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A techno-economic feasibility study of hybrid energy PV/biogas/battery for Mara Serena Safari Lodge

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Abstract

This study presents a comprehensive techno-economic evaluation of Mara Serena Lodge's current means of electricity generation infrastructure consisting of a PV/LPG/Battery and a hybrid system that would incorporate PV/Biogas/Battery, incorporating literature from various authors on the subject matter. The data used was acquired from the site by means of a data logger and the simulations performed were done using HOMER pro software. The analysis indicates a higher cost implication associated with the utilization of biogas energy in terms of LCOE, NPC, and initial capital, and operating capital. Biogas presents values of the above at Ksh 63.41, Ksh 979 million, Ksh 463 million, and Ksh 39.9 million, respectively. In contrast, diesel

generators exhibit Ksh 57.92, Ksh 846 million, Ksh 51.4 million, Ksh 61.4 million of the same. However, the fuel consumption of diesel generators is at 282,277 liters annually whereas that of biogas is at 272,822 liters. Despite the economic advantages of using diesel, there exists the drawback of the substantial amount of carbon dioxide emissions which are detrimental to the climate.