

# A Study on Users Awareness and Attitude towards Solar Water Heater in Households Hisar



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### Abstract

Energy is a fundamental input to economic activity. Modern energy services are a powerful engine of economic and social development. In the case of the developing countries like India the energy sector assumes a critical importance in view of the ever-increasing energy needs requiring huge investments to meet them. The total energy consumption in India was 572 million tonnes in 2006, while the projected energy demand for future i.e. for 2031-32 is 1,818 million tonnes (Maithani, 2009). Energy in household sector is mainly used for lighting, cooking, water heating etc. Cooking and water heating use of energy for urban households is about 4,500 MJ/year whereas rural households use only 3,000 MJ/year (Sathaye *et al.*, 2009). Heating water dominates the energy needs of households sector. For households in developing nations, heating water is often the most energy intensive process, and therefore the most expensive and time-intensive. In order to reduce supply risk from energy sources with high price volatility such as oil, electricity and LPG, the government is encouraging more generation from renewable energy sources, such as hydropower and solar. Solar energy used for water heating is one of the potential solutions to this problem. The present study was conducted in hisar district, Haryana to check the users awareness and attitude towards solar water heater in households. In this paper the main focus is on usage pattern, working, care and maintenance of solar water heater. All the user families (100%) were using the solar water heating system as it is environment friendly followed by its mandatory by the government (72%), safe technology (62%). Majority of the families were satisfied with the cost and working of solar water heating system.

**Keywords:** SWH, Usage Pattern.

### Introduction

Energy is a fundamental input to economic activity. Modern energy services are a powerful engine of economic and social development, and no country has managed to develop much beyond a subsistence economy without ensuring at least minimum access to energy services for a broad section of its population. Throughout the world, the energy resources available to them and their ability to pay largely determine the way in which people live their lives. In the case of the developing countries like India the energy sector assumes a critical importance in view of the ever-increasing energy needs requiring huge investments to meet them. The total energy consumption in India was 572 million tonnes in 2006, while the projected energy demand for future i.e. for 2031-32 is 1,818 million tonnes (Maithani, 2009). Energy in household sector is mainly used for lighting, cooking, water heating etc. Cooking and water heating use of energy for urban households is about 4,500 MJ/year whereas rural households use only 3,000 MJ/year (Sathaye *et al.*, 2009). Heating water dominates the energy needs of households sector. For households in developing nations, heating water is often the most energy intensive process, and therefore the most expensive and time-intensive. Some households rely on biomass to heat water. In many countries demand for fuel wood is one of the principle contributors to deforestation. In order to reduce supply risk from energy sources with high price volatility such as oil, electricity and LPG, the government is encouraging more generation from renewable energy sources, such as hydropower and solar. Solar energy used for water heating is one of the potential solutions to this problem. Solar energy is clean and renewable. It doesn't emit carbon dioxide during operation. Solar energy is environment friendly as it has

zero emissions while generating electricity or heat. Prime Minister Mr. Narendra Modi said that his government is committed to accomplish the target of 1.75 lakh MW renewable energy including one lakh MW solar energy by 2022 (Financial Express 2015). Jawaharlal Nehru National Solar Mission, also known as the National Solar Mission (NSM), is a major initiative of the Government of India for addressing India's energy security challenge through harnessing of solar energy. Solar water heaters are also an integral part of the NSM (MNRE, 2010)

#### Review of Literature

Panapakidis (2000) reported that most of the British respondent were aware of solar water heating systems and the main source of gaining information was Internet. More than 50 percent of the Greece respondents obtained information related to solar water heating through Internet. The main source of information for Greece respondents was advertisements on T.V and radio (58%) and seen installed on house roofs (87%). Nearly 30% in both countries have been informed through magazines. The basic reasons for not considering a SWH was the weather. Laakso (2011) reported that majority of the users (67%) were found to be positive and benefitted from having the solar water heater. It was observed that 41 percent saved electricity and other fuels (5%) and money (15%). The most common activity needing hot water was bathing. Hot water was also needed for washing dishes and cleaning the house. All the households heated water at home during summer and winter. The need to heat water was though less in summer as some of the hot water needed was available by the solar water heater. 19 households were using electricity and gas (6 households). Shukla *et al.* (2012) found that solar water heating was not only environmentally friendly but required minimal maintenance and operation cost as compared to other solar energy applications. SWH systems were found to be cost effective.

Yadav (2014) reported that heating water with solar energy could be cost effective and environmentally responsible way to generate hot water, minimizing the expense of electricity or fossil fuels to heat water and reducing the associated environmental impacts. They reported that the condition were not appropriate for hot water during the whole year. The purpose of this study was to know about the awareness and attitude towards solar water heater in households hisar.

