iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 13 **Issue:** VII **Month of publication:** July 2025

DOI: https://doi.org/10.22214/ijraset.2025.73369

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 13 Issue VII July 2025- Available at www.ijraset.com

Solar Energy Consumption by Domestic Users

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Abstract: ***The use of solar energy offers social, economic, and environmental benefits to the user. Solar energy is considered to be safe for the environment, minimmise carbon emissions, naturally available, easy and economical in terms of maintenance, avail Government subsdisied, durable and suitable to modern-lifestyle. These merits of solar energy influence the common man, business entities large or small to adopt this natural, green and alternative energy source. This study aims to analyse the primary reasons domestic consumers state for accepting solar energy source. To meet the objective of the study both literature survey and primary data analysis were conducted. Thus, this article is based on both descriptive and exploratory data analysis methodology. A survey was conducted among 890 solar panel users in Coimbatore city. Article found that own house residents prefer to adopt solar energy system influenced by the reasons like: environmental concerns of self (81.64 per cent), an alternative source of energy (66.12 per cent), less expensive than power from a utility (lower price) (87.84 per cent), easily available (easy to buy) (77.84 per cent) and very easy to use (88.32 per cent). The article concludes with the key note that by education common man on the benefits of adopting clear and environmentally friendly solar energy they can realise number of benefits and should be motivated with user friendly policies cum offering monetary benefits to household consumers for voluntary adoption of solar energy generator.***

Keynote: Solar Energy,Energy Security, Domestic Electricity Consumers

I. INTRODUCTION

Green energy is the need of the day. Solar energy is the most secure and abundantly available green energy in India (MNRE, 2025). As per the CEEW (Council on Energy, Environment and Water) report, around 25 crores Indian households (the combined urban and rural households) have the potential to generate 637 GW (Giga Watts) of solar energy through rooftop panels. The report also mentioned that presently India has installed rooftop panels to generate 11.GW of solar energy (between the period 2014-2024), of which just 2.7 GW are generated by households through their rooftop panels and 60 per cent of solar energy are generated by seven regional states out of 29 states (i.e., Rajasthan, Gujarat, Uttar Pradesh, Maharashtra, Bengal, Odisha, Andra Pradesh and Tamil Nadu) (CEEW Report, 2023). One-third of the electricity power demand is raised by domestic consumers (CEEW Report, 2023). Solar energy generation in India was accounted to just one per cent in 2017, it rose to 5 per cent in 2022 it recorded 24 time growth in the nine year period and expected to rise by 25 per cent in 2032 (IBEF, 2024).

The Government of India has set up an ambitious target (establishing 10 million rooftops for households that will generate up to 300 units of free electricity to household consumers)for increasing solar energy generation and has significant investments in strengthening solar energy generation infrastructures (Deshpande, 2024 &Chand, 2025). In this context, it has been observed that the Government investment in solar infrastructure to meet the energy demand of the rural and urban masses, offers direct and indirect economic to the Government (i.e., in terms of job creation in the field of solar energy generation and offering uninterrupted electricity supply to the needy consumers) (Elkins et al., 2025).

II. THEME OF THE PAPER AND OBJECTIVES

The use of solar energy offers social, economic, and environmentalbenefits to the user. Solar energy is considered to be safe for the environment, minimmise carbon emissions, naturally available, easy and economical in terms of maintenance, avail Government subsdisied, durable and suitable to modern-lifestyle. These merits of solar energy influence the common man, business entities large or small to adopt this natural, green and alternative energy source. This study aims to analyse the primary reasons domestic consumers state for accepting solar energy source.

III. RESEARCH DESIGN AND METHODOLOGY

To meet the objective of the study both literature survey and primary data analysis were conducted. Thus, this article is based on both descriptive and exploratory data analysis methodology. A survey was conducted among 890 solar panel users in Coimbatore city.

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ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
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IV. LITERATURE DISCUSSION

Meta-analysis is conducted to understand the reasons that domestic consumers justified adopting solar energy as a source of electrification.

