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Socio Economic Barriers Related to Solar Energy Use

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Abstract: Solar energy has experienced phenomenal growth in recent years due to both technological improvements resulting in cost reductions and government policies supportive of renewable energy development and utilization. This study analyzes the technical, economic and policy aspects of solar energy development and deployment. While the cost of solar energy has declined rapidly in the recent past, it still remains much higher than the cost of conventional energy technologies. Like other renewable energy technologies, solar energy benefits from fiscal and regulatory incentives and mandates, including tax credits and exemptions, feed-in-tariff, preferential interest rates, renewable portfolio standards and voluntary green power programs in many countries. Potential expansion of carbon credit markets also would provide additional incentives to solar energy deployment. Despite the huge technical potential, development and large-scale, market-driven deployment of solar energy technologies world-wide still has to overcome a number of technical and financial barriers. Unless these barriers are overcome, maintaining and increasing electricity supplies from solar energy will require continuation of potentially costly policy supports.

Keywords: PV, NSM.

INTRODUCTION

In this paper, we review the nontechnical obstacles to solar energy use. Specifically, we draw on recent literature to help identify key barriers. A broad literature search yielded more than 25 references, which we narrowed to 10 recent documents on nontechnical barriers to the use of solar energy and other energy efficiency and renewable energy technologies.

The following were the most frequently identified barriers:

- Failure to account for all costs and benefits of energy choices.
- Lack of adequate codes, standards, and interconnection and net-metering guidelines.
- Poor perception by public of renewable energy System.
- Inadequate workforce skills and training Aesthetics.
- Lack of stakeholder/community participation in energy choices and solar projects.
- Lack of government policy.
- Lack of information dissemination and consumer awareness about energy.
- High cost of solar energy technologies compared with conventional energy.
- Difficulty overcoming established energy systems.
- Inadequate financing options for solar projects.

METHODOLOGY

To identify the relevant literature, we conducted key word searches in a number of databases:

- World Wide Web (Google), limited search
- Information Sciences Institute (ISI) Web of Science.

We use certain general strategies to search the databases, although each database required slight variations in search technique based on its structure.

We then narrowed the full list of references based on the following criteria:

- Documents focusing on technical barriers to solar energy and other technologies (e.g., inability to make high-efficiency photovoltaic cells on low quality material) were excluded.
- Documents related to developing countries (e.g., India and Bangladesh) were excluded, because these countries have considerably different market conditions compared with industrialized countries like the United States, hina.
- Documents related to industrialized countries other than the United States were included but only when the barriers discussed were not too country-specific, i.e. barriers had to be general enough to apply to technical issues.
- Documents were limited to those that had a specific purpose in the identification of multiple barriers and performed this task via explicitly identified information-gathering and analytical methods and sources.
- Documents that generated a list of barriers based solely on review of past literature were excluded. Included documents had to contain some form of original esearch or analysis.

HISTORY OF SOLAR ENERGY

The discovery of photovoltaics happened in 1839 when the French physicist Edmond Becquerel first showed photovoltaic activity. Edmond had found that electrical current in certain materials could be increased when exposed to light.

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The first patent for a motor running on solar power and continued to improve his design until about 1880. Adams began construction in late 1878. By gradually adding 17-by-10-inch flat mirrors and measuring the rising temperatures, he calculated that to generate the energy necessary to produce steam pressures high enough to operate conventional engines, the reflector would require 72 mirrors.

In 1885, Tellier installed a solar collector on his roof similar to the flat-plate collectors placed atop many homes today for heating domestic water. The collector was composed of ten plates, each consisting of two iron sheets riveted together to form a watertight seal, and connected by tubes to form a single unit. Instead of filling the plates with water to produce steam, Tellier chose ammonia as a working fluid because of its significantly lower boiling point.

By 1889 Tellier had increased the efficiency of the collectors by enclosing the top with glass and insulating the bottom.

In 1904, confident that his design would produce continuous power, he built two plants, a 6-horsepower facility in St. Louis, Mo., and a 15-horsepower operation in Needles, Calif. And after several power trials, Willsie decided to test the storage capacity of the larger system.

