Singapore Electricity Market Rules

Chapter 5
System Operation

Energy Market Authority

1 January-April 2022
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1 PURPOSES, INTERPRETATION AND GENERAL PRINCIPLES

1.1 PURPOSES OF CHAPTER AND INTERPRETATION

1.1.1 This Chapter of the market rules sets forth:

1.1.1.1 rules governing maintenance of the reliability of the power system;

1.1.1.2 rules governing the secure operation of the transmission system and the operation of registered facilities;

1.1.1.3 the conditions under which the PSO shall have authority to intervene in the wholesale electricity markets and issue directions to market participants so as to maintain the reliability of the PSO controlled system and of electricity service;

1.1.1.4 the procedures to be used by the PSO, including the issuance of directions and demand control, in the event of an emergency or an emergency operating state;

1.1.1.5 the minimum requirements for communications and the exchange of information between the EMC, the PSO and market participants relating to the reliability of the PSO controlled system;

1.1.1.6 the PSO's forecasting and reporting obligations associated with its responsibility for maintaining the reliability of the PSO controlled system;

1.1.1.7 the responsibilities of the PSO and of market participants in coordinating the outage of facilities; and

1.1.1.8 the responsibilities of the PSO and market participants in respect of the dispatch process.

1.1.2 For the purposes of this Chapter, “maintaining” reliability or security shall include re-establishing or restoring reliability or security and “maintain” and “maintenance” shall be interpreted accordingly.

1.1.3 In the event of a contradiction or inconsistency between the provisions of this Chapter and any other provision of the market rules, the provisions of this Chapter shall govern to the extent of the contradiction or
inconsistency. In performing any function, power, or duty under the market rules, the PSO, the EMC and market participants shall have due regard to and, when necessary to ensure the reliability of the power system, give precedence to, the provisions of this Chapter.

1.2 **GENERAL PRINCIPLES**

1.2.1 To the fullest extent possible consistent with maintaining the reliability of the PSO controlled system, the PSO shall apply the market rules relating to reliability so as to minimise the PSO's intervention into the operation of the wholesale electricity markets. However, maintaining the reliability of the PSO controlled system shall be considered of paramount importance under these market rules, and the PSO shall have authority to intervene in the wholesale electricity markets to the extent necessary to maintain the reliability of the PSO controlled system.

1.2.2 In all cases where the PSO takes action under this Chapter, it shall attempt to co-ordinate its actions with affected market participants and, if affected, the EMC, unless, in the PSO's opinion, conditions dictate the need for immediate action.

1.2.3 Nothing in this Chapter is intended to prevent market participants from acting to protect their assets or the environment from substantial physical damage or to protect the safety of their employees or the public, provided that any such actions that may affect the reliability of the PSO controlled system are co-ordinated with the EMC and the PSO to the fullest extent practicable and are, in any event, reported or notified to the EMC or the PSO where required by these market rules to be so reported or notified.

1.2.4 Section 7.5 of Chapter 1 does not apply to this Chapter and any action or event that is required to occur on or by a stipulated time or day under this Chapter, or under a direction, instruction or order of the PSO issued pursuant to this Chapter, shall occur on or by that time, whether or not a business hour, or on or by that day, whether or not a business day, unless otherwise specified in this Chapter.

1.2.5 Unless a direction, instruction or order of the PSO provides otherwise, wherever this Chapter specifies that an action is to be taken "promptly" or "immediately", such action shall be taken as soon as possible after receiving the direction, instruction or order from the PSO or after becoming aware that an action is to be taken or is required not to be taken, but in any event action shall be commenced to be taken within five minutes and shall be continually progressed in an expeditious manner and sustained for so long as may be required, subject only to delay necessitated by concerns for the safety of employees or the public or the prevention of substantial damage to equipment or the environment.
Where such delay occurs, the *market participant* shall promptly report such delay to the *PSO* and shall provide justification and reasons for the delay.
2 OPERATING STATES

Explanatory Note: The normal, high-risk, and emergency operating states described here serve to delineate conditions under which the PSO can exercise different powers to respond to those conditions. The term “emergency operating state” does not relate to an “emergency” as defined in the Act.

2.1 NORMAL OPERATING STATE

2.1.1 The PSO controlled system shall be considered as being in a normal operating state when:

2.1.1.1 the voltage magnitudes at all energised busbars at any switchhouse or substation of the PSO controlled system are within the security limits established by the PSO under section 5.2 or, in the case of the PSO controlled grid, set forth in the applicable operating agreement, and are not inconsistent with the limits described in section B.2 of Appendix 5B;

2.1.1.2 the MVA flows on all PSO controlled grid and generation facilities are within the security limits established by the PSO under section 5.2 or, in the case of PSO controlled grid, set forth in the applicable operating agreement;

2.1.1.3 all other electric plant forming part of, or having or likely to have a material impact on the operation of, the PSO controlled system is being operated within any equipment limits and security limits established by the PSO under section 5.2 or, in the case of other electric plant forming part of the PSO controlled grid, set forth in the applicable operating agreement;

2.1.1.4 the configuration of the PSO controlled system is such that the severity of any potential fault is within the capability of circuit breakers to disconnect the faulted circuit or equipment;

2.1.1.5 all interties having or likely to have a material impact on the operation of the PSO controlled system are being operated within the equipment ratings that are jointly established by the EMC, the PSO and the transmission licensee;

2.1.1.6 the frequency at all energised busbars of the PSO controlled system is within the normal operating frequency band described in Section B.1 of Appendix 5B;
2.1.7 the levels of reserve, regulation and other ancillary services being provided meet the requirements established by the PSO pursuant to section 4; and

2.1.8 conditions on the PSO controlled system are secure in accordance with the requirements set forth in section 5.

2.2 HIGH-RISK OPERATING STATE

2.2.1 The PSO controlled system shall be considered to be in a high-risk operating state when the observance of security limits applicable under a normal operating state will expose the PSO controlled system to a significantly higher than normal probability of one or more contingency events and associated consequences, or of a condition that may lead to, but is not yet, an emergency operating state. The system operation manual shall specify the conditions under which the PSO controlled system may be considered as entering into or exiting a high-risk operating state.

2.2.2 The PSO shall not take any action that it considers will be likely to lead to a high-risk operating state.

2.2.3 The PSO shall promptly inform market participants in accordance with the system operation manual when a high-risk operating state is anticipated or has been declared, and when it ceases to exist or to be anticipated.

2.2.4 During a high-risk operating state, the PSO shall have the authority to modify security limits as necessary to manage conditions on the PSO controlled system, and to take such other action or refrain from taking such other action consistent with good utility practice as may be required and with as little disruption to electricity supply or adverse impact on the operation of the wholesale electricity markets as is reasonably practicable in the circumstances.

Explanatory Note – The purpose of a high risk operation state is to provide warning to the market that it needs to take steps to avoid an emergency. In this state the PSO can take steps to relax some security limits, but it is not the intent that the PSO interfere with the normal operation of the market so as to return the system to a normal operating state. Rather, market participants should take such steps as are required to return the system to a normal operating state. If the market fails to achieve this result, with the system entering an emergency operating state, then the PSO can then take more direct action.
2.3 **EMERGENCY OPERATING STATE**

2.3.1 The PSO controlled system shall be considered as being in an *emergency operating state* when observance of *security limits* applicable under a *normal operating state* will require or be reasonably likely to require curtailment of *non-dispatchable load*.

2.3.2 The PSO shall not take any action that it considers will be likely to lead to an *emergency operating state*.

2.3.3 The PSO shall promptly inform *market participants* in accordance with the *system operation manual* when an *emergency operating state* is anticipated or has been declared, when it ceases to exist or to be anticipated and, where applicable, the *energy, reserve or regulation shortfall* relating to the *emergency operating state*.

2.3.4 During an *emergency operating state*, the PSO shall have the authority to modify *security limits* as necessary to manage conditions on the *PSO controlled system*, and to take such other action or refrain from taking such other action consistent with good utility practice as may be required to restore the *power system* to a *normal operating state* and with as little disruption to *electricity supply* or adverse impact on the operation of the *wholesale electricity markets* as is reasonably practicable in the circumstances.
3 OBLIGATIONS AND RESPONSIBILITIES

3.1 OBJECTIVES

3.1.1 This section 3 sets forth the responsibilities, obligations and authorities of the PSO, the EMC and each market participant in order to maintain the reliability of the PSO controlled system.

3.2 OBLIGATIONS OF THE PSO

3.2.1 The PSO shall direct the operations and maintain the reliability of the PSO controlled system and arrange for the secure operation of the PSO controlled grid. The PSO's responsibilities in this regard shall include:

3.2.1.1 monitoring generation facilities, load facilities and PSO controlled grid as required by these market rules and, in the case of PSO controlled grid, as may be required under the terms of any applicable operating agreement;

3.2.1.2 issuing orders, directions or instructions to dispatch generation facilities and load facilities generation registered facilities, import registered facilities and load registered facilities in accordance with these market rules;

3.2.1.3 directing the operations of the PSO controlled grid in accordance with these market rules and any applicable operating agreement; and

3.2.1.4 determining standards, ratings and requirements as set out in these market rules.

3.2.1.5 assessments of the future adequacy and security of the PSO controlled system.

3.2.2 The PSO shall carry out its obligations under this Chapter in accordance with all applicable reliability standards.

3.3 RELIABILITY-RELATED INFORMATION

3.3.1 The PSO shall, prior to the market commencement date, include in the system operation manual a list of the categories of reliability-related information that it shall make available to market participants, the time periods within which such information will be provided, and the manner in which such information will be provided. Such information shall include information designed to:
3.3.1.1 enable the EMC and market participants to initiate procedures to mitigate any risks that could arise from any action taken by the PSO to maintain the reliability of the PSO controlled system;

3.3.1.2 assist the EMC and market participants in meeting their obligations under this Chapter; and

3.3.1.3 notify the EMC and market participants of any operating changes or decisions that may have an impact on their respective operations, facilities or equipment.

3.3.2 The PSO shall, prior to the market commencement date, include in the system operation manual a catalogue of the reliability-related information that the PSO shall require be provided to it by market participants, the time periods within which such information will be provided, the manner in which such information will be provided and the initial monitoring indices that the PSO shall use in evaluating the information so provided. Market participants shall provide the PSO with the information referred to in this section 3.3.2 within the time specified in and in the manner required by the system operation manual.

3.3.3 Subject to the provisions of section 6 of Chapter 3, the PSO shall, if requested to do so by a market participant but subject to such constraints as may exist on the resources of the PSO, provide to that market participant reliability-related information not contained in the list referred to in section 3.3.1 provided that the PSO shall not provide any information that, in the EMC's opinion, would provide the requesting market participant with an undue preference in the wholesale electricity markets. In order to prevent any such undue preference, the PSO may provide all market participants with notice of the request prior to providing such information and may make the information requested by a market participant simultaneously available to all market participants. Where the provision of information pursuant to this section 3.3.3 imposes a significant burden or expense on the PSO, the information may be provided on payment of a reasonable fee.

3.4 OBLIGATIONS OF THE EMC

3.4.1 In carrying out its obligations under these market rules, the EMC shall act in accordance with any and all advice, requirements and instructions issued in accordance with the system operation manual or any market manual by the PSO to the EMC with respect to maintaining the reliability of the PSO controlled system.

3.4.2 In carrying out its obligations under this Chapter 5 and Chapter 6, the EMC shall utilise any and all current standing capability data and
dispatch related data communicated to it by the PSO in accordance with these market rules, the system operation manual or any market manual.

3.5 **OBLIGATIONS OF THE TRANSMISSION LICENSEE**

3.5.1 The transmission licensee shall operate and maintain all transmission facilities and equipment, including energising, de-energising, connecting, disconnecting, opening and closing equipment connected to the transmission system and raising and lowering transformer taps, in a manner that is consistent with the reliable operation of the power system and with any applicable operating agreement, and shall assist the PSO in the discharge of its responsibilities relating to reliability. Such obligation shall include the following:

3.5.1.1 ensuring that systems and procedures for automatic under-frequency load shedding in emergencies are provided for as specified in section 10;

3.5.1.2 arranging and providing controls, monitoring and secure communication systems to facilitate and carry out a manually initiated, rotational load shedding and restoration process in order to assist the PSO in the management of a prolonged, major shortage of electrical supply or an extreme disruption to or emergency on the power system;

3.5.1.3 providing the PSO with functional descriptions, equipment ratings and operating restrictions for its equipment, in such form as may be specified in the system operation manual;

3.5.1.4 promptly informing the PSO of any change or anticipated change in the status of its PSO controlled grid and of any other change or anticipated change in its PSO controlled grid that could have a material effect on the reliability of the PSO controlled system;

3.5.1.5 promptly complying with the PSO's directions, including directions to disconnect equipment from the PSO controlled grid for reliability purposes, unless the transmission licensee reasonably believes that following the PSO's direction poses a real and substantial risk of substantial damage to its equipment, to the safety of its employees or the public, or of substantial damage to the environment. In all cases where the transmission licensee does not intend to follow the PSO's directions for any such reasons, it shall promptly notify the PSO of this fact and shall nonetheless comply with the PSO's directions to the fullest extent possible without causing the harms described in this section 3.5.1.5;
3.5.1.6 permitting and participating in any commissioning, inspection, or testing that the PSO requires of equipment that is or is to be connected to the PSO controlled grid, including remote monitoring and control facilities and wired and wireless communication facilities; and

3.5.1.7 providing to the PSO within the time specified in the system operation manual, a report describing any modification proposed to be made to protection on a primary relay, and obtaining the approval of the PSO prior to implementing the proposed modification or, where the modification is effected on an unplanned, emergency basis, reporting the modification to the PSO as soon as practicable.

3.5.2 Each transmission licensee shall carry out its obligations under this Chapter in accordance with all applicable reliability standards.

3.5.3 The transmission licensee shall, no later than 2:00 p.m. on the last business day of every week, or more frequently if requested by the PSO, provide to the PSO the timing and duration of any outage, closure, test or other similar operational event in respect of any load facility that:

3.5.3.1 has been specifically designated by the PSO for inclusion in the preparation of any of the PSO’s forecasts and assessments pursuant to section 6; and

3.5.3.2 that is scheduled to commence or occur in the immediately succeeding four weeks, or during such longer period as may be requested by the PSO.

3.6 OBLIGATIONS OF WHOLESALE CUSTOMERS

3.6.1 Each market participant for a load facility that is connected to the transmission system 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 relating to reliability. Such obligation shall include the following:

3.6.1.1 promptly informing the PSO of any change or anticipated change in the status of any of the market participant’s load facilities or any related equipment 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 load facilities or equipment that could have a material effect on the reliability of the PSO controlled system;
3.6.1.2 promptly complying with the PSO's directions, including directions to disconnect equipment from the transmission system for reliability purposes, unless the market participant reasonably believes that following the PSO's direction poses a real and substantial risk of substantial damage to its equipment, to the safety of its employees or the public, or of substantial damage to the environment. In all cases where the market participant does not intend to follow the PSO's directions for any such reasons, it shall promptly notify the PSO of this fact and shall nonetheless comply with the PSO's directions to the fullest extent possible without causing the harms described in this section 3.6.1.2;

3.6.1.3 providing to the PSO, no later than 2:00 pm on the last business day of every second week, or more frequently if requested by the PSO, the timing and duration of any outage, closure, test or other similar operational event in respect of any load facility that it operates that:

a. has been specifically designated by the PSO for inclusion in the preparation of any of the PSO’s forecasts and assessments pursuant to section 6; and

b. scheduled to commence or occur in the immediately succeeding four weeks, or during such longer period as may be requested by the PSO; and

3.6.1.4 providing to the PSO within the time specified in the system operation manual, a report describing any modification proposed to be made to protection on a primary relay, and obtaining the approval of the PSO prior to implementing the proposed modification or, where the modification is effected on an unplanned, emergency basis, reporting the modification to the PSO as soon as practicable.

3.6.2 Each market participant for a load facility that is connected to the transmission system shall carry out its obligations under this Chapter in accordance with all applicable reliability standards.

3.6.3 If an LRF with REB that is issued a dispatch instruction for energy deviates, in the manner and to the extent described in section E.3.1 of Appendix 5E, from its real-time dispatch schedule which is deemed to be or is otherwise issued as the dispatch instructions issued by the PSO, such LRF with REB shall be deemed to be a deviating load registered facility unless the deviation occurred in respect of dispatch period(s) where:
3.6.3.1 Such LRF with REB had been issued dispatch instructions to deviate from its aforesaid real-time dispatch schedule (as notified by the PSO under section 9.1.6B);

3.6.3.2 Section 9.3.5 applies to such LRF with REB (as notified by the PSO under section 9.3.6); or

3.6.3.3 Section 9.3.5 applies to such LRF with REB in the immediately preceding dispatch period (as notified by the PSO under section 9.3.6).

