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Modernization of Grid System by Smart Grid Technology instead of Conventional System in On Grid Solar-Wind based Hybrid System

Veeni Sakre[1], Hemendra Khedekar[2]

PG Student [Power Electronics], Dept. of EE, Vindhya Institute of Technology & Science, Indore, M.P., India[1]

Assistant Professor, Dept. of EE, Swami Vivekanand College of Engineering, Indore, M.P., India[2]

ABSTRACT*:* At the starting time of electric power generation is the basic requirement, but changes is the law of Nature, Today the time of new changes adding in technology because one of the primary needs for socio-economic development of any nation in the world is the provision of reliable electricity supply systems.The Indian population are increasing day by day and energy demand are also increasing exponentially but the conventional energy sources are limited and exhaustible, not eco-friendly and more power loss in Tradition Grid Technology, power supply also interrupted due to dependency on one source of energy.The modernization of traditional Grid system is requirement of modern time because uninterrupted electricity is the basic need of development

The main objective of my research work is to analyse the need of modernization of Grid technology. To modernize the all Grid system first we proposed the small solar-wind on grid Hybrid system.

KEYWORDS: Smart Grid, HOMER, Hybrid System, On-Grid, Smart Meter, MATLAB

I. INTRODUCTION

Energy is the basic requirement to do any type of work without energy nothing possible in present. There are many types of energy in which one type of energy Electrical Energy, before generation of electrical energy all work based on mechanical system but after invention of electric power generation everything based on electric power. The electric energy generation is the basic building block of any country development in present time. The electric power generation not possible on all locations so we generate power and transmitted to other location but in transmission many losses occurs and result is that power loss and black out situation. In our thesis work we try to reduce this electric power loss and remove the blackout situation by analysing the proposed solar-wind grid connected hybrid system.

India is a developing country, there are total 6, 38,596 villages in India, in which 5, 93,732 villages are inhabited. Out of 5, 93,732 villages, 5,127 villages are electrified only for some hours & rest 38605 villages are using kerosene lamp for lighting their houses.India is not economically stable as it is a developing country. As the population increases day-by-day, so the demand of electricity increases simultaneously. All the electricity is supplied in cities, industries, mills and factories.

The renewable energy sources are inexhaustible and pollution free and these are available free of cost. These sources have been used by human beings in many applications like driving windmills for grinding corn and pumping water, propelling ships, etc. The cost of harnessing energy from renewable energy sources was high because the technologies used at that time were not as advance as now.

II. LITERATURE SURVEY

Literature review has helped to attain the conceptual clarity and to frame my theoretical perspective. Smart Grid &Renewable Global Status Report provides a comprehensive and timely overview of renewable energy and energy policy development worldwide, World wind energy scenario, Global investment in renewable energy, Global demand for renewable energy, Total renewable power capacity worldwide, New Policies Scenario, Efficient World Scenario, Global warming effect on environment etc., annual global support for renewables in New policies Scenarios.

Mag. Inż. Indrajeet Prasad-"Smart Grid Technology: Application and Control" In this paper the smart grid system as compare to conventional grid system. Smart grid system more reliable to power supply and analysis the system.

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III. SYSTEM DATA FOR PROPOSED MODEL

The proposed Solar-Wind Hybrid system required some basic data to analyse the conventional grid system in comparison with Smart Grid system. For proposed a solar-wind hybrid system collection of electric load requirement a survey conducted in village Borganw, Khandwa, M.P. The 24 hours data of electric load of survey location used for system design and these basic data required in HOMER software as shown in fig. 1 below and wind dataand solar data in table 2 feed average months wise because the system is based on conventional model. In my thesis work this is the research point, what happen the data feed month wise and data feed real time wise.

