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A Survey on Solar Automatic Water Pumping System for Irrigation Purpose in Upper Hilly Region of Uttarakhand

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ABSTRACT: The biggest problem in today's scenario for Uttarakhand state is the shortage of electricity or to fulfil the electricity requirements in the region. The problem arises when we talk about the upper hilly regions, where still in many villages electricity is just a dream. The life is immense tough over there, even the basic regular works like water arrangement for daily needs, mobile phone charging, transportation etc, are seems to be a huge task for daily life, people has to walk many kilometres to fulfil their basic requirements. The upper hilly regions are filled with the barren land which having huge potential of cultivating the agricultural land. But due to unavailability of electricity and water supply the lands are not irrigated. A few parts of the regions are totally dependent on rain for cultivation, which result in the form of unemployment and therefore people get migrated to the plain regions. Thus, with a simple and reliable model of automatic solar water pumping system, they are able to fulfil their basic needs and it also encourage them to do agriculture and farming there and also solve the problem of migration.

KEYWORDS: Uttarakhand , Irrigation, Solar automatic water pumping system, Migration, Unemployment.

I.INTRODUCTION

The study has carried out for Uttarakhand state. Its falls in the north of the country between 77° 34' and 81° 02'E longitude and 28° 43' and 31° 27'N latitude. Uttarakhand spread over an area of 53,483 km² and population of 10,086,292 according to 2011 census. As the regions are dully filled with the waterfalls and small rivers, the water can be pump up from these sources and the huge water tank can be constructed to the required regions to irrigate the lands for farming as per required for the crops. Now, the problem of electricity can be sought out by installing the solar panels to the water sources to pump water to the tank. The solar water pump system is fully automatic and does not require any manual operations. Solar panels can directly energize the drive to start the submersible pumps according to the water level in the tank. A water level inductor with relay cut-off will be install in the tank and as the water level goes down the pump starts itself and turn off while the water reach the pre-defined level.

This system can be made in the steps or say tank wise through which water can be delivers to the upmost part of the regions and the land can be irrigated so that migration from hilly regions can be control and people can do farming to survive and earn well.

The work in this paper discussed the proposed system model and its desirable outcomes. The advantage of the proposed model is discussed through a case study. SCADA animation model is also shown in order to show the structure of model.

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II. RELATED WORK

The problem of reliability and availability is always there where the fuel supply is erratic and expensive. Usually diesel – powered pumps are used in such areas which is not only expensive but also unfriendly to the environment. All these problems therefore, required an alternative source of power for irrigation which is solar pumping system. All the work till date is based on solar water pumping system but our project is different from other in the way it includes automatic working of the whole system which means more reliable and friendly to the environment. Lots of review paper on solar powered water pumping system shows the advantages of solar water pumping system over diesel one. They also show the advantage of solar power water pumping system for rural electrification and community water supplies to irrigation and livestock water supplies etc.

III. SYSTEM MODEL

System is build up with the main components like solar panel, VFD drive, water level indicator, relay cut off system, surface/submersible pumps and the huge water tank according to the need of capacity required.

METHOD:

Water is suctioned by the nearby source, pumped by the submersible pump energizes by the solar panels and controlled by the variable frequency drives, further deliver to the storage tank for use of irrigating the cultivating land and for daily requirement of drinking water. As the system is build up with the water level indicator and relay cut off system, there is no need of manual operation and thus the system will works itself which means more convenience and reliability and the problem of electricity is solved by the solar panels.