The automatic financial penalty scheme described in Appendix 5E shall apply to the market participant of such deviating load registered facility.

3.6.4 For the avoidance of doubt, financial penalties applied under the automatic financial penalty scheme described in Appendix 5E shall not prejudice or derogate from the market surveillance and compliance panel's powers, including the imposition of any other or additional sanctions or enforcement actions, under section 7 of Chapter 3.

3.6.5 Section 9.6.3 shall not exempt a market participant of an LRF with REB from compliance with a dispatch instruction for energy on the ground that compliance with the dispatch instruction would substantially damage equipment.

3.7 Obligations of Generators

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 and related responsibilities specified under this section 3.7.1. Such obligation shall include the following:

3.7.1.1 Arranging and providing controls, monitoring and secure communication systems to facilitate and carry out a manually initiated restoration process in order to assist the PSO in the management of a prolonged, major shortage of electrical supply or an extreme disruption to or emergency on the PSO controlled system;

3.7.1.2 Providing the PSO, in such form as may be agreed with the PSO, with functional descriptions, equipment ratings and operating restrictions for its equipment, as required by the PSO to reliably operate the PSO controlled system;

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;

3.7.1.4 providing the PSO with current information showing the maximum unit capabilities of each of its generating units to facilitate dispatch when the PSO controlled system is in an emergency operating state. Such maximum unit capabilities shall consist of the maximum physical rating of the generating unit and shall not be limited to the unit capabilities implied by any offers submitted on behalf of such generating unit, or to standing capability data, pursuant to Chapter 6;

3.7.1.5 promptly complying with the PSO's directions, including directions to disconnect equipment from the PSO controlled system for reliability purposes, unless the market participant reasonably believes that following the PSO's direction poses a real and substantial risk of substantial damage to its equipment, to the safety of its employees or the public, or of substantial damage to the environment. In all cases where the market participant does not intend to follow the PSO's directions for any such reasons, it shall promptly notify the PSO of this fact and shall nonetheless comply with the PSO's directions to the fullest extent possible without causing the harms described in this section 3.7.1.5;

3.7.1.6 providing to the PSO within the time specified in the system operation manual, a report describing any modification proposed to be made to protection on a primary relay, and obtaining the approval of the PSO prior to implementing the proposed modification or, where the modification is effected on an unplanned, emergency basis, reporting the modification to the PSO as soon as practicable; and
3.7.1.7 promptly complying with the PSO’s directions issued under Chapter 9, section 9.6.4(ii) of the System Operation Manual, and any further directions issued by the PSO relating to (a) the fuel to be used by the generation facility, (b) the relevant market participant’s contractual agreements for and in relation to the purchase and use of fuel by the generation facility, and (c) the associated energy offers deemed necessary by the PSO to prevent inefficient market outcomes arising from the PSO’s directions issued under Chapter 9, section 9.6.4(ii) of the System Operation Manual.

3.7.2 Each market participant for a generation facility shall carry out its obligations under this Chapter in accordance with all applicable reliability standards.

3.7.3 If a generation registered facility deviates, in the manner and to the extent described in section D.3.1 of Appendix 5D, from its real-time dispatch schedule or its short-term schedule (as the case may be) which is deemed to be or is otherwise issued as the dispatch instructions issued by the PSO, such generation registered facility shall be deemed to be a deviating generation registered facility unless the deviation occurred in respect of dispatch period(s) where the generation registered facility:

3.7.3.1 was at all relevant times operating under AGC;

3.7.3.2 had been issued dispatch instructions to deviate from its aforesaid real-time dispatch schedule or short-term schedule (as the case may be), and such dispatch instructions in respect of the generation registered facility were complied with;

3.7.3.3 was undergoing re-commissioning test(s) which had been approved by the PSO;

3.7.3.4 experienced a forced outage, which caused the generation registered facility to automatically disconnect from the transmission system;

3.7.3.5 had experienced a forced outage in the immediately preceding dispatch period, which caused the generation registered facility to automatically disconnect from the transmission system in that immediately preceding dispatch period;

3.7.3.6 was being start-up or shut-down in accordance with its aforesaid real-time dispatch schedule or short-term schedule (as the case may be);

3.7.3.7 was performing a fuel changeover as required under the transmission code; or
3.7.3.8 was on free governor control and responding positively to a power system disturbance.

The automatic financial penalty scheme described in Appendix 5D shall apply to the market participant of such deviating generation registered facility.

3.7.4 For the avoidance of doubt, financial penalties applied under the automatic financial penalty scheme described in Appendix 5D shall not prejudice or derogate from the market surveillance and compliance panel’s power, including the imposition of any other or additional sanctions or enforcement actions, under section 7 of Chapter 3.

3.7.5 For the avoidance of doubt, section 3.7.3 and Appendix 5D shall not apply to a generation settlement facility, an import registered facility or a commissioning generation facility.

Explanatory Note: A generation settlement facility is not subject to dispatch, that is, no dispatch schedules are produced for and no dispatch instructions are issued to a generation settlement facility. Accordingly, the automatic financial penalty scheme does not apply to generation settlement facilities. The automatic financial penalty scheme will also not apply to import registered facilities or commissioning generation facilities.

### 3.8 OBLIGATIONS OF IMPORTER LICENSEES

3.8.1 Each market participant for an import registered 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:

3.8.1.1 arranging and providing controls, monitoring and secure communication systems to facilitate and carry out a manually initiated restoration process in order to assist the PSO in the management of a prolonged, major shortage of electrical supply or an extreme disruption to or emergency on the PSO controlled system;

3.8.1.2 providing the PSO, in such form as may be agreed with the PSO, with functional descriptions, equipment ratings and operating restrictions for its equipment, as required by the PSO to reliably operate the PSO controlled system;

3.8.1.3 promptly informing the PSO of any change or anticipated change in the status of its import registered 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 import registered facility 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 an import registered facility or the availability of the connecting interties;

3.8.1.4 providing the PSO with current information showing its maximum import capabilities to facilitate dispatch when the PSO controlled system is in an emergency operating state. Such maximum import capabilities will relate to the physical ratings of the interties and shall not be limited to the capabilities implied by any offers submitted on behalf of its import registered facilities, or to standing capability data, pursuant to Chapter 6;

3.8.1.5 promptly complying with the PSO's directions, including directions to disconnect equipment from the PSO controlled system for reliability purposes, unless the market participant reasonably believes that following the PSO's direction poses a real and substantial risk of substantial damage to its equipment, to the safety of its employees or the public, or of substantial damage to the environment. In all cases where the market participant does not intend to follow the PSO's directions for any such reasons, it shall promptly notify the PSO of this fact and shall nonetheless comply with the PSO's directions to the fullest extent possible without causing the harms described in this section 3.8.1.5;

3.8.1.6 providing to the PSO within the time specified in the system operation manual, a report describing any modification proposed to be made to protection on a primary relay, and obtaining the approval of the PSO prior to implementing the proposed modification or, where the modification is effected on an unplanned, emergency basis, reporting the modification to the PSO as soon as practicable; and

3.8.1.7 ensuring that the minimum quantity of energy as may be established by the Authority for each import registered facility must be scheduled in accordance with section 3.8.3, unless:

a. the import registered facility or any part of the interties connecting the import registered facility to the transmission system is on planned outage or forced outage; or

b. the import registered facility has been ordered, directed or instructed by the PSO to be scheduled at a different level.
3.8.2 The Authority shall notify the EMC of the minimum scheduled quantity of energy for each import registered facility when such quantity is established by the Authority.

3.8.3 The scheduled quantity of energy for any import registered facility shall comply with the formula set out in section 3.8.4 for every hour. The EMC shall report any breach of the foregoing requirement to the market surveillance and compliance panel for investigation.

3.8.4 The formula referred to in section 3.8.3 above is as follows:

\[ \text{Scheduled Quantity} \geq \text{Minimum Scheduled Quantity} \]

where:

| \( N \) | the number of dispatch periods in an hour; |
| \( i \) | a dispatch period in an hour; |

Scheduled Quantity = the scheduled quantity of energy (in MW) for a dispatch period, as scheduled in the real-time dispatch schedule if such real-time dispatch schedule is released to the dispatch coordinator of the import registered facility on time, in accordance with the market operations timetable, or, if such real-time dispatch schedule is not released on time as aforesaid, as scheduled in the short-term schedule that is issued as dispatch instructions for that dispatch period; and

Minimum Scheduled Quantity = the minimum scheduled quantity of energy (in MWh) in an hour for an import registered facility as notified by the Authority in accordance with section 3.8.2.

3.8.5 Each market participant for an import registered facility shall carry out its obligations under this Chapter in accordance with all applicable reliability standards.
4 ANCILLARY SERVICES

4.1 PURPOSE

4.1.1 This section 4 sets forth the requirements relating to the availability of sufficient ancillary services for dispatch so that the PSO can maintain the reliability of the PSO controlled system.

4.2 STANDARDS FOR ANCILLARY SERVICES

4.2.1 The requirements for ancillary services shall be determined by the PSO based on all applicable reliability standards and actual and expected conditions on the PSO controlled system. Requirements for ancillary services may be adjusted from time to time by the PSO to take into account factors including variations in power system conditions, real-time dispatch constraints, contingency events, the prevailing risk or vulnerability level of the PSO controlled system and the results of assessments of the voltage and dynamic stability of the PSO controlled system.

4.2.2 The EMC shall operate the real-time markets to ensure that sufficient ancillary services, other than contracted ancillary services, are available to satisfy the requirements for such ancillary services set by the PSO pursuant to section 4.2.1.

4.2.3 Contracted ancillary services shall be procured by the EMC, on behalf of the PSO, in accordance with section 8.

4.3 GENERIC PERFORMANCE REQUIREMENTS FOR ANCILLARY SERVICES

4.3.1 Ancillary services may be provided to the PSO and the EMC only by registered facilities.

4.3.2 The EMC shall not enter into a contract with a prospective ancillary service provider to provide a contracted ancillary service unless the facilities and procedures of such prospective ancillary service provider meet the requirements for registration as a registered facility in respect of the ancillary service to be provided and are otherwise in compliance with the requirements of this Chapter.

4.3.3 In order to make the determination referred to in section 4.3.2, the PSO, acting on behalf of the EMC, may require each prospective ancillary
service provider to demonstrate through physical tests or other appropriate means specified by the PSO that the registered facilities or equipment that will be used to provide the ancillary service meet the performance standards for the applicable ancillary service set forth in Appendix 5A.

4.4 REGULATION

4.4.1 Regulation may be provided by registered facilities to the extent that each meets the applicable requirements to be a registered facility and have been so registered. Notwithstanding the foregoing, regulation may not be provided by a load facility until the date on which the EMC publishes a notice pursuant to section 5.1.2.2 of Chapter 2 to the effect that load facilities may be registered as registered facilities for the purpose of providing regulation.

4.4.1A The PSO shall establish and include in the system operation manual the methodology by which the amount of regulation required in any dispatch period to meet all applicable reliability standards is determined.

4.4.2 The EMC shall operate the real-time market for regulation in accordance with Chapter 6 to schedule regulation specified by the PSO to be required in any dispatch period.

4.4.3 The PSO shall determine and include in the system operation manual, the minimum requirements for regulation providers.

4.4.4 The PSO shall, in accordance with the methodology described in section 4.4.1A, determine the quantity of regulation required for each dispatch period of the market outlook horizon to satisfy the requirements of section 2.1.4 of Chapter 6.

4.4.5 If the real-time market for regulation fails to provide adequate regulation capacity to satisfy all applicable reliability standards, the PSO shall immediately take corrective action as allowed by these market rules to achieve compliance as soon as possible.

4.4.6 A registered facility providing regulation shall meet the performance standards referred to in section A.1 of Appendix 5A and in the system operation manual, where applicable.

4.5 RESERVE

4.5.1 Reserve may be provided by generation facilities or load facilities to the extent that each meets the applicable requirements to be a registered
facility in respect of each applicable reserve class and have been so registered. Notwithstanding the foregoing, reserve may not be provided by a load facility until the date on which the EMC publishes a notice pursuant to section 5.1.2.2 of Chapter 2 to the effect that load facilities may be registered as registered facilities for the purpose of providing reserve.

4.5.2 The various reserve classes are set forth in section A.2.1 of Appendix 5A and have been established for the purpose of:

4.5.2.1 arresting a fall in the frequency of the PSO controlled system resulting from the forced outage of a generation facility, a part of the PSO controlled grid or associated equipment;

4.5.2.2 restoring the frequency of the PSO controlled system to an acceptable limit following a contingency event and maintaining such frequency at an acceptable limit until such time as AGC or action by the PSO restores such frequency to normal; or

4.5.2.3 replacing energy or reserve lost as a result of the forced outage of a generation facility, a part of the PSO controlled grid or associated equipment so that the PSO controlled system can operate in a secure manner in future dispatch periods.

4.5.3 The PSO shall establish and include in the system operation manual the methodology by which the amount of reserve of each reserve class required in any dispatch period to meet all applicable reliability standards is determined.

4.5.4 The PSO shall determine the necessary input parameters associated with the calculation of reserve capacity required for each dispatch period of the market outlook horizon to satisfy the requirements of section 2.1.4 of Chapter 6.

4.5.5 The EMC shall operate the real-time market for reserve in accordance with Chapter 6 to schedule reserve of each reserve class specified by the PSO to be required in any dispatch period.

4.5.6 If, for any reason, there is a deficiency of reserve of any reserve class, the PSO shall immediately take corrective action as allowed by these market rules to achieve compliance as soon as possible.

4.5.7 The sharing of reserve between the PSO controlled system and an interconnected system shall be effected in accordance with the applicable agreements governing such sharing.
4.5.8 A dispatch coordinator offering reserve from a registered facility shall ensure that the registered facility is capable of providing reserve consistent with the reserve offer and the standing capability data held by the PSO and the EMC for that registered facility.

4.5.9 A reserve provider shall provide energy corresponding to scheduled reserve when instructed to do so by the PSO or by means of automated response systems approved by the PSO.

4.5.10 A registered facility providing reserve shall meet the performance standards referred to in section A.2 of Appendix 5A.

4.6 RESERVE PROVIDER GROUPS

4.6.1 The PSO shall establish and publish notice of reserve provider groups for the purpose of grouping together registered facilities with similar reserve effectiveness for scheduling and settlement purposes in respect of the provision of reserve. The PSO may establish new reserve provider groups or eliminate existing reserve provider groups and shall publish notice of such new or eliminated reserve provider groups.

4.6.2 The PSO shall publish the minimum performance standards required of reserve providers for each reserve provider group. Such performance standards may include the reserve response of the reserve provider over a variety of timeframes and the reliability of reserve response.

4.6.3 The PSO shall determine piece-wise linear effectiveness functions for each reserve provider group to satisfy the requirements of section 2.1.5.4 of Chapter 6.

4.6.4 The PSO shall, in consultation with market participants, review the reserve provider groups, the minimum performance standards referred to in section 4.6.2 and the effectiveness functions referred to in section 4.6.3 at least annually.

4.6.5 The PSO shall assign each registered facility that has been registered to provide reserve of a given reserve class to one reserve provider group of that reserve class. In making such assignment, the PSO shall have regard to the results of tests of the registered facility’s capability to provide reserve and to the historic performance of the registered facility during contingencies. The PSO shall notify each dispatch coordinator as to the reserve provider group to which each of its registered facilities has been assigned.
4.6.6 The PSO may, upon notice to the applicable dispatch coordinator, remove a registered facility from one reserve provider group and assign it to another reserve provider group.

4.7 REACTIVE SUPPORT AND VOLTAGE CONTROL

4.7.1 The resources utilised to supply reactive power to the PSO controlled system include capacitors, static VAR compensators, reactors, synchronous generation facilities and synchronous condensers.

4.7.2 The PSO shall ensure that sufficient resources are available throughout the PSO controlled system for dispatch by the PSO to meet all applicable reliability standards for reactive support and voltage control service and shall establish procedures to this effect in the system operation manual. Voltage levels shall be maintained within the levels specified in Appendix 5B within the PSO controlled system and at its boundaries with interconnected systems. As part of its assessment of PSO controlled system adequacy under the market rules, the PSO shall on a continual basis assess whether sufficient reactive power resources are available to it.

4.7.3 The PSO shall direct providers of reactive support and voltage control service to take any actions necessary to maintain stable voltage levels in accordance with all applicable reliability standards and to prevent the collapse of voltages on the PSO controlled system. Subject to section 8.4.2, a market participant that is providing reactive support and voltage control service other than pursuant to an ancillary service contract that is so directed may make a request to the PSO for compensation in accordance with the procedure set forth in section 3.11 of Chapter 3.

