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STUDY AND ASSESSMENT OF PV/DG/BIOMASS AND GRID BASED HYBRID NETWORK USING HOMER SOFTWARE FOR METRO HOSPITAL AND CANCER CENTER JABALPUR MADHYA PRADESH

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Abstract

This paper discusses the economic feasibility of an autonomous hybrid power system with a PV/DG/biomass/grid based hybrid system. Emphasizing the use of hybrid renewable energy systems to achieve reliable autonomous systems while optimizing component sizes and capital costs Hybrid energy systems based on renewable/alternative energy are efficient mechanisms for electric power generation. The basic idea of power source hybridization is that the primary load is provided by the main power source and the peak load is provided by other, unequal sources This study aims to determine the best use of electricity to generate electricity from various natural sources. This study evaluated the power system design based on SPV and grid systems.

Keywords: *Renewable power system; Diesel Generator; HOMER software:*

1. Introduction

The number The research site is Metro Hospital and Cancer Research Center, Jabalpur (MP) India. The study is based on models and simulations of renewable energy using the Hybrid Optimization of Renewable Electricity (HOMER) model.

Power is critical to the development of technology and the global economy today. There is a positive correlation between energy use and individuals' income. Therefore, the adequacy of energy supply at a reasonable price is an important factor in the development of a country in virtually all areas. India is a country with a rural population, inhabiting about 70 percent of its workforce. Thus, national development is closely related to rural development [1-2].The lack of long-distance electrical connections and the high cost of communication cause schedules to expand and blank cards often lead to congestion. Independent renewable energy systems provide efficient ways to meet the energy needs of these sectors [3-5]. The need for electricity in remote areas is a major force for research into the use of electricity [6].Emphasis is placed on renewable energy supplies to provide a reliable, dependable, cost-effective and cost-effective multi-component solution. This hybrid power system includes a photovoltaic array, a wind turbine and a biomass plant as well as a battery and diesel fuel for emergencies due to the uncertainty of these four sources. according to the price. As a first step, an action plan was developed to measure the electrical welding signal, the replenishment of the resource, its status and information such as solar radiation. The entire system is designed on the Hybrid Optimization Renewable Energy Environment (HOMER) model [8]. The use of these natural energy sources has the effect of increasing greenhouse gas emissions. However, the Government of India is seriously reducing the carbon emissions and the percentage of electricity generated from fossil fuels and increasing the amount of electricity from renewable sources. The development of renewable energy technology has reduced costs and increased environmental sustainability, increasing the potential for emergency load delivery.

Energy use is an effective solution for maintaining and relying on rural burden that makes expanding communications difficult and expensive or costly [9]. The combined power system is established after a comprehensive site survey to match the availability and quantity of the source type and quantity. shipping place. The most common source of solar energy in the study area [10].

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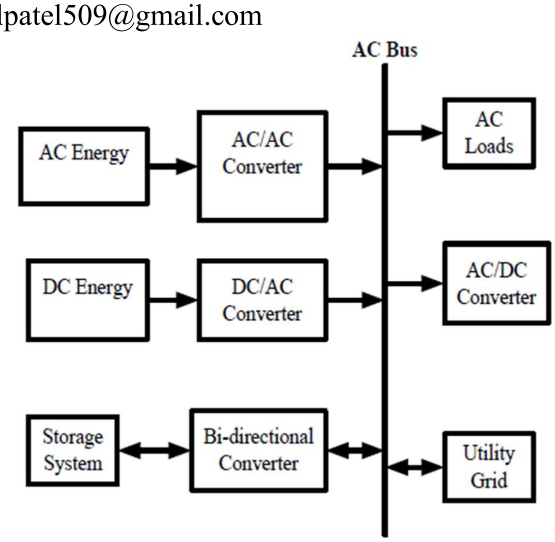


Fig. 1. Schematic diagram of a hybrid power system

In this paper, the hybrid optimization model for renewable electricity (HOMER program) was used as a model tool for the classification and use of renewable energy. There are a number of examples of energy sectors and related technological changes related to the availability of climate and resources. Research with HOMER requires data on resources, economic crises, regulatory mechanisms, and more.

