



## Consumer Awareness of Solar Energy Products: A Study with Special Reference to Tirupur District

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### ABSTRACT

In India, Solar energy Products are launched mainly with the objective to create environmental awareness of mass power consumption and the need to conserve power using Solar energy Products. The major drawback of Solar energy Products is its high cost and space requirement to setup a device. Apart from these drawbacks, the customers must consider the fact that Solar energy Products are highly beneficial not only for the environment but also for human beings for its unique feature of infinite abundant energy. Though most people still prefer the usage of electrical

Products, the attitude of the customers is steadily changing owing to the current environmental hazards caused by the former and increasing in the awareness of solar energy. Hence, the present study examines about the customers attitude, preferences and their awareness about the usage of Solar energy Products in Tirupur district of Tamilnadu and their evolution in the market trend.

*Keywords*--Solar, Solar energy, Solar products and Energy conservation, Consumer awareness and preferences

### I. INTRODUCTION

Solar energy, radiant light and heat from the sun, is harnessed using a range of ever-evolving technologies such as solar heating, solar photovoltaic's, solar thermal electricity, solar architecture and artificial photosynthesis. A great amount of energy can be harnessed from the sun. The amount of energy reaching the Earth Surface every day from the Sun is far greater than the energy that of man needs for the foreseeable future. The key to using this vast source of energy is developing effective methods for collecting and storing this energy. Once this is done solar energy can contribute significantly to satisfying man's every growing energy requirements. The solar energy received has a range of frequencies and wavelengths from lower frequency (long wavelength) of infrared to the higher frequency radiation of ultraviolet. It is this higher frequency radiation, visible light and ultra violet light which can be harnessed to produced an electrical current and can be used for different gadgets for industry and domestic usage. With the increase of Literacy and Social Responsibility in people, the Solar Energy Products has increasing attention in the recent scenario. There has been many researches being conducted with the help of

Government funds and many industries have started manufacturing different Solar energy Products with the view of Electricity conservation and Eco-Friendly environment. Manufacturers such as Tata, Luminus, Goodsun and many other popular companies have come forward as the market pioneers in making of best quality Solar energy Products for both residential and industrial purposes there by taking the infinite Solar energy into Commercial terms too.

### II. REVIEW OF LITERATURE

Shamsun Naha Momotaz and Asif Mahbub Karim (2012), analyzed Customer Satisfaction of the Solar Home System Service in Bangladesh. In Bangladesh rural electrification through Solar Home System is becoming more popular day by day particularly for remote, inaccessible areas where there still exists no infrastructure for conventional energy supply. It presents an attractive alternative to conventional electricity such as no monthly bills, no fuel cost, little repair and maintenance costs, easy to install any where etc. Solar Home Systems have already made significant headway in Bangladesh. The present study made an effort to assess the customer satisfaction of

the Solar Home System service in Bangladesh by conducting the research. From the study it has been found that most of the consumers are found just satisfied with the Solar Home System service and there is little gap exists between expectation and perception of the consumers of the Solar Home System service in Bangladesh.

Valentina G (2014), explained the renewable energy potential, estimation and achieve of renewable energy in India and challenges of renewable energy power generation. She observed, India, estimated 150GW of renewable energy potential and other challenges is transmission and distribution of the power to far flung areas of the country and lower-cost scenario is based on developing low-diversity, low-cost renewable energy sources, while the higher-cost estimate is based on a renewable energy mix that is high diversity, including high-cost sources like solar. She concluded, Indian Government has increased its renewable energy target for 2020 from increased 4% to 15%, this achievement will be growing for renewable energy technology and contribution to India's energy mix sources of renewable energy

Ramesh Khanna (2010) made his study on "Solar panel powers two-stage lead acid battery charger" revealed that, the working of a solar panel powering two-stage lead-acid battery charger. A solar powered lead-acid battery charger can ensure that the battery remains fully charged over a wide temperature range. Solar or photovoltaic panels comprise multiple solar cells that connect in series. A solar cell has limited current generating and-carrying capability, which results in limited current carrying ability for the entire solar panel."

Gene R. Heinze and Fry (1986) in their study "The economics of home solar water heating and the role of solar tax credits" states that, the finances of home solar water heating, using flat plate collectors and a conventional water heater for backup, for 69 cities in 46 states. Natural gas is much cheaper than electric resistance heating in most areas, yet half the homes built in 1978-83 have electric heat, while only 40% use gas. Gas may be unavailable for new homes in many areas. So in this study solar/electric water heaters are compared to electric ones and solar/gas water heaters are compared to gas ones, using the cost difference between a solar/backup system and a conventional water heater."

