A.10.1. Analyse du cycle de vie environnemental des câbles moyenne tension aux Pays Bas

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A.10.1. Environmental life cycle analysis of MV cables in the Netherlands

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Résumé

Une analyse du cycle de vie du point de vue environnemental, a été effectuée sur 2 câbles 10 kV, à savoir un câble à gaine de plomb isolé au papier et un câble XLPE de la même taille, suivant la méthode SETAC/CML.

Les résultats ont servi à comparer les deux types de câbles au niveau de leur impact sur l'environnement et à déterminer leurs problèmes principaux au cours de leur vie.

Pour les deux câbles, les pertes d'énergie en mode de fonctionnement éclipsent toutes les autres charges environnementales. Si l'on considère les pertes dans le conducteur comme inévitables et qu'on les ignore, le câble XLPE a les meilleures performances du point de vue de l'environnement.

Abstract

An environmental life cycle assessment was carried out on two 10 kV cables, a paper-insulated lead-covered cable and an XLPE cable of the same rating, in accordance with the system of SETAC/CML. The results were used to compare the two cable types with respect to environmental impacts, and to determine the main problems in their life cycles. For both cables, the energy losses during the operation stage appear to overshadow any other environmental load. If conductor losses are considered unavoidable and ignored, the XLPE cable appears to carry the lesser environmental load.

Introduction

In 1992 the Dutch electricity distributing companies have expressed their wish to acquire insight in the environmental effects of some types of cables. This is part of their general effort to minimise the environmental impact of their activities.

The distributing companies are well aware that within the electricity supply system cables make only a very small contribution to the environmental impacts. Nevertheless, it was considered desirable to focus attention to cables as a starting point.

Beginning in 1993, a project was started for finding and developing a method for comparing the impacts of different types of cable for the same application. This method was then applied to compare the environmental impact of two MV cable types. In this paper, the method is comprehensively described, and the results of its application to the two selected cable types are presented.

The ELCA-method

The use of a cable for distribution of electricity causes waste and emissions with environmental impact, during the entire life cycle of the cable. The life cycle is divided into five phases or stages, starting with winning of raw materials, including the manufacturing of the cable, the installation in the distribution network, the operation or "use" of the cable, up to the dismantling and eventual recycling of its constituent materials.

In comparing the effects of different cables it is of course necessary to view the entire life cycle of the cables. A method that does so is called an Environmental life cycle assessment, an ELCA or usually LCA. At this moment, the LCA is a reasonably broadly accepted method, and is also applied outside the electric utilities.

The Dutch CML (Center for Environmental Science, Leiden) amongst others has given a scientific structure to the method of life cycle assessment. The ELCA starts with a description of its objectives, then makes an inventory of the use of raw materials and energy, and the waste flows during the entire life cycle of the product under investigation. Apart from choices that have to be made with respect to system parameters this part of the ELCA is basically objective.

The items on the inventory are called "impacts". They are then sorted into so called impact categories or classes, this is called the classification. Within these categories, the separate impacts are weighed and aggregated. This is called the characterisation. This part of the ELCA is subjective by nature because it is necessary to put a value to the importance of environmental impacts.

In this study, the system of classes is applied as defined by CML in accordance with SETAC, and modified for use in the program Simapro version 2.0. The classes are:

- eutrophication
- ozone depletion
- exhaustion of non renewable resources
- ecotoxicity
- energy use
- acidification
- greenhouse effect
- solid waste disposal
- smog formation
- human toxicity

The aggregation factors are formulated by a panel of experts (SETAC). This is of course a subjective operation.