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Improving resilience of overhead networks under abnormal weather conditions using a risk based methodology

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1 PURPOSE

The aim of this Engineering Technical Report (**ETR**) is to present a risk based methodology that provides guidance on how to improve the overall performance of overhead distribution networks by upgrading resilience to vegetation related faults that can occur under abnormal weather conditions. This includes problems caused by falling trees and wind-blown tree branches.

Whilst the methodology is directly aimed at improving the resilience of networks under abnormal weather conditions it is expected that there will also be some consequential benefits under normal weather conditions.

2 SCOPE

This ETR provides guidance for Network Operators on how to improve network performance under abnormal weather conditions by adopting a risk based methodology to identify the most effective locations to carry out resilience related vegetation management, and/or other solutions. Abnormal weather conditions include high winds, ice, snow, prolonged high temperatures and heavy rainfall.

Current climate change predictions indicate an increased incidence of strong winds, rainfall and other severe weather events combined with extended vegetation growth periods. This may lead to the need for increasing levels of investment to maintain network resilience.

This ETR focuses on vegetation management as the first and most important step in improving overhead line resilience and considers the combined effect of high winds and extreme rainfall.

However, for a number reasons which are identified in the report there may be restrictions on the amount of tree cutting that can be carried out. Also, in some areas additional protection may be required to protect overhead lines from windblown material.

To address these situations the report considers other opportunities for enhancing resilience that could be applied alongside resilience tree cutting. These include the following:-

- Choice for construction standards of wood pole overhead lines
- Choice for construction standards for tower lines
- Enhanced network protection or automation
- Network diversion and undergrounding.

This ETR advocates a risk based approach to determine where and when to carry out vegetation management or other measures for the purpose of improving network resilience. The risk assessment will identify areas of the network where it is beneficial to either carry out vegetation management to a set of deterministic criteria or take alternative actions to reduce the risk of network damage during abnormal weather conditions.

The process described in this ETR should be regarded as non-prescriptive guidance on a range of good practice initiatives to improve network resilience under Abnormal Weather conditions.

This ETR takes as its starting point the safety clearances for Overhead Lines as specified in ENA-TS 43-8 [Ref 1] and as required under the Electricity Safety, Quality and Continuity Regulations, 2002 (ESQCR) [Ref 2].

This ETR considers the various opportunities and some of the constraints imposed on Network Operators as they endeavour to control vegetation in proximity to overhead lines and its potential impact on network resilience and performance. In particular there is information on the efficient use of resources and risk assessments.

This ETR is applicable to all public overhead lines in Great Britain from 230V to 132,000V.

This ETR should help to inform third parties of the reasons why vegetation management or other resilience measures are necessary and the absolute need for the co-operation of all stakeholders.

As this ETR is a technical document, issues such as care for the environment, standards of workmanship, dealing with arisings etc. are out of scope. These issues are covered in part in ETR 136 [Ref 3], and it is considered that they are best addressed within the relevant Vegetation Management policy documents of each Network Operator.

This ETR deals with proactive measures and it is not designed to provide guidance on how to manage vegetation under emergency conditions such as the after effects of a major storm.

3 DEFINITIONS

For the purposes of this Engineering Technical Report the following definitions apply.

NOTE: Defined terms are capitalised where they are used in the main text of this report.

Abnormal – Weather or Conditions

Weather conditions or weather related events with the potential to cause vegetation related faults that have a widespread impact either because of the number of faults and/or the system affected.

Customer Interruptions (CI)

The number of customers experiencing a power interruption expressed per 100 customers per year in accordance with Ofgem definitions.

Customer minutes lost (CML)

The average minutes without power per customer per year in accordance with Ofgem definitions.

DECC

The Department of Energy and Climate Change.

DEFRA

Department for Environment, Food and Rural Affairs.

Network Operator (NO)

The organisation that owns and/or operates an electricity network and that is responsible for managing overhead lines. The term NO includes Distribution Network Operators (DNOs), Independent Distribution Network Operators (IDNOs), Transmission Owners and the System Operator (SO).

Landowner

Means a person who either owns or is in actual occupation of the land.

Line Conductor

A conductor used, or to be used, for conveying a supply of electricity. A line conductor is deemed to include a through jumper.

Network

All those elements of the Network Operator's electrical infrastructure associated with the transmission and distribution of electrical energy. This includes, but is not limited to, Overhead Lines, Overhead Line supports, stay wires, open terminal transformers and switchgear.

Ofgem

The Office of Gas and Electricity Markets – the government regulator for gas and electricity markets in Great Britain.

Overhead Line (OHL)

Means any electric line which is placed above ground and in the open air.