

# **Coordination of generation and transmission expansion planning in a liberalized electricity context — coordination schemes, risk management, and modelling strategies: a review**

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## **Abstract-**

After more than two decades of experience with the deregulated functioning of electricity markets, the need to coordinate generation and transmission investment decisions has been defined as a relevant problem, moreover considering the high penetration of renewables expected in the upcoming years. This lack of coordination creates risks for investors in both activities. This article reviews and classifies the most relevant works in this field in a liberalized context. We compare works on different planning approaches and the implementation of regulatory coordination schemes complementing the former to define the state of the art. Part of these works explores the role of coordination schemes in managing risks that can condition investment decisions and lead to coordination failures. We also discuss the suitability of different modelling approaches to represent the different possible planning, regulatory coordination schemes and risk measurements. Based on the review of previous works, we identify a research gap in the analysis of the combined use of planning approaches and appropriate complementary regulatory coordination schemes, including their ability to manage the most relevant risks that investors in both activities are subject to and the lack of the implementation of risk modelling strategies to assess risk aversion from stakeholders properly, especially under a proactive planning approach.

**Index Terms-** Review; Generation expansion planning; Transmission expansion planning; Regulatory mechanisms; Risk management; Risk modelling

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