System Grounding of 132 kV Networks

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Introduction and background:

Due to electrification of transport and industry to reduce CO2 emission there will be considerable growth in electric power consumption. This development will have a heavy impact on the regional sub- transmission systems,66-132kV as a result, there is need to strengthen the already existing system grounding.

Resonant and isolated grounding are most used grounding method mostly used in Norway. Only a few 132 kV networks are directly grounded. Skageraks two 132 kV networks are all resonant – each of them with 3 – 5 Peterson coils, but all are in the central part of the networks. The compensated network is achieved using an arc suppression coil known as Peterson coil which could be centralized or distributed. Most of the overhead lines on towers inside transmission systems acquire earth wires, which plays a significant role in safety operation during faulty conditions in direct grounded systems.

Asides from the transmission lines, the transformer station may also be grounded either directly, by impedances or isolated. Depending on whichever method of grounding, the transformer tends to behave differently during single phase fault in terms of the voltage/current impact transfer from one side of the transformer to another. However, the existing high Voltage networks' non-transposed architecture, on the other hand, makes fault detection and location more difficult.

In this thesis, the overvoltage analysis is restricted to single phase to ground fault and as a result, it is important to have a sound knowledge on symmetrical component before analysing the overvoltage impact on the transmission line and transformers during single phase fault for both compensated and direct grounding methods.

Problem description and objective:

The project topic: System grounding of 132kV network focuses on difference in overvoltage due to single phase ground faults on 132kV Vestfold and Telemark for both resonant and direct grounded system. The network, which is simplified from a system containing about 100 busbars onto 20 busbars with two separate networks each powered from the overlaying 300 – 420 kV transmission system with two centrally located points together with several distributed stations which also may be equivalents of local hydropower units within vicinity of each other is validated using PowerFactory.

The project is aimed at analyzing the impact of expanding an existing transmission and distribution 132kV local Vestfold and telemark network on its grounding systems putting into consideration a change of grounding system from resonant to direct.

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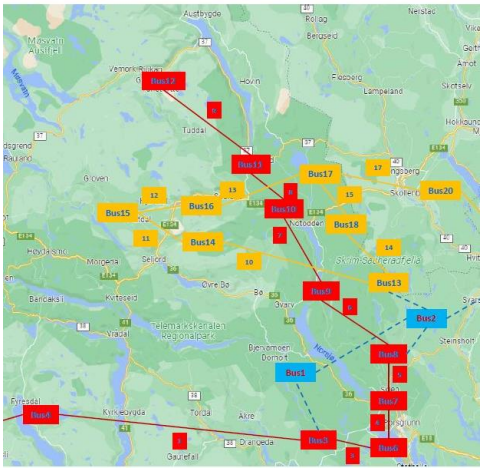

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