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Cost Estimation of Solar Energy Required to Run the Housing of Oil Sector Employees in Remote Locations

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Abstract:

In the past two decades, the people growing interested in alternative energy sources have grown because most of the energy currently used is depleted sources and it is not sufficing to meet the growing needs. Therefore, thinking about the sources of solar energy to generate photovoltaic energy, especially in remote areas, is far from the processing centers, as well as the effort, time and costs that you need. Because it is clean energy Clean, unpolluted to the environment and not depleted. However, Iraq suffers from a severe shortage in the generation of electrical energy necessary for life facilities. Where the diesel generators were approved to fill the shortage of electrical energy for consumers and to the negative effects they generate on the environment. Therefore, it has been proven in this study that the use of solar panels to generate photovoltaic energy is the optimum and sustainable solution for home uses in remote areas. where solar energy is available on an unlimited scale in the current research. Iraq suffers from a severe shortage in the generation of electrical energy necessary for life facilities. Where the diesel generators were approved to fill the shortage of electrical energy for consumers in addition to the negative effects they generate on the environment. Therefore, it has been proven in this study that use of solar panels to generate photovoltaic energy is the optimum and sustainable solution for home uses in remote areas where solar energy is available on an unlimited scale in the current research.

keywords, solar energy, remote areas, cost,

1. Introduction:

The developing world faces many challenges that are in direct contact with human life and that have direct and indirect impacts on the economy, environment and society. Providing sustainable and reliable electrical energy to reach the rural and desert areas and the marginalized at reasonable prices is one of the biggest challenges in the developing world. Also, sustainable electric power generation in addition to the infrastructure required to extend the clean lines and the long-distance distribution network is considered very expensive. Solar panels, also known as electrode panels, convert sunlight into electricity that can be used, as solar energy is generated for homes separately and has an economic benefit and reduces CO2 emissions. Photovoltaic panels operate using small photovoltaic cells that are arranged between thin layers of silicon that stimulate when daylight hits these cells as they intersect with electrons, which leads to the flow of electricity. Typically, PV cells are installed on rooftops and parking lots, and can also be installed on walls. It is worth noting that solar panels do not need direct sunlight, and that they can generate energy even in cloudy weather. As for the night time, the electric energy is saved by storing it in a battery during the day and using it during the night time

Solar energy is receiving increasing attention as an alternative, sustainable, environmentally friendly and accessible source, especially in areas with sunny hours, such as arid and semi-arid regions. Harnessing the sun's rays by converting them into energy that can be utilized by using solar cells has given them importance and flexibility in use as one of the cleanest alternative sources of sustainable energy. Energy with some side effects on the environment. Therefore, an important source like solar energy needs to be used with great care by choosing the best location to achieve optimal economic returns while taking into account the least possible environmental damage. Decrease in the size of its available reserves, and with the passage of time and the growing demand for energy, it will not be sufficient to meet these needs. Therefore, attention must be paid to developing alternative sources and harnessing them in a way that meets the immediate need with their sustainability for the future, which facilitates their use in desert and remote areas relatively far from the processing centers, which reflects positively on the effort, cost and time. In contrast, electric power generation systems are required.

In Iraq government does not take advantage of solar energy to use in remote areas. However, it uses normal fuel which is increased in prices. Moreover, there are other issues such as electric power generation and distribution problems, as well as exorbitant costs for extending electrical networks and bringing them to remote human settlements. In addition, it creates high rate of environmental pollution as a result of the use of hydrocarbons and their negative impact on human and animal health and side climatic effects, which led to the need to rely on alternative sources. However, this study aims of the research is to arrive at the best scientific and economic method of using solar energy to generate photovoltaic energy. The importance of research is to apply solar energy which is sustainable and environmentally friendly energy sources, especially in remote desert areas far from the city centers because of its fertile environment for investment. Especially since Iraq has hours of solar brightness throughout the year and is estimated at 3700 hours.

2. Advantages of Using Solar Energy in Desert and Remote Areas:

Most of the population centers in desert and remote areas are very far away and suffer from the difficulty of connecting them to the transmission and distribution lines of energy of the National Electricity Network, in addition to the difficulty of securing drinking water, which requires the use of photovoltaic panels. In addition to the above-mentioned reasons that stimulate the use of photovoltaic energy, there are a number of other factors that encourage this type of investment, as follows:

a- Providing the suitable environment for investment in desert and remote areas for long periods while ensuring the sustainability of the source, which may reach more than (25 years) due to the relatively long life of the PV systems.

b- Availability of large and sufficient areas to put the solar panels at a symbolic cost if compared to the populous cities that do not have such areas with the same costs or relatively less.

c- Ease of installing and operating PV systems, with little or no maintenance requirements under some conditions. In addition, it does not need the constant presence of technicians with expertise continuously in remote desert areas.

