

# nationalgrid

# **Company Directive**

# STANDARD TECHNIQUE: SD11A

# Requirements for Category A Load Management Schemes that utilise Protection Class Operational Intertripping

# Policy Summary

This document specifies the requirements for **Category A Load Management Schemes (LMSs)** including the network design requirements. **Category A LMSs** utilise protection class operational intertripping to curtail load (i.e. demand, generation or electrical energy storage).

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Implementation Date:	October 2020
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Date:

28<sup>th</sup> October 2020

Target Staff Group	Staff involved with the analysis, design, construction, maintenance, replacement, operation and control of Western Power Distribution's network
Impact of Change	Green – Negligible. The detailed requirements for Type A Load Management Schemes have been moved from POL: SD11 to this Standard Technique but these requirements are unchanged.
Planned Assurance checks	On issue of this document, the author will check that the Load Management Scheme assessments have been completed and that any identified deficiencies are on course to be rectified by 31 <sup>st</sup> December 2022, in accordance with POL: SD11.

All references to Western Power Distribution or WPD must be read as National Grid Electricity Distribution or NGED

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#### **IMPLEMENTATION PLAN**

#### Introduction

POL: SD11 specifies the detailed requirements for **Category A Load Management Schemes (LMSs)**. These schemes utilise protection class operational intertripping to curtail **Load** (i.e. demand, generation or electrical energy storage).

#### Main Changes

This is a new document which incorporates the requirements for **Category A LMSs** that were previously specified in POL: SD11. No significant changes have been made.

#### Impact of Changes

Target Staff Group	Staff involved with the analysis, design, construction, maintenance, replacement, operation and control of Western Power Distribution's network
Impact of Change	Green – Negligible. The detailed requirements for Type A Load Management Schemes have been moved from POL: SD11 to this Standard Technique but these requirements are unchanged.

#### Implementation Actions

Managers shall ensure that staff involved in the design, installation, maintenance, operation and control of load management schemes are aware of and follow the requirements of this document. POL: SD11 requires all existing **LMSs** to be assessed and any deficiencies addressed.

#### Implementation Timescale

This document is implemented on issue for new and substantially modified **Category A LMSs**. The timescale for retrospective assessment and modification of existing **LMSs** is defined in POL: SD11.

### **REVISION HISTORY**

Document Revision & Review Table			
Date	Comments	Author	
October 2020	<ul> <li>This is a new document but the requirements have been taken from the first issue of POL: SD11. No changes have been introduced.</li> <li>References to ratings of overhead lines have been modified to align with ST: SD8A.</li> </ul>	Andy Hood	

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# 1.0 INTRODUCTION

This document describes the requirements for the application of **Category A Load Management Schemes (LMS)**. It shall be read in conjunction with <u>POL: SD2</u>, <u>POL: SD3</u>, <u>POL: SD4</u>, <u>POL: SD5</u> and <u>POL: SD11</u> as applicable.

Where any difficulty is encountered with the application of this policy, the author shall be notified, who will consider if a variation is appropriate.

# 2.0 **DEFINITIONS**

- 2.1 **Category A:** A category of **LMS** that utilises protection class intertripping and that satisfies the prerequisites specified in ST: SD11A.
- 2.2 **Category Z:** A category of **LMS** that does not satisfy the prerequisites associated with any other category of **LMS**.
- 2.3 **Demand Security**: The ability to meet customer demand under **Intact Network** and outage conditions.
- 2.4 **Generation Security**: The ability to accept customer export under **Intact Network** and outage conditions.
- 2.5 Intact Network: A network operating with open points in their normal position and without any outages that are material to the condition being considered or studied. The Intact Network arrangement shall be agreed between Primary System Design, Network Services, Network Strategy, Operations Support and Control and indicated on network diagrams and Western Power Distribution's control systems (PowerOn Fusion etc.).
- 2.6 **Load:** The apparent power (e.g. kVA or MVA) associated demand, generation and/or electrical energy storage.
- 2.7 Load Management Scheme: Plant, equipment and software systems that together manage network loading and voltages by either controlling demand and/or generation connected to the network, operating switchgear to change the topology of the network and/or controlling the settings of tap-change controllers, reactive compensation equipment and flexible power links.

Examples of Load Management Schemes include but are not limited to:

- Operational Intertripping
- Active Network Management (ANM)
- Soft-intertripping
- Timed connections
- Overload protection
- Auto-changeover
- Voltage constraint systems
- Remote control of switchgear or other plant and equipment

The following are outside of the scope of this definition:

- Customer-owned export limitation schemes
- Conventional independent tap-change control schemes
- Network protection for fault clearance
- Loss-of-mains protection, including loss-of-mains intertripping
- 2.8 **Network Integrity**: The ability of a network to operate within thermal, voltage and other technical limits, excluding frequency-related limits, under both **Intact Network** and outage conditions.
- 2.9 Network Security: The requirement for Demand Security and Generation Security.
- 2.10 Secured Outage: An outage or combination of outages after which Network Security, Network Integrity and System Integrity requirements must be satisfied in design studies. Further guidance is provided in POL: SD2, POL: SD3, POL: SD4, POL: SD5 and POL: SD11, as applicable.
- 2.11 **System Integrity**: The ability of the GB system to operate within acceptable frequency-related technical limits under both **Intact Network** and outage conditions.

**System Integrity** is primarily managed by National Grid, but it can be affected by the operation of WPD's network and customers. This includes but is not limited to:

- Low Frequency Demand Disconnection
- Generator Interface Protection
- Changes in net **Load** caused by protection operation, manual intervention or the operation of **LMSs**.

