

**DETERMINATION OF THE MARKET SURVEILLANCE AND COMPLIANCE PANEL
MSCP/2013/D5**

Market Surveillance and Compliance Panel (“MSCP”)

Mr Thean Lip Ping, Chair
Professor Lim Chin
Mr Lee Keh Sai
Mr TPB Menon
Mr Philip Chua

Date of Determination

26 November 2013

Party

Keppel Merlimau Cogen (“KMC”)

Subject

Failure of Keppel Merlimau Cogen to Promptly Inform The Power System Operator of Plant Tripping on 1 May 2013

BACKGROUND FACTS

1. On 27 May 2013, the Power System Operator (“PSO”) submitted a referral to the Market Surveillance and Compliance Panel (“MSCP”), stating that Keppel Merlimau Cogen (“KMC”) might have breached the Singapore Electricity Market Rules (the “market rules”) and System Operation Manual (“SOM”) when KMC failed to promptly inform the PSO that its Combined Cycle Plant, KMC CCP3 had tripped on 1 May 2013 at 0120 hrs towards the end of period 3. As such, the PSO stated that “the power system was at high risk operating state from 0120 hrs to 0230 hrs without knowledge of the PSO and the other Market Participants”.

INVESTIGATION

PSO’s Referral

2. On 1 May 2013, at 0120 hrs, the PSO control centre staff noticed a dip in the system frequency to 49.85Hz, which was an indication that there was a generator tripping. While the control centre staff investigated the source of the disturbance, they were unable to pinpoint which generator had tripped or how much generation was lost.

3. At 0134 hrs, there was a telephone call from KMC control room operator to enquire if there was still reading from the output of KMC CCP3. The PSO responded that their Energy Management System (EMS) showed that the KMC CCP3 output was 309MW. Subsequently, at 0155 hrs, KMC called up again to inform the PSO that they were "bringing down" KMC CCP3. Between 0223 hrs to 0232 hrs, the PSO repeatedly asked KMC for the time of de-synchronisation of KMC CCP3, but KMC's response was that they were unable to establish the time of de-synchronisation as KMC CCP3 GT controllers "hanged" and were unable to send updated data to the PSO's EMS. It was only at 0938 hrs on 1 May 2013 that KMC faxed an outage request to take KMC CCP3 out of service from 0131 hrs to 1200 hrs on 1 May 2013.
4. While there was no change in the output reading of KMC CCP3 and the generator circuit breaker status, the PSO was subsequently able to identify that the system disturbance was due to the tripping of KMC CCP3 (at 309 MW) based on the trending of the outputs of all online generators at that time and other relevant data. PSO's gas consumption records showed that at 0120 hrs the gas consumption of KMC power station suddenly dropped. This gas reduction was equivalent to about 300MW of generation output reduction.
5. As KMC did not promptly report the tripping of KMC CCP3, despite several communications over the telephone between their control room staff with the PSO, the PSO was unable to pinpoint which generator tripped and how much generation was lost immediately and could not activate Contingency Reserve to replace energy and reserve lost as a result of the KMC CCP3 forced outage for the entire duration from 0120 hrs to 0230 hrs. As such, the PSO stated that the power system was at high-risk operating state from 0120 hrs to 0230 hrs without knowledge of the PSO and the other market participants.

Explanation by KMC

6. In responding to the PSO's referral, KMC stated that on "1st May 2013 at 0120 hrs, the KMC operator observed that KMC CCP3's Human-Machine Interface ("HMI") pages and controller systems hanged and went on to investigate the incident. It was found that a Gas Turbine protection was activated resulting in shutdown of KMC CCP3. As KMC CCP3 did not have a normal safe shutdown, the Operations' immediate focus was to ensure the safety of the plant equipment."
7. KMC did not immediately notify the PSO upon knowing the forced outage, as it was focusing on carrying out the rotor barring/turning gear to ensure the safety of the plant. KMC pointed that if rotor barring/turning gear had not been carried out promptly, the damage to the machine would be significant, and could result in prolonged outage of the KMC CCP3.
8. KMC stated that the Operations team at the time of outage was also not aware of the inaccuracy of the signal to the PSO, until the PSO's call at 0223 hrs.