2. Electrical Output

Annual electricity generation from system components. Too much electricity, unsatisfactory power charges and lack of capacity. Most of the electricity is extra electricity that needs to be disposed of because it cannot be used to carry or charge batteries. Incomplete electrical charges are electrical charges that cannot be used by electricity and a lack of capacitance is a malfunction that occurs between power lines.

3. Load Pattern

The daily load rate is shown in Fig. 2. The total incoming load demand is approximately 180 kWh /day with a maximum load capacity of 9.67 kW. With a sudden change from day to day by 15%.

Table 1. Load profile of a day

Sl. No.	Time (Hours)	Load (Kw)
1	1	144
2	2	144
3	3	144
4	4	144
5	5	144
6	6	144
7	7	156
8	8	156
9	9	156
10	10	156
11	11	156
12	12	170
13	13	170
14	14	170
15	15	170
16	16	170
17	17	170
18	18	185
19	19	185
20	20	185
21	21	185
22	22	187
23	23	187
24	24	144

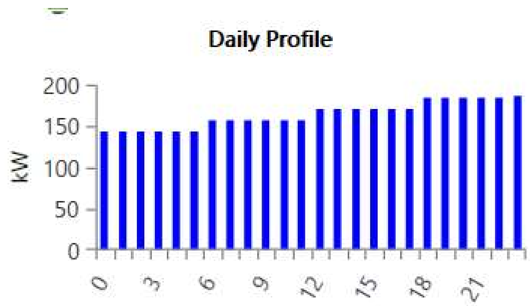


Fig. 2. Load profile of a day

4 Solar Energy Resources

Metro Hospital and Cancer Research Center, Jabalpur (Latitude 23◦.18_N, Longitude 79◦.98_E) India was taken to study solar energy through the HOMER software. The average annual solar radiation was measured at 3.45 kWh /m^2 /day and the average Clearness index was 0.372. Solar radiation is available throughout the year, so it can provide a large amount of PV energy as shown in Figure 3. In summer, solar energy is higher. Sun instead of cold weather. During the rainy season there are clear signals and less sunlight than in summer and winter. The base cost and replacement cost for a 1 kW SPV system is approximately Rs. 1,80,000 rupees. 1,80,000 in sequence. As the PV system requires less maintenance, only 800 / kW / year is used and maintenance costs.

Table 2. Daily radiation and clearness index with respect to months

Sl. No.	Months	Daily Radiation (kWh/m^2/day)	Clearness Index
1	January	3.25	0.258
2	February	4.12	0.367
3	March	3.25	0.251
4	April	2.14	0.368
5	May	3.65	0.312
6	June	4.15	0.451
7	July	4.09	0.401
8	August	4.02	0.403
9	September	3.64	0.428
10	October	3.58	0.432
11	November	2.69	0.329
12	December	2.87	0.343

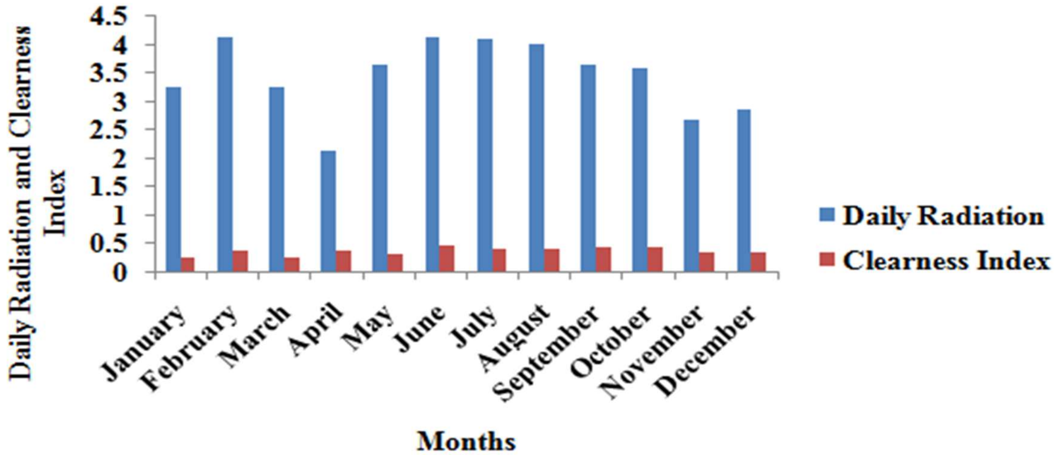


Fig. 3. Daily radiation and clearness index with respect to months

5. Battery Bank

The battery bank is used as a backup system and the voltage is maintained during high loads. The battery was selected for 1 kWh photovoltaic cells and a lead acid type battery used in the system with an estimated capacity of 150 Ah.

