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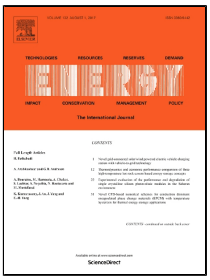

Mutual information for Evaluating Renewable Power Penetration Impacts in a Distributed Generation System

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Mutual information for Evaluating Renewable Power Penetration Impacts in a Distributed Generation System

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ABSTRACT

Renewable energy (RE) is regarded as the main part of the primary energy in the forthcoming "energy internet". However, the intermittence and variability of renewable energy limit its present penetration. To study the effect of the renewable energy penetration on power supply and demand, a dynamic distributed multi-energy generation system combining RE, natural gas (NG) and energy storage was built based on the semi-physical model library. The model library consisted of four key links of a distributed generation system: a generation link, storage link, recycle link and user-load link. Simulation indicated that the responses of a reversible solid oxide fuel cell (RSOC) and Li-ion battery were faster than that of a gas internal combustion engine (GICE). Furthermore, a novel indicator based on the mutual information was applied in a distributed generation system coupling RE, NG and energy storage. The results showed that the indicator was applicable for evaluating power balance degree and device capacity selection. Based on the indicator, it was found that the power balance degree

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