



Notice of market rule modification

Paper No.	EMC/RCP/13/2004/232
Rule reference:	Alternate Default Bus
Proposer:	Chen Jianhong (Market Operations, EMC Pte Ltd)
Date received by EMC:	10 March 2004
Category allocated:	2
Status:	Approved by EMA
Effective Date:	5 July 2004
Summary of proposed rules change:	

This rule change proposal requires the PSO to designate a set of alternate default buses for all generation registered facilities and generation settlement facilities. The MCE will use the alternate default bus in its run when a generator and its main default bus are both disconnected from the PSO controlled system. With this proposal, EMC no longer needs to do a MCE re-run to revise the MEP of a disconnected generator whose main default bus is also isolated. This, in turn, translates into time saving and price certainty for the market.

Date considered by Panel:	11 May 2004
Date considered by EMC Board:	26 May 2004
Date considered by Energy Market Authority:	17 June 2004
Proposed Rule Modification:	

Refer to attachment

Reasons for rejection/Reasons for referral back to Panel (if applicable):



PAPER NO. : **EMC/BD/03/2004/05(a)**

RCP PAPER NO : **EMC/RCP/13/2004/232**

SUBJECT : **ALTERNATE DEFAULT BUS**

FOR : **DECISION**

PREPARED BY : **TEO WEE GUAN**

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Chief Economist

APPROVED BY : **PAUL POH LEE KONG**
General Manager, Market Administration

DATE : **26 May 2004**

Executive Summary

This paper assesses EMC's rule change proposal that PSO designate a set of alternate default buses for generation registered facilities and generation settlement facilities. The alternate default bus, in effect, 'mimics' the main default bus. The MCE will use the alternate default bus in its run when a generator and its main default bus are both disconnected from the PSO controlled system. With this proposal, EMC no longer needs to do a MCE re-run to revise the MEP of a disconnected generator whose main default bus is also isolated. This, in turn, translates into time saving and price certainty for the market. Hence, we recommend that the EMC Board **adopts** the rule change proposal.

1. Introduction

This paper assesses EMC's rule change proposal which requires the PSO to designate an alternative default bus, which is in the same switchhouse or substation as the main default bus, for a generation facility.

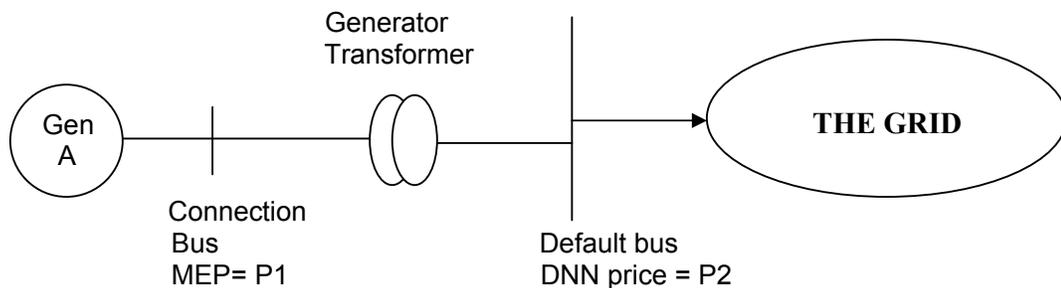
The rules in question relate to sections D.7.2 and D.7.3 of Appendix 6D, Chapter 6 of the market rules. The proposed rule modifications are detailed in Annex 1.

2. Background

2.1 Calculation of Nodal Prices

The dispatch network, comprising dispatch network nodes (DNNs) and dispatch network lines, is used to determine dispatch schedules and prices. In its dispatch/pricing run, the market clearing engine (MCE) automatically determines a dispatch schedule and the prices at each node in the network (i.e. nodal prices) which represent the least-cost market solution to the dispatch of energy and the provision of reserve and regulation. To do this, the MCE takes into account the projected load at various nodes on the network, generators' offers, grid configurations, system constraints, reserve and regulation requirements and physical characteristics of generation plants. Nodal price differences can arise due to transmission losses, grid congestion or interactions within the transmission system (loop-flow effect). Dispatchable generators will be paid the nodal price at their point of injection (called the 'Market Energy Price' or MEP). Fig. 1 below gives an illustration.

