

## **Nonlinear Dynamics of Aggregate Load Models**

The presentation will consider the fidelity of aggregate models used to simulate, analyze and control large populations (ensembles) of relatively small loads. Of particular interest are loads that operate according to hysteresis controls, for example thermostatically controlled loads (TCLs) such as residential air-conditioners. The so-called bin model forms the basis for this investigation. It will be shown that control of such load ensembles can result in undesirable, highly nonlinear behaviour including synchronization, sustained oscillations and bifurcations. Events of this form would be quite disruptive to power system operations and therefore must be avoided. The nature of such events will be explored and the implications for control strategies will be considered.