

The human factor in transmission network expansion planning: the grid that a sustainable energy system needs

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Abstract-

The decarbonization of the energy sector puts additional pressure on the transmission network. The main cause for this is that renewable sources are often more abundant in geographical areas far away from the main demand centers, so new transmission lines are required to connect the new renewable energy capacity. In addition, by connecting different geographical zones, the transmission network could smooth the intermittency and the variability of renewable energy production. Thus, the changing energy landscape leads to a need to reinforce the transmission network through the Network Transmission Expansion Planning. Ideally, all the idiosyncrasies of the electricity system are considered in the operation and expansion planning process. However, several critical dimensions of the planning process are routinely ignored since they may introduce parameters that are difficult to quantify and complexity that state-of-the-art planning methods cannot handle. This paper identifies the most relevant elements related to the human factor, which have been grouped around the main topics: the human behind the technical, the human at the institutional level, and the human at the individual level. This paper also provides an additional formulation that can be used to upgrade existing models to include the human element and discusses the implications of these upgrades.

Index Terms- power system expansion planning; power system operation; transmission expansion planning

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