#### Study Duration of The Study

Approximately 2days

#### Methodology

##### Locale of study

The study was conducted in urban area of Hisar city of Haryana state which was selected purposively as the researcher is well acquainted with the area.

##### Sampling Procedure

A sample of 50 respondents were selected users of solar water heaters.

##### Tools for Data Collection

Data were collected personally by the researcher using questionnaire method in order to

assess the energy use pattern for hot water requirement.

#### Analyses of data

Data was coded and tabulated to draw meaning inferences.

#### Results

**Table 1: Socio-Economic Attributes of Families**

| Variables                       | Users (n=50)<br>f (%) |
|---------------------------------|-----------------------|
| <b>Respondents age (years)</b>  |                       |
| 17-31                           | 4 (8.00)              |
| 31-45                           | 24 (48.00)            |
| 45-60                           | 22 (44.00)            |
| <b>Respondents education</b>    |                       |
| Illiterate                      | -                     |
| High school                     | -                     |
| Senior Secondary                | 4 (8.00)              |
| Graduate                        | 26 (52.00)            |
| Post graduate or above          | 20 (40.00)            |
| <b>Family education status</b>  |                       |
| Low (2.5-3.5)                   | 4 (8.00)              |
| Medium (3.5-4.5)                | 20 (40.00)            |
| High (4.5-5.5)                  | 26 (52.00)            |
| <b>Caste</b>                    |                       |
| Lower                           | -                     |
| Middle                          | 10 (20.00)            |
| High                            | 40 (80.00)            |
| <b>Occupation</b>               |                       |
| Private employed                | -                     |
| Government service              | 15 (30.00)            |
| Business                        | 35 (70.00)            |
| <b>Family income (Rs/month)</b> |                       |
| 20,000-40,000                   | 10 (20.00)            |
| > 40,000- 80,000                | 10 (20.00)            |
| >80,000                         | 30 (60.00)            |
| <b>Size of plot (sq yd)</b>     |                       |
| 250-350                         | 14 (28.00)            |
| >350-450                        | 21 (42.00)            |
| >450-550                        | 15 (30.00)            |
| <b>No. of house storeys</b>     |                       |
| Single storey houses            | -                     |
| 2 storey houses                 | 47 (94.00)            |
| 3 storey houses                 | 3 (6.00)              |

**Frequency is equal to the percentage as the total sample size was 100**

The results explain about the socio-economic attributes of users of solar water heaters. Envisaged less than half of the user respondents belonged to the age group of 31-45 yrs (48%) of age followed by the 45-60 yrs (44%), having education upto graduate class (52%) followed by the post graduate or above (21%). More than half of the user respondents (52%) had high family education status followed by the medium FES (40%). A huge majority of the user respondents belonged to high caste (80%) and having occupation as business (70%) followed by the government service (30%). Maximum of the respondents (60%) had average monthly income of more than Rs 80,000 followed by Rs> 40,000- 80,000 and Rs 20,000-40,000 (20% each). They were having plot size >350-450 sq yd (42%) followed by more than 450-550 sq yd (30%). A huge majority of the

respondents (94%) were living in two-storey houses with only 6 percent living in three-storey houses.

**Table 2: Usage pattern of solar water heaters**

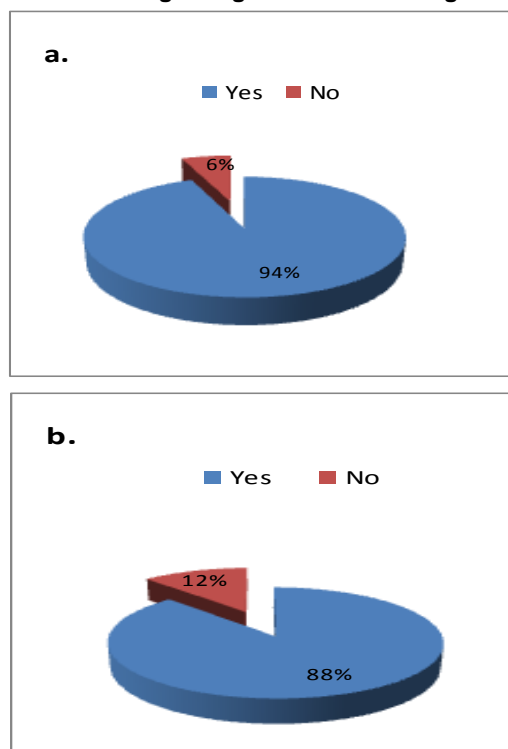
| (n=50)  |             |
|---|-------------|
| Attributes  | f (%)       |
| <b>Reasons for using the solar water heaters*</b> |             |
| Economical  | 24 (48.00)  |
| Safe  | 31 (62.00)  |
| Convenient  | 29 (58.00)  |
| Environment friendly                              | 50 (100.00) |
| Mandatory   | 36 (72.00)  |
| <b>Source of information*</b>                     |             |
| Friends   | 26 (52.00)  |
| Neighbors   | 15 (30.00)  |
| Govt. or non govt. agencies                       | 12 (24.00)  |
| <b>Knowledge of Govt. or non Govt agencies*</b>   |             |
| Department of Renewable Energy                    | 17 (34.00)  |
| HUDA  | 37 (74.00)  |
| <b>Type of solar water heater</b>                 |             |
| Flat plate collector                              | 50 (100.00) |
| Evacuated tube collector                          | -           |
| <b>Capacity of SWHs (litre)</b>                   |             |
| 200   | 17 ( 34.00) |
| 300   | 18 (36.00)  |
| 400   | 1 (2.00)    |
| 500   | 14 (28.00)  |

