

**DETERMINATION OF THE MARKET SURVEILLANCE AND COMPLIANCE PANEL
MSCP/2014/D2**

Market Surveillance and Compliance Panel (“MSCP”)

Mr Thean Lip Ping, Chair

Mr Lee Keh Sai

Mr TPB Menon

Mr Philip Chua

Date of Determination

9 December 2014

Party

Energy Market Company Pte Ltd (“EMC”)

Subject

Failure of Energy Market Company to determine, release and publish short-term and real-time schedules on time on 20 July 2014

FACTS AND CIRCUMSTANCES

1. Energy Market Company Pte Ltd (“EMC”) submitted a self-report on 10 September 2014 that it did not determine, release and publish the short-term schedule (“STS”) and the real-time schedule (“RTS”) for period 29 on time on 20 July 2014, as required under the Singapore Electricity Market Rules (“market rules”).
2. On 20 July 2014, EMC found at 13:35hrs that there was a lack of computer processor (“CPU”) resources to process the STS and RTS for period 29. As a result, the STS was released and published late; the RTS was determined incorrectly and released and published late.
3. At 13:30hrs on 20 July 2014, EMC received a SMS alert on high CPU utilisation in the production Oracle database server. EMC responded immediately to the issue and started investigation.
4. EMC said its investigation between 13:30hrs and 13:35hrs revealed that there were high instances (about 30 to 40) of active database queries. These database queries were run to retrieve a specific report named “generation by generator type”. The database queries were attributed to two market participants (“MP”) who were using an automated download programme to retrieve the data. Under normal operating conditions, these database queries should complete within two minutes. However, the 30 to 40 active database queries from the two MPs took 40 minutes to process and consequently caused high CPU utilisation. This resulted in a lack of CPU resources to process mission critical STS and RTS database queries, hence causing:

- a. The STS for period 29 on 20 July 2014 to be released late to the Power System Operator (“PSO”) and published late on the NEMS trading website at 13:53hrs (instead of 13:35hrs or T+5 minutes as stated in the market rules); and
 - b. the RTS for period 29 on 20 July 2014 to be determined using an incorrect network status file (“NWStat file”), released late to the PSO and published late on the NEMS trading website at 14:01hrs (instead of 13:59:30hrs or T-30 seconds as stated in the market rules).
5. One of the MPs has an automated retry mechanism which will retry should the automated download programme fail. In this incident, the data was not downloaded within the normal time window (two minutes) and the retries were activated repeatedly. The multiple retries resulted in the accumulation of about 55 active database queries as observed at 13:55hrs.
6. At 13:55hrs, to prevent further delay to the critical rule bound processing, EMC decided to terminate these database queries to alleviate the high CPU utilisation in the Oracle database server. The two MPs were notified and arrangements were made to send the data to them at a later time. The CPU utilisation was normalised at 14:00hrs. The STS and RTS for period 30 were released in accordance with the market operations timetable, as provided in Appendix 6A.2 of Chapter 6 of the market rules.
7. The incident was effectively resolved at 14:00hrs on 20 July 2014.
8. On 20 July 2014, the Oracle server had changed its execution plan and used an execution plan which took 40 minutes instead of the usual two minutes. The longer processing time was because the execution plan used a data element called primary key (“PK”) which was changed in a project in May 2014. The PK uniquely defines each row in the Market Clearing Results and was changed to reduce the size of the data storage space. However, the database queries which used the PK to search for data were slow and inefficient. During the project-testing phase in May 2014, this anomaly was not present and there was no observation of bad performance of database queries till the incident on 20 July 2014.
9. As the RTS for period 29 on 20 July 2014 was not released to the PSO in accordance with the market rules, the PSO dispatched the generating units for the affected period based on the latest available STS (i.e. STS issued at period 28 on 20 July 2014).
10. The stipulated NWStat file to determine the RTS was unavailable as high CPU utilisation in the database server caused the NWStat file to require more time than usual to be loaded into the database. Hence, the RTS was determined using the previous approved dispatch run results.
11. EMC conducted a re-run using the intended NWStat file to establish the scheduling and pricing for the affected RTS for period 29 on 20 July 2014. There was no significant impact on the wholesale electricity market.
12. On 5 November 2014, the MSCP wrote to inform EMC that it considered EMC was prima facie in breach of sections 7.7.2A, 7.7.3, 9.2.1, 9.2.3 and 9.2.4 of Chapter 6 of the market rules and invited EMC to make written representations.
13. EMC replied on 12 November 2014 that this incident was not reasonably foreseeable. During the testing phase, EMC did not discern any issue which could have alerted it to any possibility of this incident. The first time that any issue had arisen was on 20 July 2014 itself.
14. EMC implemented a solution to prevent the recurrence of the issue on 30 October 2014, which was in line with the deadline stated in its self-report.

APPLICABLE MARKET RULES

15. Section 7.7.2A of Chapter 6 provides that

Not later than 25 minutes prior to the commencement of the first *dispatch period* of the *short-term schedule* referred to in section 7.4A, the *EMC* shall, for each *dispatch period* included in the *short-term schedule*:

7.7.2A.1 release to the *dispatch coordinator* for each *registered facility* the projected schedules for *energy*, *regulation* and *reserve*, by *reserve class*, for that *registered facility*;

7.7.2A.2 *publish* the information described in section 7.7.3; and

7.7.2A.3 communicate to the *PSO* the projected schedules for *energy*, *regulation* and *reserve*, by *reserve class*, for each *registered facility*, together with the information described in section 7.7.3, in accordance with the *system operation manual* and any applicable *market manual*.