### III. STATEMENT OF PROBLEM

Energy consumption is an indispensable activity in the daily lives around the world. Energy demand is shaped by multiple factors like climatic conditions, area of living, lifestyle of people, income levels and other socio-economic factors. Domestic energy requirements are associated with the usage of energy based appliances for air conditioning, cooking, lighting, refrigeration, water

heating and powering of widespread appliances. A major constraint in utilization of solar energy system is their high initial cost. The costs of solar or other renewable energy sources are considerably higher than that of utilizing conventional energy sources. This becomes a deterrent to most potential users for solar energy systems in India where capital relatively scarce and individual earnings are not high. The problem of the high cost of solar energy systems has to overcome through intensive efforts of technology development, materials and manufacturing innovation. The pattern of energy consumption in the household sector is determined by several factors. The factors that have a major impact on the amount of energy consumed by households and the fuels used include income, settlement size, family size, population density, price or personal costs of obtaining fuels, availability of and accessibility to modern fuels, and efficiency of equipment used. Most of these factors are interrelated and have major implications for the policies aimed at solving problems of household energy. In this context, pricing of conventional energy to the users do not reflect the real cost of introducing and distributing them, instead they are considering monthly electricity bills alone. Economic feasibility of utilization of solar energy products have to be necessitated to the consumers at a possible extends, bearing these problems the study is focusing attention towards consumers awareness marketing potential of solar products- a study with special reference to Tirupur District of Tamilnadu.

### IV. OBJECTIVES OF THE STUDY

1. To study the detailed demographic profile of the selected consumers of Tirupur District who uses solar energy.
2. To study consumers awareness towards solar energy and their willingness to switch over to renewable energies.
3. To offer valuable suggestions based on the findings of the study.

### V. RESEARCH METHODOLOGY

Research methodology refers to the way in which the research is conducted and how the data collection progressed. It typically involves a full breakdown of all the options that have been chosen, in order analyze consumers' awareness and market potentials. Also includes the procedures and techniques used to perform the research effectively, to evaluate market for the emerging renewable energies among the domestic consumer. Convenience sampling methods is used in this study and sample size is 50 respondents. Period of the study covered two years from June 2015 to June 2017.

### VI. ANALYSIS AND INTERPRETATION

Age	Frequency	Percent	Valid Percent	Cumulative Percent
Less than 25 years	14	28.0	28.0	28.0
25-35Years	13	26.0	26.0	54.0
35-45 years	15	30.0	30.0	84.0
45-55 years	6	12.0	12.0	96.0
Above 55years	2	4.0	4.0	100.0
Total	50	100.0	100.0	

From the table it is observed that there are 30% of the respondent fall in the age group of 35 to 45 years followed by 28 % of the respondents in less than 25 years category and only 4% of the respondent are above 55 years

of age group. So the sample is issued to all group of people to analyse their opinion about the awareness of solar products.

Gender	Frequency	Percent	Valid Percent	Cumulative Percent
Male	27	54.0	54.0	54.0
Female	23	46.0	46.0	100.0
Total	50	100.0	100.0	

It is clear from the analysis that there are 54% of the respondents are male and remaining are female who are selected for the study.

Educational Status	Frequency	Percent	Valid Percent	Cumulative Percent
No formal education	4	8.0	8.0	8.0
Upto HSC	8	16.0	16.0	24.0
Diploma	8	16.0	16.0	40.0
Under graduation	18	36.0	36.0	76.0
Post graduation	9	18.0	18.0	94.0
Professional	3	6.0	6.0	100.0
Total	50	100.0	100.0	

Table no: 3 From above table it is clear that 36% of the respondents have under graduation whereas 16% of the respondents have upto HSC and diploma qualification

and only 6% of the respondents are with professional background.

Occupational status	Frequency	Percent	Valid Percent	Cumulative Percent
Agriculturalist	3	6.0	6.0	6.0
Business man	11	22.0	22.0	28.0
Govt. employee	1	2.0	2.0	30.0
Non government employee	14	28.0	28.0	58.0
Professionals	5	10.0	10.0	68.0
Others	16	32.0	32.0	100.0
Total	50	100.0	100.0	

Table no: 4 Indicates that 28 % of the respondents are non government employees and 22% are business man and 10% of the respondents are professional employees.

