

Title: Valuing Transmission Flexibility for System with Intermittent Resources

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Description:

The increased penetration of distributed energy resources, intermittent renewable energy sources, and demand-side technologies in the future electricity grid is likely to change the generation and demand patterns in the electricity grid and increase the amount of variability and uncertainty associated with these patterns. In order to handle this increasing level of variability and uncertainty, the current electricity infrastructure needs to be enhanced to allow for a greater level of flexibility in the grid. In a smart transmission system, grid flexibility can be introduced using control devices that alter the electrical parameters of the system, such as Flexible Alternating Current Transmission System Devices (FACTS), or direct current (DC) power lines.

As it stands, the current transmission investment planning and pricing framework does not provide appropriate incentives for optimal investment in transmission infrastructure even if we do not consider new transmission technologies. The introduction of new flexible transmission devices in a Smart Grid will provide an additional level of complexity that system planners and regulators are not equipped to support. Therefore, the goal of our work is to develop a mathematical and computational framework to evaluate the optimal level of investments in both new and conventional transmission technologies. The mathematical framework will be used to design a future regulatory and investment planning framework that provides the right incentives to encourage optimal level of investments in new and conventional transmission technologies. Such a framework would provide one of the necessary links that is required for a smooth transition towards a Smart Grid with high levels of intermittent and distributed resources.