Pacific Northwest National Laboratory's Industry Acceptance Program: How the Use of Analytics Can Improve the Value Proposition for Energy Storage in the United States

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Abstract

The energy storage analytics team at the Pacific Northwest National Laboratory (PNNL) is currently working with utilities and private developers to evaluate energy storage systems with combined power and energy capacities of 1.6 GW and 18.2 GWh, respectively, at 16 sites across the United States. PNNL is evaluating lithium-ion and redox flow batteries in Washington, demand response programs in Hawaii, microgrids in Massachusetts, and pumped storage hydro systems in Washington, California, New York, Puerto Rico, and Hawaii.
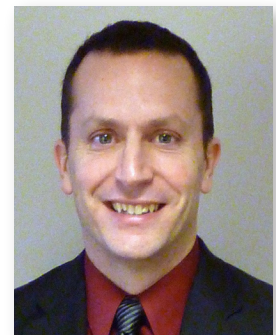
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PNNL has developed analytical frameworks and tools for evaluating the economic benefits of storage systems, characterizing performance during economic operation, integrating storage into the distribution system, and developing real-time control systems in order to capture real-time value. These efforts have resulted in the development of a taxonomy and framework for evaluating the economic benefits of energy storage at multiple points in the grid, a storage valuation tool, self-learning non-linear models for predicting storage performance, state of health models, and a model for evaluating the performance of real-time dispatch control systems. Learning objectives for this presentation session will include:

• Learn the definition of grid services provided by energy storage systems and the bases of monetization

• Review several recent assessments of energy storage projects and draw conclusions regarding what worked and how improvements could be made

• Review energy storage cost estimates and forecasts, and review our recent findings associated with grid-connected energy storage performance

• Understand the recent advancements in energy storage analytics around non-linear operation, stochastic optimization, degradation factoring, performance optimization, and application of imperfect knowledge in modeling.

This presentation will demonstrate how lessons from these engagements are being used to fill gaps in the industry knowledge base regarding storage valuation and will outline next steps in our research agenda.

Biography

Patrick Balducci has 20 years of professional experience as an economist and project manager. He is a Chief Economist at the Pacific Northwest National Laboratory (PNNL) where he has been employed since 2001. He is currently leading the industrial acceptance areas of the PNNL Energy Storage Program. He has extensive experience in modeling the benefits of energy infrastructure and in leading research and development efforts supporting the U.S. Department of Energy (DOE) and the electric power industry. He has authored over 100 publications, including journal articles, conference proceedings, and technical reports. He is currently leading research efforts evaluating the benefits of microgrids and energy storage systems in California, Massachusetts (Northampton), Oregon, and Washington. He is also leading efforts to enhance energy storage economic assessment tools for the DOE. He serves as an Adjunct Professor of Business at Marylhurst University and as the President of the Pacific Northwest Regional Economics Conference's Board of Directors. He holds a BS in Economics from Lewis and Clark College, where he graduated with honors, and an MSc in Applied Environmental Economics from the University of London, Imperial College of London. He will serve as the technical lead of the market feasibility assessment.

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