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Renewable Electricity Futures: Exploration of a U.S. Grid with 80% Renewable Electricity

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Renewable Electricity Futures is an initial investigation of the extent to which renewable energy supply can meet the electricity demands of the contiguous United States over the next several decades. This study explores the implications and challenges of very high renewable electricity generation levels: from 30% up to 90% (focusing on 80%) of all U.S. electricity generation from renewable technologies in 2050. At such high levels of renewable electricity penetration, the unique characteristics of some renewable resources, specifically geographical distribution and variability and un-certainty in output, pose challenges to the operability of the nation's electric system. The study focuses on key technical implications of this environment from a national perspective, exploring whether the U.S. power system can supply electricity to meet customer demand on an hourly basis with high levels of renewable electricity, including variable wind and solar generation. The study also identifies some of the potential economic, environmental, and social implications of deploying and integrating high levels of renewable electricity in the U.S. The full report and associated supporting information is available at: http://www.nrel.gov/analysis/re_futures/.