According to Mishra and Behera (2016) solar electrification has greater potential in rural India as the majority of the rural households do not have access to grid electrification facilities.Kansal et al., (2017) acknowledged that the acute shortage of electricity supply issues faced by India can be solved with the adoption of clean and green solar energy as an alternative source of energy. Tamilmani et al., (2018) claim that price and technology are two important factors that influence households to adopt solar energy systems. Aggarwal et al., (2019) listed the factors that influence domestic consumers to adopt rooftop solar energy. The authors listed the merits of rooftop solar energy panels are environmentally friendly, safe and clean energy production. socially accepted, cost-effective, efficient performance and durable. Kumar et al., (2020) documented the fact that consumers' acceptance and adoption of solar energy generating technology is purely dependent on the nature of motivation consumers receive from the Government, i.e., monetary benefits like subsidiaries, tax rebates and concessions. Roy and Mohapatra (2021) commented that middle-income families in India are ready to adopt solar electricity, but the potential consumers are skeptical about the cost of investment they would have to meet for the installation of solar energy panels. Kumar et al., (2022) recorded domestic users' perceived understanding on the solar energy and its benefits and perceived usefulness of this energy i.e., its compatibility, suitability of this energy for modern lifestyle and continuous power supply influence them to adopt or switch to solar energy. Bhandari and Jnawali (2023) observed that domestic users of solar energy have expressed satisfaction towards the qualities of this energy system i.e., efficacy in supply of power for a longer duration, convenient to use, low cost of energy generation and maintenance and the quality of energy generated through the panel. Mittal and Upadhay(2024) acknowledged that India has a higher potential of generating green energy; however, demographic and income factors of individual households determine their adoption and usage of solar energy. Kaur and Sharma (2025) commented that household consumers' preparedness to accept and adopt solar energy is determined by their social-economic cum demographic status (i.e., their gender, age, income level and their educational qualification). Through literatures analysis author understood that demographic cum social-economic status of domestic electricity consumers and their realisation about the merits of the solar energy mostly influences domestic consumers to adopt solar energy for the day-to-day electrification purposes.

V. RESULTS AND DISCUSSION

Four hundred and eighty samples are equally distributed with 50 per cent male respondents and 50 per cent female respondents. Further, it has been inferred that 37.29 per cent of the solar energy consumers are young, mostly in the age group of 24-34 years (37.29 per cent) and 45.83 per cent are aged above 34 -55 years. It has been concluded that solar energy consumers are married and are in their middle age, who shoulder highly demanding family responsibilities, so switching to alternative energy sources could support them to save their hard-earned income, which is spent on meeting huge electricity bills. Based on this conclusion, the researcher explored a number of reasons that influence the common man (domestic households) to adopt solar energy.

TABLE: 1
REASONS FOR ADOPTION OF SOLAR ENERGY

Variables	Sum	Mean	Rank
Environmental Concerns of Self	87.00	4.35	1
Financial Benefits	86.00	4.30	2
Environmentally Friendly Features	80.20	4.01	5
Encouraging Government Subsidies	79.00	3.95	10
An Alternative Source of Energy	82.60	4.13	3
Less Expensive than Power from a Utility (lower price)	79.80	3.99	8
Better Features than Power from a Utility (Greater Benefits)	80.20	4.01	5
Lower Adoption Cost (Easy to Use)	79.40	3.97	9
Easily Available (Easy to Buy)	78.20	3.91	12
Very Suitable for Indian Climate Conditions	81.40	4.07	4
More Reliable	80.20	4.01	5
Very Easy to Use	78.40	3.92	11

Source: Primary Data

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Consumers of solar energy are influenced by a number of factors of which environmental consciousness (87 per cent), financial benefits (86 per cent) and considering solar energy as the best alternative energy source (79.80 per cent). On the contrary, respondents rated Government support and subsidiaries (79 per cent), feasibility of solar energy equipment availability (78.20 per cent) and convenience of usage (78.40 per cent) at lower order of ranks. That these are considered as least influencing reason for adoption of solar energy for their domestic usage as electric power.

