marginal pricing.

The suggestion of replacing $P^{m,spq}$ with MEP^m (original MEP) in section K1.4.4 of Appendix 6K is analogous to not conducting price revision at all, since generators are paid the original MEP instead of the revised MEP. As mentioned in section 3.3.2 of this paper, this would unduly burden loads/consumers, even though they were not responsible for the need to carry out price rerun in the first place.

From Dispute Resolution Counselor

We have also consulted the Dispute Resolution Counselor on the proposed amendments to Sections 3.3.1.5 and 3.11.1.3 of Chapter 3 of the Market Rules. The Dispute Resolution Counselor has responded that he does not have any comments on the proposed amendments.

8. Legal Sign Off

The text of the rule modification has been vetted by EMC's external legal counsel whose opinion is that the modification reflects the intent of the rule modification proposal as expressed in the analysis section of this paper.

9. Deliberation by the RCP at the Meeting

The RCP considered the proposed rule modifications at the 36th, 37th and 38th meeting. At the 38th RCP, the proposed rule modifications i.e. Annex 2, 3 and 4 were put to a vote. The RCP divided the voting into two parts.

Part 1:

By majority vote, the RCP supported the proposed rule modifications to remove Type 4 reruns and redraft the existing market rules for greater clarity (i.e. Annex 2 and 3).

The following Panel members VOTED to support the removal of Type 4 reruns and redraft of the existing market rules for greater clarity:

Mr. Dallon Kay
Mr. Tay Swee Lee
Dr. Daniel Cheng
Mr. Henry Gan
Dr. Goh Bee Hua
Mr. Michael Lim
Dr. Kang Cheng Guan

The following Panel members VOTED to redraft of the existing market rules for greater clarity but not support the removal of Type 4 reruns:

Mr. Philip Tan
Mr. Low Boon Tong
Ms. Annie Tan

The following Panel members ABSTAINED:

Mr. Robin Langdale
Mr. Lawrence Lee

Part 2:

There was a split vote on the compensation amount for generators affected by a downward price revision.

The following Panel members VOTED to provide Compensation (C) and pay generators just "Loss₁" arising from price revision (see Figure 1 in page 11):

Mr. Robin Langdale
Mr. Michael Lim
Mr. Henry Gan
Mr. Lawrence Lee
Dr. Goh Bee Hua

The following Panel members VOTED to provide Compensation (B) and pay generators “Loss₁” and “Surplus₂” arising from price revision:

Mr. Philip Tan
Ms. Annie Tan
Mr. Low Boon Tong
Mr. Dallon Kay
Mr. Tay Swee Lee

The following Panel members ABSTAINED:

Dr. Daniel Cheng
Dr. Kang Cheng Guan

Section 2.5.2 of Chapter 3, provides that at all meetings of the RCP, every question shall be decided by a majority of votes. Since there was no majority vote on this issue of compensation, no changes are proposed to the Market Rules to provide for compensation to affected generators when prices are revised.

10. Recommendations

Arising from the first part of the voting, with a vote of 7 for and 3 against, the RCP recommends by majority that the EMC Board:

- a. **adopt** the rule modification proposal as set out in Annexes 2 and 3;
- b. **seek** EMA’s approval of the rule modification proposal; and
- c. **recommend** that the rule modification proposal come into force **2 weeks**³ after the date on which the approval of the Authority is published by the EMC

³ As the RCP made no decision on the issue of compensation, the implementation time for rule modification proposal as set out in Annexes 2 and 3 is 2 weeks. Also there are no material costs required to implement Annex 2 and 3.

ANNEX 1

Final Report on “Review of Price Revision in the Singapore Wholesale Electricity Market”

**REVIEW OF PRICE REVISION IN THE
SINGAPORE WHOLESALE ELECTRICITY MARKET**

01 October 2007

Written by: Teo Wee Guan
Senior Economist

Reviewed by: Paul Poh Lee Kong
SVP, Market Administration

REVISIONS

Version	Date	Remarks
0	18 Sep 2006	Draft for industry consultation.
1	07 Nov 2006	Revision made to include comments from the industry and EMC's response to those comments.
2	27 Dec 2006	Revision made to include price revision/MCE re-run for cases where the MCE produces prices not reflective of their respective locational system marginal price(s), i.e. Type 5 cases. (Note: This version was presented to the RCP.)
3	01 Oct 2007	Revision made to include decisions made by the RCP.

LIST OF ABBREVIATIONS

AEMC	Australian Energy Market Commission
CVP	Constraint Violation Penalty
EMC	Energy Market Company
IEQ	Injection Energy Quantity
LSMP	Locational System Marginal Price
MCE	Market Clearing Engine
MEP	Market Energy Price
NEM	Australia National Electricity Market
NEMMCO	National Electricity Market Management Company
NWSF	Network Status File
P&I	Pricing & Information
PSO	Power System Operator
RCP	Rule Change Panel
RTS	Real-Time Schedules
SMP	System Marginal Price
SWEM	Singapore Wholesale Electricity Market
USEP	Uniform Singapore Electricity Price
WEM (Argentina)	Argentina Wholesale Electricity Market
WEM (Philippines)	Philippines Wholesale Electricity Market
WEQ	Withdrawal Energy Quantity

INTRODUCTION

Background

The Singapore Wholesale Electricity Market (SWEM), in principle, adopts ex-ante pricing where spot prices for energy, regulation and reserve are determined by the market clearing engine (MCE) just prior to the start of each half-hour dispatch period.

In its market design paper ('Wholesale Market Design', dated 2 August 2002), PHB had recommended ex-ante pricing because it has the advantage of giving market participants certainty about prices in advance of dispatch. It had stated that ex-ante pricing was considered desirable by most markets, and is appropriate for Singapore where the actual dispatch does not differ significantly from expectations because of (i) the reserve market arrangements in place to handle supply side volatility, and (ii) low demand volatility in Singapore.

PHB had provided that the only circumstances that necessitate price revision would be (a) if there is a re-dispatch, as a result of a significant contingency, or (b) the [market] operator errs in calculating the original ex-ante prices.

Accordingly, the Market Rules has in place an arrangement for price revision. Prices are revised by re-running the MCE. If it is not possible to perform a MCE re-run, the revised prices are determined by taking an average of last 30 days' prices.⁴

The existing price revision arrangement has become a contentious issue. It began with a rule change proposal on 'Compensation Arising from Revised Market Energy Price' (Paper No.: EMC/RCP/25/2006/253) which was presented at the Rules Change Panel (RCP) meeting in March 2006.

At that meeting, some RCP members had questioned the rationale of the existing price revision arrangement. According to them, the arrangement seems to run afoul with an ex-ante market. In an ex-ante market, prices determined prior to the start of a dispatch period should be firm and bind both sellers and buyers. Strictly, ex-ante prices should not be revised.

However, other RCP members contend that price revision is necessary to ensure that the prices determined by the MCE for settlement purposes are correct and reflect the prevailing underlying market conditions.

Arising from the contention, the RCP at its meeting in May 2005 had tasked EMC to undertake a review on price revision in SWEM ('the Review'). In particular, EMC is required to re-examine the rationale for, and circumstances giving rise to, price revision in the SWEM. Arising from the Review, EMC will recommend whether to retain, augment or abolish the existing price revision arrangement. EMC is also required to assess the impact of its recommendation on various stakeholders and on the overall efficiency of the market.

SCOPE OF REVIEW

EMC has agreed with the RCP on the scope of the Review as follows:

⁴ Except where: (1) there was a load shed, then the MEP and USEP shall be equal to the energy price ceiling; or (2) the average price of the past 30 days exceeds the applicable upper price limit specified in Appendix 6J, then that price shall be set to that upper limit.

1. To study practices in other jurisdictions to find out:
 - whether prices are subject to revision. If so, how and under what circumstances can prices be revised? Can market participants seek compensation arising from price revision and if so, who pays for the compensation costs?
 - how does the market deal with the situation where no real-time dispatch schedule is produced and the situation where erroneous input data is used to generate the real-time dispatch schedule. Is compensation available to market participants in such situations?
2. To study internal procedures used by EMC for price revision and examine, for each historical case of price revision in the SWEM:
 - the circumstances giving rise to the need for the price revision; and
 - the frequency and impact of the price revision on the market.
3. To consider the rationale/justifications for price revision in SWEM and recommend whether price revision should remain or be abolished, and if it is to stay, whether SWEM should:
 - retain the current price revision arrangement; or
 - augment the current price revision arrangement with some recommended changes;
4. To evaluate how the recommendation in (3) would impact on various stakeholders and on the efficient and fair operations of the market;
5. To identify, in relation to the recommendation in (3):
 - the changes to the current Market Rules that may be needed to support the recommendation; and
 - the measure(s) that can be taken to mitigate any adverse impact the recommendation may have on any particular stakeholder.

EMC's REVIEW AND RECOMMENDATIONS

Guidelines for the Review

In making any recommendations, EMC is required to give due consideration to the basic market design principles of the SWEM. The fundamental one is that of economic efficiency, while the others (in no particular order) are that of:

- robustness;
- transparency;
- equity and fairness; and
- minimization of transaction costs.

EMC's recommendation should also have regard for the current system operation.

Practices in other Jurisdictions

As part of the Review, EMC has looked at the pricing regime in other markets (see Table 1).

Table 1: Pricing Regime in Other Markets

Market	Pricing Regime	Nodal/ Market Type/Algorithm
NZEM (New Zealand)	Ex-post	Full Nodal, real-time market, co-optimized.
NEM (Australia)	Ex-ante	Zonal pricing, real-time market, co-optimized.
PJM (U.S.)	Hybrid of ex-ante and ex-post	Full nodal, (ex-ante) day-ahead and (ex-post) real-time balancing markets, co-optimized.
Ontario (Canada)	Ex-post	System marginal pricing, real-time market, co-optimized.
WEM (Argentina)	Ex-ante	Full nodal, hour-ahead market.
NORD POOL (Norway, Sweden, Denmark, Finland, and Holland)	Ex-post	Zonal pricing, full demand participation, runs an ex-ante day-ahead and ex-post real-time balancing market.
New England (U.S.)	Hybrid of ex-ante and ex-post	Full nodal on supply side and zonal on load side, (ex-ante) day-ahead and (ex-post) real-time balancing markets.
SWEM (Singapore)	Ex-ante	Full nodal on supply side, single price (USEP) for loads, 30-min real time market.
WEM ⁵ (Philippines)	Hybrid of ex-ante and ex-post ⁶	Zonal, ex-ante and ex-post energy pricing. Ex-ante prices apply to ex-ante quantities, while ex-post prices apply to only difference between ex-ante and ex-post quantities.

⁵ The WEM commenced on 1 June 2006.

⁶ In this hybrid regime, rules provide for revision of ex-ante prices where no ex-ante prices can be determined or the ex-ante prices calculated are believed to be in error due to load shedding or any other reasons.)

Of these markets, some have pure ex-ante or ex-post pricing regime (e.g. NEM, NZEM), while others have a hybrid of ex-ante and ex-post pricing regime (e.g. PJM, WEM). In this review, we have chosen to focus on two markets with pure ex-ante pricing regime (similar to SWEM) – The Australia National Electricity Market and the Argentina Wholesale Electricity Market.

Australia National Electricity Market (NEM)

Price revision arising from incorrect inputs to dispatch engine

National Electricity Market Management Company (NEMMCO) is the market operator for the NEM. NEMMCO had proposed a rule change to allow price revision for spot energy and ancillary service prices, where these prices are based on manifestly incorrect inputs to the dispatch engine. The proposal came into effect on 1 June 2006, after being approved by the Australian Energy Market Commission (AEMC).⁷

The proposal defined ‘input’ as any value that is used by the dispatch engine including measurements of power system status, five minute demand forecast values, constraints equations entered by NEMMCO or software setup, but excluding dispatch bids and offers submitted by market participants.

The proposal was to implement a process that would result in published ex-ante prices for a dispatch period being replaced by the prices from a previous dispatch period if selected key outputs were identified to have exceeded certain pre-defined trigger levels and a manifestly incorrect input was identified within a fixed time limit.⁸ This is a 2-stage process involving:

- The automatic identification of suspect dispatch periods, which will be marked as ‘subject to review’; and
- The manual rejection of suspect dispatch periods subsequently found by NEMMCO to be affected by manifestly incorrect input(s). This triggers an automatic replacement of all published ex-ante prices for rejected dispatch periods with the corresponding prices from the last valid dispatch period.

NEMMCO noted that the ideal way to replace the erroneous (ex-ante) prices is to re-run the dispatch engine using the correct inputs because this will produce prices most reflective of the market conditions. However, resolution of correct inputs may take a significant amount of time, depending on the type of input error that has occurred.

In striking a balance between ensuring price accuracy and being administratively straightforward, NEMMCO has proposed using last valid prices to replace erroneous prices. It was argued that last valid prices would reasonably reflect prevailing market conditions, and they could be established more quickly with more certainty to market participants without the need to re-run the dispatch engine.

⁷ For more information on NEMMCO’s proposal and the determination of the AEMC, please refer to this website: <http://www.aemc.gov.au/electricity.php?r=20051214.195534>

⁸ NEMMCO has defined the trigger for each region to be: (1) unusual change in dispatch price and unusual change in interconnector flow; OR (2) unusual change in dispatch price and isolated region. The trigger level settings have been determined in consultation with the industry. For details, please refer to ‘Setting of Trigger Levels for Determination of Dispatch Intervals Subject to Review due to Manifestly Incorrect Inputs’, <http://www.nemmco.au/dispatchandpricing/148-0076.htm>.

Prior to the implementation of this proposal, the National Electricity Rules make no provision to revise wrong prices arising from erroneous inputs to the dispatch engine. As a result, wrong prices would 'pass through to the spot market settlement process and persist as wrong market price signals'.

Reasons for the rule change proposal

The issue on price revision was first brought up by NEMMCO in 2001 for industry consultation. At that time, the industry decided that NEMMCO would focus on reducing the number of instances of incorrect inputs used by the dispatch engine to improve pricing accuracy.

Although considerable improvements have been made since then, some potential for erroneous inputs to the dispatch engine remain. For instance, NEMMCO noted that there were 4 events in 2004 where erroneous inputs used by the dispatch engine had affected pricing outcomes. NEMMCO had quantified the impact of these events on the average annual spot price for each region (with South Australia region experiencing the largest increase in average price by \$0.14).⁹ NEMMCO also stated that these events had a net effect of reducing the total inter-regional settlement residue by about \$315,000 in 2004.

NEMMCO noted that these events 'even though infrequent, have a small but still material impact'. Also, 'such events, which do not reflect the prevailing supply-demand balance, can affect average prices and price volatility, resulting in distortion of market signals'. Consequently, a proposal was put up to introduce price revision arising from incorrect inputs to the dispatch engine.

NEMMCO noted that the introduction of a price revision process would increase short-term uncertainty regarding whether published ex-ante prices for a dispatch interval would stand for the purposes of settlement. However, NEMMCO also recognised that the process has the benefit of reducing the number of instances where erroneous inputs to the dispatch engine would result in incorrect and distortionary pricing outcomes. The proposal had made an attempt to strike a balance between these two issues.

In its determination, the AEMC was satisfied that the proposal potentially can contribute to the economic efficiency of NEM by improving the quality and reliability of spot market price signals relied on by market participants and investors.

Safeguards in the proposed price correction process and compensation

In its proposal, NEMMCO has proposed a number of safeguards to reduce the short-term uncertainty to market participants. This includes allowing for potentially incorrect published prices to be flagged (prior to the dispatch), and for those prices to be replaced within 30 minutes if they are found to be formed on the basis of manifestly incorrect input(s).

Further, NEMMCO is required to report on each event of price revision and to review and report annually on the effectiveness of the price revision process.

The rules also provide compensation to participants in the event where a manifestly incorrect input is found in a dispatch period.

The compensation is paid out from a "Participant Compensation Fund" of \$5 million, funded by participants through a weekly fee. The amount of compensation will be determined by

⁹ For more information on the net effect on average price for the various region, please refer to NEMMCO's proposal which can be found in: <http://www.aemc.gov.au/electricity.php?r=20051214.195534>

the 'Dispute Resolution Panel'.¹⁰ However, NEMMCO's liability is limited to the balance of the compensation fund. We understand from NEMMCO that so far, no compensation claims arising from scheduling errors have been lodged with them.

Argentina Wholesale Electricity Market (WEM)

Spot market price determination

Argentina WEM is an ex-ante market where the spot energy prices are calculated before the start of a trading period.

The spot energy prices consist of hourly prices calculated to value generated energy for each dispatch period. A spot energy price, called 'Market Price', is set at each load-center node. The market price is equal to the short-term marginal cost of supplying the next demand increment at that node, taking into account grid losses and production costs declared by generators.

CAMMESA, the market operator, carries out hourly, real-time generation units' optimum economic dispatch, based on generators' production costs, for the purpose of minimizing the overall production costs.

Spot market price revision

Ex-ante spot energy prices will be used for settlement if the information used in calculating them does not differ from the reality.

However, the rules provide for revision of the spot energy prices after a trading period if CAMMESA determines that erroneous data had been used in the determination of the (ex-ante) spot energy prices.¹¹ Currently, the rules make no provisions to compensate generators who are adversely affected as a result of a price revision.

EMC's INTERNAL PROCEDURES FOR PRICE REVISION

Price Revision/MCE Re-Run in SWEM

Declaration of whether prices are final or provisional

The Market Rules require EMC to confirm by 12pm each day whether prices determined for the previous trading day are final or provisional. Provisional prices may be revised, pending investigation by EMC.

¹⁰ In determining the level of compensation, the 'Dispute Resolution Panel' must, among other things, (1) determine compensation on the basis of the prevailing loading level and not the 'dispatch instruction' applicable to the relevant 'scheduled generating unit' for that 'dispatch interval'; and (2) use the 'spot price' as determined under clause 3.9 ("Determination of Spot Prices"), including any spot prices that have been adjusted in accordance with clause 3.9.2B ("Pricing Where NEMMCO Determines A Manifestly Incorrect Input"). The rules on the compensation regime can be found in Chapter 3, Section 3.1.6.2, of the 'National Electricity Rules' (<http://www.aemc.gov.au/rules.php>).

¹¹ The rule book for Argentina WEM is under the purview of the Argentina's Secretary of Energy. Unfortunately, no official version of the Rules is available in English. The information we have obtained is provided by an analysis and control manager working in CAMMESA. The manager is also a respondent (and contact person) for the 'Electricity Market Operation Benchmarking Survey 2005' administered by EMC.

Under the rules, EMC has up to 5 business days to finalise provisional prices of a trading day. If price revision is required, EMC is to first perform a re-run of the MCE. If it is not possible to conduct a MCE re-run, the rules provide for the use of an average of last 30 days' prices to establish the revised prices.¹²

Cases subject to price revision/MCE re-run

Currently, the following types of cases are subject to price revision/ MCE re-run:

Table 2: Various Types of Price Revision/MCE Re-Run Cases

Type of Price Revision/MCE Re-Run Cases	What EMC does	Intention
<p>Type 1</p> <p>Cases where the MCE has failed¹³ to produce a real-time schedule (RTS) for a dispatch period for any reason other than a real-time market suspension.</p>	<p>Re-run the MCE to produce the real-time pricing schedule (Section 9.2.6, Chapter 6)</p>	<p>To determine prices for settlement.</p>
<p>Type 2</p> <p>Cases where the MCE has used input data that are not entirely what should have been supplied to it at the time the RTS for a dispatch period would normally have been produced.</p>	<p>Re-run the MCE by using all correct input data that should have been used by the MCE at the time when the MCE runs. (Section 10.2.5, Chapter 6)</p>	<p>To ensure that prices for settlement are based on correct and timely input data to the MCE.</p>
<p>Type 3</p> <p>Cases where the MCE has used the adjusted nodal load forecasts which take into account the energy shortfall specified by the PSO for a dispatch period.</p>	<p>Re-run the MCE by using the 'unadjusted' nodal load forecasts to (i) determine the prices for settlement, and (ii) to determine compensation for affected generators under Appendix 6I of Chapter 6. (Section 10.2.8, Chapter 6)</p>	<p>To ensure that prices for settlement reflect the energy shortfall in the dispatch period.</p>

¹² The revised price for a dispatch period is the average of the prices for the corresponding dispatch periods for the last 30 days. This does not apply to price revision relating to Type 4.

¹³ This would include 'failed/missing/late' RTS. The word 'failed' means the MCE did not issue a RTS to market participants and PSO prior to "T-30 seconds" (i.e., in accordance with the market operations timetable in Appendix 6A of the Market Rules). Strictly speaking, 'failed' or 'missing' RTS should not be considered as price revision, since no prices had been produced by the MCE initially.

Type of Price Revision/MCE Re-Run Cases	What EMC does	Intention
<p>Type 4</p> <p>Cases where the MCE has applied constraint violation penalty (CVP) for line constraint for a dispatch period and the PSO has subsequently confirmed that there was no load shed in that period.</p>	<p>Re-run the MCE by using the maximum actual line flow values supplied by the PSO; if no such values is received from the PSO, EMC will re-run the MCE by relaxing the line constraints in accordance with D.16.4, Appendix 6D of Chapter 6. (Section 10.2.3A, Chapter 6)</p>	<p>To ensure that prices for settlement reflect the prevailing line conditions for the dispatch period.</p>
<p>Type 5</p> <p>Cases where the MCE has produced prices which do not reflect their respective locational system marginal price(s) (LSMP).</p>	<p>Re-run the MCE by using all correct input data that should have been used by the MCE at the time when the MCE runs. (Section 10.2.5, Chapter 6)</p>	<p>To ensure that all prices used for settlement reflect their respective LSMP(s). In absence of transmission congestion, all nodal prices should reflect one SMP, after adjusting for losses. However, when congestion occurs, there would be price separation where there will be two or more SMPs established, and the nodes within different systems should reflect their respective LSMPs.</p>

EMC's Internal Price Check Procedures

EMC conducts daily price check based on a set of established internal procedures.¹⁴ These procedures can be found in the *P&I Internal Procedures Manual* published on EMC's website.

On a daily basis, EMC performs the following check on the real-time schedules (RTS) to determine if price revision /re-run is required:

¹⁴ Specifically, pricing-related work (e.g. price checks, price revisions, etc.) are undertaken by the Pricing and Information (P&I) unit of the Market Operations and IT (MOIT) Team within EMC.

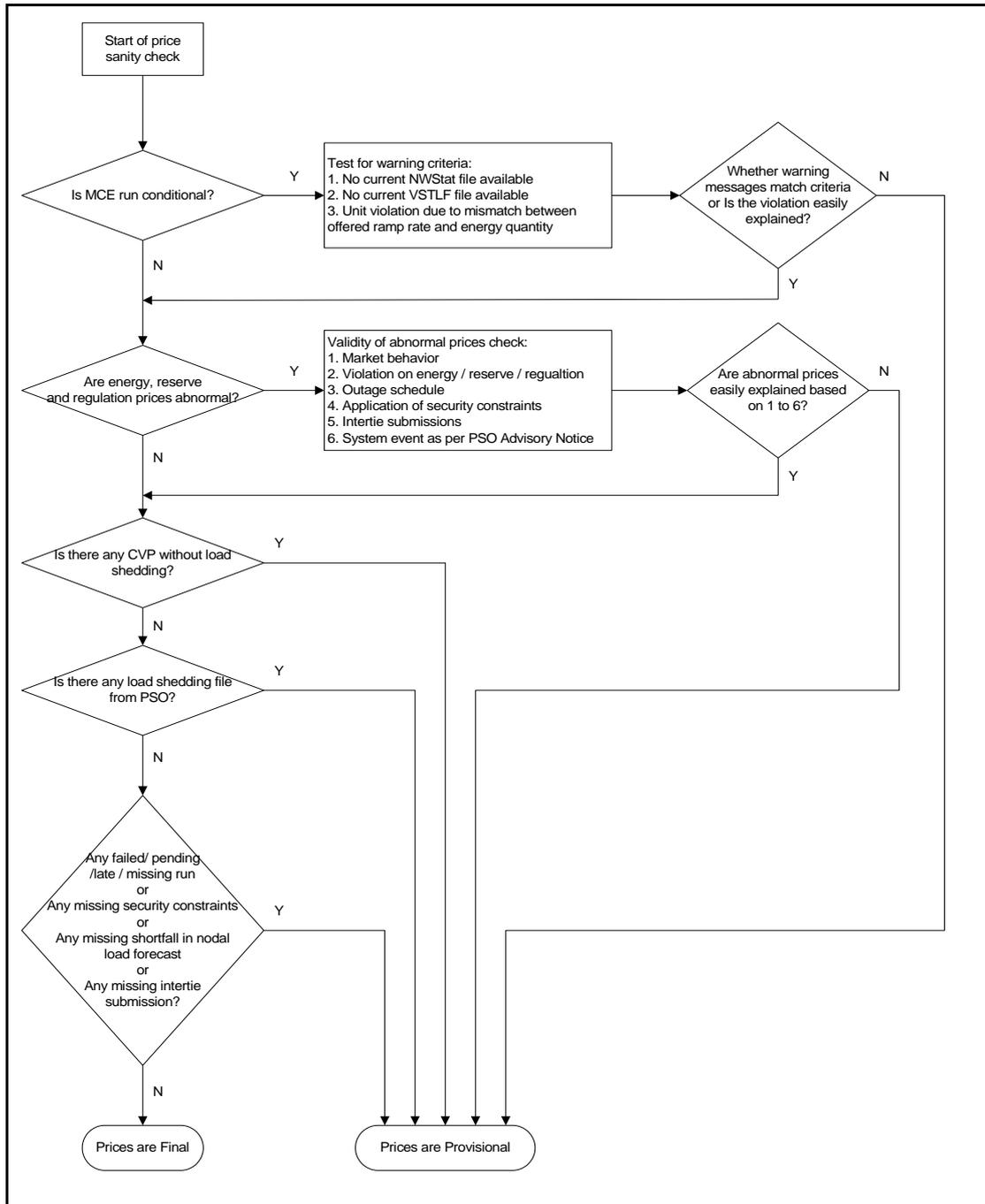
Table 3: Price Confirmation Checks for RTS

Check for:	Yes/No
Failed/ Pending/ Missing/ Late RTS run	
Missing or late application of intertie offer submissions	
Missing or late application of security constraints	
Load shedding files from PSO	
Energy shortfall	
Application of CVP for line constraint in the MCE	
Abnormal Prices for Energy, Reserves and Regulation	
Any other problems	

If the answers to any of the checks above is 'Yes', the prices will be declared 'Provisional' and a detailed investigation by EMC has to be followed before prices can be finalised.