RELEVANT MARKET RULES

9. Section 3.7.1.3 of Chapter 5 of the market rules provides that

3.7.1 Each *market participant* for a *generation facility* shall operate and maintain its facilities and equipment in a manner that is consistent with the *reliable* operation of the *PSO controlled system* and shall assist the *PSO* in the discharge of its responsibilities related to *reliability*. Such obligation shall include the following:

3.7.1.3 promptly informing the *PSO* of any change or anticipated change in the status of any *generation facility* in respect of which it is the *market participant* or any related equipment and that is under the *dispatch* control of the *PSO* as described in these *market rules*, or of any other change or anticipated change in its *generation facilities* or equipment that could have a material effect on the *reliability* of the *PSO controlled system*. Such change shall include any change in status that could affect the maximum output of a *generating unit*, the minimum load of a *generating unit*, the ability of a *generating unit* to operate with automatic voltage regulation or the availability of a *generating unit* to provide *contracted ancillary services*;

10. Sections 9.6.2 of Chapter 5 of the market rules provide that

9.6.2 A *dispatch coordinator* that expects its *registered facility* to operate in a manner that differs materially from the *dispatch instructions* issued to it shall so notify the *PSO* as soon as possible. The *PSO* shall *publish* in the *system operation manual* guidelines defining when a difference is material and how notice shall be provided for the purposes of sections 9.6.2 and 9.6.3.

11. Section 2.5.2 of Chapter 2 of the System Operation Manual provides that

Dispatch Coordinator of *Generation registered facilities* that intends to *synchronise* a *generating unit* to the *PSO Controlled Grid* must notify and obtain approval from the *PSO* (Appendix 2A) at least 30 minutes in advance of the intended synchronisation time, unless an *energy shortfall advisory notice* is in force, in which case the *generating unit* will be subject to the conditions of the *energy shortfall advisory notice*. A *generating unit* intending to *de-synchronise* shall follow the same process and notification shall be given to the *PSO* (Appendix 2B) at least 30 minutes prior to the intended de-synchronisation time.

Reports to the *PSO* shall also include event times, for example, *generating unit* that was synchronised or separated from the *PSO Controlled Grid*, *generating unit* that was unavailable while shut down, expected changes in real or reactive capability, planned periods of unavailability of equipment, expected return to service times from outage, status of automatic voltage regulators, etc.

Generation Licensee shall request authorisation from the *PSO* before operating its switch-house devices. If the *Transmission Licensee* operates all, or part of the switch-house, it shall together with the *Generation Licensee* request authorization from the *PSO* prior to operating the switch-house devices.

Dispatch Coordinator of Generation registered facilities connected to the *PSO Controlled Grid* shall report the following contingencies promptly and directly to the *PSO*:

- unscheduled step changes in a *generating unit's* output;
- derating in a *generating unit's* output;
- automatic removal from service of generation or *generation registered facilities*;
- degradation of auxiliary equipment that reduces *PSO Controlled Grid reliability* (e.g. primary protection systems, automatic voltage regulators, power system stabilisers, governors, etc);
- operation of power system auxiliaries such as primary protection systems;
- unavailability of any *generating unit* that have been scheduled to provide *reserve, regulation* or contracted ancillary services;
- fuel changeover of any *generating unit*.

12. Section 10.1 of Chapter 10 of the System Operation Manual provides that

The *PSO* shall report a compliance issue. A compliance issue can be either an event of non-compliance with the *PSO's* directions, *dispatch instructions* or a breach of the *Market Rules* especially with regard to operation of the *PSO controlled system*. When the *PSO* has detected an alleged non-compliance event, the *PSO* will: -

- a. notify the non-compliant party that an event of non-compliance has been observed;
- b. require the non-compliant party to explain the reason for the noncompliance; and
- c. request that the behaviour leading to the non-compliance be corrected.

