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Research Article

A Study On Energy Consumption, Energy Saving Andeffectiveness Of Alternate Energy Sources Indomestic Sector Of India

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ABSTRACT

The purpose of this article is to investigate the relationship between the amount of electricity consumed and the income of consumers, as well as the efficiency of alternative energy sources in the household sector. India is a developing nation, and the demand for energy is consistently growing at a rapid rate. These fossil fuels are the primary sources of energy that are utilized in this nation. It is necessary to transition away from fossil fuels and toward non-conventional energy sources because fossil fuels are becoming more expensive and more difficult to locate, in addition to having a number of additional drawbacks. Electricity can be generated by the utilization of solar energy, which is readily available in plenty. This study also makes an effort to utilize renewable energy sources in the domestic sector in order to assist with the regular supply of electricity.

Keywords: Consumer Income, Domestic Sector, Energy Consumption, Energy Saving, Renewable Energy.

1. INTRODUCTION

There is a prediction made by the World Energy Forum that fossil fuel reserves, which include oil, coal, and gas reserves, will be entirely depleted in a period of time that is less than ten decades hence. Modern life is only possible because of fossil fuels. Steam and electricity are produced as a result of the abundant sources of energy because they work. There is also the use of fossil fuels to power automobiles. It is responsible for more than 79% of the main energy that is utilized around the world, and 57.7% of the total quantity is consumed in transportation, however, this percentage is fast reducing. Energy challenges that are now being experienced by developing countries could potentially be alleviated by the utilization of non-conventional energy sources. It is possible to reduce the amount of energy that is in short supply in India by utilizing alternative energy sources such as solar energy, wind energy, ocean energy, geothermal energy, biomass energy, and fuel cell technology [1].

Regarding the amount of wind power that is produced, India is ranked sixth in the world. It is possible for the nation to generate a significant amount of power from non-traditional sources of energy. The government of India is making effective efforts to capitalize on this tremendous potential. In terms of economic size, India is the twelfth largest in the world. When it comes to the ability to buy things, it is ranked fourth. Due to the low cost of people and the higher quality of output, investors from industrialized countries are interested in investing in India. The need for energy in India seems to be steadily increasing. In comparison to China, Japan, Russia, and the United States, India allocates the most amount of its energy resources to its domestic, industrial, and agricultural sectors [2].

The amount of solar power that is generated in India is growing. The market is expected to have a substantial expansion over the next ten years as a consequence of the increasing demand for power and the pricing of fossil fuels according to [3].

With regard to energy, the demand-supply imbalance in India is approximately 8.2%, which is having a negative impact on the expansion of the industrial sector and preventing the economy from making sufficient development. There is a significant economic loss for India as a result of the importation of fossil fuels such as coal, gas, and oil. The nation is experiencing a loss of financial resources as a result of the rapid depletion of

fossil fuels, which is driving up the cost of these fuels. In order to effectively address the energy issue, it is necessary to implement technologies that utilize renewable sources of energy [4].

Through the utilization of renewable energy sources in the home sector, the overall energy consumption will be reduced. Solar thermal systems, for instance, have the potential to supplant the traditional electrical geysers that are found in residential homes. A reduction in reliance on grid power can be achieved through the generation of electricity through solar photovoltaic panels [5]. As a result of the decrease in the cost of energy, there will be an increase in the amount of energy that is saved. Because of this, it is possible to lower the monthly expenses that are incurred on a home level.

Designing for a home renewable energy system is a process that involves analyzing the current electricity use and planning energy efficiency actions to reduce it, adhering to local codes and requirements, determining whether the system will operate on or off of the electric grid, and gaining an understanding of the technology options that are available at the site.

First things first: before you start using renewable energy, you should investigate whether there are any ways to cut down on the amount of energy you use. For the purpose of determining the most effective means of optimizing or lowering consumption, it is vital to conduct proper observation of all traditional equipment found in the home. In comparison to incandescent bulbs, compact fluorescent lights (CFLs) have a lifespan that is ten times longer and a higher efficiency rate of four times [6].

The Ministry of New and Renewable Energy provides a capital subsidy of thirty percent on capital expenditures for solar systems installed on rooftops of residential homes for systems that are up to one hundred kilowatts in capacity. With regard to fifty percent of the capital expenditures for residential implementation, the government additionally provides loans for a period of five years at a rate of five percent each year.

It is the purpose of this work to investigate the use of renewable energy in the household sector in order to augment the energy requirement by narrowing the gap between the demand and supply of energy products. This report also provides evidence of the current state of the economy, as well as the contribution of alternative energy sources to the electrification of residential areas and the savings that have resulted from this.

