

# International Journal of Advance Research in Computer Science and Management Studies

Research Article / Survey Paper / Case Study

Available online at: [www.ijarcsms.com](http://www.ijarcsms.com)

## *Customers' Willingness to Pay More for Solar Energy*

**G. Mahendar**

Research Scholar, School of Management Studies,  
University of Hyderabad,  
Hyderabad - 500 046 – India

---

*Abstract: Energy is the key force that drives the development of any economy. Energy demand is growing at a rapid pace in India due to urbanization, population explosion and faster growth of the economy. There is a demand-supply mismatch of energy in India. But meeting this demand is challenging due to the limited conventional energy sources. Renewable energy, in particular solar energy represents a promising alternative for fossil fuels owing to its abundance. In a developing country like India favourable geographical conditions would add more prominence to solar energy. Currently, energy generated using solar sources at household level costs more than the electricity generated from power plants using conventional fuels. One of the major reasons for this is the high installation cost for solar energy. There have been numerous studies published over the past few years focusing on customers' willingness to pay more for solar energy. This paper identifies key characteristics that determine customers' willingness to pay more for solar energy based on the extant review of literature. And is also focused to design a conceptual framework and provide propositions for the same. From the study it is shown that customer's willingness to pay more for solar energy is influenced by socio-economic profile, awareness towards solar energy products, environmental protection.*

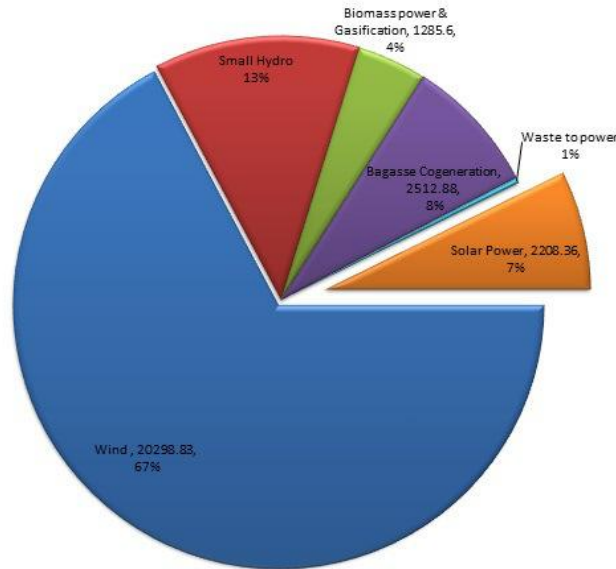
*Keywords: Renewable energy, Solar energy, Willingness to pay more, Indian customers.*

---

### I. INTRODUCTION

Energy is the major factor in fueling the socio-economic status of any country. By the year 2020, India's energy demand will be almost double the present capacity. (Vivek Panwar, Tarlochan Kaur, 2014). But meeting this demand is highly challenging with the conventional sources of energy. This can problem can be addressed by renewable energy sources owing to its abundancy and eco-friendliness. Renewable energy products utilize energy harvested from renewable energy resources such as sunlight, wind, and geothermal heat. For homeowners, renewable energy products may be solar electric or photovoltaic systems, wind electric systems, and other energy generating systems at small scales. Solar energy is considered to be a promising source of renewable energy to the world facing a severe energy crisis particularly in developing countries like India. The adoption of solar energy is limited due to many factors. Research also shows that widespread adoption of renewable energy technologies is proving problematic (Yiming 2011). Customer's willingness to pay more for solar energy is one of the major factors that affects purchase intention.