4.7.4 The PSO shall obtain reactive power resources to maintain reactive support and voltage control service in accordance with all applicable reliability standards. Where reactive support and voltage control service is made available by market participants, it shall be provided from equipment and facilities including the following:

4.7.4.1 reactive resources produced from within the standard power factor range of a generation facility in accordance with the requirements referred to in the transmission code or in any applicable connection agreement, which shall be dispatchable by the PSO; and

4.7.4.2 equipment owned or operated by market participants that is made available to the PSO pursuant to these market rules and to ancillary service contracts.
4.7.5 The equipment comprising the transmission system and each registered facility providing reactive support and voltage control service shall meet the performance standards referred to in sections A.4 and A.3, respectively, of Appendix 5A.

4.8 **BLACK START SERVICE**

4.8.1 The PSO shall determine the required amounts and locations of black start capability across the PSO controlled system, as required to satisfy the requirements of the Singapore power system restoration plan and all applicable reliability standards. The PSO shall notify market participants of these requirements before requesting the EMC to enter into ancillary service contracts with market participants for black start capability service.

4.8.2 A registered facility providing black start capability service shall meet the performance standards referred to in section A.5 of Appendix 5A.

4.8.3 The PSO shall, in consultation with the transmission licensee ensure that adequate transmission capacity exists to connect the registered facility or registered facilities proposing to provide black start capability to the generation facilities referred to in section A.5.7 of Appendix 5A before requesting the EMC enter into ancillary service contracts with the applicable market participants for black start capability service from any such registered facility.

4.9 **FAST START SERVICE**

4.9.1 The PSO shall determine the required amounts and locations of fast start service across the PSO controlled system in accordance with all applicable reliability standards. The PSO shall notify market participants of these requirements before requesting the EMC to enter into ancillary service contracts with market participants for fast start service.

4.9.2 A registered facility providing fast start service shall meet the performance standards referred to in section A.6 of Appendix 5A.

4.10 **RELIABILITY MUST-RUN SERVICE**

4.10.1 The PSO shall determine the required amounts and locations of reliability must-run service across the PSO controlled system in accordance with all applicable reliability standards. The PSO shall notify market participants of these requirements before requesting the EMC to enter
into ancillary service contracts with market participants for reliability must-run service.

4.10.2 A registered facility providing reliability must-run service shall meet the performance standards referred to in section A.7 of Appendix 5A.

**4.11 AUDITING AND TESTING OF ANCILLARY SERVICES**

4.11.1 The PSO shall develop requirements for the testing of facilities that will provide ancillary services to the PSO controlled system. The PSO shall use such tests to determine whether to register a facility as a registered facility for the provision of ancillary services and to ensure that each such registered facility continues to meet the requirements for registration to provide the applicable ancillary services. Such requirements:

4.11.1.1 shall not be inconsistent with any applicable reliability standards; and

4.11.1.2 shall be included in the system operation manual.

4.11.2 Prior to participating in any tests referred to in section 4.11.1, the ancillary service provider or prospective ancillary service provider shall submit a detailed test procedure plan for the PSO’s approval. The PSO shall evaluate the detailed test procedure plan and shall either grant its approval or reject, with reasons, the detailed test procedure plan.

4.11.3 The costs incurred by the PSO in conducting and evaluating any tests referred to in section 4.11.1 shall be communicated to the EMC and shall be included in the monthly uplift charges imposed by the EMC pursuant to section 4.1 of Chapter 7.

4.11.4 Any costs incurred by an ancillary service provider or prospective ancillary service provider in participating in any tests referred to in section 4.11.1 shall be borne by the ancillary service provider or prospective ancillary service provider.

**4.12 CONSEQUENCES OF FAILURE TO PASS A TEST**

4.12.1 If a registered facility providing ancillary services fails a test performed pursuant to section 4.11.1, the EMC shall not schedule, and the PSO shall not dispatch, the applicable ancillary service from the registered facility until the ancillary service provider demonstrates that the registered facility can provide the relevant ancillary service. In addition, the EMC or the PSO may require the ancillary service provider to refund any compensation it has received for the applicable ancillary service during any period prior to the date of the test to the extent that the test results and
other information available to the PSO indicate that the applicable ancillary service was not provided during that period. Further, the EMC may impose such other sanctions as are permitted by the market rules or any applicable ancillary service contract.

4.13 **ANCILLARY SERVICES AND EMERGENCY CONDITIONS**

4.13.1 Notwithstanding any other provision of the market rules the PSO may, when the PSO controlled system is in an emergency operating state, acquire ancillary services from any market participant, whether or not such market participant satisfies all of the standards and registration requirements applicable in respect of such ancillary services and whether or not the EMC has a contracted ancillary services contract with the market participant.
5 SYSTEM SECURITY

5.1 OBJECTIVES AND GENERAL OBLIGATIONS

5.1.1 This section describes the procedures necessary to enable the PSO to ensure the security of the PSO controlled system and the secure operation of the PSO controlled grid in accordance with all applicable reliability standards.

5.1.2 In order to maintain the security of the PSO controlled system and the secure operation of the PSO controlled grid the PSO shall:

5.1.2.1 monitor the real-time operating status of the PSO controlled system;

5.1.2.2 establish and publish security limits for all facilities that are part of the PSO controlled system;

5.1.2.3 establish and include in the system operation manual the criteria and margins to be used in the development of security limits and a process for reviewing and revising such criteria and margins;

5.1.2.4 direct the operation of facilities that are part of the PSO controlled grid within the appropriate security limits and in accordance with the applicable operating agreement;

5.1.2.5 investigate major operational incidents on the power system and initiate plans to manage abnormal situations or significant deficiencies which, in the PSO’s opinion, threaten the reliability of the PSO controlled system;

5.1.2.6 issue directions to market participants in order to manage emergency operating states; and

5.1.2.7 assess, on a monthly basis, the future adequacy and security of the PSO controlled system for the following 12 months.

5.2 SECURITY LIMITS

5.2.1 The PSO shall establish and publish security limits to prevent, contain and alleviate the effects of contingency events. Such security limits shall be as described in section 5.2.4.1 and shall be observed by the PSO in directing the real-time operation of the PSO controlled system.
5.2.2 The **PSO** shall establish and **publish** the **equipment limits** described in section 5.2.4.2, which **equipment limits** shall be observed by applicable **market participants** in operating their facilities and equipment.

5.2.3 **Market participants** shall immediately respond to directions from the **PSO** to alter their operations to stay within the **security limits** established by the **PSO**.

5.2.4 The following shall be established by the **PSO** based on data submitted by the **transmission licensee** and by **generation licensees** **market participants**:

5.2.4.1 **security limits** based on the dynamic response of the **PSO controlled system**, including transient stability limits, voltage stability limits, dynamic stability limits, and voltage decline limits; and

5.2.4.2 **equipment limits** based on the ratings of equipment, including the thermal ratings of **transmission lines** and transmission equipment (e.g. the design characteristic of lines and equipment and weather conditions), **generation facility ratings** and the short circuit capability of equipment.

5.2.5 To enable the **PSO** to establish the **security limits** and **equipment limits** referred to in section 5.2.3, the **transmission licensee** and each **generation licensee** **market participant** shall ensure that the equipment that it owns or operates has established ratings and shall provide such ratings to the **PSO** in a form suitable for the dynamic calculation of ratings, including continuous and limited time ratings. The **PSO** shall not deliberately operate or plan to operate equipment comprising the **PSO controlled grid** or require the operation of any **generation facility**, in excess of the relevant **equipment limit** for such equipment.

**Explanatory Note:** This information will be conveyed as part of facility registration.

5.2.6 Both the **EMC** and the **PSO** shall respect all pre-and post-contingency **security criteria** that are used to establish **security limits**.

5.3 **The Use of Interties**

5.3.1 The **PSO** shall schedule the flow of **energy** over an **intertie** in accordance with applicable agreements for the management of that **intertie**.
5.4 **THE MANAGEMENT OF VIOLATIONS TO SECURITY LIMITS**

5.4.1 When there is a violation of a security limit on the *PSO controlled system* while in a *normal operating state*, the sequence of control actions taken by the *PSO* shall be as defined in the *system operation manual*.

5.4.2 In providing the information referred to in section G.5.1 of Appendix 6G of Chapter 6 to the *EMC* in accordance with sections 6.1 and 8.1 of Chapter 6, the *PSO* shall permit, provide for and use market mechanisms to the maximum extent possible for purposes of responding to violations of *security limits*.

5.4.3 Where market mechanisms fail to sufficiently maintain the *security* of the *PSO controlled system*, the *PSO* may direct *market participants* to take actions in accordance with the provisions of these *market rules*. A *market participant* that complies with such a direction may make a request to the *PSO* for compensation in accordance with the procedure set forth in section 3.11 of Chapter 3.

5.5 **OPERATION UNDER A HIGH-RISK OPERATING STATE**

5.5.1 Once a *high-risk operating state* has been declared by the *PSO*, the *PSO* shall temporarily and selectively increase the level of *security* on the *PSO controlled system*. In this regard, the *PSO* may take such action as it determines appropriate, including:

5.5.1.1 cancelling all planned maintenance or other work affecting the *security* of the *PSO controlled system*;

5.5.1.2 cancelling, denying requests for or deferring approved *planned outages*;

5.5.1.3 directing that parts of the *PSO controlled grid* be returned to service, as required;

5.5.1.4 operating to *security limits* appropriate for a *high-risk operating state*; and

5.5.1.5 coordinating with *interconnected system operators*.

5.6 **OPERATION UNDER AN EMERGENCY OPERATING STATE**

5.6.1 Once an *emergency operating state* has been declared by the *PSO*, the *PSO* shall operate to the *security limits* appropriate for an *emergency operating state* so as to allow for increased power transfers on the *PSO*
controlled grid. In this regard, the PSO may take such action as it determines appropriate, including:

5.6.1.1 cancelling all maintenance or other planned work affecting the security of the PSO controlled system;

5.6.1.2 cancelling, denying requests for or deferring approved planned outages;

5.6.1.3 directing that PSO controlled grid or generation facilities be returned to service;

5.6.1.4 operating to security limits appropriate for an emergency operating state; and

5.6.1.5 coordinating with interconnected system operators.

5.6.2 A market participant that complies with a direction issued to it pursuant to section 5.6.1 may make a request to the PSO for compensation in accordance with the procedure set forth in section 3.11 of Chapter 3.

5.7 RESTORATION OF SYSTEM SECURITY FOLLOWING A CONTINGENCY EVENT

5.7.1 Market participants shall be prepared for, shall be able to manage and shall take such actions as may be necessary to restore security of the PSO controlled system following a contingency event, as directed by the PSO.

5.7.2 The PSO shall, in consultation with market participants, establish and include in the system operation manual detailed procedures:

5.7.2.1 that identify the steps and timeframe necessary to restore the operation of the PSO controlled system to a normal operating state, respecting corresponding security limits from both high risk operating states and emergency operating states;

5.7.2.2 that are designed to restore supply first to individual loads identified by market participants as being essential in nature, once the minimum acceptable level of security on the PSO controlled system has been restored; and

5.7.2.3 that are designed to restore the operation of transmission equipment following automatic outages due to the operation of protection equipment.
6 FORECASTS AND ASSESSMENTS

6.1 FORECASTS PREPARED BY THE PSO

Explanatory Note: The PSO produces half-hourly forecasts for the next 2 weeks (for outage scheduling and market use) and monthly forecasts of daily peak load for the next 12 months (used for outage planning). Both forecasts contribute to assessments of security requirement compliance over the following year. It is understood that the Authority, and not the PSO, will be doing longer term forecasting to support system investment planning.

6.1.1 The PSO shall produce the following forecasts for Singapore on an ongoing basis:

6.1.1.1 on a daily basis, a forecast of the following 14 day’s load, by dispatch period, net of the PSO’s estimate of the output of any generation facilities that are not registered facilities, with the forecast for the first 7 days being provided to the EMC in accordance with section 6.1 of Chapter 6;

6.1.1.2 on a daily basis, a forecast of any load shedding expected in the following 7 days, by dispatch period, such forecast to be provided to the EMC in accordance with section 6.1 of Chapter 6;

6.1.1.3 on a monthly basis, a forecast to be published no later than 5 business days before the end of each month of the peak daily load for each dispatch day in the next 12 months; and

6.1.1.4 such additional forecasts of load, by dispatch period, as may be required by sections 6.1 and 8.1 of Chapter 6.

6.1.2 The forecasts referred to in section 6.1.1 shall, in addition to the purposes specified in that section, be used in conducting the assessments referred to in section 6.2.

6.1.3 The PSO shall publish the method to be used to perform the forecasts described in section 6.1.1.

6.1.4 Notwithstanding section 13 of Chapter 1, no market participant shall be entitled to compensation from the PSO for any financial loss sustained by the market participant due to the market participant having been dispatched on the basis of load as forecasted pursuant to section 6.1.1 rather than on the basis of actual load.
6.2 **ADVANCE ASSESSMENTS OF SYSTEM SECURITY AND ADEQUACY**

6.2.1 The PSO shall administer continuous processes to assess the security and adequacy of the PSO controlled system and shall publish reports of its findings in relation to such security and adequacy assessments over the following two time frames:

6.2.1.1 assessments performed monthly, covering a twelve-month period including the current month; and

6.2.1.2 assessments performed daily, covering the fourteen-day period beginning at the end of the current day.

6.3 **PURPOSE OF ASSESSMENTS**

6.3.1 The PSO shall conduct the monthly assessments referred to in section 6.2.1.1 to:

6.3.1.1 provide forecasts of expected peak daily loads, generation capacity, import capacity and transmission capacity, energy capability of generation facilities, and the possibility of occurrence of any security-related events on the PSO controlled system that could require contingency planning by market participants or by the PSO; and

6.3.1.2 allow the PSO to identify exigencies potentially impacting on the coordination of outages that could give rise to shortfalls in generation capacity and import capacity and thus provide information by which market participants and the PSO could act to reschedule outage plans to avoid such projected shortfalls.

6.3.2 The PSO shall conduct the daily assessments referred to in section 6.2.1.2 to provide forecasts of expected half-hourly loads, generation capacity, import capacity and transmission capacity, energy capability of generation facilities, exports and imports of energy, and of events that may affect the security of the PSO controlled system or affect operational decisions to be taken by the PSO that must be made more than a day in advance.

6.4 **INFORMATION REQUIREMENTS**

6.4.1 The PSO shall, prior to the market commencement date, establish and include in the system operation manual the information that the PSO will require from market participants in order to perform the forecasts and the adequacy and security assessments referred to in sections 6.1 and 6.2,
respectively, and to prepare the reports referred to in section 6.6, including:

6.4.1.1 the information required to be reported by market participants;
6.4.1.2 the format in which the information is to be reported; and
6.4.1.3 the time by which the information is to be reported.

6.4.2 In addition to the information referred to in section 6.4.1, the PSO shall have regard to the outage information provided to it by market participants pursuant to section 7 in performing the adequacy and security assessments referred to in section 6.2 and in preparing the reports referred to in sections 6.6.2 and 6.6.3. For this purpose, the PSO shall include in the system operation manual the date by which such outage information must be submitted in order to be included in the assessment referred to in section 6.2.1.1 in a given month, failing which it shall be included in the assessment performed in the following month.

6.5 THE REPORTING OF ADEQUACY AND SECURITY ASSESSMENTS

6.5.1 Upon receiving the information required to be provided by market participants pursuant to this section 6, the PSO shall perform the forecasts and security and adequacy assessments referred to in sections 6.1 and 6.2, respectively, and prepare reports summarising the information (in aggregate form, where necessary for confidentiality purposes) and presenting its findings and conclusions. The types of information to be contained in the reports referred to in section 6.6 shall be published and shall include the information referred to in section C.1 of Appendix 5C, such further information as may be deemed necessary by the Authority or other relevant agencies of the Government of Singapore and the EMC and the following information:

6.5.1.1 any significant assumptions made in the assessment;
6.5.1.2 projected conditions on the PSO controlled system and projections of power system reliability, including adequacy and security; and
6.5.1.3 requirements for ancillary services.

6.6 PUBLICATION OF REPORTS

6.6.1 The information contained in each of the reports referred to in this section 6.6 may differ in content, reflecting the different purposes of the individual assessments that form the bases of the reports.
6.6.2 The PSO shall, not later than 5 business days prior to the end of each month, prepare and publish a 12-Month Assessment Report covering a 12-month period commencing the following month. The PSO shall publish and periodically update as required a schedule of the dates on which such 12-Month Assessment Report will be published.

6.6.3 The PSO shall, not later than 17:00 hours on each day, prepare and forward a Daily Assessment Report covering a 14-day period commencing on the following day to the EMC. Upon receipt of such report, the EMC shall communicate the information received to market participants via electronic means.

