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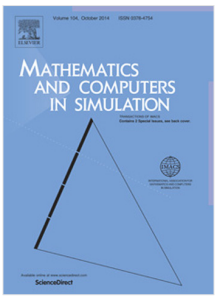

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Impact of load models on the static and dynamic performances of grid-connected wind power plants: a comparative analysis

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Abstract

The integration of renewable energy technologies in power systems causes a significant change in the electromechanical, and electromagnetic properties of the hosting systems. Consequently, the overall steady state, and dynamic performances of power systems are altered due to the presence of these technologies. Therefore, the conclusions derived from the conventional system structures need to be updated. Recently, wind energy presented a worldwide major source of renewable energy. The performance of the generating subsystem is not only affected by the technologies of the generators, but also by the dynamics of the network and load components. Since the majority of network components is passive elements, the loads present the most impacting subsystems on the performance of power systems. Investigation of the impact of load models on the performance of power systems hosting wind energy is the main objective of this paper. This paper presents a detailed analysis of the steady state and dynamic performances of power systems as affected by popular WECTs, and composite load structures and models. The results are compared with the performances of the conventional synchronous generators. The results presented in the paper provide evidences of the strengths and weaknesses in power systems caused by the presence of various WECTs. In addition, the results show the levels of capability of various WECTs to match the classical distinct performances of conventional synchronous generators.

Keywords

Wind energy systems; load models; steady state analysis; dynamic analysis; stability.