The figure below gives a flowchart on the routine daily price check process.

Figure 1: Flowchart on Daily Price Check Process¹⁵



* By 'easily explained', it means whether P&I is able to ascertain a valid cause or reason for certain observed phenomena (e.g. abnormal price spikes) in the RTS and decide if a price revision is required within the time limit stipulated under the market rules. In reality, P&I only has 4 hours (i.e. from 8 am to 12 noon each day) to decide if prices for the previous day are final or provisional.

¹⁵ Extracted from Appendix 5 (Routine Checklist Process) of the *P&I Internal Procedures Manual*.

Detailed Investigation

If prices are flagged as 'provisional', a detailed investigation will follow up before EMC determines whether these prices need to be revised. The following serves a (non-exhaustive) guide for the detailed investigation by EMC¹⁶:

- Check why violations occurred which caused MCE run to be conditional;
- Check if demand/ system requirements are within reasonable range and trend;
- Check if offer submissions are sufficient to meet demand / system requirements while satisfying constraints;
- Check if outage schedule is the cause of violation(s) and abnormal prices;
- Check if security constraint is the cause of violation(s) and abnormal prices;
- Check for variation in submissions (if any) and variation in scheduled output against demand / system requirements between periods before and after the abnormal price occurred;
- Check network configuration and line flows and determine if the status and numbers are lined up with the physical grid (where applicable);
- Check if energy, reserve, and regulation co-optimization is the cause of abnormal prices.

Following the detailed investigation, EMC will determine if the 'provisional' prices will remain firm or require revision.

Historical Cases of Price Revision/MCE Re-Run

Number of re-runs from 01 January 2003 – 30 June 2006

From 01 January 2003 to 30 Nov 2006, the market had a total of 535 price revision//MCE re-run cases. The table below gives a detailed breakdown:

Table 4: Breakdown of Price Revision/MCE Re-Run Cases

Type of Price Revision / MCE Re-run Cases	2003	2004	2005	2006 (01 Jan to 30 Nov)
Type 1: Failed/Missing/Late RTS ¹⁷	23 (9%)	18 (26%)	23 (43%)	27 (16%)

¹⁶ For more information, please refer to Appendix 10 (Detailed Investigation Process) of the P & I Internal Procedures Manual.

¹⁷ Such cases arose due to NEMS system (planned) maintenance as well as unplanned outage.

Type of Price Revision / MCE Re-run Cases	2003	2004	2005	2006 (01 Jan to 30 Nov)
Type 2: Erroneous/untimely inputs to MCE ¹⁸	224 (91%)	48 (68%)	24 (45%)	9 (6%)
Type 3: Scheduling by MCE taking into account anticipated energy shortfall by PSO	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Type 4: Application of CVP in the MCE due to violation of line constraints when there is no load shedding in real-time	N.A.	4 (6%)	6 (11%)	3 (2%)
Type 5: MCE has produced prices not reflective of their respective LSMP(s)	0 (0%)	0 (0%)	0 (0%)	126 (76%)
Total	247	70	53	165

The highest number of price revision/MCE re-run occurred in year 2003. This could be attributed to market commencement where many glitches were present in the market systems initially. Considerable efforts have been put in since to improve the quality of input data and to augment the market systems.

These efforts have resulted in considerable reduction in number of price revision/MCE re-run relating to cases where the MCE has used the wrong input data in determining the RTS (i.e. Type 2 cases).

The number of price revision/MCE re-run fell subsequently from year 2003 to 2005. Price revision occurred on an average incidence rate of 53 out of 17,530 dispatch periods for year 2005. However, in year 2006 (until 30 Nov), the number of price revision/MCE re-run has increased again due to a big rise in Type 5 cases.

Our statistics suggest that it is impossible to eradicate the incidence of price revision/MCE re-run completely. No matter how we improve on the quality of input data, we can expect some cases which necessitate price revision/MCE re-run to occur still.

¹⁸ Such cases could be due to unplanned NEMS system outage (e.g. latest NWSF not used), SCADA error (e.g. incorrect NWSTAT status, wrong MVar), standing data error and grid data error (e.g. isolated bus bar).

Impact of Price Revision on MEP and USEP

Original prices may change as a result of price revision.¹⁹ This will impact on both loads and generators (since revised prices are used for settlement, and they bind both parties). To assess the price impact, we quantify the largest, and smallest, price differential (i.e. determined by taking the revised price minus the original price) for USEP and MEP that resulted from all MCE re-runs in each year. The table below reports on the results:

Table 5: Price Impact Arising from Price Revision/MCE Re-Run

Year	Largest increase in USEP, i.e. consumers pay higher price with price revision	Largest decrease in USEP, i.e. consumers pay lower price with price revision	Largest increase in MEP, i.e. generator receives higher price with price revision	Largest decrease in MEP, i.e. generator receives lower price with price revision
2003	\$7.48	-\$288.58	\$46.64	-\$4,397.75
2004	\$6.12	-\$116.66	\$9,000.00*	-\$4,426.22
2005	\$49.08	-\$2,220.30	\$4,601.05^	-\$2,940.28
2006 (until 30 Nov)	\$0.49	-\$169.27	\$15.25	-\$4,407.44

*Original MEP was -\$4,500 and revised MEP was \$4,500.

^Original MEP was -\$4,500 and revised MEP was \$101.05.

From the table, we assess that the price differential resulting from a price revision can be huge in some instances and potentially, this can have a significant impact on consumers or on a particular generator.²⁰ Also, a price revision/re-run can have a favourable or unfavourable financial impact on the consumers and generators.

First decision: to allow price revision/MCE Re-run or not?

In this section, we seek to first address a high-level issue, i.e. whether, in principle, we should allow price revision/re-run in the SWEM. Once this has been addressed, we will then proceed (in the next section) to identify the circumstances where price revision /re-run should apply and study how the price revision process can be augmented.

Despite considerable efforts to improve the quality of input data and augment the market systems, we can expect cases some cases which necessitate price revision to occur still. Essentially, there are two options to deal with erroneous/provisional prices:

- to accept the erroneous/provisional prices as final and binding; or
- to revise (ex-post) the erroneous/provisional prices.

¹⁹ Other than cases belonging to failed or missing RTS where no original price has been determined.

²⁰ To assess the full impact, we need to take into account the quantity consumed (i.e. WEQ) or quantity produced (i.e. IEQ). However, the focus here is to assess only price changes/differences, while ignoring quantities involved.

We will evaluate these two options in turn.

Option (A): Accept Erroneous/Provisional Prices as Final and Binding

Operationally, Option (A) is a straight-forward and simple arrangement, since ex-ante prices determined by the MCE will remain final and binding under all circumstances.²¹ It also gives market participants full certainty with regards to prices that will be used for settlement.

The impact of Option (A) on (i) economic efficiency, and (ii) equity and fairness, is further assessed below.

Economic Efficiency

We consider economic efficiency to be the primary consideration in assessing whether or not price revision should be allowed in SWEM.

Prices play an important role in the market because they guide market behaviour and aid decision-making. Hence, prices are fundamental to determining economic efficiency. In principle, it is important that market prices reflect the correct market fundamentals (i.e. the prevailing supply/demand conditions²²) as that will improve the confidence of investors and help them make better decisions. This is the case for day-to-day operational decisions and long-term investment alike.

In this regard, it may be argued that Option (A) is undesirable because it will allow erroneous prices, which are not reflective of prevailing market conditions, to flow through to the spot market settlement and persist as wrong market prices. We note that NEMMCO adopted such an argument in advocating for the introduction of price revision in NEM. Likewise, such an argument can also be adopted in our market.

Essentially, spot prices are determined by the MCE based on the laws of economics using a market model that takes into account the physical realities (e.g. network conditions, characteristics of generating units, etc.) and requirements of the power system (e.g. regulation and reserve requirements).²³

Given such a price determination setup, it is very crucial to have an accurate or correct representation of the market in the MCE (which will depend on how the market and physical system are being modelled and the accuracy of the input data). Otherwise, the prices determined by the MCE will not be based on correct market conditions. And thus, it can be argued that such prices are incorrect and invalid. In addition, the incorrect prices can also accentuate price volatility.²⁴

However, we assess that the overall impact of erroneous prices on the market will largely depend on the frequency of pricing error.

²¹ Except for the case of missing RTS.

²² We have defined 'prevailing' conditions as inputs that should have been supplied to the MCE at the time when the MCE runs to produce the RTS. (We have referred to 'the time when the MCE runs to produce the RTS' as the 'reference time' in this paper and this is currently 'T-5 minutes'. See section 2.5.1 of the paper.)

²³ Essentially, it is the interaction of the market supply (i.e. an aggregation of the offers submitted by generators) and the market demand (i.e. load forecasts supplied by the PSO). Currently, there is no demand bidding and demand is treated as perfectly inelastic. The objective function of the MCE is to maximize the 'Net Benefits' in clearing the market. The 'Net Benefit' is the difference between the value of each fulfilled unit of demand and the lowest possible costs of generation in fulfilling the costs of demand. The MCE takes the generators' offers as the costs of fulfilling demand, and assigns a fixed value (since there is no demand bidding) to each unit of fulfilled demand.

²⁴ Some of the erroneous prices, if uncorrected, will result in price spikes in the market. In most cases, anomalous prices (i.e. atypical high or low prices) revert to roughly the mean level after a re-run. This problem is also noted in NEMMCO's proposal.

If pricing error occurs frequently and the erroneous prices are not revised, then eventually these prices can become wrong and misleading market signals for market participants and potential investors. Clearly, this is undesirable from the economic efficiency's point of view.

In our context, we consider that the impact of price revision on economic efficiency to be quite small for the following reasons:

- it may be argued that price revision does nothing for economic efficiency in the period concerned because market participants can no longer respond to the revised prices ex-post (in fact, market participants would have already physically responded based on the original ex-ante prices);
- it is debatable whether pricing error (in particular, where it rarely occurs) has any significant impact on long-term decision making. Typically, market participants make long-term decisions based on their expectations of future prices, taking into account historical prices. As far as pricing error rarely occurs, and there exists no systematic discrepancy between the ex-ante and revised (ex-post) prices over time, it is unlikely that erroneous prices (if uncorrected) will have a significant impact on the long-term price signal.²⁵

Hence, while Option (A) will result in erroneous prices remaining firm and binding in the market, we assess that it is unlikely to have a material adverse impact on economic efficiency due to the infrequency of pricing error.

Equity and Fairness

Although we assess that Option (A) is likely to have minimal adverse impact on economic efficiency, it certainly has a material financial impact on various market players since Option (A) will involve a settlement arrangement that is based on wrong prices.

With such an arrangement, consumers and generators will naturally be concerned about paying or receiving wrong price(s), especially if the wrong price(s) is/are unfavourable to them and they cannot seek compensation.

Allowing wrong prices to flow through to settlement raises an issue of why should consumers and generators be paying or receiving wrong price(s) (unfavourable to them) when they have not caused the pricing error. From this perspective, it can be argued that such an arrangement is inequitable and unfair and consequently, it will undermine participants' (and public) confidence in the integrity of the market.

In addition, under such an arrangement, consumers are more likely to be adversely affected compared to the generators due to absence of demand-bidding and consumers cannot submit bids to reflect their willingness to curtail load when the market price exceeds a certain level.²⁶ As a result, consumers can potentially end up paying an extremely high (erroneous) price.

Unlike consumers, generators can submit their offers which reflect their willingness to supply. Even in the event where the MCE determines a low (erroneous) price, generators

²⁵ In other words, market participants or potential investors do not make long-term decisions based on just a few prices they have observed in the market (hence, a few 'wrong' prices will not have a major impact on long-term decision making). Rather, market participants and potential investors will look at historical prices over a period of time. In the absence of any systematic bias, ex-ante prices will generally provide an unbiased estimate of ex-post prices, and thus provide an equally good price signal for long run economic behaviour.

²⁶ The MCE currently assigned a very high fixed value for each unit of fulfilled demand since there is no demand bidding. However, the highest price which consumers will pay is capped at \$4,500.

will still be dispatched based on their offers, i.e. only generators whose offer prices are equal or lower than the clearing price will be scheduled for dispatch.²⁷

Having said these, this problem of equity and fairness can be solved if the affected parties can seek compensation from the error-causer(s). However, in reality, this solution is workable only if:

- the error-causer(s) can be clearly identified in relation to a particular pricing error;²⁸ and
- the error-causer(s) is/are made to pay for the compensation from 'its own pocket'.

With regard to (a), we assess that it is often not easy to pinpoint the error-causer(s) in practice, especially in the context of a complicated market system involving multiple users/parties. Also, in the case where a pricing error involved several error-causers, there can potentially be disputes among them over the share of responsibility.

Even if we were to assume the above do not pose a problem, it may not be possible to make the error-causer(s) pay from its/their 'own pocket(s)' given the existing regulatory framework.

Option (B): Revise Erroneous/Provisional Prices

Option (B) will introduce some short-term uncertainty to market participants with regard to prices for settlement. However, we assess that this is not likely to have a major impact on the market players, given that pricing error rarely occurs (for instance, ex-ante prices were firm 99.7% of the time in year 2005). Also, the uncertainty can be further mitigated with continual efforts to improve the accuracy of the data inputs and to augment the MCE system.

The impact of Option (B) on (i) economic efficiency, and (ii) equity and fairness, is assessed below.

Economic Efficiency

In principle, Option (B) is desirable for economic efficiency because it will ensure that prices reflect the prevailing market fundamentals and hence, they can be relied on as the correct market signals for market participants and potential investors. (We note that NEMMCO uses this as its main argument in pushing for the introduction of price revision in NEM.)

In addition, there can exist some extreme situations under which economic efficiency could be enhanced by (the promise of) price revision. These are situations where the published ex-ante prices are manifestly wrong (in the sense that they are clearly inconsistent or incompatible with the scheduled dispatch, given participants' offers) and to the extent that market participants roughly know what the prices "should" be and what the final prices would likely to be after price revision, compared to the original prices provided by the ex-ante MCE run.

Such extreme situations could arise due to, say, the MCE, or its support systems, malfunctioning in some way. As a result, we could have missing prices or some 'ridiculous' prices established by the MCE which are clearly incompatible with scheduled dispatch and the physical system conditions. In such situations, market participants may only be induced to keep producing (in the period concerned itself) by the promise that prices will be revised to reflect the prevailing operating physical conditions.

²⁷ This will normally be the case except where there is out-of-order merit dispatch of generators due to system constraints or requirements.

²⁸ Error-causers potentially can include: the EMC, PSO and transmission licensee.

However, as we have earlier mentioned, given that pricing error rarely occurs, the efficiency impact arising from price revision is likely to be minimal.

Equity and Fairness

Option (B) will ensure that consumers and generators settle based on correct prices. Hence, this arrangement can be considered fair and equitable. We have earlier noted that a pricing error can lead to a significant price differential (i.e. the difference between the original and revised prices). For instance, Table 5 showed that consumers would end up paying \$2,230/MWh more (for a dispatch period in year 2005), and a generator would end up receiving \$9,000/MWh less (for a dispatch period in year 2004), had there been no price revision.

However, Option (B) can have an adverse financial impact on a generator who physically responded based on the original price, but has to receive a revised price (lower than its offer price) following a price revision. From this perspective, Option (B) can be deemed as being 'unfair' to such a generator.

This problem above can be overcome by offering appropriate compensation to a generator who is adversely affected by price revision. However, establishing a compensation arrangement that is perceived as 'fair' by the industry can also pose a challenge in reality. Often, one can expect contention to revolve around the eligibility criteria for compensation, the methodology (or formula) used in calculating the compensation amount and the way in which compensation amount is being recovered.

Overall Evaluation

Clearly, there are pros and cons associated with each option. Thus, we need to adopt a holistic and balanced approach in recommending which option we should adopt.

The main advantage of Option (A) is that it gives the market participants full certainty.

We have assessed that, in principle, Option (A) is not ideal for economic efficiency, but the impact is likely to be minimal given that pricing error rarely occurs.

The main disadvantage of Option (A) is that it will result in consumers and generators paying or receiving wrong prices even though they have not caused pricing error. To them, Option (A) can be deemed as inequitable and unfair. In particular, we have seen that the price differential involved (arising from a pricing error) can be very large, and consumers are more likely to be adversely affected compared to generators.

In contrast, Option (B) enables any pricing error to be corrected and hence, contribute to a fairer and more equitable outcome where parties settle based on correct prices.

Also, in principle, Option (B) contributes to economic efficiency by ensuring the prices (used for settlement) reflect prevailing market fundamentals and act as the correct market signals for market participants. Additionally, Option (B) can enhance economic efficiency under certain extreme situations (e.g. malfunctioning of the MCE or its supporting system resulting in the MCE producing prices which are clearly inconsistent with the dispatch schedule). Again, it must be said though, that the efficiency impact arising from price revision is likely to be minimal given the infrequency of pricing error.

One disadvantage of Option (B) is that it will lead to some uncertainty for the generators. But we have assessed that the impact of uncertainty is also likely to be minimal.

The main disadvantage associated with Option (B), really, is that it can have an adverse financial impact on a generator who responded physically based on the original price, but is subsequently paid a revised price lower than its offer price following a price revision.

The table below summarises our evaluation of both options.

Table 6: Summary of Evaluation of Option (A) and Option (B)

	Option A: Without Price Revision	Option B: With Price Revision
Economic Efficiency	- wrong prices will persist in the market; they are not based on correct market fundamentals and thus, send the wrong market signals (but in practice, the impact is likely to be infrequency of pricing error)	- in principle, this option is ideal in terms of enhancing economic efficiency (but again, in practice, the efficiency gain is likely to be minimal due to the infrequency of pricing error)
Equity and Fairness	- unfair to those who have to settle based on wrong prices unfavourable to them - in particular, the price differential involved can potentially be very large and also, consumers are more likely to be adversely affected, compared to generators	- ensure correct prices are used for settlement. This is deemed fairer and more equitable - can have adverse financial impact on a generator who physically responded based on the original price but received a revised price lower than its offer price following price revision
Mitigating Measures	- to continue with efforts to improve on quality of data inputs and to augment the MCE system - to allow consumers or generators to seek compensation from the error-causers	- to continue with efforts to improve on quality of data inputs and to augment the MCE system - to offer affected generator appropriate compensation
Practical difficulties involved (in implementing mitigating measures)	- in practice, it may not be possible to clearly identify the error-causer(s) - potentially, there can be disputes among multiple error-causers over share of responsibility - may not be able to make the error causer pays compensation from its own pocket under the current regulatory regime (e.g. error causer may be indemnify from damages or compensation will still ultimately be recovered from load)	- determining an appropriate or 'fair' compensation arrangement for affected generator can give rise to several contentious issues (mainly, eligibility criteria, methodology used for determining compensation amount, way in which compensation is recovered)

In conclusion, while we consider economic efficiency to be the primary consideration of which the issue of price revision should be assessed, it has been assessed that price revision (i.e. whether we have it or not) does not have a material impact on economic efficiency and long-term decision making.

We assess that the more critical issue really is that of equity and fairness. In this regard, we consider Option (B) to be more ideal as it offers a more equitable and fairer outcome for the market in general (with the exception of those generators adversely affected by price revision).

Hence, we recommend that the **RCP supports Option (B)**, to be supplemented with a compensation arrangement (to be addressed in the later part of this paper) that would allow a generator adversely affected by price revision to seek compensation to recover for its losses.

Second Decision: Applicability of Price Revision/MCE Re-Run and Augmentation of the process

In this section, we will (i) identify the circumstances where price revision should apply and, (ii) study how the existing price revision process can be augmented. (We assume the RCP gives its in-principle support for price revision in the SWEM albeit it being an ex-ante market.²⁹)

Applicability of Price Revision/MCE Re-Run

To recap, price revision/MCE re-run currently applies to the following types of cases:

- Type 1:** cases where the MCE has failed to produce real-time pricing schedule;
- Type 2:** cases where the MCE has used the wrong input data in determining the RTS;
- Type 3:** cases where the MCE has used the adjusted nodal load forecasts which reflect energy shortfall specified by the PSO;
- Type 4:** cases where the MCE has incurred CVP for line constraints where there is no load shed in real-time; or
- Type 5:** cases where the MCE has produced prices not reflective of their respective LSMP(s).

In this section, we will evaluate whether each type of cases should still be subject to price revision / MCE re-run in the SWEM and why.

Type 1: Failed/Missing/Late RTS

There will be no original price established by the MCE in cases of failed (or missing) RTS. Strictly speaking, the use of term 'price revision' is not appropriate for such cases since price revision would entail the original (ex-ante) prices being overridden by the revised prices (ex-post).

Basically, we have two ways to determine the prices for settlement in cases of failed RTS:

²⁹ If the RCP's decision is not to have price revision at all, then it is pointless to discuss this section (other than to discuss how we should deal with cases where there are missing RTS (i.e. Type 1 cases) and where the MCE has used the adjusted nodal load forecasts which reflect energy shortfall specified by the PSO (i.e. Type 3 cases).

- to use the last valid prices (i.e. the most recent prices established by the MCE for the affected dispatch period) in place of the missing periods;³⁰ or
- to re-run the MCE to establish the prices for settlement.

Using last valid prices has the advantages of being administratively straightforward. It also gives market participants more certainty. These prices could be obtained more quickly, compared to re-running the MCE. However, these prices may not reflect the prevailing market conditions, in particular when the MCE runs the pre-dispatch schedules and market outlook scenarios (MOS) very infrequently.³¹

Re-running the MCE to obtain the prices would be a more attractive arrangement as the primary objective is to have the prices more accurately reflect the market conditions of the affected dispatch period.

Hence, we recommend the RCP supports re-running the MCE to obtain prices for settlement in cases of failed RTS.

In cases where it is not possible to re-run the MCE, we recommend retaining the current arrangement of setting the price in the affected dispatch period to the average of previous prices for comparable dispatch periods over the past 30 days, as provided for in the current section 10.2.6, Chapter 6 of the Market Rules.

Type 2: Erroneous inputs to the MCE

Erroneous inputs to the MCE clearly constitute a case which necessitates price revision. The issues we need to grapple with here are:

- What constitutes an 'erroneous' input data to the MCE?
- What should be the reference time for inputs to be taken as being reflective of the prevailing market conditions for a dispatch period if a MCE re-run is required? (Since certain inputs, for example, the network status file (NWSF), are always changing in retrospect, there is a need to fix a reference time where inputs that should be used by the MCE would have to be taken as final and representative of the market conditions for a half-hour affected dispatch period.)

With regard to (a), it is important that we define what constitutes an 'erroneous' input to the MCE. The MCE uses a broad range of inputs, some of which relates to data submitted by market participants (e.g. offers), while others relate to the current or future status of power system (e.g. NWSF, demand forecasts, system constraints and requirements and others).

We are of the view that EMC cannot take a view as to whether a market participants bid or offer is correct or erroneous, as the bid or offer is a matter for the market participant to determine³². It is conceivable however that EMC could identify errors in input data that are derived from other sources, such as manually entered information on system constraints and standing data of generators, load forecasts, NWSF, etc.

