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PERFORMANCE EVALUATION OF HYDRO HYBRID AND PHOTOVOLTAIC ELECTRIC POWER SYSTEM

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ABSTRACT

In this paper we are focusing on Renewable energy sources have become a popular alternative electrical energy source where power generation in conventional ways is not practical. In the last decade the photovoltaic and wind power generation have been increased significantly. In this study, we proposed a hybrid energy system which combines both solar panel and wind turbine generator as a choice for conventional source of electrical energy like thermal and hydro power generation. The whole hybrid system is described given along with complete simulation results that find out the feasibility of the system. A software simulation model is developed in Matlab/Simulink.

Keywords:-Hydraulic turbine generator, Electrical utility, photovoltaic array

INTRODUCTION

Due to the serious condition of industrial fuels which include oil, gas and others, the development of renewable energy sources is always improving. This is the reason why renewable energy sources have become most important these days. Few other reasons comprise advantages like abundant availability in nature, eco-friendly and recyclable. A lot of renewable energy sources like solar, wind, hydel and tidal are there. Amid these renewable sources solar and wind energy are the world's greatest growing energy resources. With no emission of pollutants, energy conversion is done through wind and PV cells.

Day by day, the requirement for electricity is rapidly increasing. But the available base load plants are not able to provide electricity as per demand. So these energy sources can be used to bridge the gap between supply and demand during peak loads. This type of small scale stand-alone power generating systems can also be used in remote areas where conventional power generation is not practical.

In this paper, a pv/hydro hybrid power generation system model is studied and simulated. A hybrid system is more beneficial for individual power generation system is not totally reliable. When any one of the system is shutdown the other can supply power. The PV system is driven by the solar energy which is abundantly available in nature. PV modules, maximum power point tracking systems make the PV energy system. The light implant on the PV cells is converted into electrical energy by solar energy. The maximum power point tracking system and DC-AC inverter algorithm is used, which extracts the maximum possible power from the PV modules. The ac-dc converter is used to converter ac voltage to dc.

PROBLEM STATEMENT

Daily hydro-thermal scheduling (HTS) problem, one of the most serious tasks in electric power system operations, faces new challenges as the system uncertainty increases radically due to the integration of time-varying resources, such as wind. To successfully address these challenges, we propose the formulation of the solution of a generalized HTS problem for a system integrated with wind resources. Given the pre-specified wind nodal power output information by intervals, the HTS problem solution is robust against all wind uncertainty. The generalized HTS problem integrates the detailed statement of hydroelectric resource, especially in the form of stored water in the reservoirs which couples the decision makings at consecutive time periods. Thus, the system operator can give a more precise scheduling result from the hydro resources for coping with the uncertainty caused by wind. The description of the problem is comprehensive, providing information on important operating considerations and constraints which need to be modeled in practice. The problem is modeled as a two-level mixed integer optimization problem and we develop a computationally tractable method for practical power systems.

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METHODOLOGY USED

PV Technology

Many crystalline or thin film PV modules power a solar PV system. Individual PV cells are interconnected to create a PV module. This takes the form of a panel for simple installation. PV cells are made of light-sensitive semiconductor materials which uses photons to extricate electrons to drive and electric current. There are two wide categories of technology used for PV cells, namely, crystalline silicon, as shown in figure 1. This accounts for the majority of PV cell construction and thin film, which is newer and increasing the popularity. The "family tree" in figure 1 gives an overview of these technologies available today.

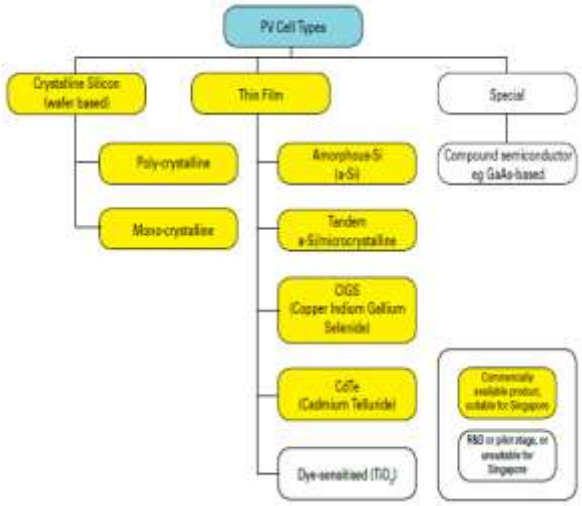

Figure.1 PV technology family trees

Hybrid System

A hybrid system is a mixture of one or more resources of renewable energy such as solar, wind, micro/mini-hydropower and biomass with other technologies such as batteries and diesel generator. As an off-grid hybrid power generation, the pv/hybrid system offers clean, proficient and sustainable power that will in a lot of cases be more cost-effective than sole energy systems. As a result, renewable energy sources options have increasingly become the ideal solution for off-grid power generation.

