Australian Journal of Basic and Applied Sciences, 5(8): 655-658, 2011
ISSN 1991-8178

Application of Photo Voltaic Systems in Production of Electricity

A. Zatirostami.

Department of Science and Engineering, Behshahr branch, Islamic Azad University, Behshahr, IRAN.

Abstract: Nowadays, over 45 percent of solar energy is produced in Japan, Europe has second rank with 25 percent and USA has third rank with 19 percent. Concerning the supply market, solar cells of silicon and crystal type have allocated themselves 88 percent of market, although, it is a weak absorption and for using, needs a high thick withiness of several microns, but these types of cells are often used in absorption systems of solar light and they have 11 to 16 percent extensive applications in microelectronics technology. Each solar cell of this type produces within 5 percent of voltage electricity, for example in a solar system of type MA 36/45, 36 solar cells in series with a production power of 45 watts of electric power can be conceived in unison with each other. The lifetime of solar platons (photo voltaic medals) is 25 years, and of course solar cells of the photo voltaic type have a good absorption for light in comparison with plates. Generally, the application of renewable energy systems especially photo voltaic systems economically need to have a high investment factor.

Key word: Photo Voltaic, Solar, Electricity, Collector, Energy

INTRODUCTION

In 1998, Paly Veda calculated the output of solar photo voltaic model Exsergy, photo voltaic and p v/t and he offered a useful conclusion (Nozik, 2003). In 2003, Boosanak and colleagues accomplished analysis Exsergy of a liquid p v/t system and they reported an maximum Exsergy output within 12 percent and total energy output within 60 percent (Chuang, 1995). In 2007, Shahin and colleagues accomplished an analysis of solar photo voltaic model Exsergy and they offered factors of Exsergy in photo voltaic medals and they determined the output of photo voltaic model Exsergy. In 2007 Jooshi and Tivary accomplished an analysis of energy and Exsergy in a p v/t gatherer. They reported output within 55-65 percent and 12-15 percent respectively (Green, 1982). In 2008, Tivary and Nayak studied operations of Exsergy in a photo voltaic model connected to a green house and they reported output within 4 percent efficiency for this system.

Usually, applications with this type of system encounter have more special preference in areas that lack fossil energy sources and faraway distances of electric distribution networks. Existing large investment in this field and the production of electricity via photo voltaic systems are leading to more studies in this field. Several researchers in private enterprise reported photo voltaic systems indicating a cost of each system with power 5 and 15 kilo watt for conditions of area. Research in constructor companies and fixing of photo voltaic in the world also indicates the costs of purchasing and installing of photo voltaic systems as being various in a lot in different countries. They often consider the cost of photo voltaic systems as 40 to 60 percent for production and the cost of fixing and maintaining of system systems being the remaining percentage of the whole. Photo voltaic cells with silicon crystal cells for one square meter produce within 100 to 120 watts of power of electrical energy. Studies indicate costs of investment upon photo voltaic systems are dependent on the place and kind of application which is estimated at $5 US to $15 US. Also the lifetime of photo voltaic is variable considering it qualifies for fixing and retaining annually for periods estimated at from 15 to 30 years, that nowadays it is variable in terms of an average lifespan of 20 years, with normal cost of production of electric photo voltaic systems in the world between 20 to 60 (x/k) dependent on the work place and costs of variable lateral equipment. The price of electrical energy produced by photo voltaic systems in European countries is offered for example.

Corresponding Author: A. Zatirostami., Department of Science and Engineering, Behshahr branch, Islamic Azad University, Behshahr, IRAN.
E-mail: Zati@iausari.ac.ir; Ahmad.Zati@iausari.ac.ir

Table 1:

(Country)	Photo voltaic system's power(KE)	Cost (Euro/ KΩη)
0.5-0.62	-----	German
0.6	>20	Australia
0.47	<20	Australia
0.22	-----	Italy
0.4	>5	Spain
0.2	<5	Spain

Effect of Solar Light Angle on Cell's Surface in Extent Replacement of Energy:

The Axis of the earth's circle in terms of moving it around its solar orbit has a clouding angle equal to 23.5^o (4 figure). This difference in angle causes changes in the long time of day and night on planet Earth. In the summer, due to the long haul of motion of solar in the sky, days are longer and in the winter, day are shorter due to the shortening of the path of solar movement in the sky (figure 1)

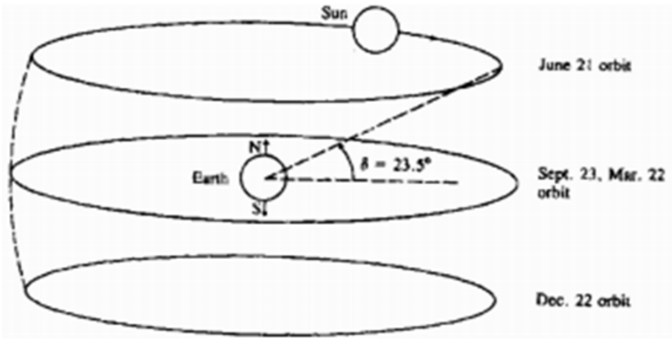

Fig. 1:

