



## “Sustainable Conservation – Heading for Harmony”

**Abstract:** Dr. Lukas Swan, Dalhousie University

---

### ***Technical and economic convergence of electricity services and energy storage***

The continued installation of wind turbines provides new renewable energy to the NS electricity grid. However, the non-dispatchable nature of the wind resource results in widely varied power output that can fluctuate minute-by-minute. This generation frequently runs counter to changes in load, and thus creates a doubly-difficult situation for operators to maintain system stability. Energy storage, such as pumped-hydro, batteries, compressed-air, and flywheels, represent a present-day technological solution that smooth such fluctuations. Storage can bring a host of supportive services to the electricity grid including: energy arbitrage, peak/valley clipping, ramp-rate compensation, and frequency regulation. The storage technologies come with capital and operating costs, and energy losses due to inefficiency. For mainstream adoption there must be sufficient revenue created from the service they provide to make them economically feasible. This high-level presentation explores the technical and economic characteristics of present day electricity services and storage technologies. It then compares these to determine points of both technical and economic convergence. Electricity planners and storage suppliers can use these results to identify project opportunities and conduct fast preliminary assessment. This research is presently expanding with new concepts of multi-service control strategies.