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# Demand of Solar Home System (SHS) among the Consumers of Off-Grid Area

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***Abstract:*** *Though energy has always been a government sector, but with the rise of global warming issues and renewable technologies, it is possible for end consumers to buy devices like Solar-Home-System that provide electricity. This research focuses on the demand of potential customers of SHS, who live in the remote off-grid areas of Bangladesh. Two variables- availability of fund and after sales service, have been tested against their willingness to buy through binary logit model. The model has not proved to be fit. This fact was justified by the qualitative research which reveals that, people from off-grid areas are mostly poor and their priority is earning livelihood, rather than having electricity. Hence these people cannot be taken as targeted customers of SHS.*

***Keywords:*** *Renewable Energy, Solar Home System, Off Grid Area.*

## Introduction

In his speech, Ban-Ki-Moon has suggested that if the worst climate impact had to be averted and the temperature had to be kept from rising even for two degree centigrade in this century, the world needed a universal, legally-binding global climate agreement by 2015. He also stated "Energy will be a determining factor in whether the world can avoid dangerous climate change and make a transition to a sustainable, more inclusive global economy" (Frankfurt School-UNEP Centre, 2013). Bangladesh government's policies align with the UN's stance on renewable energy.

In order to promote renewable energy, Bangladesh government has initiated installing solar home systems (SHS) in the off grid areas of Bangladesh, as one the methods to execute low carbon emission strategy and to secure future energy sector (Power division, 2011). SHS refers to the solar panel which uses photovoltaic technology to convert light into electricity (Nuery, 2013).

IEA has predicted that, $32 billion investment per year till 2030 will be required to have access to the electricity all over the world. It is also estimated that by 2018, 75 countries will develop off-shore wind capacity, 65 countries will develop solar PV and 50 countries will acquire bio-fuel technology. IEA expects that, globally renewable capacity will

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increase from 1580 GW in 2012 to 2350 GW in 2018 (International Energy Agency 2013).

Even in this challenging economy, in 2012 worldwide investment on clean energy was $244 billion. Fossil fuels are costly in terms of production cost as well as damaging human health, ecosystem, and climate. Yet in 2012, the gross investment in fossil based fuel like-coal, gas and oil power was estimated to be $262 billion which is higher than that of on renewable energy. The scenario of these imbalances and externalities should be recognized if renewable energy is to grow its' full potential (Frankfurt School-UNEP Centre, 2013).

Regarding the above mentioned issue about investment, OECD and non-OECD countries alike are developing and patronizing their renewable energy sector. It is predicted that from 2008-2018, renewable power sector will rise up to 25% (International Energy Agency, 2013).In developing or poor economies, where there is no or very limited access to electricity, renewable based electricity can be very useful to millions of people.

The above mentioned statement is also true for Bangladesh. In the off-grid areas of Bangladesh, there is an existing market size of 1 million households for SHS on a fee-for-service basis (power division, 2011). Other than subsidized government market, it is a viable option for the consumers of off-grid area, where it is not cost effective for the government to establish national power grid. This sector has the capacity to bring economic, environmental, and social benefits to people living in remote rural areas in Bangladesh (Mondol et al., 2010). This research intends to find characteristics of the demand of those consumers. In order to do that, after examining other variables, researcher has considered two variables, availability of fund and after sales service. Since most of the researches on renewable energy are focused on government side, this research has taken both quantitative and qualitative approach to understand the attributes of the demand of the consumers of the off –grid area of Bangladesh.

