Abstract

The Climate Leadership and Community Protection Act (CLCPA), signed by New York Governor Andrew Cuomo in 2019, specifies that the state's electricity system must be 70% renewable by 2030 and carbon-free by 2040. In this work, three bottom-up engineering cost models are constructed to study the feasibility of achieving these ambitious goals. The study first analyzes the historical operation of the grid in 2019 before analyzing two future power systems specified in the literature. A two-node model of New York State is constructed using publicly available datasets from the New York Independent System Operator (NYISO), Energy Information Agency (EIA), National Renewable Energy Laboratory (NREL), and Oak Ridge National Laboratory (ORNL). The production cost models are constructed using a commercial software tool (PLEXOS), which uses optimization techniques to find the minimum cost for operating a grid system. The models show that New York could come close to achieving both its power sector goals, but could fail to meet them due to insufficient grid flexibility. Despite failing to meet both goals, a power system that relies heavily on wind, solar, and nuclear could operate with approximately 20% of the current annual carbon-dioxide emissions and generation costs. Furthermore, sources of grid flexibility, such as short and long-duration storage and demand response, will be crucial to enabling New York to develop a power system that can reliably achieve its decarbonization goals.