Middle-East Journal of Scientific Research 8 (4): 831-836, 2011
ISSN 1990-9233

Development Generation Technologies of Photovoltaic System

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Abstract: Since the oil shock in 1973 the governments of developed countries have spent more than four billion U.S. Dollars on R & D of solar energy technology and the total investment on renewable energy of developed countries (the half of that has been the share of solar energy) has been comparable with investments in coal and with over 15% investment in nuclear energy technology. The major part of investment has been in Coal with 15% investment in nuclear energy technology.

Key words: Photovoltaic % Generation % Technology % Chemical

INTRODUCTION

The major part of investing in solar energy was inclined to the relatively advanced technologies. Only a relatively small component of this investment in technology that has been particularly good for developing countries which are small and for which they supplement the amount of their investment could do in those countries. From the private sector to the total industrial progress in developing this added technology and other, non-governmental investment values in solar energy R & D during the past 15 years is valued at approximately $2 US billion. In contrast with this situation several times over the state department for technology, development fee has been increased [1-4].

Investment in solar energy in establishing has a very extensive collection of resource information, technology and options as well as experience with basic systems, which was very successful and some solar applications led to the transition to performance in commercial exploitation. However, rapid increase and decrease of the budget as the government supports R & D and market incentives, due to oil shock, there has bee a major effect on the industry to mature devices and services related to solar energy. The initial growth was much faster than planned and the support is possible (growth of 100% per year).

Current Trends: The basic core solar industries that have survived the fall of 1980, have found their way into specialized markets because the solar energy market has been the main economic choice and is still in place in areas such as California, where they finally have a use. After the end of 1980, there was a new passion for the development of renewable technologies.

In addition, in solar energy in particular it has emerged that the support of R & D will rise again. The majority of these interests one inclined in cells and the related technology is developing rapidly. The reasons that exist for this new interest to renewable surely are the added environmental concerns resulting from penetration of increasing fossil fuels in energy markets. The sector systems market is growing in the world by 15% rate since 1989 because there are economic and reliable markets due to power generation in the small scale and in remote places and the required power supply of electronics devices [5-6].

If manufacturers take an active role in electricity markets and electricity generation is assume to be independent and then a double jump will be observed in the growth of PV. One of these companies supplying electricity at about 20 different applications away from the center has identified regular consumption. It uses sensors in high mountain lakes upstream of hydroelectric dams to power the aircraft warning lights on the tops of mountains and is included in an overall facility until 1989; four hundred away from the centers have made a total 32 Kwe produced.

On the other hand, this company has come to the conclusion that the energy of single-family housing where more than half a kilometer distance from transmission lines are located in an area covered by the company and ate

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more cost-effective and are automatically to be supplied by solar energy which is done by expanding the power grid analysis and also shows that supply of the energy required by such places during the useful life of diesel system costs nearly twice the energy supplied by the PV system which was focused upon. Considerably, among California's economy and developing countries are differences but the results are similar. In South Africa was conducted analysis for rural areas showing that PV systems for electricity consumption of less than four kilowatt hours a day in more than a kilometer away from electrification networks are cost-effective PV systems and are the same diesel generator systems which will be drawn with coefficients 40% cheaper than energy. If these villages are located within 10 km of the existing systems. The facts refer to happenstance opportunities for the majority of people in the world currently without access to a live update grid [7-10].

The Necessary Investment for the Solar Technology Development Be Concerning: The almost $6 US dollars investment during the past 20 years in this area in order to approach the achieved level of technology which has been pointed out previously in this chapter in the current technology sector already has reached Fs referred to the need for investment in solar technologies, for complete development of these technologies will take considerable time. Estimates that have been shown in different government laboratories have been built and show that during the next 20 years will be well into a global investment of $8 US billion in public and private sector.

The analysis of this investment is approximate and as it can be seen, more than half of this investment will be spent on technology development because a considerable improvement is expected compared to today's technology. The last column of the table shows the subsidies likely to support the preparation over time where the initial failure to exploit technology to mass production when economically competitive with conventional options. The estimates of R & D are more uncertain and depend on a number of factors considered by the Government placed.

The total estimated investment in both activities for groups is almost $15-20 U.S. Milliard which will be approximately 1% of the world national GDP in the early twenty-first century. The amount that private sector investment gives will depend on the economic influence because the market would expect this investment back in the early years after production and this will cause the funds to be added to the system components [11-15].

