pumping low levels of water. The efficiency of water is also known to be decreased during the cloudy days. The appropriate pump matching and solar module is needed for the compensation of these differences in the rate of flow and running of solar photo voltaic water pumping in an efficient way in various circumstances of sunlight (Singh, 2013).

Water is not pumped in the cloudy days and at the night time that can be compensated by designing at a larger scale as compared to the needed size of solar water pumping system. The quantity of water that is pumped in the days of maximum sunlight can be stored in huge water tanks from where it can be transferred to the small tanks of water according to the requirement. In addition, the size of water storage tank can be adjusted in order to identify the storage cost. The storage of water for about two to five days is enough.

Electric Power Output Type

The current that is created by the solar PV panels is mainly the direct current. It can be transformed into alternate current by the help of an inverter. Therefore, the solar photo voltaic water pumping system is mainly controlled by AC or DC. In the direct current type of solar photovoltaic water pumping system, the pump of direct current is used. The motor of direct current is of two types a conventional direct current motor and the brushless motor with direct current. The conventional direct current motor makes use of carbon brushes for transferring the electric power from PV array to the motor shaft. These brushes get old along with the use and they are also required to be changed after a few days. This results in the increase in cost of maintenance and operation of the machine (Denholm and Margolis, 2007). A direct current motor that is a brushless machine that does not have electric commutator. The brushless motor uses induction and magnetic principle for transferring the PV power to the shaft of motor. Many people select the permanent brushless motor having a submersible pump because it does not consists of brushes. It has an increased efficiency level, increased reliability, compact size, silent operation and the lower requirements of maintenance. The direct current water pumping system can also be connected with the battery or it can be connected directly with the configuration.

The alternate current water pumping system have a pump that is controlled by the AC motor. The photo voltaic panel produces direct current of electricity and in this type of a pumping system, an inverter is needed to convert direct current in alternate current electric power. However, the overall efficiency can be decreased due to the use of an inverter. The major services along with an easy availability of the spare parts. The presentation of solar photovoltaic water pumping system mainly depends on the solar irradiance on the solar panel. The direction and intensity of the solar irradiation can be altered in daytime. In order to acquire the complete solar irradiance, the solar panel must be following the path of the sun. Though, the tracking system is a costly issue and it must justify an increase in the water supply quantity by the pump. There are a few studies that have been carried out in accordance to these efforts.

Clark and Vick (1997) explored the performance of two similar 100W solar PV powered diaphragm pumps at the depth of 30m in Texas. The initial pump set made use of a PV panel that was placed on a huge passive tracking system. They have examined that the produced data of the various pump sets have been observed for a period of a year. It has been concluded in the research that the tracking system have given increased solar energy in an year and it further increased the intensity level of irradiance at a level more than 800W/m^2. Though, the pump cannot use the increased radiation intensity for creating the increased amount of water. In addition, the cost of tracking system was also higher to satisfy an increase in the quantity of pumped water.

Clark and Vick (2002) further explored the ability of solar photovoltaic water pumping system by making use of fixed panel and PTS. The PTS included warming Freon with the solar energy in order to move the PV panel from the direction of east to west. It has been reported that the PTS increased about 19% of solar power in the season of spring and summer. Though, they can pump only 15% of water. A small increase in the quantity of pumped water in comparison to the power is because of the controller that restricts the power that is about to be higher than the pump about 700W/m^2.

Bione et al (2004) have examined the solar photovoltaic water pumping system under the climatic conditions of Brazil having fixed tracking and the tracking with the help of V trough. This is mainly based on the concentration of generator arrangements. The research further identified that the cost of water pumping by the tracking system and the concentrating system have decreased 19% and 48% separately than the fixed system. The ratio of benefit that was acquired for the tracking system was 1.41 in comparison to 1.23 for the foxed configuration. In terms of concentrating collectors, the ratio of benefit was 2.49 as compared to 1.74 for the fixed configuration. The performance of directly associated solar photovoltaic water pumping system cannot be predicted easily because of the threshold in radiation and the non-linear dependence of research further showed that results of planned process and the tool of software were in complete coordination with each other. Abdeen (2001) has explored about the economic and technical feasibility of the solar photovoltaic water pumping system in Sudan to fulfill the requirements of water for drinking purposes. It has been identified that the photovoltaic water pumping system was an efficient solution to fulfill the demands of water. This can accredited to the several factors of economy, vast area, overall population and less maintenance. His main focus was to boost the involvement of manufacturers for the low cost device and the solar photovoltaic water pumping system becomes more sustainable and economical.

Narvatre et al (2005) studied about the solar photovoltaic water pumping system in the 18 villages that were located in Morocco. A European company installed and custom-built pumps under the management of a local NGO. An external agency was then kept for maintaining the operation of the system. It was suggested by the authors that the local governing body was required in order to take care of the maintenance and operation issues. It was further focused that it is the will of a society to pay the charges of water for the system sustainability. Pande et al (32) developed, designed and tested the solar photovoltaic water pumping system for a drip irrigation system. The field testing was carried out on 900 Wp PV arrays having an 800 WDC mono block pump with the help of openable low pressure drippers that are compensating. The authors have studied about the effect of pressure compensation and irradiance in the drippers on the size of pump, requirements of water and the diurnal variation of the pressure of pump. It has been reported that the solar photovoltaic water pumping system have provided water with the pressure of 70-100kPa and the rate of discharge of 3.4 to 3.8 each hour in the dripper. This amount of water can irrigate about a hectre of land area in two hours. In addition, the payback period of installed SPVWPS is reported to be about six years.

Durusun and Yilmaz (2008) developed and created an internet based software program for the acquisition of data, system of monitoring and the monitoring of complete performance of solar photovoltaic water pumping system. Mahjoubi et al (2010) has explored the economic stability of solar photovoltaic water pumping system in comparison to the diesel generator in Tunisia. The lifecycle cost was calculated in the research of both types of water pumping systems. The research showed that the life cycle cost for solar photovoltaic water pumping system was 50% less than the diesel generator. In addition, the use of solar photovoltaic water pumping system facilitated the nomads living in deserts in order to acquire water and further

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