Figure 1



In Fig. 1, the MCE solves for prices at all connected default buses (i.e. DNN prices) in the dispatch network. This gives rise to, say, a DNN price of P2 at the default bus for Gen A. The MEP for Gen A, which is P1 at the connection bus, will also be automatically determined by the MCE when Gen A is physically connected to the system. The price difference between P1 and P2 is due to transformer losses occurring between the connection bus and the default bus. Typically, P2 is greater than P1--- it reflects a higher marginal cost of supplying electricity at the default bus due to losses. However, such losses are generally small (hence, P2 and P1 are very close values).

2.2 The Price Conversion Factor (PCF)

When the Network Status File (NWSTAT) shows that a generator is physically disconnected, the MCE will not be able to determine a MEP at the generator's connection bus (i.e. P1). However, a MEP for that generator would still need to be established for pricing purposes (say, to calculate the vesting contract reference price (VCRP) and to settle the generator's consumption of station load). This is done by using the PCF.

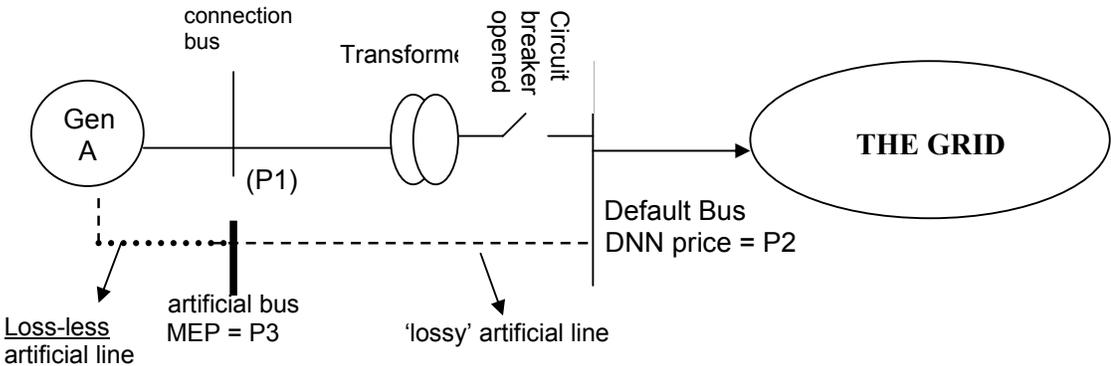
The PCF is a price ratio between a generator's connection bus and its default bus. It reflects the transformer losses between these two nodes. Using Fig. 1 as an example, the PCF for Gen A is $P1/P2$. The PCF is determined based on historical data and has an expected value slightly less than 1. It is reviewed annually by the EMC.

The following section explains how the PCF is used.

How is PCF used?

Referring to Fig. 2 below, when the NWSTAT shows that Gen A is disconnected, $P1$ at the connection bus cannot be determined. To derive the MEP for Gen A in this instance, the MCE will create a 'loss-less' Artificial Line to connect Gen A to an Artificial Bus. This artificial bus is then connected to the Gen A's default bus, using another 'lossy' Artificial Line whose loss is set by Gen A's PCF. The loss is such that the price difference between Gen A's default bus and the artificial bus is the same as the price difference that would have occurred between Gen A's default bus and its connection bus (i.e. $P2 - P3 = P2 - P1$). $P3$ will now become Gen A's MEP for pricing/settlement purposes. $P3$ is determined using $P2$ and the PCF for Gen A. In effect, $P3 = P2 \times PCF$.

