Electricity Distribution

nationalgrid

Company Directive

POLICY DOCUMENT: SD11/1

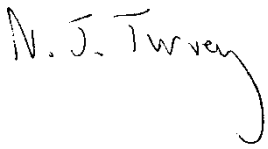
Requirements for Load Management Schemes

Policy Summary
This document specifies the requirements for **Load Management Schemes (LMSs)** including the Network Design requirements.

Author: **Andy Hood**

Implementation Date: **October 2020**

Approved by



Nigel Turvey
DSO & Future Networks Manager

Date: **28th 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	**Amber – This document specifies the requirements for the design of LMSs. Many of the detailed requirements have been moved to a series of STs in the SD11 series. The deadline for any necessary remedial works is 31st December 2022.**
Planned Assurance checks	**On issue of this document, the author will check that the required assessments have been completed and that any identified deficiencies are on course to be rectified by 31st December 2022.**

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

IMPLEMENTATION PLAN

Introduction

POL: SD11 specifies the requirements for **Load Management Schemes (LMSs).** These requirements are applicable to all Western Power Distribution networks, irrespective of voltage level.

Main Changes

The document has been modified and re-structured to align with changes to POL: SD2, POL: SD3 and POL: SD4. The detailed requirements have been moved to new Standard Techniques in the SD11 series.

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	**Amber – This document specifies the requirements for the design of LMSs. Many of the detailed requirements have been moved to a series of STs in the SD11 series. The deadline for retrospective modification or replacement of existing LMSs is 31st December 2022.**

Implementation Actions

Managers shall ensure that staff involved in the design, installation, maintenance, operation and control of **LMSs** are aware of and follow the requirements of this document.

Retrospective action is required to modify or replace **LMSs** that do not meet the requirements of the original version of this Policy, POL: SD11.

Implementation Timescale

This document is implemented on issue for new or modified **LMSs**.

Any existing **LMSs** that do not comply with the requirements of this policy shall be rectified by 31st December 2022.

REVISION HISTORY

Document Revision & Review Table		
Date	**Comments**	**Author**
October 2020	• The document has been re-structured and modified to align with POL: SD2, POL: SD3 and POL: SD4 • Detailed requirements have been moved to STs in the SD11 series • The deadline for retrospectively modifying or replacing LMSs is 31st December 2022 • References to overhead line ratings have been modified to align with ST: SD8A.	Andy Hood
April 2019	• New document	Andy Hood Stephen Quinn Sven Hoffmann

Contents

1.0 INTRODUCTION

This document specifies the requirements for **Load Management Schemes (LMSs)**. It shall be read in conjunction with POL: SD2, POL: SD3, POL: SD4 and POL: SD5 as applicable.

Detailed requirements for specific categories of **LMSs** are provided in the SD11 series of Standard Techniques.

At the time of issue of this document, the following STs are in place:

- ST: SD11A: Requirements for **Category A LMSs** that utilise Protection Class Operational Intertripping
- ST: SD11B: Requirements for **Category B LMSs**; that utilise Full Pre-event Curtailment
- ST: SD11Z: Requirements for **Category Z LMSs** that do not meet the Prerequisites for other **LMS** Categories

As other **LMS** categories are identified and their requirements determined additional Standard Techniques will be issued.

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 Load Management Scheme:** A **Load Management Scheme (LMS)** that utilises protection class intertripping and that satisfies the prerequisites specified in ST: SD11A.

2.2 Category B Load Management Scheme (LMS): A Load Management Scheme that utilises full pre-event curtailment and that satisfies the prerequisites specified in ST: SD11B.

2.3 **Category Z Load Management Scheme:** A **Load Management Scheme (LMS)** that does not satisfy the prerequisites associated with any other category of **LMS**.

2.4 **Demand Security**: The ability to meet customer demand under **Intact Network** and outage conditions.

2.5 **Generation Security**: The ability to accept customer export under **Intact Network** and outage conditions.

2.6 **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, Control and Network Services and indicated on network diagrams and control systems.

2.7 **Load:** The apparent power (e.g. kVA or MVA) associated demand and generation

2.8 **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 link**s.**

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

2.9 **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.

2.10 **Operational Secured Next Fault:** A fault outage after which **Demand Security, Generation Security, Network Integrity** and **System Integrity** requirements must be satisfied when operating the network.

The following fault conditions starting from the prevailing running arrangement are applicable:

- Each circuit fault
- Each busbar fault

Outages at all voltage levels relevant to the network in question shall be considered, including outages on the transmission system and other third party networks, where applicable.

2.11 **Secured Outage**: An outage or combination of outages after which **Demand Security, Generation Security, Network Integrity** and **System Integrity** requirements must be satisfied in design studies.

The following types and combinations of outages are considered when networks are designed:

- Each circuit fault outage*
- Each busbar fault outage
- Each circuit arranged outage*
- Each circuit arranged outage followed by each circuit fault outage*
- Each circuit arranged outage followed by each busbar fault outage
- Each busbar arranged outage*
- Each busbar arranged outage followed by each circuit fault outage*
- Each busbar arranged outage followed by each busbar fault outage

Outages at all voltage levels relevant to the network in question shall be considered, so far as is possible, including outages on the transmission network and other third-party networks where applicable.