³⁰ They will be prices from the STS, and if the STS is not available, from the PDS, and if the PDS is not available, from the MOS.

³¹ The more frequent the MCE runs the pre-dispatch schedules, the more accurate the last valid price will be in reflecting the prevailing market conditions. Take NEM for instance, the market uses last valid prices to replace the erroneous prices because the valid prices would reasonably reflect the market conditions accurately due to 5-minute pricing.

³² Here, we are referring to cases where the latest valid offers/bids have been validated and used by the MCE in the determination of the RTS but subsequently, market participant claims that these offers/bids are 'wrong'.

Hence, we recommend that erroneous inputs to the MCE that can trigger price revision should include **all** inputs used by the MCE in determining the real-time schedules, excluding cases where market participants claim that the latest bids and offers submitted by them (which have been validated and accepted by the MCE) are ‘erroneous’.

With regards to (b), it is important we set a reference time for input data if a MCE re-run is required.

In theory, one could argue that the input data are always “wrong” in retrospect, at least as far as the load is concerned for the demand-side. And for the supply-side, data will also be “wrong” if there is any unexpected outage during the dispatch period. Thus, if the MCE were to be re-run to revise prices every time such an “error” occurred, it would have to re-run every period and thus, effectively shifting the SWEM to an ex-post pricing regime (as in the NZEM, for example).

Hence, while it may be argued that prices should be based on the most current/valid market conditions to the greatest extent possible, with the ex-post pricing being the ultimate expression of that philosophy, this would entirely be inconsistent with an ex-ante pricing regime. Hence, basically, we need to set a reference time for the input data to the MCE (to be taken as being reflective of the prevailing market conditions for a dispatch period if a MCE re-run is required), and any changes occurring after that time should be ignored.

In the limit, one may reasonably argue that the appropriate reference time should be “T” if the objective of price revision is to ensure that prices accurately reflect the prevailing market conditions. But, if it is believed that there are significant advantages to this approach, then it should be applied consistently, to all periods, not just those subject to price revision under the current rules.

Practically, that would mean re-running the MCE to re-determine prices for each dispatch period, immediately after the dispatch schedules have been delivered in SWEM (since the MCE runs at “T-5 minutes” to determine the RTS). This could certainly be done, and may result in marginally more accurate prices, but we see little to be gained and there is no way real-time prices could be made known to market participants before “T”.

Also, one could suggest that to better meet the objective of ‘ensuring prices accurately reflect the prevailing market conditions’, then the reference time should be after “T” (say, “T+15 minutes” which is the mid-point of the dispatch period or even “T+30minutes” where the scheduled generators are supposed to meet their scheduled energy at the end of a dispatch period and hence, the time should be “T+30minutes” to match the system condition at the end of the same dispatch period.)³³ But, again, this argument is also equally true for all other dispatch periods, for which no price revision is employed. And hence, practically, this also means we have to re-run the MCE for each dispatch period to re-determine the prices with the reference time as “T+15 minutes” or “T+30 minutes”.

Accordingly, we are of the view that it is most consistent for any MCE re-run to assume inputs data which should have been supplied to the MCE at the time when the MCE runs to produce the RTS for a dispatch period (i.e. currently “T-5 minutes”), rather than any update to that data which may reflect changes in circumstances, or perceptions, occurring after that time, whether in the last 5 minutes prior to the dispatch period commencing, or during the dispatch interval itself.³⁴

³³ No matter which reference time we fix, perfection will never be achieved. This is because some conditions including load, which is the fundamental driver vary throughout a dispatch period, while others, such as transmission system state may change abruptly within it.

³⁴ This is the case currently, as provided for under section 10.2.5, Chapter 6 of the Market Rules.

In summary, we recommend that the RCP supports:

- a re-run of the MCE to obtain revised prices for settlement where EMC determines an erroneous input to the MCE;
- the scope of ‘erroneous’ inputs to include all inputs used by the MCE, except for the latest valid offers/bids have been used by the MCE in the determination of the RTS but subsequently, these offers/bids are claimed to be ‘wrong’ by market participants;
- ‘erroneous’ inputs be defined as inputs deemed as not being reflective of the prevailing market conditions for a dispatch period at the time when the MCE runs to produce the RTS (currently “T-5 minutes”); and
- the EMC using all input data that should have been supplied to the MCE to produce the RTS if a MCE re-run is required (i.e. currently “T-5 minutes”).

Type 3: The MCE has used the adjusted nodal load forecasts which reflect energy shortfall specified by the PSO

This type of ‘price revision’ applies only to cases where the PSO sends EMC a load shed file. The rules require the following process comprising three distinct steps be applied in such cases:

- Step 1:** Adjusting nodal load forecasts
- Step 2:** Re-running of MCE to determine prices for settlement
- Step 3:** Determining compensation amounts

We explain the purpose and rationale for each step below.

Step 1 is required to ensure that the dispatch schedule produced by the MCE is both optimal and feasible, after taking into account the expected shortfall in energy. Having reckoned that the market could not respond to an anticipated energy shortfall (an energy shortfall advisory notice would already have been in place) and hence, involuntary load shedding in real-time is inevitable, the PSO will send EMC a load shed file indicating the locations of load shed and the associated quantities.

EMC will upload the load shed file into the MCE. This has the effect of ‘adjusting’ the nodal load forecasts for locations where there will be load shedding. The purpose is to ensure the MCE can come out with a feasible dispatch schedule when load shedding occurs.

Step 2 is designed to preserve the integrity of price signals in that situation. A re-run is performed using the ‘unadjusted’ (or original) nodal load forecasts to determine the prices for settlement. This has the effect of setting prices which reflect load shedding in real-time (since the prices reflecting load shedding have been removed as a result of the MCE using the ‘adjusted’ nodal load forecasts).

Step 3 is to provide for compensation. Load shedding in practice generally occurs in large blocks of loads and hence, load shed may exceed the shortfall in capacity. As a result, some generators could not generate even though they have some available capacity. The compensation is to offer such generators, primarily with a purpose of improving generator incentives with respect to provision of peaking capacity.

This entire process is designed with a purpose of achieving certain objectives in situations where the PSO anticipates energy shortfall in real-time and sends EMC a load shed file.

We consider the process appropriate in this context because:

- With regard to Step 1, the adjustment of the nodal load forecast is necessary to ensure that the MCE can determine a dispatch schedule that is both optimal and feasible, after taking into the expected shortfall in energy. This is necessary mainly for the operation of the power system (otherwise the PSO would have to override the dispatch schedules determined by the MCE);
- With regard to Step 2 and Step 3, the benefits are primarily in terms of improved economic signalling in that the prices are maintained at the level at which they would have been without load shedding, and generators are incentivised to provide peaking capacity and, at least arguably, not to 'play games' in order to secure dispatch under those conditions.

Hence, we recommend that the RCP supports the retention of the price revision process pertaining to such cases.

(**Note:** This issue also formed part of the RCP workplan for 2006.³⁵ Market participants have indicated that they are not sure how this type of price revision process works, and what rationale behind having this process is. We have explained above the purpose and rationale for each of the steps involved in such a process. Hence, we consider that this issue has been addressed.)

Type 4: Incurrence of CVP for line constraints in MCE when there is no load shed in real-time

Current rules provide for price revision for cases where MCE has applied CVP for line constraints where there is no load shed in real-time. In such cases, EMC will re-run the MCE by using the maximum actual line flow values supplied by the PSO, or if the EMC does not receive such values from PSO, EMC shall re-run the MCE by relaxing the line constraints (in accordance with D.16.4, Appendix 6D of Chapter 6).

This process was implemented as a result of an approved rule change in 2003 (RCP Paper: 'EMC/RCP/09/2003/215 on 'Removing the Effect of CVP on Energy Settlement when Load is Not Shed'). The rule change sought to address a modelling imperfection in the MCE where a line constraint violation ends up setting high settlement prices despite the absence of physical load shedding in the power system.

We note that such a practice is common in other markets, but question whether a relaxation of the line constraints in the MCE for the re-run is really appropriate in our context.³⁶ In our opinion, the issue is not well-understood, or dealt with, particularly well in other markets. Two misconceptions are common:

³⁵ This is Issue No. 11, entitled "The real-time pricing schedule no longer reflects energy shortfall after the EMC has adjusted nodal load forecasts following a PSO's energy shortfall forecast", in the RCP work plan. This issue has been ranked as of 'medium' priority by the RCP.

³⁶ In our preliminary research, we observe that NEMMCO has a similar practice where if the original prices are set by CVP, these prices will be replaced by prices from a re-run of the dispatch engine with the offending constraint(s) relaxed (NEMMCO termed this as 'over-constrained' dispatch). The reasons for price revision in such cases are (i) the original prices are not a true reflection of the cost of energy and (ii) the application of CVP in the dispatch engine has no effect on dispatch of the power system.

- First, concern is often expressed that CVPs should not be allowed to set market prices, and most markets attempt to avoid this.³⁷ But there are no strong theoretical grounds for this position. In principle, Value of Lost Load (VoLL) is just another CVP and yet, VoLL is allowed to set market prices under certain circumstances. In our opinion, the problem is not so much that CVPs should not set prices but that, whereas some effort may be devoted to determining an appropriate level for VoLL, very little effort is typically spent on determining appropriate CVP values, and the values employed may be quite arbitrary, and typically very high. Thus, it may be argued that they do not properly reflect the economics of the situation and hence, using such values to set the market price is not appropriate.
- Second, it is a common misconception to think that, when high prices are set by CVP values, those high prices are an artefact due to the way CVPs are applied arising from constraint violations in the MCE. Thus, this could be eliminated by removing the constraints in the MCE. However, the reality is that, when we do this, an even higher price (generally infinite) should have arisen instead, if the constraint had been treated as “hard”, that is inviolable, with no CVP applied.

We have identified four circumstances where it might be argued that there should be a re-run of the MCE with the ‘binding’ line constraints relaxed. They are:

- (1) where the constraints have been mis-specified in the MCE (e.g. the line limit entered into the MCE was incorrect);
- (2) where the load-flows implicit in the MCE mis-estimate real-time flows;
- (3) where the actual load and/or generation capacity differ from the forecast at the time of the ex-ante MCE run; and
- (4) where no untoward circumstance (e.g. load shedding) has actually occurred, ex-post.

We will evaluate whether a re-run of the MCE is appropriate under each of these circumstances, and why.

Circumstance (1)

This is a case where the line constraints have been wrongly specified (or entered) in the MCE. In which case, we would agree that a re-run of the MCE is appropriate, but on ground of erroneous input data to the MCE.

It is to be noted that such a re-run should be conducted by correcting the erroneous input data, not by relaxing the line constraints, in the MCE. Thus, while price revision is appropriate in such a case, it is that relating to Type 2 which should apply.

Circumstances (2) and (3)

For these cases, we do not consider that there was really an ‘error’ involved simply because the estimates/forecasts (e.g. load forecast) used in the MCE differ from the actual values in real-time. An ex-ante pricing regime will certainly require the MCE to use certain estimates/forecasts of the physical conditions of a dispatch period (e.g. load forecast) as inputs in determining the ex-ante prices. Where estimates or forecasts are involved, they

³⁷ This is one reason why CVPs have been set at such high levels in the Australia NEM, for example, and why they have been set to multiples of VoLL. But it can be shown that, even so, it is impossible to stop prices being set by CVPs under some circumstances, and this probably does occasionally happen in practice, despite best efforts to avoid it.

are bound to differ from actual values. But this should not straightaway be construed as an 'error' and thus, be used as a reason to argue for a MCE re-run.

We consider the key really lies in whether these estimates/forecasts are based on the most current valid information at the time of the ex-ante MCE run. If they are, then we consider that there is really no 'error' involved. In such cases, a re-run of the MCE by relaxing the 'binding' line constraints is inappropriate, and we would expect the ex-ante prices to stand firm.

Circumstance (4)

Lastly, we note that it is a common practice to re-run the MCE with a 'binding' constraint relaxed if, ex-post, it is observed that no untoward circumstance (e.g. load shedding) has actually occurred. We are of the view that this is not appropriate.

Many of the constraints in the MCE are precautionary in nature. Hence, they can often be breached with impunity so that, ex-post, one may think that since no constraint or untoward circumstance has actually occurred, the cost of complying with them was not justified. Such thinking is flawed; it is analogous to paying an insurance premium but realising no claims were made later and thus, felt that paying the premium was not justified since no harm has occurred.

Likewise, it may also be said that, in most dispatch periods, it will seem unnecessary, in retrospect, to have carried any contingency reserve at all, and thus the constraints requiring such reserves could be relaxed (ex-post), thus collapsing the reserve prices to zero.

The fact is, in the power system, we are required to make ex-ante provisions for such contingencies, regardless of the actual outcome. Thus, it is inconsistent and inefficient to charge ex-ante prices only if the constraints were 'necessary' in a period (e.g. where an untoward circumstance has actually occurred), while "relaxing" the constraints and re-run the MCE, ex-post, in other periods where no untoward circumstance has actually occurred.

In conclusion, a re-run of the MCE where it involves a 'binding' line constraint would be appropriate only if an input error is involved in the ex-ante MCE run (e.g. line limit was wrongly specified). But such re-run does not seem justified in cases where the constraints reported as 'binding' in the MCE merely turned out to be, ex-post, absent or not as severe as they had seemed, ex-ante.

Accordingly, we consider that there is no proper basis for the current price revision relating to the relaxation of line constraints in the MCE re-run where a CVP for line constraint has been incurred (ex-ante) but there is no load shed (ex-post). Hence, we recommend that the RCP supports such type of price revision (i.e. Type 4) be removed from the rules.

Type 5: Where the MCE has produced prices not reflective of their respective LSMP(s)

Price revision for this type of cases applies where the MCE has produced prices that do not reflect their respective LSMP(s).

The MCE is a marginal pricing model that establishes nodal prices that reflect their respective LSMP(s). In economic terms, the price at a nodal (i.e. 'nodal price') gives the per MWh cost that has to be incurred by the system in order to meet incremental demand at that node.

In the absence of transmission constraints (or congestion), all nodal prices should reflect one SMP, i.e. each nodal price within a system should be that SMP after adjusting for losses associated with that node.

However, where there is transmission constraints (or congestion), one system would be broken into two or more isolated systems. This will give rise to (two or more) different SMPs and the nodes within different systems should reflect their respective LSMPs. This phenomenon is also known as 'price separation'.

There exist instances where MCE establishes nodal prices which do not reflect their respective LSMP(s).³⁸ Clearly, such pricing outcome is erroneous under a locational marginal pricing regime used in our market. Hence, it is necessary to perform price revision to ensure the prices produced by the MCE correctly reflect their respective LSMP(s).

Summary on Applicability of Price Revision/MCE Re-Run

The table below summarizes our recommendations on the applicability of the various types of cases subject to price revision / MCE re-run.

Table 7: Applicability of Price Revision / MCE Re-run

Situations	Applicable (Yes/No)	What EMC is to do
Type 1: Where the MCE has failed to produce a real-time schedule (RTS) for a dispatch period for any reason other than a real-time market suspension.	Yes. (Note: As mentioned earlier, this is not considered as 'price revision' since the MCE failed to produce the real-time pricing schedule.)	Re-run the MCE to determine the prices for settlement.
Type 2: Where the MCE has used input data which are erroneous in its original ex-ante run	Yes.	Re-run the MCE by using all correct input data that should have been used by the MCE at the time when the MCE runs (this is currently 'T-5' minutes.) 'Inputs' are defined as any values/data which the MCE uses in determining the RTS, except for bids and offers submitted by market participants.

³⁸ Some possible causes for this type of cases include MCE modelling error and existence of 'multiple optimal solutions' to the linear programming problems solved by the MCE.

Situations	Applicable (Yes/No)	What EMC is to do
Type 3: Where the MCE has used the adjusted nodal load forecasts which take into account the energy shortfall specified by the PSO for a dispatch period. (Section 10.2.8, Chapter 6)	Yes.	Re-run the MCE by using the 'unadjusted' nodal load forecasts to determine the prices for settlement and to determine compensation for affected generators under Appendix 6I of Chapter 6.
Type 4: Where the MCE has applied constraint violation penalty (CVP) for line constraint for a dispatch period, and the PSO has subsequently confirmed that there was no load shed in that period.	No.	We recommend that the current rules which allow such a price revision be removed.
Type 5: Where the MCE has produced prices not reflective of their respective LSMP(s)	Yes	Re-run the MCE by using all correct input data that should have been used by the MCE at the time when the MCE runs (this time is currently 'T-5' minutes.)

Augmentation of the Price Revision Process

We are proposing the following measures be adopted to augment the price revision process further:

- EMC to report to the RCP on the number of price revision and the circumstances giving rise to price revision (we suggest this be part of the RCP monitoring list, instead of stipulating this requirement in the Market Rules);
- EMC to develop an appropriate compensation arrangement for generators adversely affected by price revision. (EMC had earlier proposed a compensation arrangement, but the proposal was rejected by the RCP. We attach the proposal in Annex A. We urge the RCP to reconsider this proposal again.)

Identification of rule changes required

In this section, we have identified some required changes to the rules, assuming the RCP agrees to all our recommendations arising from this review.

Proposed Rule Changes

We present the proposed rule changes required in the table below.³⁹

Table 8: Proposed Changes to the Rules

Sections of the Rules	Purpose of Rule	Proposed changes and Reasons
Section 9.3.2C, Chapter 6	- allows prices to be provisional where constraint violation costs have applied by the MCE in accordance with section D.16 of Appendix 6D	- Delete rules Reason: It is inappropriate for the current price revision process to allow for relaxation of line constraints in the MCE re-run where a CVP for line constraint has been incurred (ex-ante) but there is no load shed (ex-post). We recommend that the RCP supports such type of price revision be removed from the rules.
Section 9.3.2D, Chapter 6	- allows EMC to request the PSO to confirm whether or not load shedding has occurred, and provide to EMC the maximum actual line flow values	- Delete rules Reason: Same as above.
Section 9.3.2E, Chapter 6	- allows EMC to revise prices if PSO confirms no load shedding	- Delete rules Reason: Same as above.
Sections 10.2.3A, 10.2.4A, 10.2.5A and 10.2.5B of Chapter 6	- spell out the procedures on how EMC should perform price revision relating to cases where constraint violation costs have applied by the MCE for line constraints but PSO has confirmed there is no load shedding	- Delete rules Reason: Same as above.
Appendix 6D, D3	- new parameters included to provide for relaxation of line constraints if there is a re-run of the MCE under section 10.2.3A.2 and section 10.2.5B of Chapter 6	- Delete rules Reasons: Same as above.

³⁹ The proposed rule changes we have identified are the main ones and are by no means complete. Some consequential rule amendments (which are required) may have been missed out. EMC will table the detailed proposed rule changes to the RCP for consideration, if the RCP agrees to all our recommendations arising from this review.

Sections of the Rules	Purpose of Rule	Proposed changes and Reasons
Appendix 6D.16.4, Chapter 6	- provides for relaxation of line constraints if there is a re-run of the MCE under section 10.2.3A.2 and section 10.2.5B of Chapter 6	- Delete rules Reasons: Same as above.
Appendix 6D 21.2	- required by Appendix 6D, 16.4 so that line flows exceeding line capacities do not incur violation penalties in the instance of a re-run of the MCE under section 10.2.3A.2 and section 10.2.5B of Chapter 6	- Delete rules Reasons: Same as above.
Sections 3.3.1 and 3.11.1 of Chapter 3, section 10.2.10 of Chapter 6 (new provision) and Appendix 6K of Chapter 6 (new provision) (Please see Annex A for the proposed rules.)	- provide compensation to generators adversely affected by price revision	- amend Sections 3.3.1 and 3.11.1 of Chapter 3 Reason: To allow generators to seek compensation under the dispute resolution process provided for under the Market Rules, and to provide for how the amount would be recovered. - add new provisions (section 10.2.10 of Chapter 6 and Appendix 6K of Chapter 6) Reason: To spell circumstances where generators will be entitled to compensation arising from price revision, and to provide for how compensation amount shall be determined, paid out and recovered.

CONSULTATION WITH STAKEHOLDERS

Feedback and Response

Table 9: Industry's Comments and EMC's Responses

PowerSeraya's Comments/Feedback	EMC's Response
<p><u>Section 2.2.1 NEM</u></p> <p>The Section here describes the NEM approach to detection and revision of prices resulting from errors to the inputs to the Dispatch Engine (SPD) as outlined in the reference:</p> <p>http://www.nemmco.com.au/dispatchandpricing/140-0086.pdf “Setting of Trigger Levels for Determination of Dispatch Intervals Subject to Review due to Manifestly Incorrect Inputs”</p> <p>Section 2.2.1 does not, however, refer to the practise in Australia of revising prices resulting from Constraint Violations as described in:</p> <p>http://www.nemmco.com.au/dispatchandpricing/mo_di587v001.pdf “Pricing During Over constrained Dispatch”).</p> <p>The latter shows Australia has the same approach as presently in the Singapore Market for handling price revisions where CVPs arise but no load shedding is observed.</p> <p>We would appreciate if EMC could find out a bit more why NEM has not proposed a similar change for handling price revisions where CVPs arise but no load shedding is observed.</p>	<p>We understand there was a high degree of polarisation in the views put forward on this matter in the NEM.</p> <p>Several generators were of the view that pricing during over-constrained period should carry a risk premium which reflect insecure operation to which load is exposed to.</p> <p>However, several retailers and NEMMCO felt that it is inappropriate to set a VoLL energy price when all energy can still be supplied and there is no involuntary load shedding. Setting price to VoLL would send a false signal to shed load even though there is adequate energy and load can be met.</p> <p>NEMMCO also considers setting price to VoLL will reduce competitiveness. This is because “all supply side resources will be paid the price cap even though all demand is met, so that action of suppliers will no longer influence price even though demand is still being met”. On the demand side, there is currently no evidence that participants can respond competitively to short duration of VoLL prices. Furthermore, the effectiveness of the competitive price signals will be lost because there would be no discrimination between times when all demand can be met, and times when it cannot.</p>

PowerSeraya's Comments/Feedback	EMC's Response
<p><u>Section 2.2.2 WEM</u></p> <p>Argentina operates a cost based power pool. There are no generator bids to the market or response to market price signals. Generators submit for review cost details of each of their generators every six months. Once approved these are used by the market operator to commit and dispatch generation to meet demand forecast by the system operator.</p> <p>The similarities to Singapore are remote and we do not see either the market or its handling of price revisions relevant to the real time price based pool of Singapore where participants self dispatch their units in response to near real time price signals from the market.</p> <p>We suggest Argentina is not a good choice to support the rule changes proposed by the paper.</p>	<p>We acknowledge that there some differences between the two markets. However, it is not likely for two markets to be identical, in terms of market design and operation.</p> <p>We highlight the examples of the NEM and WEM to show that there is price revision in markets with ex-ante pricing (similar to our case).</p>

PowerSeraya's Comments/Feedback	EMC's Response
<p><u>Section 2.3.3 Historical Cases of Price Revision</u></p> <p>Table 4 illustrates the percentage of times a price revision resulted from each cause. It does not, however, state anything regarding the materiality of the revision.</p> <p>Table 5 Shows the price impact arising from the revision whereby the biggest impact on MEP price revisions is clearly at Constraint Violation Penalty Prices (i.e. close to VOLL) and not a result of participant offers to the market. It is therefore not possible to draw conclusion as to the relative material impact of any type of price revision from the data contained in these tables.</p> <p>We recommend that the information in Table 4 with percentage of incidents of each price revision type supplemented with percentage materiality of each price revision type. This will then show the material importance of the revision type to the market.</p>	<p>The decision of whether to have price revision or not should be based on the basic design principles of SWEM. In this regard, we note that price revision is not likely to increase economic efficiency (at least in the short run). We are advocating price revision to maintain equity and fairness because the parties involved should not be made to pay (or receive) a price that has been determined wrongly.</p> <p>The extent of equity and fairness will depend on the magnitude of price differences. The maximum price difference in our market is \$9000/MWh (from -\$4500 to \$4500 /MWh or vice versa). Table 5 is used to illustrate that this has already happened before.</p> <p>We do not think that it is necessary to carry out extensive work required to provide this additional information requested as this will not impact on the decision.</p>
<p><u>Section 2.4 Allow Price Revision or Not</u></p> <p>We [PowerSeraya] agree with the conclusion of the EMC Paper to allow price revision and to provide a compensation scheme.</p>	-
<p><u>Section 2.5 Applicability of Price revision</u></p> <p>Type 2: where the MCE has used the wrong input data in determining the RTS</p> <p>We are not agreeable with the exclusion of participant offers to the market in the identification of wrong input data. The EMC is required to use the latest valid offer or offer amendment available in its running of the MCE, should it choose the wrong offer then this is an error just like any other and should result, in our opinion, in a price revision.</p>	<p>Yes, we agree that where the latest valid offer (or offer variation) is not used by the MCE, it should be considered as a case where wrong/invalid input data has been supplied to the MCE.</p> <p>Our initial exclusion of participant offers was meant to exclude cases where market participants claimed that they have submitted 'wrong' offers.</p> <p>We have amended the paper to reflect this.</p>

