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Consumer Preference and Selection for renewable energy schemes- A study in Southern Tripura

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Abstract: *The Energy is the key pillar of our day to day life. Without Power-Energy thus electricity it becomes impossible to execute our activities. This study investigates the changes in perception level of people using of alternate source of energy in comparison to traditional source of energy. The case study is being developed after thorough interaction with the people of Belonia, (South Tripura District); those who are using alternate source of energy for meeting their daily necessities and also they were asked to fill up their opinion regarding some close ended questions which portrays some key facts regarding their innovative thoughts of using non-conventional energy. This study concludes that after getting exposure of non-conventional energy their user friendliness nature , a large part of people are moving to use non-traditional source energy rather than conventional source of energy.*

Keywords: Renewable Energy, Perception, Consumer Behaviour, Eco- friendly, Environmental pollution, Fossil Fuel.

I. INTRODUCTION

Energy generated by utilizing natural sources which is available in the world i.e.; wind, tide, solar geo-thermal hydel power bio-mass including farm and animal waste as human excreta is known as nonconventionalenergy. Above mentioned sources are called renewable energy and it never create any kind of environmental pollution. Now a day'sgovernment sector as well as private sectors organizations are very much interested and also concentrated for awareness programme to common peoples in the country as well as they have introduced different types of renewable energy schemes and their utilizations in day to day life in commercial sectors like Agriculture irrigation, petrol pump,banking services including ATM counter facilities to people (24 hours service), transportation service, computer services etc as well as educational institutions (School, College specially technical college and Universities) are properly utilizing non-conventional energy. It also saves costly fossil fuel in our country.

In India non conventional sources of energy consists of those energy sources that are natural, infinite and restorable. For example solar energy, tidal energy wind energy waves rain geo-thermal heat hydel energy etc. The Ministry of New and renewable Energy (MNRE) is the nodal ministry of the Government of India for all matters relating to new and renewable energy. The main aim of the ministry is to develop and implement new and renewable energy for substitutes of conventional energy which is required inour country. The following bodies have been establishingby the Ministry of New and Renewable Energy:

- Commission for Additional sources of Energy (CASE) in 1981.
- Department of Non-conventional Energy Sources (DNES) in 1982
- Ministry of Non- Conventional Energy Sources (MNES)
- Ministry of Non conventional Energy Sources (MNES) renamed as Ministry of New and Renewable (MNRE) in 2006.

In Tripura, TREDA (Tripura Renewable Energy Development Agency) is the state Nodal Agency for implementing New and renewable energy projects, which was established in the year 1998 and the activities of TREDA, is extended throughout the state. The case study has been developed after field survey in the Belonia,South Tripura district and trying to understand about consumer choice for renewable energy and particularly consumer preferences for schemes of TREDA. It is true to be fact that TREDA is the main institution in Tripura which is continuously working for the promotion of non-conventional energy in Tripura, although a huge segment of people are not aware about the schemes and benefits of using non-traditional source of energy.

II. NEED OF THE STUDY

The conventional sources of power are in some of the cases may not provide the adequate support to meet the consumer's demand. Thus, there is obvious need to search for some alternative sources. The study thus positioned itself in the zone of identifying and establishing the customer's preferences for non conventional energy sources.

III. REVIEW OF LITERATURE

The International Energy Agency has assessed India to be the Second Largest Consumer in global energy demand up to 2035. Future growth in energy deman will place considerable stress on India's ability to garner domestic and imported energy supplies. Continuous shortages of energy and environmental pollution particularly in urban areas as well as rural also, leads to thinking about using of non-traditional oil and gas supply disruptions and to volatility of petroleum crude prices.

R.Ramkrishna in the research titled" Some aspects of the energy domestic purposes in rural areas: A Study with special reference to Pondicherry region" found that the greater energy requirements (85.50% of total energy consumed) were met by bio-fuels. The major fuel used in the study area was CRTB (Crop Residues in the form of Twings and Branches) which constituted 33.87% of total energy used. In gross energy consumption the expenditure under fuel, Kerosene and electricity LPG constitute 50%, Petrol and diesel together constitute 14.2% of total energy consumption. 92.47% of the total gross energy was used for cooking followed by transportation and lighting and other purposes respectively.(Ramakrishna 2010).