6.6.4 The PSO shall prepare updated versions of either of the assessment reports referred to in section 6.6.2 or 6.6.3 in the event of changes that, in the PSO’s opinion, are materially significant and should be communicated to market participants. The updated version of the assessment report referred to in section 6.6.2 shall be published whilst the assessment report referred to in section 6.6.3 shall be forwarded to the EMC, which shall upon receipt communicate the information received to market participants via electronic means.

6.6.5 The EMC may, on the basis of the reports referred to in sections 6.6.2 and 6.6.3, produce additional related reports as required by relevant standards authorities, the EMC Board, the Authority or the Government of Singapore.
7 OUTAGE AND TESTING CO-ORDINATION

7.1 INTRODUCTION

7.1.1 The objectives of this section 7 are to enable the PSO to review and assess the impact of outage schedules on the fulfilment by the PSO of its reliability-related responsibilities under the Electricity Act and the market rules, to require market participants to obtain the approval of the PSO in respect of planned outage schedules, to permit the PSO to reject, defer and recall outages that may have an impact on the reliability of the PSO controlled system, to provide for certain consequences following the cancellation of outages and to require the publication of approved annual outage plans and pro forma biennial outage plans.

7.1.2 The PSO shall facilitate outage planning and administer the outage scheduling process over a number of timeframes in accordance with this section 7.

7.1.3 The PSO shall maintain a record of all submissions to the outage planning and scheduling process and of all forced outage notices and associated forced outage information submitted to it, and shall periodically, and not less than quarterly, submit a report to the market surveillance and compliance panel indicating the following with respect to outages and related requests for compensation and disputes occurring since the submission to the market surveillance and compliance panel of a previous report under this section 7.1.3:

7.1.3.1 a list of all forced outages that have occurred, including forced outages resulting from planned outages that exceeded their approved duration, differentiated to identify forced outages for facilities or equipment for which a planned outage was initially submitted to the PSO from other forced outages, together with the reasons for each forced outage;

7.1.3.2 a list of all outages where approval by the PSO was withdrawn, including recalled outages, together with the reasons for such withdrawal and a record of whether the market participant submitted the matter to the dispute resolution process referred to in section 3 of Chapter 3;

7.1.3.3 a list of all outages which were withdrawn by the applicable market participant prior to commencement of the outage; and

7.1.3.4 such other outage-related information as may be requested by the market surveillance and compliance panel.
7.1.4 The PSO shall develop and publish a full description of the equipment and facilities the outage of which must be reported to and scheduled with the PSO in accordance with this section 7. Such equipment and facilities shall include the following:

7.1.4.1 facilities and equipment forming part of the PSO controlled grid;

7.1.4.2 subject to section 7.1.6, generation registered facilities, import registered facilities and auxiliary equipment connected to the PSO controlled grid;

7.1.4.3 protective relaying; and

7.1.4.4 communication equipment required for the PSO to communicate with the operators of registered facilities.

7.1.5 The PSO shall, in consultation with market participants, update the description of equipment and facilities referred to in section 7.1.4 from time to time as may be required. The PSO shall publish all updated versions of such description.

7.1.6 The following outages of the following generation facilities do not need to be reported to or scheduled with the PSO pursuant to sections 7.2 to 7.5 unless the generation facility has been designated by the PSO as affecting the reliability of the PSO controlled system:

7.1.6.1 any outage of a non-registered generation facility;

7.1.6.2 any outage of a generation registered facility having a name-plate rating of less than 10 MW, a generation settlement facility, or a non-exporting embedded intermittent generation facility;

7.1.6.3 an outage of a generation registered facility having a name-plate rating of 10 MW or more but no more than 50 MW, where the outage involves a de-rating of less than 20% of the generation facility’s capacity and where such de-rating is not expected to last more than 72 hours; or

7.1.6.4 an outage of a generation registered facility having a name-plate rating of more than 50 MW where the outage involves a de-rating of less than 10% of the generation facility’s capacity and where such de-rating is not expected to last more than 72 hours.

7.1.7 The PSO may, upon request, exempt certain additional facilities and equipment from the application of the outage reporting and scheduling
obligations set forth in this section 7 if the PSO determines that the granting of such an exemption is not inconsistent with the reliable and efficient operation of the PSO controlled system. Market participants may submit an exemption request to the PSO at any time, provided that they shall continue to comply with the outage reporting and scheduling obligations with respect to the facilities or equipment that they wish to be exempted until the PSO has approved the applicable exemption request.

7.1.8 Nothing in this section 7 shall relieve a market participant from its responsibility for and arising from the performance of all work relating to any outage or test, whether in respect of energised or de-energised facilities or equipment, including its responsibility in respect of worker safety.

7.1.9 No market participant shall remove equipment or facilities of a type described in section 7.1.4 or 7.1.5 from service except in accordance with this section 7 unless such removal from service is necessary to prevent substantial damage to the market participant’s equipment, facilities or the environment or to protect the safety of employees or the public. If any equipment or facilities are removed from service for these reasons, the market participant shall promptly so notify the PSO.

7.2 **ANNUAL OUTAGE PLAN**

| Explanatory Note: Once each calendar year, the PSO forms an approved annual outage plan for the upcoming calendar year, and a pro forma biennial outage plan for the next succeeding two years following the upcoming calendar year. |
| Approved Annual Outage Plan |

For the upcoming calendar year, market participants submit their outage plans and the PSO forms an initial plan including details of where outages are planned by market participants at times that are unacceptable to the PSO. The market participants use this information to refine their submissions and, based on these revised submissions, the PSO determines and publishes the approved annual outage plan for the upcoming calendar year.

Market participants can still make submissions after the approved annual outage plan is finalised and published, and updated outage plans will be issued by the PSO at intervals for the remainder of the year to which the approved annual outage plan relates. This is the first phase in the outage approval process, and market participants will also need to apply for final approval closer to the time of the outage.
Pro Forma Biennial Outage Plan

A pro forma biennial outage plan is formed and published by the PSO alongside each given approved annual outage plan described above (referred to below as the “related approved annual outage plan”). Each pro forma biennial outage plan covers a period of two consecutive calendar years, being a period which falls immediately after the calendar year covered by that pro forma biennial outage plan’s related approved annual outage plan.

At the same time as when market participants submit their outage plans for the upcoming calendar year for the purposes of an approved annual outage plan, market participants must also submit their indicative outage plans for the succeeding two-year period for the purposes of the pro forma biennial outage plan. The PSO will use these indicative outage plans to form and publish the pro forma biennial outage plan for the aforesaid succeeding two-year period.

7.2.1 Each market participant shall inform the PSO of its long-term plans for outages in accordance with the provisions of this section 7.2.

7.2.2 Each market participant shall establish its outage planning process in such manner as will enable it to comply with its reporting and scheduling obligations under this section 7.

7.2.3 The PSO shall carry out an annual outage planning process in accordance with the procedures and timetable specified in the system operation manual.

7.2.4 Subject to section 7.1.6, each market participant shall submit to the PSO outage submissions that include the information set forth in section 7.2.

7.2.4.1 planned outages in the calendar year period to be covered by an approved annual outage plan. Such outage submission shall be submitted in accordance with the timeline specified in the system operation manual; and

7.2.4.2 indicative planned outages in a period of two consecutive calendar years (immediately following the period referred to in section 7.2.4.1 above) to be covered by a pro forma biennial outage plan. Such outage submission shall be submitted at the same time as when the outage submission for the related approved annual outage plan referred to in section 7.2.4.1 is submitted.
7.2.5 An outage submission submitted in accordance with section 7.2.4.1, 7.2.8 or 7.2.14 by a market participant shall represent the intention, subject only to approval by the PSO, of the market participant to take the relevant facility or equipment out of service at the scheduled time and to return the relevant facility or equipment to service at the scheduled time.

7.2.6 The PSO shall confirm receipt of an outage submission submitted in accordance with section 7.2.4.1, 7.2.8 or 7.2.14, which confirmation shall contain the information set forth in section C.3.1 of Appendix 5C.

7.2.7 The PSO shall use the information described in section 7.2.4.1 to form and publish the results of the provisional annual outage planning exercise in respect of an approved annual outage plan in accordance with the timetable specified in the system operation manual, which results shall include, for the calendar year period to which such approved annual outage plan relates:

- 7.2.7.1 a list indicating the requested planned outages, by market participant and associated facility or equipment; and
- 7.2.7.2 the degree to which, for each applicable time period, the planned outages requested by market participants, individually or in combination, would fail to meet the PSO's standards for PSO controlled system reliability.

**Explanatory Note:** The information described in the previous clause should be used by market participants to refine their outage schedule plans before seeking formal approval of those plans.

7.2.8 Following publication of the results referred to in section 7.2.7, market participants may revise and resubmit outage submissions in respect of the planned outages to be covered by an approved annual outage plan, that include the information referred to in section C.2 of Appendix 5C in accordance with the timetable specified in the system operation manual.

7.2.9 Where the scheduling of outage submissions of different market participants submitted for the purposes of section 7.2.4.1 conflicts such that the planned outages cannot all be accepted by the PSO for the purposes of an approved annual outage plan, the PSO shall inform the affected market participants and request that they resolve the conflict. The affected market participants may then submit revised outage submissions in accordance with section 7.2.8.

7.2.10 Should a conflict referred to in section 7.2.9 remain unresolved, the PSO shall determine which of the planned outages requested by market participants pursuant to section 7.2.4.1 or 7.2.8 can be accepted for
inclusion in the approved annual outage plan on the basis of the precedence accorded to each planned outage pursuant to section 7.5.

7.2.11 The PSO shall use the outage submissions submitted to it in accordance with section 7.2.4.1 or 7.2.8 and the precedence rules prescribed in section 7.5 to establish and publish the approved annual outage plan in accordance with the timetable specified in the system operation manual.

7.2.12 The approved annual outage plan shall comprise a list indicating the planned outages, by market participant and associated facility or equipment, that have received the PSO’s planning approval. Outage submissions submitted in accordance with section 7.2.4.1 or 7.2.8 that are not included in the approved annual outage plan shall be deemed to have been rejected by the PSO.

7.2.13 The PSO shall publish updated outage plans in accordance with the timetable specified in the system operation manual. Each updated outage plan shall cover the period from the beginning of the calendar month following the calendar month in which it is published until the end of the period covered by the current approved annual outage plan. Each updated outage plan shall contain a list of all planned outages that have received planning approval pursuant to section 7.2.14, that have been withdrawn pursuant to section 7.2.15 or that have been cancelled by the PSO pursuant to section 7.2.16 since the publication of the immediately preceding updated outage plan or, in the case of the first updated outage plan published after publication of an approved annual outage plan, since the publication of the approved annual outage plan.

7.2.14 A market participant may at any time following publication of an approved annual outage plan submit an outage submission that includes the information referred to in section C.2 of Appendix 5C for a planned outage in the period covered by that approved annual outage plan, for approval by the PSO. The PSO shall assess such outage submission against all applicable reliability standards and shall notify the market participant within 4 business days as to whether planning approval has been granted for the planned outage which is the subject of such outage submission, or if the planned outage has been rejected. Any such outage submissions that receive planning approval from the PSO shall be included in the next updated outage plan published by the PSO.

7.2.15 A market participant that no longer intends to conduct a planned outage for which planning approval has been granted shall so notify the PSO. Any such withdrawn planned outages shall be included in the next updated outage plan published by the PSO.
7.2.16 The PSO may cancel a planned outage for which it has previously granted planning approval if it determines, in accordance with the system operation manual, that the planned outage would pose a risk to the reliable operation of the PSO controlled system. If the PSO cancels such a planned outage, it shall inform the affected market participant as soon as practicable.

7.2.17 The PSO shall, in accordance with section 6.4.2, include in each 12-Month Assessment Report referred to in section 6.2.1.1 all planned outages that have been granted planning approval and that are scheduled to occur in the period covered by the Report.

7.2.18 The PSO shall, in accordance with section 6.4.2 where applicable, reflect all planned outages that have been granted planning approval or final approval and that are scheduled to occur in the applicable period in the daily assessments referred to in section 6.2.1.2.

7.2.19 The PSO shall confirm receipt of the outage submissions submitted to it in accordance with section 7.2.4.2 and use such outage submissions to establish and publish the pro forma biennial outage plan. Such publication shall take place at the same time as the publication of the related approved annual outage plan. For the avoidance of doubt, sections 7.2.6 to 7.2.18 above shall not apply to outage submissions submitted in accordance with section 7.2.4.2, or the establishment and publication of a pro forma biennial outage plan.

7.3 **Final Confirmation of Planned Outages**

7.3.1 No later than 12:00 on the trading day that is two trading days in advance of the scheduled time for a planned outage, the PSO shall confirm the planned outage with the applicable market participant. At the time of such confirmation:

7.3.1.1 the PSO shall communicate to the market participant the unique identifier associated with the planned outage as originally provided to the market participant by the PSO in accordance with section C.3 of Appendix 5C; and

7.3.1.2 the market participant shall either update any information provided to the PSO pursuant to section 7.2.4.1, 7.2.8 or 7.2.14 that has changed since it was provided, or shall confirm that the original information has not changed.
7.3.2 The PSO shall:

7.3.2.1 as soon as possible following confirmation and the receipt of any updated information pursuant to section 7.3.1, assess each confirmed planned outage;

7.3.2.2 provide its final approval to a planned outage confirmed by it pursuant to section 7.3.1 unless it determines, in accordance with the system operation manual and based primarily on the Daily Assessment Report referred to in section 6.2.1.2, that the planned outage will or is reasonably likely to have an adverse impact on the reliable operation of the PSO controlled system, in which case it may cancel the planned outage;

7.3.2.3 if the planned outage was confirmed by the PSO more than two trading days in advance of the planned outage, advise the relevant market participant, on a regular basis, of the expected outcome of the final approval process; and

7.3.2.4 if the planned outage was confirmed by the PSO more than two trading days in advance of the planned outage, advise the relevant market participant of the final approval or cancellation of the planned outage no later than 15:00 on the trading day that is two trading days prior to the day on which the planned outage is scheduled to commence.

7.3.3 No planned outage shall occur or be permitted by a market participant to occur unless:

7.3.3.1 the planned outage has been confirmed by the PSO with the market participant in accordance with section 7.3.1; and

7.3.3.2 the planned outage has received final approval from the PSO in accordance with section 7.3.2.

7.3.4 [Deleted and Intentionally Left Blank]

7.3.5 Market participants shall coordinate with the PSO in respect of the return to service of equipment following an outage in accordance with and in the manner provided in the system operation manual.

7.3.6 Any planned outage that has not received final approval from the PSO, or that takes place at a time or times other than the time period approved by the PSO, including outages that extend beyond the time originally approved by the PSO unless such extension was approved under section 7.4.5, shall be considered a forced outage. The forced outage may be referred by the PSO to the market surveillance and compliance panel at any time.
7.3.7 Subject to section 7.1.6, each market participant shall, to the maximum extent possible, notify the PSO in advance of a forced outage. When such advance notice cannot be given, the market participant shall as soon as practicable and in any event within 5 minutes of the beginning of the forced outage, notify the PSO of the occurrence of the forced outage.

7.3.8 Subject to section 7.1.6, the information required by section C.2 of Appendix 5C in respect of a forced outage shall be provided to the PSO by the applicable market participant as soon as practicable and in any event within 24 hours, or within such lesser period of time as may be required by the PSO. A detailed investigation report shall subsequently be submitted by the applicable market participant to the PSO as required by the system operation manual.

7.3.9 The PSO shall provide to each market participant that has submitted the forced outage information referred to in section 7.3.8 the information referred to in section C.3 of Appendix 5C.

7.4 Rescheduling Outages

7.4.1 Where the PSO does not give its final approval to a planned outage pursuant to section 7.3.2, the PSO shall work with the relevant market participant to re-schedule the cancelled planned outage to a date and time at which the cancelled planned outage will not or is not reasonably likely to have an adverse impact on the reliable operation of the PSO controlled system. In re-scheduling the cancelled planned outage, the PSO shall where reasonably practicable take into account the date and time preferences of the market participant.

7.4.2 The PSO may direct a market participant to defer a planned outage that has received final approval from the PSO if the PSO determines that either an emergency operating state or a high-risk operating state is occurring or is reasonably likely to occur at the time at which the planned outage would otherwise take place or if necessary to avoid recalling another planned outage pursuant to section 7.4.4.

7.4.3 Where the PSO directs the deferral of a planned outage pursuant to section 7.4.2, the PSO shall work with the relevant market participant to re-schedule the planned outage to a date and time at which the planned outage will not or is not reasonably likely to have an adverse impact on the reliable operation of the PSO controlled system. In re-scheduling the planned outage, the PSO shall where reasonably practicable take into account the date and time preferences of the market participant.