PowerSeraya's Comments/Feedback	EMC's Response
<p><u>Section 2.5 Applicability of Price revision</u></p> <p>Type 4: where the MCE has incurred CVP for line constraints where there is no load shed in real-time.</p> <p>We are advised that CVPs are a device to enable the MCE to converge. Their levels need to be set to make sure that this happens and that constraints breach, where necessary, in the correct sequence. The size of the CVP is driven by this requirement and not economic fundamentals.</p> <p>The MCE is of necessity imperfect performing a DC load flow optimisation of a complex AC network. Its results will not necessarily reflect reality where CVPs arise. The proof of this is whether load is actually shed or not. Where load is not shed then any prices that arise from a CVP should be revised.</p> <p>The above is supported by approach followed in the Australian market identified by the EMC as comparable with Singapore, and by the market rules currently in place in Singapore.</p> <p>Therefore, we are not able to agree to the conclusion not to perform a Price revision when type 4 conditions apply unless EMC can confirm that the advice given to us in the above paragraphs are incorrect and what are the "unintended" consequences experienced in other markets for keeping this in the rules.</p>	<p>There are situations where a solution cannot be found by the MCE within the 'usual' set of constraints and hence, the need to relax some (soft) constraints for the MCE to find a feasible solution. The MCE applies CVP for the relaxation of constraints.</p> <p>As we have explained, in the power system, we are required to make ex-ante provisions for contingencies, regardless of the actual outcome. Thus, it is inconsistent and inefficient to charge ex-ante prices only if the constraints turned out 'necessary' for the period (e.g. where an untoward circumstance has actually occurred), while "relaxing" the constraints and re-running the MCE ex-post in other periods where no untoward circumstance has actually occurred.</p> <p>We note that some other markets relax 'binding' constraints ex-post where it is observed that no untoward circumstance (e.g. load shedding) has actually occurred. However, we feel that this is not appropriate. If the constraints and CVP values do properly reflect system requirements, and these constraints were breached in the ex-ante run, then a breach of those constraints should be taken seriously, and prices be allowed to stand, regardless of whether any harm or untoward circumstance has actually occurred. This is not to mention that some of these cases in SWEM actually involved the line limits being breached physically.</p>

PowerSeraya's Comments/Feedback	EMC's Response
	<p>In SWEM, relaxation of CVP (where there is no load shed in real-time) applies only for line constraints. Currently, CVP for violation of line constraints is set at $2.2 \times \text{VoLL}$. VoLL is defined as the value an average consumer puts on an unsupplied unit of energy, and this is currently set at \$5,000/MWh.</p> <p>The setting of violation penalties in the MCE is undertaken to ensure it is consistent with the objectives of the Market Rules, and to ensure that correct signals are given to market participants. In its paper to EMA "Specification of Offer Bounds, Market Price Bounds, and Constraint Violation Penalties (2002)", PA Consulting has explained the rationale for selection of penalties for line constraints as follows:</p> <p>"The recommended violation penalty for line flow is derived from the violation of energy, since line flow or node violations trade off against each other. Generally, the deficiency leading to a line flow violation could alternatively result in a nodal violation – load could be shed at the receiving node rather than violating the flow limits. Assuming the flow limits are hard, then the solution that best matches what will happen in reality is for load to be shed at the receiving end of the line. Hence, the price for the line flow violation is the maximum difference between energy price at each end of the line, VoLL and $-\text{VoLL}$, plus an adder (to account for losses)". [This is why CVP for line constraints are set at $2.2 \times \text{VoLL}$].</p> <p>Hence, we disagree with the statement that "the size of the CVP [for line constraints in SWEM is driven by this requirement [i.e. for the MCE to converge] and not economic fundamentals".</p>

Senoko Power's Comments / Feedback	EMC's Response
<p>The criteria for re-run under Type 2 scenario require more definition as it introduces great uncertainty and potentially inequitable price settlement for Market Participants.</p> <p>It is critical that these criteria be unambiguously specified so that there is clarity and certainty to, and agreement by, all Market Participants (as well as potential investors).</p> <p>Senoko also wishes to highlight that in the PPB GT1's case on 11 Dec 05 (P26), the NWStat file used by the MCE was correct and thus, there was no question as to the correctness of the RTS prices generated by the MCE since accurate, correct data has been used at that time.</p>	<p>The scope of erroneous data inputs is unambiguously specified as all input data used by the MCE. Input data is 'erroneous' if it is deemed as not what should have been supplied to the MCE at the time when the MCE runs to produce the real-time schedule. (Please see section 2.5.1 of the paper for more details.)</p> <p>With regard to the incident on 11 Dec 05 (P26), it is not for the RCP to deliberate whether the input data used by the MCE is correct or not. It is for Senoko to pursue the issue with EMC.</p>
<p>To be economically efficient, input data should be 'timely' such that Market Participants are actually able to respond to changes in market conditions. There is no economic efficiency if generators are not able to respond to a change in market conditions that was reflected in updated input data used by the EMC for re-run. Prices generated under circumstances where supply is inelastic cannot be regarded as 'economically efficient'.</p>	<p>We agree that the impact of price revision on economic efficiency is minimal in the short run. However, there can be significant impact on economic efficiency in the long run (depending on the frequency of pricing error). As explained in the paper, if pricing error occurs frequently and the erroneous prices are not revised, then eventually these prices can become wrong and misleading market signals for market participants and potential investors.</p> <p>We disagree with the statement that 'prices generated under circumstances where supply is inelastic cannot be regarded as economically efficient'. While it is true that producers (and consumers) are generally less price-responsive in the short run, compared to in the long run, this does not mean prices generated in the short run (where supply and/or demand are relatively inelastic) are 'economically inefficient'. Price elasticity and economic efficiency are two different concepts.</p>

Senoko Power's Comments / Feedback	EMC's Response
<p>We note Price Confirmation Checklist for RTS that "Abnormal Prices For Energy, Reserve and Regulation" would render market prices as 'provisional'. It begs the question as to under what circumstances would a certain price constitute an 'abnormal' or 'normal' price.</p>	<p>'Abnormal' prices are prices that are of an unusually high (or low) value, after taking into consideration the day-type, the period concerned and the prevailing price trend. Ultimately, this will involve some judgement call or discretion on the part of the pricing manager.</p>
<p>We note a key factor in EMC's recommendation for price revision was the impact of no price revision on customers. We are unable to verify the examples raised by EMC and would appreciate it if concrete examples can be provided.</p>	<p>The key factor in our recommendation for price revision is to uphold the principle of equity and fairness in our market, and not because the recommendation would favour any party in particular.</p> <p>In terms of impact, both generators and consumers can be adversely affected by erroneous prices.</p>

PSO's Comments/Feedback	EMC's Response
<p data-bbox="297 357 1200 488">It is fundamental to any market that price determine ex-ante should never be changed ex-post after the buyer consumed and the seller delivered the goods/services in good faith based on the price agreed-on ex-ante.</p> <p data-bbox="297 759 1178 890">There is no compelling reasons to revise prices be it Type 1, 2, 3 or 4. In our view, the only scenario where price revision is required is when there is internal MCE logic error (here refers to inconsistency with formulations in the Market Rules).</p> <p data-bbox="297 1161 1193 1260">What is important is to minimise instances of invalid inputs to the MCE, rather than to create uncertainty on and undermine confidence in the market with frequent price revisions ex-post.</p>	<p data-bbox="1223 357 2047 727">We agree with this statement per se, but applying it directly to our market has limitations. As the price in our market is set by the MCE (which is a mimic of the market and <u>not</u> the actual market itself like, for instance, the stock exchange where buyer decides whether or not to buy a stock at the price offered by the seller), it is important that the price is determined correctly. Price revision is provided for in recognition that errors can occur in the price determination by the MCE. Had the price been agreed <u>directly</u> between the seller and buyer in the market, we agree that either party should not renege on the agreed price.</p> <p data-bbox="1223 746 2018 916">We maintain that price revision should apply to Type 2 cases (whereas Type 1 is to establish the price by re-running the MCE, and Type 3 is to establish the price using unadjusted nodal load forecast). We agree that price revision should not apply to Type 4 cases.</p> <p data-bbox="1223 935 2047 1129">All MCE code changes have been audited to ensure they are consistent with the formulations in the Market Rules. Thus, it is unlikely there is a MCE code error. Even if there is such an error, it is unlikely that the error can be discovered and resolved within the time allowed (4 business days) for prices to be finalised.</p> <p data-bbox="1223 1149 2033 1286">We agree that it is important that all relevant parties work together towards minimizing the incidence of invalid inputs to the MCE. However, it is not possible to eradicate cases which necessitate price revision completely.</p>

PSO's Comments/Feedback	EMC's Response
Page 10, "Figure 1: Flowchart on Daily Price Check Process" is hardly readable	We have improved on the clarity of the picture.
Page 12, The statement "Pricing error will still occur, mainly due to erroneous input data to the MCE and missing/failed RTS." doesn't reflect the latest data in 1H 2006, where 70% of price revisions were due to missing/late/failed RTS.	We have revised the statement to read as: "We can expect cases some cases which necessitate price revision to occur still."
Table 5 "Price Impact Arising from Price Revision" – On balance, instead of just showing the extremes, what are the price impacts from majority of price revisions?	<p>The decision of whether to have price revision or not should be based on the basic design principles of SWEM. We are advocating price revision to maintain equity and fairness because the parties involved should not be made to pay (or receive) a price that has been determined wrongly.</p> <p>The extent of equity and fairness will depend on the magnitude of price differences. The maximum price difference in our market is \$9000/MWh (from -\$4500 to \$4500 /MWh or vice versa). Table 5 is used to illustrate that this has already happened before.</p> <p>We do not think that it is necessary to carry out extensive work required to provide this additional information requested as this will not impact on the decision.</p>
Section 2.4 – "erroneous prices". Given that table 4 stated 3 out of 4 identified causes of price revision were due to failed/missing/late RTS, it is not appropriate to refer to all "provisional prices" as "erroneous prices".	We have revised the phrase to read as "provisional/erroneous prices".

PSO's Comments/Feedback	EMC's Response
<p>Section 2.4.1 – <i>“it may be argued that Option (A) is undesirable because it will allow erroneous prices, which are not reflective of true market conditions, to flow through to the spot market settlement and persist as wrong market prices.”</i> – In our view, EMC could always recalculate the prices based on what it deems to be the true market conditions and make known to the market players on what could have been the prices (e.g. if there was not constraint), but the revised price should never be used for settlement as it is paramount for any commercial transactions that prices determined ex-ante should remain firm and binding on both sellers and buyers, esp. after the goods changed hands.</p>	<p>To uphold equity and fairness, recalculated prices should be used for settlement.</p>
<p>Page 15, <i>“Otherwise, the prices determined by the MCE will not be based on correct market conditions. And thus, it can be argued that such prices are incorrect and invalid.”</i> – We disagree, the MCE price determined ex-ante reflected the prevailing condition of the market, so long as the inputs are “valid”, i.e. not rejected by the MCE as “erroneous” at the instance when these were presented to the MCE.</p>	<p>The MCE would not know if an input submitted to it is ‘erroneous’ or not.</p> <p>It is only from subsequent price check that ‘erroneous’/‘invalid’ input data can be discovered.</p>
<p>Page 16, <i>“it certainly has a material financial impact on various market players since Option (A) will involve a settlement arrangement that is based on wrong prices.”</i> – That is only half the story, extreme high/low prices, whether considered “wrong” would also have significant financial impact on market players. See above too, prices produced from “valid” inputs to the MCE should not be considered as wrong price. In addition, market players would have already decided whether to consume or produce based on the ex-ante price made known to them ex-ante.</p>	<p>As the price in our market is set by the MCE (which is a mimic of the market and <u>not</u> the actual market itself like, for instance, the stock exchange where buyer decides whether or not to buy a stock at the price offered by the seller), it is important that the price is determined correctly. Price revision is provided for in recognition that errors can occur in the price determination by the MCE. Had the price been agreed <u>directly</u> between the seller and buyer in the market, we agree that either party should not renege on the agreed price.</p>

PSO's Comments/Feedback	EMC's Response
<p>Page 16, <i>“Allowing wrong prices to flow through...it will undermine participants’ (and public) confidence in the integrity of the market.”</i> – We disagree, changing the prices ex-post after the goods had been delivered and consumed is even worst. Who would want to sell/deliver if there were no certainty that he would be paid what was agreed on in the first place; there would be serious system security concern if some Market Participants decided not to delivered or produce less than expected if they know that every time there is high prices, they would likely not be paid the prices they seen</p>	<p>We disagree with this. Likewise, it can be argued who would want to transact in a market where one has to accept whatever price determined by the MCE (and not by the seller and buyer directly) and there can be cases where the prices can be determined wrongly?</p> <p>We recognise that having price revision after generators have physically responded can have adverse financial impact on the generators. This is why we proposed having an appropriate compensation regime for adversely affected generators.</p>
<p>Page 16, <i>“...consumers are more likely to be adversely affected compared to the generators...due to absence of demand-bidding, consumers cannot submit bids to reflect their willingness to curtail load when the market price exceeds a certain level.”</i> – Experience of other markets seems to suggest otherwise, one can't assume there would be meaningful demand elasticity even if demand-bidding is available. Moreover, as settlement is based on actual energy consumed, consumers could choose to curtail load, i.e. actually consuming less or none at all if price is deem too high, and avoid paying for high energy prices during settlement. In fact, it is the Gencos that can't choose not to deliver once the RTS (binding prices & scheduled qty) is published by the EMC ex-ante, otherwise the Gencos would be subject to sanction by the MSCP.</p>	<p>We agree that consumers can reduce their payment for energy by reducing consumption in general. However, to ensure consumers pay a price which reflects their usage preference and pattern, there has to be demand-bidding and real-time pricing. We note that demand-bidding <u>and</u> real-time pricing are absent from load-side, but not for generation-side.</p>

PSO's Comments/Feedback	EMC's Response
<p>Page 16, <i>“Having said these, this problem of equity and fairness can be solved if the affected parties can seek compensation from the error-causer(s).”</i> – As consumers/gencos consumed/delivered based on agreed ex-ante prices, there should not be compensation as long as ex-ante prices remain firm and binding. Compensation would more likely be an issue when prices are revised ex-post. I.e. there would always be winner & losers from their original position as they had consumed/delivered based on ex-ante prices agreed earlier.</p>	<p>We disagree with this. Where parties are made to settle at the wrong price would also necessitate compensation even if there is no price revision ex-post. There will always be winners and losers where there is a wrong price, regardless of whether there is price revision or not.</p>
<p>Section 2.4.2 <i>“Option (B)...not likely to have a major impact...pricing error rarely occurs...can be further mitigated with continual efforts to improve the accuracy of the data inputs and to augment the MCE system”</i> – Isn't the same argument valid for option (A)?</p>	<p>The uncertainty to market participants resulting from ex-ante prices being revised is not likely to have a major impact because of the small number of price revision cases.</p> <p>However, despite the small number of price revision, we support price revision (Option B) on ground of maintaining equity and fairness because the impact on market players can be great due to large price difference.</p>
<p>Page 17, <i>“Option (B) is desirable...prices reflect the prevailing market fundamentals and hence, they can be relied on as the correct market signals for market participants and potential investors.”</i> – Contradict with earlier statement on page 15 <i>“Typically, market participants make long-term decisions based on their expectations of future prices, taking into account historical prices.”</i> and footnote 22 <i>“...market participants or potential investors do not make long-term decisions based on just a few prices they have observed in the market...”</i></p>	<p>The statement on page 17 is a statement of principle.</p> <p>The statement on page 15 and footnote 22 support our assessment that the impact of price revision on economic efficiency is minimal due to small number of price revision cases.</p> <p>Hence, the two statements are NOT contradictory.</p>

PSO's Comments/Feedback	EMC's Response
<p>Page 17, “...we could have missing or ridiculous prices...market participants may only be induced to keep producing (in the period concerned itself) by the promise that prices will be revised to reflect the prevailing operating physical conditions.” – Purely speculative, in the first place, how would MPs know that the “abnormal” prices they observed were due to invalid inputs or result of actual market conditions? Even market operation staffs of EMC took hours to analyse the observed “unusual” prices. In fact, it is more likely that MPs will continue to produce when they are sure that the ex-ante prices are what they would receive come settlement; and if the forecasted ex-ante prices they observed are not attractive, they could always change their offers.</p>	<p>We are not asserting that MPs would know that ‘abnormal’ prices they observed are due to invalid inputs but rather, they would probably suspect the prices to be ‘abnormal’ based on their experience of trading in the market. Hence, generators would continue to produce because if the ‘abnormal’ prices are indeed due to invalid inputs (as determined by the EMC later), the prices will be revised to reflect the prevailing system conditions.</p>
<p>Page 18, “However, Option (B) can have an adverse financial impact on a generator who physically responded based on the original price, but has to receive a revised price (lower than its offer price) following a price revision. From this perspective, Option (B) can be deemed as being ‘unfair’ to such a generator.” – The reverse is also possible, i.e. Consumers may have ex-ante price much lower than the revised price ex-post. Are consumers entitled to compensation then, since the next para only championed the award of compensation to Gencos with price revisions?</p>	<p>Price revision is to ensure parties settle at the <u>correct</u> price. Hence, if a consumer ends up paying a higher price after price revision, it should not be entitled to any compensation since that is the right price that the consumer should pay.</p> <p>Compensation is proposed for generators only because some have physically responded based on a high price but made to receive a lower (revised) price and hence, are not able to fully recover the variable costs of production for the affected quantity of energy produced.</p>
<p>Page 18, “Overall Evaluation” – We disagree that option (B) be adopted and the statement “But we have assessed that the impact of uncertainty is also likely to be minimal.” As we mentioned earlier, there could be serious system security concerns when the sellers cannot be sure of revenue received with the possibility of price revisions ex-post, esp. if it is likely to be lower.</p>	<p>The proposed compensation for generators is to ensure that generators are not adversely affected by price revision. Thus, we do not think that generators would cause serious system security concerns by not generating in accordance with their schedules.</p>

PSO's Comments/Feedback	EMC's Response
<p>Table 6, <i>Summary of evaluation...</i>, “<i>Equity & Fairness</i>” – On balance, for option (A), it should reflect that most price differentials are small and large differentials are rare occurrences, even more rare than price revisions; for option (B), it should also mentioned that there were also cases where revised prices ex-post were higher than the original ex-ante price.</p>	<p>Equity and fairness is dependent on the magnitude of price difference, and not the frequency of price revision.</p> <p><i>“it should also mentioned that there were also cases where revised prices ex-post were higher than the original ex-ante price”</i> - We think this is irrelevant as the revised prices are the correct prices; hence, it does not matter if the revised prices were higher than the original ex-ante prices.</p>
<p>Table 6, <i>Summary of evaluation...</i>, “<i>Mitigating Measures</i>” – Why wasn't the statement “to continue with efforts to improve on quality of data inputs and to augment the MCE system” in Option (B) reflected in Option (A) too? Isn't this equally important regardless of which option is adopted.</p>	<p>We agree that improvement on quality of data inputs and augmentation of the system should be on-going initiatives regardless which option is adopted. We have included this under Option (A).</p> <p>We wish to further highlight that NEMMCO had initially relied on improving data inputs to reduce the incidence of pricing error, instead of using price revision. However, they realised some incidents of pricing error still occur. Although infrequent, the wrong prices can have material impact on the parties involved. In view of this, they had proposed a price revision process be established to correct pricing error.</p>
<p>Table 6, <i>Summary of evaluation...</i>, “<i>Practical difficulties</i>” – We believe this is irrelevant as comparison, there are always contentious issues with compensation whether Option (A) or (B).</p>	<p>The contention over compensation under Option (B) involves the quantum of compensation. Whereas compensation under Option (A) involves even more challenging task of changing the current regulatory regime to allow adversely affected parties to seek compensation from error causer(s).</p>

PSO's Comments/Feedback	EMC's Response
<p>Page 21, Type 1 <i>“There will be no original price established by the MCE in cases of failed (or missing) RTS.”</i> – Not strictly correct, as prices are determined by earlier STS, DAS or MOS runs. See footnote 27. In addition, PSO uses STS (DAS or MOS in that order) for dispatch when RTS is not available, this implies that in the absent of RTS, the STS (etc.) would become binding</p>	<p>We are referring to prices contained in the real-time pricing schedules, and not in the STS, PDS or MOS. In any case, prices in STS, PDS or MOS are only forecast prices and are non-binding on MPs.</p> <p>PSO using the STS (PDS or MOS in that order) for dispatch in the cases of missing/failed RTS is a separate matter from the price that should be used for settlement for those affected dispatch periods. We have proposed how prices should be established (see section 2.5.1 of the paper).</p>

PSO's Comments/Feedback	EMC's Response
<p>Page 22, <i>“Using last valid prices has the advantages of being administratively straightforward. It also gives market participants more certainty...However, these prices may not reflect the prevailing market conditions, in particular when the MCE runs the pre-dispatch schedules and market outlook scenarios (MOS) very infrequently. Re-running the MCE to obtain the prices would be a more attractive arrangement as the primary objective is to have the prices more accurately reflect the market conditions of the affected dispatch period.”</i> – MCE runs are always based on prevailing market conditions, be it RTS, STS, DAS or MOS. Why conveniently left out STS, which are determined every 30mins, in the above statement? There are also misplaced objectives. Is it that critical to have prices that reflect the actual market condition of the affected dispatch period? What is actual market condition? Baring in mind that all MCE runs are based on perceived/forecasted market conditions, so why the insistent on actual? A probable scenario, what if a GRF is scheduled to run by the STS, but not the ex-post RTS or vice versa and that GRF actually delivered for the period. What is the true market condition then? Is it equitable to pay the GRF the revised price ex-post even if it is lower? A clear benefit of using STS prices in the absence of RTS would also incentivise the Gencos to offer realistically for the future dispatch periods knowing very well that they would be paid the STS prices should the RTS fail. The STS & even DAS schedules will be more realistic and could contribute positively to overall security of the power system. Besides, short-term forecasted price signal will also be more realistic and will enable the market participants to make more informed decisions.</p>	<p>The infrequency of run refers to the PDS and MOS, not the STS. We note the STS runs more frequently and hence, is more updated than the PDS and MOS.</p> <p>Even then, we do not support using prices in the STS in cases of failed/missing RTS. As explained in our paper, re-running the MCE to obtain the prices would be a more attractive arrangement as the primary objective is to have the prices more accurately reflect the prevailing market conditions of the affected dispatch period.</p> <p>Yes, it is important that prices reflect the underlying conditions of the market for affected dispatch period. This is because prices are determined by the MCE which mimics a market, while taking into account the prevailing physical conditions and requirements. Because of these, prices become very sensitive to how the market is being modelled and what are the physical conditions and requirements.</p> <p>We acknowledge that the actual physical conditions keep changing. Hence, we only endeavour to have the best estimates of the physical conditions being taken into account by the MCE in determining the prices. This is why we suggest a reference time of “T-5minutes” (i.e. the time when the MCE runs to determine the RTS) for input values for price revision.</p>

PSO's Comments/Feedback	EMC's Response
<p>Page 22, Type 2... <i>"It is conceivable however that the EMC could identify errors in input data that are derived from other sources,...Hence, we recommend that erroneous inputs to the MCE that can trigger price revision should include all inputs used by the MCE in determining the real-time schedules, except for bids and offers submitted by market participants."</i> – What if a MP informed EMC that its offer was incorrect, would EMC revise the prices ex-post then? Apparently not, then why other inputs to the MCE are subject to price revision?</p>	<p>MPs are free to decide on any offers they want to submit. There is no such thing as 'correct' or 'wrong' offer as the value is entirely up to the MPs to decide and submit.</p> <p>This is different from other inputs (e.g. a line limit or the connectivity status of a busbar) which take on certain values at the point when the MCE runs but these values were different from the MCE input values. For example, at the point when the MCE runs, a busbar is actually connected to the grid but the MCE has run using input which indicates the busbar is disconnected from the grid.</p>
<p>Page 23, <i>"Also, one could suggest that to better meet the objective of 'ensuring prices truly reflect the market conditions', then the cut-off time should really be "T+15 minutes" (and not 'T'),..."</i> – This is also incorrect, the scheduled MW of GRFs are supposed to be delivered at the end of a dispatch period, hence strictly, it should match the system condition at the end of the same dispatch period. A catch 22 dilemma.</p>	<p>We agree "T+30 minutes" should be included as a possibility. The report has been revised to include this as an example.</p>
<p>Page 23, <i>"a re-run of the MCE to obtain revised prices for settlement where the EMC determines an erroneous input to the MCE;"</i> – We disagree, MCE should have already rejected any invalid input; hence ex-ante prices determined by MCE with the accepted inputs must be valid. The ex-ante prices determined simply reflected the prevailing conditions/inputs as seen by the MCE.</p>	<p>The MCE would not know if an input submitted to it is 'erroneous' or not.</p> <p>It is only from subsequent price check that 'erroneous'/'invalid' input data can be discovered.</p>

