Reinforcement Learning base DR Method for ESS SoC Optimization and Users Satisfaction

Yong Hee Park, Seong Gon Choi

Information & communication Engineering, Chungbuk National University, Chungcheongbuk-do, Korea
yh0360@chungbuk.ac.kr, wschoi@chungbuk.ac.kr, choisg@chungbuk.ac.kr

Abstract— **We proposed a Demand Response (DR) method to optimize Energy Storage System (ESS) State of Charge (SoC) and prevent user satisfaction decrease using Reinforcement Learning (RL). ESS SoC should be managed as an optimal value for reasons such as peak load responsiveness and battery life. However, the existing method for ESS SoC optimization assumed a fixed environment. In the actual environment, each factor, such as the departure time of the vehicle, is variable. Therefore, there is a need for a DR plan that can adapt to the environment. In addition, since DR reduces supply power for user, there is a problem of decrease user satisfaction. We aim to learn ESS SoC optimization, shifted load minimization, and optimal management of EV SoC. To this end, we formulate each element for RL and design environment to simulate. In the simulation results, we found the optimal policy.**

Keyword— **Smart Grid, Demand Response, ESS SoC, Peak Shaving, Reinforcement Learning**

Yong Hee Park received B.S. degree in the College of Information & Communication Engineering, Chungbuk National University, Korea in 2019. He is currently a M.S. candidate in School of Information & Communication Engineering, Chungbuk National University. His research interests include Autonomous Vehicle, AI, Smart Grid.

Seong Gon Choi received B.S. degree in Electronics Engineering from Kyeongbuk National University in 1990, and M.S. and Ph.D. degree from Information Communications University, Korea in 1999 and 2004, respectively. He is currently an associate professor in College of Electrical & Computer Engineering, Chungbuk National University. His research interests include Autonomous Vehicle, smart grid, IoT, mobile communication, high-speed network architecture and protocol.