**Multiple responses**

The following section deals with the results of the data for the user families of SWH. Highlights that all the user families (100%) were using the solar water heating system as it is environment friendly followed by its mandatory by the government (72%), safe technology (62%), convenient to use (58%) and economical (48%). More than half of the families (52%) received information from friends followed by the neighbors (30%), and government and non-government agency (24%). Nearly three-fourth of the families (74%) had knowledge about Haryana Urban Development Authority (HUDA) installing the SWH system whereas one-third of the families (34%) had knowledge about the Department of Renewable Energy. All the user families (100%) were having the flat plate collector solar water heating system installed in their homes. A further reveal of Table 4.10 reveals that more than one- third of the families (36%) were using the 300 litre storage capacity of SWHs followed by 200 litre (34%), 500 litre (28%) and 400 litre (2%).

Majority of the families (94%) were satisfied with the cost of solar water heating system whereas only 6 percent of families were not satisfied. Similarly, 88 percent of families were satisfied with its working while only 12 percent were not satisfied with the working of SWHs.

**Fig 1a & b: Distribution of Respondents Having Satisfaction Regarding Cost and Working of SWH**

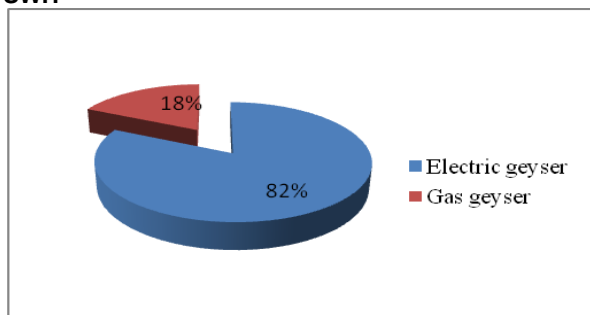


**Table 3: Care and Maintenance of Solar Water Heater**

| Attributes                                   | f (%)      |
|--|------------|
| <b>Proper cleaning of solar water heater</b> |            |
| Yes  | 44 (88.00) |
| No   | 6 (12.00)  |
| <b>If yes, frequency of cleaning</b>         |            |
| Weekly                                       | 6 (12.00)  |
| Monthly                                      | 8 (16.00)  |
| As per need                                  | 30 (60.00) |
| <b>Method of cleaning</b>                    |            |
| Use Cloth                                    | 40 (80.00) |
| Use Brush                                    | 4 (8.00)   |

Regarding care and maintenance, 88 percent of the families were properly cleaning the solar water heater. Maximum families (60%) used to clean it as per need followed by monthly (16%) and weekly (12%). Four-fifth of the families (80%) were using the cloth for cleaning the SWH followed by few (8%) using the brush for cleaning.

**Fig 2: Mode of water heating before installation of SWH**



Results shows that a few number of user and non- user families (4% & 8%, respectively) faced hazards using electricity while six percent of the non-user families faced hazards with the LPG using water heating mechanism.

**Table 4: Hazards faced by families while using different water heating mechanism**

| Hazards           | Electricity           | LPG                   |
|-------------------|-----------------------|-----------------------|
|                   | Users (n=50)<br>f (%) | Users (n=50)<br>f (%) |
| Electric shock    | 4 (8.00)              | -                     |
| Breathing problem | -                     | -                     |

**Conclusion**

This study was conducted at hisar city to identify the users awareness and attitude towards solar water heater. The findings of the study describe that the users have less aware about solar energy

and SWH. There is a need for public awareness about the benefits of SWHs. To improve the utilization of solar energy government should make very strict rules and give subsidy to install the solar systems in their homes for domestic purpose. Government and educational institutes should organize workshops and trainings for promoting adoption of solar water heater. This can help to reduce energy demand and money for water heating on household level.

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