6. Converter

A powerful electronic transformer is needed to stabilize the power supply between the AC and DC components. For a 1 kW transformer system, the base cost and replacement cost are approximately Rs. 24,000 rupees and Rs.24,000. The total service life of this unit is 15 years, the efficiency of the converter is 90% and the efficiency is 85%. Prices and information are deducted from the Homer Software.

7. Diesel Generator

The generator set is used to supply the high demand when there is no SPV output in the off-grid hybrid power system and for savings in the grid coupled hybrid power system. The base and replacement cost of a 1 kW DG set is Rs. 40,000 rupees and Rs.40,000. Operating and maintenance costs are charged at Rs. 3.28/h / kW. The generator is connected to an AC alternator with a lifespan of 12,000 working hours. Minimum load rate has 25% of the total load.

8. Analysis

In this paper, HOMER software is used to simulate grid-connected systems and networks that use electrical charges by using renewable energy sources and other energy sources along with the electrical component. It requires a wide range of components for system modeling such as load and power requirements, power components for electricity generation and the many available energy sources. \

9. Results And Discussion

In a hybrid electricity system, only the purchase of electricity from the system is considered and it is assumed that there is no option to resell the electricity. in the layout. The best component design for this study was a 15 kW PV system, a 20 kW DG array, a 150 kW lead acid battery and a 20 kW transformer. The total cost and maintenance cost of this system is Rs. 12662814 and Rs. 4056284 respectively. The cost of electricity (COE) for this use of the network is Rs. 0.1696. Figure 4 shows an example of the use of network connections.

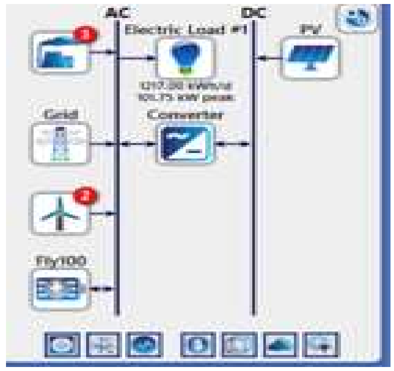


Fig.4. Grid-connected hybrid power system design

Figure 5 show the different configuration of Hybrid Renewable Energy System.

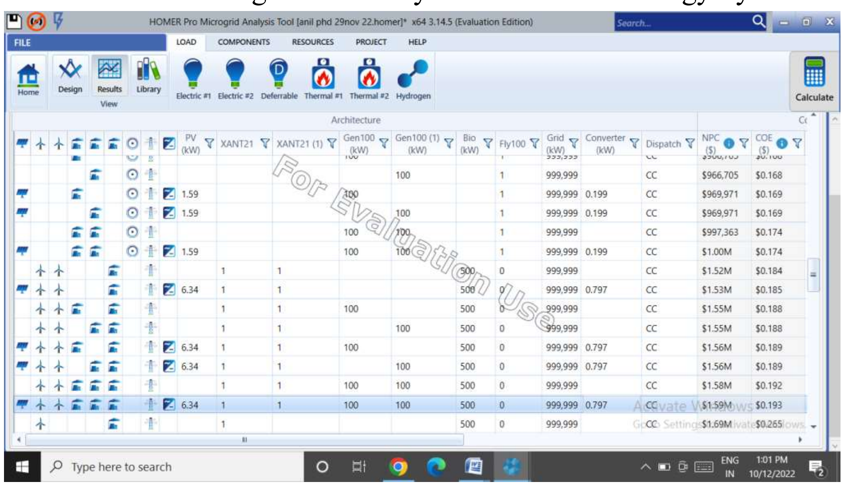
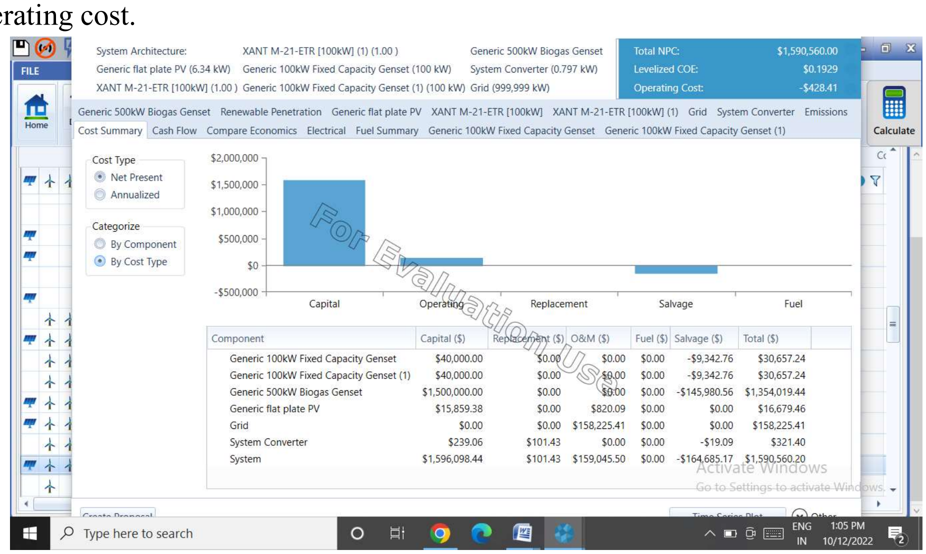


