

ELECTRICITY INDUSTRY ACT  
ELECTRICITY INDUSTRY (WHOLESALE ELECTRICITY  
MARKET) REGULATIONS 2004

WHOLESALE ELECTRICITY MARKET RULES

**Power System Operation Procedure:  
System Restart Overview**

This procedure commences on 1 April 2008.

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<b>1.</b>	<b>Purpose</b> .....	5
<b>2.</b>	<b>Relevant procedures</b> .....	5
2.1	SM System Restart Overview.....	5
2.2	Sub-network Restart and Synchronising Procedures.....	6
2.3	Generator Restart Procedures.....	6
<b>3.</b>	<b>Definition of a Black System Condition</b> .....	7
3.1	Criteria for a significant part of the transmission system.....	7
3.2	Exiting a Black System Condition .....	7
<b>4.</b>	<b>Notification of a Black System Condition</b> .....	8
<b>5.</b>	<b>Responsibilities</b> .....	8
5.1	System Management .....	8
5.2	NOCC .....	8
5.3	Generators .....	8
<b>6.</b>	<b>System Restart Ancillary Services</b> .....	9
<b>7.</b>	<b>Communication Protocols and Facilities</b> .....	9

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## 1. Purpose

Clause 3.7 of the Wholesale Electricity Market (WEM) Rules requires System Management (SM) to prepare a System Restart Plan. This document forms part of the SM System Restart Plan.

The purpose of this document is to provide Rule Participants with an overview of the System Restart Procedures, describe the actions to be taken by SM, and define the responsibilities of participants, in response to a black system condition or a major supply disruption.

## 2. Relevant procedures

The SM System Restart Plan consists of a number of procedures as shown in figure 1.

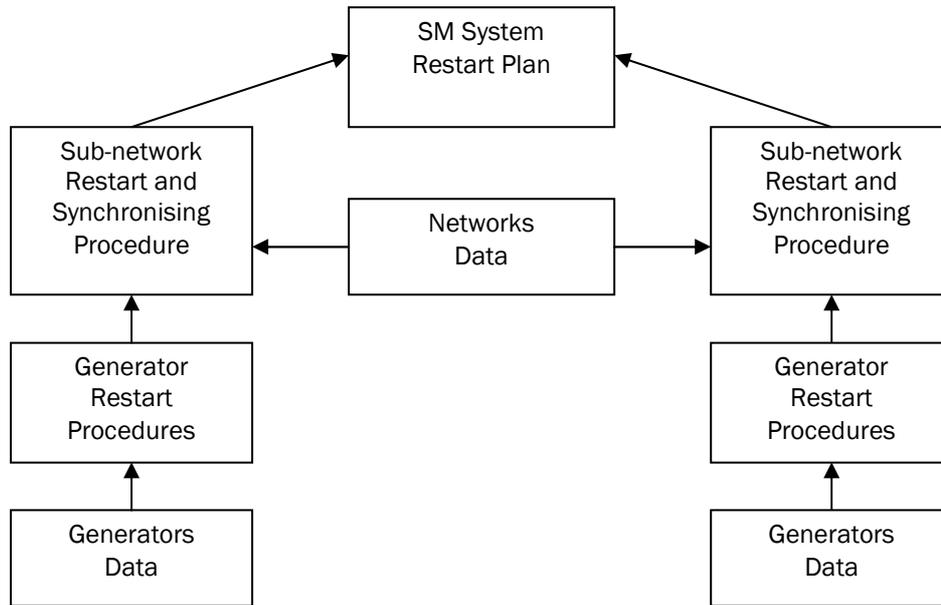


Figure 1: System Restart Procedures

### 2.1 SM System Restart Overview

This procedure provides a definition of a black system and describes at a high level SM's response to a black system or major system disturbance.

A major part of SM's responsibility is the operation of the WEM and this procedure provides information on how the WEM will be operated during a black system or major system disturbance.

Although the WEM Rules give SM overall authority for restoration of the power system, all participants have a responsibility to supply relevant information and assist in the restoration process. This procedure defines the areas of responsibility of the major participants including, SM in its role as Market Operator (SM), SM in its role as the Transmission Network Operator (SOCC) and Distribution Network Operator (NOCC), and Generators.

A major requirement necessary for a successful system restart is the provision of System Restart Ancillary Services (SRAS). An overview of these services is provided.