7.4.4 The PSO may, where necessary to maintain the reliability of the PSO controlled system and in accordance with the system operation manual,
recall a planned outage that has already commenced, having regard to the time needed to return the facility or equipment to service as identified by the relevant market participant in the information submitted in accordance with section C.2 of Appendix 5C, and the PSO shall so advise the relevant market participant. Such market participant shall arrange for the accelerated return to service of the facility or equipment in accordance with the instructions of the PSO. The PSO shall not recall a planned outage unless further control action is required and it has cancelled, deferred or rejected requests for approval of all other planned outages the cancellation, deferral or rejection of which could eliminate the need to recall the planned outage that has already commenced.

7.4.5 Each market participant shall notify the PSO if a planned outage which has received planning approval or final approval from the PSO will have a duration which exceeds the duration originally approved by the PSO, which notice shall include a request that the PSO approve the extension. Such notice shall be provided to the PSO as soon as possible but in any event no less than 48 hours in advance of the date and time at which the planned outage, as approved by the PSO, was scheduled to end.

7.4.6 If the PSO determines that an extension to the duration of a planned outage will or is reasonably likely to adversely affect the reliability of the PSO controlled system or will or is reasonably likely to require the re-scheduling of another planned outage confirmed by the PSO pursuant to section 7.3.1 or the cancellation, deferral or recall of another planned outage that has received final approval pursuant to section 7.3.2, the PSO shall reject such extension and the market participant shall use its reasonable best efforts to ensure that the duration of the planned outage does not exceed the duration originally approved by the PSO or such longer period as the PSO may advise in rejecting the extension requested.

7.5 **TIME STAMPING OF OUTAGE SUBMISSIONS**

7.5.1 The PSO shall time stamp each outage submission received by the PSO in accordance with sections 7.2.4.1, 7.2.8 and 7.2.14. Where the PSO is required or permitted by this Chapter to approve, reject, re-schedule, cancel, defer or recall one or more planned outages, such planned outages shall:

7.5.1.1 be approved in order of precedence determined on the basis of sections 7.5.2 to 7.5.6; and

7.5.1.2 be rejected, re-scheduled, cancelled, deferred or recalled in reverse order of precedence determined on the basis of sections 7.5.2 to 7.5.6.
7.5.2 Where a planned outage referred to in a previous outage submission is confirmed by the PSO and there is no change in the commencement, duration or nature of the planned outage relative to the commencement, duration or nature described in that previous outage submission, the time stamp associated with such previous outage submission shall be used by the PSO in determining the precedence to be given to the planned outage.

7.5.3 Where a market participant gives notice of a change in the commencement, duration or nature of a planned outage relative to the most recent outage submission submitted in accordance with section 7.4.2.1, 7.2.8 or 7.2.14 for that planned outage, the PSO shall stamp such notice with the time at which it was received by the PSO, which time shall be used by the PSO in determining the precedence to be given to the planned outage, except that where such notice reflects only a shortening in the duration of a planned outage relative to the most recent outage submission submitted in accordance with section 7.4.2.1, 7.2.8 or 7.2.14 for that planned outage, the time stamp associated with such previous outage submission shall be retained in determining the precedence to be given to the planned outage.

7.5.4 Where:

7.5.4.1 the PSO cancels or defers an approved planned outage prior to the commencement thereof; and

7.5.4.2 the PSO subsequently re-confirms the planned outage with the market participant;

the time stamp of the re-confirmed planned outage shall be deemed to be the time stamp of the original planned outage as it was prior to such cancellation or deferral for the purpose of determining the precedence to be given to the planned outage.

7.5.5 Where:

7.5.5.1 a planned outage is, within 7 days of the date on which it was scheduled to commence, required by the PSO pursuant to this section 7 to be re-scheduled;

7.5.5.2 the PSO did not identify, through one or more of its reliability forecasts, a concern relating to reliability of the PSO controlled system in respect of the time scheduled for the planned outage; and

7.5.5.3 the planned outage is re-scheduled to a date that is within 9 days of the originally scheduled commencement date,
the time stamp of the rescheduled planned outage shall be deemed to be the time stamp of the original planned outage as it was prior to the rescheduling for purposes of determining the precedence to be given to the planned outage.

7.5.6 Where the PSO has cancelled a planned outage pursuant to section 7.2.16 or 7.3.2, the time of receipt of confirmation of the planned outage shall be retained until such time as the confirmed commencement date of the planned outage has passed so as to facilitate the possible consent to the occurrence of the planned outage on the confirmed commencement date, in the event that the reliability concerns that prompted the cancellation cease to preclude the occurrence of the planned outage.

7.6 Tests

7.6.1 A market participant who wishes to engage in a test of its facilities or equipment referred to in section 7.6.3 or that could affect the reliability of the PSO controlled system or the operation of the wholesale electricity markets shall request the approval of the PSO to the conduct of the test and shall provide the information referred to in section 7.6.2 to the PSO, the EMC and to any parties that are likely to be affected by the proposed test at least 14 days in advance of the proposed test to allow co-ordination and assessment to take place. No such test shall commence without PSO approval.

7.6.2 As a minimum, the information referred to in section 7.6.1 shall identify:

7.6.2.1 the equipment involved;

7.6.2.2 the relevant details of contracts or agreements as they relate to the test activities;

7.6.2.3 preferred and alternative dates and times for the conduct of the test activities;

7.6.2.4 detailed system configurations or setup;

7.6.2.5 the expected impact of the test activities on power flows, voltage and frequency, and of any other dynamic that could affect the reliability of the PSO controlled system, including details of the steps or precautions to be taken so as to minimise the impact on the reliability of the PSO controlled system;

7.6.2.6 details of special readings, curves, plots or observations, as available; and
7.6.2.7 the names, designation and affiliation of, and methods of communication with, personnel who will be involved in the test activities and who may be contacted with respect thereto.

7.6.3 Tests covered by the requirements of this section 7.6 and for which approval of the PSO is required shall include:

7.6.3.1 the deliberate application of short circuits;

7.6.3.2 stability tests of generation facilities and PSO controlled grid, including but not limited to drop load tests for generating units and line trip tests;

7.6.3.3 deliberate actions which could cause abnormal voltage, frequency or overload;

7.6.3.4 changes to PSO controlled grid or transmission system configurations;

7.6.3.5 commissioning tests of new generation facilities and re-commissioning tests of existing generation facilities; and

7.6.3.6 commissioning and re-commissioning tests of control, monitoring and communications systems in all transmission substations and generation facilities.

7.6.4 The PSO shall permit a test referred to in this section 7.6 to be performed unless the PSO determines that the performance of the test will have an adverse impact on the reliability or security of the PSO controlled system.

7.6.5 In permitting a test to be performed, the PSO shall endeavour to permit the test to be performed at the time and on the date preferred as identified by the market participant pursuant to section 7.6.2.3.

7.7 COMPENSATION

7.7.1 Notwithstanding section 13 of Chapter 1, the transmission licensee shall not be entitled to compensation for any costs, expenses, losses or damage associated with the rejection, cancellation, deferral or recall of outages of the PSO controlled grid.

7.7.2 The market participant for a generation facility or an import registered facility in respect of which an outage is cancelled, deferred or recalled by the PSO shall be entitled to compensation for direct expenses incurred as a result of such cancellation, deferral or recall if:
7.7.2.1 the outage had originally received planning approval or final approval by the PSO;

7.7.2.2 the outage was cancelled, deferred or recalled by reason of a material error in the PSO's demand forecast, a failure of generation facilities within the PSO controlled system, a failure of facilities forming part of the PSO controlled grid or a failure of intertie facilities;

7.7.2.3 the direct expenses were identified to the PSO in accordance with section C.2 of Appendix 5C; and

7.7.2.4 the direct expenses exceed $10,000.00.

7.7.3 A market participant that wishes to make a request to the PSO for compensation for direct expenses pursuant to section 7.7.2 shall follow the procedure set forth in section 3.11 of Chapter 3.

7.7.4 Except as otherwise provided in section 7.7.2, the market participant for a generation facility or an import registered facility in respect of which an outage is cancelled, deferred or recalled by the PSO shall not be entitled to compensation for any costs, expenses, losses or damage incurred as a result of such cancellation, deferral or recall.

7.7.5 Notwithstanding section 13 of Chapter 1, a market participant for a generation facility or an import registered facility shall not be entitled to compensation for any costs, expenses, losses or damage associated with or incurred in respect of the rejection of an outage of that generation facility or import registered facility by the PSO pursuant to section 7.2.12 or 7.2.14.
8 PROCUREMENT OF ANCILLARY SERVICES

8.1 INTRODUCTION

8.1.1 The EMC, on behalf and at the request of the PSO, shall procure, primarily through contracts, certain physical services that are needed to maintain reliable PSO controlled system operations but are not available in the real-time markets. This section 8 describes such physical services and the manner in which the EMC shall procure them.

8.2 CONTRACTED ANCILLARY SERVICES

8.2.1 The EMC shall procure, on behalf and at the request of the PSO, contracted ancillary services through contracts with ancillary service providers that have either:

8.2.1.1 demonstrated the ability to the PSO to provide such contracted ancillary services from registered facilities in accordance with the performance standards and other applicable requirements referred to in section 4; or

8.2.1.2 concluded ancillary service funding agreements with the Authority with respect to such contracted ancillary services.

8.2.2 The principal contracted ancillary services that the EMC may procure pursuant to section 8.2.1 are

8.2.2.1 reactive support and voltage control service,

8.2.2.2 black start capability;

8.2.2.3 fast start service; and,

8.2.2.4 reliability must-run service.

8.2.3 The EMC shall procure each contracted ancillary service:

8.2.3.1 in sufficient quantities and at the appropriate locations to enable the PSO to meet its obligations under this Chapter to ensure the reliable operation of the power system, in accordance with all applicable reliability standards; and

8.2.3.2 having regard to the applicable performance standards referred to in section 4.
8.2.4 Amounts payable to a market participant under an ancillary service contract shall be paid by the EMC in accordance with the ancillary service contract and instructions to this effect given to it by the PSO, and shall be recovered by the EMC in accordance with section 4.1 of Chapter 7.

8.2A CONTRACTED ANCILLARY SERVICES FUNDING

8.2A.1 The Authority may from time to time enter into an ancillary service funding agreement with an ancillary service provider to fund the refurbishment cost for purposes of the provision of contracted ancillary services by that ancillary service provider.

8.2A.2 The EMC and an ancillary service provider (which have entered into or will be entering into an ancillary service funding agreement with the Authority pursuant to section 8.2A.1) shall, at the request of the Authority, enter into a tripartite agreement with the Authority to allow the EMC to set-off or deduct ASFA liabilities from ASC payments.

8.2A.3 The ancillary service provider shall:

   8.2A.3.1 submit the proposed scope, cost and completion timeline with respect to the refurbishment works to the PSO for its approval;

   8.2A.3.2 procure the refurbishment works, as approved by the PSO, to be performed in accordance with good utility practice and all applicable laws and regulations and so as to ensure that such refurbishment works when completed, shall be fit for the purposes of providing the applicable contracted ancillary service;

   8.2A.3.3 procure the refurbishment works to be completed no later than the agreed completion date stipulated in the ancillary service funding agreement, failing which the ancillary service provider shall be liable to pay liquidated damages to the Authority in accordance with the ancillary service funding agreement; and

   8.2A.3.4 if applicable, obtain the land lease extension.

8.2A.4 Amounts payable to an ancillary service provider to fund the refurbishment cost shall be paid by the Authority in accordance with the ancillary service funding agreement.

8.2A.5 The amounts of the refurbishment cost funded by the Authority shall be recovered by the EMC (on behalf and at the request of the Authority) as part of the Authority funding costs by including such amounts in the computation of the payments under section 4.1 of Chapter 7.
8.2B ANCILLARY SERVICE FUNDING AND TRIPARTITE AGREEMENTS

8.2B.1 Each ancillary service funding agreement shall contain the terms as required by the Authority which may include terms that address the following:

8.2B.1.1 the scope of the refurbishment works and if applicable, duration of the land lease extension;

8.2B.1.2 the situations in which the refurbishment works may be varied;

8.2B.1.3 the agreed fixed lump sum refurbishment cost to be funded by the Authority and if such costs could not be ascertained or agreed on a fixed lump sum basis as at the date of the conclusion of the ancillary service funding agreement, the manner in which such costs will be calculated and the agreed cap on such costs;

8.2B.1.4 the agreed date by which the refurbishment works and if applicable, land lease extension must be completed (subject to any adjustments as permitted under the ancillary service funding agreement) and the consequences of any delay in the completion;

8.2B.1.5 the situations in which the agreed costs or cap and the completion date of the refurbishment works and if applicable, land lease extension may be adjusted;

8.2B.1.6 the conditions and schedule for the disbursement of funds by the Authority to the ancillary service provider;

8.2B.1.7 the obligation of the ancillary service provider to enter into an ancillary service contract with the EMC and tripartite agreement with the Authority and the EMC;

8.2B.1.8 the grounds which entitle the Authority to terminate the ancillary service funding agreement and consequences of termination;

8.2B.1.9 the right (but not the obligation) of the Authority to step-in to take possession and control of the refurbishment works or registered facility (or any part thereof) in the event of certain breach or default of the ancillary service provider, and

8.2B.1.10 the terms of assignment or transfer of the ancillary service funding agreement in the event of the assignment or transfer of the funded contracted ancillary service resource to another person.
8.2B.2 An ancillary service provider shall agree on and enter into an ancillary service funding agreement with the Authority at or about the same time when it is agreeing on and entering into an ancillary service contract with the EMC pursuant to section 8.3.2.2 for the provision of contracted ancillary service from its funded contracted ancillary service resource.

8.2B.3 The Authority may of its own accord engage one or more independent consultant(s) to:

8.2B.3.1 conduct an audit in respect of the scope, cost and schedule of the refurbishment works proposed by a prospective ancillary service provider prior to the entering into of any ancillary service funding agreement;

8.2B.3.2 conduct an audit in respect of the costs of the refurbishment works incurred by the ancillary service provider; and/or

8.2B.3.3 monitor progress and verify compliance of the refurbishment works in accordance with the standards set out in section 8.2A.3 and the ancillary service funding agreement.

In the event of any such engagement:

8.2B.3.4 the Authority may engage a consultant, where necessary, with inputs from the prospective ancillary service provider (where the engagement is for the scope referred to in section 8.2B.3.1) or the ancillary service provider (where the engagement is for the scope referred to in section 8.2B.3.2 and/or 8.2B.3.3). The consultant selected should be an independent professional consultant of good repute and having relevant skill and expertise, and should not have any real or potential conflict of interests, whether commercial or otherwise, in connection with the conduct of such audit;

8.2B.3.5 prior to commencing the conduct of such audit, the consultant shall have executed a confidentiality agreement upon such terms and in such form as the Authority may prescribe;

8.2B.3.6 the scope of the audit shall be determined by the Authority, where necessary, with inputs from the prospective ancillary service provider (where the engagement is for the scope referred to in section 8.2B.3.1) or the actual ancillary service provider (where the engagement is for the scope referred to in section 8.2B.3.2 and/or 8.2B.3.3);

8.2B.3.7 all fees incurred by the Authority relating to the engagement of the consultant shall be recovered by the EMC under section 4.1 of Chapter 7;
8.2B.3.8 the prospective or actual ancillary service provider (as the case may be) shall fully cooperate with, and provide all information and/or access to facilities, where relevant to the audit, to the consultant engaged by the Authority; and

8.2B.3.9 the findings of the consultant’s audit (where the engagement is for the scope referred to in section 8.2B.3.1) shall serve as only a reference for further negotiations between the Authority and the prospective ancillary service provider.

8.2B.4 Subject to section 8.2B.6, each tripartite agreement shall contain the terms as required by the Authority which may include terms that address the following:

8.2B.4.1 the right of the EMC to set-off or deduct ASFA liabilities from ASC payments;

8.2B.4.2 any future ancillary service funding agreement(s) and future ancillary service contract(s) (which is concluded at or about the same time as an ancillary service funding agreement(s) pursuant to section 8.2B.2) to be entered into by the ancillary service provider;

8.2B.4.3 the procedures to effect the rights of set-off or deduction by the EMC;

8.2B.4.4 the grounds which entitle the Authority to terminate the tripartite agreement and consequences of termination;

8.2B.4.5 the right (but not the obligation) of the Authority to step-in to remedy any breach or default of the EMC (as notified by the ancillary service provider to the Authority) under any ancillary service contract which is subject to the tripartite agreement; and

8.2B.4.6 the terms of assignment or transfer of the tripartite agreement in the event of the assignment or transfer of the funded contracted ancillary service resource to another person.

