

## Energy Storage for the Electric Grid – MegaWatts from picoWatts

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The rapid expansion of non-dispatchable renewable generation onto the US electric grid is driving the need for new grid energy storage options. The impetus for this need is largely based on the variable nature of renewable energy, which can cause instabilities in power delivery and directly impact our daily lives (e.g. our ability to watch Netflix). However, the deployment of energy storage technologies is hampered by high initial cost, often inadequate service lifetimes, and the low monetary value of the services provided. In this presentation, we will discuss the current state of drivers for the utilization of grid energy storage and dive into a specific example of how nano-science is being used to understand and control degradation in Li batteries.

This research was conducted at the Center for Nanophase Materials Sciences and at the Center for Integrated Nanotechnologies, Office of Science User Facilities operated for the U.S. Department of Energy (DOE) Office of Science.

**Sean J. Hearne, Ph.D.** – Is the Director of the Materials Science and Technology Division (MSTD) at Oak Ridge National Laboratory. The division conducts fundamental and applied materials research for basic energy sciences programs and a variety of energy technologies, including energy efficiency, renewable energy, transportation, conservation, fossil energy, fusion energy, nuclear power, and space exploration. Key areas of research include quantum materials, advanced alloy development, additive manufacturing, structural materials for extreme environments, and materials corrosion and aging. Dr. Hearne served as the president of the Materials Research Society in 2018 and was formally the director for the Center for Nanophase Materials Sciences (CNMS) a Department of Energy user facility. Prior to directing CNMS, Sean was co-Director at Sandia National Laboratories' Center for Integrated Nanotechnology and previously led the Office of Electricity Delivery and Energy Reliability's Energy Storage at Sandia. Sean received his bachelors' degree in 1991 from Embry-Riddle Aeronautical University, Prescott AZ, where he was trained and licensed as a commercial pilot. He then went on to receive his Ph.D. in Solid State Physics from Arizona State University in 2000, where his dissertation research emphasized the mechanical properties of materials. Sean holds multiple patents in microfabrication and published in topics ranging from fundamental material science through electroplating and energy storage for the electric grid.

