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A search space reduction method for transmission expansion planning using an iterative refinement of the DC Load Flow model

Q. Ploussard, L. Olmos, A. Ramos

Abstract- This paper provides a new methodology to compute a reduced but efficient set of candidate lines in a transmission expansion planning (TEP) context. Considering this reduced set of candidate lines should lead to similar investment decisions as if all the possible ac and dc candidate lines that could be installed in the network were considered. A first «hybrid» relaxed TEP problem is solved. Based on this initial solution, a new relaxed TEP problem is iteratively solved in which the dc load flow (DCLF) model is enforced to a certain extent in the partially expanded ac corridors. Once a convergence threshold has been reached, an upper bound of the number of candidate ac and dc lines to install in each corridor can be defined. This process results in a compact search space. Our algorithm has been implemented in General Algebraic Modeling Software (GAMS) and has been tested on a case study based on the European power system. The method produces very promising results and in the considered case study, leads to a very efficient investment.

Index Terms- Dimension Reduction; Integer linear programming; Transmission Expansion Planning; Relaxation methods

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