Angle Delta, i.e., angle between axis north-south and Earth's revolution circle plate around solar, is indicated by this linkage:

$$S=23.45*\sin\left[\ 2\pi(n-80)\ /\ 35\ \right] \quad (1)$$

In the above linkage n, is the number of day's in A.D.; it is first day of January n=1

Effect of Collector Angle in Absorption of Solar Energy:

Given that the sun always moves during the day, light radiates on the stable surface of a collector and the existing reflection from light of the collector surface, it will not be a perfect change of energy and about photo voltaic converter due to expansion of solar majors, this subject is important. Graphs of solar energy were gathered in the day in terms of the annual calendar which is observed for types of solar collector with different states of installation in areas with latitude 23.5^o North. It is expected that a direct collector is in front of the sun, during the whole of the year, and it absorbs a maximum of energy in comparison with other collectors. Also, the extents of absorption of energy are observed by steep collectors with equal angles of latitude in places facing South (and also for horizontal collector). One of the reasons of energy reduction was gathering for a steep collector during daytime, in comparison with a horizontal collector, is the decrease of a long solar day for steep surfaces (hours of existing sun over surface of the gathering plate) that is facing South (in the northern hemisphere of Earth), but the length of a solar day for a horizontal collector and direct collector is from sunrise or sunset.

The output of electrical current in a solar cell placed in an array depends on the angle of radiation of sunlight on a cell's surface. A change of exit current in a solar cell is observed in the time of change in the radiation angle of light. A horizontal collector in the summer season absorbs more energy with regard to the steep collector so that it is due to an increase of light of the sun in the middle of the day. But always, sunlight radiates upon it at an angle.

Especially, in the level of changed energy where there is very little in the start time and end time of the day and it is, therefore, not a suitable design for a solar array when the solar collector is at an angle with regard to the horizon because of the level of absorbable energy. But, there is a shortage that length of the solar day for a collector type is shorter when there is a shortage of real daytime, and this difference is important especially in the summer and the output of a converter becomes small. In a movable solar collector that has a capacity for chasing the path of the sun's movement all of day, as a result of vertical radiation of sunlight's rays on the array cell's surface, it will absorb the majority of sunlight energy.

We can see a movable solar array that was made for accomplishing this study. This system has the capacity of chasing the path of the sun's movement with an existing two degrees of freedom and using of special light sensors during the daytime. Axes of this array will move just in time for the sensor of the axis to distinguish the necessity for regulation. Therefore, we are using little energy relatively (within 10 watt/h) for movement and regulation during the daytime.

4. Specialty of Power in Two Stable and Movable Arrays During Daytime:

In figure (14) is observed a speciality of power-voltage which acquired of two stable and movable photo voltaic arrays at 9 AM as, it is expected, movable solar array produces more power due to direct radiation of sunlight on the array, when sunlight radiate on the stable array surface at an angle. In figure (15) curves of two array is observed at 10 clock. As ,it is excepted with sunrise, the power of stable array has an increase, that it is due to decrease of sun radiation angle on the stab array surface. The output power by move able array has little changes as a result of vertical radiation of light on the its surface in each time. It is closed, extent of output power in 11 to 13 a carding to curves in figures 16 to 18, because movable array place in front of south in these hours, so movable array produce a more power.

The move of sun to ward west from 13 o clock, high and output power of sun decrease by stable array. Also movable array has gradually decrease power very little, as result of decrease in intensity of sunlight. But given that curves, it is obvious so level of energy that was absorbed by movable solar array, is high, so that at 17 o clock pick of output power by movable array (23 figure) is equal stable photo voltaic and this ration is a number significantly within 6.1 in 18 o clock 4. thus ,it is observed that when we use photo voltaic array with movable factor and it has ability of chasing move path of san, the level of absorbable energy has an increase significant Hay. observed specialties of power in two stable and movable in different times of day for comparison the curves relating to movable array have changes very little, due to sunlight radiate on it to form vertical, whereas this curve has a lot changes for stable photovoltaic array that it cause disorders a lot in current of charge and it needs to storage of energy (like an electrochemical battery) with more capacity for compensation of energy changes.