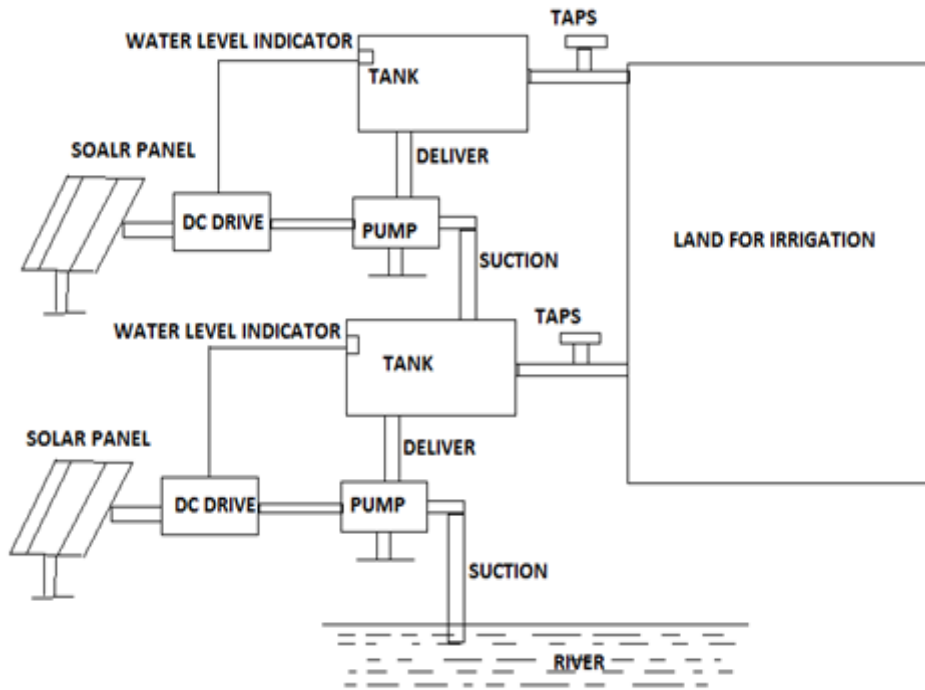


Fig.1. Block Diagram

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IV. PROPOSED MODEL

Figures below shows the scada animation visuals in order to show the working of the proposed model. In fig 2(a) it shows the empty state of model when the water is not pumped as the system is not start working while fig 2(b) shows the filling state of all the tanks alongwith the automatic operation .

SCADA ANIMATION VISUAL

I. Sc

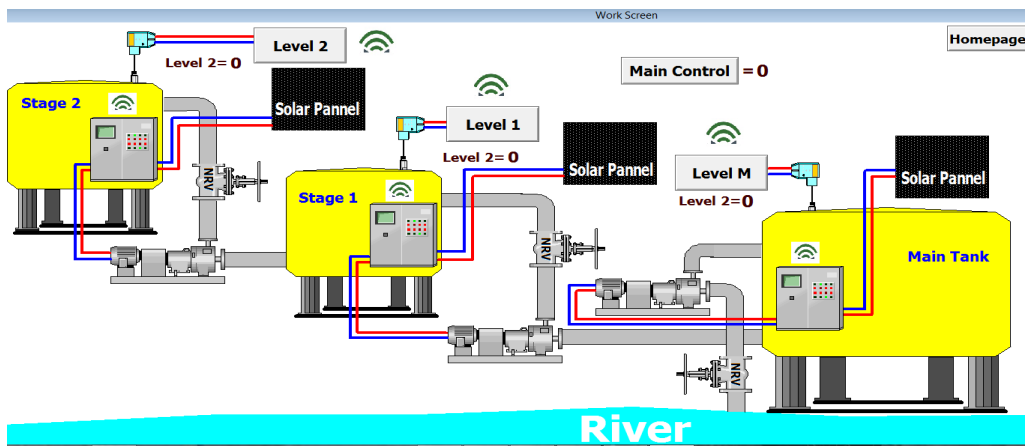


Fig 2(a) Empty state

Fig 2(a) shows the empty state of the system when the water is not pumped by the pump. It shows the three step tank model of the system in steps as one step tank is not feasible at a particular height. Solar panels are connected with motors in order to energize them whenever be required.