Alternatively, if *transmission licensee*, any *generation licensee*, wholesaler (Generation) licensee or Interruptible Load Provider has become aware that the operation of its *transmission facilities, generation or load registered facilities* will deviate significantly from the directions or *dispatch instructions* issued by the *PSO*, the *transmission licensee, generation licensee, wholesaler (Generation) licensee or Interruptible Load Provider* shall promptly inform the *PSO*.

The *PSO* shall refer the non-compliance to the *market assessment unit* of the *EMC* and the *Market Surveillance and Compliance Panel*. In such case, the *PSO* will ensure that the *market assessment unit* and the *Market Surveillance and Compliance Panel* have full access to records, information or data in the possession or control of the *PSO*.

HEARING BEFORE THE MSCP

13. On 19 August 2013, the MSCP informed KMC of its prima facie breach and invited KMC to submit its written representation. On 2 September 2013, KMC submitted its written representation and requested for a hearing before the MSCP.
14. A hearing was conducted on 26 September 2013 during which KMC presented further material information on the events surrounding the tripping of KMC CCP3 and the failure of the HMI pages as well as the GT controllers.

SUMMARY OF KMC'S SUBMISSIONS

15. The relevant parts of KMC's representation, explanations and points presented in the written submission and the hearing may be summarised in these terms.

- (1) The forced outage of KMC CCP3 was due to unusual circumstances relating to the HMI pages and Gas Turbine control system hanging. It was only after the post-event investigation with Alstom - the plant manufacturer - that KMC had established that KMC CCP3 had tripped. This was the first time such plant abnormality occurred not just for KMC but in Alstom's worldwide fleet of GT26 gas turbines, and KMC Operations on duty took time to investigate.
- (2) KMC stated that they had kept the PSO informed of the plant abnormality at 0134 hrs. The KMC Operations would have needed some time to carry out preliminary fact-finding sufficiently to report on the incident and to ensure the safety of the plant equipment. They are of the view that the 14 minutes KMC took to inform PSO was prompt under the circumstances.
- (3) In response to the PSO's comments that a genset would automatically trip when its control system fails, KMC said that the Gas Turbine control system have redundancy such that the CCP unit will not trip when the gas turbine control system fails. KMC also added that when the Gas Turbine control system tripped, the CCP unit went into by-pass operations, which meant that the steam produced from the heat recovery steam generator went directly to the by-pass system, and there was no safety valves floating. This explains why there were no loud noises due to the steam escaping from the safety valve float.
- (4) When KMC Operations on duty first found out that KMC CCP3 HMI pages and Gas Turbine control system hanged at around 0120 hrs, KMC did not expect KMC CCP3 not to be able to comply with the dispatch instructions as the HMI screen was hanged. Hence, there was no revised offer variation submitted for period 4.
- (5) KMC also stated as the KMC CCP3 turbine hall is located approximately 75m away from the main building where the centralized control room is situated, the KMC CCP3 trip was not and would not be noticeable either by visual or reduction of engine noise.
- (6) KMC first became aware that KMC CCP3 HMI pages and Gas Turbine control system had hanged at around 0120 hrs. Given the time required for initial investigation, communication and preparation for offer variations, KMC was not able to submit offer variations for period 4 before its firm gate closure at 0125 hrs.
- (7) KMC management had taken the issue seriously and had instructed KMC Operations to promptly notify the PSO when abnormal conditions of KMC CCP units occurred. Following this incident, KMC CCP3 had tripped on 13 July at 2244 hrs and KMC CCP4 had tripped on 16 July at 2320 hrs, due to the same Gas Turbine controller failure. In both cases, KMC Operations had promptly notified PSO.