d- The ability to use the largest number of panels to generate photovoltaic energy without the need for storage batteries at times when there is no need for electrical energy in the evening, which reduces the cost of purchasing and operating the system in addition to its reflection on the cost of operation and maintenance This type of system is essential in the operation of water, solar cooker, solar heater, and simple solar distillers (Aref et al., 2008).

e- The system requires washing the solar panels from the dirt to increase their efficiency, which is considered relatively low cost, which can be done with simple capabilities and modest experiences.

f- Do not use conventional energies that generate toxic gases as a by-product of the generation process. Accordingly, the solar energy project is clean and pollution-free.

g- Availability of photovoltaic systems that reduce the costs of water and electricity infrastructure in desert and remote areas, as expanding these networks and connecting them to those areas is very expensive in the case of using traditional energy.

h- The availability of photovoltaic energy in desert and remote areas is a sustainable and suitable source of environmentally friendly energy, which in turn reduces pressure on traditional energy sources and the transportation and distribution networks in those areas, which provides energy for regions that depend on traditional energy sources.

3. The Cost of Equipping a Small House with Solar Energy

As is well known, when building a house in desert and remote areas, it is necessary to provide the infrastructure with the provision of electrical energy as well as the provision of a water source such as drilling one well. In desert areas, wells are usually used as a primary source of water, in addition to other sources such as rain water. In this research, well water has been used to provide water to both homes and by means of photovoltaic powered pumps. As for Khazan and thus to the household desalination system, which are of two types:

The principle that works on it is to enter the water into a black painted basin, as part of it evaporates thanks to the heat, so the water vapor rises to reach the inner surface of the vitreous envelope, where it condenses, forming drops. From the fresh water that runs on the surface of the cover towards the bottom and collects in a canal at the bottom end, and it works during the day so that it becomes excess to collect and use at night. The cost of this type of distillates is estimated at about $ 250, and it is economically feasible, as it does not need mechanical or electrical devices, control or regulation, and its faults are virtually non-existent.

An integrated system with electric powered filters as it is equipped with energy from the PV system. This system produces water free of salts, bacteria and clay deposits and costs $ 500. The process of providing electrical energy is necessary for every house, which we assume is 100 square meters of construction, and it contains two rooms and a hall with a kitchen and a bathroom. For the purpose of calculating the house's needs of PV, it is necessary to calculate the consumption for the summer and winter seasons separately for the different devices used in both. The table below shows the power in watts for the electrical appliances required for a single household in the summer, according to the area of the house and the number of rooms:

Table (1) the proposed electrical appliances for the residential unit and the power in watts

Chilled air	T.V,satlliat	FAN	Light plugs	refrigerator	Water desalination device	Devices
2	1	4	4	1	1	the number
*350	100	200	160	150	40	Power in watts

The total power of 1000 watts, equivalent to 5 amps, is sufficient to operate the home. As for the rest of the devices, such as a washing machine, electric mixer, and cleaning devices, they can be operated by regulating the load by using the rotation system in operation by switching off some of the devices mentioned in Table (1) a certain period with the use of the alternate device. It is possible to use a 1000 watt photovoltaic power generation system that is sufficient to operate the proposed house and is economically feasible compared to a generator powered by conventional fuel and the same capacity.

Given that Iraq enjoys hours of solar brightness throughout the year estimated at 3,700 hours, it is Solar energy can be used for domestic and agricultural uses. The photovoltaic power generation system consists of photovoltaic solar panels, the structure of the solar panel holder, storage batteries, charging regulator, power inverter, and it needs an area of 8 m 2 and a price of pitching $ 3250, this type of system can work for three days continuously cloudy. For the purpose of clarifying the economic feasibility of using photovoltaic energy. It is necessary to compare with conventional energy sources such as the conventional fuel (gasoline) electric generator, as shown in appendix 1. The cost of generating 5 amps of solar energy is economically feasible and is approximately equal to $ 0.36 per day paid for the costs of the system compared to the traditional powered generator (gasoline) that costs $ 10.23 per day regardless of the cost of the backup generator that works alternately with the primary generator on Throughout the day as well as not calculating the transportation costs of oil and gasoline, periodic maintenance, extinction and other additional costs such as costs arising from treating or removing the effects of pollution caused by generators as a result of burning fuel and pollution The environment and its side effects on plants, animals, soil, and water.

