Association And Influence Of Demographic Components In Purchase Decision Of Products Of Renewable Energy

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Abstract

Prior to mid-19th century, nearly all energy used was renewable. One of the oldest use of renewable energy is in the form of traditional biomass to fuel fires. Traces of renewable energy is found in its own history, way back in 1860's and 1870's, there was a fear that civilization would run out of fossil fuels which gave rise to an alternative and better source. However, the entry of renewable energy in north eastern part of India is still at its nascent stage. More and more research is based on the technical viability of its existence, which is indeed a primary need for expansion of renewable energy. But the fact remains, related to research based on marketing of various products of renewable energy has a huge gap, which acts as a bottleneck for these products' wide entry in domestic market. Hence, this research paper focuses on the findings of factors which may relate to adoption of renewable energy by people of Sikkim and Darjeeling. The paper helps to identify demographics factors and its relation with other identified factors which may help manufacturers and marketeers in introducing products of renewable energy.

Keywords: renewable energy, demographic factors, price, design, environment.

1. Introduction

The Sikkim Renewable Energy Development Agency (SREDA) was constituted by the State Government in 1999[1]. This autonomous agency was mandated with the charge of promoting and popularizing renewable energy and to function as the State Nodal Agency for all renewable energy programmes and projects in the State. Similarly, West Bengal Renewable Energy Development Agency[2], formed in the year 1993, has a mandate to promote Renewable Energy Technologies and create an environment favourable to commercialization through innovative projects. The Agency, popularly known as WBREDA, has its corporate office at Kolkata, India. The West Bengal Renewable Energy Development Agency (WBREDA) is the State Nodal Agency for implementation of Non Conventional Energy Programmes in the State of West Bengal. SREDA and WBREDA have been
relentless in providing renewable energy benefits to possible part/section of the state. Darjeeling (which lies towards North Bengal) and Sikkim have erratic weather conditions and it lies in Himalayan States. Despite of its topographical challenges and poor road infrastructure due to rain and landslide SREDA and WBREDA have diligently been promoting renewable energy technologies. This research attempts to identify association of various demographical components leading to the purchase of the products of renewable energy. Four factors, have been chosen along with three demographical components, as they were found to be closely reliable. Before conducting this research, a pilot study was conducted at Sikkim where these four factors along with other factors were identified as important by respondents. Pilot study had an open-ended question, as the researcher desired to know in detail about respondents’ opinion in the products of renewable energy. In present scenario, solar lanterns, solar water heater is available through nodal offices, where cost is high. Biomass tank had been constructed by Government in various households of Sikkim and Darjeeling but all these products are not used by people/owner as the products (solar lanterns) have stopped working and people in rural areas are no more interested in decomposing and keeping agricultural waste in biomass tank.

1.1 Literature review
Few consumers opt to purchase renewable energy at higher tariffs, which are supplied by existing rather than new firm (Karsten Neuhoff,2005)[3]. Surveys suggested that over half of Americans claim they are willing to pay a premium for "green power," but only 1 percent of the households preferred to do so when provided with the opportunity (Wiser et al. 2001)(Heiman and Solomon,2004)[4]. Role of engineers in dispersal of technologies is parallel collaboration of commercial aspects of a business (Alireza Aslani, 2014)[5]. (McDonald C. N and Pearce M. J,2013) conducted study on Nunavut, where they found residents were dissatisfied due to bureaucratic barrier within government and it discouraged shift to renewable energy[6]. One of the major problem is the lack of adequate biogas technology for cold temperate regions of India. The percentage of biogas plants achieved is stagnant in hilly areas such as Jammu and Kashmir because of operational difficulties experienced due to cold weather. Distribution of biogas plants in high altitude regions needs more improvement in the design and process control (S.K. Lohan et al.2015)[7]. Mas’od A and Chin Ai Thoo identified that accessibility is one of the important criteria to reach and serve customers. The detail green consumer profiles helps managers and hoteliers to evaluate current green purchase behaviour in green hotels of Malaysia while serving the customer and also fulfilling societal and environmental responsibilities [8]. During free trial period or live demonstration or trade fairs must focus on the durability of the product. (Adam Faiers, Charles Neame,2006)[9]. Hence, as suggested by other researchers who have dedicated their time in renewable energy have highlighted the importance of engineering and suppliers to understand the need of the customers.

