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Prospects for grid-connected solar PV in Kenya: a systems approach

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Abstract-

Capacity planners in developing countries frequently use screening curves and other system-independent metrics such as levelized cost of energy to guide investment decisions. This can lead to spurious conclusions about intermittent power sources such as solar and wind whose value may depend strongly on the characteristics of the system in which they are installed, including the overall generation mix and consumption patterns. We use a system-level optimization model for Kenya to evaluate the potential to use grid-connected solar PV in combination with existing reservoir hydropower to displace diesel generation. Different generation mixes in the years 2012 and 2017 are tested with a unit commitment model. Our results show that the value of high penetrations of solar in 2012 exceeds expected payments from the national feed-in-tariff. Under two 2017 generation mix and demand scenarios, the value of solar remains high if planned investments in low-cost geothermal, imported hydro, and wind power are delayed. Our system-scale methodology can be used to estimate the potential for intermittent renewable generation in other African countries with large reservoir hydro capacities or where there is a significant opportunity to displace costly diesel generation.

Index Terms- Solar PV; Renewable integration; Developing countries

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