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Analysis of the Reliability of Communication Services of a Transmission System Operator Considering Dynamic Routing for Enhanced Availability

The decarbonization of German emissions necessitates the expansion of renewable energy sources while concurrently decommissioning nuclear and coal power plants. Consequently, the geographical points of energy input are changing, prompting transmission system operators in Germany to expand and optimize the utilization of the electrical transmission grid at several locations [1]. Research projects such as InnoSys2030 demonstrate that the coordinated implementation of curative measures, alongside increased automation, can facilitate higher electrical transmission grid utilization without compromising system stability [2]. These measures require a permanent and reliable data connection before and during a curative measure [3]. Data connection can link the data source and their corresponding sinks through various types of routes like static and dynamic routes. These types of routes influence the availability of the connection, as the reliability data vary between static and dynamic routes.

In this contribution, the reliability of communication services of a transmission system operator is examined. The approach from [4] is adopted and further developed with a focus on dynamic routing. The purpose is to develop a model that combines service availability requirements and the minimum number of routes with adjusted reliability metrics through communication network protection mechanisms. This involves analyzing which network protection mechanisms are relevant for dynamic routes and how these influence the reliability data of routes. Furthermore, the contribution investigates how many alternative routes must exist in a dynamic network to hit a service-specific availability class (e.g. AC 3 high availability with 99.99 % [5]). The resulting insights are validated in an abstracted section of a real communication network of a transmission system operator.

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