National Electricity Market of Singapore

DETERMINATION OF THE MARKET SURVEILLANCE AND COMPLIANCE PANEL
MSCP/2019/D1

Market Surveillance and Compliance Panel
Mr T P B Menon, Chair
Mr Lee Keh Sai
Mr Philip Chua
Professor Euston Quah
Professor Walter Woon

Date of Determination
13 February 2019

Party
Energy Market Company Pte Ltd

Subject
Failure to determine, release and publish real-time dispatch schedule, short-term schedule and pre-dispatch schedule on 2 October 2018

FACTS AND CIRCUMSTANCES

1. Energy Market Company Pte Ltd ("EMC") submitted a self-report on 22 October 2018 that it did not release the following schedules to the Power System Operator ("PSO") on 2 October 2018, as required under the Singapore Electricity Market Rules ("Market Rules"):

    a. real-time dispatch schedule for periods 27 and 28;

    b. short-term schedule for periods 27 and 28; and

    c. pre-dispatch schedule for period 29.

2. From 12:00hrs to 12:16hrs on 2 October 2018, the average central processing unit ("CPU") utilisation of the National Electricity Market of Singapore ("NEMS") database was about 30 percent.

3. From 12:16hrs to 12:22hrs, there were 40 data service requests from an external market participant ("MP") system to EMC's system to download reports directly. The influx of requests within a short period caused the CPU utilisation to surge to 100 percent.

4. EMC submitted that the MP had previously approached EMC for assistance with such data extraction. EMC offered alternative offline download methods but did not receive further interest from the MP.

5. At 12:28hrs, EMC received an automated alert regarding the real-time dispatch run and started an investigation.

6. At 12:33hrs, EMC received alerts regarding the short-term forecast run.

7. At 12:36hrs, EMC received another alert – the CPU utilisation of the NEMS database was 100 percent as there were many connections from application servers to the NEMS database.

8. At 12:47hrs, EMC observed that the CPU utilisation remained at 100 percent but was unresponsive when EMC tried logging in to the NEMS database. The high availability management system[1] thus switched from the primary database to the standby database.

9. At 12:48hrs, the standby database was unavailable as well – the overwhelming load from the primary database prevented the standby database from starting up.

10. At 12:49hrs, EMC attempted to start up the primary database manually but was unsuccessful as the high availability management system was preoccupied with switching over to the standby database.

11. At 13:05hrs, EMC rebooted the primary and standby databases as a last resort.

12. At 13:25hrs, the primary database was restarted successfully. EMC informed MPs that the NEMS database was unavailable.

13. EMC did not inform MPs immediately upon receiving the first alert at 12:28hrs as EMC had to perform due diligence which included investigating the alerts and any potential impact, attempting to restore services, attending to calls received via EMC's helpdesk and carrying out checks to ensure that NEMS was functioning as required.

14. From 13:28hrs, all applications were progressively restarted. EMC also performed the necessary system checks and application sanity checks.

15. At 13:58hrs, EMC informed MPs that the NEMS system was available.

16. EMC did not determine, publish and send the schedules mentioned in paragraph 1 due to the unresponsive NEMS database.

17. EMC was required to conduct a price revision to establish the real-time prices for periods 27 and 28 on 2 October 2018. The revised prices were verified and finalised on 8 October 2018. Settlement was then based on the correct set of pricing and dispatch schedules. There was therefore no material financial impact on the wholesale electricity markets.

18. On 3 December 2018, the Market Surveillance and Compliance Panel ("MSCP") informed EMC that it considered EMC to be in prima facie breach of sections 7.4.1, 7.4A.1, 7.7.2, 7.7.2A, 9.2.1.1, 9.2.3 and 9.2.4 of Chapter 6 of the Market Rules on 2 October 2018 and invited EMC to make written representations before the MSCP makes a determination.

19. In its letter to EMC, the MSCP requested EMC to explain how the standby database was considered adequate as a backup if it was unable to cope with the load transfer from the primary database.

[1] The high availability management system manages the cluster service of two database servers (primary and standby). The system transfers load from the primary database server to the standby database server automatically if the former experiences an unrecoverable hardware failure or is deemed unreachable by the system.

20. On 14 December 2018, EMC submitted its written representations to the MSCP.

21. EMC submitted the following explanation regarding its primary and standby database servers:

    a. The primary and standby database servers are of the same make, capacity and configuration. This serves to address any unrecoverable hardware failure which the primary database server may encounter as the standby database server will be able to take over the functions and entire load of the primary database server.

    b. However, since the primary and standby database servers are identical, a scenario which overwhelms the primary database server is likely to overwhelm the standby database server.

    c. The design of the database servers does not cater for load sharing between the primary and standby database servers. A load balancing design requires a different NEMS infrastructure setup which would cost a few times more than the current design.

    d. The usual load on the primary database server, occasional load spikes and capacity growth rate were considered when designing the database servers in 2013. The design was deemed to be robust, given the expected load on the primary database server. EMC conducts a review on the database server every five years and has started the current review.

    e. The incident was triggered by an unexpected sustained load from an external MP system.