DETERMINATION

16. The tripping of KMC CCP3 occurred at 0120 hrs. Given that the control room is 75m away from the plant and the KMC Operations team only realized that KMC CCP3 had tripped after 0200 hrs, the MSCP finds that the KMC operators should have made serious efforts to verify the physical status of KMC CCP3.
17. While KMC had communicated with the PSO during the incident, the status updates had not been satisfactorily clear or specific. It is not in keeping with the spirit of the market rules to claim that KMC "must be aware of the change in status of KMC CCP3" before promptly reporting to the PSO. The MSCP considers the onus to be on KMC to be constantly aware of the physical status of its equipment.
18. KMC stated that on discovering that KMC CCP3 HMI pages and Gas Turbine control system had hanged at around 0120 hrs, it did not expect KMC CCP3 not to be able to comply with dispatch instructions. This does not appear to be a reasonable conclusion to make when it does not have visibility of the physical status of the machine.
19. KMC explained that given that the trip had occurred at 0120 hrs, the KMC engineers needed time to investigate and were only able to inform the traders at 0141 hrs, therefore the traders were unable to make offer variations for period 4, as the firm gate closure was at 0125 hrs. In view of the circumstances, the MSCP finds that it is reasonable that KMC may not have sufficient time to prepare and submit offer variations for period 4.
20. Based on the information before the MSCP, it determines that KMC breached:
 - 1) Section 3.7.1.3, chapter 5 of the Singapore Electricity Market Rules / Section 2.5.2, Chapter 2 of the System Operation Manual; and
 - 2) Section 9.6.2, Chapter 5 of the Singapore Electricity Market Rules / Section 10.1, Chapter 10 of the System Operation Manual.
21. Consequently, the MSCP wrote to KMC on 4 October 2013, informing KMC of the breach, and invited KMC to make any further written representation before the MSCP decided on the quantum of financial penalty.
22. KMC responded to the MSCP on 18 October 2013.

IMPACT OF BREACH ON THE WHOLESALE ELECTRICITY MARKET

23. With KMC's failure to report the tripping of KMC CCP3 promptly to the PSO, the PSO stated that they were "unable to pinpoint which generator tripped and how much generation was lost immediately and could not activate Contingency Reserve to replace energy and reserve lost as a result of the KMC CCP3 forced outage for the entire duration from 0120 hrs to 0230 hrs."
24. The PSO also added that, the "shortfall were actually met by reserves scheduled by the MCE from other GRFs, i.e. the amount of reserves provided then and unknown to the PSO were actually less than what were scheduled by the MCE, which placed the system at High-Risk Operating State". By not promptly informing the PSO of KMC CCP3 tripping, KMC had compromised system security as the PSO and the other MPs were unaware of the unavailability of KMC CCP3.

MITIGATING FACTORS

25. The MSCP now turn to the mitigating factors submitted by KMC and explanations of its actions given the conditions prevailing at the time of the rule breach. The MSCP considers the following mitigating factors to be admissible:

- The failure of the HMI pages and Gas Turbine control system was unprecedented, resulting in KMC Operations taking a longer time than usual to detect the problem.
- KMC management had taken this issue seriously and had instructed KMC Operations to promptly notify when abnormal conditions of KMC CCP units occurred. This was observed in the two subsequent incidents, in which KMC Operations had promptly notified the PSO.
- KMC also claimed that it has reviewed its operations and will increase the number of staff in each shift in the next year, where appropriate. Experienced staff involved in commissioning of the plant would be put on the roster on shift to provide additional guidance and knowledge sharing to KMC Operations.

FINANCIAL PENALTY

26. Under the circumstances, the MSCP takes a serious view of KMC's breach for its potential impact on system security. Taking into consideration mitigating factors, the MSCP hereby imposes a financial penalty of \$20,000 on KMC pursuant to section 7.2.8.5 of Chapter 3 of the market rules, and directs KMC to pay cost, fixed at \$6,125. The total sum of \$26,125 is to be paid forthwith.

Thean Lip Ping

L P Thean

Lim Chin

Chin

Lee Keh Sai

Lee Keh Sai

TPB Menon

TPB Menon

Philip Chua

Philip Chua