

Cost Benefit Analysis to select clean energy solutions in dairy farm milk collection posts in Azores

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Abstract

The aim of this paper is to evaluate the possibility of implementation of alternative renewable energy micro-generation installations in dairy farm milk collection posts, from the technical, economical and environmental perspectives.

This work was performed through a dairy farm milk collection post energy audit, to perform energy profile characterization and demand requirements. Following that, a study of the weather conditions was done and the obtained data (through CLIMAAT and MacSIMAR projects) was introduced in a renewable energy solutions calculator (HOMER). Moreover, a system design from the available portfolio of micro-generation devices was defined and a cost benefit analysis of the selected alternatives was done. In the end a comparison of the current implemented solution with alternative designs was performed.

Results show that from the analyzed solutions for this case, the set of PV (20Kw) and Wind (3KW) with no batteries is the best one, since it presents the least cost of energy, the smallest initial capital and the highest Net Present Cost. The sensitivity analysis derive that wind micro-turbines should be installed except if the solar radiation is on its maximum value and that in no case the use of batteries is an advantage for the system operation.

For systems requiring a certain degree of energy (in this case with an average of 350 kW/day), the implementation of micro generation systems, like the ones evaluated, will never be economically viable in terms of Total Economic Value, even with generous feed-in tariff schemes. It is preferable that the grid operator makes investments in renewable energy production. To improve the system energy performance, the options should be focused on energy efficiency measures.