2. Methodology
Data for analysis were collected using structured questionnaire. Continuous rating scale, starting from 0 till 10 is identified by researcher to be used in rating the response of respondents for every given factors as this rating scale would best suit the factors while responding (for respondents) and while conducting analysis (for researcher). This continuous scale was further divided into ratio scales whose range was 0-3=low,4-7=medium and 8-10 is high. If the response was towards 0 then respondents intention was not to buy the products and if response is towards 10 than respondents are willing to buy the product. Collection of data took about 6 months. 600 filled and complete questionnaires were chosen for analysis. For segregating the data, Microsoft excel sheet was used and for analysis SPSS software version 20 was used. The variables are on ratio scale so t-test will be appropriate. Solar water heater, biomass stove and solar street lamp was considered during the study.
Note: Significance value of 0.000 has been taken as 0 value.
If significance value is above 0.05, the null hypothesis is accepted or else it stands rejected.

2.1 Reliability Statistics

| Cronbach's Alpha | Cronbach's Alpha Based on Standardized Items | N of Items |
|------------------|-------------------------------------------|------------|
| .705             | .671                                      | 7          |

Cronbach's alpha is 0.705, which indicates a moderate level of internal consistency.

2.2 Null Hypotheses:
H0: There is no significant factor influencing different age groups in purchase decision of the product.
H0: There is no significant factor influencing marital status in purchase decision of the product.
H0: There is no significant factor influencing various income level in purchase decision of the product.

2.3 Result and analysis

H0: There is no significant factor influencing different age groups in purchase decision of the product.

| FACTORS                           | 15yrs-25yrs=173, between 26yrs-35yrs =198, between 36yrs-45yrs=103, between 46yrs-55yrs=72, above 56yrs=54 |
|-----------------------------------|----------------------------------------------------------------------------------------------------------------|
| **Buy if its available within 3km from my home** |                                                                                                               |
|                                   | FACTORS                           | Mean | F    | Sig.   | hypothesis                   |
|                                   | 15- 25                             | 5.09 | 1.55 | 0.186  | accept null hypothesis       |
|                                   | 26-35                              | 5.28 |      |        |                             |
|                                   | 36-45                              | 5.30 |      |        |                             |
|                                   | 46-55                              | 5.92 |      |        |                             |
|                                   | Above 56                           | 4.78 |      |        |                             |
| **Buy if its durable for more than1yr** |                                                                                                               |
|                                   | FACTORS                           | Mean | F    | Sig.   | hypothesis                   |
|                                   | 15- 25                             | 5.88 | 3.69 | 0.006  | reject null hypothesis      |
|                                   | 26-35                              | 6.20 |      |        |                             |
|                                   | 36-45                              | 6.13 |      |        |                             |
|                                   | 46-55                              | 6.18 |      |        |                             |
|                                   | Above 56                           | 4.67 |      |        |                             |
| **Buy if after sales is guaranteed by seller** |                                                                                                               |
|                                   | FACTORS                           | Mean | F    | Sig.   | hypothesis                   |
|                                   | 15- 25                             | 5.55 | 4.62 | 0.001  | reject null hypothesis      |
|                                   | 26-35                              | 5.82 |      |        |                             |
|                                   | 36-45                              | 6.43 |      |        |                             |
|                                   | 46-55                              | 6.97 |      |        |                             |
|                                   | Above 56                           | 6.37 |      |        |                             |
Buy if design is convenient to use  
15-25 5.45 5.49 0 reject null  
26-35 6.26  
36-45 6.21  
46-55 6.76  
Above 56 5.04  

