

Singapore Electricity Market Rules

Chapter 5 System Operation

Energy Market Authority

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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;

- 2.1.1.7 the levels of *reserve, regulation* and other *ancillary services* being provided meet the requirements established by the *PSO* pursuant to section 4; and
- 2.1.1.8 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* 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* when an *emergency operating state* is anticipated or has been declared, and when it ceases to exist or to be anticipated.
- 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* 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*.

3.7 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*. 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
- 3.7.2 Each *market participant* for a *generation 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 The *PSO* shall establish and include in the *system operation manual* the methodology by which the *PSO* shall determine the amount of *regulation* required in any *dispatch period* to meet all applicable *reliability standards*.
- 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 4.4.1, 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 set forth in section A.1 of Appendix 5A and in the *system operation manual*.

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 2.1.4 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 *generating 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*:
- 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* 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 on-going 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* 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 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* 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* and to provide for certain consequences following the cancellation of *outages*.
- 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* 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 or any *outage* of a *generation settlement 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 year, the PSO forms an annual outage plan. 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 the final annual outage schedule. Market participants can also make submissions after the final annual outage schedule is finalised, and revised outage schedules will be issued by the PSO at intervals for the remainder of the annual planning horizon. 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.

- 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, in accordance with the timetable specified in the *system operation manual*, submit to the *PSO* *outage submissions* that include the information set forth in section C.2 of Appendix 5C.
- 7.2.5 An *outage submission* submitted 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*, 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 to form and *publish* the results of the provisional annual *outage* planning exercise in accordance with the timetable specified in the *system operation manual*, which results shall include:
- 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* 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* conflicts such that the *planned outages* cannot all be accepted by the *PSO*, 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* 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 this section 7.2 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* 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 *update outage plans* in accordance with the timetable specified in the *system operation manual*. Each *update 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 *update 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 *update outage plan* or, in the case of the first *update 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* 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 the *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 *update 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 *update 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.

7.3 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 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 Not earlier than 5 hours and not later than 4 hours before a *planned outage* is scheduled to commence, the *market participant* shall request from the *PSO* the *PSO's* final consent to the *planned outage*. The *PSO* shall, within 1 hour of receipt of the request, give its final consent or cancel the *planned outage*.
- 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* and final consent 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 or does not give its final consent to a *planned outage* pursuant to section 7.3.4, 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*. Where the *PSO* is required or permitted by this Chapter to approve, consent to, reject, re-schedule, cancel, defer or recall one or more *planned outages*, such *planned outages* shall:
- 7.5.1.1 be approved or consented to 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* 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* 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, defers or denies its final consent to 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, deferral or denial 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 re-scheduling 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, 7.3.2 or 7.3.4, 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* 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* 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* 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* 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 that are not offered 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 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.

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.

8.3 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 shall not exceed 1 year;

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* 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 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*; and
 - 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 12 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*, instructing the applicable *registered facility* with a valid *energy offer*, *reserve offer* or *regulation offer* to provide or to limit the provision 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*.
- 9.1.3 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 co-ordinator* for a *dispatch period* at any time between the release of the *real-time dispatch schedule* to the *dispatch co-ordinator* for that *dispatch period* and the end of that *dispatch period*, instructing any *registered facility* with a valid

energy offer, reserve offer or regulation offer to provide or to limit the provision 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*.
- 9.1.7 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*, as the case may be, shall indicate either:
- 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* at the end of the *dispatch period*; or,
 - 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.
- 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* by means other than AGC signals shall 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*.

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, the *registered facilities of reserve providers* that have been issued *dispatch instructions* pursuant to section 9.1.2 for *primary reserve*, *secondary reserve* or both, 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, the *registered facility* of each *reserve provider* shall respond to any *dispatch instruction* that the *PSO* may issue pursuant to section 9.1.3 within the *dispatch period*, 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 *registered facility* of a *reserve provider* responds to a *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*.

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 *generation facility* is to provide in response to *AGC* signals.
- 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.

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*, revised *standing capability data* or both 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.
- 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*,
- 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* available from *generation 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 automatic under-frequency demand of a minimum percentage of its total peak customer demand, as determined by the *PSO*.
- 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* 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 *generation facilities* under such conditions shall be defined by the *PSO* and included in the *system operation manual*. A *market participant* for a *generation 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* request issued pursuant to section 11.2.1 shall, having regard for 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 under an *ancillary services contract* for *fast start service*.

- 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 DE-COMMITMENT

- 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*.
- 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 *generating 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 in accordance with the approval of the *PSO* 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* its *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 co-ordinating 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*

restoration plan. 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* 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 *Singapore electricity emergency plan* and the ability of its emergency preparedness plan to be integrated with the *Singapore electricity emergency plan*.

The costs incurred by the *PSO* in supporting and actively participating in such tests and exercises shall be recovered by the *EMC*, on behalf of the *PSO*, in accordance with section 4.1 of Chapter 7.

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*.