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Life Cycle Assessment of Conventional Grid System as Compare to Smart Grid System in Modern Era

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ABSTRACT: The electricity is the basic requirement of human being in present time, life activities without electricity is nothing. The world population in which population of INDIA increasing exponentially day by day, as compare to supply of electricity, electric power is less than electric energy generation (specially eco-friendly).Eco-friendly electricity generation system is the best way to protect the life of living things and Environment, in this way Solar-Wind hybrid system is best combinations of renewable source of energy in present era because all over worlds' countries are focused on installing eco-friendly power generation system.
The main objective of my research work is to finding the way by using that system, we can replace the old technic based electricity generation, transmission and distribution system by SMART GRID system, it provide alternative energy sources, save the energy, protect the Environment. To analyse the Life cycle assessment of old grid system as compareto smart grid system, Use the HOMER software for simulation & optimization of the solar-wind hybrid system. Smart Grid technology is better than old grid system, in modern era all system required smart technology.

KEYWORDS: Life Cycle,Smart Grid, HOMER, METLAB, On Grid System, Hybrid System

I.INTRODUCTION

Energy has always been a driving source in the development of human culture, lifestyle and the overall growth since ages. Energy has provided various means of comforts and luxuries as a part of modern life. It has made this world worth living. Indeed, one cannot even dream of living in absence of energy in modern times. The energy demand is growing continuously with the increase of population and improvements in the living standards. Economic growth, increasing prosperity, urbanization, rise in per capita consumption and spread of energy access are the factors likely to substantially increase the total energy demand.

Rural areas in India which are remote to the grid connectivity receive only 10-15% of electricity to meet their demand and rest of the electricity is supplied to cities, industries, mills and factories. The total installed capacity for electricity generation in the country has increased from 16,271 MW as on 31.03.1997 to 214630.02 MW as on 25.02.2020. There has been increase in generating capacity of 18,654 MW over the last one year, which is 10% higher than the capacity of last year.Lack of electricity infrastructure is one of the main hurdles in the development of rural India. Jharkhand, Bihar, Uttar Pradesh, Orissa, Uttaranchal and Madhya Pradesh are some of the states where significant numbers of villages are yet to be electrified.

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.

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II. LITERATURE SURVEY

Literature review has helped to attain the conceptual clarity and to frame my theoretical perspective. 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.

Mag. Inż. Indrajeet Prasad ''Smart grid technology: Applications and controls'' is the base paper this paper given the ideas to compare the Conventional grid system & Smart Grid system so we proposed solar-wind hybrid model used for it.

Z. Benhachani, B. Azoui, R. Abdessemed, M. Chabane–"Study the sizing and economic optimization of a stand-alone photovoltaic-wind hybrid system with storage batteries".

Two methods are developed. The first method is based on the average annual monthly values in which the size of photovoltaic (PV) and wind generators is determined from the average monthly contribution of each component.

III. SYSTEM DATA REQUIREMENT

The proposed system that is Solar-Wind Hybrid system required some basic data to analyse the life cycle assessment of conventional grid system in comparison with Smart Grid system in modern Era. For proposed a solar-wind hybrid system collection of electric load requirement purpose a survey conducted in village Umrikheda, M.P.The 24 hours data of electric load village Umrikheda used for system design and these basic data required in HOMER software as shown in fig. 1 below and wind data in fig.2 and solar data in fig.3 feed average month 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 present time wise.

