World Academy of Science, Engineering and Technology
International Journal of Energy and Environmental Engineering
Vol:11, No:07, 2017

Evaluating Viability of Solar Tubewell Irrigation Technology

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Abstract : Solar powered tubewells can be a reliable and affordable source of supplying irrigation water compared with electric or diesel operated tubewells due to frequent load shedding and soaring energy prices. A study was conducted on a solar tubewell installed at the Water Management Research Center (WMRC), University of Agriculture, Faisalabad to investigate the viability of a solar powered tubewell in terms of discharge and benefit cost ratio. The tubewell discharge was 50 m3hr-1 with a total dynamic head of 30 m. The depth of bore was 31 m (14 m blind + 17 m screen) with a casing diameter of 15.2 cm (6 inches). A 3-stage submersible pump of 10.2 cm (4 inch) diameter was lowered in the casing to a depth of 22 m. The pump was powered from 21 solar panels of 200 W capacity each. The tubewell peak discharge was observed as 6 and 7 hr day-1 in winter and summer, respectively. The breakeven analysis of the solar tubewell showed that the payback period of the solar tubewell was 1.5 years of its 10 year usable life with an IRR (internal rate of return) of 69 %. The BCR (benefit cost ratio) of the solar tubewell at 2, 4, 6, and 8 percent discount rate were 3.75, 3.45, 3.19 and 2.96, respectively. The NPV (net present value) of the solar tubewell at 2, 4, 6, and 8 % discount rates were 1.89, 1.65, 1.45 and 1.27 million rupees, respectively. These results indicated that the solar powered tubewells are a viable option as well as environmentally friendly and can be adopted by the farmers due to their affordable payback period.

Keywords : benefit cost ratio, internal rate of return (IRR), net present value (NPV), solar tubewell
Conference Title : ICEWE 2017 : International Conference on Energy, Water and Environment
Conference Location : Istanbul, Türkiye
Conference Dates : July 27-28, 2017