Family monthly income	Frequency	Percent	Valid Percent	Cumulative Percent
Below Rs.10,000	3	6.0	6.0	6.0
Rs. 10,000-20000	13	26.0	26.0	32.0
Rs. 20000-30000	11	22.0	22.0	54.0
Rs. 30000-40000	9	18.0	18.0	72.0
Rs. 40000-50000	8	16.0	16.0	88.0
Above Rs. 50000	6	12.0	12.0	100.0
Total	50	100.0	100.0	

Table no: 5 Shows that 26% of the respondents family monthly income is Rs. 10,000-20000 and only 6% of the respondents falls in Below Rs.10,000 who are selected as samples.

Area of residence	Frequency	Percent	Valid Percent	Cumulative Percent
Urban	20	40.0	40.0	40.0
Semi - urban	19	38.0	38.0	78.0
Rural	11	22.0	22.0	100.0
Total	50	100.0	100.0	

Table no: 6 Indicates 40% of the respondents resided in urban area followed by 38% from semi urban area and only 22% of the respondents belongs to rural area.

Type of house presently living in	Frequency	Percent	Valid Percent	Cumulative Percent
Individual house	41	82.0	82.0	82.0
Semi detached house	6	12.0	12.0	94.0
Apartments	2	4.0	4.0	98.0
Others	1	2.0	2.0	100.0
Total	50	100.0	100.0	

Table no: 7 Shows that 82% of the selected respondents living in individual house whereas 12% of the respondents live in semi detached house and only 2 % of the respondents are others categories.

Number of electrical connections	Frequency	Percent	Valid Percent	Cumulative Percent
1 Connection only	37	74.0	74.0	74.0
2 Connections	10	20.0	20.0	94.0
More than 2	3	6.0	6.0	100.0
Total	50	100.0	100.0	

Table no: 8 From above table 74% of the respondents have only 1 connection whereas 20% of the respondents have 2 connections and 6% of the respondents have more than 2 connections.

Energy Conservation Techniques		Very High	High	Moderate	Low	Very low	total
Compact fluorescents light bulbs-twisty bulbs	No.	7	23	14	3	3	50
	%	14.0	46.0	28.0	6.0	6.0	100.0
Incandescent light bulbs with LED technologies.	No.	10	15	17	6	1	49
	%	20.4	30.6	34.7	12.2	2.0	100.0
Energy star labelled appliances	No.	6	11	20	10		47
	%	12.8	23.4	42.6	21.3		100.0
Green buildings	No.	4	12	18	10	3	47
	%	8.5	25.5	38.3	21.3	6.4	100.0
Appliances with automatic power off	No.	10	17	14	5	3	49
	%	20.4	34.7	28.6	10.2	6.1	100.0
solar appliances	No.	9	17	19	4	1	50
	%	18.0	34.0	38.0	8.0	2.0	100.0

Table no: 9 Shows that 20.4% of the respondents following Energy Conservation Techniques under Incandescent light bulbs with LED technologies and Appliances with automatic power off are has the highest

count and only 6% of the respondents falls under Compact fluorescents light bulbs-twisty bulbs which is the low among all the conservation techniques.

Level of Awareness -Solar energy appliances	Frequency	Percent	Valid Percent	Cumulative Percent
Very high	5	10.0	10.2	10.2
High	18	36.0	36.7	46.9
Moderate	20	40.0	40.8	87.8
Low	5	10.0	10.2	98.0
Very low	1	2.0	2.0	100.0
Total	49	98.0	100.0	
Missing System	1	2.0		
Total	50	100.0		

Table no: 10 Indicate 40% of the respondents are having moderate awareness about solar energy whereas 36% opined that they have high awareness on solar energy

products and only 2% of the respondents opined they have very low awareness.

Subsidy support from Central Govt	Frequency	Percent	Valid Percent	Cumulative Percent
Very high	6	12.0	12.0	12.0
High	16	32.0	32.0	44.0
Moderate	18	36.0	36.0	80.0
Low	7	14.0	14.0	94.0
Very low	3	6.0	6.0	100.0
Total	50	100.0	100.0	

Table no: 11 From above table 36% of the respondents got moderate Subsidy support from Central

Govt. and 6% of the respondents opined they got very low subsidy from the government for using solar products.

