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Original Research

The Role of Solar Energy in Reducing Cost of Residential Users

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Abstract:

The use of natural fossil resources in the world on one hand has caused damages to animals and environment; on other hand fossil resources are running out, increasing population and consequently increasing of human demands for energy resources, caused invention of new tools and methods to use renewable cheap and harmless resources like solar energy instead of fossil natural resources. Solar energy is used in various sectors such as industry, agriculture and home affairs, it is said that about 40% of the world's energy is spent on housing. Although energy is one of the resources to meet human needs and necessities, the cost of supply and use of it, is a large consumption item for residential users. The purpose of this study is to stabilize the cost of use, and usage of users from public energy center (Electricity) and solar energy (Solar Panels) in residential units, this research has been compiled descriptively and for its analysis, has been used of valid domestic and foreign scientific sources and according to its requirements, different methods have been analyzed. The results shows the fact that use From the energy system of solar panels to supply energy sources in residential units, according to the weather conditions and useful life of solar energy production devices, the cost of energy supply has been reduced by about 76%, not only its efficiency is safe but also it is near to frugality.

Keywords: Energy - Solar panels - Natural resources - Residential unit – Cost

1. Introduction:

Energy plays important role in global economy, the energy production system through solar panels is one of the most suitable types of renewable energy production technology for electricity in residential units, and its application is increasing. Solar energy as unlimited resources in case of time and good quality, it is cost-effective due to the weather condition and availability. The growing demand for energy to run home electronic tools on one hand, and illumination and conquest of home affairs on other hand, is caused creation of new tools and instruments from new and renewable resources. In this regard, it is necessary to imply reasonable governmental policies and support of new renewable energy production technology, increased the effective use of renewable energy resources and caused of decreasing cost of energy supply for residential units. For instance about 30% of Afghanistan population doesn't have access to modern electricity. High level of consuming imported electricity energy in the country and providing its cost, increased residential units costs, which in observation of unemployment level seems a big problem. The average overall temperature all around country is 0.6-0.29 and with suitable weather conditions, we are able to use of solar energy production systems for supplying of home energy resources [18].

2. Subject Research:

Afghanistan is located in the center of South Asia with an arid and semi-arid climate [10]. According to given information from UNDP 30%of urban population and 97% percent of rural population of Afghanistan don't have accessibility to modern energy and electricity, it is said, that this situation causes before the time death of more than 45,000 people annually due to the use of fossil energy sources and environmental pollutants, while Afghanistan has abundant water and solar resources with suitable lands for electricity production. It is said that about 60% of the country's consumable electricity imports from abroad at an unreasonable cost and unstable situation. As regards that life without using of energy seems impossible, lack of energy resources and the lack of a regular and standard system of energy consumption and poor quality of resources in residential units has caused problems in providing high quality energy resources and its consumption, these and other important issues need to be explored [18].

3. Importance of research:

It is obvious that energy supply of residential units are necessities for all of us, the goal of society is to achieve the efficiency of using renewable natural resources [13]. in heterogeneous conditions and being in a suitable climate to understand and recognize the way and new methods of using new tools and instruments for production of cheap renewable energy of nature especially solar energy is considered necessary and important, to prevent damage from fossil resources. By changing the culture of energy consumption of residential units and the use of new production technologies Energy can be used from clean, harmless and fixed renewable sources, which the most important type is solar energy, in this case we

will not make changes only on the cost of family economy but even on the economy of whole country [8].

4. Research hypothesis:

H_A: p≠0 - It seems that the cost of solar power generation system is less than public center energy.

H_0: p=0 - It seems that the cost of a solar power generation system is higher than public energy center.

5. Literature and background of research:

Recently, many studies have been conducted on the application and importance of the solar energy production system and its effects on household consumption and income in the world and in Afghanistan. Foreign researches and then domestic studies which conducted on this subject is mentioned as follow; Although energy consumption is a necessity of human life, the lack of natural energy after the energy crisis in 1970 has made countries around the world to think about using new energy resources such as solar, wind and other renewable resources [9]. In recent decades, the production of electricity to enlighten residential units in some areas has depended on fossil fuels, but as it seen, fossil resources in nature are limited and running low, increasing population and increasing human demand for energy, create concerns. The vision for the future is that fossil fuels have increased pollution rates and the percentage of carbon dioxide in the atmosphere and threatened the life of the planet [1]. Solar energy is used in various forms in industry, trade and life, about 40% of the world's energy is spent on housing to create conditions for sustainable development and compliance with established standards of living, so more renewable energy utilization is considered necessary [17]. One of the most popular and common types of energy is solar resources, this type of energy is effective and environmentally friendly in reducing the cost of living without harming the environment and it is without pollution and pollutants, reducing air pollutants, water pollutants and most importantly, renewability and extent of solar energy is increasing in current situation [12]. One of the most important advantages of these natural resources is that the state of solar energy according to scientific calculations are predictable and it is said, the twenty-day energy of the sun shining on the earth is equivalent to the total stored energy of the earth such as coal, oil and natural gas [5]. World energy consumption is predicted to increase by 28% between the years (2015-2040), as energy consumption has had a significant impact on human life, with 60% of the world's emissions coming from fossil fuels. Solar energy is a suitable alternative to fossil fuels as a clean source [20]. As far as Europe Union countries plan to supply about 60% of their energy consumption through renewable energy by 2050. However, solar energy varies depending on the amount of sunlight and the climatic conditions of each region, and is one of the obstacles for development of this system is instability of the climate condition in different seasons. But it is expected that with the passage of time and changes in tools and technology, the ability to use solar energy will be sustainable [11]. Use and

