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A Review on Future Technology Development on Solar Power of Agriculture, Residential and Industrial

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Abstract- The objective is to address both technical and financial aspects of an industrial and agriculture, residential solar system The development of novel solar power technologies is considered to be one of many key solutions toward fulfilling a worldwide increasing demand for energy. Second, the effects of significant financial factors such as capital cost, utility rebates, federal tax incentives, state tax incentives, inflation rate, maintenance cost and feasible revenues on financial payback of a residential solar system are considered.

Keywords:- Grid, Solar, Solar Energy, Solar Radiation, Solar power

I. INTRODUCTION

Installation of grid-connected solar photovoltaic system (PV), has been tripled between 2000 and 2008 [1], but still represents a very small part of overall U.S. electricity generation [10]. Countries such as Germany and Japan are the leaders in solar usage despite a large growth in solar energy in US [9].

A study by National Renewable Energy Laboratory indicates that photovoltaic (PV) modules covering 0.4% of U.S land area could supply all of the nation's electricity assuming intermediate efficiency [2].

Tax rebates, government incentive programs, utility payback policies and education are significant factors to encourage the homeowners to utilize a proper sized residential solar system. Beside environmental advantages, energy independence can be accessed by providing feasible incentives and net metering programs which is a result of sharing extra energy and compensating customers in demand reduction [3,5,4].

Investments in solar PV capacities are now rapidly growing in both grid connected and off grid mode. Solar generation has been a reliable source for supplying electricity in regions without access to the grid for long. However, the penetration of solar energy as a grid connected power source has increased significantly only in the last decade. Thus the overall share in net energy generation still remains low at only 1% (2015) globally and is bound to only increase in future.

Costs of energy production are continually falling, technology is improving and a diverse and growing range of applications are open to the solar energy sector.

Hence, solar energy is going to be a competitive energy or power source in future with huge investments being drawn into this segment.

Competitiveness can be a challenge where energy storage is required to address the demand, as energy storage technologies are a little behind in learning curve, and commercial acceptability is yet to be achieved.

Though, there are many locations where grid peak is experienced during solar generation hours (day time), so broadly, solar power is currently very competitive.

II. SOLAR ENERGY PRINCIPLES

The first question for solar users is "How much of the available solar energy can be converted to electricity in my location. A photovoltaic (PV) module converts sunlight to direct current (DC) electricity. PV module ratings are listed for standard test conditions (STC). STCs are 1,000 W/m2 solar irradiance and 25°C PV module temperature [7].

A 4 kW PV system corresponds to a PV array area of approximately 35 m2 (377 ft2) [11]. PV output power is function of various factors, which that significantly impact the output generated power. These factors are listed as follows:

- Geographical Location
- Shading Residential Solar Systems:

Technology, Net-metering, and Financial payback Tilt angle and Orientation, Material/Technology of the PV panel, Efficiency of Non-PV modules A. Geographical Location Energy output of PV panels is highly dependent to their location.

For example, solar panel in California will produce more energy than the identical one in Illinois. More irradiance results in more electrical energy production [8].

Therefore, if you are located closer to the equator, more electric energy can be produced than someone located further north or south with the same size system [18]. The optimal location for solar radiation can be determined using a "Solar Pathfinder" [8, 9]. B. Shading PV modules energy output is highly sensitive to shading [7, 8]. The PV module output can be decreased to 20-30% of its rating if panel is shaded as much as a leafless tree branch [7, 8].

In a 20-30 years plan for installation of a solar system, young trees should be considered [7, 8, and 10]. The map in Fig. 1 shows the amount of solar energy in hours, received each day on an optimally tilted surface during the worst month of the year for the United States of America [10]. Fig. 1. United States solar insolation map [10] C. Tilt Angles and Orientation For a fixed PV array, the angle from horizontal of the inclination of the PV array is called the tilt angle [7] (0° = horizontal, 90° = vertical) as shown in Fig. 5. To maximize the annual energy production for fixed PV panels, the following rule of thumb is suggested to adjust the tilt angle [8]

The supporting policies for solar PV technology in agricultural sector, industrial sector and residential sector in different economies.