## Literature Review

Renewable energy has competitive opportunities in new and traditional markets (International Energy Agency, 2013). This also implies that, though government controls energy sector, renewable energy market has prospect in consumer market. This sector has the capacity to bring economic, environmental, and social benefits to people living in remote rural areas in Bangladesh (Mondol et al., 2010)

**Bangladesh Market:** On an average the daily demand of electricity in Bangladesh is 4000-5200 MW, but only 3500-4200 MW of electricity is being produced (Amin, 2011). Government heavily subsidizes the electricity supply to the rural areas and generates high transmission and distribution costs along with high transmission losses (Hossain and

Badr 2007, Ministry of Energy and Renewable Resources, 2002). Power crisis in Bangladesh is a well-known fact. People are increasingly depending on imported power sources like- oil and coal (Sarker et al., 2003). There are about 1.34 million diesel-powered irrigation pumps across Bangladesh, mostly in off-grid areas. One-third Bangladeshis live in those off-grid areas (www.worldbank.org, 2016).Though, according to Akter, (1997), Islam et al., (2006) and Islam et al., (2008) solar, biomass, wind and hydro-power are best suited for Bangladesh, but Sarker et al. (2003) voted only for solar and bio mass. According to a survey, in 2011 the national grid was serving only 50% of the 10,000 (app.) rural-markets and commercial centers in the country. In the off-grid locations, different government administrative offices, NGO offices, health centers, schools, banks, police stations are either using traditional means like- lantern, candles, kerosene wick lamps etc. or operating their own diesel generators. In the off-grid remote areas of Bangladesh, there is an existing market of 1 million households for SHS on a fee-for-service basis (Power division, 2011). But most of the rural people are in disadvantageous position due to their low-purchasing power (Sarker et al., 2003).

Comparing poverty map and electricity grid map of Bangladesh it can be seen that population below upper-poverty-line and below lower-poverty-line are concentrated in off-grid area (worldbank.org, 2014 and cnpp.iaea.org, 2016). Bottom 5% households of both rural and urban have the same socio-economic scenario, because rural and urban areas have almost same income per month, which is 5,138 and 5,284 respectively (Bangladesh Bureau of Statistics, 2010). Due to these reasons, samples for this research have been chosen from the city area, who have low income and home at off-grid areas.

**Potentiality in Bangladesh:** Significant cost reduction in solar photovoltaic (PV) technology has given it a competitive edge. For example, in 2012 30.5GW in PV capacity has been installed in Southern Europe compared to 2011's 28.8GW. However this was possible in a reduced cost which caused 11% fall in overall solar investment in 2012. In Germany this investment was decreased by 35% in 2012 because, installment of 7.6 GW solar capacity came in much lower price than it would have been in 2011 (Frankfurt School-UNEP Centre, 2013). In 2000, life cycle cost of an experimental PV system was tk 43.40/kWh for a family, in comparison to that, the cost of establishing distribution line in a village of Bangladesh even 1 km away from the main distribution line, is 125.00/kWh for a family (Bhuiya et al., 2000). But Chernoff (1983) has suggested not to consider life cycle cost while determining individual purchase criteria for energy-related durables.

The technical potentiality of gird-connected solar PV in Bangladesh was calculated as about 50174 MW (Mondal and Islam, 2011). Since, average daily solar radiation in Bangladesh is almost 4–6.5 kWh/m2, solar PV are gaining acceptance for providing electricity to households and small business enterprises in remote rural areas (Islam et al.,

2006). Biswas et al., (2001) has taken households/small business as the consumer group in his model to increase the use of renewable energy technology.

Another issue that Wüstenhagen et al., (2007) have revealed is, renewable energy may not be readily accepted by the society. But, Ministry of Energy and Renewable Resources (2002) have taken renewable energy as a socially accepted and economically viable option in Bangladesh, and so in their draft for proposed policy for renewable energy in Bangladesh they thought of providing micro finance to attract private capital in this sector. Households that receive the systems pay a 15 percent initial down payment and repay the remaining cost over three years through an innovative micro-credit program. SHS has reached more than 3.9 million rural households and shops, and about 20,000 solar homes systems are being installed every month (www.worldbank.org, 2016).

