The Environmental Decommissioning of EHV Underground Fluid-Filled Cable Systems

Introduction

There are various asset management approaches to be adopted and options to consider when Energy Networks Association member companies are deciding what to do with fluid-filled cables deemed to be no longer required for operational purposes. This document sets out the environmental considerations to be taken into account in the decommissioning process.

The environmental implications for any appropriate solution should be a major consideration in any asset management decision making. In some situations, a decommissioned fluid-filled cable remaining in-situ can still pose an environmental risk, depending on its location and how it is managed following decommissioning. However, for any of the options described below the environmental risk will always be several orders less than cables in service. Although the complete removal of any buried assets that are no longer required would appear be the ideal and permanent solution, this is not always the best overall practical environmental option and not always practical to achieve. As such all of the following solutions should be considered in the decision making leading up to decommissioning.

There are no known cases of significant groundwater pollution arising from decommissioned fluid filled cables where one of the methods outlined below have been used.

Potential solutions

1. Full removal of cables and joints by open cut trenches (full excavation)

With this solution all the cables and associated equipment are removed by excavation including ancillary equipment such as oil tanks and link boxes, allowing member companies in some cases to release the land from operational status.

This technique removes all long term risks associated with fluid-filled cables and associated systems. However, removal of the cable and joints will cause major disruption to the highways and other land users, and is costly and may have short term safety and environmental risks that need to be carefully managed, especially so whilst adjacent circuits remain in service. There are also significant environmental impacts from the energy used in the activity of recovering the cables, traffic congestion, the materials required for the remaking of the roadways, and the disposal of any material that cannot be reused or recycled.

2. Removal of cable joints, removal of fluid from cable and capping cable.
For this solution the cable joints and ancillary equipment are removed by multiple mini excavations. A pusher compound *(e.g. Hydrogel)* is then introduced to the cable to push out/replace free phase fluid in the cable by filling the cable fluid void. The cable will then be left in the ground.

This technique reduces the disruption to the highways and other land users. However, if the space occupied by the redundant cables is needed in the future then the old cable can be removed when the new assets are installed, thus avoiding the unnecessary environmental impact and cost of opening the ground twice. It should be noted that there will be a need to manage the risk of any remaining cable fluid residue in the cable (which can emerge from the ends or a leak point in the sheath of the cable). The risk of environmental damage is reduced by the removal of the majority of the cable fluid and T3788 linear alkyl benzene type hollow core saturant cable fluid (if used).

3. Removal of cable joints and extraction of cable cores and cable fluid
For this solution the cable joints and ancillary equipment are removed by multiple mini excavations as above. The cable is drained and purged of all fluids and the cores are pulled out of the cable, recovering the conductor, paper insulation and residual fluid. The cable sheath remaining in the ground can be cleaned and all risks of future oil spill removed essentially forming a new asset in the means of a duct.

Current technology is limited in this field and the effectiveness of this technique is heavily dependent on the cable system and installation.

4. Purging by nitrogen and further draining
Free phase fluid can be pushed from the cable using nitrogen. Cable joints can either be left in the ground but preferably removed as this gives easier access to the cables for purging. It is possible to fit draining points to the cables at low points on the profile for the draining of saturated fluid retained within the insulating papers at intervals, until free of all traces of any residual fluid. As above all ancillary equipment should be removed.

5. Purging by detergent and further draining
Free phase fluid can be flushed from the cable using a detergent solution. Cable joints can either be left in the ground but preferably removed as this gives easier access to the cables for flushing. It is possible to fit draining points to the cables at low points on the profile for the draining of fluid retained in the insulating papers at intervals, until free of all traces of any residual fluid. As above all ancillary equipment should be removed.

Future management of decommissioned redundant assets

All decommissioned assets remaining in the ground need to remain on the asset register, and where appropriate an asset specific maintenance regime shall be set for the particular asset. This is extremely important where they run through sensitive areas and also for third party searches.

With all of the above options, when they are effectively implemented, the risk of significant volumes of fluid leaking from the cables is extremely low and ongoing monitoring would not normally be required.

Evaluation of options and conclusions

For each decommissioning case a range of options should be considered before deciding on any one specific solution or combination of solutions. The selected solution(s) should also take into consideration the cost and disruption, both to member companies and any other land owners/users, together with the health and safety risks and environmental impacts from the proposed option.

Identification of and consultation with interested parties at an early stage is essential, especially land-owners and relevant regulators such as the Environment Agency, Natural England, English Heritage, Local Authorities and Highways Agency.

It may well be the case that a number of options apply to different parts of any one route and a mixture of options may be necessary. From an environmental perspective it is important to understand the environmental sensitivity of the land that the cable is running through taking into consideration such things as local ground water, water extraction points and the various types of areas having special conservation status etc. The commissioning of an Environmental Impact Assessment in proportion to the scale of the project, in terms of resources and environmental sensitivities, is therefore strongly recommended and may be a condition of the project.

In some cases it will be necessary to carry out research and development on a project specific basis to assess the best available technology for a particular situation. New technology should always be considered alongside existing and a full assessment of impacts considered. It should be recognised that the list of options as given above may not be exhaustive and other solutions may exist or be under development.