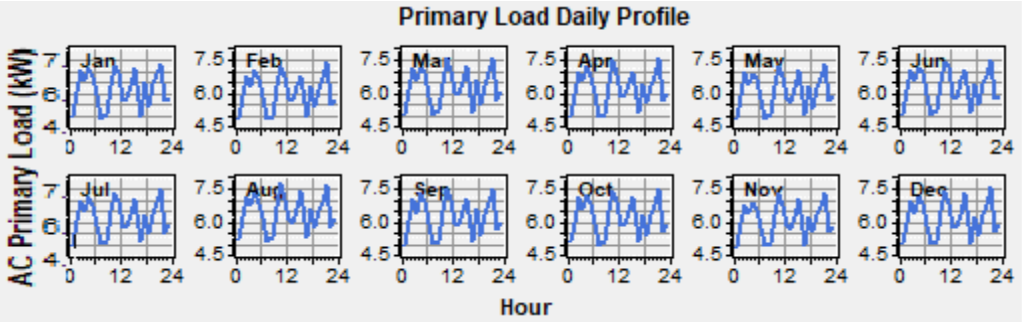

Fig. 1 Month wise Electric Load of 24 hours

The data of electric load calculated on basis of 24 hours requirements and average data of solar-wind collected yearly month wise and these data feed in HOMER software for proposed model.

Table: 1 Electrical Load Calculation

Houses Category	Load Type	Rated Power (Watts)	Quantity	Hours	Energy Wh/day	Total Energy KWh/day
Small 197 Houses	Light	15	197	5	14775	22.79
	Radio	15	21	4	1260	
	Fan	75	15	6	6750	
Medium 56 Houses	Light	20	56	5	5600	25.45
	Radio	15	25	6	2250	
	Fan	75	28	6	12600	
	TV	200	5	5	5000	
Large 32 Houses	Light	30	32	5	4800	40.11
	Radio	15	29	6	2610	
	Fan	75	28	7	14700	
	TV	200	9	5	18000	
1 School	Light	15	2	3	90	0.87
	Fan	75	2	4	600	
	Computer	60	1	3	180	
1 Store	Light	20	1	7	140	0.52
	Fan	75	1	5	375	
	TV	200	1	5	1000	
			Total Load (kWh/Day)			89.74

IV.MODERNIZATION OF GRID SYSTEM

The generation, transmission and distribution of electric energy are based on conventional Grid system since generation of Electrical Energy. The conventional Grid system generation point of building block of electricity but energy saving and continues power supply point of view. The present time required changes in electrical grid system so that to analyse the significant of new technology like "Smart Grid". We proposed a small solar-wind hybrid on grid model using HOMER software for village Borganw, Khandwa, M.P.

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Table: 2 Electric Loads Hourly

TIME (HOURS)		1	2	3	4	5	6	7	8	9	10	11	12
KW	Jan to Dec	3.50	3.47	3.40	3.39	3.54	3.77	3.96	3.75	4.05	3.93	3.72	3.73
TIME (HOURS)	Jan to Dec	13	14	15	16	13	18	19	20	21	22	23	24
KW		3.93	4.03	3.85	3.87	3.81	4.08	4.04	3.89	4.03	3.80	3.46	3.40

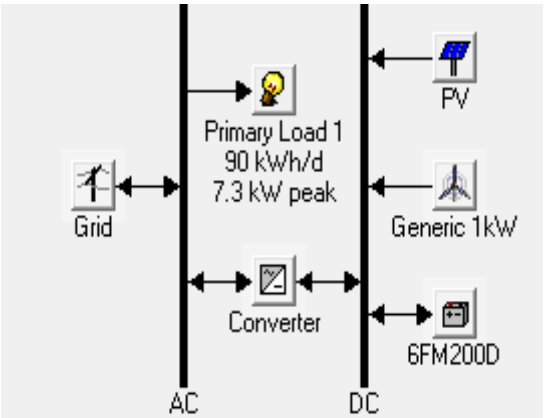

Fig.2 On-Grid Model

The electric power requirement of village Borganw, Khandwa, M.P. is around 90 kWh/day for this load, we proposed a solar-wind hybrid system using HOMER software, to analyse the significant of new technology like Smart Grid. Smart Grid means the data of electric load, power generation, transmission and distribution in present old technology calculated month wise or year wise but in smart grid technic all data calculated on present time and data updating using all digital based devices. The data of electric load may be varying season to season in tradition technic. In tradition old grid system the load forecasting is major problem. We also analyse this problem in smart grid technic to solve the problems.

In faulty condition major problem is that to find the exact faulty location, according to load variation how the react the electrical device all thesis thinks. We have to analyse in smart grid system so proposed an on-grid. In a system the system is better than other analysed in comparison with smart grid system.

