

## Notice of Market Rules Modification

**Paper No.:** EMC/RCP/33/2007/263(R)  
**Rule reference:** Chapter 6, Appendix 6D  
**Proposer:** Market Operations, EMC  
**Date received by EMC:** 22 September 2006  
**Category allocated:** 2  
**Status:** Approved by EMA  
**Effective Date:** 6 September 2007

### Summary of proposed rule modification:

This rule change is made to correct a rule transcription error in a previously approved rule change proposal to improve the modelling of regulation constraints.

**Date considered by Rules Change Panel:** 3 July 2007  
**Date considered by EMC Board:** 26 July 2007  
**Date considered by Energy Market Authority:** 22 August 2007

### Proposed rule modification:

See attached paper.

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

PAPER NO. : **EMC/BD/04/2007/04(e)**

RCP PAPER NO. : **EMC/RCP/33/2007/263(R)**

SUBJECT : **MIXED INTEGER PROGRAM BASED MODELING OF  
REGULATION CONSTRAINTS**

FOR : **DECISION**

PREPARED BY : **WANG JING  
ANALYST**

REVIEWED BY : **PAUL POH LEE KONG  
SVP, MARKET ADMINISTRATION**

DATE OF MEETING : **26 JULY 2007**

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### **Executive Summary**

This rule change proposal is made to correct a rule transcription error in a previously approved rule change proposal to improve the modelling of regulation constraints.

The RCP unanimously recommends that the EMC Board **adopt** this proposal.

## 1 Introduction

This rule change proposal is to correct an error in section D.18.3.6 of Appendix 6D of Chapter 6 of the Market Rules. This rule has previously been approved by EMA but has not been implemented<sup>1</sup>.

## 2 Background

At the 30<sup>th</sup> RCP meeting, the Panel supported the proposal in the rule change paper “263: MIXED INTEGER PROGRAM BASED MODELING OF REGULATION CONSTRAINTS”. The proposal was to introduce Mixed Integer Programming (MIP) into the Market Clearing Engine (MCE) to remedy possible regulation anomalies.<sup>2</sup> Subsequently, this rule change was adopted by the EMC Board and approved by EMA. However, the rules have not been put into effect.

Among other changes, the rule change proposal introduced seven new MIP-based constraints as listed in Table 1.<sup>3</sup>

Table 1 MIP-based Regulation Constraints

MIP1	Regulation Min Generation - Regulation + DeficitRegGen + E * z ≥ RegulationMin
MIP2	Regulation Max Generation + Regulation - ExcessRegGen - E * z ≤ RegulationMax
MIP3	Regulation Availability Switch at Regulation Min Regulation - E * y <sub>RegMin</sub> ≤ 0
MIP4	Generation Switch at Regulation Min Generation - E * y <sub>RegMin</sub> ≤ RegulationMin
MIP5	Regulation Availability Switch at Regulation Max Regulation - E * y <sub>RegMax</sub> ≤ 0
MIP6	Generation Switch at Regulation Max Generation + E * y <sub>RegMax</sub> ≥ RegulationMax
MIP7	Binary Restrictions z + y <sub>RegMin</sub> + y <sub>RegMax</sub> = 2

where,

E: a big positive constant number

z, y<sub>RegMax</sub>, y<sub>RegMin</sub>: binary integer variables of value 0 or 1.

## 3 Analysis

A rule transcription error was discovered when EMC verified the set of approved rules with the coding change of MCE that is required for implementation. The error was found in the proposed formula D.18.3.6 of Appendix 6D of Chapter 6.

<sup>1</sup> Implementation was scheduled on 5 July 07. Implementation is deferred pending EMA approval of the correction

<sup>2</sup> Please refer to rule change paper No. EMC/RCP/30/2007/263

<sup>3</sup> Details of how the MIP-based constraints work are explained in Annex 1 of paper EMC/RCP/30/2007/263

## D.18.3.6 Generation Switch at Regulation Min

$$\text{Generation}_{g(l)} + \text{InfinitePositiveValue} \times \text{RegulationSegmentSelector}1_l \leq \text{RegulationMin}_{g(l)}$$

$$\{l \in \text{REGULATIONOFFERS}\}$$

This D.18.3.6 constraint corresponds with the constraint “MIP4 Generation Switch at Regulation Min” in Table 1, which is:

$$\text{Generation} - E * y_{\text{RegMin}} \leq \text{RegulationMin}$$

Thus, the correct formula should have been:

## D.18.3.6 Generation Switch at Regulation Min

$$\text{Generation}_{g(l)} - \text{InfinitePositiveValue} \times \text{RegulationSegmentSelector}1_l \leq \text{RegulationMin}_{g(l)}$$

$$\{l \in \text{REGULATIONOFFERS}\}$$

Note that the “+” after  $\text{Generation}_{g(l)}$  should have been “-” instead.

This error was made when transcribing the text of the proposed rules. Nonetheless, the prototype MCE was developed using the correct formula. Hence, all testings were conducted with a prototype MCE that is correctly specified. Therefore, every test result and impact analysis presented in rule change paper EMC/RCP/30/2007/263 remains valid.

#### 4 Conclusion

The proposed rule change merely corrects the rule transcription error described in section 3 and has no impact on the proposal.

#### 5. Recommendation

The RCP unanimously recommends that the EMC Board

- a) **support** the rule modification proposal as set out in Annex 1;
- b) **seek** the Authority’s approval for the rule modification proposal; and
- c) **recommend** that the rule modification proposal come into force one week after the date on which the approval of the Authority is published by the EMC.

Annex 1 Propose Rule Changes

Rules Approved by EMA on 13 March 2007	Proposed Rules (Deletion represented by strikethrough text and addition underlined.)	Remarks/ Comments
<p><b>CHAPTER 6</b></p> <p><b>APPENDIX D MARKET CLEARING FORMULATION</b></p> <p><b>SECTION A: DEFINITIONS</b></p>	<p><b>CHAPTER 6</b></p> <p><b>APPENDIX D MARKET CLEARING FORMULATION</b></p> <p><b>SECTION A: DEFINITIONS</b></p>	
<p><b>D.18 <u>REGULATION</u></b></p> <p>D.18.3.6 Generation Switch at Regulation Min</p> <p>Generation<sub>g(l)</sub> + InfinitePositiveValue × RegulationSegmentSelector1<sub>l</sub> ≤ RegulationMin<sub>g(l)</sub></p> <p style="text-align: right;">{l ∈ REGULATIONOFFERS}</p>	<p><b>D.18 <u>REGULATION</u></b></p> <p>D.18.3.6 Generation Switch at Regulation Min</p> <p><del>Generation<sub>g(l)</sub> + InfinitePositiveValue × RegulationSegmentSelector1<sub>l</sub> ≤ RegulationMin<sub>g(l)</sub></del></p> <p><u>Generation<sub>g(l)</sub> - InfinitePositiveValue × RegulationSegmentSelector1<sub>l</sub> ≤ RegulationMin<sub>g(l)</sub></u></p> <hr/> <p style="text-align: right;">{l ∈ REGULATIONOFFERS}</p>	