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Title: Novel complex network model and its application in identifying critical components of power grid.

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Abstract: Abstract A novel power grid complex network model in order to in-depth characterize the power grid with its complexity is proposed in this paper, based on the power flow transmission network (PFTN). With novel definitions, considering the path, distance and capacity of power transmission comprehensively, the complex network model can comply with the basic electrical law and the physical constraints of power grid. On this basis, an index set for identifying critical buses and branches within the power grid is designed. The index set includes distance and capability degree, hub, distance and capability betweenness, which can fully evaluate the role of nodes or branches in composing the structure and maintaining the system operation of the power grid. Simulations on both IEEE benchmark systems and a provincial power grid in China are conducted using the proposed model, with critical components identification yielding good results. By comparison with existing methods, the effectiveness and superiority of

the proposed model are verified. Highlights • The power flow transmission network of the power grid is defined. • The proposed model captures both the structure and operating status of the grid. • A more systematic grid critical components identification model is proposed. • Extensive simulations show the effectiveness and superiority of the proposed model. [ABSTRACT FROM AUTHOR]

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