V. SIMULATION RESULTS

The proposed solar-wind hybrid model simulates in HOMER software and generates the number of feasible combination of system with optimized result as shown in fig.3 on-grid. It is difficult manually to finalize the feasible combination of components, which are actually used in Installation of solar-wind hybrid system. We provide the number of different combinations to HOMER software, on the basis of different combination, HOMER calculate the solar radiation of whole year, wind speed and other devices prices.

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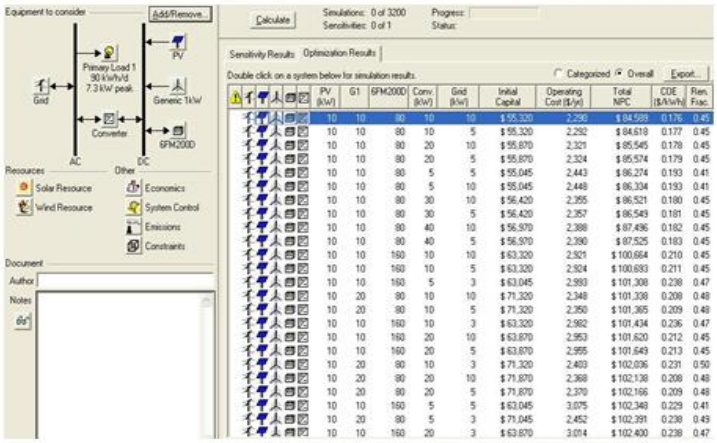

Fig.:3 Simulations results of On-Grid

The HOMER software use the data feed by us and after simulation, display the number of feasible combination of solar-wind hybrid system and also suggest the optimized combination of system. The data in both hybrid model on-grid and off-grid feed on the basis of month wise collected data. The load demand data vary day to day but these are the traditional based hybrid system so we use month wise data. In Smart Grid system these data updated time to time using digital GPS based device. In both proposed systems on-grid, we find the scope where data may be updated with real time, so we proposed these systems.

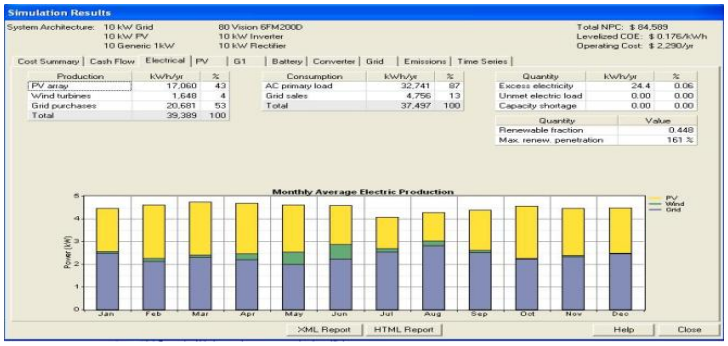

Fig.4 Renewable output power on-grid

In on-grid system 10 kW wind generator, 10 kW PV panels and 10 kW grid connections provided. The production of total renewable power output is 39389 kWh/yr. in which generation by solar 17060 kWh/yr. (43%), wind 1648 kWh/yr. (4%), and grid purchasing 20601 kWh/yr. (53%) in on grid hybrid system.

VI. CONCLUSION

The conventional grid system uses the fix tariff system and use the single source to supply electric power. As we proposed the solar-wind hybrid system based on conventional grid pattern in which all the data required are month wise or year wise according to these data, we analysed the electric power generation and distribution.
We conclude this the Smart Grid system is better than old grid system in all aspect like multi supply source instead of single source as in old grid system.

The data used for analysis not month wise or year wise, whereas real time data used in Smart Grid system with the help of digital based devices. Smart Grid system provides the alternative source of energy that's why continues the supply and avoid the blackout situations.

VII. FUTURE SCOPE

The Smart Grid system technology is better than conventional grid technology in all respect, as multiple supply sources, real time data collection, and multiple supply tariff system. The coming era in electric power generation, transmission and distribution required the smart system. In future all devices will be converted in smart devices because smart technology not only help in power generation but also help in electric power saving.

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