As an emerging industry, the fast development of photovoltaic technology, including the extension of installation capacity, rapid cost reduction, are all highly rely on the various industrial supporting policies from different economic parties. Thus, the solar power generation industry is a policy-sensitive industry, changes in government subsidies are critical to the impact of solar industry.

However, The same supporting policies in different economies could also lead to different effects according to the condition of different economies, and the regulations need to be established based on the local circumstance thoroughly.

The development status of solar industry in the past decade demonstrate the major supporting policies launched in active market.

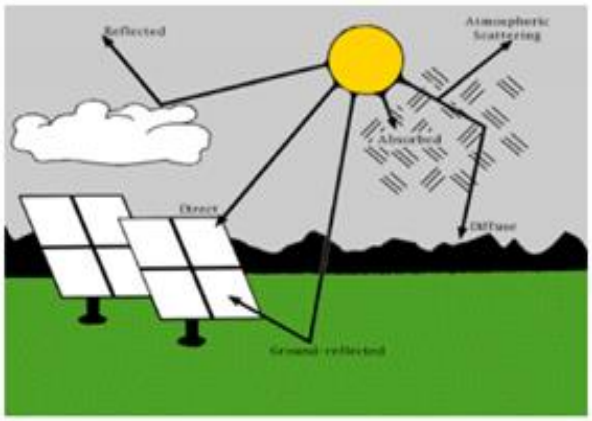

Fig 1. Illustration of Solar Radiation.

III. METHODOLOGY

Motivation The main objective of this research was to perform a technical as well as economic analysis of new solar PV technologies for residential sector in United States. It is proposed in this research that installing off-grid or on-grid solar PV technologies for the residential industrial and agriculture sector will not only increase the PV penetration level in U.S., but it will also help in electricity cost savings and environmentally responsible electric generation.

The findings presented here are part of a larger body of research considering the social acceptance of residential and industrial and agriculture solar energy

in Western Australia and USA, from the perspective of community, industry and government stake holders.

The research sought to examine the difference in solar experiences between two regional communities, one with access to a regional isolated network and with an informal solar community organization (Carnarvon, Western Australia) and the other with access to the large South-West Interconnected System and without an informal solar community organisation (Narrogin, Western Australia).

These two regional communities had similar populations, industries and proportions of rental accommodation at the 2011 census.

The research methodology is consistent with that undertaken by Vikas et al. [9], who researched the drivers, enablers, barriers and solutions to community renewable energy projects.

In order to gain an understanding of perceptions of the development of socio-political, market and community acceptance of renewable energy, stake holders with socio-political (government and public sector), market (renewable energy industry, network operator and renewable energy advocate), and community-based experiences were interviewed.

IV. AGRICULTURE ASPECTS

Solar greenhouse by utilizing the rooftop of the agriculture greenhouse, no extra ground field needed and zero impact for the soil land, which can preserve the precious farming land resources.

Firstly, the greenhouse can also select location based on the condition of the soil land, for the wasted or the water evaporation fast areas under strong sunlight, are normally difficult to be developed as agricultural farm land and no other better utilization solution. To construct solar greenhouse on such area can solve the land utilization issue.

Secondly, since the plants in the solar greenhouse need to be decided following the professional institute instruction and market demand, which is more business effective compare to the individual farmer family activities, thus, farmers could concentrate on the solar greenhouse to conduct agriculture and marketing activities, from sales company and develop online business platform, to improve the value-add and modernization of agriculture business.

1. Solar Aquaculture:
Similar to the solar greenhouse, solar aquaculture also need consider the best utilization method for the land field at the first place. And then to select the most adaptable aquaculture product based on the research on the local climate and water conditions.

2. Solar Pump:
Solar pump are mostly applied in the rural area that without sufficient power supply and transportation. It difficult to maintain due to the limited project scale and cost consideration.