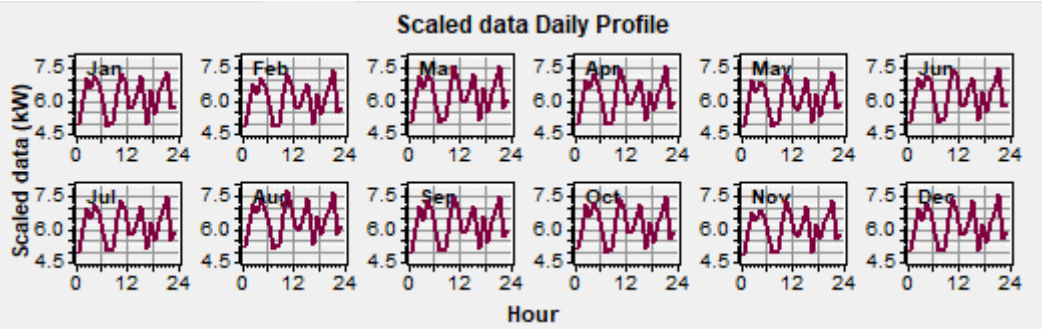

Fig.1 Electric Load hourly

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 Categery	Load Type	Rated Power (Watts)	Quantity	Hours	Energy Wh/day	Total Energy KWh/day
Small 97 Houses	Light	15	97	5	7275	39.89
	Radio	15	56	4	3360	
	Fan	75	65	6	29250	
Medium 56 Houses	Light	20	56	5	5600	40.20
	Radio	15	35	6	3150	
	Fan	75	41	6	18450	
	TV	200	13	5	13000	
Large 28 Houses	Light	30	28	5	4200	35.61
	Radio	15	19	6	1710	
	Fan	75	28	7	14700	
	TV	200	15	5	15000	
			Total Load (KWH/Day)			115.70

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IV. LIFE CYCLE ASSESSMENT OF GRID

The generation, transmission and distribution of electric energy are based on conventionalGrid systemsince 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 time required changes in electrical system so that to analyse the significant of new technology like "Smart Grid". We survey the village Umrikheda, Indore for electric load collection there electric load fluctuate time to time and design an On-Grid & off-GridModel using HOMER software for village umrikheda.

Table: 2 Electric Load 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

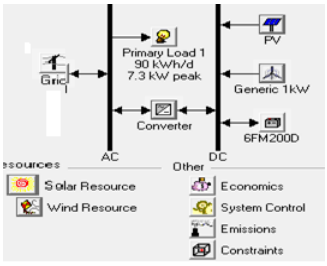

Fig.2 On-Grid Model

The electric power requirement of village umrikheda is around 90 kWh/day for this load, we proposed asolar-wind hybrid system using HOMER software, to analyse thesignificant of new technology like Smart Grid. Smart Grid means the data of electric load, data of power generation, data of transmission and data of 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 systemthe 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.

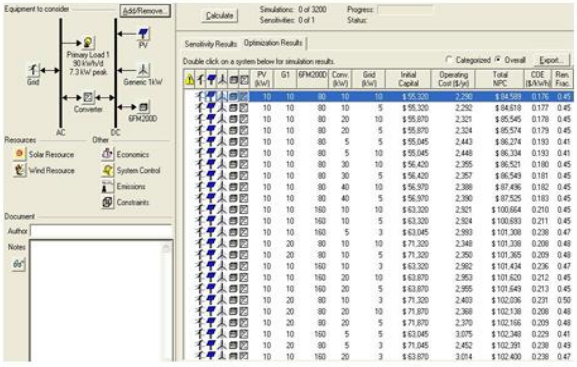

Fig.:3 Simulations results of On-Grid

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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.

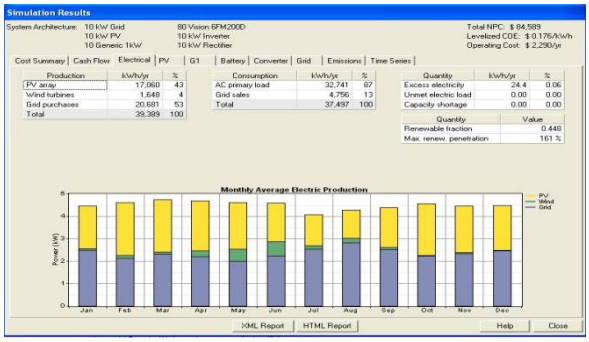

Fig.4 Renewable output power on-grid

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

Theconventional 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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