

Elektrotechnik-Elektronik-Informationstechnik

EEI KOLLOQUIUM

Power Transformer Reliability Modelling

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Diskussionsleitung: Prof. Dr.-Ing. M. Luther

Electrical power grids serve to transport and distribute electrical power with high reliability and availability at acceptable costs and risks. These grids play a crucial though preferably invisible role in supplying sufficient power in a convenient form. Today's society has become increasingly dependent on the availability of power, and has become a more and more demanding "client", putting strong pressure on the reliability, availability and cost efficiency of supply.

Once the functionality of a grid is designed and the grid is constructed, it is taken into operation and expected to stay in operation for several decades. From then on the ways to control grid quality (reliability, availability, costs and risks) are operation and maintenance. The quality of the grid may be measured in terms of quality of supply (grid performance), condition (ability to perform) or costs (to ensure quality and control risks). The grid functionality may be endangered by capacity or quality limitations. In that case the grid operator needs to come up with either operational measures (maintenance, revision, load control, process improvements) or investments (replacement, extension).

For making substantiated decisions it is important to know the condition of the grid and its components. Condition information is crucial to make the expected performance quantifiable, and to make risks and costs predictable and controllable. Without condition information risks and costs may either be accepted, at the possible expense of reliability or availability, or prevented at the expense of additional safety margins and costs. Specifically, condition assessment may contribute significantly to make maintenance effective, efficient and timely, it may allow to postpone investments in a justified way and to permit controlled overloading. Moreover, it enables to justify the asset management policy to stakeholders such as clients, shareholders and regulator.

One of the key components in the grid, in terms of both reliability and investment, is the power transformer, which allows for power transmission and distribution at the required voltage level. The reliability of transformers is a prime concern to grid operators. The ultimate aim of the presented model was to develop an integral transformer life time model. This model can predict the transformer reliability based on relevant degradation mechanisms. These degradation mechanisms can occur in the transformer subcomponents, i.e. tank, bushings, tap-changer, core, oil and windings. Further, the transformer life time model must be applicable to individual power transformers and to power transformer populations..