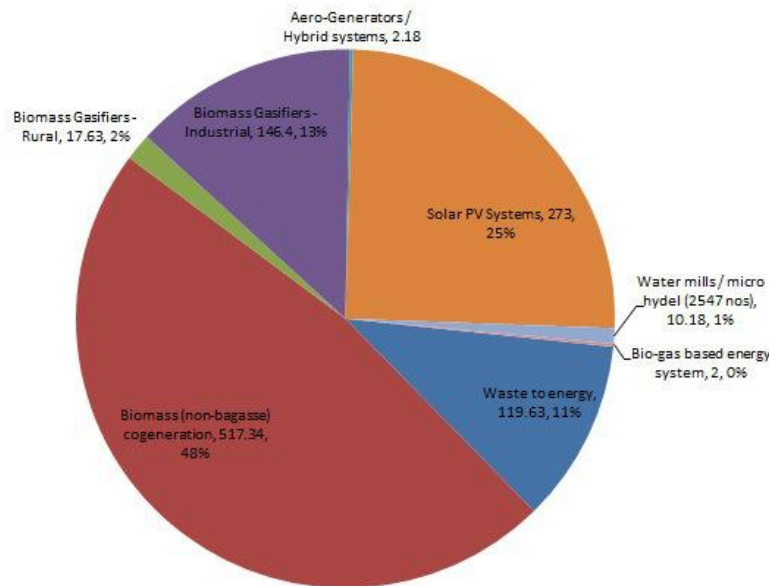
**Total Grid Interactive Renewables in India till Jan 2014  
 = 30,178 MW (Approx.)**



Source: www.mnre.gov.in

Fig I: Source wise Grid Interactive Renewable Energy in India as on January, 2014

**Total Off-Grid / Captive Renewable Power Capacity in  
 India till Jan 2014 = 973 MW (Approx.)**



Source: www.mnre.gov.in

Fig II: Source wise Off-Grid Renewable Energy in India as on January, 2014

## II. NEED FOR THE STUDY

Even though solar energy has immense potential and favorable government policies there is a limited adoption of solar energy products at domestic level in India. There are many factors affecting this, customer’s willingness to pay the extra price for solar energy is one of the major influencers of adoption. Therefore, the present paper studies determinants of customer’s willingness to pay more for solar energy at household consumption.

## III. OBJECTIVE OF THE STUDY

The present paper identifies key factors affecting customer’ willingness to pay more for solar energy, based on the available literature. It also outlines a proposed conceptual model centered on the insights obtained from the review of literature.

## IV. RESEARCH DESIGN

The current study is descriptive in nature. The study is purely based on secondary data sources. For this study, research articles were collected from various online journals. Based on the literature review, a conceptual model has been framed which could be further tested empirically.

## V. REVIEW OF LITERATURE

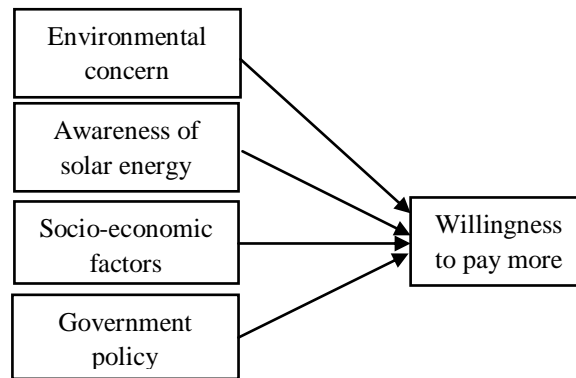
Many studies have identified characteristics of people who are likely to purchase renewable energy products (Hae-Kyong Bang et.al. 2000; S.K. Velayudhan 2003; Adam Faiers et.al. 2006; Ritsuko Ozaki 2009; Bing Zhu 2011; Kaja L. Rebane 2011; Yiming Tang, Milind Medhekar 2011). Over the past, extensive research has been conducted related to customer's willingness to pay premium for renewable energy sources. The table below highlights some of the major studies conducted in this area. The table below shows the review of literature pertaining to various green products, renewable energy and solar energy.