Detailed technical information relating to the restoration of generation and transmission systems in specific regions or areas will be provided in the more detailed Generator Restart Start Procedures and the Sub-network Restart and Synchronising Procedures.

## **2.2 Sub-network Restart and Synchronising Procedures**

SM has determined that in the initial stages it will be necessary to restart separate sub-networks using the SRAS within those sub-networks. Due to the configuration of the SWIS network and the location of the generators in relation to the load centres the synchronising of these sub-networks will be a major priority. This is necessary to enable sufficient generation to be connected to match the load demand.

SM has developed a standard for SRAS that includes the criteria to be used to determine where the boundaries of the sub-networks will be. Details of this standard, and how it has been applied to the South West Interconnected System (SWIS) will be published on the SM website and updated from time to time, given the dynamic and evolving nature of the document.

Detailed information to assist SM in understanding the likely condition and capabilities of network plant following a system shutdown or major system disturbance will be used as input into developing the Sub-network Restart and Synchronising Procedures. Whilst the information required by SM will be included in the SM guidelines which will be published on its website it will be sourced internally from within Western Power.

The Sub-network Restart and Synchronising Procedures will provide an overview of the general strategy that SM will use to restart a particular sub-network as well as the detailed steps to be followed and will be developed in conjunction with the relevant market participants. SM cannot reliably predict how a system shutdown or major system disturbance may occur or in what condition the power system will be after such an event. As a consequence the detailed plans will need to be developed to include a number of possible restart scenarios and will identify a number of possible restart methods based on the contracted SRAS generating units and other options SM considers viable.

The Sub-network Restart and Synchronising Procedures will be reviewed on an ongoing basis to ensure that network, generator, and SRAS contract changes are taken into account

## **2.3 Generator Restart Procedures**

Any generator that is contracted to provide SRAS will be expected to prepare internal procedures detailing switching sequences used by the power station staff to restart the generating units at the power stations from the black start unit(s). Other generators will be expected to have internal procedures detailing the switching sequences used by power station staff to restart the generating units from a network source.

All Generators (including those providing SRAS) will be required to provide detailed information to assist SM in understanding the likely condition and capabilities of plant following a system shutdown or major system disturbance. Provision of full and accurate information is important as this allows SM to be fully informed of the technical requirements and limitations of the power stations. SM will use this information as a major input into developing the Sub-network Restart and Synchronising Procedures. The information required by SM should conform to the SM guidelines which will be published on its website.

It is recognised that some of the information provided may be confidential and although relevant information may be used to compile the Sub-network Restart and Synchronising Procedures. SM will discuss confidentiality issues with relevant parties prior to publishing any Sub-network Restart and Synchronising Procedures.

It is expected that Generator Restart Procedures will be reviewed on an ongoing basis to ensure that network, generator, and SRAS contract changes are taken into account.

### **3. Definition of a Black System Condition**

In order for SM to declare a Black System condition the following condition must be satisfied:

*'The absence of voltage on all or a significant part of the transmission system or within a sub-network following a major supply disruption, affecting a significant number of customers'*

A major supply disruption is defined as 'The unplanned absence of voltage on a part of the transmission system affecting one or more power stations.'

SM will use the following interpretation to determine whether a black system condition exists.

#### **3.1 Criteria for a significant part of the transmission system**

If there were an absence of voltage in all of the transmission system a black system condition would clearly exist. The black system definition can also include the absence of voltage in a significant part of the transmission network. SM will determine when a black system condition exists and will inform participants accordingly.

It is noted that the definition of black system also requires at least one power station to be affected by the supply disruption.

#### **3.2 Exiting a Black System Condition**

Once there has been significant improvement in the power system emergency situation that resulted in the declaration of a black system condition, SM will declare that the power system is no longer in a black system condition and inform participants accordingly.

However the non-existence of all the conditions for declaring a black system condition alone is not itself sufficient to exit from the black system condition. Prior to exiting the black system condition, SM must have confidence that:

- a "Normal Operating State" as defined in the WEM Rules can be achieved and maintained, and
- the threat of further or continuing power system collapse is removed, and
- all involuntary load shedding has ceased and clearance to restore the last load block has been given by SM.

This is to minimise potential for successive movement in and out of a black system condition due to contingencies that can occur during the restoration of the power system.