Physicist Albert Einstein clearly described the photoelectric effect, the principle on which photovoltaics are based. In 1921 Einstein received the Nobel Prize for his theories on the photoelectric effect.

In 1954 , 6% efficient photovoltaic (PV) solar cell was developed at AT&T Bell Labs with a remarkable characteristic: It could convert sunlight into enough power to run household electrical equipment. The cell relied on silicon, an element found in sand; silicon converts the sun's energy into electricity. As with many cutting-edge technologies, early PV efforts were extremely costly, limiting their use initially to such small applications as wristwatches and calculators — or to such large endeavors as NASA's space program, which used PV cells for spacecraft and satellites. Gradually, solar power has been entering the residential market: Since the 1970s, when the first PV system for a residence was installed, there have been 150,000 PV installations.

Today researchers have developed cells with more than 20% efficiencies. 20% efficient means that out of the total energy that hits the surface of a solar cell, about 20% is converted into usable electricity.

PRESENT SCENARIAO OF SOLAR ENERGY IN INDIA

"Energy prices in India are climbing , and supplied, while growing, is not keeping pace withsteep demand. Solar power , despite initial challenges, is becoming a multibillion-dollar opportunity."

Solar will become a crucial component of India's energy portfolio in the next decade- perhaps more so than it is in most other countries. We believe a solar market can develop fairly, quickly going from nothing to several billion- dollar solar- centric firms within a decade.

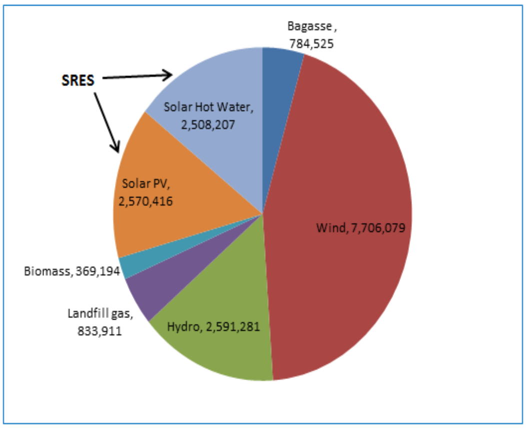

Figure 1: Comparison between various types of renewable energy.

THREE ELEMENTS TO WINNING IN SOLAR

"Global procurement is unlikely to remain a differentiator as more player achieve scale and become adept at it. Creating value in the Indian market, therefore requires efficient execution, financing and localization."

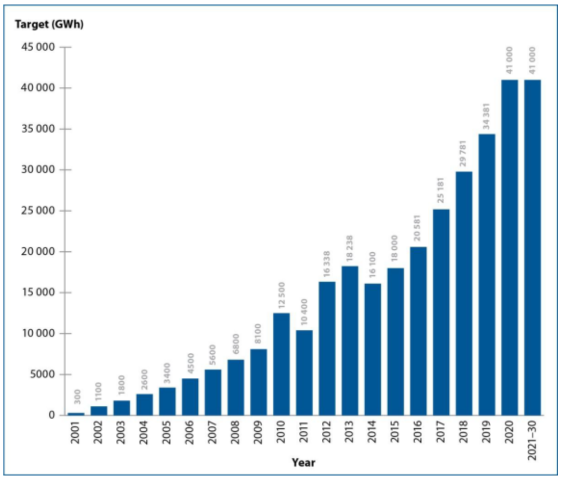

Figure 2: Showing increasing solar energy demand.

IDENTIFICATION OF NON-TECHNICAL OBSTACLES

Here is a list of the most frequently identified nontechnical obstacles to use of solar energy technologies:

- Lack of government policy supporting solar Energy.
- Lack of information dissemination and consumer awareness about solar energy.
- High cost of solar energy compared with conventional energy.
- Difficulty overcoming established energy systems.

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- Inadequate financing options for solar projects.
- Failure to account for all costs and benefits of energy choices.
- Inadequate workforce skills and training.
- Lack of adequate codes, standards, and interconnection and net-metering guidelines.
- Poor perception by public of renewable energy system aesthetics.
- Lack of stakeholder/community participation in renewable energy choices and projects.
- Lack of communication in industry.
- Safety issues.
- Lack of trust in utility, installer, system.

