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A review on: Necessity of solar awareness among people and techniques to promote use of solar energy

Abstract

Solar energy is the cleanest form of energy which can be generated without burning of fossil fuels or radiation of hazardous gases. Sun rays are available in abundance which can be tapped free of cost for generation of solar energy. Today the world is making tremendous efforts to save the environment as well as energy by making use of renewable sources of energy such as wind energy, solar energy, tidal energy, hydroelectricity etc. Number of policies and strategies are developed across globe to promote solar energy. But framing of policies is not enough as one has to bring awareness among the general public towards utilizing solar energy. Due to several barriers people hesitate to use solar applications in spite of the fact that they understand the benefits of using solar energy. It's very important to motivate people to make use of solar panels for generating electricity, solar cookers and water heaters for domestic purpose. In this paper efforts are made to highlight the work of several authors who has worked towards creating solar awareness in different countries, studied the perceptions of citizens towards the use of solar and different techniques adopted to motivate people. From the study it is understood that merely making solar policies is not enough but it has to be implemented successfully and its benefits has to reach to the masses.

Keywords: Solar energy, environment, solar awareness, policies, motivate

1. Introduction

Solar energy is the cleanest form of energy. Sun rays are available in abundance. Solar energy can be converted into electrical energy without emissions and pollution. Sun rays are available free of cost. To save the environment it is essential to make use of renewable energy at the most. Today people have recognized the importance of solar energy and are ready to adopt them. But there are certain barriers in the adoption of solar energy such as heavy cost of installation, lack of awareness and knowledge regarding the technology. Several government policies and incentives are introduced across the world to enhance the use of solar energy. Despite the policies, it is observed that people are not aware about the incentives, benefits, programmes introduced by government for the people. So it is the time to create awareness for solar energy among the public.

This paper focuses on necessity of awareness and what are the ways to create awareness. There are various concerns and misconceptions of the general public regarding use of solar energy. It is essential that the misconceptions of the people towards use of solar should be addressed properly and correct solutions and

information should be given to them. This paper is a review of papers that focuses on the above said problem of solar awareness among the general public. Initially it is discussed as what are the concerns and misconceptions of people towards solar and how current and correct information is to be provided to them. Later on various techniques are mentioned on how to create awareness with the help of solar mapping, brochures and pamphlets on solar information, solar websites, solar curriculums, solar demonstration projects, expert partnerships etc.

For any action to be initiated it is required to motivate people. In this paper we have also discussed on the role of motivation in encouraging people to invest in renewable energy for generating electricity. It states that there are different types of goal frames such as goal to gain more money, goal to feel good and happy, goal to do something good for the society, behave ethically and morally. If we are able to motivate people for fulfilling these goals with the help of renewable energy it will be of immense help in promoting use of renewable energy.

To make solar products popular it is important to commoditize these products. How to make solar products popular is a matter of study and innovations. Here we have also discussed the ways and means to popularize the solar products. Finally an effort is made to narrate the work of Grameen Shakti organization in Bangladesh. Grameen Shakti is an organization working towards promotion and marketing of renewable energy in rural areas of Bangladesh. They are also launching various financial schemes to promote purchasing of solar home systems.

2. Common Concerns and Misconceptions of Solar Energy [1]:

For implementing solar policies, it is important to understand the barriers or perceptions of utilizing solar energy by a common man. There are various misunderstandings or misconceptions of people towards using solar energy for generating electricity. The officials or the agencies who are responsible for promoting solar energy has to understand the barriers or misconceptions of people and try to remove them. Their curiosity or questions should be answered satisfactorily to increase their interest towards acceptance of solar energy. Various misconceptions are:

1. ‘We don’t have much solar radiation in our area to produce solar energy.’

2. ‘Solar is very expensive to be installed at home.’

To solve this problem various ways can be suggested such as

i) Collective purchasing programs should be conducted to reduce cost
ii) Financing schemes should be made available
iii) Making use of power purchase agreements (PPA’s)
iv) Co-operative Solar farms should be initiated which involves number of persons and saves Money.