## 4. Notification of a Black System Condition

SM will advise registered participants via its normal Market Notice system and other communication systems that SM may develop, including Short Message Service (SMS).

In the event of a black system condition arising SM may declare a “High Risk. Operating State” or an “Emergency Operating State” as defined in the WEM Rules. When this occurs SM may exercise some or all of the power available under the relevant operating state.

## 5. Responsibilities

### 5.1 System Management

SM will be responsible for overall co-ordination of all restoration processes. During a black system condition SM will:

- Advise participants of the declaration of a black system.
- Determine the cause of the contingency and assess the status of the power system.
- Develop a restoration strategy.
- Activate System Restart Ancillary Service contracts as required.
- SM will manage the restoration process including synchronising for all sub-networks. This will involve SM giving the broad instructions.
- Perform switching on the transmission system in accordance with the overall restoration strategy including converting broad instructions into detailed switching sequences.
- Liaise with NOCC on load restoration.
- Manage voltage levels.
- Use some or all the powers applicable to the relevant operating state.

### 5.2 NOCC

During a black system condition the NOCC will:

- Perform switching on the distribution system in preparation for load restoration.
- Follow directions from SOCC for load restoration.
- Maintain details of the priorities for feeder restoration.

### 5.3 Generators

During a black system condition generators will:

- Stabilise any generating plant on line and supplying load to the system.
- Stabilise any generating plant that has tripped to house load.
- Advise SM of
  - Any urgent requirement for load to stabilise on line plant.
  - The status of generating plant and ability to supply load.
  - Any requirement for a start up supply.
  - Any issues that may jeopardise generating plant.
- Restart generating units and supply load as required by SM.
- Otherwise respond to directions from SM applicable to the relevant operating state.

## 6. System Restart Ancillary Services

The WEM Rules state that sufficient black start facilities should be available to allow the restoration of power system security and to allow restarting of generating units following a black system condition and also detail the procedure SM will use for determining and procuring the quantities of system restart ancillary services (SRAS).

SRAS is the capability of a generating unit to start up or form an island with house load, and send out sufficient amounts of electrical energy, without using energy supplied externally from the power system, in order to assist other generating units to start during a black system condition.

To ensure sufficient facilities will be available SM will enter into contracts with various generators for the provision of SRAS. Generators providing the SRAS will be required meet specific standard performance criteria to ensure that the SWIS can be restored to normal operation as soon as possible. Generators providing the SRAS may be required undertake testing, both at the procurement stage and during the period of the contract, to prove that the black start generators can comply with the requirements of the published performance standard.

While SM has contracted with various generators for the provision of SRAS the restoration strategy will not necessarily be limited to these generating units alone. SM may use any generation source that is available to assist in the restoration process.

## 7. Communication Protocols and Facilities

Figure 2 shows the communication protocol that applies for black system conditions.

During a system restart or major supply disruption:

- SM will liaise directly with all major generators and NOCC.
- NOCC will liaise directly with parties connected to their distribution network, and with embedded generators.

Each Rule Participant is expected to establish and maintain communications facilities consistent with the requirements of the Power System Operations Procedure: Communications and Control Systems.

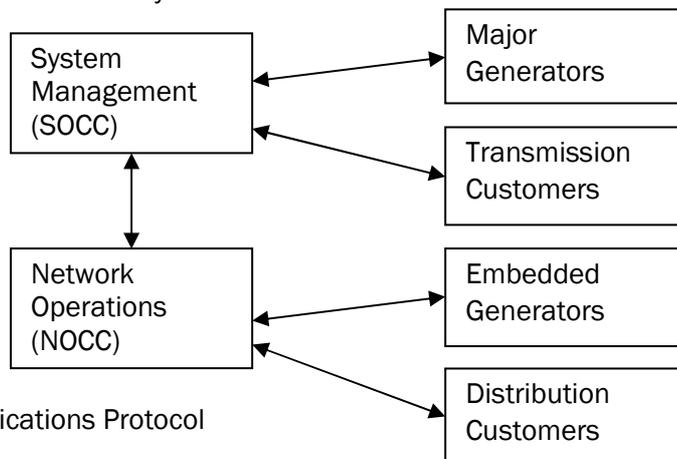


Figure 2: Communications Protocol