Figure 2



3. Analysis

3.1 Problem Definition

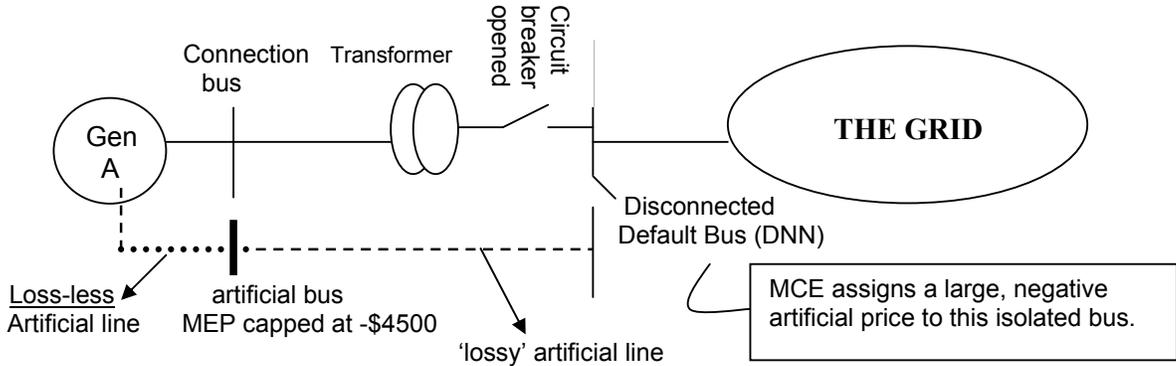


Figure 3

A problem will arise when the designated default bus of a disconnected generator also becomes isolated (i.e. physically disconnected). Please see fig. 3 above. The MCE solver will treat an isolated default bus as being 'undefined' and arbitrarily assign a very large and negative artificial price to it. If the generator also happens to be physically disconnected, then the MCE will establish a large negative price (capped at EnergyPriceMin of -\$4500) as the MEP for that generator.

Such MEP (-\$4500) is artificial and cannot be used for pricing/settlement purposes. If left unchecked, then the generator will be receiving payment instead of paying to the pool for consuming station load. Furthermore, under the vesting contract regime, MEPs are used to determine the VCRP of Gencos and MSSL for settlement purposes. Hence, EMC needs to revise the MEP by re-running the MCE with the isolated main default bus being replaced with an alternate default bus in the re-run environment.

Since market start, 4 such incidents have already occurred. An example of such incidents happened on 09 Jan 2004. That day, provisional MEP of -\$4500 for a generation facility which was not scheduled for generation was reported. The investigation showed that the main default bus for the generating facility was also isolated. This was confirmed by the PSO, who also indicated that during those affected periods, the generating facility was assigned to an alternate default bus. A re-run was done subsequently by using the alternate default bus (in place of the main default bus) in the re-run environment, so as the correct MEP for this generating facility could be determined.

3.2 Proposed Solution

It is proposed that the PSO designate a set of alternate default buses for generation registered facilities and generation settlement facilities so that these buses will be used by the MCE in its dispatch/pricing run when it encounters (via the NWSTAT) a situation when the generation facility and its designated main default bus are both disconnected from the PSO controlled system.

Cost-benefit analysis

The main advantages are time saving and price certainty for the market. This is because the MEP can be correctly determined by the MCE in the event when both the generation facility and main default bus are physically disconnected. Hence, there is no need for the EMC to re-establish prices via a MCE re-run.

This proposal will require the PSO to designate an alternate default bus for each generation facility. The alternate default bus will be in the same substation/switchhouse as the designated main default bus. The losses between these two buses are negligible since the connection between them is essentially loss-less.

Contingency

It is possible, though very unlikely, that both the designated main and alternate default buses can also be disconnected from the PSO controlled system. When this happens and when the generation facility concerned is also disconnected, the EMC will still need to perform a MCE re-run for settlement purposes. In this instance, EMC will, in consultation with the PSO, select a suitable bus to be used for MCE re-run.

4. Assessment against Section 46(4) of the Electricity Act

The proposal does not discriminate in favour of or against a market participant or a class of market participants. It is consistent with the functions and duties of the EMA under section 3(3)(b)(ii) of the Electricity Act:

- it promotes economic efficiency and the maintenance of such efficiency in the electricity industry.

5. Conclusion

Essentially, EMC's proposal to include a set of alternate default buses in the MCE system will remove the need for a MCE re-run to establish the correct MEP of a disconnected generator whose main default bus also becomes isolated (i.e. disconnected). This will translate into time-saving and price certainty for the market. The cost of implementing this proposal is minimal and the work can be done in-house. In view of these, EMC's proposal is supported.

6. Impact on market systems

Some changes to the EMC system are required.

7. Implementation process

EMC will need to modify its system to include the alternate default buses for each generation facility assigned by the PSO. This can be done in-house by EMC and the total man-day required is 2 weeks.

8. Consultation

We have published the proposed text of modifications on the EMC website for comments. No comments have been received for consideration.

9. Technical Working Group's (TWG) Review and Comments

The TWG has reviewed EMC's proposal and was satisfied with the analysis which supported the proposed rule modifications. In particular, they acknowledged that the proposed rule changes have the following benefits:

- (i) it would solve the current MCE limitation; specifically, a change in default bus, among others, can only be effected on mid-night in the standing data update, even though the isolation of a main default bus (and the replacement with an alternate bus) can happen anytime;
- (ii) it eliminates the need for PSO to inform EMC of changes (switching from the main to the alternate and vice versa) in default bus in advance and on short-notice, as these changes are already reflected in the Network Status File send by PSO to EMC every half-hourly which enables the MCE to determine which default bus (either main or alternate) to use in its real-time dispatch run; and

- (iii) it eliminates the need for EMC to do a MCE re-run (by replacing the main default bus with the alternate default bus in the re-run environment) to establish the correct MEPS.