Impact of solar products		Strongly Agree	Agree	Neutral	Disagree	total
Solar energy is a good solution for environmental impact	No.	26	20	4		50
	%	52.0	40.0	8.0		100.0
Solar energy sources do not deplete natural resources	No.	17	19	14		50
	%	34.0	38.0	28.0		100.0
It is the safest energy to meet the present energy needs	No.	25	18	6		49
	%	51.0	36.7	12.2		100.0
No burden for future generations with energy crisis and an accessible energy for the future	No.	19	22	6	3	50
	%	38.0	44.0	12.0	6.0	100.0
Little or no carbon or other greenhouse gas emissions	No.	15	15	15	4	49
	%	30.6	30.6	30.6	8.2	100.0
Best alternate to the electrical energy	No.	16	25	6	1	48
	%	33.3	52.1	12.5	2.1	100.0
Reflecting the modern life style	No.	17	16	15	2	50
	%	34.0	32.0	30.0	4.0	100.0

Table no: 12 Indicates 52% of the respondents opinion about the Impact of solar products in Solar energy is a good solution for environmental impact and they all

belong to Strongly Agree category whereas only 2.1 % of the respondents are from disagree category.

Promotional Activity		Very high	High	Moderate	Low	Very low	total
Advertisement through mass media	No.	22	13	9	4	1	49
	%	44.9	26.5	18.4	8.2	2.0	100.0
Tax exemptions for the price of solar energy products	No.	11	24	9	4	2	50
	%	22.0	48.0	18.0	8.0	4.0	100.0
Incentives for even minimum volume of energy users	No.	15	18	8	6	2	49
	%	30.6	36.7	16.3	12.2	4.1	100.0
Free demonstration	No.	14	15	14	4	2	49
	%	28.6	30.6	28.6	8.2	4.1	100.0
Free exhibitions to be conducted to the public	No.	16	16	11	3	4	50
	%	32.0	32.0	22.0	6.0	8.0	100.0
Solar products to be provided as freebie by the government	No.	15	14	13	5	3	50
	%	30.0	28.0	26.0	10.0	6.0	100.0
Government has to offer soft loans to the public to purchase renewable/ green energy products	No.	9	19	15	4	3	50
	%	18.0	38.0	30.0	8.0	6.0	100.0

Table no: 13 From the above table 44.9 % of the respondents opined that promotional will be more useful if it is advertised through mass media and 48% opined that Tax exemptions for the price of solar energy products and

38% stated Government has to offer soft loans to the public to purchase renewable/ green energy products in high scale category.

## VII. SUGGESTIONS

**Price:** The price of the Solar Energy Products may be considerably reduced, so that the people from low income groups can also afford to buy the Solar Energy Products.

**Size:** The Solar Energy Products can also be made available in small size, as they consume a large space for setup.

**Awareness:** There should be awareness about the availability of the Solar Energy Products among the people hailing from different localities, especially Rural areas and people not with proper education who doesn't have proper awareness about use of solar energy.

**Installation charges:** The Installation charges of the Solar Energy Products must be made lesser so that the Customers need not worry about high Installation charges adding onto the original price of the Products

**Demonstration and exhibits:** Free demonstrations and Exhibit stalls can be given for the introduction of the Solar Energy Products, so that it increases the popularity of the products in the market easily.

**Varieties in products:** Many companies producing Solar Energy Products for commonly used Products like Water heaters, Chargers, invertors etc., can also make a step in producing Solar energized Products of Televisions, Mobiles, Computers etc., which are also commonly used by people in their day to day lives, so that they can widen their place in the retail market of Solar Energy Products.

**Suitability:** The Solar Energy Products should be made suitable for all climates and the power storage of the Solar cells needs to be increased more so they last longer.

**Government subsidies:** People must be made aware of the subsidies provided by the government on buying a Solar Energy Device and also the Government should take more steps in promoting Solar Energy Products in Other ways such as reducing tax etc.,

**Independent existence:** The Solar Energy Products should exist fully independent without having an alternate power of electricity and technology must be improved so that Solar Energy Products do not depend upon Electricity anymore.

## VIII. CONCLUSION

In all the business activities, it is the consumer who decides its existence in the market. Therefore, consumer is the "King of the Market". This statement did not go different for solar energy products also. In this fast moving world, the consumption of energy has been increasing in abundant amount and the customers have become more conscious about saving power and switching on to other sources of power like solar energy for their consumption. Therefore, in order to meet the customers need the business sectors should come with innovative yet cost-benefit and new techniques in the solar market as it not only attracts more number of customers and keeps the

business intact, but also increases the consumers responsibility towards the environment and eco-friendliness for securing mother earth. From this study, it can be concluded that Customer's attitude towards Solar energy products is definitely changing due to many valid reasons and also there has been a significant increase in the awareness and benefits of using Solar energized products over electrical products in Tirupur district of Tamilnadu.

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