2. METHODOLOGY

Micro Generation: The generation of electric power on a smaller scale is referred to as micro generation. At the same time as it is a method for the production of low-carbon electrical power, it is also a method that domestic customers have adopted in order to fulfil their own requirements. Small wind turbines and solar photovoltaic panels are the primary sources of energy harvesting. Installing technologies that generate micro-generation is a simple process. The employment of micro-generation technologies at the domestic level has the potential to supplement the supply that is provided by the regular grid.

2.3. Solar energy in India

When compared to other non-conventional energy sources, solar energy is the most versatile and beneficial. If we were only able to make use of a small portion of it, it would still be one of the most beneficial sources of renewable energy. The solar photovoltaic cell is a device that converts solar energy into electrical energy via direct conversion. This solar photovoltaic system

Table-1: Monthly expenses and saving sat domestic level

Sl. No.	Occupation	Total number of members in the family	Total expenses per month in rupees	Savings per month in rupees
Home1	Doctor	3	19,500	30,500
Home2	Irrigation officer	4	19,700	30,300
Home3	Professor	4	18,100	31,900
Home4	Scientist	3	15,840	24,160
Home5	Sub assistant engineer	4	15,750	24,250
Home6	Schoolteacher	3	15,388	19,162
Home7	Businessman	5	13,048	16,952
Home8	Junior engineer	4	10,563	14,437
Home9	Businessman	6	9,898	10,102
Home10	Clerk	5	8,213	6,787

3. RESULTS AND DISCUSSION

Consumer in come and expenditure: Every family's monthly savings are determined by their expenditures; the lower the level of costs, the higher the amount of savings. The most significant expenditures in the home sector include the cost of electricity, the cost of food and groceries, the cost of child education, and the cost of cooking gas. The cost of electricity is the one that is of particular importance for this article. Figure 1 illustrates the expenses that a family incurs on a monthly basis.

Electricity expense: One of the essential prerequisites is the availability of electricity. When the cost of energy is raised, there will be a corresponding reduction in the overall amount of savings that a household has. Table 2 displays the total amount of money that each family spends on their electricity bills.

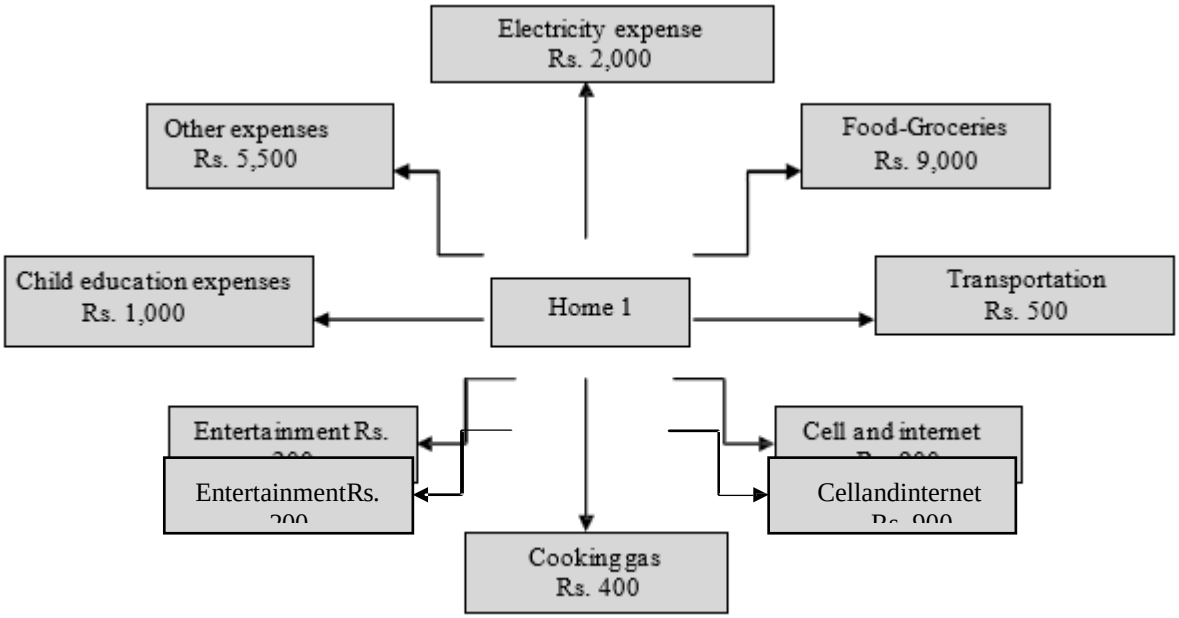

Figure -1: Monthly expense distribution

Table-2: Electricity expense

Name of the person	Total monthly expenses in rupees	Electricity expense in rupees	% electricity expense of the total expenses
Home1	19,700	2,000	10.25
Home2	19,500	2,100	10.65
Home3	18,100	1,500	8.28
Home4	15,840	1,440	9.09
Home5	15,750	1,300	8.25
Home6	15,388	1,290	8.38
Home7	13,048	1,050	8.04
Home8	10,563	965	9.13
Home9	9,898	900	9.09
Home10	8,213	865	10.53

