Resilience in the context of the management of vegetation near overhead electric lines

1. **Resilience** in the context of the management of vegetation near overhead electric lines. This document is intended to be a living document – it will be revised from time to time as understanding of the issues grows. You are encouraged to submit your thoughts to uag@trees.org.uk and these will be tabled when this document is reviewed.

2. **Purpose/Background**: This document is produced in response to a perceived need to define the term resilience.

   2.1 Anecdotal evidence suggests that the term resilience is, in some circumstances, becoming synonymous with a 'total clearance' or 'rural care' approach.
   2.1.1 Whilst there are obviously instances where this may be justifiable it is in essence a risk-averse approach as opposed to a considered risk-management approach.
   2.1.2 Members of the AA's UAG Group have experience of tree management in a variety of sectors including energy distribution networks, rail, telecoms, highways and waterways. These experiences have been brought together to produce this document.
   2.1.3 ADAS has already prepared a draft Definition and this is included as Appendix 1

   2.2 This document therefore is intended to provide both a discussion point and a basic framework, upon which to work towards
   2.2.1 A definition of the term 'Resilience' (see 4 below)
   2.2.2 Basic good practices to demonstrate compliance with the term (see 5 below and example at Appendix 1).

3. **Approach/Methodology**: The initial approach taken is to look outside the utility arboriculture sector and consider how other organisations and individuals, tasked with the management of tree populations, achieve a consistent and defendable system of work. Subsequently, at Appendix 1 there is an example of how this may be put into practice.

   3.1 Whilst the 'value' of targets (highways, energy networks, people and property etc.) is obviously a significant consideration, at a basic level a tree inspector/surveyor should, through a combination of good practice, duty of care and moral imperative, make sound and defendable decisions regardless of the value of any target. Conversely, in the case that the tree causes damage and or injury (and the potential was reasonably foreseeable) there may be associated liabilities.
   3.2 Considering the approaches above, a definition of the term resilience and some basic considerations to achieve the same are detailed below.

4. **Definitions of resilience**: These definitions are proposed

   4.1 A considered and defendable approach to the management of vegetation adjacent energy networks

4.2 Risk-based management of vegetation in proximity to electrical equipment and apparatus
4.3 The management of vegetation in proximity to energy networks based upon growth and failure potential
4.4 Resilience in the context of the vegetation management of energy networks is the ability of vegetation around the energy network to withstand a shock event without adversely affecting the purpose and quality of a network's functional capability
4.5 An objective risk assessment of the tree resilience of an overhead power line to withstand adverse weather conditions
4.6 Any combination of the above
4.7 A definition statement for resilience should also reference the purpose of the works (to prevent outage in extreme conditions).

5. Basic Considerations: The principals below attempt to provide basic guidance of how to demonstrate compliance with resilience.

5.1 The approach must be
5.1.1 Clear
5.1.2 Consistent
5.1.3 Defendable
5.1.4 Recordable and auditable.

5.2 Survey/Inspection
5.2.1 Vegetation and associated 'cutting' assessment, must consider
- Growth and failure potential (either total or partial collapse), safe life expectancy
- Wildlife and environmental/amenity value
- The value to the vegetation owner

5.2.2 The final 'cutting' assessment must objectively measure these factors against, specified clearance cycles, the 'value' of the network etc.
- The process must be documented

5.2.3 Surveyors must have an appropriate level of qualification, knowledge and expertise to make these decisions accurately and consistently.
- Assessments must be to known yard sticks (either 3rd party systems or purpose built) e.g. Visual Tree Assessment

5.2.4 Whilst these basic steps outline a reasonably practicable approach, the system should ideally be developed and agreed with Network Operators' input (particularly in relation to the value of the Network asset).

APPENDIX 1

The ADAS definition for **Arboricultural Resilience** surveys near overhead power.

Regulatory requirements
In order to comply with the Electricity Safety, Quality and Continuity (Amendment) Regulations 2006 (Regulation 20A), Network Operators (NO) are expected to manage a percentage of their networks on a risk-based approach.