application of sunlight energy in a general classification is divided into three parts, which include "photolytic, concentrator of solar and emerging heating such as ponds and solar ovens" [15]. Solar energy conversion to Heat energy is supplied through solar collectors. At medium to high temperature efficiencies, more concentrating collectors are used and now in the commercial sector, the most important type of collector is solar energy storage [19]. The economic potential of solar energy depends on several variables like; bank rates, advanced technology and atmospheric developments. Calculations of the net worth of a study in a solar energy system show that solar energy application is 14% economically, which this advantage not only be used in residential units but also in commercial sector [14]. According to the definition cost is the use and application of resources to meet the need for consumption. [6]. We couldn't disregard the use and application of energy in residential units. Research shows that 50% of people in society accepted and follows the pattern to use renewable energy resources [16]. Most current societies, especially Afghanistan, face a shortage of natural resources, and on the other hand, the method of using limited resources is a challenge in the energy consumption pattern for saving consumption, sustainable development and livelihood changes in the pattern Consumption is considered necessary [2]. The research results show that residential buildings consume 88 kilowatts of energy for heat load and by saving it, not only the amount of pollutants is reduced but it is also effective in economic growth [12]. Brent and Wood believes (1975) that energy is one of the factors influencing the economic growth, although its importance is not uniform in different models, the solar energy market has new advantages over fossil fuels [7]. Although one of the important concerns of the barrier to the accurate stabilization of the solar energy production system is the means and tools for accurate measurement of the situation and temperature in different parts of the country [3]. The average temperature in this country is in the range of (5-10 c), it indicates a suitable weather condition and has the potential to produce solar electricity. According to the report of the esteemed office of (UNDP), dozens of solar power generation projects have been established and are in progress in the country, as an instance Kandahar, Parwan and Khost province, solar power projects with a capacity of 2.6 M.W to provide energy to 7800 households can be mentioned [18].

6. Research methodology:

This research is descriptive in terms of practical purpose and data collection in order to raise information about the use of solar energy systems [4]. Data collection using library method and from reliable domestic and foreign scientific sources. And other related sources have been used according to the necessity of the research. The statistical data considered in this research include potential information of solar panels, energy storage, load savings and balance sheet statistics related to residential unit bills issued by Breshna's esteemed company.

The energy consumption of residential units is different, in order to stabilize the cost of the solar energy system and the public electricity grid system, several consumption loads are randomly collected and measured during the day with the capacity engraved in them.

Table (1): List of consumption loads of a residential unit					
No	Residential unit electrical appliances	Power (watts) of electrical appliances	On time (day and night)	Daily consumption (kilowatts)	Description
1	Group (Enlightenment)	500	12	6	Indoor and outdoor lighting
2	air conditioner	2000	8	16	
3	washing machine	1500	1.4	2.1	Twice a week
4	water pump	1000	1	1	Twice a week
5	Refrigerator	500	12	6	
6	Television	200	14	2.8	
7	Other Items	1000	1	1	
Total		**6700**	**49.4**	**34.9**	

Source: (https://barghnews.com)

Table, 1, shows that the electricity consumption of electrical appliances and equipment of a typical residential unit during a day is approximately 35 and its monthly consumption is (34.9 * 30 = 1047) watts of electricity or in other words about one kilowatt of electricity; The figure is obtained from the total figures of household consumption savings, for example:

h = 500wh4w * 12 = 6000w = 6kw:

For a typical residential unit that is a user of the public electricity network and consumes about one kilowatt of electricity, according to the principles of the esteemed management of Breshna Company, it is required to pay according to the following norms:

Table (2): Breshna Company (residential unit)				
NO	Norm of measurement	KW	Price	Amount
1	0-100	100	2.5	250
2	101-200	100	3.75	375
3	201-350	150	6.25	937.5
4	351-1000	650	8.75	5687.5
5	More than-1000		10	
6	Banking Commission			25
7	Payment transfaring Commission			20
Total				**7295**

Source: (https://main.dabs.af)

Table 2 shows the electricity savings of a residential unit, typically approximately one kilowatt of electricity in a tower, up to 7,295 Afghanis, among other uses, given the useful life of solar panels and the energy storage bank and solar resource system which considered in the average 10 years of solar resources the total energy consumption of the public network is equal to (875400) Afghanis:

P = 7295 AF * 12 m = 87540 AF

P = 87540 AF * 10y = 875400 AF

By measuring the energy efficiency of the public network electricity, to compare it with the solar energy production system, the factors of its production are measured and fixed according to the following table.

