

Svenska kraftnät – sensors and metering

Participants: Svenska kraftnät, RISE, Affectus AB, Metrum AB, Sigma

Category: Transmission enhancement applications

Time plan: Started in 2017

Contact person: Elin Viberg, Svenska kraftnät

Location: Several

Possible to visit: Yes

Background and objective

Svenska kraftnät has installed new instrumentation in some of their network stations to investigate whether new and better data could increase knowledge about the status of relevant network components. This in turn would make the national grid more robust. By having a better knowledge of how healthy components in the national grid are, maintenance can be done proactively, and failures can be avoided.

Implementation

Together with their partners, Svenska kraftnät has installed a few different types of sensors and instrumentation and investigated how to make use of the data that they provide. The different trials are outlined below.

- Temperature sensors are used on disconnectors to find aging contact surfaces. Aging contact surfaces will have a higher resistance and because of this, the surface temperature will be higher on aging surfaces.
- There are also trials where the DC motor currents are measured in the disconnectors. Here anomalies are registered and data about these occurrences are stored. The purpose of this is to identify changes over time or recurring anomalies to be able to perform predictive maintenance.
- One of the most difficult operations for a modern SF6 breaker is switching a shunt reactor on to the transmission system. In the Swedish transmission system this operation is always performed with a point-on-wave device. Misconfigured synchronisation devices have in the past been found to cause re-ignitions, eventually causing breakdowns. Instrumentation has been installed to record all switching operations and machine learning is being used to identify different kinds of faults.
- High sample data gathered from energy meters are used to identify capacitor element breakdowns in CVTs, where the voltage difference between the three phases will change. The algorithms are to be used to alert the operator when events like this occur and will allow for maintenance before component breakdown.

Benefits

By collecting data from the new instrumentation and analysing this in an appropriate manner, Svenska kraftnät will gain a better picture of the health of their network stations. This will be beneficial as preventive measures can be made to avoid costly measures. The fact that the sensors are online, is also helpful as components in the entire grid can be monitored from one location and the need for site visits is reduced.

Scalability

Sensors and instrumentation can be placed at as few or as many stations as appropriate.

Interoperability

The sensors that are installed are chosen to be interoperable with the present infrastructure.

Investment horizon

If sensors are to be installed throughout the grid, the cost will be substantial. However, the benefits of a more robust national grid could motivate this cost.

International potential

Increased use of instrumentation, remote monitoring and machine learning to perform predictive maintenance is useful in grids throughout the world.