P.V. Pratibha, in "Energy Lodder profile of All India household energy demand in rural and urban context" found that energy is not only used for domestic purposes. Energy is essential not only for cooking but also used for lighting and running various household appliances.

It was also observed that the energy requirement for urban and rural poor are grouped together as "Cooking and Lighting" Almost 80% of energy is used for cooking is rural areas. The poor sections of urban and rural areas people's non-commercial type of energy is more used than the commercial type. The main biomass fuels used are fuel wood, twings and branches leaves, roots and agricultural and animal wastages. Though Kerosene, Coal Charcoal and electricity are used to some extent as fuel. Now is many areas the usage of biogas is increasing.

Mohammad AffuddinMallick observed in his research entitled "Modeling of renewable energy system" that the energy requirement of India is increasing rapidly and both conventional and non-conventional energy is being used. Because of the insufficient resources and pollution from conventional sources and restrictions led by international agreement, it is now realized that renewable energy has to be used. In India main source of renewable energy is wind power (70%). 85000 MW renewable energy is considered to be enough to meet the energy deficit in the country. In his work three different diffusion models based on energy sources such as wind, biogas, solar etc. Are utilized for the determination of most appropriate technology which could be adopted for power generation in India. To forecast the necessity of renewable energy up to 2020 these models are used. This work shows that the wind energy is the most shows that the wind energy is the most suitable sources of renewable energy for power generation in India.

David P. Chynoweth and his associate member in connection of "Renewable Methane from anaerobia digestion of biomass" production of methane via anaerobic digestion of production of energy crops and organic wastes would be more beneficial than fossil fuel derived energy and reduce global warming and acid rain. Methane derived from anaerobic digestion is competitive in efficiencies and costs to other biomass energy forms including heat, synthesis gases and ethanol.

J.P.Painuly remarked in his research paper "Barriers of Renewable Energy has the penetration." The renewable energy has the potential to provide clean energy in developing countries. Inspite of several barriers to its penetration. In his research he found out the barriers of using renewable energy and suggested measures to overcome them.

M.Beccali and his associate in their research paper "Decision making in energy planning, Application of the Electro method of regional level for the diffusion of renewable energy technology" wanted to show an multicriteriadecion making methodological tool that gives the decision making methodological tool that gives the decision maker considerable help in the selection of the most suitable innovative technologies in the energy sector. In this proper a study is carried out in the island of sarddinia which represents high potential for energy resources exploitation and on the other hand represents specific case among other Italian regions.

D.A.Haralambopouls and his associate described in their research work: "Renewable Energy Project: Structuring a multi-criteria group decision". The study was carried out in the island of Chios, Greece, Concerning the exploitation of a geothermal resource. The presented structure gives us a transparent, Serial and separated agenda and beginnings the determination of the PROMETHEE preference. This developed methodology supplies synergy between different actors and a user friendly approach so as to reach at consensus.

Christopher Koroncos and his associate described in their research paper "Every analysis of renewable sources" dependency of economies on fossil fuel has been increased due to the oil crises. Renewable Energy sources have come out as an inexhaustible and more environment friendly energy sources than the fossil fuels. The renewable energy i.e.; solar energy, wind power and geo thermal energy are compared with the non-renewable energy sources on the basis of efficiency in this study.

E.I. Zoulias and his associate remarked in their paper "Techno economic analysis of the integration of hydrogen energy based standalone power system" in the Europe a large number of stand-alone power system" in the Europe a large number of stand-alone power system that are based on fossil fuel or renewable energy (RE) based are installed which often comprising photovoltaics (PV0 and/or diesel generators. The replacement of conventional technologies such as diesel generators and /or batteries with hydrogen technologies, including fuel cells in an existing PV-diesel stand-alone power system was simulated band optimized, using the hybrid optimization model for electric renewable (HOMER) simulation tool. The techno-economic analysis of the existing hybrid stand-alone power and the optimized by hydrogen-based system shows that the hydrogen technologies is technical feasible but reduction in the cost are need to be made in the future.