Photovoltaic System: Systems which were originally invented and developed for space applications, convert the light energy directly into the electrical energy and the basic principle of this technology, photoelectric effect" which first explained by Einstein that light causes electrons to be separated from matter and its mechanisms with respect to crystal solar cells are filtered from thin semiconductor material which made the electronic features different and under the strong emergence of electronic fields within them. When light enters the crystal, the electrons that are produced by the light fields are separated by the potential difference between upper and lower and funds cells arise. When the circuit is complete then the direct current potential difference is made. To protect cells against the environment, cells are connected together and are released as a module. Modules that have been installed on one page and the correct angle and direction for maximum seasonal and year to collect data and are called PV panels or PV networks. Modulus of single-panel or series of huge networks to be formed PV are different DC voltages with the help of solid state electronic converter to any DC or AC voltages are desirable convertible production sectors. A typical PV system usually consists of electrochemical storage batteries for applications to be independent [16-17].

The PV for terrestrial applications developed during the first oil crisis began with two very different directions. The lens surface and the other to reduce the cost of PV modules using high-volume manufacturing industries do one focus for technologies that reduce costs by replacing the PV surface. The main goal of R & D in conservative technologies is to obtain a higher efficiency. The cells have approached to the majority of 30% efficiency by the point of contact. We can reach the higher numbers of applications by combining the silicon and gallium (GA base), with other semiconductor materials, to order and organize the multi-link cells from which each of the layers collects a different part of the solar frequency spectrum. The record that has been achieved by this method so far is 37%. These cells are put in modules with high concentrations, of about 100, or very high concentrations, of about 1000. Cell efficiency with increasing cell temperature is reduced and a very strong focus on visitors to require the active cooling systems that their thermal energy as a source of significant low-temperature operation two tracking systems requires a very precise thrust to focus on these cells has been suggested [18].

Tower receptor on direct radiation reflected by a series is to be installed. This type of heating system is similar to the central receiver, PV systems have focused

on the top two ways which are similar to the system: the mechanical complexity of these systems is only suitable for central power plants and makes them unable to be used in horizontal radiation scattered from the plant, potentially limited to areas that receive solar radiation is very high and if not of a high grade then they will not be highly efficient. And like solar thermal power generation technologies there still is a real commercial market for them which has been found.

PV systems with a low concentration based on concentration or bright servers are also illegal under the firm and a review of their development is followed, while the main branch of PV industry, to realize the market, is decentralized technology independent systems that present affording the higher costs for electricity, to produce power [18].

Second Generation Technologies: This technology is directly from the first generation technologies and the ultimate goal is to replace all the basic processes by which the equivalent volume of industrial production. Because the use of sand or other material that is rich in silicon, the silicon purification process semiconductor can lead to a simpler process that will lead to the solar being replaced. Growing groups of bars with a bath of molten ingot in continuous growth has been replaced as a block and then cut from a rectangular cross section. The freezing process by process block has been replaced as a result of the initial cutting of the billet block, which is removed. With the growth of the tape directly to the narrow rectangular leads the previous steps and have also removed. The wafer temperature distribution for transplantation and to shape the back surface, a group that has been done by playing a pulp temperature has been replaced, or even of planting and lens renewing which is so much faster for this work. All of the operations related to repair of the cell surface and the wafer, which were performed by chemical substances, have been replaced by their plasma equivalents. Finally, the cell modeling, which previously was done by hand, now is done using automated methods [18].

By the help of precise design, all of the above processes can be resulting in spectacular increase in the maximum efficiency. The higher efficiency is achieved by the application of single-crystal modules, which have not achieved the number of 20%, so far. However, the faster growth of crystals is the major key of the costs reduction and this is the way which is selected for the block and tape technologies. This method is resulting in multi-crystalline cells, which have the minimum operation and usage of the waste of it. However, with the neutralization of hydrogen plasma makes this place that figures close to single digits and approaches the effective modulus and so far 17% efficiency is obtained.

This process is still in the second-generation technologies, which are not considered missing, mainly because it is still appropriate semiconductor electronics that are purchased and will be used to repay this and makes solar energy debate lasting almost 10 years [1, 5].

Third-Generation Technology: Deployment of these technologies based on thin semiconductor material on a lower layer of metal, glass or plastic is built and is a large deviation from second-generation technologies. More R & D budgets related to the cost of PV are here. A diverse variety of materials are under development and completed between them an amorphous silicon and the main candidate for the highest potential which shows that the issue however is the qualitative decline, to be solved in the first contact with the sun.