3. ‘Solar energy is still under development. Let’s wait for few years to install advance technology’

4.’ Glare from solar panels will be annoying to neighbors and drivers’

Solar panels do not reflect rather absorb radiation. It is constructed of dark-colored material and covered with antireflective coatings

5. 'Solar Panels are manufactured with toxic metals that could contaminate installation sites and pollute land after discarded

The solution to these problems can be addressed by different ways such as recycling of solar panels is easily done after completion of their lives. Many manufacturers have take-back programs to carry your solar panels after the completion of life. Only few solar panels have toxic chemicals which pose less threat of site contamination.

6. 'Solar is only for environmentalist'

Solar is not a matter of concern for the environmentalist to prevent green house gas emissions and mitigating climate change but it also saves money on electricity costs. It is safer and abundant source of clean energy.

3. Strategies for Community Engagement [1]:

It is the role of solar energy planners to inform the local residents or the common man about advantages and policies of solar energy. It is necessary to create awareness and educate people for solar energy development. Various tools and strategies that can be considered for promotion are:

3.1 Solar fact sheets, brochures or guides: Brochures or guide books should be developed to provide installation instructions of solar panels to the general public. It should provide all guidelines required to install solar panel and generate electricity. Various goals, policies ,incentives , programs regarding solar should be included in the guide books.

3.2 Solar Maps: Solar map is an internet based tool which educates and informs the user about the potentiality of generating electricity with the help of solar, of their property or open lands and provides information about the benefits associated with it. It is a user friendly tool which gives you instantaneous data with a minimal information of your street or home address , the potentiality of energy generation , cost of installation , cost saving through various incentives and rebates . Solar maps help government officials to determine the potentiality of different areas of their city to generate electricity and helps them to achieve their sustainability goals. It also informs the annual cost savings and reduction of CO_2 emissions that can be achieved by installing PV systems.

Installers can also make use of solar maps by targeting the areas with highest solar potential for their business. They can give advertisement on these sites displaying their services and pictures of their solar installations. They can also take certain tips from solar maps to provide maximum benefits to their customers.

Home owners and business owners can use solar maps for solar power potential of their property or business, they can educate themselves on cost of installation, financing options , maintenance requirements, potential energy savings, life expectancies and several other incentives.

Solar maps are innovative tools which are implemented in certain countries only. In India it is mostly used to determine the solar potential of different areas in the country to develop large solar parks by government. Use of solar maps should be increased to promote awareness among public for extensive use of solar energy to generate electricity and save environment.

3.3 Solar Websites: Websites should be created to provide information of solar energy for residents. These sites should provide links to solar information, resources, local policies, regulations, information on solar workshops or educational events, profiles of and contact information of local solar installers or information on local demonstration projects, financing incentives and permitting requirements.

3.4 Solar curriculums : Solar training on installations should be included in the education system. Teaching on solar energy should be initiated among young generation.

3.5 Solar Demonstration Projects: Various solar demonstrations should be organized for teaching purpose. Different solar panels are installed on government buildings , private industries which should be used for educational purpose. Real-time on line tracking of power generation can be taught through solar website in schools.

3.6 Partnership with Experts: Many cities have developed relationships with local experts in solar energy to help promote solar awareness in their communities. Experts can be non-profit organizations, local industry professionals or educators to provide information or educational opportunities on solar energy systems.

4. Role of Motivations for investing in renewable energy [2]:

As per the research conducted to promote use of renewable energy ,along with the advantages of decreasing energy cost and addressing to climate changes, hedonic motivations are also responsible for increasing use of renewable energy. Renewable energy production at the community level is very promising nowadays. It involves people in a community, in the neighborhood to invest in renewable energy technologies jointly and generate electricity. Individual motivations are responsible for adopting community based electricity generation using renewable energy such as solar energy. Different motivations associated with generation are

1. Financial: Save or earn money from low fuel bills and government incentives.
2. Environmental: Improve and save the environment.
3. Security of supply: Protection against future higher energy costs, making household more sufficient, protection against power cuts.
4. Impact on residence: Improve the feeling of atmosphere within my home , show-off to others on commitment towards environment.