PSO's Comments/Feedback	EMC's Response
<p>Page 24, Type 3, <i>“purpose and rationale...The compensation is to offer such generators, primarily with a purpose of improving generator incentives with respect to provision of peaking capacity.”</i> – The reasoning is flawed. How does EMC explain paying for something that is known and wouldn't be used in the first place? Also the fact that PSO forecasted a loadshed implied that there would be shortage of generation capacity to meet demand in the very near future, how would paying the Gencos ex-post, help in incentivising the Gencos to provide more capacity ex-ante? More so with respect to provision of peaking capacity in the future.</p>	<p>The reasoning is correct. To illustrate, suppose:</p> <ul style="list-style-type: none"> - total load to be served is 5000MW - there is a shortfall in generation due to contingencies; prices hit VoLL and generators would react by offering all their available peaking capacity; - total available generation is only 4000MW despite generators reacting by offering all their available peaking capacity; <p>Generators would expect to run fully to provide all 4000MW. Because there is still a shortfall of 1000MW, load will need to be shed. But as load shed has to occur in large blocks, it may not be possible to precisely shed 1000MW of load.</p> <p>If the load shed amount is 1100MW, there would be 100MW of generation capacity which was available but could not be utilised. Without compensation offered to affected generators, the incentive for generators to offer peaking capacity ex-ante would be reduced.</p>
<p>Page 25, <i>“With regard to Step 1, the adjustment of the nodal load forecast is necessary to ensure that the MCE can determine a dispatch schedule that is both optimal and feasible, after taking into account load shedding. This is necessary mainly for the operation of the power system (otherwise the PSO would have to override the dispatch schedules determined by the MCE);”</i> – The objective of step 1 is to match demand to supply beforehand, knowing that available supply would not be able to meet original demand, so that MCE can produce a feasible solution and possibly close to normal prices. We don't foresee overriding of GRF dispatch schedule if step 1 is not done, as PSO's demand control action would primarily be targeting the non-dispatchable load rather than the generators.</p>	<p>We have amended the paper to read as: “With regard to Step 1, the adjustment of the nodal load forecast is necessary to ensure that the MCE can determine a dispatch schedule that is both optimal and feasible, after taking into account the expected shortfall in energy.</p> <p>If Step 1 is not done, regardless of whether the PSO overrides the schedule, the schedule produced by the MCE would not have reflected PSO's specification of load shed locations and quantity, the dispatch of generators will not be optimal.”</p>

PSO's Comments/Feedback	EMC's Response
<p>Page 25, <i>“With regard to Step 2 and Step 3, the benefits are primarily in terms of improved economic signalling in that the prices are maintained at the level at which they would have been without load shedding, and generators are incentivised to provide peaking capacity and, at least arguably, not to ‘play games’ in order to secure dispatch under those conditions.”</i> – How could there be no load shedding when in the first place there was insufficient generation to meet demand. Prices would hit the roof if step 1 is not done, the objectives of this rule seems to be to compensate the Gencos for loss in profit, not so much as to incentivise provision of more capacity as this is done ex-post. In fact, it could be argued that this price revision ex-post would even encourage Gencos to withdraw/ withhold capacity knowing very well that they would be rewarded ex-post without having to spend on additional fuel. To incentivise provision of more capacity, the price signal should not be masked with action of step 1, i.e. forecasted price should be high to reflect expected shortage of generation capacity so that Gencos be incentivise to offer more capacity to the market.</p>	<p>‘the level at which they would have been without load shedding’ refers to the nodal load forecast <u>before</u> adjustment by the EMC to reflect the shortfall quantity and location specified by the PSO.</p> <p>The aim of compensation is not to compensate generators for ‘loss of profits’ per se, but it is to ensure the incentive for generators to offer peaking capacity ex-ante would not be reduced.</p> <p>It is possible for generators to withdraw/withhold capacity ‘knowing very well that they would be rewarded ex-post without having to spend on additional fuel’. But there are provisions in the Market Rules to ensure that generators comply with dispatch instructions (Section 9.6 of Chapter 5) and the MSCP may revise the compensation amount downwards if it finds a market participant deliberately manipulating its offers (Appendix 611.4).</p> <p>Before step 1 is performed, it is envisaged that all available generation capacity would have already been offered. As explained, Step 1 is performed to determine a dispatch schedule that is optimal and feasible. Step 2 then restores the prices so that generators and loads receive or pay the correct price that reflects the shortfall.</p>

PSO's Comments/Feedback	EMC's Response
<p>Page 25, <i>“This issue also formed part of the RCP workplan for 2006. Market participants have indicated that they are not sure how this type of price revision process works, and what is rationale behind having this process. We have explained above the purpose and rationale for each of the steps involved in such a process. Hence, we consider this issue has been addressed.”</i> – Not really, Type 3 revision should be removed too. See above, especially if price revision is to compensate for loss in profit, inconsistent with Chapter 1 Section 13 of market rules.</p>	<p>We do not consider compensation relating to Type 3 cases to be inconsistent with Section 13 of Chapter 1 because Section 13.1.4 and section 13.2.4 of Chapter 1 limit the liability of the EMC and PSO to direct costs, ‘unless otherwise provided in the market rules’. Appendix 6I clearly spells out the calculation of compensation amount relating Type 3 cases.</p>
<p>Page 27, <i>Type 4 price revision is also not appropriate due to imperfection of the MCE in modelling the real world. E.g. MCE can only approximate reactive power flow in determining limits on the amount of active power that can flow thru the lines. Ex-ante prices determined with the prevailing inputs should be binding regardless of what actually happened (i.e. regardless of loadshed). This is similar to Type 1.</i></p>	<p>We agree that if the MCE has used the best estimates of the physical system and other information when the MCE runs, then there should not be a re-run of the MCE when there is a line CVP violation regardless if there is load shed or not. This is why we have proposed price revision relating to Type 4 be removed (unless the CVP violation is due to wrong input values to MCE which will then necessitate re-run under Type 2).</p>
<p>Page 28, Table 7 <i>“Applicability of Price Revision”</i> – Type 1 to 4 all not applicable, the current related market rules should either be deleted or rewrite.</p>	<p>We disagree with this. Price revision should apply to Type 1, Type 2 and Type 3 scenarios. We recommend that only price revision process relating to Type 4 be removed from the rules.</p>
<p>Page 29, <i>“EMC to develop an appropriate compensation arrangement for generators adversely affected by price revision.”</i> – Without price revision, there is no need for this.</p>	<p>We disagree. It is likely that parties adversely affected by wrong prices which are used for settlement (i.e. without price revision) will want some form of compensation.</p>

CONCLUSION

The RCP has tasked the EMC undertake a review on price revision in SWEM. As part of the Review, EMC has identified 5 types of price revision/re-run cases in SWEM currently provided by the Market Rules. They are:

- Type 1** – Cases arising from ‘Failed/Missing/Late RTS’;
- Type 2** – Cases arising from ‘wrong/untimely inputs to MCE’;
- Type 3** – Cases arising from MCE using adjusted nodal load forecasts which take into account the energy shortfall specified by the PSO;
- Type 4** – Cases arising from application of CVP in the MCE due to violation of line constraints where there is no load shed in real-time; and
- Type 5** – Cases arising from the MCE producing prices which do not reflect their respective LSMP.

We note that the proportion of price revision/re-run due to Type 1 cases is increasing over the years. From 01 Jan 06 to 30 Jun 06, Type 1 cases accounted for majority of the price revision/re-run, followed by Type 2 cases.

In its review, EMC has illustrated that the price difference arising from price revision (i.e. the difference between the original price and revised price) can be very large with a maximum absolute difference of \$9000/MWh. Hence, this can have a significant impact on consumers or on a particular generator. Also, it can have a favourable or unfavourable financial impact on the consumers and generators.

The Review has sought decisions from the RCP at two levels. At a first-level, the decision is sought whether, in principle, we should allow price revision in SWEM or not.

We note that there are both arguments for as well as against price revision. Typically, the arguments against price revision are that it introduces uncertainty to the market and (ex-ante) prices should not change after goods have been produced/consumed.

The argument for price revision rests mainly on equity and fairness. Given a price determination setup like SWEM, it is important prices are determined correctly by the MCE and they reflect the prevailing market conditions. Otherwise, parties (who have to take prices churned out by the MCE as final and binding) will be made to settle at the wrong prices. This can have serious implications particularly if the price difference is big and impacts adversely on a particularly party.

While it is currently assessed that price revision has no material impact on economic efficiency in the short-run, it can have some considerable long-run efficiency gains particularly if pricing error occurs very frequently. Apart from the issue that prices are no longer reliable if the error is uncorrected, the wrong prices will filter down to settlement, distort the true value of the goods produced/consumed thus, sending the wrong price signals and misleading long-run decision making.

In conclusion, we assess equity and fairness to be the more critical issue in deciding whether to have price revision or not. We consider having price revision is more desirable, and yields a fairer and more equitable outcome for the market in general. Hence, we recommend that, as a principle, price revision be allowed in SWEM.

We note that there will be cases where a generator may be adversely affected by price revision, in that they have physically responded based on original high price but were

paid a lower revised price. For such generator, we recommend there be an appropriate compensation (we attached the proposal in Annex A of this paper).

At a second-level, the Review has assessed the applicability of price revision/MCE re-run and suggested some augmentation to the process.

The Review makes the following recommendations:

Type 1 cases

- We recommend re-running the MCE to obtain prices for settlement in cases of failed/missing/late RTS. We note that while it is possible to use the last valid prices (e.g. from the STS, PDS or even MOS) as replacement prices, this arrangement is not ideal as these prices may not be reflective of the prevailing market conditions.

Type 2 cases

- We recommend a re-run of the MCE to obtain revised prices for settlement where EMC determines an erroneous input to the MCE;
- We recommend that the scope of 'erroneous' inputs to include all inputs used by the MCE, except for the latest valid offers/bids have been used by the MCE in the determination of the RTS but subsequently, these offers/bids are claimed to be 'wrong' by market participants;
- We recommend that 'erroneous' inputs be defined as inputs deemed as not being reflective of the prevailing market conditions for a dispatch period at the time when the MCE runs to produce the RTS (currently "T+5 minutes"); and
- We recommend that the EMC uses all input data that should have been supplied to the MCE to produce the RTS if a MCE re-run is required (i.e. currently "T-5 minutes").

Type 3 cases

- We recommend that the entire price revision process pertaining to this type of cases should remain as it is. The entire process is designed specifically for situations where the PSO anticipates energy shortfall in real-time and sends EMC a load shed file and is intended for certain objectives (see section 2.5.1 of the paper for Type 3 cases).

Type 4 cases

- We recommend that the re-run of MCE pertaining to such cases be removed, as many constraints in MCE are precautionary in nature and we cannot simply remove them (ex-post) simply because no untoward circumstance has occurred. A re-run is justifiable only if it involves an input error in the ex-ante run (of which then, this will be classified as Type 2 cases).

For augmentation of price revision process, we recommend that

- EMC to report to the RCP on the number of price revision/re-run and explain the circumstances giving rise to the price revision/re-run (we suggest this forms part of the monitoring list); and

- EMC to develop and establish an appropriate compensation arrangement for generators adversely affected by price revision (proposal is attached in Annex A of this paper).

Type 5 cases

- We recommend a re-run of MCE for cases where the prices produced by MCE do not reflect their respective LSMP(s). This is to ensure the pricing outcome is reflective of locational marginal pricing regime used in our market.

Apart of the above, we note that the efforts put in by the relevant parties involved (the EMC, PSO and transmission licensee) to improve the quality of the input data to the MCE will form an on-going initiative to reduce the number of price revision/re-run pertaining to Type 2 cases.

In addition, we have clarified in this Review the scope of 'erroneous input data', how 'erroneous data input data' is defined and what is the reference time for input data that EMC should use if a price revision/re-run is required.

We recommend that the RCP supports all the recommendations raised in this 'Conclusion' section.

DECISIONS OF THE RCP

Deliberation by the RCP

The RCP discussed the Review over 5 meetings (from 29th meeting through 33rd meeting). The key discussion and decisions of the RCP are highlighted below:

29th RCP Meeting – 14 November 2006

The Review was first tabled for discussion at the 29th RCP meeting. At that meeting, EMC highlighted the 5 types of price revision/MCE re-run cases in the SWEM. It also provided the Panel with the statistics on price revision/MCE re-run in terms of frequency and price impact.

EMC recommended that price revision/MCE re-run be retained in the SWEM. EMC's argument rests mainly on equity and fairness. EMC is concerned that erroneous prices can have serious implications especially if the price difference involved is big and this will have significant adverse impact on consumers and generators.

EMC also assessed that while price revision/MCE re-run has no material impact on economic efficiency in the short-run, it can have significant impact on long term decision-making if erroneous prices occur very frequently. However given the low frequency of erroneous prices, erroneous prices are unlikely to have a significant impact on long-term price signals.

In conclusion, EMC considered equity and fairness to be the more critical consideration in arguing for price revision/MCE re-run to be retained in the SWEM. It asked that the Panel first support price revision/MCE re-run in the SWEM as a matter of principle before considering what are the circumstances where price revision /re-run should apply and how the price revision process can be augmented.

In response, Mr Philip Tan requested EMC to give a presentation on how price check is conducted daily by the EMC Pricing Team to help the Panel in its decision making. EMC

agreed it would do so at the next Panel meeting. With that, the discussion of the Review was deferred to the next meeting.

30th RCP meeting – 9 January 2007

Mr Henry Gan gave a detailed presentation to the Panel on the Daily Price Check carried out by the Pricing Team and provided the Panel with the Daily Price Check Checklist.

The Panel was told that, amongst other things, the Pricing team looked out for abnormal prices in relation to:

- price deviation from demand /requirements
- extreme high or low prices

Mr Philip Tan queried if 'abnormal price' determination might vary from person to person performing the price check. To that, Mr. Gan clarified that the price check is done in accordance with a set of procedures using a checklist and is reviewed by the immediate supervisor to ensure consistency is maintained for abnormal price determination. He further added that price revision/MCE re-run, if conducted, is done in accordance with market rules and there is a proper internal governance process in place.

As there was a lack of quorum for the meeting, the Chairman asked that the discussion on the Review be deferred to the next meeting.

31st RCP Meeting – 12 March 2007

At this meeting, the Panel requested the EMC to also present the part of the Review on the circumstances where price revision /re-run should apply and how the price revision process can be augmented. This would help the Panel to see a holistic picture before making its decisions.

In response, EMC presented to the Panel the applicability of price revision/MCE re-run and some suggested augmentations to the price revision process.

Specifically, EMC recommended that the price revision/MCE re-run pertaining to Type 1, Type 2, Type 3 and Type 5 cases should remain. Only price revision/MCE re-run relating to Type 4 cases should be removed, as many constraints in MCE are precautionary in nature and it is incorrect to remove them (ex-post) simply because no untoward circumstance had occurred in real-time.

For augmentation of the price revision process, EMC recommended the following:

- EMC to report to the RCP on the number of price revision/MCE re-run and explain the circumstances giving rise to those price revision/MCE re-run (this is to form part of the RCP monitoring list, rather than be enshrined in the market rules); and
- EMC to develop and establish an appropriate compensation arrangement for generators adversely affected by price revision/MCE re-run.

The Panel was asked to support all the preceding EMC's recommendations.

Mr. Kng Meng Hwee disagreed that price revision/MCE re-run should be allowed as a matter of principle. To him, having price revision/MCE re-run runs against having an ex-ante market. He felt that prices agreed beforehand should not be changed after the good has been consumed. To send out correct prices for efficient behaviour, he suggested that EMC could perform price revision/MCE re-run to establish the revised (correct) prices

and to have them published, but not to be used for settlement purpose. Using revised prices for settlement will undermine market players' confidence of the market.

Mr Robin Langdale was concerned that having no price revision/MCE re-run can have considerable adverse financial impact on an individual market player, although the amount involved may be relatively small in comparison with the total market turnover and hence, opined that there is a need for price revision/MCE re-run. Without price revision/MCE re-run, there is a need to offer compensation to the party adversely affected.

In response, the Panel was informed that compensation to the party adversely affected will have to be recovered from the error-causer(s). This may not be feasible in reality because: (1) it may not be easy to identify the error-causer(s) and (2) the error-causer(s) may not be paying from 'its own pocket' for the compensation under the current regulatory framework.

After much debate, the issue of whether to have price revision/MCE re-run or not was put to a vote.

The following members **supported** that price revision/MCE re-run should be allowed in the SWEM:

- Mr. Philip tan
- Mr. Michael Lim
- Mr. Dallon Kay
- Mr. Robin Langdale
- Dr. Daniel Cheng
- Mr. Lim Ah Kuan

The following members **did not support** the recommendations contained in the review paper:

- Mr. Kng Meng Hwee
- Mr. Tay Swee Lee

The following **abstained** from voting:

- Mr. Koh Kah Aik

The Panel noted the recommendations included removing price revision/MCE re-run relating to Type 4 cases. The Panel requested EMC to present at its next meeting the proposed changes it intends to make the Market Rules in relation to the recommendations supported by the RCP.

32nd RCP Meeting – 08 May 2007

At this meeting, EMC presented to the RCP a list of identified changes that was required in the Market Rules in order to give effect to the recommendations supported by the Panel on the Review of Price Revision in the SWEM.

In summary, the Panel supported in principle that price revision should be allowed in SWEM. Further, the Panel also supported EMC's recommendations on price revision relating to Type 1, Type 2, Type 3 and Type 5 cases.

For Type 4 cases, Mr. Philip Tan proposed to the Panel that price revision relating to such cases should be retained. He was concerned that consumers might end up paying higher

prices should price revision relating to such cases be removed as recommended by the EMC. He requested that EMC to first assess the price impact on various parties had there been no such price revision using historical data.

However, Mr. Tay Swee Lee commented that to retain price revision/MCE re-run relating to Type 4 cases would be inconsistent with the Panel's decisions to support price revision/MCE re-run relating to Type 2 cases. This is because there should not be any price revision if all information/data used by the MCE were correct and deemed to be reflective of the prevailing conditions at the time when the MCE ran to produce the real-time schedules (RTS) (currently at T-5 minutes).

Mr. Teo added that in the Review paper, it was stated that the only justification to have price revision relating to Type 4 cases is where the inputs used by the MCE are deemed incorrect or not reflective of the prevailing conditions at the time when the MCE runs to produce the RTS (of which such price revision will fall into Type 2 cases accordingly).

Mr. Robin Langdale asked what could be the possible reasons for no load shedding in real-time when the MCE predicted line violation(s) ex-ante. To that, Mr. Teo explained that it could be due a few possibilities. These included: load variation (i.e. actual load could vary from the forecast load), the lines have been loaded above their limits temporarily, load shifting has occurred in real-time or the line limits specified in the MCE might already have a 'safety buffer' built in. Mr Teo added that, notwithstanding these, if the MCE has used the most current valid information when it runs to produce the RTS, then as a matter of principle, there should not be any price revision simply because the MCE showed line violations (ex-ante) but there was no load shed (ex-post).

The Panel deferred its decisions on price revision/MCE re-run relating to Type 4 cases to the next meeting after EMC has assessed the price impact on various parties (as a matters arising).

33rd RCP Meeting – 03 July 2007

In response to Mr. Philip Tan's request at the last meeting, EMC presented to the Panel the price impact on various parties had there been no such price revision relating to Type 4 cases by using historical data.

Based on historical data of 17 reruns (relating to Type 4 cases), it was observed that:

- The price impact for consumers in most cases is not very significant. Even for the most severe case, no price revision would have resulted in an increase of about \$4.25/MWh for consumers for that half hour period.
- There were a few periods where consumers actually paid more with price revision. In other words, they would be 'better off' had there been no price revision in those periods.

EMC also concluded the impact on individual generators (had there been no re-run) was not straightforward. It would depend on (1) whether the revised MEP turn higher or lower than the original MEP for a generator, and (2) whether that generator has a positive or negative IEQ.

EMC maintained its original recommendation that re-run of MCE for Type 4 cases be removed from the rules. This is because constraints in MCE are precautionary in nature. Hence, they cannot be removed or relaxed (ex-post) simply because no untoward circumstance has occurred. It is both inefficient and inconsistent to charge ex-ante prices only if constraints prove 'necessary' in a period, ex-post.

EMC reiterated that a re-run is justifiable only if such cases involve an input error in the ex-ante MCE re-run (of which then such a case should belong to 'Type 2 cases').

EMC recommended that the RCP support the recommendation that price revision pertaining to Type 4 cases be removed.

The Panel was informed that Mr. Low Boon Tong from PowerSeraya wrote to EMC suggesting that the "re-run only be applied where CVP prices cause a material impact on market prices. The said material sum can be set in the rules and reviewed from time to time".

Mr. Dallon Kay queried why the WEP price was not reflected since it is a more appropriate reference price for consumers.

To that, Mr. Paul Poh explained that WEP would involve the calculation of HEUC. However, EMC would not be able to calculate the original HEUC unless EMC re-performs a settlement run using non rerun data. Instead, EMC used an alternative approach based on the fact that any (extra) money amount generators would have received would mean the corresponding (extra) money amount consumers would have to pay. This approach is correct, and is as good as using WEP. This is because HEUC is a balancing component used to ensure the payout to creditors equals the money collected from debtors.

Mr. Henry Gan highlighted that a rerun for Type 4 will mute the price signal for grid operator and felt that this price signal is essential for grid planning purpose in a liberalized electricity market.

Mr. Frances Gomez asked, since there is a threshold in the Grid's capacity, if it is possible to link the re-run to the actual line flow in realtime, i.e. only do a re-run if the actual line flow in real-time does not exceed the line capacity by a certain percentage tolerance. This ensures that price signals for significant line overload would not be removed.

Mr. Tay Swee Lee responded that doing that would be equivalent to having an ex-post market. In our ex-ante market, the latest cut-off time for the MCE to take into account market conditions should be 'T-5 minutes'. If all inputs into the MCE are deemed to be correct as at 'T- 5minutes', then there should not be a re-run as a matter of principle. The matter was put to a vote by the RCP members. The following Panel members **supported** EMC's recommendation that price revision pertaining to Type 4 cases be removed.

- Mr. Lim Ah Kuan
- Dr. Daniel Cheng
- Mr. Tay Swee Lee
- Mr. Koh Kah Aik
- Mr. Michael Lim
- Mr. Robin Langdale
- Mr. Henry Gan

The following Panel members **did not support** EMC's recommendation and requested EMC to continue the re-runs with increased monitoring to control around what degree the line is overloaded before deciding whether to do a re-run.

- Mr. Philip Tan

- Mr. Francis Gomez

By majority of votes, the Panel supported EMC's recommendation. Including the Panel's decision on this matter arising, the Panel has supported all the recommendations made by the EMC in its 'Review of price revision in SWEM'.