Table 1  

Discussions:  
Result from table 1 infers that products of renewable energy being available within 3 km from home have no significant relation with respondents purchase decision. Respondents between the age of 45 years-55 years have higher mean value of 5.92 amongst other age group. Though few literatures find accessibility to be an important criterion to reach and serve customers. This result may be viewed as having mixed result as different age groups have different mean value, hence, it might be premature for researcher to comment on the reasons for this result. However, researcher assumes that easy availability of products near their home might trigger curiosity towards the product as they see it every day, which might eventually lead them to buy those products. Secondly, the result from table 1 shows there is significant relation with products of renewable energy being durable for more than 1 year with purchase decision of respondents. It was found that 26 years-36 years have the highest mean for this factor stating durability as an important factor for them. Researcher found that if after sales services are guaranteed by seller there is a possibility of product purchase. Respondents aged between 46 years-55 years had high mean value of 6.97, stating that this factor is important for them. Researcher finds the result justified as in this age they might not be able to grasp techniques or steps for maintenance of the products, which may further be justified by mean value of respondents aged between 15 years to 25 years having the least mean value of 5.55 as compared to other age groups. Respondents irrespective of their age has purchase decision related to product design being convenient to use. Companies might face pricing challenge while reengineering the design. This is where Government have to play an important role for encouraging such companies with financial incentive for its sustainability in the market. 

H02: There is no significant factor influencing marital status in purchase decision of the product. Unmarried =263, Married=337  

| FACTORS | Mean | F | Sig. | hypothesis |
|---------|------|---|-----|------------|
| Buy if its available within 3km from my home | Unmarried | 4.97 | 4.95 | 0.026 | reject null |
| | Married | 5.48 |  |  |  |
| Buy if its durable for more than 1yr | Unmarried | 6.02 | 0.21 | 0.645 | accept null |
| | Married | 5.91 |  |  |  |
| Buy if after sales is guaranteed by seller | Unmarried | 5.58 | 13.54 | 0 | reject null |
| | Married | 6.39 |  |  |  |
| Buy if design is convenient to use | Unmarried | 5.78 | 2.28 | 0.132 | accept null |
| | Married | 6.12 |  |  |  |

Table 2  

Discussions:  
Irrespective of respondents’ marital status, their purchase decision is related to availability of products within 3 km from home, as seen in table 2. Sharing power supply may be adopted in Sikkim and Darjeeling, where community harmony is strong. Respondents who are married showed high mean value of 5.48, thereby giving more preference to close proximity of product availability. Subsequently, result from table 2 showed that respondents purchase decision has no significant relation with products being durable for more than 1 year. This response is taken from demographic factor of marital status of respondents, which makes researcher assume that married couple might have different priority against respondents who are single. Hence, key lies in the promotional
techniques adopted by firms which might triggers the need to purchase the product. Literature talks about the need for nexus between engineering and commercial aspect being essential. Purchase decision of respondents regardless of their marital status is related to after sales services according to the result from table 2. This facility can only be provided if manufacturing firm of renewable energy will introduce after sales services, which is the commercial aspect of the said products. Regardless of marital status of respondents there is no significant relation between them buying the product if design of the product is convenient to use. Unmarried respondents would not see the need to buy such products as they are more concerned about building their career. And married couples’ focus would be more on savings and investments rather than buying the product which they are not sure about. Hence, advocacy of existing customers in video advertisement who have been using the product satisfactorily may act as a positive stimulus for other prospective customers to buy it. However, respondents who are married had higher mean value of 6.12, showing more preference of convenience of usage of the products.

