The Need for Smart Diagnostics in Future Smart Grids

A Practical Example for MV Cables

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ABSTRACT

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In discussions around Smart Grids we tend to discuss most of the times about smart metering and application of smart control systems into the grid in order to e.g. increase the flexibility and optimal use of the grid. Increasing application of decentralized generation and storage possibilities (and needs) are often driving factors behind this need to smarten the grid. So measuring and controlling current flows and voltages in an intelligent way is an important part of the smart grid of the future.

However, although the energy flows may not be unidirectional and from point to point anymore in the modern and future grid, the core purpose of a power grid remains transporting and distributing energy. Furthermore, the primary features around this core function are, and will always be, doing this in a safe and reliable manner. All other features may be useful, needed and efficient, the core function and its primary features are still the base. Without a reliable base, all the secondary features are useless.

Looking at it this way, a grid would not be very “smart” if it would not be able to monitor its own core function and accompanying primary features. Often, one of the first features any intelligent system or product gets (or should get) is some kind of self check in order to determine at least its capability to perform its most important function. This is why intelligent systems to monitor the capability of a grid to perform its core function, transport and distribute energy, cannot be excluded from any future smart grid. If such technologies are installed in the power system itself and perform their function continuously in an intelligent way, this type of diagnostics is called ‘Smart Diagnostics’ or ‘Smart Monitoring’.

As an example of a Smart Diagnostic, this paper describes a continuous monitoring system for medium voltage cables and their accessories. Medium voltage cable feeders have a major influence on the overall reliability figures of many grids. So when smartening a grid, it seems logical to start with putting intelligence in *that* part of the network. Furthermore, when much decentralized energy is incorporated in an MV grid, the total load and load variation of the associated cable feeders may increase significantly (e.g. in the case of wind power).

ABSTRACT

Large loads or variations in load, and therefore temperature, can accelerate certain degradation mechanisms (especially in cable accessories) significantly. This increases the need for smart monitoring the MV cable feeder's core function even more. Furthermore, having continuous insight in the condition and risk on failure of the power system's components is inevitable for correct implementation of reliable asset management systems. Therefore, for risk-controlled application of any (current of new) MV cable feeders in the future grid, there is a need for a smart continuous condition monitoring system.

This paper explains the need for, the technology behind, the application of and some interesting results of a continuous condition monitoring system for MV cable feeders, together with the need for Smart Diagnostics in general.