

Under Frequency Load Shedding Requirements

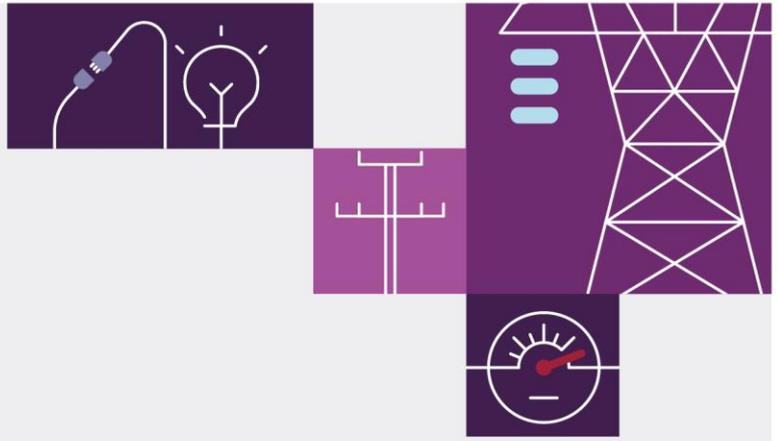
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Important notice

Purpose

This document has been prepared by AEMO as required by clause 3.6.1 of the Wholesale Electricity Market Rules (WEM Rules) and has effect only for the purposes set out in the WEM Rules. The WEM Rules prevail over this document to the extent of any inconsistency.

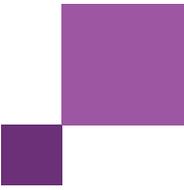
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Contents

1	Introduction	4
1.1	Purpose and Scope	4
1.2	Glossary	4
2	UFLS Requirements	5
2.1	Network Operator requirement	5
2.2	Load quantity and staging requirements	5
2.3	Prioritisation	5
2.4	Initiation requirements	6
2.5	Additional UFLS scheme requirements	6

1 Introduction

1.1 Purpose and Scope

The Under Frequency Load Shedding Requirements (UFLS Requirements) are determined by AEMO under section 3.6 of the Wholesale Electricity Market Rules (WEM Rules) and provides guidance to Network Operators in accordance with clause 3.6.2 of the WEM Rules.

The purpose of this document is to establish a set of requirements to enable each Network Operator whose Network is impacted by the UFLS Requirements to design and implement automatic Under Frequency Load Shedding (UFLS) schemes that support Power System Security in respect of its Network.

In accordance with clause 3.6.1 of the WEM Rules, AEMO must:

- (a) subject to clause 3.6.3 of the WEM Rules, determine the UFLS Requirements, taking into account the SWIS Frequency Operating Standards; and
- (b) publish the UFLS Requirements, and any amendments to them, on the WEM Website.

In accordance with clause 3.6.2 of the WEM Rules, the UFLS Requirements must include the following guidance:

- (a) the quantity of load required for shedding, or guidance on how to determine the required quantities;
- (b) prioritisation of load types;
- (c) details of any staging requirements;
- (d) initiation criteria;
- (e) speed of operation;
- (f) any required variation in settings or functional requirements based on conditions in the SWIS; and
- (g) any other relevant matters required to support Power System Security.

1.2 Glossary

Terms defined in the WEM Rules and WEM Procedures have the same meanings in this document.

2 UFLS Requirements

2.1 Network Operator requirement

Each Network Operator must install and maintain an automatic UFLS scheme and associated processes to meet the requirements set out in this document.

2.2 Load quantity and staging requirements

The Network Operator must ensure that its UFLS scheme:

- (a) in aggregate, targets 75% of the system load available at any time for interruption, where system load is the sum of generation injection into the SWIS, measured at the generator terminals;
- (b) has five stages, each targeting 15% of the system load; and
- (c) has a relay time delay setting of 0.4 second for each stage with the maximum clearance time minimised¹.

Load allocated to the UFLS scheme for shedding may also include large individual load connections, where it is possible to do so, provided that the Network Operator has considered the associated impacts of losing that individual load.

2.3 Prioritisation

The Network Operator must use its reasonable endeavours to assign loads to stages within the load shedding system. It must take into account the nature of the loads and, where reasonable, must assign loads a lower or higher priority in the load shedding priority compared to other loads.

The Network Operator must also consider auxiliary supplies to substations, power stations and communications infrastructure supporting the real-time operation of the SWIS, and either avoid shedding or give a lower priority compared to other loads.

If the aggregate load shedding requirement specified in paragraph 2.2((a) of this document is unable to be met, the Network Operator must prioritise the allocation of the available load to the earlier stages, i.e. stage 1 has the highest priority.

¹ The actual clearance time will be greater than 0.4 seconds, as it includes (among other matters) any relay processing times, communications latency, and circuit breaker operation times.

2.4 Initiation requirements

The Network Operator must ensure that each stage of the UFLS scheme initiates shedding at the frequencies listed in Table 1, where the frequency is measured by the UFLS scheme at a point on the Network Operator's Network that is electrically close to where the scheme initiates the load shedding.

Table 1 UFLS scheme initiation requirements

Stage	Initiation Threshold (Hz)	Load Shed Quantity (%)
1	48.75	15
2	48.50	15
3	48.25	15
4	48.00	15
5	47.75	15

Individual loads allocated to the UFLS scheme for shedding as described in paragraph 2.2 may also have individual initiation thresholds separate to those described in Table 1, provided that the Network Operator has considered the associated impacts of losing that individual load at that initiation threshold in meeting the overall UFLS Requirements.

2.5 Additional UFLS scheme requirements

The Network Operator must use reasonable endeavours to ensure that the SWIS, and islandable parts of the SWIS where practical to do so, remain stable following operation of the UFLS Scheme, and system voltages remain within permissible ranges².

The UFLS scheme must be designed such that, where possible, the Network Operator is able to monitor when critical elements of the scheme are unavailable (e.g. a particular relay in a particular substation).

The Network Operator must be able to reasonably establish whether the scheme operated correctly, including where possible, measuring or estimating:

- (a) the frequency that initiated the scheme at each applicable location;
- (b) the timing of actual load shedding at each applicable location, including measurements as applicable:
 - o activation of the scheme;
 - o relay pickup times;
 - o communication times; and
 - o circuit breaker operation times;
- (c) a reasonable estimate of the quantity of load shed.

² It is acknowledged that system voltages might not be kept within permissible ranges in some operational scenarios, including multiple and/or non-credible contingencies.

Under Frequency Load Shedding Requirements

The Network Operator must ensure that the quantity of load available at any point in time on each stage is able to be measured or estimated with a reasonable degree of accuracy, such that it can be sent to AEMO via a SCADA ICCP interface and updated at least every 30 seconds.