Table I. Summary of literature related to willingness to pay for renewable energy

S. No	Citation	Purpose of the study	Dimensions	Type and sample for the study	Outcome
1	Hae-Kyong Bang and Alexander E. Ellinger, John Hadjimarcou and Patrick A. Traichal (2000)	Studies the relationship of three variables – concern with the environment, knowledge of renewable energy and beliefs about renewable energy.	Knowledge, concern about the environment, beliefs, willingness to pay more for renewable energy	Empirical study Questionnaire Household customers of USA	Persuasive marketing efforts should focus on building consumer knowledge through information-based campaigns that will lead to cognition and, in turn, to stronger beliefs about the salient consequences of using renewable energy
2	Laroche et.al (2001)	Investigates the demographic, psychological and behavioral profiles of consumers who are willing to pay more for environmentally friendly products	Environmental knowledge, values (Individualism, collectivism, security, Fun/enjoyment), Attitude, Behaviour	Empirical study Questionnaire Household consumers of USA	Consumers consider ecological issues when making a purchase.
3	Brian Roe et. al. (2001)	Examines US consumers' willingness to pay for environmental attributes of deregulated electricity services	Demographic details, willingness to pay premium for renewable electricity.	Empirical study Conjoint survey Hedonic analysis USA	Results suggest that US consumers do value environmental benefits created from alterations in electricity generation methods and are willing to pay premium for renewable electricity.
4	Andre Hansla et. al. (2008)	To study the determinants of attitude towards and willingness to pay for green electricity	Environmental concern, Willingness to pay	Empirical study Questionnaire Household customers Sweden	Willingness to pay for green electricity increased with a positive attitude towards green electricity and decreased with electricity costs
5	Henry Oliver, Jako Volschenk, Eon Smit (2011)	Considers the level of willingness of households in to pay a premium for electricity from renewable energy	Knowledge/awareness, values, attitudes, concern for the environment, perceptions of the effectiveness of particular interventions	Empirical study Questionnaire Household customers Cape Peninsula	the study found a significant positive link between household income and willingness to pay more for green electricity
6	Ishaswini, Saroj Kumar Datta (2011)	Study examines if pro-environmental concerns among consumers in India are predictive of their any green buying behaviour.	Pro-environmental concerns, knowledge of environmental issues, and awareness of eco-friendly products	Empirical study Questionnaire General population India	Consumers' pro-environmental concerns significantly affect their green buying behaviour.
7	Jelena Zoric, Nevenka Hrovatin (2012)	This paper analyses the willingness to pay for electricity generated from renewable energy sources in Slovenia	Demographic details, Environmental awareness, willingness to pay	Empirical study Questionnaire Household customers Slovenia	The results confirm that age, household income, education and environmental awareness play the most important role in explaining household attitudes to green electricity programmes.

					Willingness to pay for green electricity predominantly depends on household income.
8	Elcin Akcura (2013)	Studies households' preferences and willingness to pay under a mandatory scheme and payment by choice for green electricity.	Various factors influencing willingness to pay for green electricity.	Contingent valuation method UK	Results indicate that the likelihood of paying a positive amount for supporting renewable energy is higher under a mandatory scheme compared to a voluntary payment option in the UK
9	Andreas Nilsson, Andre Hansla, Anders Biel (2014)	Investigates pro-environmental behavior in the shape of household electricity consumption	Value items, Positive emotions Negative emotions	Empirical study Questionnaire Household customers Sweden	Overall more positive and less negative emotions are experienced for a promotion frame (choosing green electricity and paying more) than for a prevention frame (not choosing green electricity and paying less).
10	Swantje Sundt, Katrin Rehdanz (2015)	Presents results of a meta-regression on valuation of consumer preferences for a larger share of renewable energy in their electricity mix.	85 different values on willingness to pay for renewable energy	Conceptual study Meta regression analysis	The analysis has identified key characteristics that determine peoples' willingness to pay for green electricity, at least for developed countries,
11	Chunbo Ma et. al. (2015)	To determine how much of the variation in willingness to pay reflects true differences across the population and how much is due to study design, such as survey design and administration, and model specification	Different variables of willingness to pay for renewable energy	Meta regression analysis	Factors that influence willingness to pay, such as renewable energy type, consumers' socio-economic profile and consumers' energy consumption patterns, explain less variation in willingness to pay estimates than the characteristics of the study design itself.