All the above benefits will ultimately translate into lower transaction cost and price certainty for the market. Given these, members of the TWG unanimously agreed to recommend the proposed rules change to the RCP for support.

10. Legal sign off

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

11. Recommendations

The RCP has accepted by consensus EMC's proposed rule modifications and recommends that the EMC Board:

- a. **adopts** EMC's proposed rule modifications as set out in Annex 1;
- b. **seeks** the Authority's approval of EMC's proposed rule modifications; and
- c. recommends that the proposed modification come into force **2 weeks** after the date on which the approval of the Authority is published by the EMC.

ANNEX 1: Proposed rule modifications

Existing Rules (version 01 Jan 2004)	Proposed Rules (Deletion represented by strikethrough text and addition by underlined text.)
<p>Ch. 6 App. 6D</p> <p>D.7.2 The <i>PSO</i> shall designate a default bus for each <i>generation registered facility</i> that is not a <i>multi-unit facility</i> and each <i>generation settlement facility</i>, representing the most likely connection point for that <i>generation facility</i>. The <i>EMC</i> shall specify on reasonable grounds for each <i>generation registered facility</i> that is not a <i>multi-unit facility</i> and each <i>generation settlement facility</i> a default price conversion factor based on the historical observed price ratio between the normal connection point of the <i>generation facility</i> and the designated default bus for that <i>generation facility</i>.</p> <p>D.7.3 The <i>PSO</i> shall designate a default bus for each <i>generation unit</i> of each <i>generation registered facility</i> that is a <i>multi-unit facility</i>, representing the most likely connection point for that <i>generation unit</i>. The <i>EMC</i> shall specify for each unit of each <i>generation registered facility</i> that is a <i>multi-unit facility</i> a default price conversion factor based on the historical observed price ratio between the normal connection point of the <i>generation unit</i> and the designated default bus for that <i>generation unit</i>, together with a proportion indicating the ratio by which the prices of the nodes corresponding to the default buses will be combined into the <i>market network node</i> energy price.</p>	<p>Ch. 6 App. 6D</p> <p>D.7.2 The <i>PSO</i> shall designate a <u>main</u> default bus, and an alternate default bus which is in the same substation/switchhouse as the main default bus, for each <i>generation registered facility</i> that is not a <i>multi-unit facility</i> and each <i>generation settlement facility</i>, representing the most likely connection point for that <i>generation facility</i>. The <i>EMC</i> shall specify on reasonable grounds for each <i>generation registered facility</i> that is not a <i>multi-unit facility</i> and each <i>generation settlement facility</i> a default price conversion factor based on the historical observed price ratio between the normal connection point of the <i>generation facility</i> and the designated <u>main</u> default bus for that <i>generation facility</i>.</p> <p>D.7.3 The <i>PSO</i> shall designate a <u>main</u> default bus, and an alternate default bus which is in the same substation/switchhouse as the main default bus, for each <i>generation unit</i> of each <i>generation registered facility</i> that is a <i>multi-unit facility</i>, representing the most likely connection point for that <i>generation unit</i>. The <i>EMC</i> shall specify <u>on reasonable grounds</u> for each <u>generation</u> unit of each <i>generation registered facility</i> that is a <i>multi-unit facility</i> a default price conversion factor based on the historical observed price ratio between the normal connection point of the <i>generation unit</i> and the designated <u>main</u> default bus for that <i>generation unit</i>, together with a proportion indicating the ratio by which the prices of the nodes corresponding to the <u>designated main</u> default buses will be combined into the <i>market network node</i></p>

Existing Rules (version 01 Jan 2004)	Proposed Rules (Deletion represented by strikethrough text and addition by underlined text.)
	energy price.
	<p><u>D.7.3A</u> In the event where both the designated <u>main and alternate default buses of a generation facility</u> referred to in section <u>D.7.2</u> above or a <u>generation unit</u> referred to in section <u>D.7.3</u> above are <u>disconnected from the PSO controlled system</u>, the <u>EMC</u> shall, in consultation with the <u>PSO</u>, select a suitable bus for that <u>generation facility</u> or <u>generation unit</u>, as the case may be, to be used for the <u>market clearing engine re-run for settlement purposes</u>.</p>