Fig 2. Village level solar power generation system.

V. INDUSTRIAL ASPECT

New materials and manufacturing methods for solar PV In the coming years, the solar photovoltaic industry will be focused on developing high stability photovoltaic devices and manufacturing methods that enable commercial-scale PV module technology with the following characteristics: Very low capital intensity (EUR 0.25 per Wp per year within 2025) High conversion efficiency (20% within 2025) Excellent environmental profile, reducing the production of harmful materials.

Long module lifetime (35 years) and low degradation (0.3%/year) with the solar PV industry currently heavily dependent on silicon, research has gone into the development of solar cells from new materials. For industrial mass production, fossil fuels became the weapon of choice, fuelling needs of people and countless wars throughout the 20th century. Solar

energy only became interesting when man started exploring space. As it is not viable to take along massive amounts of fuel into space, solar collectors in the form of sails were used to harness energy in space.

Although heavy investments for faster development were made, it took decades for domestic solar panels to reach the current effectiveness's of around 20% of turning sunlight into energy. Especially the 1970's were the real beginning for solar energy, as technological improvements initiated a massive price drop. Nowadays, solar panels are 99% cheaper than they were before 1970.

Many governments offer energy feed-in tariffs, and other renewable energy investment schemes that make solar technology accessible and more tempting to an increasing number of households. Every new technology brings new opportunities for business. Tesla and Panasonic are already planning a humongous solar panel manufacturing factory in Buffalo, New York.

Tesla's Powerwall is already one of the most popular domestic energy storage devices in the world. The big players aren't the only ones benefitting from the solar energy boom. There is likely to be a lot of demand for real estate. Landowners and farmers can lease out their land for the construction of new solar farms. Demand for medium voltage cable could rise since solar farms will need to be freshly connected to the grid. All the new opportunities will drive prices lower and drive the tech further.

VI. RESIDENTAIL ASPECT

1. Energy Storage:
Make room for better energy storage and find out various methods for storing the electricity generated by solar power. Implementing net metering in more states would help in better distribution of solar power. Also innovations in technology that offer better quality batteries for home solar installations should be promoted.

2. Better Financing Options:
To promote solar energy, government is providing soft loans at low interest rates, offering tax benefits and subsidies for solar installations. This should be taken a step further by offering tax free solar bonds which would install confidence in investors. Upfront price of solar installations is the biggest deterrent and providing easy financing can help overcome this bottleneck. India has a clear plan, goal and resource to become the solar super power. All we need now is to make our small contributions by adopting solar energy in our daily lives. With right policies, government will and aid, India will not only become power reliant but would also lead the global solar revolution.

Fig 3. Family level solar power generation system.

By decentralizing and phasing out conventional energy subsidies, emphasis can be laid on generation and usage of renewable energy.

The current solar power generation can be boosted significantly by educating the masses and promoting solar installations for every home. Large solar plants need free land which can be used to set up solar panels extensively.

Government should come forward and allot free land especially in the desert areas which are otherwise wasteland but ideal for solar power generation. Given the average number dwelling units in a typical neighbourhood in the outskirts of Cairo as of 70 units, the following electricity saving solutions will be implemented;

The Need for 8 panels* 70 homes= 560 solar panel.

Average saving of 300 K watt* 70= 21,000 K watt per month.

Thus, the economics of use of such solar panel units (fig. 3) will be of great value for both the government to sustain clean electricity production as well as dwellers who will benefit from the reduced monthly consumption.

Fig 4. Applications of Solar Panels Installation in Sheikh Zayed, Author, 2016.

VII. CONCLUSION

The paper explored the efficiency of creating energy in atypical In Industrial and residential and agriculture.

The use of the solar panels system on a wide range can lead to a considerate energy saving way for the challenges facing governments, especially in the developing world. It is highly recommended to implement further future research on the economics and design potentials associated with the spread of the system.

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