Table (3): Fixing the cost and number of components of the solar system in a residential unit

No	System parts	The power of each component	Number of	The price of each one	Total	Description
1	Solar Panels	270w	4	5,500	22,000	
2	Battery	200am	8	20,000	160,000	4 pieces in two periods
3	Charging controller	mor 5w	1	4,000	4,000	According to the power
4	Inverter	oflim 5w	1	10,000	10,000	
5	accessories	1	4	2,000	8,000	Cable...
Total					**204,000**	

Source: (http://ghojavand.blogfa.com)

Table (3): The cost of setting up and building a solar power generation system that has a capacity of about one kilowatt of DC electricity so that the capacity of solar panels (swp / 270wp = 3.8) and batteries bank P1 + p2 + p3 = 800w. h) For a typical residential unit, it shows that the amount of supply has been (204000) Afghanis based on the daily rate.

7. Conclusion:

The main purpose of this study is to compare the cost of solar energy supply system instead of using the public network energy of residential units. It is estimated that the monthly electricity consumption of a residential unit is about one thousand watts. , Then according to Table No. (2), which is measured according to the criteria of Breshna Company, the power saving of one kilowatt, shows that the power saving is based on the useful life of the solar energy production system, which is estimated at 10 years (875400) Afghanis. Following the results of Table (3), which shows the cost of supply and construction of solar energy production system, which amounts to (204,000) Afghanis, calculating the cost of payment of electricity for the public electricity network, according to the loads and the cost of providing solar energy resources. The above tables show that the use of solar energy reduces the cost of energy supply of residential units by about 75%, level users of residential units using the solar energy generation system do not have to impose high energy costs on the public electricity network. In fact, setting up this system is economical and cost-effective for the family. Since the cost of providing energy to a residential unit is an important part for public consumption of each user, to confirm the research hypothesis, it is inferred that solar energy system is more economical than public grid electricity, is less more than 75% and also more efficient and economical.

8. Recommendations:

Due to the low level of household income in the country, it seems that the volume of savings in the society is low, setting up and supplying the solar energy system is costly in the first steps and requires financial capital, support the users of this system to replace fossil fuels for the best use of renewable resources.

It is said that about 97% of the country's villagers do not have access to electricity sources, and by using natural sources of fossil fuels that cause high mortality, the use and supply of solar energy production system is more efficient in protecting the environment and human health is not harmful. Promoting the culture of using the solar energy system in the form of a network causes the creation of work in the society and is considered useful in the growth and prosperity of the country's economy.

Regards the benefits of this system, it seems that a large number of people in the community are still unaware of it and are not aware of its economics, if educational programs are launched to promote the use of various solar energy systems in the community, its application will increase.

The lack of control and accurate surveillance on country borders caused importing of low quality tools and instruments without observation of accepted global standards to the country, users of solar energy systems at the time of making instruments should be accurate on making of them and avoid of using fake instruments while making them, till it could prevent from inappropriate costs.

In order For saving permanence and using of the latest capacity of solar energy providing tools and for preventing its demolition, providing a reasonable area with specified air is mandatory.

It is clear which in our country specialists in solar energy field are skimp and unprofessional. Solar energy productive system has different components and capacity, which accurate calculation of cache capacity and solar panel is necessary at providing of high quality energy and reasonable use of actual potential of every part, Users of this system is better to employ from specialist persons.

Consumable loads of every residential units are different and even has separate potentials, users of residential units in case of using solar energy productive system should has an accurate scheduling of using instruments, which prevents from dispense of system capacity.

For honorable researchers which want to write and research in this field, it is suggested to separately study, compare and evaluate every energy production parts; hence users could easily calculate and proceed to make better energy system cache.

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Author Profile:



Assistant Professor **Abdul Wali Hazheer** son of abdul samad, a resident of baghlan province and current resident of Kabul province, a member of parwan university, has been serving the children of the homeland for more than nine years. When I successfully completed my master's degree, and after completing quality improvement and leadership training courses at the university level, I managed to wright and publish two domestic scientific article, tow work for scientific promotion and one international article. I have also collected and publisher eight volumes of textbooks related to the faculty of economics under the supervision of high-ranking professors to solve the problems of student's textbooks.