ABSTRACT: Flexible electric loads can provide a variety of benefits to power systems, for example, increased reliability, reduced operational costs, and the ability to integrate larger amounts of intermittent renewable energy resources such as wind and solar power into the power grid. However, a key challenge is how to coordinate diverse distributed loads to achieve common objectives without greatly impacting their local functions and without costly investment in new infrastructure. In this talk, I will describe several methods we can use to plan/control aggregations of loads to provide services to power systems. Importantly, these methods deal with real-world load control issues including uncertainty and access to only partial information. First, I will describe how load curtailment can be formulated as a restless bandit problem, allowing us to derive index policies that help us choose the best loads to curtail in each time step, without perfect knowledge of the state of each load. Second, I will show how we can explicitly account for the uncertainty of aggregations of loads providing power system reserves in stochastic optimal power flow problems.

Bo: Johanna Mathieu is an assistant professor in the Department of EECS at the University of Michigan. She received her PhD from the University of California at Berkeley in 2012 and recently completed a postdoc in the Power Systems Laboratory at ETH Zurich, Switzerland. Her research focuses on ways to reduce the environmental impact, cost, and inefficiency of electric power systems via new operational and control strategies, with an emphasis on demand response and energy storage.