However, in most areas of central and southern Iraq, in the winter season, the cooling devices and ceiling fans stop operating, which provides an excess of capacity and as shown in Table No. 1, as it provides approximately 550 watts that can be used to increase the load and operate other important devices for the home. Some of the necessary appliances in the winter season are water heaters and the indoor heating system required for the home. During the winter, one of the necessities of life is obtaining hot water for different household uses, which is heated by the solar heater that is supplied with water from the main tank, which is usually located on the roof of each house. The solar heater is similar to the traditional electric or fuel heaters, except that the solar energy heaters use solar energy to heat water instead of electrical energy. The solar heater provides water at a temperature of 65 ° C in winter. The heater consists of a cylindrical tank.

Thermally insulated and flat or tubular solar collectors with an iron mounting bracket that holds the heater parts at an appropriate angle depending on the location. The price of this type of heater is estimated at $ 300, and it is economically feasible despite its slightly higher price compared to electric heaters at a monthly cost of $ 1.00 over 25 years. The use of this type of heaters achieves a high material abundance in terms of material consumption and has a long operational life, (25) years, and achieves support for the national economy by providing an electric energy of 3000 watt / hour for the electric heater for each house multiplied by the number of proposed houses in the complex. Residential building of 50 houses. So, it saves 15,000 watts of power. For example, if a million families had used the solar heater, the provision of electrical energy would be estimated at 3000 MW / hour during the winter season, in addition to that it is a source that does not pollute the environment and does not need burning to any type of fuel to operate the heaters (Energy and Environmental Research Center, 2008).

One of the necessities of air conditioning in the winter is to provide heating for the country house, which is supposed to be done using a solar-powered heating system. One's house needs heating to suit the house's area of 100 square meters The solar heating system consists of solar collectors that can be assembled, respectively or in parallel, to produce hot water that is collected with a suitable thermally insulated tank, which in turn equips the house (indoor space) with heating by heat radiators. Prices for components of the solar heating system are listed in Table 3, which depended on the local market pricing.

Table 2: The materials that make up the solar heating system and costs in local market

Heat rideator	Rock wool	Pipe conect	Water tank	Solar collectors	Materails
	30 m2	6 m	5 m3	30m 2	namber
400 **	60	100	450	1500*	Cost (USD)
* For every 100 square meters we need 30 square meters of solar collectors at a price of $ 50 per square meter, so it will be 30 square meters x 50 = $ 1500 . ** The house with an area of 100 m 2 consists of three rooms with a kitchen, which requires one radiator for each room at a price of $ 100 per radiator, so it will be 4 x 100 = $ 400 .					

When calculating the total cost of the system on the basis of summing the cost of the parts of the system (Table 3), it will be approximately $ 2510, to which the connection and work costs are added, at a rate of 1% of the total cost, which equals $ 25.1. And accordingly. The total cost of the solar heating system is approximately $ 2535 USD. Table 4 shows the economic feasibility of the solar energy heating system compared to an oil heating system. As shown in Table 4, the solar powered heating system is of better economic viability, with an estimated daily cost of $ 0.84 only if compared to $ 8.5 / day for the heating system operating on conventional fuel (white oil), although the cost of periodic maintenance is not calculated Extinction and transfer cost the fuel. Added to this are the costs of treating and eliminating the effects of pollution, which usually occur as a by-product of fuel combustion, which negatively affects the environment and its serious effects on human and animal health and their side effects on plants, soil, and water. The following table shows the total costs of operating the country house appliances necessary for life. See appendix 2.

Table 3: The total costs of operating the home appliances with solar energy

Total cost ($)	heating system Solar powered	solar heater	Solar cooker	Desalination system Water is sterilized	solar energy system (5) amp	Devices
6835	2535	300	250	500	3250	Cost per device

From the aforementioned, the use of solar powered devices is considered to be relatively low economic cost as shown in Table (5), as the expected daily cost for those devices that exceed 25 years of operating life is $ 0.75 per day which is much less than the value of the electricity bill .

4. Save Fuel and Reduce CO2 Emissions

The adoption of a photovoltaic power generation system to cover the needs of employee homes will directly contribute to saving fuel consumption and reducing carbon dioxide emissions resulting from the burning of fuel to generate energy in traditional ways. The generation of 1000 watts of electrical power using gasoline generators. It needs approximately 9 liters of gasoline per day, equivalent to 3285 liters per year, as shown in Table 2. The amount of carbon dioxide emitted from the combustion of gasoline is estimated at 2.35 kg / liter. Therefore, the amount of CO2 that is prevented from emitting per day for each household for the uses indicated in Table 1 is estimated at 21.15 kg and in one year is equivalent to

7.72 tons, which is a relatively high amount if released to the atmosphere. If the amount of fuel saved in the summer is calculated from fifty homes for the uses mentioned in Table 1, it will be approximately 450 liters per day, which is approximately 164250 liters annually. As for the amount of what is obscured from the emission of pollutant gases, it is estimated at 1.06 tons per day, and thus the annual blocking amount will be approximately 386 tons.