TABLE: 2
MEASURE OF DISPERSION AND ONE-WAY ANOVA TEST
TYPE OF HOME Vs REASONS FOR ADOPTION SOLAR ENERGY

Variables	Rented House		Own Home		F Value	Sig
	Mean	SD	Mean	SD		
Environmental Concerns of Self	3.055	0.780	4.082	0.785	10.136	.013
Financial Benefits	4.217	0.751	4.208	0.742	8.017	.007
Solar Energy Features	4.434	0.756	3.392	0.759	9.373	.042
Encouraging Government Subsidies	3.443	0.790	2.416	0.783	6.133	.015
An Alternative Source of Energy	2.285	0.872	3.306	0.868	5.070	.001
Less Expensive than Power from a Utility (lower price)	2.379	0.968	4.392	1.005	10.021	.004
Better Features than Power from a Utility (Greater Benefits)	4.345	1.023	3.294	0.956	10.316	.004
Lower Adoption Cost (Easy to Use)	4.413	0.980	3.347	0.948	9.559	.045
Easily Available (Easy to Buy)	3.387	1.074	3.892	1.060	8.002	.002
Very Suitable for Indian Climate Conditions	3.226	1.015	3.224	1.022	10.000	.001
More Reliable	4.272	0.984	3.286	0.979	10.022	.001
Very Easy to Use	3.366	1.075	4.416	1.070	10.264	.007

Level of Significance: 5 per cent

Logical reasons stated by the own-house owners and rented house residents differ from one to another. Each category of the samples as per the dispersion analysis have their valid reasons for adoption of green energy, of which environmental consciousness, financial benefits, solar energy features, low cost of adoption, better utility benefits and ease of usage are rated by the two categories of households. In continuity with the above discussion, it has been found that the computed ANOVA test values for the variables: 10.136, 8.017, 9.373, 6.133, 5.070, 10.021, 10.316, 9.559, 8.002, 10.000, 10.022 and 10.264were found to be within the significance level at five per cent. Henceforth, the hypothesis framed is accepted and it has been concluded that there exist differences in the reasons stated by the rented and own home residents for adopting solar energy for electrification purposes.

VI. FINDINGS AND CONCLUSION

India is a sunshine wealth nation. The country is steadily moving from the use of fossil-fuel-based, solid-mass-based energy to natural sunlight-based energy usage. As far as Indian past literatures and research work provide evidences that the domestic electricity consumers adoption of solar energy for the day-to-day electrification purposes is primarily based on their demographic cum social-economic status. Similarly, domestic household consumers'adoption of solar energy is influenced by many factors like: environmental consciousness (87 per cent), financial benefits (86 per cent) and considering solar energy as the best alternative energy source (79.80 per cent). The article inferred that own-house owners and rented-house residents differ from one to another.

The domestic consumers of solar energy are divided into two sections based on their residential status, i.e., own house residents and rented house inhabitants. It was found that own house residents prefer to adopt solar energy system influenced by the reasons like: environmental concerns of self (81.64 per cent), an alternative source of energy (66.12 per cent), less expensive than power from a utility (lower price) (87.84 per cent), easily available (easy to buy) (77.84 per cent) and very easy to use (88.32 per cent). Whereas the rented house residents stated that they have adopted solar energy influenced by the reasons like: financial benefits (84.34 per cent), influenced by solar energy features (88.68 per cent), lower adoption cost (easy to use) (88.26 per cent), solar better features than power from a utility (greater benefits) (86.90 per cent), more reliable source of energy (85.44 per cent), encouraging