Since very few materials are used, so the energy payback time would be only a few months even if the efficiency being used were very little in all of the modules. Area costs are very low but the maximum efficiency of the model so far obtained is only 10% and therefore the same energy costs are as for second-generation modules. There is a good potential to reduce costs by 200% in this area because the imprint layer, through the production of high-volume, is better than second-generation technologies. In addition, the potential for further increase in efficiency through multiple links is even more likely, in what should be done by amorphous silicon or combined with other materials [2-6].

The Systems of Heat and Light Chemical: That group is called to the systems which use the solar energy to induce chemical reactions in order to increase the existing production quality, to be useful, or make really new productions. The heat chemical is called to the usage of heat for reaction driving and light chemical is called to the direct use of photons such as the part of sun spectrum UV.

The most basic element that can be improved with the help of solar energy is water in many regions of the world or as available or tastes as salty as seawater. For large gatherings that conventional energy sources hold that desalination with thermal evaporation technology has drawn action are missing. Use of a linear parabolic concentrator to reduce the demand for conventional energy can also be used. For remote communities an isolated solar distiller was used for many years as the only source of fresh water supply. A clear coating on a steep,

shallow pond greenhouse can induce a severe effect. Water is evaporated and deals with the clear coating and condensation flows of water and then collected and are used in desalination, but the sun has a very low efficiency and the maintenance costs are as much reduced as the cost of PV salt reduction or reverse osmosis with energy PV, often associated with UV exposure to the alleviation of bacteria; for these applications are gradually more attractive [13].

In massive state-sponsored programs in India, China and several other places the solar energy for cooking is used and about one million units of this type made is used. Solar ovens cook food with a kind of double glass, especially if they concentrator reflectors can be used for many types of foods, provided the weather is sunny during the day however and only the air is clear.

These systems were considered to replace wood fuel sources but it was necessary to change same of the cooking and preparation habits to use them and therefore the efforts to introduce them in rural areas were not successful. Programs based on biogas or coal stoves are likely to have a better chance of commercial success.

The concentrators of solar heat are capable of producing the temperatures that have a harmony with every chemical process and are operate harmoniously together. One of the major applications that are intended modification is the reaction of methane with steam to produce synthetic gas as a synthetic substance that is the main raw material for producing ammonia, methanol, most plastic monomers, synthetic fuels and hydrogen. Other applications have been proposed include making gas from coal, heavy oil refining, oil and Bitumen have fossils. However, as previously mentioned, while energy prices remain low, commercial exploitation of these systems would not be possible. Since the solar concentrator ability to achieve, the temperatures are not possible with conventional tools of some central receiver test facility in 1980, which were made on a virtually commercial basis for testing materials that must be excellent to tolerate temperatures to be used [18].

However, the major application for the high photon that produces the circular and linear concentrator is possibly photo catalytic detoxification of water. Therefore, with this, the dangerous chemicals can be broken down into carbon, water and neutralized acids and this process is extremely valuable for purifying the polluted waters. The catalysts can only make use of UV radiation and so R & D to improve the catalysts so that a part of a larger fraction of the solar spectrum in order to increase efficiency and reduce system cost is used [12].

Hydrogen Production: Hydrogen production from solar energy and water needs special attention because hydrogen fuel is unfailing and environmentally friendly as well. When hydrogen is burned completely whether to use direct heat, mechanical, or fuel cells to generate electricity, burning only, the product is water. Since hydrogen for transport and long-term density than the density of gas in a liquid is used, can the replace the human reliance on fossil fuels. Sunlight can be a focused reaction to replace fossil fuels. Sunlight can be focused on chemical reactions, heat, or high temperature electrolysis for hydrogen production solar throws. Solar hydrogen can be effects of electro and chemical systems also; hydrogen and oxygen directly from water are produces and acquired [11].

One of the new successes in this area requires special attention because the role of chlorophyll with the help of titanium dioxide particles coated with paints base that are sensitive to photosynthesis, can be emulated. However, in this case and other ongoing investigations electrochemical effects still have much progress to be much greater sense of mechanisms to increase efficiency and downtime and parsing issue that is still liquid solid interface creates inconvenience and must be solved. Electrolysis of water with the help of PV electricity has been fully tested and is the easiest way to get solar hydrogen. In the northern hemisphere countries, the national solar energy potential to use relatively earlier than the South and then take the time wanting to enter renewable energy. Probably, the easiest way to import renewable solar hydrogen is especially so when the need for incentives to reduce pollution levels in urban areas where environmental pressures are very high and do exist (although that too is limited to developing countries not). This is because for at least the only large experimental systems produce hydrogen from water and renewable energy source. In this system, a joint project of German and Canadian, the electrolysis of water is done [15-17].