Motivations can be divided into three groups as per the fundamental needs and desires they want to fulfill. People perceive every situation from different point of view according to the goal they want to achieve. There are three types of Goal-Frames:

1. Hedonic Goal: People get satisfaction if they achieve certain things. They feel better and comfortable. They get pleasure, happiness and can avoid negative situations. People feels satisfied if they are able to save the environment and contribute something good for the well-being of the society.

2. The Gain-Goal : It determines ones motivation to increase or protect resources. Due to this goal-frame people are more attracted towards incentives or opportunities which give benefits. So people who are environment conscious and also wants monetary benefits adopts renewable energy.

3. Normative-Goal: In this people behave ethically or morally. They want to meet the norms of themselves or community. So people are very much aware of environmental problems and like to adopt renewable energy.

All these goal-frames are adopted by people but any one goal- frame will become dominant as per the situation or perception of the people. So motivations for that goal-frame will be dominating and the other two goal-frames will be in the background supporting or weakening the dominant goal-frame.

4.1 Joint Investment in Renewable Energy:

People like to invest jointly in the community for generation of electricity with the help of renewable energy in order to reduce the transaction costs. Secondly community based programs can obtain permissions from government and local acceptance. Thirdly sharing of risk (failure of technology, changes in regulations) with others also attract people to invest jointly.

Other motivations apart from above said are based on norms and values. It is also called as joint production motivation. Motivations for realization of goals or meeting joint appropriateness standards are all preconditions for joint production motivation.

In renewable energy, improving neighborhood's conditions serves as a good example for others and supporting and strengthening local community are important reasons for participation. People join community projects as they don't want to be left out. Also collective action gives you pleasure, self-esteem, it can be exciting and creates good spirit. Further for doing something good, great in the community gives you immediate feedback and reinforcement from other members of society.

The researcher has examined motivations of people in two Dutch and two German communities to realize joint renewable investments to identify which goal-frame was dominant for joint investment decision. They got following results:

1. Mostly gain motivations were found and also normative motivations were also drivers for joint energy production and hedonic considerations were less important. The most frequent gain motivation in all cases was cutting energy cost. In many cases motivations were from independence from big energy companies and increasing fossil prices. Besides cost reduction, people were also motivated for earning some profit from investment. Figure 1.indicates different types of motivations prevalent in different cities.

2. Regarding normative goal-frame the protection of the environment was the most dominant motivation. Supporting development of renewable energy technologies was also included in the motivation.

3. Motivations in the hedonic goal-frame focused on an opportunity to know each other and gain new friendships.

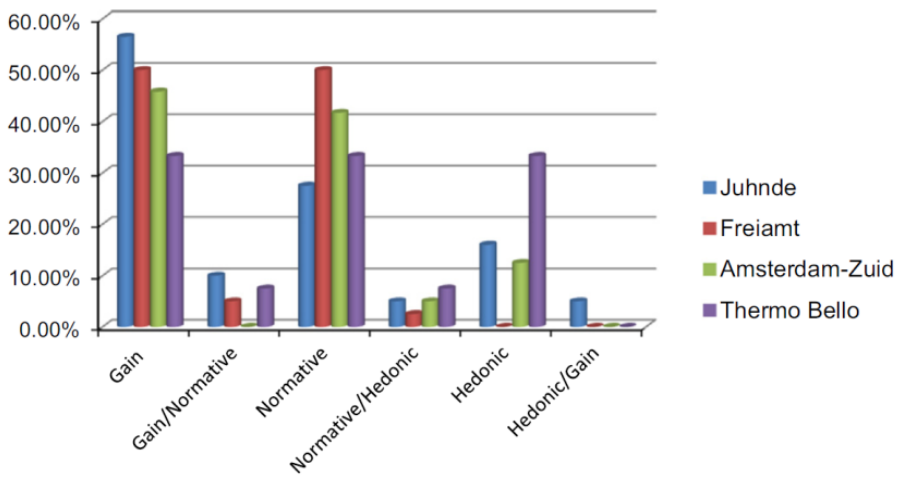

Figure 1. Motivation Chart [2]

5. Commoditization of solar product [3]:

A product is commoditized if following conditions are met :

1. Availability – The product is available in a range of standardized packages.
2. Accessibility – The product is backed by a wide network of suppliers and service providers.
3. Affordability- The product is available through easy financing.

