



Project title	Consumer-based storage in power networks
Principal supervisor	Ben Mestel
Second supervisor	Toby O'Neil, William Nuttall
Discipline	Applied mathematics
Research area/keywords	smart grids, energy systems, electricity storage, stochastic and deterministic modelling, variational methods
Suitable for	Full time or part time students

Project background and description

To meet the challenges of a low-carbon future incorporating significant renewable energy, there has been growing interest in the the role of energy/electricity storage in the management of power systems, both (i) as an aid to short-term stabilization of the power system; and (ii) as a means to handle mismatches between supply and demand.

A major challenge of renewables is storage of electrical energy, with traditional methods such as pumped storage reservoirs unlikely to provide sufficient storage capacity to even out variations in supply. The advent of the prosumer (producer/consumer) and of electric and hybrid vehicles provides a new, potentially significant method of large-scale energy storage.

The aim of the project is to use deterministic and stochastic optimisation to develop and analyse models of prosumer electricity storage, for example in batteries and electric/hybrid vehicles, focussing on price as a mechanism to incentivise and manage prosumer storage. The work will build on initial work by Mestel [1] and Cruise, Gibbens and Zachary [2].

Background reading/references

- [1] B.D.Mestel, Optimal battery charge/discharge strategies for prosumers and suppliers, preprint (2014)
- [2] James Cruise, Richard Gibbens, and Stan Zachary, Optimal control of storage for arbitrage, with applications to energy systems, arXiv:1307.0800 [math.OC] (2013)
- [3] Institution of Mechanical Engineers, Energy storage: The missing link in the UK's energy commitments (2014)