

Accurate on-line fault location (full breakdowns) for MV cables with Smart Cable Guard

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For several years Smart Cable Guard (SCG) has proven to be an effective monitoring instrument for diagnosing MV underground power cables. Partial discharges (PD's) from weak spots can be detected and located, both continuously and on-line. Based on the same technology, the DNO's Alliander and Enexis, together with DNV GL and Locamation made SCG such that it can now also detect and locate a fault in a MV cable with a location accuracy of 1 %. This is a unique new possibility to guard MV cables.

Concerning this fault locator technology the following can be said as an introduction. Different from most protection equipment for MV cables, SCG has standard a time sync on board. This is not based on GPS or atom clocks, but on own injected pulses, making the time sync very accurate and reliable. With that, the first travelling wave from a fault arriving at both sides of the cable will be detected, giving accurate location possibilities (like with PD's, also for faults it is 1 % of the cable length). But there are more advantages of detecting a fault in this way. A travelling wave is always there, independent on the system grounding or type of fault. It also doesn't matter whether a fault is being switched off or not by the protection equipment, it has already been located. Even the resistance of fault, high or low Ohmic, doesn't matter. This fault location information will become available within a few minutes after the failure. This will help DNO's to speed up their repair work.

In this paper, the technique behind the fault location will be treated, but also the field experience as obtained by the Dutch network owners. For instance in one experiment in a live MV power cable a fault was created on purpose to prove the ability of SCG to indeed locate this fault accurately, while the cable was in service (Fig. 1).

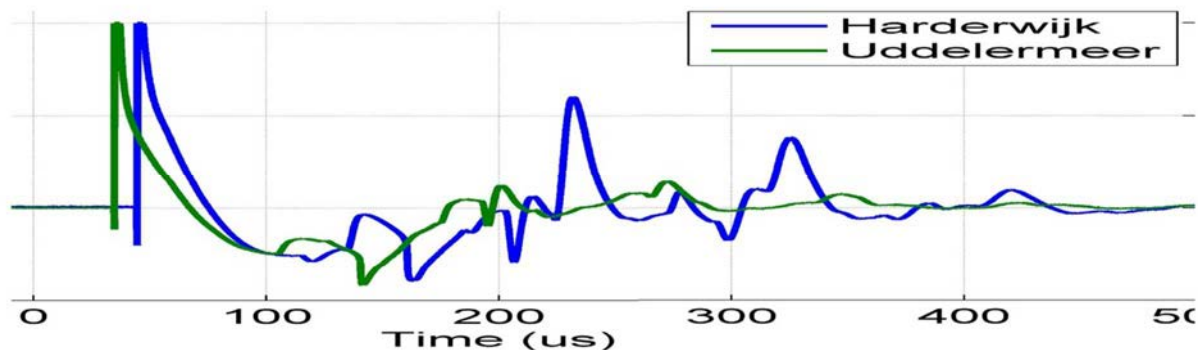


Fig 1: Travelling waves on a μs time-scale as recorded by SCG at the cable extremes (substations Harderwijk and Uddelermeer) of a 12,4 km long MV power cable. The travelling wave information was sent via internet to a server, immediately after the fault. The difference in arrival time ($9.8 \mu\text{s}$) makes it possible to determine the fault location with 1 % location accuracy. The network owner got this fault location information within a few minutes after the fault.