22. The MSCP also requested for an update on EMC's remedial actions.

23. EMC submitted the following updates on its remedial actions:

    a. On 18 October 2018, EMC reminded MPs via e-mail and the Market Systems User Group ("MSUG") forum[2] to avoid flooding EMC's systems and adhere to the terms and conditions stated in "Data Services Specification for Market Participant Applications" published on EMC's corporate website:

       The interconnection frequency for information retrieval shall be in reasonable manner to avoid flooding the EMC's systems unnecessarily. The frequency of information retrieval with same parameters shall not take place within the same second. Incessant triggering of information retrieval with the same parameters may slow down the systems and affect other Market Participants.

    b. EMC completed a review of its data services log from 3 October 2018 to 16 October 2018.

    c. EMC has started implementing an Application Programming Interface ("API") gateway solution to prevent any bulk report download from affecting critical functions of the NEMS system. Due to the complexity in code change, integration and testing, EMC targets to complete this by 31 July 2019.

24. EMC added the following points in its written representations to the MSCP:

[2] The MSUG forum is a bi-monthly event organised by EMC for invited MPs to share IT-related information and learn about the latest systems availability and incidents and updates on system enhancement.

a. The incident occurred due to unforeseen circumstances and an unexpected sustained load on the NEMS systems. This was notwithstanding EMC's best efforts at prevention.

b. EMC has since taken prompt steps to remind MPs of their obligations and will monitor its data services log monthly to identify any abnormal usage patterns. EMC is committed to prevent a recurrence and will continue to engage the relevant MPs in this regard, while implementing the API gateway.

c. EMC did not require a hearing before the MSCP.

APPLICABLE MARKET RULES

25. Section 7.4.1 of Chapter 6 provides that

The *EMC* shall, in accordance with section 7.6 and Appendix 6A, determine three *pre-dispatch schedule scenarios* corresponding to the *nodal load forecast* described in sections 7.2.1, adjusted where applicable under section 7.2.3.

26. Section 7.4A.1 of Chapter 6 provides that

The *EMC* shall, in accordance with section 7.6 and Appendix 6A, determine a *short-term schedule* corresponding to the *nodal load forecast* described in section 7.2.1.1.

27. Section 7.7.2 of Chapter 6 provides that

Not later than 15 minutes prior to the commencement of the first *dispatch period* of each of the three *pre-dispatch schedule scenarios* referred to in section 7.4.1, the *EMC* shall, for each *dispatch period* included in each of those three *pre-dispatch schedule scenarios*;

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

7.7.2.2 *publish* the information described in section 7.7.3; and

7.7.2.3 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*.

28. 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*.

29. Section 9.2.1.1 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*:

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.

30. 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*.

31. 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*;

9.2.4.1A total *load curtailment* of all *LRFs* with *REB*;

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;

9.2.4.6A the *load curtailment price*, determined in accordance with section D.24.10 of Appendix 6D;

9.2.4.6B the counterfactual *uniform Singapore energy price*, determined in accordance with sections D.24.8 and D.24.9 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*;

9.2.4.12 a list of *security constraints* and *generation fixing constraints* applied; and

9.2.4.13 the estimated hourly *energy* uplift rebate, determined in accordance with section D.25.1.13 of Appendix 6D.

ENFORCEMENT

32. The MSCP determined based on the facts referred to above that EMC had breached sections 7.4.1, 7.4A.1, 7.7.2, 7.7.2A, 9.2.1.1, 9.2.3 and 9.2.4 of Chapter 6 of the Market Rules on 2 October 2018.

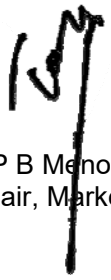
33. The incident was self-reported and did not have a significant impact on the wholesale electricity markets. EMC also offered alternative solutions to the relevant MP prior to the incident and took remedial actions following the incident.

34. The MSCP considers the failure to publish correct dispatch schedules to be inconsistent with an efficient market. Although the MSCP recognises that it might be difficult for EMC to compel MPs to comply with the data services usage guidelines, EMC has the duty as the market operator to ensure that operations in the NEMS are efficient.

35. EMC had committed a similar breach in July 2014.

36. The MSCP hereby imposes a financial penalty of $5,000 on EMC and directs EMC to pay costs fixed at $1,500.

37. The MSCP takes a serious view on any conduct by any market player which could potentially undermine the efficiency of the wholesale electricity markets. In this case, while there was no significant impact on the wholesale electricity markets, the incident could potentially distort price signals.



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