The hybrid system studied in this paper is one combining solar PV and micro hydro with bank of batteries and diesel generator during on exact scan for critical loads, like clinic and water pumping, which are integrated from backup purposes and emergency purpose respectively. Power conditioning units, such as Converter, are also part of the supply system. Micro-Hydro-PV-Battery hybrid method, offers greater reliability than any one of them alone because the energy supply does not depend entirely on any one source. For example, during winter when hydropower generation is low there's likely enough solar energy available to make up for the loss in solar electricity and as a result the size of the battery storage and dependability can be reduced Micro-hydro and PV hybrids also permit use of Smaller, less costly components than would otherwise be needed if the system depends on only one power source. This can substantially lower the cost of a remote power system. In a hybrid system the designer doesn't need to weigh the components for worst-case conditions by specifying a large PV panel size and battery bank than is necessary that make the system cost higher

RESULT

This paper presents a simulation and experimental results of the proposed pv/hydro hybrid system and its control strategy. It includes results for model validation, simulation results for Pv/hydro hybrid electric system based power management.

To simulate Utility Interfaced PV/Hydro Hybrid Electric Power System MATLAB test Bench is created

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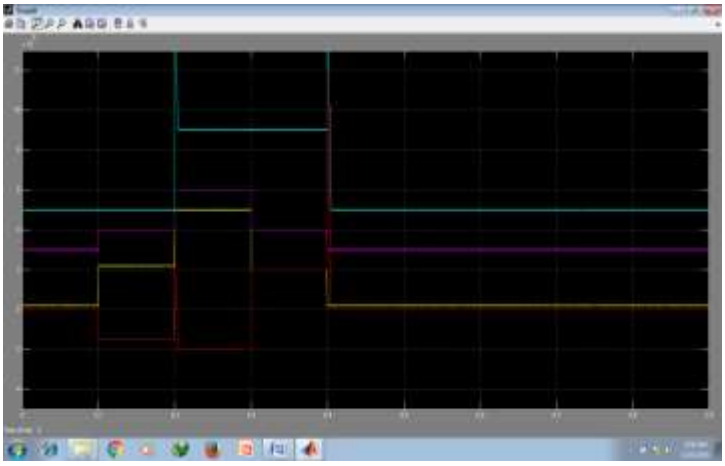

Fig.2 Generated power from PV/HTG, **load demand grid power**

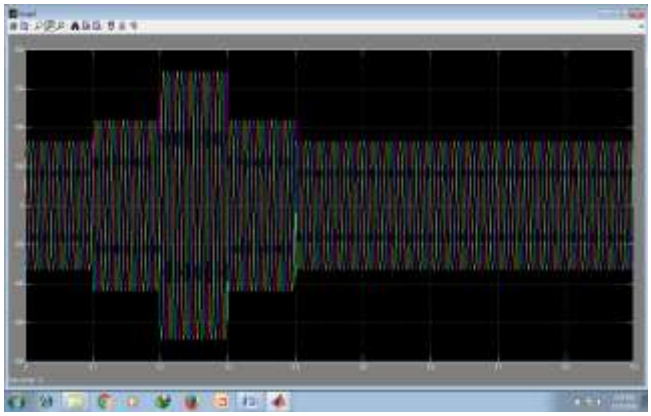

Fig.3 Inverter line current from HTG to the load/grid

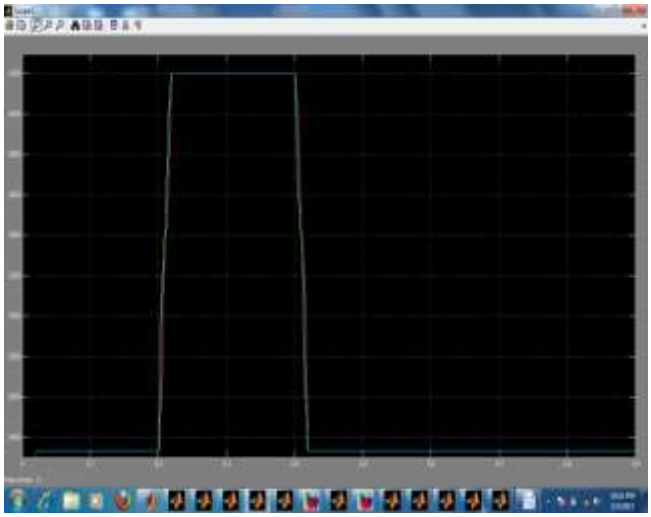

Fig. 4 Power Factor of the Grid for the Hybrid PV/HTG system

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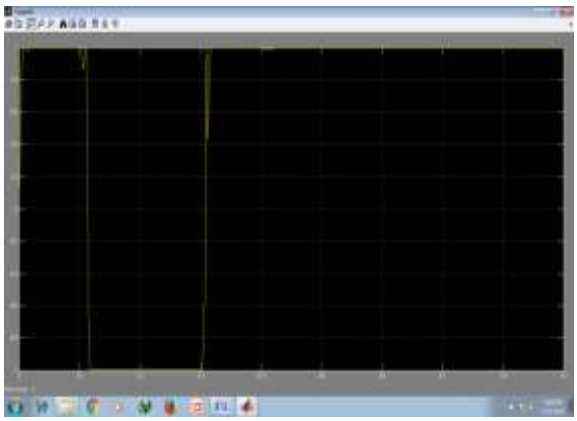

Fig.5 power factor of the grid for the hybrid PV/HTG

CONCLUSION

The design and manufacture of extremely reliable equipment made integration of HEPS easier nowadays. In this paper PV/HYDRO HEPS interface with EU for removing power crisis troubles are simulated by using Matlab/Simulink environment. On the development of a hybrid power system and its energy management unit, which guides the entity energy conversion units in such a way that the enhance renewable energy will be utilized to fulfill the load demand as much as possible.

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