



Detailed validation of GIC modelling in Great Britain

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The high-voltage (HV) power network of the mainland Great Britain (GB) consists of over 400 nodes and 750 connections. Using the National Grid Ten-Year Electricity Statement, we have developed an up-to-date model of the HV grid capturing the locations of the transformers, their connectivity and the overall topology of the network including double-circuits. We used the test network provided by Horton et al. (2012) to test our modelling methodology and to validate the code at the GIC calculation step using a uniform electric field. We then applied the same methodology to the GB grid and compared the output with a small set of GIC measurements available for the March 2015 and the September 2017 storm. We find reasonably good agreement between modelled and measured electric fields and GIC, giving us confidence that our models are providing sensible estimates of GIC at the sites where we have measurements. However, the GIC measurements are confined to a small region of the grid. As part of a wider programme, our next step will be to use the differential magnetometer method (DMM) to measure GIC under individual power lines across the UK over the next two years. We outline the approach that we will take to reconcile the flow of GIC within our model and the indirect measurements of GIC (as they will not be made at a transformer ground point). Ultimately, we wish to fully validate the HV grid model of GB (and as a complementary output the geoelectric field models) from the DMM measurements. This will allow future improvements such as transformer-level modelling and mitigation strategies to be tested.