Fig. 5. Optimization of different configurations of grid-connected hybrid power system

Figure 6 shows net present cost by cost type wise in which the capital cost, operating cost, replacement cost, salvage value and fuel are mentioned. In proposed system capital cost is more than operating cost.



Component	Capital ($)	Replacement ($)	O&M ($)	Fuel ($)	Salvage ($)	Total ($)
Generic 100kW Fixed Capacity Genset	$40,000.00	$0.00	$0.00	$0.00	-$9,342.76	$30,657.24
Generic 100kW Fixed Capacity Genset (1)	$40,000.00	$0.00	$0.00	$0.00	-$9,342.76	$30,657.24
Generic 500kW Biogas Genset	$1,500,000.00	$0.00	$0.00	$0.00	-$145,980.56	$1,354,019.44
Generic flat plate PV	$15,859.38	$0.00	$820.09	$0.00	$0.00	$16,679.46
Grid	$0.00	$0.00	$158,225.41	$0.00	$0.00	$158,225.41
System Converter	$239.06	$101.43	$0.00	$0.00	-$19.09	$321.40
System	$1,596,098.44	$101.43	$159,045.50	$0.00	-$164,685.17	$1,590,560.20

Fig. 6. cost summary by cost wise of grid-connected hybrid power system design

Figure 7 shows net present cost by component wise of the system in which biogas generator set is costlier as compare to other components.

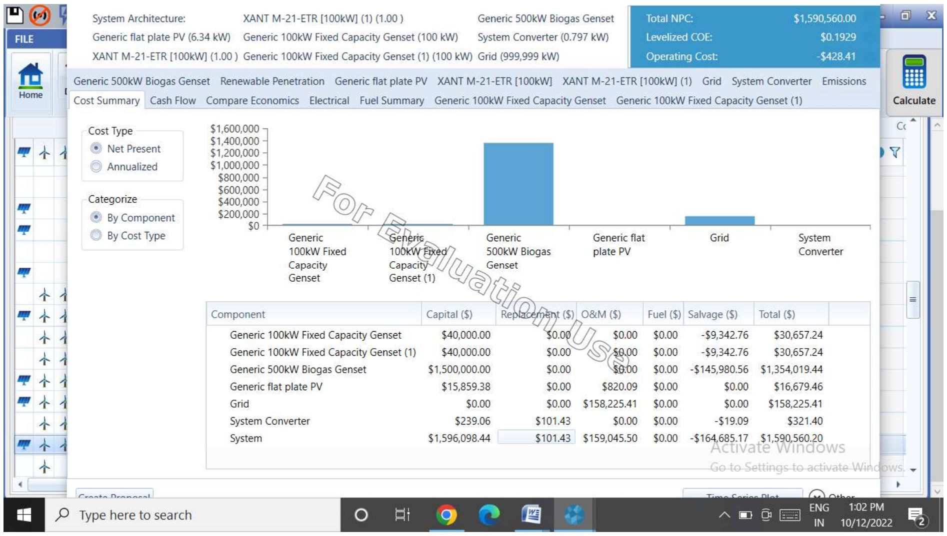


Fig.7. net present cost by component wise of grid-connected hybrid power system

Figure 8 shows cash flow bar chart of proposed grid-connected hybrid power system. The proposed system has high capital cost as compare to other costs(ie operating cost, salvage cost, replacement cost).

