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# Solar and Energy Storage Based Microgrids: Data-Driven Optimization and Economic Analysis to Examine Energy Savings from a Microgrid within a School Campus

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Solar and storage based microgrids offer a unique opportunity for both climate change mitigation by reducing CO2 emissions and for climate change adaptation by increasing infrastructure resiliency. In this work, we design a time-of-use (ToU) optimization algorithm to determine whether it would be economically viable to install microgrids within two school campuses in the Bay Area, California that have unique load profiles. Our algorithm, which combines machine learning for accurate site-level net load forecasts, examines three years of electricity consumption data to compute the school's savings from peak demand charges, energy charges, and demand response revenue generated by providing ancillary services to the grid. Given the school's unique load profile combined with SGIP and MACRS incentives available in the state of California, we determine that a 15-year battery installed at these two campuses with a cost of $600/kWh provides a net positive internal rate of return (IRR) of 11.9% and 18.3% respectively year-over-year. In addition, the battery provides backup power in case of a power outage and improves grid resilience by providing peak shaving when the power grid is stressed. We hope that our computational analysis can motivate other schools to examine the huge economic and climate benefits that a microgrid poses at their campus.