G.J.Dalton, D.A.Lockington and T.E.Baldock jointly contributed their views in connection of "Feasibility analysis of stand-alone renewable energy supply based on renewable energy supplied options for a large hotel". This study was done in a hotel (over 100 beds) regarding the power supply based on renewable energy supply for a stand-alone supply. The assessment criteria of the analysis are net present cost, renevoble factor and payback time. Due to the limitations of RES (Renewable Energy Supply) the higher degree of comfort i.e.; air conditioning and other power based system could not run continuously without any interruption in the hotel industry. The study uses RES assessment software tools, HOMER (National Renewable Energy Laboratory; US) and HYBRIDS (Solaris Homes, Queensland, Australia) in order to compare diesel generator only, RES only and RES / Diesel hybrid technologies. The result of the optimization modeling demonstrates that RES-only configuration has the capacity to meet 100% of power demand. The hybrid diesel (RES configuration provides the lowest NPC result with a resultant RF of 76% where as in comparison to the diesel generator only configuration. NPC is reduced by 50% and Green house gas (GHG) emissions by 65%. Large -scale wind energy conversion system (WECS) (over 1000KW) rather than photovoltaics are more efficient and economical. But for small-scale WECS (0.1-100 K.W) are not that much effective. From the study we conclude that RES is technically feasible and economically effective for the replacement of conventional thermal energy supply for large-scale tourist operations dependent on standalone-power supplies.

A.K.Akella, M.P.Saini and M.P.Sharma observed in their research "Social, Economical and Environmental impacts of renewable energy system", that conventional energy based on oil, coal, natural gas is effective for economic progress but is not good for environment and human health. From the different aspects of social, economical and environment problem the RES is compared with the conventional sources in this study. Finally it is said after the use of RES in remote areas the total emission reduction in different years has been largely increasing.

M.B.Blarke and H.Lund in their research paper "The effectiveness of storage and relocation options in renewable energy system!! Mentioned that the world energy planner and transmission system operators are facing challenges on how to deal with high penetration levels of intermittent energy resources and combined heat and power (CHP). The distributed supply that introduces the principle of storage and relocation, typically by integrating heat pumps(HP) or electric boilers(EBs) into the operational strategies of existing HP plants is helpful for reducing the uncertainties related to fuel and electricity price fluctuations.

Sudhakar Reddy and J.P.Painuly describe in their research regarding the diffusion of renewable energy technologies (RETS). They collected views on RETS from the households, people from industry and commercial establishments and policy experts. The study was carried out in Maharashtra state, India. The results provide evidences of how the consumers receive RET information and make decisions using their limited analytical capabilities. The study based on behavioral theory helps to understand the consumer perspectives, and also helps to develop policy interventions. After finding out the barriers of RETS the remedial measures also focused in this research.

IV. OBJECTIVES OF THE STUDY

- To find out the perception of the people of Belonia, South Tripura traditional source of energy could be beneficial for them.
- To know whether aperson gets Government subsidy and other benefits "TREDA"; are they fully ready to switch over to non-traditional source of energy from traditional one.
- To find out un-coverage area of remote village of traditional electricity will be compensate by the new TREDA's different schemes.

V. SCOPE AND LIMITATION

The study is focused on the consumer preferences aspects about the renewable energy. Also, only one region is captured as the south Tripura.

VI. RESEARCH METHODOLOGY& DATA

The present study is of the nature of exploratory. The, exploratory research as the name states intends merely to explore the research questions and does not intend to offer final and conclusive solutions to existing problems . The research does not intend to offer final and conclusive solutions to existing problems. For this case study a set of questionnaire has been developed and beneficiaries from the i) age group of 25-35yrs35 to 45 and 45&above, ii) income range from minimum Rs. 5000/- per month to above Rs. 25000/- per month, iii) both male and female (87%: 13%) were selected iv) Usage of Power and v) Consumer preference for "TREDA" scheme etc. The sources of data are Primary, obtained from the field survey.

VII. CASE STUDY AND RESULTS

This section tries to explore the various key findings about people's perception of BeloniaSouth Tripura District regarding their interest in using non- traditional source of energy. In Tripura, until now, power generation is being shown as a sign of optimism in context of two (02) ongoing power projects in Palatana and Manarchak. But soon after its operation starts, it discontinued power generation a number of times and the logic is being shown as supply of poor quality natural gas to this plant by ONGC. It is also important to mention that supply of power to household, installation and maintenance of cables, transformers, electric posts is necessary. Due to this TREDA has taken initiation to supply energy to 7278 no. of households by the renewable means.