3.3 Total Energy Consumption in Domestic Houses Using Green Energy

Table-3: Total energy consumption per day(CaseI)

Items	Wattage	Nos.	Approximate working hours per day	Energy consumption per day (kWh)
CFLlamps	15	10	2	0.3
Fluorescenttube	35	7	3	0.735
Fan	60	10	3	1.8
Computer	150	4	4	2.4
Printer	70	1	1	0.07
LEDTelevision	250	4	5	5
Watercooler	1000	1	5	5
Motor	1100	2	1	2.2

3.4 Total Energy Consumption in Conventional houses

Table-4: Total energy consumption perday (CaseII)

Items	Wattage	Nos.	Approximate working hours per day	Energy consumption per day (kWh)
Incandescent lamps	60	10	2	1.2
Fluorescent tube	40	7	3	0.84
Ceilingfan	70	10	3	2.1
Computer	150	4	4	2.4
Printer	80	1	1	0.08
Television	300	4	5	6
Watercooler	1000	1	5	5
Motor	1500	2	1	3

Case I:
Total energy consumption=0.3+0.735+1.8+2.4+0.07 +5 +5 +2.2=17.505kWh/day
Monthly energy consumption sink Wh=17.505×30= 525.15kWh

Case II:
Total energy consumption=1.2+0.84+2.1+2.4+0.08+ 6+5+3=20.62kWh/day
Monthly energy consumptions in kWh = 20.62 ×30 =618.6 kWh
Total saving in energy consumption=618.6–525.15= 93.45kWh

3.6 Design of Solar photovoltaic system

Step1:
Taking individual alternating current (ac) and direct current (dc) loads along with the usage hours of appliances is the first step in the process of determining the total demand for the load. A calculation of the total load is carried out by utilizing the equation that is presented below.
The sum of the ac load multiplied by the number of hours of operation per day and the dc load multiplied by the number of hours of operation per day is the total load that is calculated.

Step2:
In order to select the appropriate battery size, it is necessary to perform a calculation for the quantity of batteries. There are days that are devoid of sunshine, and such days are days of independence. The capacity of the needed battery bank can be calculated by multiplying the average amount of energy stored in the battery every day by the number of days of autonomy, and then dividing the battery voltage by the depth of discharge.
The total quantity of batteries, in terms of number:

Before attempting to compute the number of batteries that are linked in series, it is necessary to have knowledge of the battery's minimum voltage.
The voltage of the system divided by the nominal voltage of the battery is equal to the number of batteries that are linked in series.
Once more, to calculate the number of batteries that are connected in parallel, it is necessary to have knowledge of the Ah value of the battery.
(Ah rating of battery bank) divided by (Ah of battery) is the same as the number of batteries that are linked in parallel.

Step3:
Determining the size of the solar array: The array size should be determined in such a way that the average daily demand for amperes (Ah) and the minimum voltage required for operation are obtained. Obtaining the average Ah per day can be done in the following manner.
The array's average ampere-hours per day can be calculated by dividing the daily average that is drawn from the battery by the efficiency of the battery.
The peak amps of the array are calculated by dividing the average amount of amperes that are delivered by the array each day by the number of peak sunshine hours that occur each day.
The calculation for the parallel module can be done as follows.
Module connected in parallel equals (peak amps of the array) divided by (peak amps per module) The series module can be determined in the following manner.
When a module is connected in series, the voltage of the battery bank is divided by the nominal voltage of the module.

Step4:
The selection of the array inclination: In most cases, the photovoltaic module is positioned in such a way that the northern hemisphere is facing south and the southern hemisphere is directed toward north. As a result, the photovoltaic module is positioned in such a way that it faces the sun at noon if done correctly. When pitching in the winter, pitching at a more acute angle results in a higher production, whereas when pitching in the summer, a more subtle angle results in a higher output.

Step5:
Following the completion of the calculations for the aforementioned factors, which include the size of the battery bank, the size of the array, and the position of the array, the system design can be approximated, and lastly, all of the components may be connected.

4.CONCLUSION

A home economic analysis has been carried out in this study in order to gain an understanding of the energy consumption as well as the impact of alternative energy sources, particularly solar energy and the utilization of compact fluorescent light bulbs (CFLs), in order to assist consumers in conserving energy. The tabular example and calculation that was presented earlier makes it abundantly evident that non-conventional buildings that are powered by solar energy have the potential to enable customers to become financially independent of paying the price to the grid at a particular level. It is therefore possible for India to achieve economic health through a partial transition to renewable energy sources. In India, the movement towards green energy has the potential to raise the standard of living in the household sector.

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