16. Section 7.7.3 of Chapter 6 provides that

In accordance with sections 7.7.1, 7.7.2 and 7.7.2A, the *EMC* shall *publish* the following information for each *dispatch period* and for each *market outlook scenario*, *pre-dispatch schedule scenario* and *short-term schedule*:

7.7.3.1 the projected total *load*;

7.7.3.2 the projected transmission losses;

7.7.3.3 total *reserve* requirements by *reserve class*;

7.7.3.4 total *regulation* requirements;

7.7.3.5 projected *energy* prices associated with each *market network node* at which a *generation registered facility* or *generation settlement facility* is located, determined in accordance with sections D.24.1 and D.24.5 of Appendix 6D;

7.7.3.6 the projected *uniform Singapore energy price*, determined in accordance with section D.24.6 of Appendix 6D;

7.7.3.7 projected *reserve prices* for each *reserve class* and *reserve provider group*, determined in accordance with sections D.24.3, D.24.5 and D.24.7 of Appendix 6D;

7.7.3.8 projected *regulation prices*, determined in accordance with sections D.24.4 and D.24.5 of Appendix 6D;

7.7.3.9 any predicted system *energy* shortfalls;

7.7.3.10 any predicted system *reserve* shortfalls, by *reserve class*;

7.7.3.11 any predicted system *regulation* shortfalls; and

7.7.3.12 a list of *security constraints* and *generation fixing constraints* applied.

17. Section 9.2.1 of Chapter 6 provides that

The *EMC* shall, prior to the commencement of each *dispatch period* and in accordance with the *market operations timetable*, use the *market clearing engine* to determine for that *dispatch period*:

9.2.1.1 a *real-time dispatch schedule*, containing schedules of *energy, reserve* and *regulation* for *registered facilities*, to be released to the *PSO*, which in accordance with section 9.1.2 of Chapter 5 shall be deemed to constitute the *dispatch instructions* issued by the *PSO* to the applicable *dispatch coordinators* unless and until further *dispatch instructions* are issued by the *PSO* to a given *dispatch coordinator* pursuant to section 9.1.3 of Chapter 5; and

9.2.1.2 a *real-time pricing schedule* determined by the *market clearing engine* in accordance with section D.24 of Appendix 6D, including:

- a. *energy prices* for each *market network node*;
- b. the *uniform Singapore electricity price*;
- c. *reserve prices* for each *reserve class* and for each *reserve provider group*; and
- d. *regulation prices*.

18. Section 9.2.3 of Chapter 6 provides that

The *EMC* shall, in accordance with the *market operations timetable*, release to the *dispatch coordinator* for each *registered facility* a *real-time dispatch schedule* comprising that portion of the *real-time dispatch schedule* referred to in section 9.2.1.1 that describes the quantities of *energy, reserve* by *reserve class* and *regulation* scheduled in respect of that *registered facility*.

Explanatory Note: Participants will be sent the specific schedule quantities that pertain to them under section 9.2.3 and will be provided with the associated prices under section 9.2.4.

19. Section 9.2.4 of Chapter 6 provides that

The *EMC* shall, in accordance with the *market operations timetable*, *publish* the following information as it pertains to each *dispatch period*:

- 9.2.4.1 *total load*;
- 9.2.4.2 *total transmission losses*;
- 9.2.4.3 *total reserve requirements* by *reserve class*;
- 9.2.4.4 *total regulation requirements*;
- 9.2.4.5 *energy prices* associated with each *market network node* at which a *generation registered facility* or *generation settlement facility* is located, determined in accordance with sections D.24.1 and D.24.5 of Appendix 6D;
- 9.2.4.6 the *uniform Singapore energy price*, determined in accordance with section D.24.6 of Appendix 6D;

- 9.2.4.7 *reserve prices* for each *reserve class* and *reserve provider group*, determined in accordance with sections D.24.3, D.24.5 and D.24.7 of Appendix 6D;
 - 9.2.4.8 *regulation prices*, determined in accordance with sections D.24.4 and D.24.5 of Appendix 6D;
 - 9.2.4.9 any system *energy* shortfalls reported by the *market clearing engine*;
 - 9.2.4.10 any system *reserve* shortfalls, by *reserve class*, reported by the *market clearing engine*;
 - 9.2.4.11 any system *regulation* shortfalls reported by the *market clearing engine*; and
 - 9.2.4.12 a list of *security constraints* and *generation fixing constraints* applied.
20. Given that the PSO had dispatched the generating units for the affected period based on the latest available STS, financial impact is expected on generating units that were scheduled differently from the re-run schedule.

ENFORCEMENT

- 21. The MSCP determines on the basis of the facts referred to above that EMC breached sections 7.7.2A, 7.7.3, 9.2.1, 9.2.3 and 9.2.4 of Chapter 6 of the market rules.
- 22. This incident was self-reported and had no significant impact on the wholesale electricity markets. EMC has also taken remedial actions to rectify the problem.
- 23. The MSCP hereby issues a letter of non-compliance to EMC and directs EMC to pay costs, fixed at \$1,500.



Thean Lip Ping
Chair
Market Surveillance and Compliance Panel