DESCRIPTION

Lack of government policy supporting solar energy- This includes the lack of policies and regulations supporting development of solar technologies and the presence of policies and regulations hindering energy development and supporting conventional energy development. Examples include fossil-fuel subsidies, insufficient consumer-based energy incentives, government underwriting for nuclear plant accidents, and difficult zoning and permitting processes for renewable energy.

Difficulty overcoming established energy system- This includes difficulty introducing innovative energy systems, particularly for distributed generation such as PV, because of technological lock-in, electricity markets designed for centralized power plants, and market control by established generators.

Failure to account for all costs and benefits of energy choices- This includes failure to internalize all costs of conventional energy (e.g., effects of air pollution, risk of supply disruption) and failure to internalize all benefits of energies (e.g., cleaner air, energy security).

Inadequate workforce skills and training- This includes lack in the workforce of adequate scientific, technical, and manufacturing skills required for energy development; lack of reliable installation, maintenance, and inspection services; and failure of the educational system to provide adequate training in new technologies.

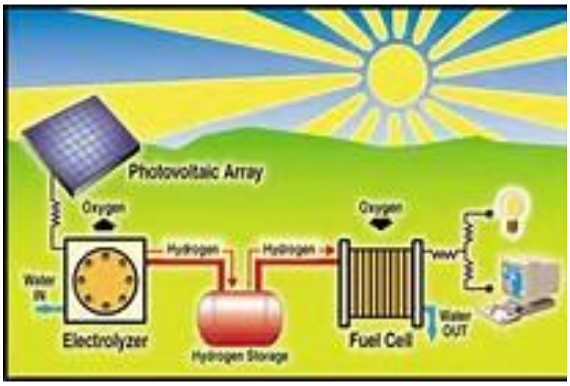

Figure 3: Block Diagram showing generation of solar energy.

FUTURE SCOPE OF SOLAR ENERGY

Innovation in solar technology continues to improve efficiency, size and cost, making it more pervasive throughout society. The trend is leaning toward incorporating solar into more buildings beyond panels placed upon the roof. Cool applications include: solar shingles**,** solar film**,** solar roadways**,** and solar windows. Other innovations being explored are: the solar orb, solar cars (commercially available), solar balloons, nano wires, and working with the infrared spectrum. As the manager of the Green Mountain Energy Sun Club, these advantages in solar technology is the growing part of pollution-free resource will provide in our lives.

Solar is one of the fastest-growing industries in America, and other devloping countries employing 110,000 workers and generating an estimated 12.5gigawatts (GW) of clean electricity – enough to effectively power 2 million homes. Installed solar capacity continues to grow as the cost of going solar drops.

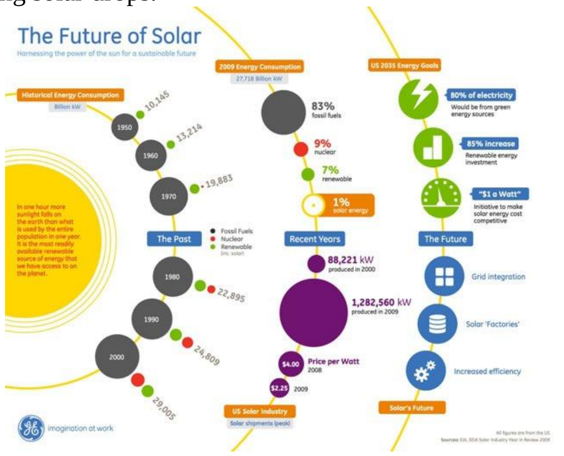

Figure 4: Showing utilization of free solar energy present in the nature.

GOVERNMENT RUNNING POLICY IN INDIA

The Jawaharlal Nehru National Solar Mission was launched on the 11th January, 2010 by our former Prime Minister, Dr. Manmohan Singh. The Mission has set the

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ambitious target of deploying 20,000 MW of grid connected solar power by 2022
and aims at reducing the cost of solar power generation in the country through :

(i) Large scale deployment goals.
(ii) Aggressive R&D; and
(iii) Domestic production of critical raw materials, components and products. It has been envisaged to achieve grid tariff parity by 2022.
(iv) Long term policy.