#### 3.0 POLICY

#### 3.1 General Requirements

**Category A LMSs** are designed to detect outages or overloads and immediately send one or more signals using protection class intertripping systems to curtail **Load**.

All **LMSs** shall be designed and implemented to satisfy the requirements specified in POL: SD11 and POL: SD2, POL: SD3, POL: SD4 and POL: SD5 as applicable. For example, these documents include high level requirements for:

- Network Security
- Network Integrity
- System Integrity
- Failure Mitigation
- Scheme Interaction
- Thermal Ratings

# 3.2 **Category A LMS Prerequisites**

All **Category A LMSs** shall satisfy the following prerequisites. Where a **LMS** does not meet all of the **Category A LMS** requirements (or those associated with one of the other categories) it shall default to a **Category Z LMS** and satisfy the requirements of ST: SD11Z.

#### 3.2.1 <u>Principle of operation</u>

The scheme shall complete post-event curtailment within 300ms of any triggering event. This is necessary to prevent sustained overloads or unacceptable voltage conditions.

#### 3.2.2 Inputs and triggers

The scheme may be triggered by one or more of:

- Breaker statuses
- Isolator statuses
- Protection trip signals
- Current measurements
- Directional power flow measurements

Where a **LMS** is only required to operate for specific outage conditions it shall include arming controls. These arming controls shall be made available as both:

- Supervisory arming controls on PowerOn, and
- Local arming switches on site.

# 3.2.3 <u>Components</u>

The scheme shall be assembled from protection-class relays and components. EE SPEC: 98 and EE SPEC: 136 provide additional information.

#### 3.2.4 Communications Paths

The scheme shall only use WPD-owned or WPD-managed protection-class communication paths that satisfy the requirements of <u>POL: TP20</u>. Options for these paths include:

- Fibre optic cable
- Microwave link
- Pilot cable
- BT EAD (Ethernet Access Direct) or other equivalent 3<sup>rd</sup> party service, where no other reasonably practical solution is available

This does not preclude the use of conventional SCADA facilities / radio systems for supervisory arming.

# 3.2.5 <u>Outputs</u>

The scheme shall achieve curtailment by:

- Tripping one or more WPD-owned circuit breakers, and/or
- Tripping one or more customer-owned circuit breakers.

Where the scheme relies on the operation of customer-owned breakers, protection shall be installed to operate WPD-owned circuit breaker(s) within 1000ms if the customer-owned circuit breaker(s) fail to trip.

# 3.2.6 Failure mitigation

Detectable **LMS** scheme failures (including but not limited to communications failure alarms, relay/controller watchdog alarms and battery system alarms) shall be presented to Control as high priority alarms.

In addition, at least one of the following measures shall be used to mitigate scheme failure:

- 'fail-safe' tripping within 1000ms in the event of detectable scheme failure (including but not limited to communications failure alarms from intertripping relays)
- Overload protection
- Duplicate **Category A LMSs** (protection class intertripping systems) without common failure modes.

When mitigation measures are selected the wider System Integrity risks (e.g. widespread tripping due to communication network failures and cascade tripping due to overload) shall be considered and controlled.

# 3.2.7 <u>Preventing over-commitment of networks</u>

Under **Intact Network** conditions, neglecting the behaviour of the **LMS** and its failure-mitigation measures, no overloads and/or unacceptable voltages shall occur. For overhead lines, the applicable rating shall be the normally assigned Pre-Fault rating (ST: SD8A refers).

# 3.2.8 Ensuring sufficiency of Load Management Schemes

Under both **Intact Network** conditions and **Secured Outage** conditions, when the **LMS** is in service and functioning correctly, no overloads and/or unacceptable voltage conditions shall be sustained for longer than 500ms, post fault.

# 3.3 **Design Assessment**

As part of the network design process all **Category A LMSs** shall be assessed to ensure they satisfy the requirement of POL: SD11 and this Standard Technique. The results of this assessment shall be recorded by the Primary System Design Engineer or Planner responsible for the **LMS** design and kept with the associated scheme records, in accordance with POL: TP10.

A Type A Assessment Form and an example of a Type A **LMS** assessment is available via the following link:

Assessment Information

#### SUPERSEDED DOCUMENTATION

This document partially supersedes POL: SD11.

#### **APPENDIX B**

#### **RECORD OF COMMENT DURING CONSULTATION**

#### ST: SD11A - Comments

#### **APPENDIX C**

#### ANCILLARY DOCUMENTATION

POL: SD2 POL: SD3 POL: SD4 POL: SD5 POL: TP10	<ul> <li>132kV Network System Design.</li> <li>66kV and 33kV Network System Design.</li> <li>11kV and 6.6kV Network System Design.</li> <li>LV Network Design.</li> <li>Protection Alarm Control Scheme and Load management Scheme</li> </ul>
	Records.
EE SPEC: 98	Approved Protection, Voltage Control and Alarm Relays and Test Access Blocks.
EE SPEC: 136	Ancillary Electrical Equipment for Use in Conjunction with Switchgear and Protection/Control Panels.
ST: SD1B	Management of P2 Non-compliance.
ST: SD11A	Requirements for Category B Load Management Schemes that utilise pre- event curtailment.
ST: SD11Z	Requirements for Category Z Load Management Schemes that do not meet the prerequisites for other Load Management Scheme categories.
ST: TP10E	Requesting, Issuing and Recording Settings for Protection Relays, Tap- change Control Relays and Load Management Schemes.
POL: TP20 EREC P2	Protection Class Communication Links. Security of Supply.
ENA TS 48-6-7	Communication Services for Tele-protection Systems.

# APPENDIX D

#### **KEY WORDS**

ANM, Category A, Category Z, design, intertrip, soft intertrip, Load Management Scheme, network, system, planning, network analysis