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How to incorporate new design criteria related to climate change?

This contribution is with respect to Question 1.7 of B2-PS1. The question was raised towards paper B2-10629, however this contribution seeks to answer the question from another viewpoint, related to paper B2-10974. The question is how new design criteria can be directly used in new line construction. This is also relevant with respect to paper B2-10974, which suggests a methodology to assess climate change impacts on design parameters, to take this into account in the design of new lines. As the paper concludes, future projections of extreme ice loads (in Norway) show a large spread (with opposite signs in many areas) based on the downscaling of two global climate models, making it challenging to incorporate into the design of new lines. To increase the robustness of results, more climate models should ideally be downscaled, but this is computationally demanding. Climate projections in this region of the world (North Atlantic region) are, however, generally very uncertain, showing large spreads, and climate models still contain relatively large biases, which affect the calculated ice loads. Consequently, it is difficult to say anything with a high degree of confidence regarding the future change in climatic design loads, before the climate science has reached a point of smaller uncertainties. How can we then use any of this information when planning line design? There are some geographic areas where the projections agree on the sign of change, and this can be utilized.

This contribution proposes an approach which involves monitoring of OHLs in exposed areas and collecting measurements of loads over longer periods of time, to identify areas where current climatic design loads may not be sufficient going into the future. The projections of future ice loads can then be used to identify these exposed areas, based on where the different model projections agree on an increase in loads. This approach may be taken by the Norwegian TSO, Statnett, in collaboration with Vindteknikk of Norconsult, and involves installation of tension load sensors in the insulator strings of suspension towers (see Figure 1) in such critical areas. The sensors are equipped with technology to transfer the measured load data via IoT directly to a recipient. This load sensor is currently being developed within the Icebox R&D project for use in Statnetts OHLs around Norway. A real-time monitoring system is also in place, where grid operators can closely follow the build-up of potentially critical ice loads, as well as potential critical wind loads or galloping. The monitoring system is attached to a forecasting system, with the ability to alert when critical load values are predicted.

Figure 1: Tension load sensor (LoadTroll) developed by Kjeller Vindteknikk at Norconsult. Left shows an installation in the insulator string of a suspension tower.