The Prime Minister has emphasised the importance of the mission as:

"The importance of this Mission is not just limited to providing large-scale grid connected power. It has the potential to provide significant multipliers in our efforts for transformation of India's rural economy. Already, in its decentralized and distributed applications, . The rapid spread of solar lighting systems, solar water pumps and other solar power-based rural applications can change the face of India's rural economy. As a result, the movement for decentralized and disbursed industrialization will acquire an added momentum, a momentum which has not been seen before."

The objective of the Jawaharlal Nehru National Solar Mission is to establish India as a global leader in solar energy, by creating the policy conditions for its large scale diffusion across the country as quickly as possible. For this purpose, the Mission has adopted a 3-phase approach: the 11th Plan and first year of the 12th Plan (2012-13) has been considered as Phase 1, the remaining 4 years of the 12th Plan (2013-17) are included as Phase 2, and the 13th Plan period (2017-22) is envisaged as Phase 3.

The first phase of NSM focused on capturing the low hanging options in solar: on promoting off-grid systems to serve rural populations and a modest capacity addition in grid-based systems. Now, in the second phase, an aggressive capacity ramp-up is targeted.

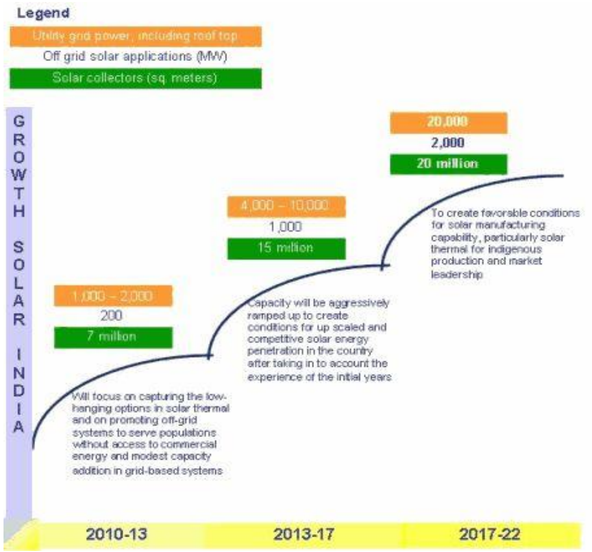

Figure 5: Showing solar energy demand by the use of Jawaharlal Nehru National Solar Mission Project

PERCEPTION ON INCREASING SOLAR ENERGY USE

In this paper, we reach to some conclusions that can make best utilization of free energy abundantly present in the nature.

By following certain ways, we can make huge use of solar energy in the form of electrical energy:

- ***By Using Solar Tree :*** A solar tree is a decorative means of producing solar energy and also electricity.it uses multiple number of solar panel which forms the shape of a tree the panel are arrange in a tree Fashion in a tall tower/pole.

Figure 6: Showing Solar Tree.

As the figure depicts the generation of energy using solar tree, we reach to some conclusions:

1. For the tradition system, we require large size of land. For example – to generate 2MW power from a PV module, we require 10-12 acres of land for housing of panel only.
2. For the same amount of energy, we require only 0.10-0.12 acres of land in case of solar tree.

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- ***Solar Mobile Body :*** Instead of using plastic or mettalic mobile body, if we use solar or PV body by which we can enhance the battery and also save energy.
- ***Awareness Camp By Government .:*** Many of the people are not aware about the use of renewable energy or the uses of solar energy, so there is a great need to create awareness following the government camps.
- ***Compulsary Awareness Project For College Students :*** *During* higher studies, a compulsory project must be given to the students, so that that they can take survey and opinions of the people of different areas regarding solar energy use.
- *Subsidity to those who are using Solar Energy*.
- *Major Advantage is fuel which is abundantly present in nature.*
- *Installation of solar power plant in rural areas*.
- *Connection of solar power station to transmission lines.*

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