Annex A -Proposed Rules for Compensation

Existing Rules (Release: 1 Jan 2008)			Proposed Rules Changes (Deletions marked as strikethrough text and additions marked as double underlined text.)			Remarks
<u>CHAPTER 3</u>			<u>CHAPTER 3</u>			
Disputes that shall be resolved by the dispute resolution process in section 3 are shown in the table below:			Disputes that shall be resolved by the dispute resolution process in section 3 are shown in the table below:			To add in the new section 10.2.10 of Chapter 6.
	Disputes between	Disputes in respect of		Disputes between	Disputes in respect of	
...	
3.3.1.5	<ul style="list-style-type: none"> - <i>EMC</i> and a <i>market participant</i> - <i>EMC</i> and a <i>market support services licensee</i> - <i>PSO</i> and a <i>market participant</i> - <i>PSO</i> and a <i>market support services licensee</i> 	<ul style="list-style-type: none"> -request for compensation made under any of the following: <ul style="list-style-type: none"> - section 4.7.3 of Chapter 5 - section 5.4.3 of Chapter 5 - section 5.6.2 of Chapter 5 - section 7.7.3 of Chapter 5 - section 8.4.3 of Chapter 5 - section 8.6.2 of Chapter 5 - section 9.1.7 of Chapter 5 - section 9.7.3 of Chapter 5 - section 10.4.1 of Chapter 5 	3.3.1.5	<ul style="list-style-type: none"> - <i>EMC</i> and a <i>market participant</i> - <i>EMC</i> and a <i>market support services licensee</i> - <i>PSO</i> and a <i>market participant</i> - <i>PSO</i> and a <i>market support services licensee</i> 	<ul style="list-style-type: none"> - request for compensation made under any of the following: <ul style="list-style-type: none"> - section 4.7.3 of Chapter 5 - section 5.4.3 of Chapter 5 - section 5.6.2 of Chapter 5 - section 7.7.3 of Chapter 5 - section 8.4.3 of Chapter 5 - section 8.6.2 of Chapter 5 - section 9.1.7 of Chapter 5 - section 9.7.3 of Chapter 5 - section 10.4.1 of Chapter 5 	

Existing Rules (Release: 1 Jan 2008)	Proposed Rules Changes (Deletions marked as strikethrough text and additions marked as double underlined text.)		Remarks
		<u>- section 10.2.10 of Chapter 6</u>	
<p>3.11.1 If a <i>market participant</i> or a <i>market support services licensee</i> (the "<i>claimant</i>") seeks compensation under section 3.3.1.5, the <i>claimant</i> shall submit its request to the <i>EMC</i> or the <i>PSO</i>. The request shall:</p> <p>3.11.1.1 meet the requirements of the relevant <i>market manual</i> or the <i>system operation manual</i>;</p> <p>3.11.1.2 refer to the section of the <i>market rules</i> that the request is based on; and</p> <p>3.11.1.3 specify the amount of compensation sought.</p>	<p>3.11.1 If a <i>market participant</i> or a <i>market support services licensee</i> (the "<i>claimant</i>") seeks compensation under section 3.3.1.5, the <i>claimant</i> shall submit its request to the <i>EMC</i> or the <i>PSO</i>. The request shall:</p> <p>3.11.1.1 meet the requirements of the relevant <i>market manual</i> or the <i>system operation manual</i>;</p> <p>3.11.1.2 refer to the section of the <i>market rules</i> that the request is based on; and</p> <p>3.11.1.3 specify the amount of compensation sought <u>(except where the request relates to compensation under section 10.2.10 of Chapter 6)</u>.</p>		<p>To indicate that a claimant need not specify in its request the amount of compensation sought where such request is in relation to compensation under section 10.2.10 of Chapter 6. The amount of compensation will be determined based on Appendix 6K.</p>
<u>Chapter 6</u>	<u>Chapter 6</u>		
(No existing provision)	<p><u>10.2.10 If the <i>EMC</i> determines under section 10.2.5 or 10.2.6 the <i>settlement data</i> described in section 10.2.1, a <i>market participant</i> with one or more <i>generation registered facilities</i> may seek compensation from the <i>EMC</i> under section 3.11 of Chapter 3. For the purposes of section 3.11.4 of Chapter 3, the <i>EMC</i> shall determine the relevant <i>claimant's</i> eligibility for compensation and the</u></p>		<p>To allow market participants with GRF(s) (if eligible) to seek compensation if price revision occurs. The amount of such compensation will be determined as set out in Appendix 6K.</p>

Existing Rules (Release: 1 Jan 2008)	Proposed Rules Changes (Deletions marked as strikethrough text and additions marked as double underlined text.)	Remarks
	<u>amount of such compensation (if any) in accordance with Appendix 6K.</u>	

APPENDIX 6K

K.1 CALCULATING COMPENSATION AMOUNTS

K.1.1 For this section K.1, the following definitions apply:

RMEP ^m	=	revised <i>market energy price</i> (in \$/MWh) at <i>MNN</i> m for the relevant <i>dispatch period</i> determined by (i) re-running the <i>market clearing engine</i> under section 10.2.5 of this Chapter, or (ii) applying section 10.2.6 of this Chapter.
IEQ ^m	=	injection <i>energy quantity</i> (in MWh) for <i>GRF</i> m for the <i>settlement interval</i> corresponding to the relevant <i>dispatch period</i> .
REQ ^m	=	quantity of <i>energy</i> scheduled (in MW) for <i>GRF</i> m after re-running the <i>market clearing engine</i> for the <i>settlement interval</i> corresponding to the relevant <i>dispatch period</i> .
spq	=	index of a specific <i>price-quantity pair</i> in an <i>energy offer</i> .
pq	=	index of a <i>price-quantity pair</i> in an <i>energy offer</i> , ordered by increasing price.
Q ^{m,pq}	=	quantity of a <i>price-quantity pair</i> pq for the <i>energy offer</i> for <i>GRF</i> m for the relevant <i>dispatch period</i> .
P ^{m,pq}	=	price of a <i>price-quantity pair</i> pq for the <i>energy offer</i> for <i>GRF</i> m for the relevant <i>dispatch period</i> .
COMP ^{m,pq}	=	compensation payable in relation to a <i>price-quantity pair</i> pq of the <i>energy offer</i> for <i>GRF</i> m for the relevant <i>dispatch period</i> .
COMP ^m	=	compensation payable in relation to the <i>energy offer</i> for <i>GRF</i> m for the relevant <i>dispatch period</i> .

K.1.2 Under this section K.1, where the *EMC* determines a revised *market energy price* for a given *dispatch period* by re-running the *market clearing engine* under section 10.2.5 of this Chapter, a *market participant* with a *generation registered facility* will be eligible for compensation only if the *EMC* determines that (a) the quantity of *energy* scheduled for that *generation registered facility* based on its *real-time dispatch schedule* for that *dispatch period*, is more than (b) the quantity of *energy* scheduled for that *generation registered facility* for that *dispatch period* after re-running the *market clearing engine*. If a *dispatch instruction* for that *generation registered facility* for that *dispatch period* was issued by the *PSO* under section 9.1.2.2 of Chapter 5, then the *EMC* shall use the quantity of *energy* specified in that *dispatch instruction* for the purpose of section K.1.2(a) instead. The *PSO* shall provide such *dispatch instruction* to the *EMC* within three *business days* after the date of that receipt by the *PSO* of a request for such *dispatch instruction* from the *EMC*.

K.1.3 Subject to sections K.1.2, the compensation as described in section 10.2.10 of this Chapter for a *generation registered facility* of a *market participant* shall be calculated as follows:

$$\text{COMP}^m = \sum_{pq=1}^{10} \text{COMP}^{m,pq}$$

K.1.4 For the purposes of section K.1.3, the compensation payable for each *price-quantity pair* spq of the *energy offer* of a *generation registered facility* shall be calculated as follows:

K.1.4.1 If $P^{m,spq} \leq \text{RMEP}^m$, then

$$\text{COMP}^{m,spq} = 0$$

K.1.4.2 If $\sum_{pq=1}^{spq} Q^{m,pq} \leq \text{REQ}^m$, then

$$\text{COMP}^{m,spq} = 0$$

K.1.4.3 If $\sum_{pq=1}^{spq-1} Q^{m,pq} \geq (\text{IEQ}^m \times 2)$, then

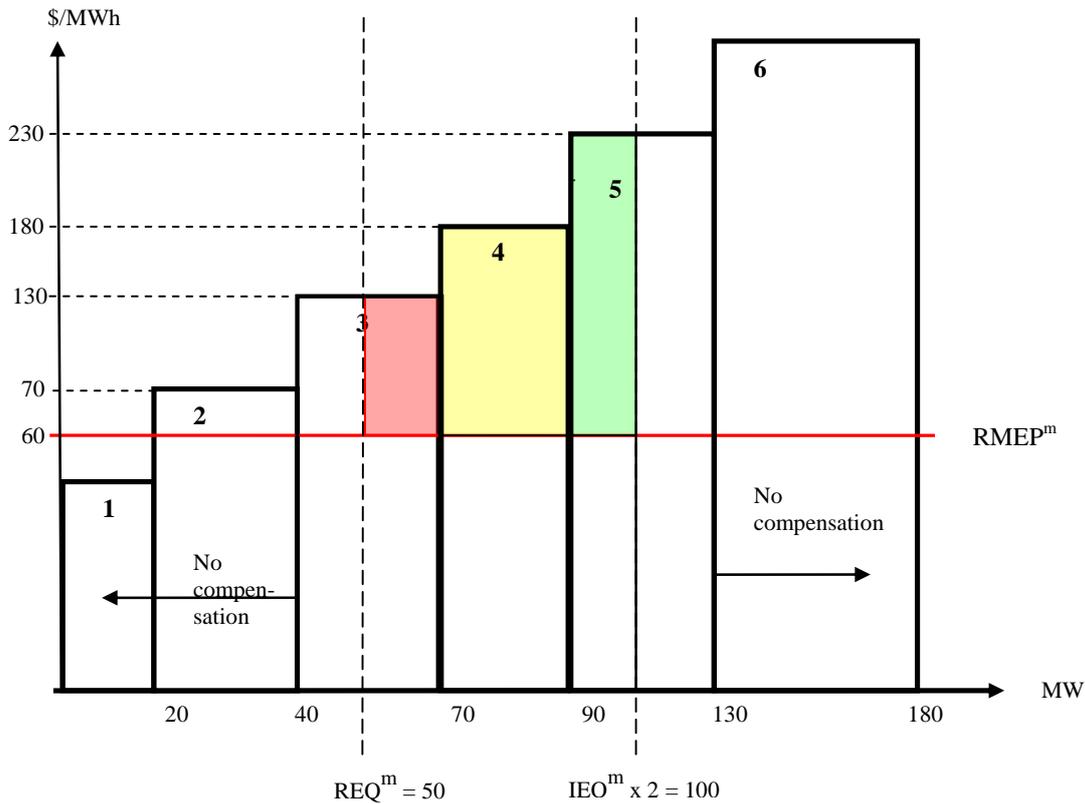
$$\text{COMP}^{m,spq} = 0$$

K.1.4.4 Otherwise, the compensation payable for *price-quantity pair* spq is:

$$\text{COMP}^{m,spq} =$$

$$\left(P^{m,spq} - \text{RMEP}^m \right) \times 0.5 \times \left[\min \left(\sum_{pq=1}^{spq} Q^{m,pq}, \text{IEQ}^m \times 2 \right) - \max \left(\sum_{pq=1}^{spq-1} Q^{m,pq}, \text{REQ}^m \right) \right]$$

Explanatory Note – The following example illustrates the compensation calculation for a generation which is eligible for compensation arising from revised energy price.



Suppose for a generator: IEQ= 50MWh (convert this to MW is 100); and REQ=50MW

Then, the compensation for each *price-quantity pair* (spq) of that generator is calculated as follows:

$$\text{COMP}^{m,1} = 0 \text{ (Based on condition K.1.4.2)}$$

$$\text{COMP}^{m,2} = 0 \text{ (Based on condition K.1.4.2)}$$

$$\text{COMP}^{m,3} = (130 - 60) \times 0.5 \times (\min(70, 100) - \max(40, 50)) = 70 \times 0.5 \times (70 - 50) = \$700$$

(Based on condition K.1.4.4. The amount is equivalent to half of the shaded area in spq=3)

$$\text{COMP}^{m,4} = (180 - 60) \times 0.5 \times (\min(90, 100) - \max(70, 50)) = 120 \times 0.5 \times (90 - 70) = \$1200$$

(Based on condition K.1.4.4. The amount is represented by half of the shaded area in spq=4)

$$\text{COMP}^{m,5} = (230 - 60) \times 0.5 \times (\min(130, 100) - \max(90, 50)) = 170 \times 0.5 \times (100 - 90) = \$850$$

(Based on condition K.1.4.4. The amount is represented by half of the shaded area in spq=5)

$$\text{COMP}^{m,6} = 0 \text{ (Based on condition K.1.4.3)}$$

Therefore, the compensation payable to that generator is:

$$\begin{aligned} \text{COMP}^m &= \text{COMP}^{m,1} + \text{COMP}^{m,2} + \text{COMP}^{m,3} + \text{COMP}^{m,4} + \text{COMP}^{m,5} + \text{COMP}^{m,6} \\ &= \$0 + \$0 + \$700 + \$1200 + \$850 + \$0 = \mathbf{\$2,750} \text{ (Based on condition K.1.3)} \end{aligned}$$

ANNEX 2 Proposed Rule Changes

Existing Rules (Release: 1 Jan 2008)	Proposed Rewritten Rules	Remarks
<u>CHAPTER 6</u>	<u>CHAPTER 6</u>	
<p>9.3 <u>MARKET ADVISORIES</u></p> <p>9.3.1 The <i>EMC</i> shall issue, as soon as practicable and in such manner as will provide adequate notice, using electronic means or in the case where electronic means are not available, by any other means it considers suitable, <i>advisory notices</i> pertaining to the incidence and extent of any of the following events for any <i>dispatch period</i> included in the current <i>market outlook horizon</i> in respect of which such event is indicated by the <i>market outlook scenarios, pre-dispatch schedule scenarios</i> and <i>short term schedule</i> described in sections 7.3, 7.4 and 7.4A respectively, and containing the applicable information described in Appendix 6H:</p> <p>9.3.1.1 any <i>energy</i> surplus;</p> <p>9.3.1.2 any <i>energy</i> shortfalls;</p> <p>9.3.1.3 any <i>reserve</i> shortfalls, by <i>reserve class</i>; and</p> <p>9.3.1.4 any <i>regulation</i> shortfalls.</p>	<p>9.3 <u>MARKET ADVISORIES</u></p> <p>9.3.1 The <i>EMC</i> shall issue, as soon as practicable, <i>advisory notices</i> pertaining to the incidence and extent of any of the following events for any <i>dispatch period</i> included in the current <i>market outlook horizon</i> for which such event is indicated by the <i>market outlook scenarios, pre-dispatch schedule scenarios</i> and <i>short term schedule</i> described in sections 7.3, 7.4 and 7.4A respectively:</p> <p>9.3.1.1 any <i>energy</i> surplus;</p> <p>9.3.1.2 any <i>energy</i> shortfalls;</p> <p>9.3.1.3 any <i>reserve</i> shortfalls, by <i>reserve class</i>; and</p> <p>9.3.1.4 any <i>regulation</i> shortfalls.</p>	<p>The manner and the means of issuing such advisory notices are now set out in the new section 9.3.7 below. The required contents of such advisory notices are now set out in the new section 9.3.8 below (read together with Appendix 6H).</p>

Existing Rules (Release: 1 Jan 2008)	Proposed Rewritten Rules	Remarks
<p>9.3.2 The <i>EMC</i> shall issue, as soon as practicable and in such manner as will provide adequate notice, using electronic means, or in the case where electronic means are not available, by any other means it considers suitable, and containing the applicable information described in Appendix 6H:</p> <p>9.3.2.1 system status <i>advisory notices</i> for the current <i>dispatch period</i>, any <i>dispatch period</i> of the current <i>short-term horizon</i> or any <i>dispatch period</i> of the current <i>pre-dispatch horizon</i> in respect of which it has been informed by the <i>PSO</i> that a major equipment <i>outage</i>, <i>load shedding</i> or other abnormal condition on the <i>PSO controlled system</i> that the <i>PSO</i> considers material is occurring or is likely to occur;</p> <p>9.3.2.2 communications warning <i>advisory notices</i> for the current <i>dispatch period</i>, any <i>dispatch period</i> of the current <i>short-term horizon</i> or any <i>dispatch period</i> of the current <i>pre-dispatch horizon</i> in respect of which <i>market participants</i> are experiencing, or the <i>EMC</i> considers that there is a significant probability that <i>market participants</i> will experience, difficulties in delivering communications to, or receiving communications from, the <i>EMC</i>, or that the <i>EMC</i> will experience, difficulties in delivering communications</p>	<p>9.3.2 The <i>EMC</i> shall issue, as soon as practicable:</p> <p>9.3.2.1 system status <i>advisory notices</i> for one or more <i>dispatch periods</i> (including the current <i>dispatch period</i>, or a <i>dispatch period</i> of the current <i>short-term horizon</i> or of the current <i>pre-dispatch horizon</i>), for which it has been informed by the <i>PSO</i> that a major equipment <i>outage</i>, <i>load shedding</i> or other abnormal condition on the <i>PSO controlled system</i> that the <i>PSO</i> considers material is occurring or is likely to occur;</p> <p>9.3.2.2 communications warning <i>advisory notices</i> for one or more <i>dispatch periods</i> (including the current <i>dispatch period</i>, or a <i>dispatch period</i> of the current <i>short-term horizon</i> or of the current <i>pre-dispatch horizon</i>), for which:</p> <p>(a) <i>market participants</i> are experiencing; or the <i>EMC</i> considers that there is a significant probability that <i>market participants</i> will experience, difficulties in communications with the <i>EMC</i>; or</p> <p>(b) the <i>EMC</i> will experience, difficulties in communications with the <i>PSO</i>;</p>	<p>The manner and the means of issuing such advisory notices are now set out in the new section 9.3.7 below. The required contents of such advisory notices are now set out in the new section 9.3.8 below (read together with Appendix 6H).</p> <p>Rule Change: To clarify that the advisory notices issued under section 9.3.2.1 and section 9.3.2.2 may be issued in respect of more than one dispatch period.</p>

Existing Rules (Release: 1 Jan 2008)	Proposed Rewritten Rules	Remarks
<p>to, or receiving communications from, the <i>PSO</i>; and</p> <p>9.3.2.3 price warning <i>advisory notices</i> for the current <i>dispatch period</i>, any <i>dispatch period</i> of the current <i>short-term horizon</i>, any <i>dispatch period</i> of the <i>pre-dispatch horizon</i> or any <i>dispatch period</i> of the <i>market outlook horizon</i> for which the prices calculated or released to <i>market participants</i> may be subject to revision.</p>	<p>and</p> <p>9.3.2.3 price warning <i>advisory notices</i> for the current <i>dispatch period</i>, or any <i>dispatch period</i> of the current <i>short-term horizon</i>, of the <i>pre-dispatch horizon</i>, or of the <i>market outlook horizon</i> for which the prices calculated or released to <i>market participants</i> may be subject to revision.</p>	
<p>9.3.2A The <i>EMC</i> shall provide confirmation by 12.00 noon each day, in such manner as will provide adequate notice, using electronic means, or in the case where electronic means are not available, by any other means it considers suitable, as to whether prices determined for the previous <i>dispatch day</i> are final or provisional. Provisional prices may be subject to revision.</p>	<p>9.3.3 The <i>EMC</i> shall provide confirmation by 12:00 noon each day as to whether prices determined for the previous <i>dispatch day</i> (as referred to in sections 9.2.1.2a to 9.2.1.2d) are final or provisional. Provisional prices may be subject to revision.</p>	<p>Re-numbered.</p> <p>The manner and the means of providing such confirmations are now set out in the new section 9.3.7 below.</p>
<p>9.3.2B For provisional prices which are confirmed to be subject to revision, and where section 9.3.2C does not apply, the <i>EMC</i> shall issue, as soon as possible but no later than 2 <i>business days</i> prior to the time at which the <i>preliminary settlement statements</i> for the relevant <i>dispatch day</i> must be issued in accordance with section 5.2.1 of Chapter 7, price revision <i>advisory notices</i> for the relevant <i>dispatch day</i> in such manner as will provide adequate notice, using</p>	<p>9.3.4 If any provisional price for any <i>dispatch period</i> for a given <i>dispatch day</i> is confirmed to be subject to revision, then as soon as possible but no later than 2 <i>business days</i> prior to the time for issuance of the <i>preliminary settlement statement</i> for that <i>dispatch day</i> under section 5.2.1 of Chapter 7, the <i>EMC</i> shall issue a price revision <i>advisory notice</i> for that <i>dispatch period</i>. Provisional prices for any <i>dispatch period</i> for which no such price revision <i>advisory</i></p>	<p>Re-numbered.</p> <p>The manner and the means of issuing such advisory notices are now set out in the new section 9.3.7 below. The required contents of such advisory notices are now set out in the new section 9.3.8 below (read</p>

Existing Rules (Release: 1 Jan 2008)	Proposed Rewritten Rules	Remarks
<p>electronic means, or in the case where electronic means are not available, by any other means it considers suitable, and containing the applicable information in Appendix 6H. Provisional prices in respect of which no such price revision advisory notices are issued by the deadline stipulated above shall be deemed final.</p>	<p><i>notices</i> are issued by the deadline stipulated above shall be deemed final.</p>	<p>together with Appendix 6H).</p> <p>Rule Changes:</p> <p>(1) The reference to section 9.3.2C is deleted because of the deletion of that section.</p> <p>(2) Price revision advisory notices are issued in respect of a given dispatch period and not for a dispatch day.</p>
<p>9.3.2C Where <i>constraint violation costs</i> have been applied by the <i>market clearing engine</i> in accordance with section D.16 of Appendix 6D in respect of any <i>dispatch period</i>, the <i>EMC</i> shall declare the prices for that <i>dispatch period</i> to be provisional in accordance with section 9.3.2A.</p>	<p>Deleted.</p>	<p>Rule Change: A part of the rule changes to remove the need to carry out a price revision when constraint violation costs have been applied by the MCE in accordance with section D.16 of Appendix 6D.</p>
<p>9.3.2D Where prices in respect of any <i>dispatch period</i> have been declared to be provisional pursuant to section 9.3.2C, the <i>EMC</i> shall request that the <i>PSO</i> confirm whether or not <i>load shedding</i> had occurred during that <i>dispatch period</i> and provide to the <i>EMC</i> the maximum actual line flow values of such lines as identified by the <i>EMC</i> for that <i>dispatch period</i>.</p>	<p>Deleted.</p>	<p>Rule Change: A part of the rule changes to remove the need to carry out a price revision when constraint violation costs have been applied by the MCE in accordance with section D.16 of Appendix 6D.</p>

Existing Rules (Release: 1 Jan 2008)	Proposed Rewritten Rules	Remarks
<p>9.3.2E If the <i>PSO</i> confirms that <i>load shedding</i> had not occurred in the <i>dispatch period</i> referred to in section 9.3.2D, the <i>EMC</i> shall issue a price revision <i>advisory notice</i> for that <i>dispatch period</i> no later than 2 <i>business days</i> prior to the time at which the <i>preliminary settlement statements</i> for the relevant <i>dispatch day</i> must be issued in accordance with section 5.2.1 of Chapter 7, in such manner as will provide adequate notice, using electronic means, or in the case where electronic means are not available, by any other means it considers suitable, and containing the applicable information in Appendix 6H. Provisional prices in respect of which no such price revision <i>advisory notices</i> are issued by the deadline stipulated above shall be deemed final.</p>	Deleted.	Rule Change: A part of the rule changes to remove the need to carry out a price revision when constraint violation costs have been applied by the MCE in accordance with section D.16 of Appendix 6D.
<p>9.3.3 The <i>EMC</i> shall, as soon as practicable, withdraw any of the <i>advisory notices</i> referred to in sections 9.3.1 and 9.3.2.1 to 9.3.2.3 and issued in respect of a <i>dispatch period</i> to the extent that the conditions referred to in such <i>advisory notices</i> are no longer or are expected to no longer be applicable to such <i>dispatch period</i>.</p>	<p>9.3.5 The <i>EMC</i> shall, as soon as practicable, withdraw an <i>advisory notice</i> issued under sections 9.3.1 or 9.3.2 to the extent that the conditions referred to in such <i>advisory notice</i> are no longer, or are expected to no longer be, applicable.</p>	<p>Re-numbered.</p> <p>Rule Change: Removed references to “a dispatch period” since the advisory notices issued under sections 9.3.2.1 and 9.3.2.2 may apply to more than one dispatch period.</p>
<p>9.3.4 [Deleted and Intentionally Left Blank]</p>	Deleted.	
<p>9.3.5 [Deleted and Intentionally Left Blank]</p>	Deleted.	

Existing Rules (Release: 1 Jan 2008)	Proposed Rewritten Rules	Remarks
9.3.6 Where the <i>EMC</i> issues a communications warning <i>advisory notice</i> pursuant to section 9.3.2.3, it shall use all reasonable endeavours to promptly restore communications, establish alternative means of communication or avoid the communications problem anticipated in the <i>advisory notice</i> , as the case may be.	9.3.6 Where the <i>EMC</i> issues a communications warning <i>advisory notice</i> pursuant to section 9.3.2.2, it shall use all reasonable endeavours to promptly restore communications, establish alternative means of communication or avoid the difficulties in communications referred to in the <i>advisory notice</i> , as the case may be.	Rule change: The reference to “section 9.3.2.3” is changed to a reference to “section 9.3.2.2” to correct a cross-referencing error in the existing section 9.3.6.
[New section]	9.3.7 The <i>EMC</i> shall issue <i>advisory notices</i> , and provide confirmation referred to in section 9.3.3, in such manner as will provide adequate notice, using electronic means, or in the case where electronic means are not available, by any other means it considers suitable.	
[New section]	9.3.8 An <i>advisory notice</i> issued by the <i>EMC</i> shall contain all the relevant information prescribed in Appendix 6H.	

