A Comparison Between Solar Thermal and Photovoltaic/Thermal (PV/T) systems for typical household in Libya

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Abstract

The fossil fuel in Libya produces the most of the generated electricity. As the energy demand will escalate significantly in the near future, more oil and gas are consumed and hence more CO2 emission. Therefore, for a sustained development the renewable energy must share in the electricity market. The special location of Libya in the highest sunny belt makes the solar energy one of the best alternative energy supplier. This paper is aimed at proposing an effective solution to enhance continuous power availability and to reduce the peak load demand in Libyan electric grid through replacing the electric heaters with Domestic Solar Water Heating (DSWH). Two alternatives are analyzed; photovoltaic-solar water heating (PV-SWH) system and photovoltaic-photovoltaic/thermal (PV-PV/T). The two options are compared in terms of the capital cost, maintenance cost, total cost, fuel cost and the CO2 emission. The results show that the total energy saving for the PV-SWH system is around 69.79% of the total energy required. Furthermore, the total energy saving for the PV-PV/T system is about 75.02% of the net energy need.

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