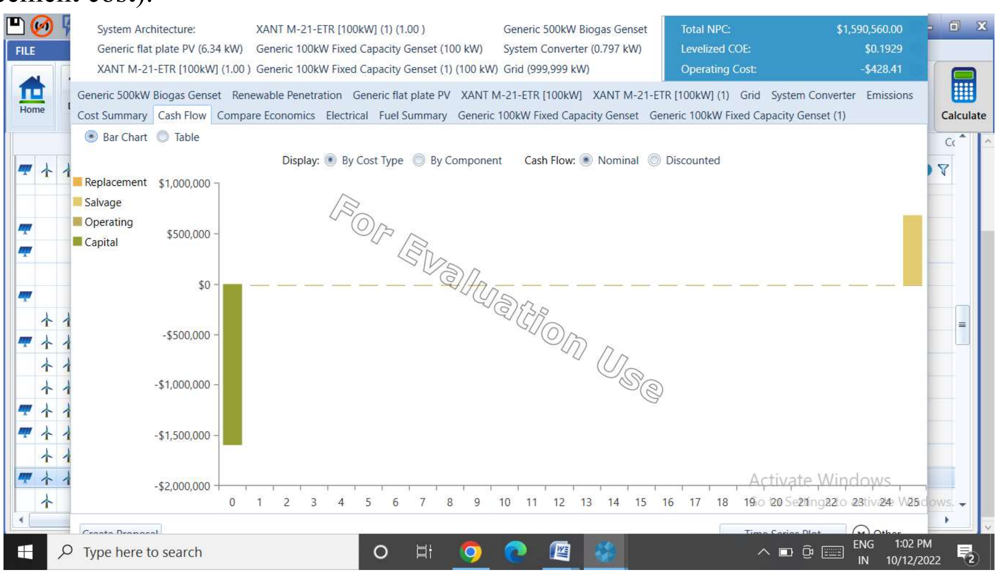


Fig. 8. cash flow by Bar chart grid-connected hybrid power system

Figure. 9 shows economics comparison of proposed system with base system of grid-connected hybrid power system

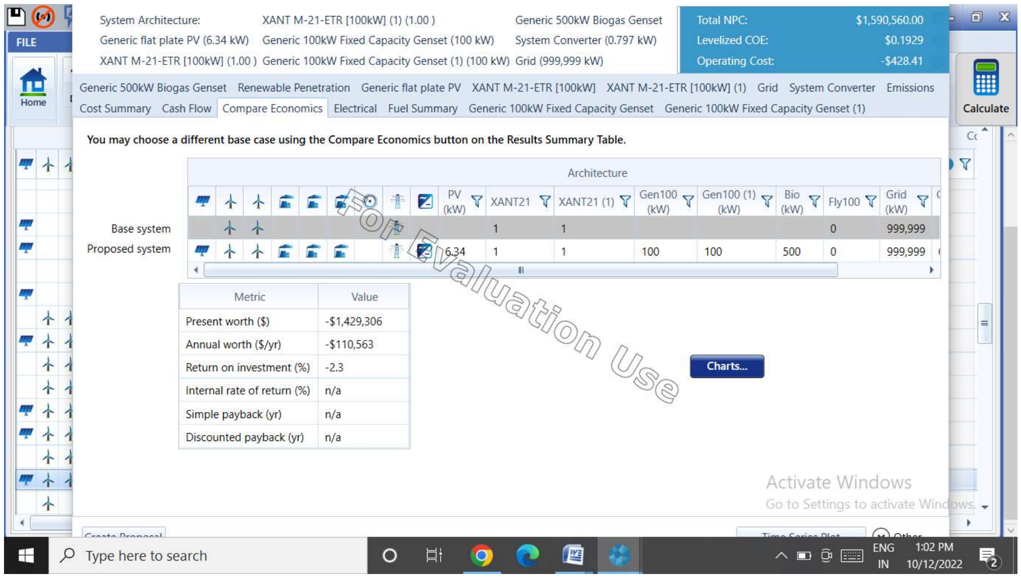


Fig. 9. Compare economics of grid-connected hybrid power system

Figure. 10 shows the Electrical output generated by different energy sources of grid-connected hybrid power system. Electrical power generated by the flat plate PV is large as compare to other renewable sources.