The survey was conducted amongst 54 no of participants in the district South Tripura during the month of Marchto April 2016. Amongst the participants 87% was male category and rest 13% of female category. Their income range varies from Rs. 5000/- to Rs. 25000/- & above , age group varies from 25 yrs to 45 yrs, usage of energy for domestic as well as commercial purpose etc.

Interestingly amongst all the participants, all are using traditional sources of energy (100% approx). 100% respondents have deep concerns for disturbance in electric line; they are facing. Load shedding is one of the major issues noa –a days in developing economies like India, although scenario has been changed recently but the residents of Belonia are facing load-shedding for 1hr (approx38%) and rest no. of people are facing it daily for 2 hours 50% and more than 2 hours12% regularly. As the respondents are traditional village persons, so they do not require huge source of energy. It has been observed in the graph that a majority of people i.e.approx47% does not require more than 50 units of electricity. It has been observed that majority of the users consumes electricity for domestic purpose only (approx89%), rests uses for commercial purposes. A typical observation has been found during research that power supply is inadequate according to the demand of village people and almost 100% strongly agree. Here comes the role of TREDA; they are playing an important role for promotion of using non-traditional sources of energy though solar lantern, solar powered torch light, solar powered Chula, using of biomass, for domestic cooking gas. Moreover "TREDA" and Govt. of Tripura are jointly working on usage of non traditional sources of energy for the people of Tripura; like Government subsidy on various items, after sale service, setting up of Govt. shop for repair and maintenance works, cheap spare parts etc. Most of the participants prefer various schemes provided by "TREDA" like availability of Government subsidy, eco- friendly nature easy to use etc. Approx 100% and other scheme at present few demand. "TREDA" and moreover the way "TREDA" promotes their product through Nagar Panchayat Offices.

Thus from the analysis of above data obtained during the month of March 2016to April 2016.It is evident that Belonia, South Tripura district are trending towards the use of non-conventional sources of energy and moreover it has been also identified that if they get Govt. subsidy as well as other benefits by TREDA they have no hesitation to switch over from traditional electricity.

VIII. FINDINGS

- Most of the beneficiaries are interested for using non-conventional source of energy apart from traditional sources of energy.
- The main reason behind the idea of using non-conventional energy are cost effectiveness, user –friendly nature, moreover renewable also their pollution free nature.
- The study shows that if Government provides them subsidy during the time of purchase of these machines and their installation charges are also borne by the Government authority; a huge number of people will be attracted towards utilizing those non-conventional energy efficient machines.
- One of the interesting findings in the case study is that participants are very much satisfied with the products supplied by "TREDA" and the participants very much enthusiasm about more energy efficient products.

- Typically it has been observed in the case study that most of the village people are not aware about the usage of non-conventional energy efficient products.
- Service centre function and activities should be increase area wise more high quality of Battery and spare - parts should be supplied at the time of repairing.

IX. CONCLUSION

After thorough study and observation of renewable energy mission which is also contributed by "TREDA" as well as Government administrative levels through Nagar Panchayat and BDO offices; the coverage level of these programmes should reach to the every nook and corner of the state so that people can be aware about the mission of "TREDA". Because majority of the people of Tripura, specially people belong to hilly area are not aware about utility and usage of renewable energy schemes provided by "TREDA" as well as Government Officials.Sufficient care should be taken by "TREDA" as well as different NGO's can take part for campaign of the use of renewable energy efficient products and also their maintenance.

It has also been observed that in the hilly areas power is being supplied through uncovered electricity lines. Both "TREDA" and Government should take sufficient care to identify care to identify those households for urgent basis of distribution of solar lantern, installation of bio-gas plant, installation of solar light as well as wind power energy plants to provide facilities and benefits to those households but also for promotion of small trade or business activities which will give indirectly more revenue to rural people as well as their standard of living will also increase.

As a result when there will be huge demand by the people of Tripura for non- conventional energy equipments (i.e. Solar light, solar lantern, bio-gas plant, wind energy machine , solar street light) ; at that stage Government must welcome other private agencies to supply such machines and also initiative must be taken for proper maintenance along with "TREDA" and Nagar panchayat and Panchayat Office . As a result people can enjoy the success of this mission (i.e. proper implementation and use of non-conventional energy by maximum no. of people in Tripura)

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