# Application of multi-agent Markov Decision Process to operational planning of energy grid

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Smart grid is an intelligent energy grid with advanced information sharing and energy sources like renewable energy in the network. Its flexible management has been increasingly required for more efficient energy generation and distribution. Markov Decision Process (MDP) has been widely applied to this kind of planning problems. As there are several spatially distributed energy generation and dispatch units coexisting in a smart grid, a multi-agent MDP (MMDP) which is an extension of single-agent MDP to multi-agent can be an improved approach in terms of reliability and scalability. However, if a system has uncertainty such as solar and wind power generation, solution to the planning problem with dynamic programming is computationally infeasible. Instead, it can be solved by Reinforcement Learning (RL). In this study, planning of a microgrid which aims to provide energy and match the demand is solved using the concepts of MMDP and RL. The target microgrid draws energy from renewable energy generation units. It is also connected to a main grid which it exchanges excess or insufficient energy with. The results of solving this problem using a single-agent and multi-agent are compared.