Five elements need to be focused for commoditization of solar products:

1. Consumer awareness- Awareness about rooftop solar photovoltaic system.

2. Product attributes - Ability to power end-use loads, ability to supply electricity24*7, ability to provide backup power during outage, ability to reduce grid electricity consumption, ability to last for longer periods, safety.

3.Cost and Procurement - Availability of financing , ease of getting finance , options through EMI scheme , availability of third party insurance, availability of government incentives , ease of getting government incentives , competitiveness of unit cost of solar electricity from solar with grid electricity , ease of installation(network of suppliers and service providers).

4. After Sales service – Availability of annual maintenance contract from the system suppliers, ease of getting after sales service, availability of system recycle after end of life.

5. Policy and Regulatory – Existence of regulations for metering arrangement and connectivity standards regulations for energy accounting.

5.1 Barriers in commoditization:

1. High Cost: High investment in purchasing and installing the system is one of the biggest hindrance in the commoditization of solar products.

2. Limited Finance by Banks: Finance from banks is limited to certain extent only.

3. Lack of awareness: People are unaware about the information on solar energy, its installation, generation of electrical energy with solar photovoltaic system, government policies and incentives regarding solar generation, financial incentives given by banks etc. Bringing awareness is of prime importance to promote solar systems .

4. Limited standardized rooftop solar PV systems: Proper PV systems are not available easily everywhere.

6. Promotional Programs in Bangladesh [4]:

Grameen Shakti is an organization in Bangladesh which carries out various activities in rural areas of Bangladesh for promotion of utilization of solar energy. It is engaged in providing solar home system in rural Bangladesh. It offers easier financing schemes to the customers so that they can afford solar home system. It emphasizes on promoting and marketing of photovoltaic system for rural electrification and generation of income for the rural households. They also train technicians to install and maintain photovoltaic systems in order to create employment for local people. Training program includes

1. Transferring of technology and development of skilled technicians in rural areas.
2. Technicians will provide after sales service to solar home system buyers.
3. Technicians will educate rural people about renewable energy and popularize its use.
4. They also train customers in application and maintenance of photovoltaic systems.
5. Special training for women is also conducted by this group.

They also have research and development Programme to

1. Develop appropriate technologies
2. Developing ways to promote Renewable energy systems.
3. Innovate financial services for customers.
4. Developing and fabricating the solar accessories locally.

Grameen Shakti has introduced good financial schemes to increase the use of solar home system. They have also arranged demonstration at schools/colleges where engineers of Grameen Shakti describe the technology, its uses and preference. They make posters, leaflet, brochures, and videos of this Renewable energy system to make people understand better. They have advertised in national dailies to develop general awareness among the people about Photovoltaic programs.

7. Conclusion:

Energy use has become most important issue for common people relating to both environmental and economic reasons. Renewable energy is gaining importance nowadays. Solar energy is one of the cleanest form of energy. It should be tapped to reduce energy cost, green house gas production, dependence on fossil fuels. Government should play a vital role in the promotion of solar energy. Along with solar policies it is important to make people aware about different plans and policies regarding solar. They should know the incentives given by government to promote solar energy utilization. Various methods should be adopted to

promote solar such as solar websites, leaflets, brochures, solar mapping, solar curriculums. Training of the local people should be conducted for installation of solar systems so that people may find ease in installing the solar system.

Different awareness programs in schools/colleges should be carried out to make the young generation think about this field. Different projects on solar should be undertaken at the school or college level to give them on hand practice on solar technology. R&D should be there to develop solar technologies. Its high cost is a big hindrance in promoting solar systems. Methods and technologies should be developed to manufacture different solar devices, spare parts, accessories locally to reduce prices. People should be trained to provide after sales service so that the maintenance of the system can be done easily and the solar users do not find any difficulty in utilizing it.

In promotion program human behavior should be studied and such incentives should be offered which will motivate people to adopt solar. If the solar programs are designed in such a way which satisfies different goal-frames of a human-being, the person is properly motivated to adopt solar systems. Various strategies and tools for increasing public awareness will help communities to move towards greater sustainability.

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