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# McKean FBSDE applied to the management of microgrid under uncertainty of production/consumption

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## Abstract

I will present a stochastic control arising from the optimal management of the electricity consumption of a building equipped with solar panels and battery. The objective is to minimize the risks over the public grid. The storage facilities help to smooth the load on the large public grid. The cost functions involve the distribution of both the state space variable  $X$  and the control  $u$ . The uncertain solar production and consumption may be modeled with jump processes accounting for sudden drop of power production (due to clouds for instance) and switch-on/off of appliances/devices.

Derivation of stochastic maximum principle will be performed and under some convexity assumptions, the optimal control will be identified as solution of Forward-Backward SDE (possibly with jumps) with McKean interaction (both on the state  $X$  and the control  $u$ ). The existence and uniqueness are derived owing to a fixed point argument. Quasi-explicit solutions are obtained in the linear-quadratic case. Some numerical experiments are supporting the study.

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