H0: There is no significant factor influencing various income level in purchase decision of the product.

| FACTORS                              | Mean  | F    | Sig. | hypothesis |
|--------------------------------------|-------|------|------|------------|
| Buy if its available within 3km from my home |       |      |      |            |
| BELOW Rs.25,000                       | 5.19  | 0.52 | 0.670| accept null |
| Rs.25,001-Rs.50,000                  | 5.53  |      |      | hypothesis |
| Rs.50,001-Rs.75,000                  | 5.22  |      |      |            |
| Rs.75,001-ABOVE                      | 4.90  |      |      |            |
| Buy if its durable for more than 1yr  |       |      |      |            |
| BELOW Rs.25,000                       | 6.02  | 6.87 | 0    | reject null |
| Rs.25,001-Rs.50,000                  | 6.33  |      |      | hypothesis |
| Rs.50,001-Rs.75,000                  | 4.03  |      |      |            |
| Rs.75,001-ABOVE                      | 4.80  |      |      |            |
| Buy if after sales is guaranteed by seller |       |      |      |            |
| BELOW Rs.25,000                       | 5.96  | 2.31 | 0.075| accept null |
| Rs.25,001-Rs.50,000                  | 6.50  |      |      | hypothesis |
| Rs.50,001-Rs.75,000                  | 5.59  |      |      |            |
| Rs.75,001-ABOVE                      | 4.80  |      |      |            |
| Buy if design is convenient to use    |       |      |      |            |
| BELOW Rs.25,000                       | 5.94  | 2.60 | 0.051| accept null |
| Rs.25,001-Rs.50,000                  | 6.39  |      |      | hypothesis |
| Rs.50,001-Rs.75,000                  | 5.13  |      |      |            |
| Rs.75001-ABOVE                       | 4.80  |      |      |            |

Table 3

Discussion:
Result based on table 3 shows that products availability within 3 km from home might not lead to purchase decision of respondents irrespective of their earning level. This may be because domestics products of renewable energy are in real scenario not easily available in the market. Hence, respondents are not bothered even if those products are available within 3km from home. Another reason for this result may be associate with easy availability of Chinese made products which is a hybrid of solar energy and may be charged through grid power as well, might not be durable. Result based on the research shows that there is significant relation between purchase decision of respondents if product is durable for more than 1 year. Hence, as stated in literature, energy efficient cook stove coupled with its durability and health benefit may lead to its adoption. Similarly, the same can be said for solar water heater and solar street lamps. It is interesting to find that purchase decision regarding products of renewable energy of respondents, irrespective of their income level is not related to whether after sales is guaranteed or not, based on the result from table 3. This result may be attributed to the fact that they were not provided with after sales facility when Government has distributed solar lamps in subsidized rates. Maximum respondents were not using solar lamps provided under Government schemes because it has stopped working and there were no repairing centres. Hence, solar lamps were kept in store room of the house or thrown away. When products of renewable energy are
launched with after sales facility than the result found in this observation will definitely be different. The said products of renewable energy have not yet found its niche in Sikkim and Darjeeling hence if it can be made available it can be tried on trial basis keeping in mind whether it can restrain itself from hail stones and heavy rainfall. Respondents who have high income level do not compromise with design, if they feel that they need the products then they buy it. However, income level of customers is one factor which can decide the fate of products of renewable energy. Researcher also found that regardless of their income level, respondents purchase decision was not associated with user friendly design. This issue may be solved at the faster rate if policy makers and manufacturers and engineers work towards the attainment of re-engineering the design.

3. Conclusion
Researcher is of the opinion that the approach adopted by the Government towards making renewable energy available to the remotest part of India have been taking trolls. Faster adoption of the said product can be achieved if it is easily available in the market with user friendly design. Easy said than done, but we feel that it is achievable but may take endless effort from policy makers to manufacturers to marketeers. Governments' role in policy making might encourage manufacturers in designing user friendly and efficient products, by providing them with production and research and development incentive might encourage producers to come forward and experiment with new technology. Along with potential customers, producers too find it expensive for making renewable energy products. Hence, the trio needs to work together hand in hand, those are, policy makers, producers and advertisers. The product may be for domestic use as well as for other businesses, such as, hospitals, offices, hotels, transport and any public service domain. Lastly, there is wide scope in research in future in marketing aspects of products of renewable energy, both in domestic and industry sector.

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