

A case of a 5 MW, 10 MWh off Grid Solar Powered Street Lighting Project for Eldoret City, Kenya

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Street lighting, a devolved function under Kenya's Constitution (2010), is managed by County Governments. However, infrastructure is often controlled by external agencies, with one operator charging Uasin Gishu County USD 2 million annually for street lighting services, projected to rise to USD 4 million in 10 years due to tariff increases. Eldoret City enjoys high solar irradiance ($2,000 \text{ kWh/m}^2/\text{year}$, $\text{SD} \approx 50 \text{ kWh/m}^2/\text{year}$) and approximately 65% sunny days annually. Uasin Gishu County hosts key solar projects, including the operational 55 MW Kesses 1 Solar Plant, the operational 40 MW Radiant Solar Plant, and the 40 MW Eldosol Solar Plant (construction completed and commissioning), totaling approximately 135 MW of installed solar capacity which is fed to the grid and about 20 MW that is captive power. This paper evaluates both technical and financial feasibility of constructing a 5 MW, 10 MWh off-grid solar plant to power 20,000 LED street lanterns (60 W, 12 h/day, 5,256 MWh/year) in Eldoret City, comparing its financial implications with the current operator-based model. If the current model is maintained, it is projected that the County will spend 92 Million USD in the next 15 years for expansion, repair and maintenance and bills payment to the independent operator (driven by the annual cost escalation of 8.2%) compared to 23 Million USD required to set up, operate and maintain the proposed off grid solar plant over the same period. Additional benefits include potential carbon credit revenues ~USD 0.552 million ($\text{USD } 10/\text{tCO}_2\text{e}$, $3,679 \text{ tCO}_2\text{e}/\text{year}$, $\text{SD} \approx 200 \text{ tCO}_2\text{e}$) and enhanced system reliability. The opportunities for financing of the project through Public Private Partnerships (PPP) is reviewed as a probable financing model to bridge the gap of huge initial capital costs of the project at the start which may not be accommodated within the County budget.

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