Consumer Preference on Energy Management Schemes in the Smart City Proposal with Special Reference to the Coimbatore City

Vinothini V and Vishnu Sakravarthy N[1], Nalini Palaniswamy[2]

[1]M.B.A. students – Kumaraguru College of Technology Business School
[2]Assistant Professor – Kumaraguru College of Technology Business School

Abstract: *Smart city mission is an urban renewal and retrofitting program initiated by Ministry of urban development, Government of India; in which 20 cities are selected for the first phase project. Coimbatore being selected as one of the city, it has to undergo many infrastructural reforms in which energy management is an important sector. As the public acceptance is involved in bringing the reforms for implementing the energy management techniques like renewable energy, it is necessary to understand level of awareness among the public and their preference towards it. For example the implementation of the renewable energy technologies involve the cost factor starting from the price of the particular product to the maintenance cost. Thus the awareness of the households and industries about a particular technology will decide their preference, affordability and various other factors. There is a necessity to study these deciding factors for the subsequent plans of the government campaigns in the future to create public acceptance for the smooth implementation of the project. The paper summarizes the survey undertaken to understand the preference of the consumers which include public as well as the MSME towards the renewable energy.*
Key words: Energy management, renewable energy, Smart city, Consumer preference

I. Introduction

There is no universally accepted definition of a smart city. It means different things to different people. The conceptualization of Smart City, therefore, varies from city to city and country to country, depending on the level of development, willingness to change and reform, resources and aspirations of the city residents. A smart city would have a different connotation in India than, say, Europe. Even in India, there is no one way of defining a smart city.

But as a whole the objective of the Smart Cities Mission is to promote cities that provide core infrastructure and give a decent quality of life to its citizens, a clean and sustainable environment and application of 'Smart' Solutions.

The smart solutions have been categorized into 6 major topics by MOUD which includes
1. E-governance and citizen's management
2. Waste management
3. Water management
4. Energy management
5. Urban mobility
6. Others

Objectives of the study
1. To find the perception towards energy management with respect to the residential sector and the industrial sector.
2. To analysis the amount affordability for adapting the changes or technologies this in turn will show the expectations on the subsidies.
3. To analysis the citizens' expectations of the time duration to adapt the changes.

II. Review of literature

Sarah Darby, building research &information (2010), titled, "Smart metering: what potential for householder engagement?" This paper deals with questions of customer engagement with some of the technical and management systems. Smart metering, is useful not only because it puts the energy user closest to the center of the discussion, but also because it cites the energy user in relation to technology, and in relation to

the designers of a smart metering system. In this way, it sheds some light on the possibilities for householder engagement with smart meters. If the aim is to make the customer central to a smart metering rollout, a determined effort has to be made to identify affordances for customer engagement – physical and relational characteristics of a system – and include them in the specifications. The literature cited in this section gives some pointers, and the following section adds to these by considering a sample of qualitative research into attempts to engage householders with various forms of energy feedback information. Qualitative work on feedback gives some more clues, illustrating something of the range of meanings of feedback to energy users.

Prakash.S.V (2010) Renewable Energy and Sustainable Development: An Overview of Building Research & Information. The main objective of this paper is to discuss the environmental problems and the anticipated patterns of future energy use and consequent environmental impacts, to identify some solutions to the current environmental problems, focusing on renewable energy technologies and their linkage which is a key component of sustainable development.

Dr. Patrick Devine-Wright (2007), titled Reconsidering Public Attitudes and Public Acceptance of Renewable Energy Technologies A Critical Review stated that Public acceptance is recognized as an important issue shaping the widespread implementation of renewable energy technologies and the achievement of energy policy targets. This paper critically summarizes existing social research on public understanding and attitudes towards renewable energy technologies, providing classification of personal, psychological and contextual factors explaining public acceptance. It concludes by revealing for the need for inter-disciplinary research combining qualitative and quantitative approaches, using social research methods.

The smart city proposal of the Coimbatore submitted to MOUD, government of India during the Stage 2 of the Smart city Challenge is taken for the review to know the plans of the Coimbatore City Municipal Corporation (CCMC) towards the energy management. Energy efficiency and security ranked among the top seven vision themes with nearly 17% of respondents considering it a necessary to be included in the City's Vision Statement. Thus Implementation of Solar rooftop through MNRE's subsidy program and implementation of renewable technologies at residential, commercial and industrial segments are planned.

(August 2012)Title Development of Coimbatore Solar City - Final Master Plan The report titled as above was submitted to Ministry of new and Renewable energy (MNRE), Government of India by the CCMC which got its approval. A renewable energy resource assessment has been done to identify the potential renewable energy sources for the Coimbatore city. The strategy has been prepared for each sector namely, Residential, Commercial & Institutional, Government & Municipal and Industrial sectors and identifying most techno economically viable renewable energy options considering a wide range of potential consumers in the particular sector.

Study population

The population of the study includes the citizens who belong to the households under the corporation of Coimbatore city. The population of the Coimbatore city is about 1,052,721 and 98.23 % of the 5,06,009 households in the Coimbatore have access to the electricity.

Sample size

The sample size is restricted to 80 households with an average of 4 members in each household, the samples being collected mainly from the locations like Saravanampatti, Udayampalayam, R. S. Puram and Ganapathy and a few samples from other areas. Thus the study covers the 320 citizens and 80 households.

Sample design for study

For the study simple random sampling method is used and the sampling is done for the locations and the households in the location. All the areas in the Coimbatore city limit are listed and numbered based on pin-code and 4 locations are selected based on the random number table and in each location every 5th household is taken for the sample collection as the research period has limited days.

