

## John Bistline, Electric Power Research Institute Recommendations to the Committee on the Future of the Electric Power in the United States

- Finding: The spatial and temporal variability of renewable generation has important economic implications for electric sector investments and system operations
  - There are reduced-form methods for capturing the joint variation of time-series data like load, wind, and solar in long-term electric sector models: Blanford, Merrick, Bistline, and Young (2018). "Simulating Annual Variation in Load, Wind, and Solar by Representative Hour Selection." *The Energy Journal*, 39(3): 189--212 ([link](#)).
  - Common simplifications of temporal variability in energy system models can inaccurately characterize the economic competitiveness of variable renewable energy vis-à-vis dispatchable generators and understate the value of technology: Bistline and Blanford (2020). "Value of Technology in the U.S. Electric Power Sector: Impacts of Full Portfolios and Technological Change on the Costs of Meeting Decarbonization Goals." *Energy Economics* ([link](#)).
  - Research needs: Decomposition approaches to solve larger problem instances; guidance on domains where increased model complexity matters; increasing spatial and temporal granularity to make analysis more applicable to local decision-making; addressing interannual variability and climate impacts
- Finding: Multi-model studies can help to develop robust insights, identify areas of disagreement, and encourage adoption of best practices
  - Example: Model intercomparison study of variable renewable energy in long-term electric sector models between EIA, EPA, EPRI, and NREL, as described in the project summary report: Cole, et al. (2017). Variable Renewable Energy in Long-Term Planning Models: A Multi-Model Perspective. NREL/TP-6A20-70528 ([link](#)).
  - Both model structures and input assumptions play important roles in evaluating the future competitiveness of different electric sector resources: Mai, et al. (2018). "The Role of Input Assumptions and Model Structures in Projections of Variable Renewable Energy: A Multi-Model Perspective of the U.S. Electricity System." *Energy Economics*, 76: 313--324 ([link](#)).
  - Recommendation: In addition to publishing a report on our qualitative findings and peer-reviewed article to summarize our quantitative comparisons, we also tried to make our findings more accessible to policymakers and the public by holding a seminar in DC where we summarized the project and answered questions.
- Finding: Significant changes to hourly load shapes from electrification, efficiency, and other drivers impact electric sector planning
  - Electric Power Research Institute (2018). U.S. National Electrification Assessment. EPRI Report 3002013582 ([link](#)).
  - Research need: Data about behavioral responses (e.g., to different rate structures and externality pricing); cross-sector integration; linking power sector tools
- Finding: Renewables and energy storage valuation vary significantly by region and assumptions about future technologies, markets, and policies
  - Bistline and Young (2019). "Economic Drivers of Wind and Solar Penetration in the U.S." *Environmental Research Letters*, 14(12): 124001 ([link](#)).
  - Although a best practice is to conduct range of sensitivities to explore how decisions can change, there is a communications need to summarize findings succinctly.