Existing Rules (Release: 1 Jan 2008)	Proposed Rules Changes (Deletions marked as strikethrough text and additions marked as double underlined text.)	Remarks
<u>APPENDIX 6H</u>	<u>APPENDIX 6H</u>	
<p>H.1 INFORMATION TO BE INCLUDED</p> <p>H.1.1 This Appendix sets forth details of the information to be included in <i>advisory notices</i> issued by the <i>EMC</i> pursuant to section 9.3 of this Chapter.</p>	<p>H.1 INFORMATION TO BE INCLUDED</p> <p>H.1.1 This Appendix sets forth details of the information to be included in <i>advisory notices</i> issued by the <i>EMC</i> pursuant to section 9.3 of this Chapter.</p>	
<p>H.1.2 An <i>energy surplus advisory notice</i> shall indicate:</p> <p>H.1.2.1 the <i>dispatch periods</i> for which an <i>energy surplus</i> is expected by the <i>EMC</i>;</p> <p>H.1.2.2 the amount by which the output from <i>generation facilities</i> is expected to exceed <i>load</i> for each <i>dispatch period</i> referred to section H.1.2.1; and</p> <p>H.1.2.3 whether the <i>energy surplus advisory notice</i> applies to the <i>electricity system</i> as a whole or is localised and, if localised, the <i>dispatch network nodes</i> to which the <i>advisory notice</i> relates.</p>	<p>H.1.2 An <i>energy surplus advisory notice</i> shall indicate:</p> <p>H.1.2.1 the <i>dispatch periods <u>period</u></i> for which an <i>energy surplus</i> is expected by the <i>EMC</i> to <u>which such <i>advisory notice</i> relates</u>;</p> <p>H.1.2.2 the amount by which the <i>energy</i> output from <i>generation facilities</i> is expected to exceed <i>load</i> for each <u>such</u> <i>dispatch period</i> referred to section H.1.2.1; and</p> <p>H.1.2.3 whether the <i>energy surplus</i> <u>such</u> <i>advisory notice</i> applies to the <i>electricity system</i> as a whole or is localised and, if localised, the <i>dispatch network nodes</i> to which the <u>such</u> <i>advisory notice</i> relates.</p>	<p>Rule Change: This type of advisory notice is issued in respect of one dispatch period only.</p> <p>The other amendments are drafting changes which are intended to remove unnecessary cross-references/text only.</p>
<p>H.1.3 An <i>energy shortfall advisory notice</i> shall indicate:</p>	<p>H.1.3 An <i>energy shortfall advisory notice</i> shall indicate:</p>	<p>Rule Change: This type of advisory notice is issued in</p>

Existing Rules (Release: 1 Jan 2008)	Proposed Rules Changes (Deletions marked as strikethrough text and additions marked as double underlined text.)	Remarks
<p>H.1.3.1 the <i>dispatch periods</i> for which an <i>energy</i> shortfall is expected by the <i>EMC</i>;</p> <p>H.1.3.2 the amount by which the output from <i>generation facilities</i> is expected to fall short of <i>load</i> for each <i>dispatch period</i> referred to section H.1.3.1; and</p> <p>H.1.3.3 whether the <i>energy</i> shortage <i>advisory notice</i> applies to the <i>electricity system</i> as a whole or is localised and, if localised, the <i>dispatch network nodes</i> to which the <i>advisory notice</i> relates.</p>	<p>H.1.3.1 the <i>dispatch periods <u>period</u></i> for which an <i>energy</i> shortfall is expected by the <i>EMC</i> to which such <i>advisory notice</i> relates;</p> <p>H.1.3.2 the amount by which the <i>energy</i> output from <i>generation facilities</i> is expected to fall short of <i>load</i> for each <i>such dispatch period</i> referred to section H.1.3.1; and</p> <p>H.1.3.3 whether the <i>energy</i> shortage <i>such advisory notice</i> applies to the <i>electricity system</i> as a whole or is localised and, if localised, the <i>dispatch network nodes</i> to which the <i>such advisory notice</i> relates.</p>	<p>respect of one dispatch period only.</p> <p>Rule Change: To clarify that “output” refers to energy output only.</p> <p>The other amendments are drafting changes which are intended to remove unnecessary cross-references/text only.</p>
<p>H.1.4 A <i>reserve</i> shortfall <i>advisory notice</i> shall indicate:</p> <p>H.1.4.1 the <i>reserve classes</i> to which the <i>advisory notice</i> relates;</p> <p>H.1.4.2 the <i>dispatch periods</i> for which a <i>reserve</i> shortfall in respect of each affected <i>reserve class</i> referred to in section H.1.4.1 is expected by the <i>EMC</i>; and</p> <p>H.1.4.3 the amount by which the required <i>reserve</i> for each affected <i>reserve class</i> referred to in section H.1.4.1 is expected to exceed the <i>reserve</i> provided for each <i>dispatch period</i></p>	<p>H.1.4 A <i>reserve</i> shortfall <i>advisory notice</i> shall indicate:</p> <p>H.1.4.1 the <i>reserve classes <u>class</u></i> to which the <i>such advisory notice</i> relates;</p> <p>H.1.4.2 the <i>dispatch periods <u>period</u></i> for which a <i>reserve</i> shortfall in respect of each affected <i>reserve class</i> referred to in section H.1.4.1 is expected by the <i>EMC</i> to which such <i>advisory notice</i> relates; and</p> <p>H.1.4.3 the amount by which the required <i>reserve</i> for each <i>such affected reserve class</i> referred to in section H.1.4. is expected to</p>	<p>Rule change: This type of advisory notice is issued in respect of one reserve class for one dispatch period only.</p> <p>The other amendments are drafting changes which are intended to remove unnecessary cross-references/text only.</p>

Existing Rules (Release: 1 Jan 2008)	Proposed Rules Changes (Deletions marked as strikethrough text and additions marked as double underlined text.)	Remarks
referred to section H.1.4.2.	exceed the <i>reserve</i> provided for each <u>such</u> <i>dispatch period</i> referred to section H.1.4.2.	
<p>H.1.5 A <i>regulation</i> shortfall advisory notice shall indicate:</p> <p>H.1.5.1 the <i>dispatch periods</i> for which a <i>regulation</i> shortfall is expected by the <i>EMC</i>; and</p> <p>H.1.5.2 the amount by which the required <i>regulation</i> is expected to exceed the <i>regulation</i> provided for each for each <i>dispatch periods</i> referred to section H.1.5.1.</p>	<p>H.1.5 A <i>regulation</i> shortfall advisory notice shall indicate:</p> <p>H.1.5.1 the <i>dispatch periods <u>period</u></i> for which a <i>regulation</i> shortfall is expected by the <u><i>EMC</i> to which such advisory notice relates;</u> and</p> <p>H.1.5.2 the amount by which the required <i>regulation</i> is expected to exceed the <i>regulation</i> provided for each for each <i>dispatch periods</i> referred to section H.1.5.1 <u>such <i>dispatch period</i>.</u></p>	<p>Rule change: This type of advisory notice is issued in respect of one dispatch period only.</p> <p>The other amendments are drafting changes which are intended to remove unnecessary cross-references/text only.</p>
<p>H.1.6 A system status advisory notice pertaining to load shedding shall indicate:</p> <p>H.1.6.1 the <i>dispatch periods</i> for which load shedding is expected by the <i>PSO</i>;</p> <p>H.1.6.2 the amount by which the output from <i>generation facilities</i> is expected to exceed load for each <i>dispatch period</i> referred to section H.1.6.1; and</p>	<p>H.1.6 A system status advisory notice pertaining to load shedding shall indicate:</p> <p>H.1.6.1 the <i>dispatch periods</i> <u>to which such advisory notice relates</u> for which load shedding is expected by the <i>PSO</i>;</p> <p>H.1.6.2 the amount by which the output from <i>generation facilities</i> is expected to exceed load for each <u>such <i>dispatch period</i></u> referred to section H.1.6.1; and</p>	<p>The amendments are drafting changes which are intended to remove unnecessary cross-references/text only.</p>

Existing Rules (Release: 1 Jan 2008)	Proposed Rules Changes (Deletions marked as strikethrough text and additions marked as double underlined text.)	Remarks
H.1.6.3 whether the system status <i>advisory notice</i> applies to the <i>electricity system</i> as a whole or is localised and, if localised, the <i>dispatch network nodes</i> to which the <i>advisory notice</i> relates.	H.1.6.3 whether the system status <u>such</u> <i>advisory notice</i> applies to the <i>electricity system</i> as a whole or is localised and, if localised, the <i>dispatch network nodes</i> to which the <u>such</u> <i>advisory notice</i> relates.	
<p>H.1.7 A system status <i>advisory notice</i> pertaining to a major equipment outage, <i>load shedding</i> or any other abnormal <i>PSO controlled system</i> conditions that the <i>PSO</i> considers material shall indicate:</p> <p>H.1.7.1 the <i>dispatch periods</i> for which a major equipment outage, <i>load shedding</i> or other abnormal <i>PSO controlled system</i> condition is expected by the <i>PSO</i>; and</p> <p>H.1.7.2 the nature of the major equipment outage, <i>load shedding</i> or abnormal <i>PSO controlled system</i> condition.</p>	<p>H.1.7 A system status <i>advisory notice</i> pertaining to a major equipment <i>outage</i>, <i>load shedding</i> or any other abnormal <u>condition on the <i>PSO controlled system</i></u> conditions that the <i>PSO</i> considers material shall indicate:</p> <p>H.1.7.1 the <i>dispatch periods</i> for which a <u>such</u> major equipment <i>outage</i>, <i>load shedding</i> or other abnormal <u>condition on the <i>PSO controlled system</i></u> condition <u>is occurring or</u> is expected <u>to occur</u> by the <i>PSO</i>; and</p> <p>H.1.7.2 the nature of the <u>such</u> major equipment <i>outage</i>, <i>load shedding</i> or abnormal <u>condition on the <i>PSO controlled system</i></u> condition.</p>	<p>Formatting change: The text indicated in bold fonts to be italicised.</p> <p>The other suggested amendments are drafting changes only and are intended to track the language of the section 9.3.2.1 above more closely.</p>
<p>H.1.8 A communications warning <i>advisory notice</i>:</p> <p>H.1.8.1 pertaining to an existing communications problem, shall indicate the nature and expected duration of the communication problems and provide details of any interim</p>	<p>H.1.8 A communications warning <i>advisory notice</i>:</p> <p>H.1.8.1 pertaining to an existing communications problem, shall indicate the nature and expected duration of the communication problems and provide details of any</p>	<p>Rule change: The expression “the information referred to in section H.1.8.1” (as used in the existing section H.1.8.2) is inappropriate since it would refer to information relating to</p>

Existing Rules (Release: 1 Jan 2008)	Proposed Rules Changes (Deletions marked as strikethrough text and additions marked as double underlined text.)	Remarks
<p>alternative communication methods to be used by the <i>EMC</i>, the <i>PSO</i> or <i>market participants</i>, as the case may be, while the <i>advisory notice</i> is in effect; and</p> <p>H.1.8.2 pertaining to an anticipated communications problem, shall contain the information referred to in section H.1.8.1, an indication of time at which the communications problem is expected to commence if not avoided and the means by which the <i>EMC</i> intends to avoid the occurrence of the communications problem.</p>	<p>interim alternative communication methods to be used by the <i>EMC</i>, the <i>PSO</i> or <i>market participants</i>, as the case may be, while the <i>advisory notice</i> is in effect; and</p> <p>H.1.8.2 pertaining to an anticipated communications problem, shall contain the information referred to in section H.1.8.1, an indication of time at which the communications problem is expected to commence if not avoided and the means by which the <i>EMC</i> intends to avoid the occurrence of the communications problem.</p> <p><u>H.1.8 A communications warning <i>advisory notice</i> pertaining to existing or anticipated difficulties in communications shall indicate:</u></p> <p><u>H.1.8.1 the nature and expected duration of such difficulties; and</u></p> <p><u>H.1.8.2 details of any interim alternative communication methods to be used by the <i>EMC</i>, the <i>PSO</i> or <i>market participants</i>, as the case may be, while the <i>advisory notice</i> is in effect.</u></p> <p><u>A communications warning <i>advisory notice</i> pertaining to anticipated difficulties in</u></p>	<p>“an existing communication problem” under section H.1.8.1, rather than “an anticipated communications problem” for the purposes of H.1.8.2.</p>

Existing Rules (Release: 1 Jan 2008)	Proposed Rules Changes (Deletions marked as strikethrough text and additions marked as double underlined text.)	Remarks
	<u>communications shall also indicate the time at which such difficulties (if not avoided) are expected to commence and the means by which the EMC intends to avoid such difficulties.</u>	
<p>H.1.9 A price warning <i>advisory notice</i> shall indicate:</p> <p>H.1.9.1 the <i>dispatch periods</i> to which the <i>advisory notice</i> relates;</p> <p>H.1.9.2 the nature of the pricing problem; and</p> <p>H.1.9.3 the actions proposed by the <i>EMC</i> to address the problem.</p>	<p>H.1.9 A price warning <i>advisory notice</i> shall indicate:</p> <p>H.1.9.1 the <i>dispatch periods <u>period</u></i> to which the <u>such</u> <i>advisory notice</i> relates;</p> <p>H.1.9.2 the nature of the pricing problem; and</p> <p>H.1.9.3 the actions proposed by the <i>EMC</i> to address the<u>such</u> problem.</p>	<p>Rule change: This type of advisory notice is issued in respect of one dispatch period only.</p> <p>The amendments are drafting changes which are intended to remove unnecessary cross-references/text only.</p>
<p>H.1.10 An pricing revision <i>advisory notice</i> shall indicate:</p> <p>H.1.10.1 the <i>dispatch periods</i> to which the <i>advisory notice</i> relates;</p> <p>H.1.10.2 the nature of the pricing problem; and</p> <p>H.1.10.3 the methodology to be used to determine settlement prices and/or quantities.</p>	<p>H.1.10 An pricing <u>A price</u> revision <i>advisory notice</i> shall indicate:</p> <p>H.1.10.1 the <i>dispatch periods <u>period</u></i> to which the <u>such</u> <i>advisory notice</i> relates;</p> <p>H.1.10.2 the nature of the pricing problem; and</p> <p>H.1.10.3 the methodology to be used to determine settlement prices and/or quantities <u>for the purposes of <i>settlement</i></u>.</p>	<p>Rule change: To correct a typographical error.</p> <p>Rule change: This type of advisory notice is issued in respect of one dispatch period only.</p>

ANNEX 3 ANCILLARY RULE CHANGES

Existing Rules (Release: 1 Jan 2008)	Proposed Rules Changes (Deletions marked as strikethrough text and additions marked as double underlined text.)	Remarks
<u>CHAPTER 5</u>	<u>CHAPTER 5</u>	
<p>9.8.2 The <i>PSO</i> shall provide to the <i>EMC</i> confirmation as to whether or not <i>load shedding</i> had occurred in the <i>dispatch period</i> referred to in section 9.3.2D of Chapter 6 within 1 <i>business day</i> of the <i>EMC</i>'s request. If <i>load shedding</i> had not occurred in that <i>dispatch period</i>, the <i>PSO</i> shall also at the same time provide the information requested by the <i>EMC</i> under section 9.3.2D of Chapter 6 in such format as the <i>EMC</i> and the <i>PSO</i> may agree or, if such information is not available, inform the <i>EMC</i> of such fact.</p>	Deleted.	Rule Change: A part of the rule changes to remove the need to carry out a price revision when constraint violation costs have been applied by the MCE in accordance with section D.16 of Appendix 6D.
<u>CHAPTER 6</u>	<u>CHAPTER 6</u>	
<p>3.3 MARKET CLEARING ENGINE</p> <p>3.3.1 The <i>EMC</i> shall, prior to the <i>market commencement date</i>, develop, test, and implement the <i>market clearing engine</i>, which shall:</p> <p>...</p> <p>3.3.1.6 produce <i>price schedules</i> for each <i>dispatch</i></p>	<p>3.3 MARKET CLEARING ENGINE</p> <p>3.3.1 The <i>EMC</i> shall, prior to the <i>market commencement date</i>, develop, test, and implement the <i>market clearing engine</i>, which shall:</p> <p>...</p> <p>3.3.1.6 produce price <u>pricing</u> <i>schedules</i> for each</p>	Rule Change: To correct a typographical error.

Existing Rules (Release: 1 Jan 2008)	Proposed Rules Changes (Deletions marked as strikethrough text and additions marked as double underlined text.)	Remarks
<p><i>period</i> containing the data referred to in sections C.3.1 of Appendix 6C; and</p> <p>...</p>	<p><i>dispatch period</i> containing the data referred to in sections C.3.1 of Appendix 6C; and</p> <p>...</p>	
<p>9.2.6 In the event the <i>market clearing engine</i> fails to produce any <i>real-time pricing schedule</i> for a particular <i>dispatch period</i> for any reason other than due to the suspension of <i>real time market</i>, then the <i>EMC</i> shall issue a price revision <i>advisory notice</i> in accordance with 9.3.2B as if for provisional prices confirmed to be subject to revision. In such circumstances, the prices for the affected <i>dispatch period</i> for which no <i>real-time pricing schedule</i> was produced shall be determined in accordance with the provisions of section 10.2.</p>	<p>9.2.6 In the event the <i>market clearing engine</i> fails to produce any <i>real-time pricing schedule</i> for a particular <i>dispatch period</i> for any reason other than due to the suspension of <i>real time market</i>, then the <i>EMC</i> shall issue a price revision <i>advisory notice</i> in accordance with <u>9.3.4</u> 9.3.2B as if for provisional prices confirmed to be subject to revision. In such circumstances, the prices for the affected <i>dispatch period</i> for which no <i>real-time pricing schedule</i> was produced shall be determined in accordance with the provisions of section 10.2.</p>	<p>The cross-reference change to section 9.3.4 is a consequential change due to renumbering of section 9.3.2B.</p>
<p>10.2.2 If a price revision <i>advisory notice</i> for a <i>dispatch period</i> is not in effect at beginning of the <i>dispatch period</i>, the <i>EMC</i> shall use prices taken from the <i>real-time pricing schedule</i> described in section 9.2.1.2 for that <i>dispatch period</i>, whether or not produced in accordance with the <i>market operations timetable</i>, as and for the <i>settlement</i> data described in section 10.2.1 for that <i>dispatch period</i>, unless and until a price revision <i>advisory notice</i> is later issued by the <i>EMC</i> for that <i>dispatch period</i> under section 9.3.2B or section 9.3.2E, in which case the <i>settlement</i> data described in section 10.2.1 shall be</p>	<p>10.2.2 If a price revision <i>advisory notice</i> for a <i>dispatch period</i> is not in effect at beginning of the <i>dispatch period</i>, the <i>EMC</i> shall use prices taken from the <i>real-time pricing schedule</i> described in section 9.2.1.2 for that <i>dispatch period</i>, whether or not produced in accordance with the <i>market operations timetable</i>, as and for the <i>settlement</i> data described in section 10.2.1 for that <i>dispatch period</i>, unless and until a price revision <i>advisory notice</i> is later issued by the <i>EMC</i> for that <i>dispatch period</i> under section <u>9.3.4</u> 9.3.2B or section 9.3.2E, in which case the <i>settlement</i> data described in section 10.2.1 shall be determined in accordance with section 10.2.3 or section</p>	<p>The cross-reference change to section 9.3.4 is a consequential change due to renumbering of section 9.3.2B.</p> <p>Rule Change: To delete reference to sections 9.3.2E and 10.2.3A because of the deletion of those rules.</p>

Existing Rules (Release: 1 Jan 2008)	Proposed Rules Changes (Deletions marked as strikethrough text and additions marked as double underlined text.)	Remarks
determined in accordance with section 10.2.3 or section 10.2.3A as appropriate.	10.2.3A as appropriate.	
<p>10.2.3 If a price revision <i>advisory notice</i> is issued by the <i>EMC</i> under section 9.3.2B in respect of a <i>dispatch period</i>:</p> <p>10.2.3.1 and if an <i>energy</i> shortfall <i>advisory notice</i> was in effect at the beginning of that <i>dispatch period</i>, the <i>EMC</i> shall use the process described in sections 10.2.7 to 10.2.8 to determine the <i>settlement</i> data described in section 10.2.1 for that <i>dispatch period</i>; and</p> <p>10.2.3.2 in all other cases, the <i>EMC</i> shall use the process described in section 10.2.4 to determine the <i>settlement</i> data described in section 10.2.1 for that <i>dispatch period</i>.</p>	<p>10.2.3 If a price revision <i>advisory notice</i> is issued by the <i>EMC</i> under section 9.3.2B <u>9.3.4</u> in respect of a <i>dispatch period</i>:</p> <p>10.2.3.1 and if an <i>energy</i> shortfall <i>advisory notice</i> was in effect at the beginning of that <i>dispatch period</i>, the <i>EMC</i> shall use the process described in sections 10.2.7 to 10.2.8 to determine the <i>settlement</i> data described in section 10.2.1 for that <i>dispatch period</i>; and</p> <p>10.2.3.2 in all other cases, the <i>EMC</i> shall use the process described in section 10.2.4 to determine the <i>settlement</i> data described in section 10.2.1 for that <i>dispatch period</i>.</p>	Cross-reference change is a consequential change due to renumbering of section 9.3.2B.
<p>10.2.3A If a price revision <i>advisory notice</i> is issued by the <i>EMC</i> under section 9.3.2E in respect of a <i>dispatch period</i> and:</p> <p>10.2.3A.1 if the <i>EMC</i> has received the maximum actual line flow values</p>	Deleted.	Rule Change: A part of the rule changes to remove the need to carry out a price revision when constraint violation costs have been applied by the MCE in

Existing Rules (Release: 1 Jan 2008)	Proposed Rules Changes (Deletions marked as strikethrough text and additions marked as double underlined text.)	Remarks
<p>10.2.3A.2 requested from the <i>PSO</i> under section 9.3.2D, the <i>EMC</i> shall use the process described in section 10.2.4A to determine the settlement data described in section 10.2.1 for that <i>dispatch period</i>; and</p> <p>if the <i>EMC</i> has not received the maximum actual line flow values requested from the <i>PSO</i> under section 9.3.2D, the <i>EMC</i> shall determine <i>settlement</i> data referred to in section 10.2.1 for that <i>dispatch period</i> by re-running the <i>market clearing engine</i> with the application of section D.16.4 of Appendix 6D.</p>		accordance with section D.16 of Appendix 6D.
<p>10.2.4 Where section 10.2.3.2 applies, the <i>EMC</i> shall, as soon as possible but no later than 1 <i>business day</i> prior to the time at which the <i>preliminary settlement statements</i> for the relevant <i>dispatch day</i> must be issued in accordance with section 5.2.1 of Chapter 7, calculate in accordance with sections 10.2.5 and 10.2.6 and <i>publish</i> revised values of the <i>settlement</i> data described in section 10.2.1 to be used for <i>settlement</i> purposes for that <i>dispatch period</i>.</p>	<p>10.2.4 Where section 10.2.3.2 applies, the <i>EMC</i> shall calculate in accordance with sections 10.2.5 and 10.2.6 and <i>publish</i> revised values of the <i>settlement</i> data described in section 10.2.1 to be used for <i>settlement</i> purposes for that <i>dispatch period</i>. The <i>EMC</i> shall carry out such calculation as soon as possible but no later than 1 <i>business day</i> prior to the time when the <i>preliminary settlement statements</i> for the relevant <i>dispatch day</i> must be issued under section 5.2.1 of Chapter 7.</p>	Rule rewrite only.