However, if the amount of what is provided for fifty houses in the summer period is calculated in addition to what was supposed to be used for heating in the winter, then the amount of saving of white oil will be approximately 300 liters of white oil per day, assuming 6 liters per day for each house as indicated in Table 4, which is approximately 36,000 liters in the winter season. As a result, it will be estimated that what will be withheld from the emitted gases is approximately 0.8 tons per day, and consequently, the release of approximately 96.5 tons of CO2 will be avoided during the winter season.

5. **Conclusion**

The use of alternative energy sources, such as photovoltaic energy, for purposes in the housing complexes of oil projects located in remote desert areas is economically feasible because of the money it provides in the long run and the fuel it provides, which is one of the basics of investment for its material value. The expected savings in gasoline and white oil products, which are supposed to be dispensed when using energy. Photoelectricity is estimated at 171,035 l / year and 48,000 l / year, respectively. On the environmental side, the use of photovoltaic energy will contribute to preventing the emission of more than 533 tons per year of CO2 gas, which is a main source of pollution and climate change that the planet suffers from. Therefore, in line with the requirements of environmental protection by reducing the gases emitted from the combustion of fuel, and in harmony with the important economic aspect in the establishment of any project, especially what is located in desert areas due to the difficulty of providing infrastructure and services, the use of photovoltaic energy as a primary source of energy in the housing complexes of oil projects in the regions Desert is the optimal solution that is economically feasible and environmentally clean while ensuring the sustainability factor.

References

United nations, Economic committee of Western Asia, Train Arabian Organization to produce oil , Secretary general's report (1984 p 86), 25th , binder 1(no2).

General association of research and industrial development, Project of research station to use renewal sources, Baghdad, Abu Ghraib, 2000, p2.

United nations, Economic committee of western Asia, Regional program of new and renewal sources (1984), p83, Referring especially to the rural uses, binder (1), no 2.

Prof. Dr. Saad Abdulhussein, Commercial Production Guide of broiler meat, technical bulletin (12), Iraqi Association of poultry sciences.

Iraqi league of poultry producers, July 2006, p20 ban Ali Abbood, Exploiting renewal sources in the farther human settle. , Modern planning center, p76, Arabian countries university.

P (42), Dr. Arif and others, Feasibility and Technical Study and use of solar application as a common source for electricity power. 2008, p2.

Regional program of Arabian Peninsula, ministry of industry and minerals, Center of energy and environment researches and use in energy sector-8.

Waters in Iraq 2008, p2 ministry of minerals and industry, Center of energy and environment researches, pumping water for agricultural lands by using solar 2009, p(1) ministry of minerals and industry.

Center of energy and environment and uses in water and energy sector in Iraq. 2009, p17, ministry of minerals and industry, Center of energy and environment, producing of new energy power by using energy.

Appendix 1

Daily cost (dollars / day) (Total operating cost with generator price÷ number of days)((	Age Operational source		Total cost of the resource (dollars) (includes the purchase price + the annual operating cost)	The cost of operating the power source (dollars) with a 5-amp generation capacity		Purchase price Source (dollars)					Type of source
				PETROL AND GAZOLIN		GASOLIN		benzen			
	days	annually		annually	monthly	monthly	Weekly	monthly	Dialy		
10.23	365	1	3735.6	3585.6	298.8	28.8	2.7**	270	*9	150	Gasoline powered generator
0.36	9125	25	3250	-	-	-	-	-	-	3250	Solar powered system
The generator spent 1 / liter an hour in gasoline and at the official price (450) Iraqi dinars, equivalent to (0.37) of the dollar, which means we need (24 liters) gasoline for (24 hours) per day at a cost of 24 x 0.37 = 9 dollars. ** The price of a liter of engine oil is (3240) dinars, equivalent to (2.7) dollars per week .											

Appendix 2

The cost paid daily is the total cost ÷ Number of days for operating life (Dollars / day)	The total cost of the system price along with the operating cost of the system For all seasons (Dollars)	The cost of operating the system for several seasons according to its operating life (dollars)	Operating life of the system		Operating cost (dollars)			price The system (dollars)	Types of heating systems
			day Season	Year (season)	(season	monthly	Daliy		
8.5	10200	7200	1200	10	720**	180	6*	3000	Conventional fuel heating system (oil)
0.85	2335	----	3000	25	--	--	--	2535	Solar powered heating system
** The oil-powered system discharges 1 liter / hour at a price of 300 Iraqi dinars, which is equivalent to $ 0.25, the daily cost is 24 x 0.25 = 6 dollars for a period of 24 hours .									
** The winter season is only 4 months of the year, which is (the months of November, December, January, February), which is equivalent to 120 days in the season and 1200 days for ten years, i.e. for ten seasons, the seasonal cost = $ 180 per month x 4 = $ 720 .									