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Large-scale transmission expansion planning: from zonal results to a nodal expansion plan

A. Ramos Galán; C. Pache; F. Báñez Chicharro; J. Maeght; L. Olmos Camacho; P. Panciatici; S. Lumbreras Sancho

Abstract-

Performing optimal Transmission Expansion Planning (TEP) in real, large-scale power systems such as the European one can be an unmanageable task, especially when long-term time scopes and multiple scenarios are considered. Project e-Highway had the daunting objective of planning the European network for the very long term and under high renewable energy penetration. The project objectives included the development of a planning methodology capable of applying optimization to large-scale systems that are currently unmanageable in practice. This paper presents this approach, which is based on simplifying the system while keeping its main features and investment drivers. The simplified system is then expanded optimally for the full time scope. Last, the original system is expanded optimally for the first time horizon taking into account the constraints imposed by the full time-scope optimization of the simplified system. It illustrates the applicability of the method with a case study based on the European Union.

Index Terms- power transmission planning

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