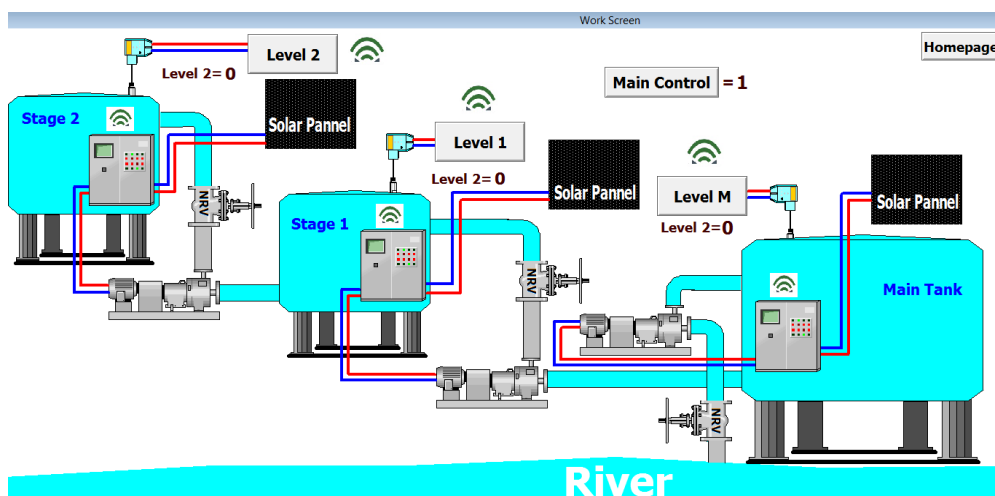


Fig 2(b) Filling state

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Fig 2(b) shows the filled state of the system when the water is pumped by the help of motor which is energized by the solar power and the filling of the tank takes place step by step and whenever be the water reached below the predefined value it again pump the water automatically.

V.DESIRABLE OUTCOME OF THE RESEARCH

Uttarakhand has multiple micro-climatic zone. The entire state receives good amount of solar radiation, about 3-6.5 kwh/m²/day. This plan can be used as a former stage of decision making to capture the solar energy as sustainable development. This solar plan is useful to administrate the global energy resources in the district of Uttarakhand. This can be a basic tool for further analysis to implement the solar energy system in Uttarakhand. Therefore it is necessary for further researches to examine the technical and economical potential of solar energy from the viewpoint of a specific location and technology. Power producer of Uttarakhand could adopt remote unelectrified villages to provide green electricity. It's time to exploit Uttarakhand green potential. GIS helps government leaders where to site alternative energy sources such as solar panels, wind turbine and biomass supply. With web GIS, information can be communicated to the public so they can consider private installations of green energy sources.

With use of automatic solar water pumping system, the use of conventional sources i.e. through electricity or DG set will be reduced, which low down the dependency of hilly peoples on these medium. On the other side its reduce the air pollution that normally happen due to running of DG set which highly use by the hotels and restaurants for their commercial purpose. Thus this step can be a big change in improving the stability of the hilly regions, further much more energy is conserve by the use of solar energy, it will also promote green energy, and people start relaying and accepting it when they see it working properly.

A CASE STUDY:

Tables below shows the result of a case study , accordingly there is a small village whose water consumption capacity of per day is about 2000 L. Without solar automatic water pumping system it is difficult to them to fulfil their daily water need and therefore no water is available for irrigation too. But if the solar automatic water pumping system will be installed ,then it would fulfil their basic or day to day water need and they also able to get water for irrigation.

TABLE 1.1: COST ESTIMATION

Without Solar Automatic Water Pumping System	Cost Estimated
A shopkeeper sails 20 freshwater bottles per day	20 Rs/liter * 20 = 400 Rs/day
For 100 shopkeepers	100*400 = 40000 Rs/day
In a year	40000*365= Rs 14,600,000

TABLE 1.2: WITH SOLAR AUTOMATIC WATER PUMPING SYSTEM

RATING	7.5 Kw
SUPPLY	MORE THAN 2000 L /DAY
SAVING	13600000 RS ANNUALLY

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VI.CONCLUSION

Thus if electricity needs for hilly regions can be fulfilled by the solar energy, we can save huge amount of money which normally expenses on its transmission and distribution to long distance, besides this we have to purchase electricity by neighbouring states or by private firms, which result in the wastage of huge amount as it cost much to us. Else we can stop the problem of migration by providing enough water supply and by electrifying the villages.

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