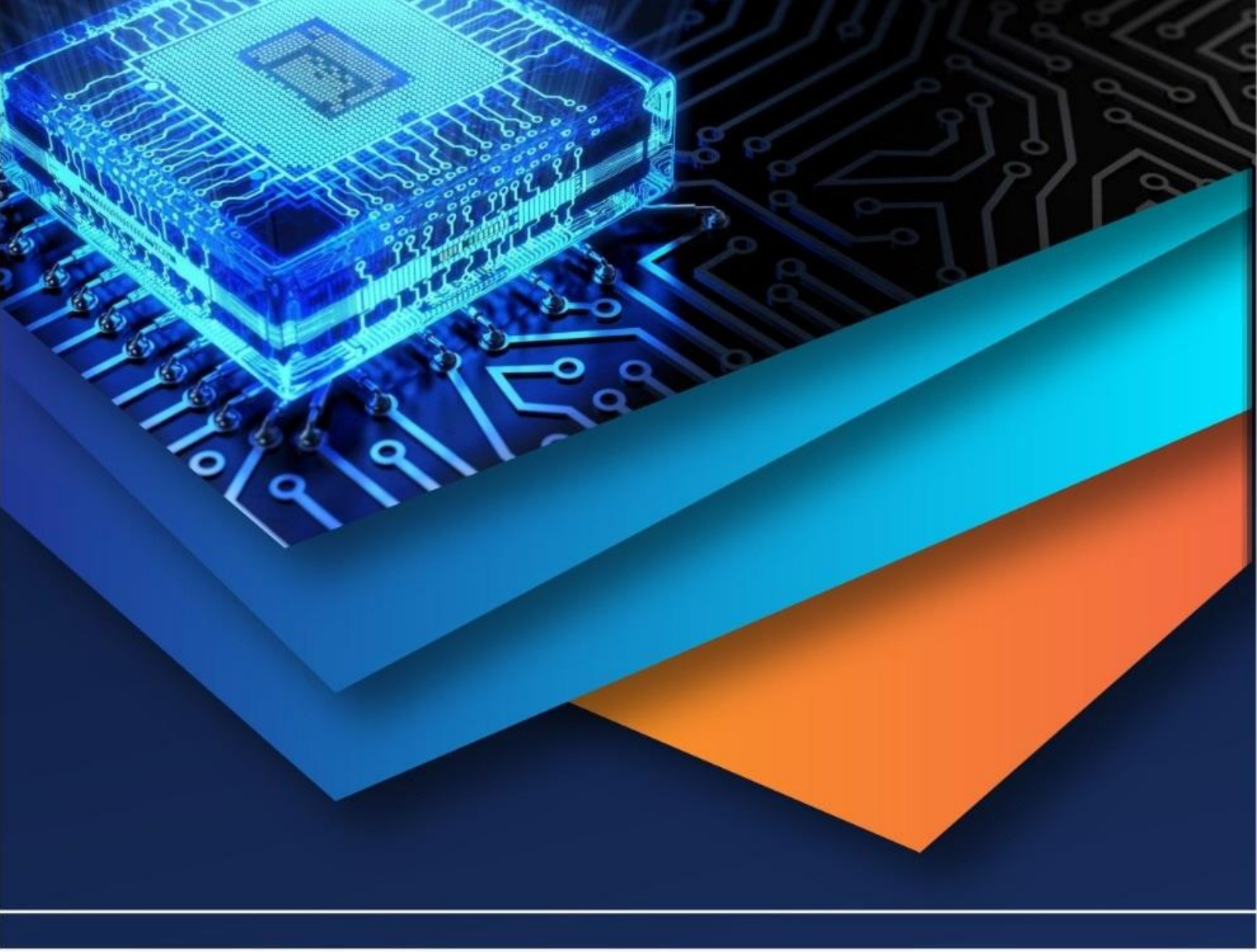
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Government subsidies (68.86) and very suitable for Indian climate conditions (64.52 per cent). The article concludes with the key note that by education common man on the benefits of adopting clear and environmentally friendly solar energy they can realise number of benefits and should be motivated with user friendly policies cum offering monetary benefits to household consumers for voluntary adoption of solar energy generator. These steps will support the Government of India to achieve its target of producing 500 GW of solar energy in the near future i.e., by 2030 and meet the environmental safety norms committed at COP (Conference of Parties) Hauge, Netherland.

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