Decision-making on optimal design and operation of multi-microgrid under uncertainty using two-stage stochastic programming

한동호, 이재형†
KAIST
(jayhlee@kaist.ac.kr†)

The main challenge associated with the operation of a microgrid (MG) supplying energy generated by renewable sources to satisfy the demand of a local region is to handle the energy generation behaving in a highly irregular and less predictable pattern due to the intermittent and uncertain nature of renewable sources. Multi-microgrid (MMG) incorporating the flexibility to trade energy between constituent MGs can alleviate the demand-supply mismatch problems, but its design and operation are complicated. To best achieve a tradeoff between the design and operation of MMG, this study proposes a two-stage stochastic decision-making approach considering both the capital and operating costs. First, stochastic models are developed to predict the behavior of renewable sources. Then the first stage determines design-level decisions which include the site selection among several candidate spots for each of the constituent MGs and the installation of electric cables between the MGs. Based on a realized scenario of the renewable energy production, a daily decision-making on the optimal energy dispatches in each individual MG and between the MGs is carried out in the second stage.