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Design of 15 kW Micro Hydro Power Plant for Rural Electrification at Valara

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Abstract

There is a fast depletion of renewable sources that was used in the past for the generation of electricity and the difficulty in reachability of the grid supply to the remote villages was a big challenge faced. The best possible remedial measure in this scenario is to make use of the natural resources available to generate electricity. In an endeavourance towards this end, the paper has been formulated for the electrification of valara village in Idukki district of Kerala, India. Valara is a kind of locality in which there is a tribal settlement of about 120 families that do not have privilege of electrical energy supply. The present work focus on the preliminary studies carried out at the site for the development of a complete micro hydro power plant which focuses on three main folds such as technical as well as economical feasibility studies, design of civil works and selection of electro mechanical components. The results of the study reveal that there is a huge potential at the site to develop a micro hydro power plant which would meet the energy demand of the tribal settlement and thereby improving their living condition.

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1. Introduction

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Energy is the backbone for the growth of a nation [1]. India's demand for electrical energy is growing rapidly, while its electrical energy system is struggling with severe shortage to supply the same [2]. Renewable energy technologies play an important role to narrow down the shortage. In order to diversify the country's power generation mix, the Government of India, has issued several national policies to promote their further development [3,4]. Among the renewable energy sources, small hydro power contributes 13% of the total grid-connected power generation, thereby constituting the second largest grid-connected system after wind power, as per the report by the Ministry of New and Renewable Energy. India is endowed with a vast and viable hydro potential for cleaner power generation. Due to its abundant availability, it can be utilized effectively to reduce the gap between the energy demand and supply. Development of small hydro power plants rapidly is one of the important assignments in the policy announced by the Ministry of Power. Such kind of power plants is quite possible wherever water resources are available and where power is to be provided to remote areas away from the grid. Kerala state has huge untapped potential for small hydro power generation. Small, mini and micro hydro power plants play an important role in electrifying the rural parts [5-8].

1.1 National Status Review

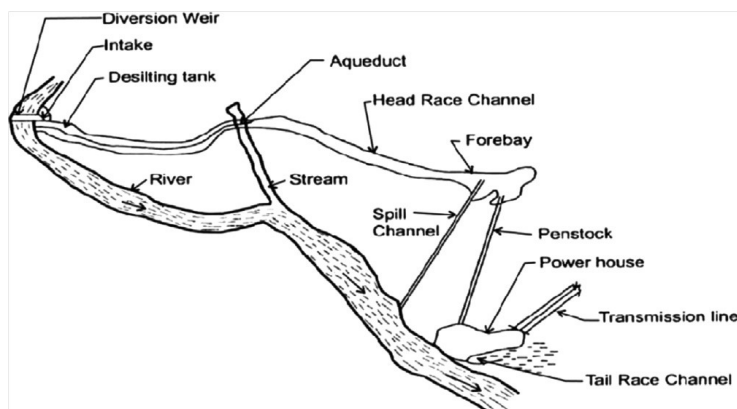
For more than 100 years the commissioning of hydro projects are in existence. Right in 1897 at Darjeeling the first SHP was commissioned with a capacity of 130 kW. In 1902 at Chambal and in 1911 at Jubbal 40 kW and 50 kW power was generated at the plants respectively. The statistics say that till independence there was 1362 MW energy available in the country generated by the hydro power projects. 50 years after independence the power generation measured up to 85,019 MW. All the above mentioned plants were commissioned by Government sectors and few public sectors but the major awareness of SHP was developed in late 90's [9-15]. Due to the emergence of SHP at the end of August 2014 the power generation reached around 20,000 MW only by SHP with more than 15,000 MW potential remains unexploited.

1.2 International Status Review

Of the total potential available in the world, the potential generation of hydro counts to 19%. The hierarchy of the largest producers of power using hydro as the resources are China followed by Japan, Italy and Brazil. The target potential at the end of 2015 by Europe was 300 MW [16]. Statistics say that 28.9 MW potential is available in West Bengal (Hussein and Raman, 2010) of which 50 kW is by micro hydro power plant [17]. In Canada there are still potentials identified which are capable of generating high potentials [18]. Sri Lanka and Bangladesh has a potential of 97.4 MW [19] and 10 kW [20] respectively.

2. Small Hydro Power Technology

The small hydro river type)
The basic



schematic of a power plant (run-of-river type) is shown in Fig. 1.

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