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Case-study of probabilistic risk assessment on the Icelandic power system

Samuel Perkin, Guðjón Hugberg Björnsson and Íris Baldursdóttir

Landsnet & Reykjavik University - Iceland

Abstract

Power system reliability is commonly managed by TSOs within the context of the N-1 criterion. This criterion is useful in its simplicity, and generally results in systems with high reliability if followed. There are however cases in which a TSO cannot comply with the N-1 criterion, either due to maintenance outages, or due to social or environmental barriers to the construction of new transmission lines. There are also threats to power systems that cannot be adequately described within the context of the N-1 criterion, such as the threat of storms due to high wind speeds or lightning strikes, or the variability of load and generation. Finally, there are measures taken by TSOs to manage reliability, that are not justifiable under an N-1 criterion, yet still improve the social benefit to consumers.

This discussion relates to a pilot test of the probabilistic risk assessment approach described in [1] and as an extension to [2], carried out in the control room of Landsnet (the Icelandic TSO) as part of the EU FP7 GARPUR project. The pilot test uses operational system state data and live observational weather data. Specifically, the discussion looks at how such measures can justify alternative control measures to resolve reliability issues. A real-world example from the Icelandic system is used to show how probabilistic risk assessments can be used to measure the benefit of control measures and decision making, beyond the capabilities of N-1. The research leading to these results has received funding from the European Union Seventh Framework Programme (FP7/2007-2013) under grant agreement No 608540, project acronym GARPUR.

References:

[1] GARPUR Consortium, "D6.2 How to upgrade reliability management for short-term decision making", framework programme, EU Commission grant agreement 608540, 2016, <http://www.garpur-project.eu/>

[2] S. Perkin, A.B. Svendsen, T. Tollefsen, I. Honve, I. Baldursdottir, H. Stefansson, R. Kristjansson, and P. Jensson, "Modelling weather dependence in online reliability assessment of power systems", Proceedings of the Institution of Mechanical Engineers, Part O: Journal of Risk and Reliability, March 2017