III. Method of data collection

The data for the study is mainly collected from the primary sources including observation, interviews and validated questionnaire.Sometimes administration in public places is also done in the particular location due to the time constraints.

Tools used for study
SPSS software & Ms Office Excel

Table 1: Profile of the respondents

Characteristics	Percentage
Residential Age	
below 18	2.5
between 18-35	57.5
between 36-50	26.3
above 50	13.8
Gender	
Male	53.8
Female	46.3
Location	
Saravanampatti	30.0
Ganapathy	33.8
R.S.puram	23.8
Udayampalayam	2.5
Others	10.0
Type of home	
house	52.5
bungalow	17.5
flat/apartment	30.0
Average income of family	
below 1L	12.5
1L-3L	46.3
3L-6L	28.8
above 6L	12.5
Awareness about renewable energy	
yes	82.5
no	17.5
Awareness about green buildings	
yes	62.5
No	37.5
Industry	
Location	
Saravanampatti	73.3
Others	26.7
Type of Industry	
Manufacturing Industry	53.3
Service Industry	33.3
Food and Beverage industry	13.3
Awareness about renewable energy	
yes	83.3
no	16.7
Awareness about green buildings	
yes	76.7
no	23.3

Findings - Residential sector

The average annual income of the house hold has no influence over all the factors determining the purchasing the product. Also the annual income has no influence on the expectations for the subsidies from the government. Thus the households at any income level are ready to pay price for the renewable energy but also expect the subsidies from the government.

About 66.2% of the sample population has preference towards the changing the home infra to adopt the renewable energy. Thus the households in the Coimbatore city have the significant preference towards making change. The other findings are represented in the graph below:
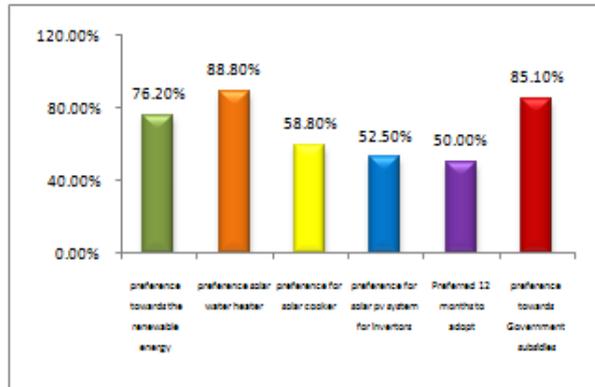
Findings - Industrial sector
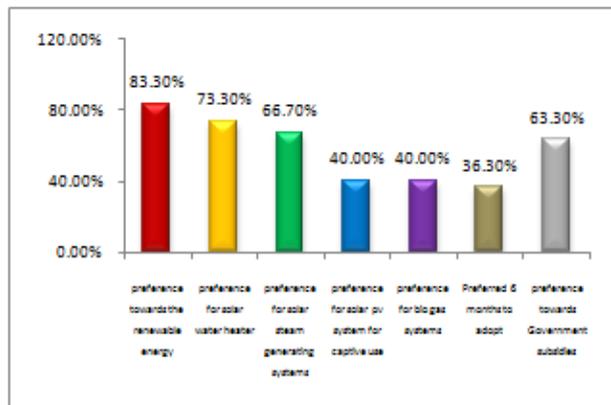
IV. Suggestions

The large proportion of the sample population is aware about the renewable energy techniques and also prefers to use it hence there is no need for the awareness campaigns instead the campaigns regarding the renewable technologies.

Also the people at all income level expect support from the government like subsidies to install the renewable energy technologies. Thus the government should plan accordingly.

And people all income level prefer a specific time period to adopt the changes even they are provided with government support. Thus the general public should be provided with the specific time period to adapt to the changes.

V. Conclusion

The residents or the households and industries of the Coimbatore perceive the energy management techniques with a positive attitude as they significantly prefer the renewable energy techniques and ready to adapt to make changes in their houses when given with a specific time period along with the government support.

The income level which determines the affordability doesn't have significant influence over the preference, price of the product or the government support. Thus the entire sample population expects sufficient from the government irrespective of their affordability.

Bibliography

[1]. Darby, S. (2010). Smart metering: what potential for householder engagement?. Building Research & Information,38(5).
[2]. Prakash, S. V. (2010). Renewable Energy and Sustainable Development: an Overview. CURIE Journal, 3(2), 59-69.
[3]. N. S. Venl cataraman (2010). India slipping towards energy crisis can the Energy scenario be better managed? CHEMICAL BUSINESS.
[4]. Smart city proposal Coimbatore, smart city challenge, stage 2, Indian smart city mission from Ministry of Urban development.
[5]. Development of Coimbatore Solar City, Final Master Plan, August 2012, submitted to MNRE, Government of India.
[6]. Victor Meyer,Charles Myres and Nitin Bakshi, The vulnerabilities of the power-gridsystem: Renewable microgrids as analternative source of energy (2009)

[7].   Dr. Patrick Devine-Wright (2007). Reconsidering public attitudes and public acceptance of renewable energy technologies: a critical review.
[8].   Darby, S. (2008) Energy feedback in buildings – improving the infrastructure for demand reduction. Building Research &Information, 36(5), 499–508.
[9].   Ashish Rana (2003).Evaluation of a renewable energy scenario in India for economics and co2 mitigation effects
[10]. 2016 Strategic Directions: Smart City/Smart Utility Report from Black & Veatch insights group
[11]. Lamb, P. (2006) The Indian electricity market: Country study and investment context, Working Paper, StanfordUniversity.
[12]. Krishna, G. (2005), 'Lucknow Waste-to-Energy Project Dubious,' The Indus Telegraph.