Existing Rules (Release: 1 Jan 2008)	Proposed Rules Changes (Deletions marked as strikethrough text and additions marked as double underlined text.)	Remarks
<p>10.2.4A Where section 10.2.3A.1 applies, the <i>EMC</i> shall, as soon as possible but no later than 1 <i>business day</i> prior to the time at which <i>the preliminary settlement statements</i> for the relevant <i>dispatch day</i> must be issued in accordance with section 5.2.1 of Chapter 7, calculate in accordance with sections 10.2.5A and 10.2.5B and <i>publish</i> revised values of the <i>settlement</i> data described in section 10.2.1 to be used for <i>settlement</i> purposes for that <i>dispatch period</i>.</p>	<p>Deleted.</p>	<p>Rule Change: A part of the rule changes to remove the need to carry out a price revision when constraint violation costs have been applied by the MCE in accordance with section D.16 of Appendix 6D.</p>
<p>10.2.5 The revised values referred to in section 10.2.4 shall, if possible, be determined by re-running the <i>market clearing engine</i> for the <i>dispatch period</i> using all the input data that should have been supplied to the <i>market clearing engine</i> at the time the <i>real-time dispatch schedule</i> for that <i>dispatch period</i> would normally have been produced.</p>	<p>10.2.5 The revised values referred to in section 10.2.4 shall, if possible, be determined by re-running the <i>market clearing engine</i> for the <i>dispatch period</i> using all the input data that should have been supplied to the <i>market clearing engine</i> at the time the <i>real-time dispatch schedule</i> for that <i>dispatch period</i> would normally have been produced.</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p><u>Explanatory Note: Section 10.2.5 contemplates that one of the possible causes of price revision/MCE re-run is where erroneous inputs have been used in the production of the real-time schedules. The MCE currently commences production of the real-time schedules at ‘T-5 minutes’ before the desired dispatch period.</u></p> </div>	<p>Addition of an explanatory note only.</p>

Existing Rules (Release: 1 Jan 2008)	Proposed Rules Changes (Deletions marked as strikethrough text and additions marked as double underlined text.)	Remarks
	<p><u>Such erroneous inputs are inputs used by the MCE in determining the real-time dispatch schedule which are deemed not reflective of the prevailing market conditions existing at the time when the MCE was run to produce the real-time schedule for a dispatch period. Offers, which have been validated at the time the MCE was run, will not be considered to be erroneous inputs.</u></p> <p><u>The EMC will re-run the MCE by using all inputs that should have been supplied to the MCE at the time when the MCE was run to produce the real-time schedules for that dispatch period.</u></p>	
10.2.5A The revised values referred to in section 10.2.4A shall, if possible, be determined by re-running the <i>market clearing engine</i> for that <i>dispatch period</i> using the maximum actual line flow values provided by the <i>PSO</i> under section 9.8.2 of Chapter 5 and applying the rest of the input data that have been supplied to the <i>market clearing engine</i> at the time the <i>real-time dispatch schedule</i> for that <i>dispatch period</i> would normally have been produced.	Deleted.	Rule Change: A part of the rule changes to remove the need to carry out a price revision when constraint violation costs have been applied by the MCE in accordance with section D.16 of Appendix 6D.
10.2.5B If any <i>constraint violation costs</i> , including the <i>constraint violation costs</i> referred to in section	Deleted.	Rule Change: A part of the rule changes to remove the

Existing Rules (Release: 1 Jan 2008)	Proposed Rules Changes (Deletions marked as strikethrough text and additions marked as double underlined text.)	Remarks		
9.3.2C, are still present in the revised values determined after re-running the <i>market clearing engine</i> in accordance with section 10.2.5A, the <i>EMC</i> shall determine <i>settlement</i> data referred to in section 10.2.1 by re-running the <i>market clearing engine</i> with the application of Section D.16.4 of Appendix 6D.		need to carry out a price revision when constraint violation costs have been applied by the MCE in accordance with section D.16 of Appendix 6D.		
10.3.3 Where the <i>EMC</i> has issued a price revision <i>advisory notice</i> under section 9.3.2B for a <i>dispatch period</i> with no useable <i>real-time dispatch schedule</i> for <i>energy, reserve and regulation</i> , the <i>EMC</i> shall determine, for <i>settlement</i> purposes: ...	10.3.3 Where the <i>EMC</i> has issued a price revision <i>advisory notice</i> under section <u>9.3.4</u> 9.3.2B for a <i>dispatch period</i> with no useable <i>real-time dispatch schedule</i> for <i>energy, reserve and regulation</i> , the <i>EMC</i> shall determine, for <i>settlement</i> purposes: ...	Cross-reference change is a consequential change due to renumbering of section 9.3.2B.		
<p><u>Appendix 6D, D3</u></p> <table border="1" data-bbox="192 1013 896 1318"> <tr> <td data-bbox="192 1013 539 1318">AdditionalNumPoints_k</td> <td data-bbox="539 1013 896 1318">The additional number of line flow/line loss points used to represent <i>dispatch network line k</i> for the purpose of constraint relaxation. Set by the <i>EMC</i>.</td> </tr> </table>	AdditionalNumPoints _k	The additional number of line flow/line loss points used to represent <i>dispatch network line k</i> for the purpose of constraint relaxation. Set by the <i>EMC</i> .	Deleted.	Rule Change: A part of the rule changes to remove the need to carry out a price revision when constraint violation costs have been applied by the MCE in accordance with section D.16 of Appendix 6D.
AdditionalNumPoints _k	The additional number of line flow/line loss points used to represent <i>dispatch network line k</i> for the purpose of constraint relaxation. Set by the <i>EMC</i> .			

Existing Rules (Release: 1 Jan 2008)		Proposed Rules Changes (Deletions marked as strikethrough text and additions marked as double underlined text.)	Remarks
RevisedMaxLineRating k	The new max line rating that is calculated based on the number of additional flow/line points used to represent <i>dispatch network line k</i> for the purpose of constraint relaxation.		
<p><u>Appendix 6D, 16.4</u></p> <p>D. 16.4 Relaxation of Line Constraints</p> <p>The provisions of this section shall only apply to a re-run of the <i>market clearing engine</i> under Section 10.2.3A.2 and section 10.2.5B of Chapter 6.</p> <p>D.16.4.1 Revised Flow Reverse Constraint</p> $\text{LineMaxReverse}_k \leq \text{LineFlow}_k$ $+ \text{ExcessLineFlowReverse}_k$		Deleted.	Rule Change: A part of the rule changes to remove the need to carry out a price revision when constraint violation costs have been applied by the MCE in accordance with section D.16 of Appendix 6D.

Existing Rules (Release: 1 Jan 2008)	Proposed Rules Changes (Deletions marked as strikethrough text and additions marked as double underlined text.)	Remarks
<p>This constraint will replace constraint in D.16.2.1</p> <p>D.16.4.2 Revised Flow Forward Constraint</p> $\text{LineMaxForward } k \geq \text{LineFlow } k - \text{ExcessLineFlowForward } k$ <p>$\{k \in \text{ARTIFICIAL LINES1} \cup \text{ARTIFICIAL LINES2}\}$</p> <p>This constraint will replace constraint in D.16.2.2</p> <p>D.16.4.3 The constraint in section D.21.2 shall apply in place of the constraint in section D.21.1.</p> <p>D.16.4.4 Revised MaxLineRating</p> $\text{MaxLineRating } k = \text{maximum}(\text{LineRatingForward } k, \text{LineRatingReverse } k)$		

Existing Rules (Release: 1 Jan 2008)	Proposed Rules Changes (Deletions marked as strikethrough text and additions marked as double underlined text.)	Remarks
$\text{RevisedMax LineRating}_k = \frac{\text{Additional NumPoints}_k}{2}$ $\times \frac{\text{MaxLineRating}}{(\text{NumPoints}_k - 1)}$ $\times \text{MaxLineRating}_k$ $\text{LineFlowConstraint}_{k,j} = -\text{RevisedMax LineRating}_k$ $+ \frac{j-1}{\text{NumPoints}_k - 1}$ $\times \text{RevisedMax LineRating}_k \times 2$ <p>$\{k,j/j \in \{1, \dots, \text{NumPoints}_k\}, \text{ where } k \in \text{LINES}, k \notin \text{ARTIFICIAL LINES}\}$</p> <p>This section will replace section D.9.3 for the purposes of constraint relaxation.</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Explanatory Note: Additional line flow/line loss points are required in order to accommodate the increased flow that may occur when line flow constraints are relaxed.</p> </div>		
<p><u>Appendix 6D, 21.2</u></p> <p>D.21.2 Line Flow Constraint (applies only to a re-run of</p>	<p>D.21.2 [Deleted and Intentionally Left Blank]</p>	<p>Rule Change: A part of the</p>

Existing Rules (Release: 1 Jan 2008)	Proposed Rules Changes (Deletions marked as strikethrough text and additions marked as double underlined text.)	Remarks
<p>the <i>market clearing engine</i> under section 10.2.3A.2 and section 10.2.5B of Chapter 6):</p> $\sum_{j \in \text{VIOLATIONGROUPBLOCKS}_{y(k)}} \text{ViolationGroupBlock}_{y,j} \geq \text{DeficitWLineFlow}_k + \text{ExcessWLineFlow}_k$ <p style="text-align: center;">$k \in \text{LINES}, k \notin \text{ARTIFICIAL LINES}$</p>		<p>rule changes to remove the need to carry out a price revision when constraint violation costs have been applied by the MCE in accordance with section D.16 of Appendix 6D. The paragraph number is retained as indicated, without re-numbering the remaining sections of D.21.</p>
<p><u>Appendix 6D, 22.5</u></p> <p>D.22.5 Subject to section D.22.4, if the number of times the linear program has been solved for the purpose of loss calculation correction for a given <i>dispatch period</i> in a given run of the <i>market clearing engine</i>:</p> <p>D.22.5.1 is equal to the maximum number established by the <i>EMC</i> under section D.22.1.2, and that run of the <i>market clearing engine</i> is to produce:</p> <p>a. a <i>real-time dispatch schedule</i>, the <i>EMC</i> may halt the process of loss calculation correction and the provisions of section</p>	<p><u>Appendix 6D, 22.5</u></p> <p>D.22.5 Subject to section D.22.4, if the number of times the linear program has been solved for the purpose of loss calculation correction for a given <i>dispatch period</i> in a given run of the <i>market clearing engine</i>:</p> <p>D.22.5.1 is equal to the maximum number established by the <i>EMC</i> under section D.22.1.2, and that run of the <i>market clearing engine</i> is to produce:</p> <p>a. a <i>real-time dispatch schedule</i>, the <i>EMC</i> may halt the process of loss calculation correction and the provisions of section 9.1.2.2 of Chapter 5 and section <u>9.3.4</u> 9.3.2B of Chapter 6 shall</p>	<p>Cross-reference change is a consequential change due to renumbering of section 9.3.2B.</p>

Existing Rules (Release: 1 Jan 2008)	Proposed Rules Changes (Deletions marked as strikethrough text and additions marked as double underlined text.)	Remarks
9.1.2.2 of Chapter 5 and section 9.3.2B of Chapter 6 shall apply; or ...	apply; or ...	
<u>CHAPTER 8</u>	<u>CHAPTER 8</u>	
1.1.139 <i>market outlook scenario</i> means a projected schedule determined and revised in accordance with sections 7.4, 7.5 and 7.6 of Chapter 6;	1.1.139 <i>market outlook scenario</i> means a projected schedule determined and revised in accordance with sections 7.4 <u>7.3</u> , 7.5 and 7.6 of Chapter 6;	Rule change: To correct a cross-referencing error.
1.1.189 <i>price schedule</i> means a schedule produced by the <i>market clearing engine</i> that contains prices for <i>energy, reserve or regulation</i> ;	1.1.189 price <u>pricing</u> <i>schedule</i> means a schedule produced by the <i>market clearing engine</i> that contains prices for <i>energy, reserve or regulation</i> ;	Rule Change: To correct a typographical error.
1.1.204 <i>real-time price schedule</i> means a schedule determined by the <i>market clearing engine</i> that contains the prices referred to in section 9.2.1.2 of Chapter 6;	1.1.204 <i>real-time</i> price <u>pricing</u> <i>schedule</i> means a schedule determined by the <i>market clearing engine</i> that contains the prices referred to in section 9.2.1.2 of Chapter 6;	Rule Change: To correct a typographical error.
1.1.205 <i>real-time schedule</i> means a <i>real-time dispatch schedule</i> and a <i>real-time price schedule</i> ;	1.1.205 <i>real-time schedule</i> means a <i>real-time dispatch schedule</i> and a <i>real-time</i> price <u>pricing</u> <i>schedule</i> ;	Rule Change: To correct a typographical error.

ANNEX 4 Proposed Rule Changes to Implement Compensation under Price Revision

Existing Rules (Release: 1 Jan 2008)			Proposed Rules Changes (Deletions marked as strikethrough text and additions marked as double underlined text.)			Remarks
<u>CHAPTER 3</u>			<u>CHAPTER 3</u>			
3.3.2 Disputes that shall be resolved by the dispute resolution process in section 3 are shown in the table below:			3.3.2 Disputes that shall be resolved by the dispute resolution process in section 3 are shown in the table below:			To add in the new section 10.2.10 of Chapter 6.
	Disputes between	Disputes in respect of		Disputes between	Disputes in respect of	
...	
3.3.1.5	<ul style="list-style-type: none"> - <i>EMC</i> and a <i>market participant</i> - <i>EMC</i> and a <i>market support services licensee</i> - <i>PSO</i> and a <i>market participant</i> - <i>PSO</i> and a <i>market support services</i> 	<ul style="list-style-type: none"> -request for compensation made under any of the following: - section 4.7.3 of Chapter 5 - section 5.4.3 of Chapter 5 - section 5.6.2 of Chapter 5 - section 7.7.3 of Chapter 5 - section 8.4.3 of Chapter 5 - section 8.6.2 of Chapter 5 - section 9.1.7 of Chapter 5 - section 9.7.3 of Chapter 5 	3.3.1.5	<ul style="list-style-type: none"> - <i>EMC</i> and a <i>market participant</i> - <i>EMC</i> and a <i>market support services licensee</i> - <i>PSO</i> and a <i>market participant</i> - <i>PSO</i> and a <i>market support services</i> 	<ul style="list-style-type: none"> - request for compensation made under any of the following: - section 4.7.3 of Chapter 5 - section 5.4.3 of Chapter 5 - section 5.6.2 of Chapter 5 - section 7.7.3 of Chapter 5 - section 8.4.3 of Chapter 5 - section 8.6.2 of Chapter 5 - section 9.1.7 of Chapter 5 - section 9.7.3 of Chapter 5 	

Existing Rules (Release: 1 Jan 2008)		Proposed Rules Changes (Deletions marked as strikethrough text and additions marked as double underlined text.)	Remarks
	<i>licensee</i> - section 10.4.1 of Chapter 5	<i>licensee</i> - section 10.4.1 of Chapter 5 <u>- section 10.2.10 of Chapter 6</u>	
3.11.1	If a <i>market participant</i> or a <i>market support services licensee</i> (the " <i>claimant</i> ") seeks compensation under section 3.3.1.5, the <i>claimant</i> shall submit its request to the <i>EMC</i> or the <i>PSO</i> . The request shall: 3.11.1.1 meet the requirements of the relevant <i>market manual</i> or the <i>system operation manual</i> ; 3.11.1.2 refer to the section of the <i>market rules</i> that the request is based on; and 3.11.1.3 specify the amount of compensation sought.	3.11.1 If a <i>market participant</i> or a <i>market support services licensee</i> (the " <i>claimant</i> ") seeks compensation under section 3.3.1.5, the <i>claimant</i> shall submit its request to the <i>EMC</i> or the <i>PSO</i> . The request shall: 3.11.1.1 meet the requirements of the relevant <i>market manual</i> or the <i>system operation manual</i> ; 3.11.1.2 refer to the section of the <i>market rules</i> that the request is based on; and 3.11.1.3 specify the amount of compensation sought <u>(except where the request relates to compensation under section 10.2.10 of Chapter 6)</u> .	To indicate that a claimant need not specify in its request the amount of compensation sought where such request is in relation to compensation under section 10.2.10 of Chapter 6. The amount of compensation will be determined based on Appendix 6K.
<u>CHAPTER 6</u>		<u>CHAPTER 6</u>	

Existing Rules (Release: 1 Jan 2008)	Proposed Rules Changes (Deletions marked as strikethrough text and additions marked as double underlined text.)	Remarks
(No existing provision)	<p><u>10.2.10</u> If the <i>EMC</i> determines under section 10.2.5 or 10.2.6 the <i>settlement</i> data described in section 10.2.1, a <i>market participant</i> with one or more <i>generation registered facilities</i> may seek compensation from the <i>EMC</i> under section 3.11 of Chapter 3. For the purposes of section 3.11.4 of Chapter 3, the <i>EMC</i> shall determine the relevant <i>claimant's</i> eligibility for compensation and the amount of such compensation (if any) in accordance with Appendix 6K.</p>	<p>To allow market participants with GRF(s) (if eligible) to seek compensation if price revision occurs. The amount of such compensation will be determined as set out in Appendix 6K.</p>

APPENDIX 6K

K.1 CALCULATING COMPENSATION AMOUNTS

K.1.1 For this section K.1, the following definitions apply:

$RMEP^m$ = revised *market energy price* (in \$/MWh) at *MNN* *m* for the relevant *dispatch period* determined by (i) re-running the *market clearing engine* under section 10.2.5 of this Chapter, or (ii) applying section 10.2.6 of this Chapter.

IEQ^m = injection *energy quantity* (in MWh) for *GRF* *m* for the *settlement interval* corresponding to the relevant *dispatch period*.

REQ^m = quantity of *energy* scheduled (in MW) for *GRF* *m* after re-running the *market clearing engine* for the *settlement interval* corresponding to the relevant *dispatch period*.

spq = index of a specific *price-quantity pair* in an *energy offer*.

pq = index of a *price-quantity pair* in an *energy offer*, ordered by increasing price.

$Q^{m,pq}$ = quantity of a *price-quantity pair* pq for the *energy offer* for *GRF* *m* for the relevant *dispatch period*.

$P^{m,pq}$ = price of a *price-quantity pair* pq for the *energy offer* for *GRF* *m* for the relevant *dispatch period*.

$COMP^{m,pq}$ = compensation payable in relation to a *price-quantity pair* pq of the *energy offer* for *GRF* *m* for the relevant *dispatch period*.

$COMP^m$ = compensation payable in relation to the *energy offer* for *GRF* *m* for the relevant *dispatch period*.

K.1.2 Under this section K.1, where the *EMC* determines a revised *market energy price* for a given *dispatch period* by re-running the *market clearing engine* under section 10.2.5 of this Chapter, a *market participant* with a *generation registered facility* will be eligible for compensation only if the *EMC* determines that (a) the quantity of *energy* scheduled for that *generation registered facility* based on its *real-time dispatch schedule* for that *dispatch period*, is more than (b) the quantity of *energy* scheduled for that *generation registered facility* for that *dispatch period* after re-running the *market clearing engine*. If a *dispatch instruction* for that *generation registered facility* for that *dispatch period* was issued by the *PSO* under section 9.1.2.2 of Chapter 5, then the *EMC* shall use the quantity of *energy* specified in that *dispatch instruction* for the purpose of section K.1.2(a) instead. The *PSO* shall provide such *dispatch instruction* to the *EMC* within three *business days* after the date of receipt by the *PSO* of a request for such *dispatch instruction* from the *EMC*.

K.1.3 Subject to sections K.1.2, the compensation as described in section 10.2.10 of this Chapter for a *generation registered facility* of a *market participant* shall be calculated as follows:

$$COMP^m = \sum_{pq=1}^{10} COMP^{m,pq}$$

K.1.4 For the purposes of section K.1.3, the compensation payable for each *price-quantity pair* spq of the *energy offer* of a *generation registered facility* shall be calculated as follows:

K.1.4.1 If $P^{m,spq} \leq RMEP^m$, then

$$COMP^{m,spq} = 0$$

K.1.4.2 If $\sum_{pq=1}^{spq} Q^{m,pq} \leq REQ^m$, then

$$COMP^{m,spq} = 0$$

K.1.4.3 If $\sum_{pq=1}^{spq-1} Q^{m,pq} \geq (IEQ^m \times 2)$, then

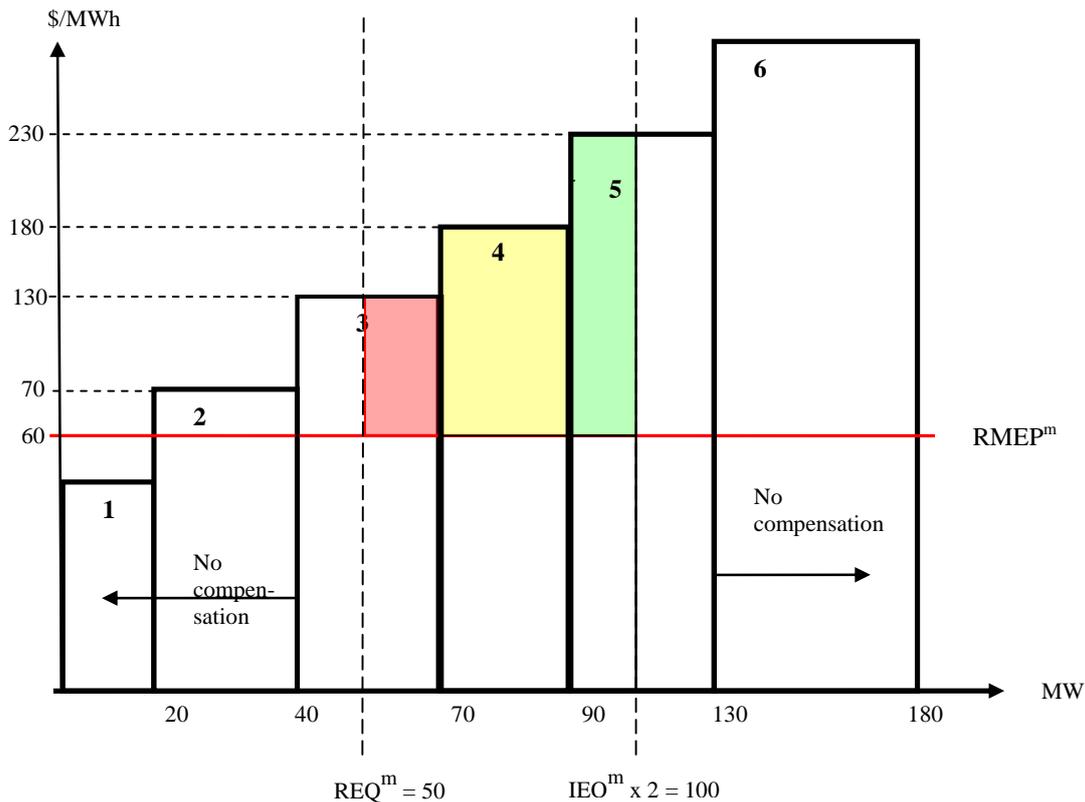
$$COMP^{m,spq} = 0$$

K.1.4.4 Otherwise, the compensation payable for *price-quantity pair* spq is:

$$COMP^{m,spq} =$$

$$\left(P^{m,spq} - RMEP^m \right) \times 0.5 \times \left[\min \left(\sum_{pq=1}^{spq} Q^{m,pq}, IEQ^m \times 2 \right) - \max \left(\sum_{pq=1}^{spq-1} Q^{m,pq}, REQ^m \right) \right]$$

Explanatory Note – The following example illustrates the compensation calculation for a generation which is eligible for compensation arising from revised energy price.



Suppose for a generator: IEQ= 50MWh (convert this to MW is 100); and REQ=50MW

Then, the compensation for each *price-quantity pair* (spq) of that generator is calculated as follows:

$$\text{COMP}^{\text{m},1} = 0 \text{ (Based on condition K.1.4.2)}$$

$$\text{COMP}^{\text{m},2} = 0 \text{ (Based on condition K.1.4.2)}$$

$$\text{COMP}^{\text{m},3} = (130 - 60) \times 0.5 \times (\min(70, 100) - \max(40, 50)) = 70 \times 0.5 \times (70 - 50) = \$700$$

(Based on condition K.1.4.4. The amount is equivalent to half of the shaded area in spq=3)

$$\text{COMP}^{\text{m},4} = (180 - 60) \times 0.5 \times (\min(90, 100) - \max(70, 50)) = 120 \times 0.5 \times (90 - 70) = \$1200$$

(Based on condition K.1.4.4. The amount is represented by half of the shaded area in spq=4)

$$\text{COMP}^{\text{m},5} = (230 - 60) \times 0.5 \times (\min(130, 100) - \max(90, 50)) = 170 \times 0.5 \times (100 - 90) = \$850$$

(Based on condition K.1.4.4. The amount is represented by half of the shaded area in spq =5)

$$\text{COMP}^{\text{m},6} = 0 \text{ (Based on condition K.1.4.3)}$$

Therefore, the compensation payable to that generator is:

$$\begin{aligned} \text{COMP}^{\text{m}} &= \text{COMP}^{\text{m},1} + \text{COMP}^{\text{m},2} + \text{COMP}^{\text{m},3} + \text{COMP}^{\text{m},4} + \text{COMP}^{\text{m},5} + \text{COMP}^{\text{m},6} \\ &= \$0 + \$0 + \$700 + \$1200 + \$850 + \$0 = \mathbf{\$2,750} \text{ (Based on condition K.1.3)} \end{aligned}$$

ANNEX 5 Estimated Resources to Implement Compensation Arrangement**Table A5-1: Estimated Manpower Resources Required**

Activity	Estimated Effort (Man-Days)
To scope the specifications of the standalone compensation calculator	5
To develop a standalone compensation calculator	30
To test the standalone compensation calculator	5
To setup business processes, forms and templates and brief MPs on the manual compensation process	10
Total Estimated Effort :	50 (2.5 months)

It is assumed that EMC's Market Operations Team will do the work. Based on the planned projects and resources available, EMC (MO) will require a lead time of 1-2 months after the rules have been approved before it can start work. Adding to time requirement estimated above to be around 2.5 months, EMC (MO) should be able to implement the system within 3-4 months after EMA's approval.

Using estimated internal resource costing figure (\$120 per hour), the indicative cost for the implementation is \$48,000.