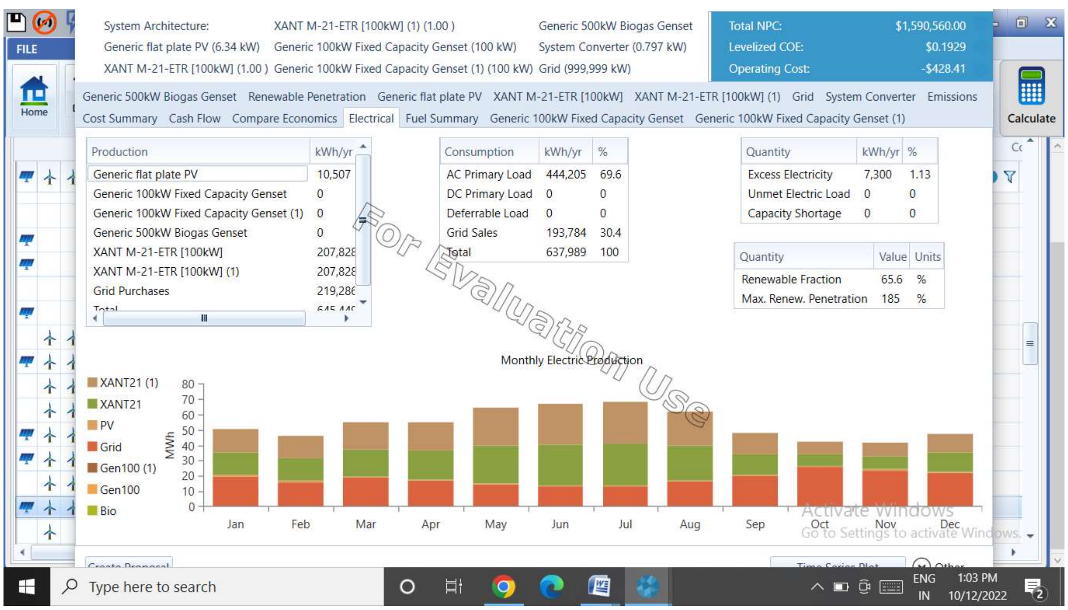


Fig.10. Electrical output of grid-connected hybrid power system

Figure. 11 shows the grid analysis of Grid-connected hybrid power system in which energy purchased and energy sold to the grid is mentioned in the figure. Result shows that from april to august the system supplied the power to grid.

