

Security-constrained unit commitment problem with transmission switching reliability and dynamic thermal line rating

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Abstract-

In security-constrained unit commitment (SCUC) problems, one approach to decrease operation costs is using a transmission switching (TS) tool. In SCUC problems with TS, one of the main challenges is that there is no limitation for the number of switching of circuit breakers (CB) in the system. In this article, the reliability of CB is merged into the SCUC problem with the TS and is considered as a limiting factor for switching. With a more reliable CB, the overall reliability of the system will be increased. So, it can be concluded that the reliability of a CB affects the amount of load shedding. Reliability of a CB is a nonlinear equation based on the number of switching in a period. An approach is presented to linearize the switch reliability equation. In this article, the power flow model uses an improved linear ac optimal power flow and a dynamic thermal line rating (DTLR) model, which considers the weather conditions. Other than CB reliability, DTLR in SCUC problems affects the number of switching and, as a result, operation costs will be significantly decreased. The proposed model is empowered by Bender's decomposition and is tested on 6-bus and 118-bus IEEE test systems.

Index Terms- Benders' decomposition, dynamic thermal line rating (DTLR), expected energy not supplied (EENS), linear ac power flow, transmission switching (TS).

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