8.2B.5 The EMC and an ancillary service provider shall agree and enter into a tripartite agreement with the Authority at the same time when they are agreeing and entering into an ancillary service contract pursuant to section 8.3.2.2 for the provision of contracted ancillary service from the ancillary service provider’s funded contracted ancillary service resource(s).

8.2B.6 The provisions of section 8.2B.4 shall be subject to any contrary provisions in:

8.2B.6.1 any electricity licence; or
8.2B.6.2 the terms of any tripartite agreement the terms of which are required by an electricity licence to be, and have been, approved by the Authority.

8.2C  Refurbishment Cost

8.2C.1 Subject to section 8.2C.2, the refurbishment cost to be funded by the Authority under an ancillary service funding agreement may cover any of the following:

8.2C.1.1 the costs payable to the contractors and consultants appointed by the ancillary service provider to perform the refurbishment works and any other works (including pre-inspection works) to prepare for the commencement of the refurbishment works;

8.2C.1.2 to the extent not included in the costs referred to in section 8.2C.1.1, the costs of insurances which the ancillary service provider is required to effect and maintain under the ancillary service funding agreement;

8.2C.1.3 the premium and stamp duty (if any) payable for the land lease extension; and

8.2C.1.4 such other costs and/or compensation amount as the Authority determines to be fair and reasonable under the circumstances.

8.2C.2 The refurbishment cost to be funded by the Authority under an ancillary service funding agreement shall exclude:

8.2C.2.1 any mark-up by the ancillary service provider; and

8.2C.2.2 any costs, loss and expense incurred or to be incurred by the ancillary service provider, its contractors and/or consultants arising from or attributable to any default or negligence of the ancillary service provider, its contractors and/or consultants.

8.2D  Framework Agreement

8.2D.1 The EMC shall, at the request of the Authority, enter into a framework agreement with the Authority to require the EMC to amongst others recover (on behalf of the Authority) the Authority funding costs.

8.2D.2 The Authority funding costs payable to the Authority under the framework agreement shall be recovered by the EMC (on behalf of and at the request of the Authority) in accordance with section 4.1 of Chapter 7, and such amounts shall be paid by the EMC in accordance with the framework agreement.
8.2D.3 The *framework agreement* shall contain the terms as required by the *Authority* which may include terms that address the following:

8.2D.3.1 the obligation of the *EMC* to recover (on behalf of the *Authority*) the *Authority funding costs* by including such costs in the computation of the payments under section 4.1 of Chapter 7;

8.2D.3.2 the obligation of the *EMC* to exercise its rights to set-off or deduct *ASFA liabilities* from *ASC payments* upon receipt of instructions from the *Authority*;

8.2D.3.3 the procedures for the recovery of the *Authority funding costs* and *ASFA liabilities*;

8.2D.3.4 the grounds which entitle the *Authority* to terminate the *framework agreement*; and

8.2D.3.5 the process for modifying the terms of the *framework agreement*.

8.2D.4 The *EMC* shall conclude the *framework agreement* with the *Authority* on or before the conclusion of any *ancillary service funding agreement* pursuant to section 8.2B.2 with an *ancillary service provider*.

### 8.3 Ancillary Service Contracts

8.3.1 The *EMC* shall, subject to section 8.3.5, include in each *ancillary service contract* terms and conditions that address, at a minimum, the following:

8.3.1.1 the duration of the *ancillary service contract*, which may be of any duration as deemed appropriate by the *PSO* or, in the case of an *ancillary service contract* which is concluded at or about the same time as an *ancillary service funding agreement* pursuant to section 8.2B.2, the *Authority*;

8.3.1.1A in respect of any *ancillary service contract* which is concluded at or about the same time as an *ancillary service funding agreement* pursuant to section 8.2B.2, the term for the provision of the *contracted ancillary services* shall only commence on the completion of the *refurbishment works* and the *PSO* being satisfied that the applicable *registered facility* is able to provide *contracted ancillary services* in accordance with the performance standards and other applicable requirements referred to in section 4;
8.3.1.2 the situations in which the contracted ancillary service resource(s) may be called;

8.3.1.3 the nature and timing of any advance notice required for the PSO to call upon the contracted ancillary service resource(s);

8.3.1.4 payment terms for the provision of the contracted ancillary service above the levels required to be provided by any electricity licence or any registration or connection requirements referred to in these market rules, the transmission code or any applicable connection agreement, including the amount and timing of any availability payment;

8.3.1.5 the situations under which some or all of the terms of the ancillary service contract may be suspended;

8.3.1.6 the process for modifying the terms of the ancillary service contract;

8.3.1.7 the terms of assignment or transfer of the ancillary service contract in the event of the assignment or transfer of the contracted ancillary service resource(s) to another person; and

8.3.1.8 in the case of an ancillary service contract for reliability must-run service, agreed offer variation data that the PSO may direct the contracted ancillary service resource(s) to submit when it is called by the PSO to operate in various modes under the ancillary service contract for reliability must-run service, and provisions for the revision of such offer variation data, when necessary.

8.3.2 The EMC shall use one or a combination of the following processes to conclude ancillary service contracts with ancillary service providers:

8.3.2.1 where practicable, the EMC shall employ a competitive tendering or negotiation process to identify multiple potential ancillary service providers and to determine competitive prices and other terms for the ancillary service contracts; or

8.3.2.2 otherwise, the EMC may negotiate ancillary service contracts with a single potential ancillary service provider where the EMC determines that this will result in reasonable prices and other terms.

8.3.3 At the time of commencement of the process(es) described in section 8.3.2 for the procuring of an ancillary service under an ancillary service contract, the EMC shall publish the following particulars in respect of that ancillary service:
8.3.3.1 the desired quantity (if any) of that ancillary service;
8.3.3.2 the desired duration of that ancillary service contract;
8.3.3.3 the desired situations in which that ancillary service may be called upon to be provided;
8.3.3.4 the desired nature and timing of any advance notice required for the PSO to call upon the provision of that ancillary service;
8.3.3.5 the desired timing of payment for the provision of that ancillary service;
8.3.3.6 the desired service standards and performance levels applicable to that ancillary service;
8.3.3.7 the desired situations under which some or all of the terms of the ancillary service contract may be suspended;
8.3.3.8 the desired process for modifying the terms of the ancillary service contract; and
8.3.3.9 the desired terms of assignment or transfer of the ancillary service contract to another person.

8.3.4 The EMC may, of its own accord or at the request of the PSO, engage an independent consultant to conduct an audit in respect of the proposals from prospective ancillary service providers pursuant to section 8.3.2, upon the following terms:

8.3.4.1 the EMC shall engage a consultant with inputs from the PSO and the prospective ancillary service provider. The consultant selected should be an independent professional consultant of good repute and having relevant skill and expertise, and should not have any real or potential conflict of interests, whether commercial or otherwise, in connection with the conduct of such audit;

8.3.4.2 prior to commencing the conduct of such audit, the consultant has executed a confidentiality agreement upon such terms and in such form as the EMC may prescribe;

8.3.4.3 the scope of the audit shall be determined jointly by the PSO and EMC, with inputs from the prospective ancillary service provider.

8.3.4.4 all fees incurred by the EMC relating to the engagement of the consultant shall be recovered by the EMC under section 4.1 of Chapter 7;
8.3.4.5 the market participant, who is the prospective ancillary service provider, shall fully cooperate with, and provide all information and/or access to facilities, where relevant to the audit, to the consultant; and

8.3.4.6 the findings of the consultant’s audit shall serve as only a reference for further negotiations between the EMC and the prospective ancillary service provider. The prospective ancillary service provider is not obliged to sign the proposed ancillary service contract based on specific prices and terms arising from the findings of the audit.

8.3.5 The provisions of sections 8.3.1 and 8.6.1 shall be subject to any contrary provisions contained in:

8.3.5.1 any electricity licence; or

8.3.5.2 the terms of any ancillary service contract the terms of which are required by an electricity licence to be, and have been, approved by the Authority.

8.3.6 Each person that:

8.3.6.1 has entered into an ancillary service contract with the EMC; and

8.3.6.2 is not, at any time during the term of such ancillary service contract, the dispatch coordinator for the facility from which the contracted ancillary service will be provided,

shall ensure that the dispatch coordinator for that facility complies with the provisions of the ancillary service contract.

8.4 The Effect of Grid Connection Requirements

8.4.1 The PSO may at any time direct the market participant for a registered facility or generation settlement facility to provide the level of any ancillary service that the registered facility is required to provide as a condition of any electricity licence or as a result of any connection requirement or any registration requirement referred to in these market rules, the transmission code or any applicable connection agreement.

8.4.2 No person shall be entitled to compensation from the PSO or the EMC for any ancillary service that must be provided by a registered facility or generation settlement facility pursuant to any electricity licence or connection requirement or any registration requirement referred to in these market rules, the transmission code or any applicable connection agreement.
agreement unless and until the EMC develops a market for such ancillary service that:

8.4.2.1 pays all providers of the ancillary service; or

8.4.2.2 requires any person to pay for the failure of a registered facility or generation settlement facility to provide the ancillary service up to some standard that may be less than that attributable to the connection requirement,

or both.

8.4.3 If the PSO directs the market participant for a registered facility or generation settlement facility to provide a level of any ancillary service above the levels required by the electricity licence applicable to that registered facility or generation settlement facility, or by any registration or connection requirements or any registration requirements referred to in these market rules, the transmission code or any applicable connection agreement and the registered facility or generation settlement facility is not otherwise subject to an ancillary service contract with the EMC, the market participant for that registered facility or generation settlement facility may make a request to the PSO for compensation in accordance with the procedure set forth in section 3.11 of Chapter 3.

8.5 **CONTRACTS FOR RELIABILITY MUST-RUN SERVICE**

| Explanatory Note: Must-run contracts could be used by the PSO to direct the operation of generating units in specific ways for reasons of reliability. The market price gives the incentive to address adequacy. If the PSO uses must-run contracts in this instance it will be seriously distorting the market outcomes. These contracts should only be used to address localised problems or timing issues. |

8.5.1 Where the EMC and a generation licensee enter into an ancillary service contract for reliability must-run service with respect to a given facility, the PSO may direct that facility to operate in specific ways when directed by the PSO to do so for reasons of reliability, other than in situations of overall adequacy of the PSO controlled system.

8.5.2 The PSO shall not request the EMC to enter into an ancillary service contract for reliability must-run service unless studies performed by the PSO indicate that a reliability must-run resource is required to be available for the purposes of reliability, other than in situations of overall adequacy of the PSO controlled system.

8.5.3 The EMC shall enter into an ancillary service contract for reliability must-run service in respect of a facility only where the electricity licence
of the *generation licensee* for the facility contains a condition that provides for the *generation licensee* to enter into *ancillary service contracts* for *reliability must-run service*. Where the *electricity licence* of the *generation licensee* contains such a condition, the *generation licensee* shall enter into *ancillary service contracts* for *reliability must-run service* at the *EMC’s request*, acting at the request and on behalf of the *PSO* under this section 8.

8.5.4 The *PSO* may call upon a facility with which the *EMC* has an *ancillary service contract* for *reliability must-run service* if and only if the *PSO*, in consultation with the *EMC*, determines that *market participants* will not offer sufficient *physical services* into the *real-time markets* to enable the *PSO* to maintain *reliability*, other than in situations of overall *adequacy* of the *PSO* controlled system.

8.6 **COSTS PAYABLE FOR CERTAIN ANCILLARY SERVICES**

8.6.1 Subject to section 8.3.5, the price payable under an *ancillary service contract* entered into by the *EMC* may cover any of the following:

8.6.1.1 the cost of being available to provide a *contracted ancillary service* if directed by the *PSO* to do so;

8.6.1.2 the direct costs and the opportunity costs of actually providing the *contracted ancillary service* when directed by the *PSO* to do so; and

8.6.1.3 such other compensation as the *EMC* determines to be fair and reasonable under the circumstances.

8.6.2 The *PSO* may, in the circumstances referred to in section 4.13, direct the *market participant* for a *registered facility* to provide any class of *contracted ancillary services* even though the *EMC* does not have an *ancillary service contract* in respect of that *registered facility* for that *contracted ancillary service*. A *market participant* for a *registered facility* that complies with such direction may make a request to the *PSO* for compensation in accordance with the procedure set forth in section 3.11 of Chapter 3.

8.7 **PUBLICATION OF PROCUREMENT CONTRACT INFORMATION**

8.7.1 The *EMC* shall treat information relating to the funding of the *refurbishment cost* and procurement of *contracted ancillary services* as follows:
8.7.1.1 the EMC shall publish annually the total costs of each class of contracted ancillary services listed in section 8.2.2 subject to ancillary service contracts, together with estimates of the total costs of each class of contracted ancillary services the EMC expects to recover for the next 36 months;

8.7.1.2 the EMC shall publish annually the quantities of each class of contracted ancillary service listed in section 8.2.2 covered under ancillary service contracts, together with estimates of any additional quantities the EMC expects to acquire during the next 36 months; and

8.7.1.3 the EMC shall publish annually the total Authority funding costs for the preceding 12 months which the EMC has recovered on behalf of the Authority in accordance with section 4.1 of Chapter 7, together with estimates of the total Authority funding costs that the EMC expects to recover on behalf of the Authority for the next 36 months.

8.7.2 Where an ancillary service contract is concluded pursuant to section 8.3.2.1, the EMC shall publish the price specified in that ancillary service contract in respect of the contracted ancillary service procured thereunder. Where an ancillary service contract is concluded otherwise than pursuant to section 8.3.2.1, then except where required by section 8.7.1, the EMC shall not publish the price specified in that ancillary service contract in respect of the contracted ancillary service nor the quantity of the contracted ancillary service procured under that ancillary service contract.
9 DISPATCH PROCESS

9.1 ISSUING DISPATCH INSTRUCTIONS

9.1.1 The PSO shall issue dispatch instructions for each registered facility in accordance with this section 9 as the primary means of coordinating the real-time operation of the PSO controlled system.

9.1.2 The issuance of dispatch instructions shall be as follows:

9.1.2.1 where a real-time dispatch schedule is released by the EMC pursuant to section 9.2.3 of Chapter 6 to a dispatch coordinator for a given registered facility, such real-time dispatch schedule shall be deemed to be the dispatch instructions issued by the PSO for that registered facility and that dispatch period unless and until the PSO issues subsequent dispatch instructions for that registered facility for that dispatch period in accordance with section 9.1.3; or

9.1.2.2 where a real-time dispatch schedule is not released by the EMC pursuant to section 9.2.3 of Chapter 6 to a dispatch coordinator for a given registered facility and dispatch period, the PSO shall issue dispatch instructions to that dispatch coordinator for that dispatch period in accordance with the procedures described in the system operation manual and section 9.1.2A, instructing the applicable registered facility to provide, to limit the provision of, to withdraw or to limit the withdrawal of the relevant physical service at or to the level specified in the dispatch instruction; and

9.1.2.3 in the case of dispatch instructions for reactive support and voltage support service, the PSO shall issue dispatch instructions for that dispatch period, instructing the applicable registered facility to provide or to limit the provision of the relevant reactive support and voltage support service, at or to the level specified in the dispatch instruction.

9.1.2A When issuing the dispatch instructions for a dispatch period referred to in section 9.1.2.2, the PSO shall, to the extent which the PSO determines that it is feasible to do so, use the latest available short-term schedule, pre-dispatch schedule or market outlook scenario released by the EMC pursuant to section 7.7 of Chapter 6 as the dispatch instructions for that dispatch period.

9.1.3 Where the PSO considers that any dispatch instructions issued in accordance with section 9.1.2 could result in the PSO controlled system
entering into a high-risk operating state or an emergency operating state, the PSO may issue dispatch instructions to a dispatch coordinator for a dispatch period at any time between the release of the real-time dispatch schedule to the dispatch coordinator for that dispatch period and the end of that dispatch period, instructing any registered facility to provide, to limit the provision of, to withdraw or to limit the withdrawal of the relevant physical service at or to the level specified in the dispatch instruction. Any such dispatch instructions shall override any prior dispatch instructions.

9.1.4   Dispatch instructions referred to in sections 9.1.2.2, 9.1.2.3 and 9.1.3 for any registered facility shall:

9.1.4.1 be consistent with the current operating status of that registered facility and with all relevant security limits and equipment limits established by the PSO pursuant to section 5.2; and

9.1.4.2 subject to section 9.3.5, be used by the PSO for the purpose of declaring the registered facility as non-conforming in accordance with section 9.6.4.

9.1.5   If a dispatch coordinator fails to receive a real-time dispatch schedule for a dispatch period for a registered facility and the PSO fails to issue dispatch instructions for that dispatch period and that registered facility pursuant to section 9.1.2.2, the dispatch coordinator for that registered facility shall use as its default dispatch instructions the most recent dispatch instruction issued to it in respect of that registered facility.