Energy Networks Association (ENA) publication 'Engineering Technical Report' (ETR) 132 Improving network performance under abnormal weather conditions by use of a risk-based approach to vegetation management near overhead lines, provides non-prescriptive guidance on how this could be done, although it does provide detailed guidance on the methodology for carrying out a resilience survey. The specification below should be read in conjunction with ETR 132.

The need for a common standard
The need is for all industry stakeholders (e.g. Utility Arboriculture Group (UAG), Department of Energy and Climate Change (DECC) and ENA) to agree and adopt a common approach, so that by complying with the agreed methodology, contractors and NO's can be seen to be doing all that can reasonably be expected to achieve the optimum level of protection for the overhead lines.

What is a 'Resilient Network'?
ETR 132 sets out a definition of 'Resilience' as *The ability of a Network to withstand a shock event and then return to its former purpose and quality.* Whilst ETR 132 provides guidance on a methodology for carrying out a resilience survey of a network, it is not specific on how trees should be assessed to determine whether they are considered as likely to cause damage or not, i.e. whether they should be felled/reduced or retained.

Outline procedure

Option 1 – a risk-averse approach
The first option to consider is to fell or reduce all trees so that the risk of them falling across the lines is completely removed. Where this can be carried out, the lines can be made fully resilient, with no risk of tree related outages.

Where trees are to be retained, it will be necessary to negotiate a height reduction that will allow for future growth. To maintain full resilience, it will be necessary to re-visit as often as necessary to cut back any subsequent growth and avoid them growing within falling distance of the lines.

Whether this risk averse option is possible or not will depend on whether permissions can be obtained, the effect on the landscape (e.g. this is unlikely to be an option in AONB's) and other environmental considerations (e.g. veteran trees).

This option actually goes further than that recommended in ETR 132, which suggests felling or reducing only trees "that are considered likely to cause damage to the overhead line during abnormal weather conditions".

Option 2 – a risk-based approach
The aim with this approach is to
(a) Ensure that all trees which represent a threat to the overhead lines, in abnormal weather conditions, are managed so as to remove that threat, and

(b) Demonstrate that all retained trees within falling distance of the lines, have been assessed as having an acceptably low risk (as it is not possible to confirm in any situation that a tree presents no risk).

There are a number of methodologies which incorporate a Visual Tree Assessment (VTA), and it is for the individual NO's to decide which method, or combination of methods, is the most appropriate for them. However, the following are the minimum elements that need to be included irrespective of the method used

1. The target (usage/value)
The target will always be the overhead power line, but it will be up to the industry to devise and agree a common 'value' for the various elements of their network e.g. to allocate a score for each line voltage.

2. The impact on the target (based on size of part)
All defective parts of a tree should be identified, measured and scored in accordance with an agreed (industry approved) methodology.

3. Likelihood of failure (dependant on severity of defect)
Assess the probability of the defective part failing and give a score in accordance with an agreed (industry approved) methodology

4. Total score
A methodology is required to take scores from 1 – 3 above and calculate an overall score. This is likely to involve multiplying or adding the score and perhaps some form of additional weighting.

5. Final score
Final score after score/s deducted for all remedial work. If tree still has an unacceptably high score, then the tree will need to be felled

The scores will then need to grouped into the following (draft) categories:
(a) Tree to be retained – no remedial work necessary (acceptably low risk)
(There may still however be some clearance needed to achieve the required clearance distances)
(b) Tree to be retained – remedial work required [detailed]) – acceptably low risk after remedial work carried out
(c) Tree to be felled – unacceptable risk after taking into account any possible remedial work

Qualifications of resilience surveyor
A resilience surveyor should hold the following qualifications:
- National Qualification - Level 3
- City & Guilds NPTC UA1 (parts 1 & 2), UA2 (part 2.1) UA5 (5.1 and 5.2).