It was said in table (1) that peaking of output power by each of two systems with the theory of majority absorption in array power and absorbed energy is calculated later during the day and increases of levels of energy for a movable array is within 36 percent, that it will be a movement of 40 percent regarding taking samples in the whole day (from sunrise to sunset). Curves of voltage current in a movable photo voltaic array is observable. So that it is obvious, that specialties have changed very little in different hours of day (a majority of 18 percent), whereas, it is significantly changes of specialties for a stable array and there is within 86 percent change in power. Therefore, a movable array offers stable electrical city specialties during most of the day. It is necessary to know that, as result of radiation, less than 1 kilowatt/square meter (less than 850 square meters) in the area and high temperature of arrays (more than 55^{o}C) and lost ohm from cables in the laboratory, it will be a major power of each one of the arrays less than 180^{o} (in standard condition with radiation 1 k v/s m and 25^{oC}).

The other important point is in speciality of two arrays, output of major power in voltage near to 25volts that it depends on the intensity of light. Thus, we can give charge to two arrays with adjusting activity of photo voltaic array in this voltage (this voltage is a constant percentage of voltage lack of charge that is produced by the majority of power in it and it depends on the quality and the type of cells in the solar majors and for a major that is used in this study there is 68 percent).

Regarding the benefits of photo voltaic converters, they are important for intensive use, change of energy without nuisance and without polluting the environment, having a long lifetime, with less retaining and servicing, capacity and ability of installation in small power consumption (several watt) to large power consumption (several megawatt) and lightweight aspects of the components in solar energy change systems and due to the high cost of photo voltaic array systems, the major absorption of solar energy and as the result of price reduction of output electricity by them; hence, they become necessary tools.

Regarding the lack of need of a movable system constantly with adjustment of the direction of the sun (less than 45 seconds in a day) little energy within 10 v/h is used in mechanical system engines that finally it has the effect on the output and efficiency of the whole of the system. There are laboratory objects in creating with this movable system and a limited number of installed majors on it, it would not be a correct and right study in this research and judgment about price of added energy that was absorbed.

If one is going to use this array intensively (to form a solar farm) with a lot of majors, significantly the extent of solar energy is changed to electrical energy and we can account for a high cost of investment for using this array in the extensive dimensions in an electric station and accomplish a service and retainment, on time. The cost of construction will be decreased by constructing a large number of this type for a solar farm.

Lack of need of external electrical resources for circulating the element fluid in a solar gatherer by use of output electricity in the photo voltaic medal is the cost of one output of electrical power by gatherers such as p v/t is within 7$ US margin and the period of repayment of investments on such systems is almost 10 to 15 years. It is clear that if an efficiency of a p v/t gatherer be increased then the period of repayment of investment is decreased. Then, it is important to assess efficiency of a p v/t gatherer. The efficiency and output of a p v/t gatherer depends on parameters such as atmospheric, head, electric like environment temperature, intensity of solar radiation, speed of wind, temperature of solar cell, temperature of under surface in toddler, temperature of output and input fluid, speed of input fluid, voltage open circuit, current of short connect, voltage and current in maximum power, long and wide of p v/t gatherer, coefficient of heat total waste.

A. It is not important to analyze the energy for accomplishment of processes. In the first rule, the balance of energy is important, and for example, in this rule it is not important that some heat goes automatically from a place with less temperature to a place with a higher temperature, but it is important just to have transferable heat.
B. Analysis of energy does not specify quality of energy, for example, 1 watt of heat is identified as being equal to1 watt of electricity or work.
C. Analysis of energy does not interpret some of the processes, for example, the output of the environment when it is compressed to form an equal temperature, the exchange of energy is equal to zero, whereas Exsergy of it is more than zero.
D. Analysis of energy does not indicate an internal unreturnable entity and it is not a good standard for assessing the efficiency of a p v/t gatherer .

Conclusions:

A heat gatherer of solar photo voltaic is a kind of head converter that get sun radiation energy and change it to electrical and heat energy. The p v /t gatherers relative to solar gatherers often have the following benefits:

A. Application of installing optimum space due to integration of solar gatherer and photo voltaic model in a single system .
B. Increase in output of photo voltaic model at a result of heat absorption of its surface by flowing fluid in the solar gatherer.

Thus, Exsergy analysis in comparison with analysis of energy offers a practical aspect and a reality of the process. Therefore, in this essay, there is an assessment of the efficiency of a p v/t gatherer, in view of the second rule of thermodynamics.

REFERENCE

Chuang, S.L., 1995. Physics of optoelectronic devices, John Wiley.

Green, M.A., 1982. solar cells, Prentice-Hall, Englewood Cliffs, NJ, USA.

Nozik, A.J., 2003. Advanced concepts for photovoltaic cells, NCVP and solar program review meeting, pp: 422-426.

Partain, L.D., 1995. Solar Cells and Their Application, John Wiley and Sons, New York.

Patel, M.R., 1995. Systems, CRC press, Wind and solar cell.