Network Integrity and **System Integrity** requirements apply to all **Secured Outages**.

Demand Security and **Generation Security** requirements are set by EREC P2, bilateral agreements with customers, consideration of CIs and CMLs and consideration of vulnerable customer obligations, in accordance with Section 3.1. They may only apply for a subset of **Secured Outages**. The outage types and combinations with **Demand Security** requirements in EREC P2 are marked with asterisks (*) above.

2.12 **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 **Load Management Schemes**.

2.13 **Unsecured Outage:** An outage condition that is beyond the scope of a **Secured Outage**.

Unsecured Outages are not normally considered when designing the network. Examples include:

- Multiple concurrent arranged outages
- Circuit breaker failure fault outages
- Multiple concurrent fault outages
- The concurrent fault outage of multiple circuits sharing the same structure, such as double circuit tower lines

3.0 POLICY

3.1 Network Security Requirements

LMSs and the associated networks shall be designed to satisfy the requirements specified in POL: SD2, POL: SD3, POL: SD4 and POL: SD5, including:

- EREC P2 for **Demand Security**
- Bilateral connection agreements with customers and other network operators for both **Generation Security** and **Demand Security**

Due consideration shall also be given to Customer Interruptions (CIs), Customer Minutes Lost (CMLs) and to vulnerable customer obligations.

3.2 **Network Integrity Requirements**

LMSs shall be designed to enable **Network Integrity** to be maintained under **Intact Network** and **Secured Outage** conditions, for **Operational Secured Next Faults**. Further guidance is included in POL: SD2, POL: SD3 and POL: SD4.

3.3 System Integrity Requirements

LMSs shall be designed to enable **System Integrity** to be maintained under **Intact Network, Secured Outage,** and **Operational Secured Next Fault** conditions for credible step changes in **Load** and for and for communications network and control system events, including action by a **LMS** following failure of the **LMS** or its associated:

- Communication network
- **LMS** calculation engine
- SCADA equipment
- Control system
- IR infrastructure

In this context, the change of **Load** across all license areas and all voltage levels shall not exceed 300MW unless explicitly agreed with National Grid.

It is recognised that Primary System Design (PSD) engineers do not currently have access to design tools that are capable of automatically assessing every **Operational Secured Next Fault** under all relevant network loading conditions. In the absence of such design tools Primary System Design engineers may study a limited number of scenarios that, to the best of their knowledge, represent the most onerous cases.

3.4 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.

3.5 Scheme Interaction

Where an area of network is subject to control by or affects the behaviour of more than one **LMS** the interaction between those load management schemes shall be assessed to ensure that it does not result in incorrect operation.

3.6 Thermal Ratings

When selecting ratings for the assessment of networks managed by **LMSs** consideration should be given to the applicability of ratings that rely on assumed daily or long-term loading patterns. These include:

- Cyclic and distribution ratings for cables
- Transformer ratings which rely on assumed ageing rates
- Overhead line ratings greater than the Sustained Load Pre-Fault

4.0 SCHEME CATEGORISATION

Every **LMS** shall be allocated a category in accordance with the STs in SD11 series.

Each category of **LMS**, with the exception of category Z, includes a number of prerequisites. Any **LMS** that does not meet the relevant prerequisites for one of the other categories is automatically assigned to Category Z and must satisfy the requirements of ST: SD11Z.

The **LMSs** category shall be recorded as part of the **LMS** scheme settings.

5.0 SCHEME ASSESSMENT AND RECTIFICATION

5.1 New and Substantially Modified LMSs

All new and substantially modified **LMSs** shall be assessed against the requirements of this Policy and the associated Standard Techniques by the Primary System Design Engineer or Planner that is responsible for the scheme, as applicable. An assessment form shall be completed and saved with the scheme records.

Assessment forms and guides are available via the following link.

LMS Assessment Information

5.2 Retrospective Assessment of Existing LMSs

In accordance with the original issue of POL: SD11, every existing **LMS** should have been retrospectively assessed against the requirements this document by 1st May 2020. Assessment forms and guides are available from the preceding link.

As part of these assessments **LMSs** should have been allocated a category and a report issued to the relevant Primary System Design Manager identifying any deficiencies and costs associated with rectifying these issues.

5.3 Rectification of Deficiencies

The Primary System Design Managers shall arrange for the deficiencies to be rectified by 31st December 2022.

APPENDIX A

SUPERSEDED DOCUMENTATION

This document supersedes POL: SD11 dated April 2019 which has now been withdrawn.

APPENDIX B

RECORD OF COMMENT DURING CONSULTATION

POL: SD11/1 - Comments

APPENDIX C

ANCILLARY DOCUMENTATION

POL: SD2	132kV Network System Design.
POL: SD3	66kV and 33kV Network System Design.
POL: SD4	11kV and 6.6kV Network System Design.
POL: SD5	LV Network Design.
POL: TP10	Protection, Alarm, Control Scheme and Load management Scheme 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	Protection Class Communication Links.
EREC P2	Security of Supply.
ENA TS 48-6-7	Communication Services for Tele-protection Systems.

APPENDIX D

KEY WORDS

ANM, intertrip, soft intertrip, load management scheme, system design, planning, network analysis