Though GOB has taken initiative to provide electricity to the whole country by 2021, but that is not possible via grid expansion due to inaccessibility and low consumer density in the remote areas of Bangladesh (Ministry of Energy and Renewable Resources, 2002). Under the 'Rural Electrification and Renewable Energy Development (RERED) programme 64000 SHSs have been installed by 2007 (Islam et al., 2006). Now RERED II project is assisting GOB to give access to electrical power to all Bangladeshis by 2021(www.worldbank.org, 2016). Currently a few public sectors and NGOs are developing renewable energy technology (RET) projects in rural areas (Mondol et al., 2010).

**Variables considered**

While researching on different aspects of renewable energy, researchers have considered many variables, depending on their objectives. Neji (1997) found that large investments and government policies can help the adaptation rate of renewable technologies like-wind turbines and PV modules. But these variables are suitable to for government market. Same justification is applicable for Voivontas et al., (1998), who took expected energy output and installation cost as variables to evaluate economical potential to evaluate availability and technological potential.

A research has also shown that, rural entrepreneurship, government programs, and donor assistance, is helping to grow the markets for renewable energy in rural area, but for this research, biogas and small hydro was considered along with SHS, which were used to light rural households. Yet researchers have found that technical know-how transfer, new replicable business models, credit for rural households and entrepreneurs, regulatory frameworks and financing for private power developers, market facilitation organizations, donor assistance, and smarter subsidies are required to make this sector profitable and socially beneficial (Martinot et al., 2002). Though, this research was not

considering individual household, but among the variables, 'credit for rural household' can be taken as a determinant factor for individual consumers' demand.

Akter, (1997) identified the several other market barriers, like- high initial cost, dependence on the weather, lack of awareness, lack of established high-volume supplier-dealer chains, high prices of the components and lack of fund. Nalan et al., (2009) have found that, in turkey, their lack of knowledge about renewable energy technologies among policy-makers, potential consumers, and energy firm managers are the main market barriers. Bang et al. (2000) took almost same three variables to measure consumers' attitude towards renewable energy- concern with the environment, knowledge about renewable energy, and beliefs about the consequences of using renewable energy. But these variables are hardly related with this research, because, in rural area of Bangladesh per household expenditure for education is only 604.00 tk. (Bangladesh Bureau of Statistics, 2010). So it is justifiable to presume that, the population for this research have little knowledge about SHS, so they are supposed to have problem understanding the research questions. In order to overcome this barrier, the respondents were informed about the renewable energy first.

Barua (2001) has stated that, the high cost of PV module is the main barrier for marketing PV program in rural Bangladesh. Customers need easier financing scheme to make the system affordable. In order to evaluate the renewable energy sector, cost and the efficiency of different incentives schemes need to be assessed (Menanteau et al., 2003, Cherni and Kentish, 2007). Islam et al., (2011) have mentioned that, rural people are not likely to invest in a technology which is not durable and there is no after sales service available. They suggested that long term warranty, installment based financial scheme may attract the customers.

As seen from the above mentioned researches, they have encompassed the whole market scenario especially on government market, rather than focused solely on consumer market. Moreover there is no research on SHS consumer market of Bangladesh. So, this research has considered only those variables those are related with the mindset of the end-customers of Bangladesh, they are- availability for fund for rural households and after sales service.

**Objectives of the Study**

This research intends to find, whether the availability of fund and after sales service can influence the demand of SHS among the low income people of Bangladesh.

**Methodology of the Study**

From the above discussion, two independent variables have been chosen as independent variables, financial schemes to buy the SHS and warranty.

