Design and Performance evaluation of a solar PV system for powering irrigation in isolated regions

Introduction

The solar energy is the rich energy source present in the world. The solar power is helpful in dealing with the energy crisis and it is also environmental friendly. The PV or photovoltaic creation is a competent method for using the solar energy. The solar panels are now being utilized for powering the heaters, for the street lights and fulfilling other domestic loads. The solar panel's decreasing cost is increasing utility globally. This technology is also used in the irrigation systems for farming. The solar powered irrigation system is a suitable substitute for farmers in the recent condition. It is a method of energy production that gives free energy after making the initial investments (Harishankar et al., 2014).

The generation these days is heading towards ultra technology. The pumping of water has a huge history and there are several methods that have been user ordered a pumping system. There are several resources that are being used by perpendence electricity including animal power, solar energy, wind energy, hydropower and fossibilities. Some of the common pumps that are utilized in the remote communities are hard pumps, solar submersible pumps, direct drive deter, and use borehole pumps.

Advantages of Solar Pump in Irrigation Area

The major advantages of a photovoltaic system are that it has decreased the operating cost and physical labor. This is because there is no need of fuel for these pumps like diesel or charcoal so the cost of operation is minimal. When a solar system is designed properly then it does not requires any maintenance apart from the cleaning of these panels once in a week. It is an important benefit that the system provides with maximum output of water when it is required most that is the dry months. These panels can be placed up to 20m away from the well or at a place where water is required. These pumps can be turned on or switched off according to the requirement.

Aims

• To design as solar PV for the requirements in the isolated regions.

being used in the Upper Egypt region which also indicates that the cost of water unit that is pumped by PV systems is less than the pumping used by diesel systems (Yiu et al., 2011).

There are certain limitations of using the PV pump. It is not necessary to use the pump in the places of high requirement. The maximum capacity that is present with the use of solar panels is very low. In addition, the output acquired from the solar DC pump is higher than a normal pump. The yield of water of the solar pump is changed with respect to the sunlight. The yield is very high in afternoon and it is lower in evening and early morning. Therefore, it is required to operate the pump during afternoon. The solar panels can also be theft in some of the regions and it is needed that the farmers must be taking needed steps. The PV system must be protected from being theft or other natural hazards like rain or lightening.

Methodology

Review Method

The search of literature is defined as a systemic approach for reviewing, identifying and bibliographic material to manage the studies. The intic purpose of the study was to locate the information or knowledge on any particular topic for recognizing the study parts for future. For establishing any search of literature, it is important to comprehend any research and its role in informing the polyconce as well as clussioning (Parahoo 2006). The main argument for this particular research study is to carry out a review to examine the design and performance evaluation of a solar PV system for powering irrigation in isolated regions.

The literature review is an important step in the process of research. The literature review means identification of documents and the articles that are published or unpublished on the specific topic. It consists of information, ideas and evidences that are extracted from a specific point of view in order to acquire the views regarding the nature of any topic. Silveira et al. (2001), stated that the information which is acquired for the review should be read in a systematic way, synthesized and critically appraised into the logical literature review and the coherent structure. The literature is not only a summary of different studies but it has a specific pattern of organization which consists of synthesis and summary. It provides the information regarding the parts of topic that have been searched along with the use of methodology. In addition, it also indicates about the research gaps and the further research that must be carried out for providing the evidences.

The main aim of literature review is to provide the complete coverage of literature along with introducing the research insights and major developments that can be translated back in the practice setting along with highlighting those areas that require further investigation (Bryman, 2015). A literature review facilitates in providing more than a critical appraisal of the articles. In addition, it must also provide a structure on which the research can be based. The gaps in the knowledge base are needed to be identified along with the weakness and strength of the previous studies. According to Yin (2013), a literature review is considered to be fundamental when all the studies that have been developed in the modern era. After getting an understanding about the previous research, the conclusion and results of a previous research can be compared by the previous results. The thinking of new researchers can be more systematic and logical. The main aim of literature review is to summarize the literature that is present on any of the provided topics. It facilitates the researchers to get associated with the topics for examining the evidences or interpretations of existing knowledge.

The literature review is known to be a type of research which he are aim to provide the credible recommendations for research. The critical le conversion for interest of the critical le conversion of the critical l use the research evidence in practice mart from depending on the individual studies. The literature review is known to be a complete regrarch methodology. In addition, they provide with the research paper. The detailed knowledge of field a solid back cand for the intestigat of literature is important for many of the research papers (Polit & Beck, 2013). The research imagination can also be stimulated by the help of a critical literature review (Yin, 2013). An important way of dealing with the research problem is to focus on how different people are dealing with it. The different positive benefits can be acquired by the researchers in order to create the new ideas for working. The use of photo voltaic or the solar power pumps for irrigation of water is identified to be a useful method. Several authors have tried to assess the effectiveness of Solar PV systems for empowering irrigations to isolated areas and the literature review is a best method to provide an overview for a specific topic (Parahoo, 2006). The limitations of the current practice can also be identified. The relevant research papers have been selected for the review.

house or the farm house. In addition, the requirement of electricity is also increasing each day and the grid supply extension has decreased due to the restricted resources like fossil fuel and more. Moreover, it is not possible to expand these resources due to several economic and technical reasons. This condition has caused the researchers to improve the solar power convertor to produce power that can fulfill the increasing demand of energy for the rural areas and the country related with the weak grid supply.

In the research of Singh et al (2010), the investigations have been made for developing the solar power convertor as a modified and an alternative source to grid for the agricultural and the household applications for rural areas in villages. The system consists of following features that the technology being used in this proposed scheme is very simple, fast response, cost effective with respect to stability and control under load conditions or the solar radiation. This system can also be managed up to a higher rating in an effective way. It can be maintained easily with the sinusoidal quality, a bit of harmonic content and decreased loss of switched. The feature of load power and adaptability of inverter and PWM control stratege provides with the constant efficiency with an increased value and less than Thu cane which is not associated with the different level of load demand and the retrinsolation.

Mansaray (2014) tenducted a research in which the simulation of time step was carried system by making use of interactive simulation of out in the selar photovoltai <u>vo</u>t n renewable electrical energy supply systems (INSEL) software. The time step simulation is a tool that is being used for the pumping of system analysis and optimization of design. This is necessary for increasing the efficiency of time and decreasing the needed size of solar PV generator. The checking of system that is designed in this work by the help of time step simulation is made possible to differentiate the behavior of system by changing the irradiations. These irradiations can further result in a final and optimized design of a system. This ideal design can be considered as impractical if the theory is highly complicated. Therefore, the analysis facilitates in the derivation of the simplified rules of design and the problem comprehension. The solar PVP system installers require simple guidelines of design or an easy way of using the integrated model of computer. This simulation process indicates that the final layout of the system is known to be the selected one pump system and the collection of rain water in the month of July, August and September as the back-up. An increase in the size of solar

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