Hydrogen produced in European ships carrying it can be stored in Europe and through the use of different means and currently the only the Aerospace industry uses the stored energy, but R & D worldwide for the use of this energy in other parts of the stream, such as in vehicles with emissions harmful to very low, generators produce steam aided hydrogen peak oxygen consumption, transportation of intercontinental liquid hydrogen similar to the LNG, hydrogen, oxygen and fuel cell catalyst.

Table 1: Estimates place the type of solar technology research and development falls (Billion dollars 1990)

R & D	Old Technology	Kind of Solar Estimate
1-1.5	1.0	Low Temperature Thermal
3-5	5.0	Photovoltaic
3-5	1.4	High temperature heat
0.4-2	0.6	Other various technologies

Status of Technology of the Solar: The Table of 2-1 shows the status of technology of the major solar systems, which one developed, or developing. The calculation of energy costs and the annual system efficiency is considering application in Albuquerque area where is a desert area with the latitude of 35 degrees and 1600 meters elevation in New Mexico United States of America. Annual radiation received in this place horizontally is 0.24 KW/m, the clear sky 85% and scattered part of radiation is 26% (Table 1).

For heating systems, it has been assumed that the collector in terms of latitude has the angle with the horizontal level, resulting in total annual exposure for the collector of horizontal 28.0 and for low-concentration collector with 23.0 is assumed that the collector of radiation 70% direct solar radiation scattered around. Solar pond of the total annual radiation Horizons 24.0 use linear public type and height of the sun revolves around the constant looking to the East West, 20.0 annually receives direct radiation. For the other two axes tracking systems is assumed that led to 30.0, the annual directs radiation concentrator for PV and other systems are electric heat and 40.0 of total exposure PV systems are to visitors to non-concentrating. Since the maintenance costs of solar systems, solar power is negligible, so the cost for other locations can be compared based on the annual radiation on the collector is directly taken from fixed tables or done, achieved. However, this is an approximate calculation because the performance depends on solar radiation and local temperature [2-6].

It is important to consider the vital differences between different types of systems. The concentrating systems (which only use the direct incoming radiation) and from the systems that operate with high thermal inertia notice more influenced by variable weather such as clouds of withdrawal, compared to constant low temperature heating systems or a PV system. In the conditions of changing solar radiation, the thermal systems suffer more from the efficiency wastage because the thermal waste is a constant value without considering the received radiation and the efficiency of such systems damage more comparing to PV systems in no complete process condition.

The thermal systems that use a thermodynamic cycle for converting the thermal energy to electrical energy suffer from the waste of energy, such as power plants with regular fuel and their efficiency cycle for concentrating systems with high temperature is between 20 to 40%. In addition, in desert, areas to the radiation received its highest reaches; water-cooling may be very limited. PV systems convert electricity from alternating to direct current with only a very slight loss of energy and water are only occasionally the modules need to be washed.

Through thermal systems, compared with fixed systems, or for applications with PV concentrator capacity over 25% (non-focus system with two central track, over 35%), they have the advantage. Thermal energy storage using insulated tanks only costs a little more capital for thermal systems and there will be reduced energy costs. However, the equivalent battery system for energy storage PV systems demands a significant additional cost and efficiency of the whole system is considered a deficit. The difference between direct electrical systems and electric heating costs much lower than the Bt cost per kilowatt hour compared to the tank batteries and other devices thermodynamic coefficient of better use in a thermal storage system [5, 7, 12, 14].

CONCLUSION

The heat stored can be kept only for a relatively short time. However, the battery can keep its charge for a long time. It is important to remember that in a solar system there is a direct link between the capacity of design coefficient and capital costs, which is different from the regular systems that can burn more fuel by using the same existing machines in power plant and increase their inconsistencies. Although the supporting fossil-fuel heaters can be used to continue the work of heating systems at the time when there is less radiation of the sunshine, these current heaters using fossil fuel normally show a brief increase in capital costs but they are important for a general trade success because they ensure the constant capacity of production.

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