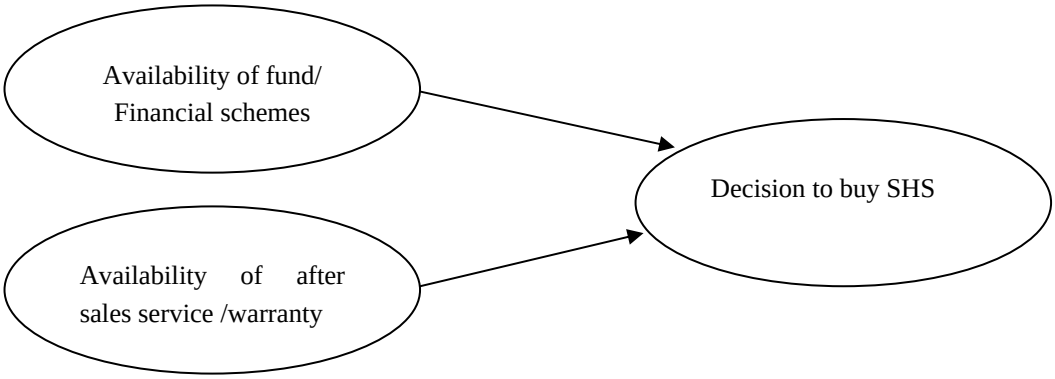


Figure: Conceptual framework (developed by author)

First this empirical study has taken quantitative research to determine the extent to which the price and after sales service influence the demand of SHS. On the second part a qualitative research was conducted to have clarification of the result acquired from quantitative research (Saunders et al., 2013). Since there was no prior standard deviation or any such research focusing on rural households as the end-consumer, it was not possible to mathematically determine the sample size (Malhotra and Das, 2015). So as a rule of thumb, this research has taken 30 respondents to generalize the result (Lind et al., 2013).

As mentioned in literature review, the income of urban and rural poor people is almost same (Bangladesh Bureau of Statistics, 2010). So the respondents have been chosen from the urban area, those have a monthly income of BDT 5,000 or below. Their monthly income suggested that they belong to 'Bottom 5%' group of population (Bangladesh Bureau of Statistics, 2010). The respondents were chosen from construction workers and house workers using judgmental sampling. Through screening question it was ensured that they were the earning members of their households in off-grid areas.

The independent variables are cost and after sales services, which are metric data produced using 5 scale Likert scale to generate metric data. The dependent variable is their willingness to buy a SHS or not, which produced binary response. So binary logit model has been used for this research (Malhotra and Das, 2015, Gujrati et al., 2013).

After the pilot survey on 8 respondents, it was evident that they do not have any knowledge about this product. So every respondent was briefed by the researcher first and then they were asked to respond to a structured questionnaire. Later in-depth interviews of 5 respondents have been taken for triangulation and clarification of the result (Saunders et al., 2013).

**Findings and Analysis**

If 'buy' and 'will not buy' are taken as two outcomes of an event, the probability of buying may be explained using logit model as:

$$\text{Log}_e\left(\frac{p}{1-p}\right) = a_0 + a_1X_1 + a_2X_2$$

Where,

p = Probability of buying ao= Constant

a1 = Logistical coefficient for warranty a2 = Logistical coefficient for installment

X1= Warranty X2 = Installment

As suggested by Malhotra and Das (2013) the researcher has considered Nagelkerke R Square to determine the fitness of the model, rather than Cox & Snell. The result of this logit model shows in table 1 that, the data is not strongly fitted with the model, since Nagelkerke R Square is .220, which is less than 0.5. This is further verified by the fact that, only 63% of the cases are correctly classified. The Wald's statistics shows the significance of estimated coefficients. For 1 degree of freedom and .05 level of significance, calculated Wald's statistics for 'installment' and 'warranty' are .231 and 3.067 respectively, which are lower than the critical t value of 6.3138. So none of the variables is significant (Malhotra and Das, 2013).

