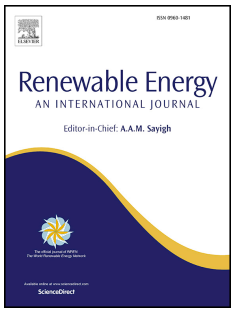
Accepted Manuscript



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PII: S0960-1481(17)30953-9

DOI: 10.1016/j.renene.2017.09.085

Reference: RENE 9283

To appear in: *Renewable Energy*

Received Date: 6 December 2016

Revised Date: 8 August 2017

Accepted Date: 28 September 2017

Please cite this article as: Li J, Liu F, Li Z, Mei S, He G, Impacts and benefits of UPFC to wind power integration in unit commitment, *Renewable Energy* (2017), doi: 10.1016/j.renene.2017.09.085.

Impacts and Benefits of UPFC to Wind Power Integration in Unit Commitment

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Abstract

Unified Power Flow Controller (UPFC) is recognized as the most powerful flexible AC transmission systems (FACTS) device for power system operation. This paper addresses how UPFC explores the transmission flexibility and facilitates the integration of uncertain and volatile wind power generation. To this end, a comprehensive unit commitment (UC) model with UPFC and uncertain wind power generation is proposed. Then, some metrics are introduced to evaluate the impacts of UPFC on the reliability, security and economy of power system operation. Further, different dispatch strategies of UPFC are compared to provide helpful guidances on making full use of UPFC to hedge against uncertainties. In addition, facing the challenging mixed-integer non-linear non-convex problems, approximate models are proposed to provide a starting point to solve the problems efficiently. All these models are easy to adapt to other types of FACTS devices. Illustrative numerical results are provided.

Keywords: UPFC, unit commitment, transmission flexibility, wind power, uncertainty

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