Background

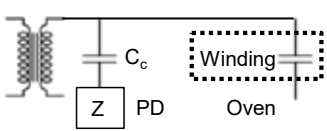
The majority of the Norwegian hydropower generators was installed between 1960 and 1990, and many of these will soon reach the expected lifetime and need refurbishment. One main root cause for failure in hydro generators is generally located to the groundwall insulation. It is therefore important to have reliable diagnostic methods to assess the groundwall insulation. This reduces the risk of unexpected breakdown and also too early winding replacement.

The objective of this PhD work is to correlate insulation defects and non-destructive measured quantities.

The method to be used is to first measure on single generator windings with different history, both spare windings and in-service aged windings from both high and low voltage locations. This will create a connection between the pristine system and the aged system to quantify measurable differences. Then, the faults will be localized by acoustic or high frequency techniques before a smaller area containing the fault, as well as a non-fault area, will be measured again by the same techniques. Next step is to reproduce the faults artificially in a model system and prove that the correlations found in the real system is originating from the proposed defects.

Relevant measurement techniques for condition assessment are dielectric spectroscopy, partial discharges, acoustic measurement and dissection. These methods will characterize the condition of the hydropower generator winding.

Laboratory test setup for partial discharge (PD) testing at 50 Hz. Transformer in front, connected to a coupling capacitor and the generator winding in back. An oven is surrounding the winding and enables measurements at different temperatures



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Condition assessment of generator insulation

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