**Table 1: SPSS output of the proposed Logit model**

<table>
<tr><th colspan="6">Dependent Variable Encoding</th></tr>
<tr><td colspan="3">Original Value</td><td colspan="3">Internal Value</td></tr>
<tr><td colspan="3">Will not buy</td><td colspan="3">0</td></tr>
<tr><td colspan="3">Buy</td><td colspan="3">1</td></tr>
<tr><th colspan="6">Model Summary</th></tr>
<tr><td>Step</td><td colspan="2">-2 Log likelihood</td><td colspan="2">Cox & Snell R Square</td><td>Nagelkerke R Square</td></tr>
<tr><td>1</td><td colspan="2">34.162a</td><td colspan="2">.161</td><td>.220</td></tr>
<tr><td colspan="6">a. Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.</td></tr>
<tr><th colspan="6">Classification Table[a]</th></tr>
<tr><td></td><td colspan="2">Observed</td><td colspan="3">Predicted</td></tr>
<tr><td></td><td colspan="2"></td><td colspan="2">Buy</td><td rowspan="2">Percentage Correct</td></tr>
<tr><td></td><td colspan="2"></td><td>0</td><td>1</td></tr>
<tr><td>Step 1</td><td>buy</td><td></td><td>6</td><td>5</td><td>54.5</td></tr>
<tr><td></td><td>1</td><td></td><td>6</td><td>13</td><td>68.4</td></tr>
<tr><td></td><td colspan="2">Overall Percentage</td><td></td><td></td><td>63.3</td></tr>
<tr><td colspan="6">a. The cut value is .500</td></tr>
</table>

| Variables in the Equation | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | B | S.E. | Wald | df | Sig. | Exp(B) |
| Step 1[a] | Installment | .209 | .436 | .231 | 1 | .631 | 1.233 |
| | Warranty | 1.014 | .579 | 3.067 | 1 | .080 | 2.757 |
| | Constant | -3.884 | 2.305 | 2.839 | 1 | .092 | .021 |
| a. Variable(s) entered on step 1: Installment, Warranty. | | | | | | | |

Since the model was not reasonably fit, 5 of the respondents were contacted again for discussing about the factors which hinders their buying intension. It was found that, since the consumers belong to ultra-poor category, their priority is not Solar Home System. Rather, if they have any opportunity to have loan, they will like to invest it on something that have more immediate influence on their income level. Two respondents wish to buy 'cattle'.

In other research it is found that, future demand of renewable energy depends on the acceptance of this technology to the customer, especially rural people. Experts have mentioned that, people are developing a favorable mindset by using renewable technology. Business organizations are mainly targeting mid-level category of poor for their solar panel market, because, experts have also mentioned that, ultra poor people are not a suitable target market for solar panel, because they cannot afford the renewable technology, even if that has been installed in their home upon loan or instalment basis. Most of the time these ultra-poor customers stop paying the instalment for solar panel because of their priority for paying other types of instalments like- microfinance, which have much more tangible immediate benefits than that of solar panels (Nuery, 2013). The same result can be observed in this research. So on the basis of triangulation, this research is valid (Saunders et al., 2013).

## Conclusions

IDCOL's SHS program involved around 70,000 people are directly or indirectly, which is a huge contribution to the employment scenario of Bangladesh (idcol.org, 2014). World bank (2016) reported that, increasing number of farmers have access to reliable, cleaner and less expensive electricity through RERED II renewable energy projects. But these projects are all heavily subsidized. As found in the research, consumers, who are at bottom 5% in poverty line, are not willing to buy the SHS, even if funds are available to them, rather they will like to secure their livelihood. So they cannot be the target customer for SHS. These findings open new scope for research in this sector, which may include the level of poverty as a variable, along

with level of education, concern about the environment, knowledge about the renewable energy.

## References

Akter, N. (1997). "*Alternative energy situation in Bangladesh a country review"*, BRAC, Research and Evaluation Division. Available at: https://www.google.com.bd [Accessed 5th April 2014]

Amin, A. R. M. R. (2011). "Explosion of solar power in Bangladesh", Available at: http://cdkn.org[Accessed 10th April 2014]

Bang, H. K., Ellinger, A. E., Hadjimarcou, J. and Traichal, P. A. (2000). "Consumer Concern, Knowledge, Belief, and Attitude Toward Renewable Energy: An Application of the Reasoned Action Theory", *Psychology & Marketing*. Vol. 17, No. 6, pp. 449–468. Available from: http://onlinelibrary .wiley.com [Accessed 10th April 2014]