9.1.6   In relation to the dispatch instructions described in section 9.1.2.2, 9.1.2.3 or 9.1.3 the PSO shall:

9.1.6.1 establish and publish the communication systems and protocols to be used for issuing such dispatch instructions;

9.1.6.2 issue such dispatch instructions using the systems and protocols referred to in section 9.1.6.1; and

9.1.6.3 record and time-stamp all such dispatch instructions, store such records for at least six years and make such records available for purposes of audit and dispute resolution in accordance with these market rules.

9.1.6A   If the PSO has:

9.1.6A.1 pursuant to section 9.1.3, overridden a real-time dispatch schedule released by the EMC under section 9.1.2.1 or a dispatch instruction issued by the PSO under section 9.1.2.2 for an LRF with REB relating to energy for a dispatch period; or
9.1.6A.2 pursuant to section 9.1.2.2, issued any dispatch instructions relating to energy to an LRF with REB for a dispatch period,

the PSO shall, by the next business day, provide to the EMC the last dispatch instruction issued to that LRF with REB for that dispatch period prior to the start of that dispatch period.

9.1.6B The PSO shall, by the next business day, notify the EMC if any dispatch instructions relating to energy for a dispatch period had been issued to an LRF with REB during that dispatch period.

9.1.7 Subject to section 9.1.8, a market participant for a registered facility that complies with dispatch instructions issued pursuant to section 9.1.3 may make a request to the PSO for compensation in accordance with section 3.11 of Chapter 3.

9.1.8 Dispatch instructions for reactive support and voltage support service released pursuant to section 9.1.3 shall not be eligible for compensation from the PSO.

9.2 Dispatch of Energy

9.2.1 The dispatch instructions for energy issued to each applicable dispatch coordinator for or within a given dispatch period shall indicate, as the case may be:

9.2.1.1 the instantaneous rate, in MW, at which energy is to be injected onto the transmission system by a generation registered facility or import registered facility at the end of the dispatch period;

9.2.1.2 in the case of dispatch instructions received as AGC signals, the dispatch instructions shall consist of control information consistent, were the AGC signal to continue until the end of the dispatch period, with the information described in section 9.2.1.1. Receipt of such AGC signals shall not constitute receiving new dispatch instructions pursuant to section 9.1.3 where the control information in the AGC signals continues to be consistent with the original dispatch instructions issued in accordance with section 9.1.2; or

9.2.1.3 the instantaneous rate, in MW, at which energy is to be withdrawn through the transmission system by an LRF with REB at the end of the dispatch period.

9.2.2 Each dispatch coordinator for a registered facility that receives dispatch instructions pertaining to energy from the PSO by means of AGC signals
shall ensure that the applicable registered facility is ready and able to respond to such signals.

9.2.3 Each dispatch coordinator for a registered facility that receives dispatch instructions pertaining to energy for a given dispatch period by means other than AGC signals shall:

9.2.3.1 in the case where the registered facility is registered to provide energy, immediately begin ramping the output of the registered facility linearly so as to be able to attain the instructed level of output by the end of the dispatch period; and

9.2.3.2 in the case where the registered facility is an LRF with REB, immediately begin ramping its energy withdrawal level at its ramp-up or ramp-down rate stated in its valid energy bid submitted under section 5.2A.2.6 of Chapter 6 so as to be able to attain the instructed level of energy withdrawal and maintain such level of energy withdrawal until the end of the dispatch period.

9.3 DISPATCH OF RESERVE CAPACITY AND RESERVE ACTIVATION

9.3.1 The dispatch instructions for reserve issued to each applicable dispatch coordinator for or within a given dispatch period, as the case may be, shall indicate the amount of reserve, in MW, of each reserve class that, throughout the dispatch period unless an event that triggers a reserve response occurs in such dispatch period, is to be in a condition to respond to a fall in PSO controlled system frequency or to respond to a dispatch instruction issued pursuant to section 9.3.4 calling for additional energy production.

9.3.2 Each registered facility that is issued a dispatch instruction for reserve in accordance with section 9.1.2 shall maintain unused generation capacity or load reduction capacity, as the case may be, during that dispatch period consistent with the dispatch instructions issued to it, so as to be able to increase energy production or decrease energy withdrawal, as the case may be, in accordance with sections 9.3.3 and 9.3.4 when a contingency event has occurred or is occurring.

9.3.3 Where a contingency event has occurred or is occurring, each reserve provider that has been issued dispatch instructions pursuant to section 9.1.2 for primary reserve, shall respond automatically to a frequency drop by increasing energy production or decreasing energy withdrawal by the amount specified in such dispatch instructions within the time and in accordance with the performance standards specified in section A.2 of Appendix 5A, until such time as further dispatch instructions are issued to it.
9.3.4 Where a contingency event has occurred or is occurring, each reserve provider that has been issued of dispatch instruction pursuant to section 9.1.2 for contingency reserve shall respond to any dispatch instruction that the PSO may issue, instructing the registered facility providing reserve to begin increasing energy production or decreasing energy withdrawal, as the case may be, and subject to section 4.13.1, up to the quantity specified in its real-time dispatch schedule for that reserve class within the time and in accordance with the performance standards specified in section A.2 of Appendix 5A.

9.3.5 Where a reserve provider responds automatically to a contingency event or to a dispatch instruction from the PSO pursuant to section 9.3.3 or 9.3.4, it shall not for the purposes of section 9.6 be considered as departing from, or declared as non-conforming in respect of, any other dispatch instructions for energy or regulation for the same dispatch period.

9.3.6 Notwithstanding anything to the contrary in section A.2 of Appendix 5A, if a load registered facility that is issued a dispatch instruction for reserve decreases energy withdrawal pursuant to the market rules, the market manuals or the system operation manual, its load shall not be restored until and unless directed or permitted by the PSO via a load restoration notice.

9.3.7 A market participant for a load registered facility may make a request to the PSO for compensation in accordance with the procedure set forth in section 3.11 of Chapter 3 if:

9.3.7.1 the load registered facility responded automatically to a contingency event in accordance with section 9.3.3, and the duration between the time of response and the time of a load restoration notice referred to in section 9.3.6 exceeds 120 minutes; or

9.3.7.2 the load registered facility responded to a dispatch instruction from the PSO in accordance with section 9.3.4, and the duration between the time of issuance of such dispatch instruction and the time of a load restoration notice referred to in section 9.3.6 exceeds 120 minutes,

provided that the market participant shall not be entitled to compensation for the initial 120-minute activation period.
9.4 Dispatch of Regulation

9.4.1 The dispatch instructions for regulation issued to each applicable dispatch coordinator for or within a given dispatch period, as the case may be, shall indicate the amount of regulation, expressed as a MW range about its then current operating point, that a registered facility is to provide in response to AGC signals or other signals acceptable to the PSO.

9.4.2 Each registered facility providing regulation shall maintain unused generation capacity during the applicable dispatch period consistent with the dispatch instructions issued to it, so as to be able to increase or decrease energy production in response to AGC signals or other signals acceptable to the PSO.

9.5 Dispatch of Reactive Support and Voltage Control

9.5.1 The dispatch instructions for reactive support and voltage control service issued to each applicable market participant for or within a given dispatch period, as the case may be, shall be instructions, in a form suitable for the equipment at the applicable registered facility, for reactive support and voltage control service to be provided under ancillary service contracts.

9.5.2 Each market participant for a registered facility providing reactive support and voltage control service shall operate its equipment, which may include reactors, transmission lines, generation plant and on-load transformer taps, in a manner consistent with the dispatch instructions issued to it in respect of reactive support and voltage control service.

9.6 Non-Compliance with Dispatch Instructions

9.6.1 Each dispatch coordinator shall ensure that each of its registered facilities complies with the dispatch instructions issued in respect of such registered facility, except as may otherwise be permitted under these market rules.

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.
Explanatory Note: In addition, the market participant will likely have to resubmit offers for any future period in which it expects not to be able to comply, under section 5.1.5 of Chapter 6.

9.6.3 Compliance with a dispatch instruction for a registered facility is not required if such compliance would endanger the safety of any person, substantially damage equipment, or violate any applicable law. Subject to section 9.3.5, the dispatch coordinator for a registered facility that departs from dispatch instructions for any such reason shall so notify the PSO in accordance with section 9.6.2.

9.6.4 If the failure by a registered facility to comply with a dispatch instruction has a materially adverse impact on the reliability of the PSO controlled system, the PSO shall declare the registered facility to be non-conforming and shall take any actions allowed by sections 9.6.5 and 9.6.6 or any other provision of these market rules as the PSO determines appropriate.

9.6.5 If the PSO declares a registered facility to be non-conforming under section 9.6.4:

9.6.5.1 the PSO shall require the dispatch coordinator for that registered facility to explain the reason for the non-compliance and shall record the response;

9.6.5.2 if the PSO determines that the registered facility is physically incapable of implementing the dispatch instructions, the PSO may require the dispatch coordinator for the registered facility to submit offer variations, bid variations, revised standing capability data or some or all of the foregoing for the non-conforming registered facility; and

9.6.5.3 if the PSO is not satisfied that the registered facility will respond to future dispatch instructions, the PSO may direct the registered facility to follow, as closely as practicable, an energy output profile specified by the PSO, and shall thereafter represent the registered facility as having the specified profile until the non-conforming registered facility satisfies the PSO that it has remedied the conditions causing the non-conformance, where applicable.

9.6.6 Until the dispatch coordinator for a non-conforming registered facility responds to the requirements of this section 9.6 to the satisfaction of the PSO, such registered facility shall continue to be designated as non-conforming, and such failure to respond on the part of that dispatch coordinator may be referred by the PSO to the market surveillance and compliance panel at any time.
9.7 Dispatch Errors

9.7.1 A dispatch error shall be deemed to have occurred if either:

9.7.1.1 an arbitration tribunal determines that the PSO has failed to follow the real-time dispatch process as set out in these market rules; or

9.7.1.2 the PSO declares that it has made a dispatch error.

The PSO will notify the EMC of any dispatch error by electronic mail within 24 hours of the dispatch error being discovered.

9.7.2 A dispatch error shall not invalidate the market prices determined contemporaneously with the real-time dispatch schedule that was deemed to constitute the dispatch instructions that contained the dispatch error.

9.7.3 When a dispatch error has occurred, a market participant that has sustained a loss or damage as a result of the dispatch error may make a request to the PSO for compensation in accordance with the procedure set forth in section 3.11 of Chapter 3.

9.8 Advisory Notices

9.8.1 The PSO shall inform the EMC as soon as practicable of conditions on the PSO controlled system that in the PSO’s opinion, merit the issuance by the EMC of an advisory notice under section 9.3 of Chapter 6.

9.8.2 The PSO shall provide to the EMC confirmation as to whether or not load shedding had occurred in the dispatch period referred to in section 9.3.2D of Chapter 6 within 1 business day of the EMC’s request. If load shedding had not occurred in that dispatch period, the PSO shall also at the same time provide the information requested by the EMC under section 9.3.2D of Chapter 6 in such format as the EMC and the PSO may agree or, if such information is not available, inform the EMC of such fact.

9.9 PSO Obligations After the Dispatch Period

9.9.1 The PSO shall, in respect of real-time operations, maintain a record, in sufficient detail to allow review by the market surveillance and compliance panel, of any situations with respect to one or more market participants, or to the PSO controlled system as a whole, in which:

9.9.1.1 it issued dispatch instructions pursuant to section 9.1.3;

9.9.1.2 load shedding occurred;
9.9.1.3 reserve or regulation requirements were compromised; or

9.9.1.4 it imposed a generation fixing constraint on the output level of a generation registered facility or import registered facility,

and shall communicate such information to the EMC.

9.9.2 The PSO shall, in respect of real-time operations, maintain a record, in sufficient detail to allow review by the market surveillance and compliance panel, of any situation:

9.9.2.1 in which market participants have performed in a manner inconsistent with or contrary to;

9.9.2.2 where equipment and processes have performed in a manner inconsistent with or contrary to; or

9.9.2.3 which has prevented the PSO from performing in a manner consistent with,

these market rules, any applicable market manuals or the system operation manual.
10 DEMAND CONTROL

10.1 INTRODUCTION

10.1.1 This section 10 applies in situations on the PSO controlled system where there is insufficient generation capacity and import capacity available from generation facilities and import registered facilities to satisfy expected demand, where operating problems (such as frequency, voltage levels or thermal over-loads) exist which affect the ability to serve load, or where there is a breakdown on any part of the PSO controlled system. This section 10 identifies actions that the PSO may take or may direct market participants to take to assist in achieving reductions in demand to either avoid or alleviate such situations.

10.1.2 The PSO shall continuously inform market participants of conditions of the PSO controlled system that may require the PSO to initiate reductions in demand by non-dispatchable loads.

10.2 UNDER-FREQUENCY LOAD SHEDDING

10.2.1 Automatic under-frequency load shedding shall be accomplished to maintain the frequency of the PSO controlled system and to restore the PSO controlled system to normal frequency following frequency deviations outside of the range established by the PSO.

10.2.2 The PSO shall make arrangements to facilitate the disconnection of a minimum percentage of the total peak customer demand, as determined by the PSO, by means of automatic under-frequency response equipment.

10.2.3 If directed by the PSO, the transmission licensee shall make arrangements to facilitate the disconnection of a minimum percentage of its total peak customer demand, as determined by the PSO, by means of automatic under-frequency response equipment.

10.2.4 The non-dispatchable load that is subject to automatic under-frequency load shedding pursuant to this section 10.2 shall be split into discrete stages. The number, location, MW size and associated low frequency settings of these stages shall be as specified by the PSO. Such specifications shall be established by the PSO, following consultations with relevant market participants, prior to the market commencement date and thereafter by the last day of June in each calendar year to cover the immediately following twelve-month period.
10.2.5 The PSO shall develop and include in the system operation manual a policy detailing the basis for exclusions to load management activities that are undertaken for the purpose of shedding load during under-frequency conditions. The PSO shall consult with market participants when developing the policy.

10.2.6 Once load has been shed to maintain the frequency of the PSO controlled system, the PSO shall as soon as practicable report conditions on the PSO controlled system to the transmission licensee.

10.2.7 Neither the transmission licensee nor the market participant for a load facility connected to the transmission system shall restore load that has been shed pursuant to this section 10.2 until directions have been received from the PSO permitting it to do so. The transmission licensee or such market participant shall commence the restoration of load immediately following receipt of such direction.

10.2.8 The transmission licensee and each market participant for a load facility connected to the transmission system shall, as soon as practicable, provide the PSO with an estimate of the demand reduction that has occurred as a result of disconnecting under-frequency demand.

10.3 DEMAND CONTROL INITIATED BY THE PSO IN AN EMERGENCY OPERATING STATE

10.3.1 When an emergency operating state has been declared by the PSO, the actions available to the PSO to safeguard the security of the PSO controlled system may include issuing directions to the transmission licensee or to the market participant for a load facility connected to the transmission system to reduce demand for electricity.

10.3.2 The transmission licensee and each market participant for a load facility connected to the transmission system that receives a direction from the PSO to reduce demand shall achieve the reduction in demand within 5 minutes of receipt of the direction and shall, as soon as practicable, notify the PSO that it has done so.

10.3.3 Neither the transmission licensee nor a market participant for a load facility connected to the transmission system that has reduced demand pursuant to this section 10.3 shall restore demand until directions have been received from the PSO permitting it to do so. The transmission licensee or market participant for the load facility connected to the transmission system shall commence restoration of demand immediately following receipt of such directions.
10.3.4 The PSO shall develop and include in the system operation manual a policy detailing the basis for exclusions to load management activities that are undertaken for the purpose of controlling demand. The PSO shall consult with market participants when developing the policy.

10.4 GENERATOR OBLIGATIONS DURING ABNORMAL FREQUENCY

10.4.1 Abnormal frequency conditions on the PSO controlled system may require immediate actions by market participants for generation facilities or import registered facilities to restore the frequency to an acceptable level. The abnormal frequency conditions to which this section 10.4 applies and the actions that may be required of market participants for generation facilities or import registered facilities under such conditions shall be defined by the PSO and included in the system operation manual. A market participant for a generation facility and import registered facility that takes action in response to an abnormal frequency excursion may make a request to the PSO for compensation in accordance with the procedure set forth in section 3.11 of Chapter 3.
11 COMMITMENT/DECOMMITMENT PROCEDURES

11.1 INTRODUCTION

11.1.1 Subject to 11.1.2, no dispatch coordinator for a generation registered facility may synchronise that generation registered facility to the transmission system or desynchronise that generation registered facility from the transmission system except as provided in this section 11.