**VI. CONCEPTUAL FRAMEWORK**



**VII. CONCLUSION**

The present paper identified important characteristics that influence customer’s willingness to pay more for solar energy. And also presents a conceptual framework, based on the available literature – research papers, reports etc. The study revealed that customer’s willingness to pay is influenced by environmental concern, knowledge towards solar energy, socio-economic factors, and government policy.

**References**

1. Adam Faiers, C. N. (2006). Consumer attitudes towards domestic solar power systems. *Energy Policy*, 34(14), 1797-1806.
2. Andre Hansla et. al. (2008). Psychological determinants of attitude towards and willingness to pay for green electricity. *Energy Policy*, 36, 768–774
3. Andreas Nilsson, Andre Hansla, Anders Biel (2014). Feeling the green? Value orientation as a moderator of emotional response to green electricity. *Journal of Applied Social Psychology* 2014, 44, pp. 672–680
4. Bing Zhu, W. Z. (2011). Adoption of renewable energy technologies (RETs): A survey on rural. *Technology in Society*, 223–230.
5. Brian Roe et. al. (2001). US consumers' willingness to pay for green electricity, *Energy Policy*, 29, 917-925

6. Chunbo Ma et. al. (2015). Consumers' willingness to pay for renewable energy: A meta-regression analysis. *Resource and Energy Economics*, 42, 93–109
7. Elcin Akcura (2013). Mandatory versus voluntary payment for green electricity, European Bank for Reconstruction and Development, Working Paper No. 161.
8. Hae-Kyong Bang et.al. (2000). Consumer Concern, Knowledge, Belief, and Attitude toward Renewable Energy: An Application of the Reasoned Action Theory. *Psychology & Marketing*, Vol. 17(6):449–468
9. Henry Oliver n, Jako Volschenk, Eon Smit (2011). Residential consumers in the Cape Peninsula's willingness to pay for premium priced green electricity, *Energy Policy*, 39, 544–550
10. Ishaswini, Saroj Kumar Datta (2011). Pro-environmental Concern Influencing Green Buying: A Study on Indian Consumers. *International Journal of Business and Management*, Vol. 6, No. 6
12. Jelena Zoric, Nevenka Hrovatin (2012). Household willingness to pay for green electricity in Slovenia. *Energy Policy*, 47, 180–187
13. Kaja L. Rebane, B. L. (2011). Knowledge and adoption of solar home systems in rural Nicaragua. *Energy Policy*, 3064–3075.
14. Michel Laroche, Jasmin Bergeron and Guido Barbaro-Forleo (2001). Targeting consumers who are willing to pay more for environmentally friendly products. *Journal of Consumer Marketing*, Vol. 18 No. 6, pp. 503-520
15. Ozaki, R. (2011). Adopting Sustainable Innovation: What Makes Consumers Sign up to Green Electricity? *Business Strategy and the Environment*, 1-17.
16. Swantje Sundt, Katrin Rehdanz (2015). Consumers' willingness to pay for green electricity: A meta-analysis of the literature. *Energy Economics*, 51, 1–8
17. Velayudhan, S. (2003). Dissemination of solar photovoltaics: a study on the government programme to promote solar lantern in India. *Energy Policy*, 1509–1518.
18. Vivek Panwar, T. K. (2014). Overview of Renewable Energy Resources of India. *International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering*, 3(2), 33-45.
19. Yiming Tang, M. M. (2011). Factors Differentiating Green Power Electricity User/Non-user Status in Australia. *Asian Journal of Business Research*, 1(1).