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## *EVALUATION OF ENERGY STORAGE STRATEGIES FOR INTEGRATION OF RENEWABLES INTO THE GRID*

### **Abstract.**

Integration of increased and abundant renewable energy sources into the grid will have the potential to reduce our dependence on fossil fuel and minimize the greenhouse gas emission. The unique aspect of the grid is that the generation and load must be balanced at all times. Renewable energy sources such as wind and solar are considered “intermittent” and their output power are unpredictable which makes the balancing very difficult.

Energy storage is expected to play a major role in promoting the development of renewable energy, intermittent power source balancing, reducing carbon emission, managing peak power, and reducing transmission congestion. Large-scale storage technologies that can rapidly respond to variations in generation and load are vital. There are various emerging energy storage technologies, some with significant rate of maturity. They include Compressed Air Energy Storage (CAES), pumped hydro energy storage (PHES), batteries, flywheels, and ultracapacitors which can be used to support renewable energy integration into the grid. Our focus will be on deployment of large-scale energy storage technologies which are suitable candidates for Nebraska. One of the key research tasks will be the investigation of feasibility and economic analysis of Nebraska’s natural resources such as High Plains Aquifer (Ogallala Aquifer) as the compressed air storage reservoir.