11.1.2 All generation registered facilities located within Singapore or located outside of Singapore but connected to the transmission system are subject to this section 11.

11.2 PROCESS FOR SELF-COMMITMENT

11.2.1 A dispatch coordinator shall request approval from the PSO for the synchronisation of a generation registered facility where:

11.2.1.1 a valid and outstanding energy offer, reserve offer or regulation offer has been submitted for that generation registered facility; or

11.2.1.2 the generation facility is being called to provide an ancillary service pursuant to an ancillary service contract,

such that the dispatch coordinator can comply with any dispatch instructions for that generation registered facility which may be issued as a result of the acceptance of such offer or with the call to provide such ancillary service.

11.2.2 The dispatch coordinator’s request issued pursuant to section 11.2.1 shall, having regard to the time taken to complete synchronisation of the generation registered facility on earlier occasions, be issued to the PSO in sufficient time to enable:

11.2.2.1 the PSO to approve and, where necessary, participate in the synchronisation of the generation registered facility; and

11.2.2.2 the dispatch coordinator to obtain approval of synchronisation in time to allow it to comply with any applicable dispatch instruction or call to provide ancillary services,

and in no event shall such request be issued less than 30 minutes in advance of the anticipated time of synchronisation, unless the request is
associated with operations relating to the provision of fast start service or regulation.

11.2.3 Notwithstanding that a request for synchronisation may have been made pursuant to section 11.2.1, a dispatch coordinator shall not synchronise or attempt to synchronise a generation registered facility except and in accordance with the approval of the PSO.

11.2.4 The PSO shall process and approve or reject requests by dispatch coordinators for synchronisation in the order in which such requests are received by the PSO unless the PSO considers, on reasonable grounds, that the security and reliability of the PSO controlled system would be threatened by the processing of synchronisation requests in such order. In such case, the PSO may process and approve or reject requests for synchronisation in an order other than in the order in which the requests were received by the PSO.

11.2.5 The PSO shall approve requests by dispatch coordinators for synchronisation issued pursuant to 11.2.1 unless the PSO considers, on reasonable grounds, that the security and reliability of the PSO controlled system would be threatened by such approval. In such case, the PSO may reject the request.

11.2.6 The PSO shall notify a dispatch coordinator of the approval or rejection of its request for synchronisation as soon as practicable having regard to the order in which the request was processed in accordance with section 11.2.4.

11.2.7 If the PSO rejects a request for a generation registered facility to synchronise, its dispatch coordinator shall ensure that it does not commence to synchronise and that an offer variation is submitted in accordance with section 5.1.5 of Chapter 6.

11.2.8 Receipt by the dispatch coordinator for a generation registered facility of notification of approval by the PSO under section 11.2.6 gives the dispatch coordinator the right to synchronise the generation registered facility to the PSO controlled system at and from the time directed by the PSO pursuant to section 11.2.9. This right does not preclude the PSO from requiring desynchronisation of a generation registered facility in the event of there being a surplus of energy in accordance with any applicable provisions of these market rules relating to energy surplus market advisories.

11.2.9 The exact time of any synchronisation shall be subject to directions from the PSO.
11.2.10 Each dispatch coordinator for a generation registered facility shall promptly notify the PSO where it is unable to synchronise in accordance with the approval, or any directions given pursuant to section 11.2.9 by the PSO. Upon receipt of such notice, the PSO shall re-assess accordingly such approval for the dispatch coordinator to synchronise its generation registered facility.

11.3 PROCESS FOR DECOMMITMENT

11.3.1 A dispatch coordinator responsible for a generation registered facility that is synchronised to the transmission system and that, having regard to any valid and outstanding offers that may have been submitted in respect of the generation registered facility and to the provisions of any ancillary service contract, wishes to desynchronise from the transmission system, shall request approval from the PSO to desynchronise that generation registered facility, and in no event shall such request be issued less than 30 minutes in advance of the anticipated time of desynchronisation, unless the request is associated with operations relating to the cessation of provision of fast start service or regulation.

11.3.2 Except as otherwise permitted by section 11.3.5, a dispatch coordinator for a generation registered facility shall not desynchronise that generation registered facility except and in accordance with the approval of the PSO except where the EMC has issued an energy surplus advisory notice pursuant to section 9.3 of Chapter 6 and the PSO has directed that the generation registered facility be desynchronised. Where the PSO so directs a dispatch coordinator to desynchronise a generation registered facility, the PSO shall use reasonable endeavours to issue such direction no less than 30 minutes in advance of the required desynchronisation time.

11.3.3 The PSO shall approve any request to desynchronise made pursuant to section 11.3.1 unless:

11.3.3.1 the generation registered facility is operating under the provisions of an ancillary service contract for reliability must-run service and the PSO has directed it to operate thereunder;

11.3.3.2 the PSO requires the generation registered facility to remain synchronised to maintain the security or adequacy of the PSO controlled system; or

11.3.3.3 an energy, reserve or regulation shortfall advisory notice is in effect.

11.3.4 The PSO shall notify a dispatch coordinator of the approval or rejection of its request for desynchronisation as soon as practicable.
11.3.5 If the PSO rejects a request for a generation registered facility to desynchronise, its dispatch coordinator shall ensure that it remains synchronised and that an offer variation is submitted in accordance with section 5.1.5 of Chapter 6. The dispatch coordinator shall do the foregoing unless prevented on the grounds of plant or personnel safety.

11.3.6 The exact time of any desynchronisation approved by the PSO shall be subject to directions from the PSO.

11.3.7 Receipt by the dispatch coordinator for a generation registered facility of notification of approval by the PSO under section 11.3.4 gives the dispatch coordinator the right to commence shut-down of the generation registered facility at and from the time directed by the PSO pursuant to section 11.3.6.

11.3.8 Each dispatch coordinator for a generation registered facility shall promptly notify the PSO if it is unable to comply with:

11.3.8.1 a properly given direction by the PSO to desynchronise the generation registered facility pursuant to section 11.3.2; or

11.3.8.2 the approval of the PSO for desynchronisation given pursuant to section 11.3.4.

Upon receipt of such notice, the PSO shall re-assess accordingly any direction to, or approval for, the dispatch coordinator to desynchronise such generation registered facility.
12 EMERGENCY PREPAREDNESS AND SYSTEM RESTORATION

12.1 OBJECTIVE

12.1.1 The objective of this section 12 is to establish the means by which the PSO, the EMC and market participants will fulfil their respective emergency preparedness and power system restoration obligations, including regular and real-time testing; the preparation by the PSO of the Singapore electricity emergency plan and of the Singapore power system restoration plan; the preparation by market participants and the EMC of emergency preparedness plans that support and are coordinated with the Singapore electricity emergency plan; and the preparation of restoration plan market participant attachments that support and are coordinated with the Singapore power system restoration plan. This objective will be met through cooperation with all relevant market participants.

12.2 EMERGENCY PREPAREDNESS PLANS AND SINGAPORE ELECTRICITY EMERGENCY PLAN

12.2.1 The PSO shall develop and maintain the Singapore electricity emergency plan describing the responsibilities of, and co-ordinating the actions of, market participants and each of the EMC and the PSO for the purpose of alleviating the effects of an emergency on the power system, having regard to the mitigation of the impact of an emergency on public health and safety as identified in each market participant’s emergency preparedness plan.

12.2.2 In order to assist the Authority in fulfilling its responsibilities under section 40 of the Electricity Act, each market participant and the EMC shall prepare and submit to the PSO an emergency preparedness plan and such other emergency preparedness-related information as the PSO considers necessary. Each market participant and the EMC shall ensure that its emergency preparedness plan complies with section 12.2.3 and is submitted to the PSO not later than the market commencement date, or at such later times as the PSO may specify.

12.2.3 Each market participant and the EMC shall ensure that its emergency preparedness plan:

12.2.3.1 describes such planning, testing, information, communication and other elements designated by the PSO;
12.2.3.2 complies with such emergency planning criteria as may be designated by the PSO;

12.2.3.3 complies with all relevant reliability standards;

12.2.3.4 is consistent with the emergency planning and preparedness procedures established by relevant government authorities;

12.2.3.5 indicates the manner in which the impact of an emergency on public health and safety will be mitigated; and

12.2.3.6 indicates the manner in which the market participant will minimise the cutting and expedite the restoration of critical loads and sensitive users during short and prolonged emergencies.

12.2.4 The PSO shall assist market participants and the EMC in the development of their respective emergency preparedness plans for the purpose of ultimately establishing emergency preparedness plans that support and are coordinated with the Singapore electricity emergency plan.

12.2.5 The PSO may exempt a market participant or the EMC from the requirement to submit an emergency preparedness plan pursuant to section 12.2.2 or from the requirement to comply, in whole or in part, with the requirements of section 12.2.3 if the PSO is satisfied that such exemption will not adversely affect performance by the PSO of its obligations related to emergency preparedness or its reliability-related obligations.

12.3 SINGAPORE POWER SYSTEM RESTORATION PLAN AND RESTORATION PLAN MARKET PARTICIPANT ATTACHMENTS

12.3.1 The PSO shall develop and maintain the Singapore power system restoration plan for restoring the security of the power system following a major contingency event or emergency as required by all applicable reliability standards and considered prudent by the PSO for Singapore.

12.3.2 The Singapore power system restoration plan shall cover each of the planning, testing, information, load reduction, load restoration, communication and other elements described in section 10 and this section 12 and such other elements as the PSO determines necessary to implement effective restoration of the security of the power system.
12.3.3 The *Singapore power system restoration plan* shall include:

12.3.3.1 plans for managing major disturbances on the *power system* that black out all or a portion of the *power system*;

12.3.3.2 plans for the testing and verification of emergency preparedness facilities and procedures; and

12.3.3.3 descriptions of the roles of the *EMC*, the *PSO* and various *market participants* in the *Singapore power system restoration plan*.

12.3.4 Each *restoration plan market participant* shall prepare and submit to the *PSO* a *restoration plan market participant* attachment to the *Singapore power system restoration plan* and such other *power system* restoration-related information as the *PSO* considers necessary. Each *restoration plan market participant* shall ensure that its *restoration plan market participant* attachment complies with section 12.3.5 and is submitted to the *PSO* not later than the *market commencement date*, or at such later times as the *PSO* may specify.

12.3.5 Each *restoration plan market participant* shall ensure that its *restoration plan market participant* attachment:

12.3.5.1 includes the elements described in section 12.3.6;

12.3.5.2 complies with such restoration planning criteria as may be designated by the *PSO*; and

12.3.5.3 complies with all relevant *reliability standards*.

12.3.6 Each *restoration plan market participant* shall ensure that its *restoration plan market participant* attachment includes:

12.3.6.1 a three year schedule of *power system* restoration training activities, to be conducted by the *restoration plan market participant* at its own expense. The schedule shall be updated annually;

12.3.6.2 documentation detailing organisational responsibility for coordinating with the *PSO* the development of and participation in *power system* restoration drills. Such development and participation shall be conducted by the *restoration plan market participant* at its own expense;

12.3.6.3 a schedule for testing the *restoration plan market participant*’s equipment as may be designated in the *Singapore power system*.
such testing shall be conducted by the restoration plan market participant at its own expense;

12.3.6.4 a statement of policy and supporting documentation demonstrating how the restoration plan market participant will minimise the cutting and expedite the restoration of critical loads and sensitive users under power system restoration conditions; and

12.3.6.5 any other documentation that the PSO deems necessary to support or facilitate the successful implementation of the Singapore power system restoration plan.

12.3.7 The PSO may exempt a restoration plan market participant from the requirement to submit a restoration plan market participant attachment pursuant to section 12.3.4 or from the requirement to comply, in whole or in part, with the requirements of section 12.3.5 or 12.3.6 if the PSO is satisfied that such exemption will not adversely affect performance by the PSO of its obligations related to restoration of the security of the power system or its reliability-related obligations.

12.3.8 The PSO shall assist restoration plan market participants in the development of restoration plan market participant attachments that support and are co-ordinated with the Singapore power system restoration plan for the purpose of ultimately establishing one integrated restoration plan for Singapore.

12.3.9 Each restoration plan market participant shall ensure that the guidelines and procedures applicable to it and set forth in the Singapore power system restoration plan are carried out by trained operating staff with sufficient authority to take any action that may be necessary to ensure that all relevant equipment is operated in a timely, stable and reliable manner.

12.3.10 The PSO shall direct market participants in restoring the power system following major disturbances. Each market participant shall be responsible for carrying out such PSO directions in accordance with the provisions of the Singapore power system restoration plan.

12.4 REVIEW AND AUDIT

12.4.1 The PSO shall review each emergency preparedness plan and each restoration plan market participant attachment submitted to it, whether in its original or a revised form, and shall prepare and provide to the EMC or the relevant market participant, as the case may be, a record of review indicating the changes, if any, required to be made and the date by which
the revised emergency preparedness plan or restoration plan market participant attachment must be submitted to the PSO.

12.4.2 The EMC and each market participant shall make such changes to its emergency preparedness plan or restoration plan market participant attachment as may be required by the record of review and shall submit to the PSO a revised emergency preparedness plan or restoration plan market participant attachment within the time specified in the record of review or within such other period as may be agreed with the PSO.

12.4.3 The EMC and each market participant shall review its emergency preparedness plan and restoration plan market participant attachment at least annually, or as required, and shall, following such review, submit to the PSO:

12.4.3.1 confirmation that the review has not required any change to be made to its emergency preparedness plan or its restoration plan market participant attachment; or

12.4.3.2 a revised version of its emergency preparedness plan or restoration plan market participant attachment, modified as may be required by the results of the review, together with a statement identifying such modifications, as the case may be. The EMC and each market participant shall ensure that any revised emergency preparedness plan or restoration plan market participant attachment prepared and submitted pursuant to this section 12.4.3 complies with section 12.2.3 or with sections 12.3.5 and 12.3.6, as the case may be.

12.4.4 Notwithstanding any reviews conducted pursuant to section 12.4.3, the EMC and each market participant shall ensure that its emergency preparedness plan and restoration plan market participant attachment are audited every three years by the PSO or by an independent person approved by the PSO.

12.4.5 The PSO shall review the Singapore power system restoration plan and the Singapore electricity emergency plan at least annually, or more frequently if required.

12.5 EMERGENCY FACILITIES

12.5.1 Each of the EMC and the PSO may evacuate their respective principal control centres in the event that a circumstance arises that poses a hazard to their respective personnel. During and following such evacuation, operation of the PSO controlled system shall be effected in accordance with this section 12.5.
12.5.2 The wholesale electricity markets shall continue to operate during an evacuation of the EMC’s or the PSO’s principal control centre unless conditions exist that would warrant a suspension of market operations.

12.5.3 During the interval between the evacuation of the PSO’s principal control centre and the establishment of a backup control centre:

12.5.3.1 the PSO shall designate an interim emergency system coordinator to act in its stead, as required; and

12.5.3.2 the transmission licensee and all generation licensees and importer licensees shall manage their facilities and support the interim emergency system coordinator in the operation of the PSO controlled system.

12.5.4 Each of the EMC and the PSO shall test their respective backup control centres and associated procedures and facilities on a regular basis, and each market participant whose facility is connected to the transmission system shall, at its own expense and as directed by the PSO, support and actively participate in evacuation tests and simulations.

12.6 TESTING

12.6.1 The EMC and each market participant shall ensure that the capability and reliability of its personnel, procedures and equipment are maintained to the extent necessary to enable it to fulfil its obligations under its emergency preparedness plan and its restoration plan market participant attachment.

12.6.2 The PSO shall develop, schedule, implement and conduct such tests as are provided for in the Singapore electricity emergency plan and the Singapore power system restoration plan.

12.6.3 The PSO shall develop and publish test plans and procedures for voice communication during an emergency on the power system.

12.6.3.1 The EMC and each market participant shall support and actively participate, at its own expense and as directed by the PSO, in the implementation and testing of its emergency preparedness plan, its restoration plan market participant attachment, the Singapore electricity emergency plan, the Singapore power system restoration plan, and the voice communications procedures referred to in section 12.6.3 and associated equipment; and

12.6.3.2 any emergency management exercise designed to test the compatibility of its emergency preparedness plans with the
12.6.4 The PSO shall schedule the tests referred to in section 12.6.3 at an appropriate time of the year and time of day, in consideration of the needs of the EMC and of market participants and of the desire to minimise their costs relating to such tests. To the extent practicable, the tests of any restoration plan market participant attachment shall be scheduled in a manner consistent with the outage co-ordination process described in section 7.

12.7 Enforcement

Failure by a market participant to take any action required to be taken in, or to act in a manner consistent with, its emergency preparedness plan or its restoration plan market participant attachment shall be deemed to constitute a breach of the market rules.