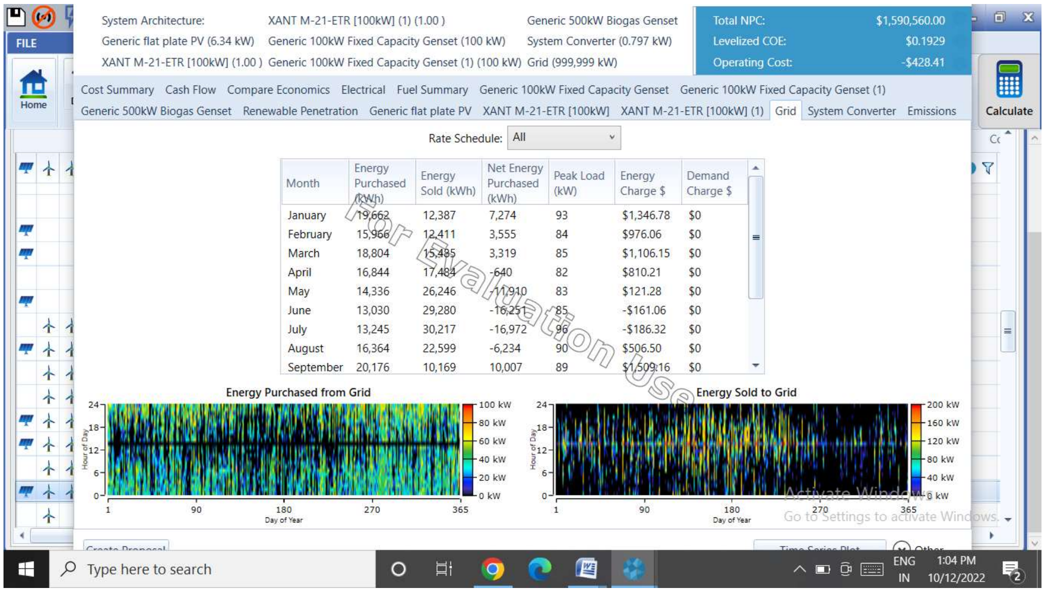


Fig.11. Grid analysis of Grid-connected hybrid power system

Figure. 12 shows the emission result of grid-connected hybrid power system. The result shows the amount of different harmful gases (Carbon dioxide, Carbon monoxide, Unburned Hydrocarbon, Sulphur dioxide, Nitrogen oxides) released by proposed system.

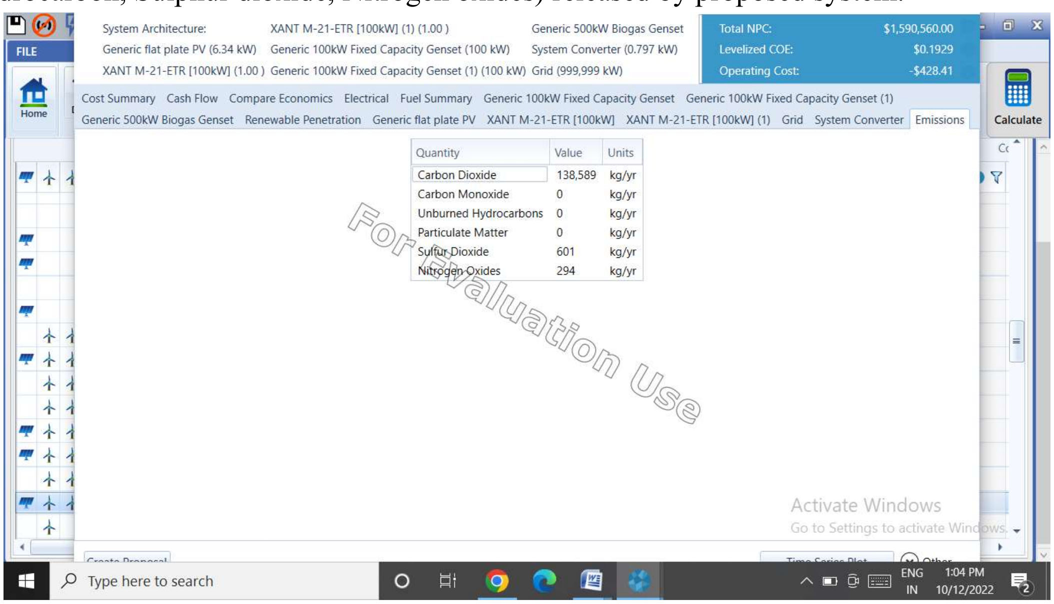


Figure. 12 ***Emission result of grid-connected hybrid power system.***

Table 3. Generation and annual consumption of electricity in the hybrid system

Sl.No.	**Output**	**kWh/year**
1	Solar power system	10,507
2	XANT M 21[ETR] 100KW	415,656
3	Grid purchases	219,286
Total		645,449

10 Conclusions

This research has been done to realize a useful and rich technology that can be linked to meet the needs of consumers by saving electricity. This process is a combination of PV, DG, Wind turbine, Biomass and Grid-based hybrid system. This study was conducted to study Jabalpur (MP) India to develop the concept of the use of electric power supply. For the equivalent load of 180 kWh/day and the maximum load of 9.67 kWh, the cost of electricity (COE) for the consumption of the external power source is 0.1920$. The implementation of the proposed grid hybrid system reduces gas emissions in significant quantities due to lower fuel consumption. The carbon dioxide emission rate in this study was 138,589 kg per year and the sulfur dioxide emission rate was 601 kg per year. The major analysis of the proposed system is that in the months of april to august the hybrid system will sold the energy to the grid.

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