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Analysis of the operational benefits of hybrid hydropower-floating solar photovoltaic systems

Sika Gadzanku[1], Ana Dyreson[2], and Nathan Lee[1]
[1]National Renewable Energy Laboratory, United States of America (sika.gadzanku@nrel.gov)
[2]Michigan Technological University

Floating solar photovoltaics (FPV) systems have become an attractive RE option due to their potential energy, environmental, and social benefits. FPV systems have been deployed as standalone systems and hybridized with other generation or energy storage technologies. Hybrid FPVs, especially those paired with hydropower plants, are of specific interest because of potential cost and performance benefits such as improved system operation at different time scales, additional energy storage opportunities, improved transmission utilization, reduced solar PV curtailment, and water conservation. Despite the interest in hybrid hydropower-FPV systems, there is limited research quantifying the operational benefits of these hybrid systems. To help address this research gap, this study analyzes the potential grid-level operational benefits of a generic hybrid hydropower-FPV system through a modeling exercise. Using a solar resource time-series and resource data for an example hydropower plant, we quantify the potential curtailment reduction, increased transmission utilization, and changes in seasonal and diurnal electricity generation for the hybrid FPV system compared to stand alone systems. Results suggest that depending on the seasonality of hydropower resources and the ratio of the size of the FPV system to hydropower plant sizes, the hybrid hydropower-FPV system could reduce curtailment and lead to more optimal use of limited water resources.