Bangladesh Bureau of Statistics (2010). "Report of household income and expenditure survey, 2010",[Online] Available from: http://www.bbs.gov.bd/

Barua D. C. (2001). "Strategy for promotions and development of renewable technologies in Bangladesh: experience from Grameen Shakti", *Renewable Energy*. Vol. 22, No. 1–3, pp. 205–210. Available from: http://www.sciencedirect.com [Accessed 10thApril 2014]

Biswas, W. K., Bryce, P. and Diesendorf, M. (2001). "Model for empowering rural poor through renewable energy technologies in Bangladesh", *Environmental Science & Policy*.Vol. 4,No.6, pp. 333–344. Available from http://www.sciencedirect.com [Accessed 10th April 2014]

Bhuiyan, M.M.H., Asgar, M.A., Mazumder R. K, and Hussain, M. (2000). "Economic evaluation of a stand-alone residential photovoltaic power system in Bangladesh", *Renewable Energy*. Vol. 21, no. 3–4, pp. 403–410. Available from: http://www.sciencedirect.com [Accessed 10th April 2014]

Cherni, J. A. and Kentis, J. (2003). "Renewable energy policy and electricity market reforms in China", *Energy Policy*. Vol. 35, No.7, pp. 3616–3629. Available from: http://www.sciencedirect.com [Accessed 10th April 2014]

Chernoff, H. (1983). "Individual purchase criteria for energy-related durables: The misuse of life cycle cost", *The Energy Journal*, 4(4), 81-86. Retrieved from http://www.jstor.org/stable/41321630

Cnpp.org (2016). "IAEA: Country Nuclear Power Profile, Bangladesh", [Online] Available from: cnpp.iaea.org [Accessed 16th October 2016]

Frankfurt School-UNEP Centre (2013). "*Global trends in renewable energy investment 20*13", Frankfurt School of Finance &Management. Frankfurt. Bloomberg Energy Finance. Available from: http://www.unep.org [Accessed 5th April 2014]

Gujrati, D. N., Porter, D. C. and Gunasekar, S. (2013). "*Basic Econometrics"*, 5th Edition. New Delhi, McGraw Hill Education.

Hossain, A. K. and Badr, O. (2007). "Prospects of renewable energy utilization for electricity generation in Bangladesh", *Renewable and Sustainable Energy Reviews.* Vol. 11, No. 8, pp. 1617–1649. Available from http://www.sciencedirect.com [Accessed 10th April 2014]

Idcol (2014). "Renewable energy", Available at: http://www.idcol.org[Accessed 10th April 2014]

International Energy Agency (2013). "Renewable energy medium term market report 2013, market trends and projection to 2018", Available from: http://www.iea.org [Accessed 5th April 2014]

Islam, A. K. M. S., Islam, M. and Rahman, T. (2006). "Effective renewable energy activities in Bangladesh", *Renewable Energy*. Vol. 31, No. 5, pp. 677–688.Available from: http://www.scien cedirect.com [Accessed 15th April 2014]

Islam, M. R., Islam, M. R. and Beg, M. R. A. (2008). "Renewable energy resources and technologies practice in Bangladesh", *Renewable and Sustainable Energy Reviews.* Vol. 12, No. 2, pp. 299–343. Available fromhttp://www.sciencedirect.com [Accessed 10thApril 2014]

Islam, M. S., Khan A. M. H. R., Nasreen S., Rabbi, F. and Islam, M. R. (2011). "Renewable energy: The key to achieving sustainable development of rural Bangladesh", *Journal of Chemical Engineering, IEB* .Vol. 26, No. 1. pp. 9-15. Available from: https://www.google.com.bd [Accessed 10th April 2014]

Lind, D. A., Marchal, W. G. and Wathen, S. A. (2013). "*Statistical techniques in business and economics*", 13th edition. New Delhi, McGraw Hill Education.

Malhotra, N. K. and Dash, S. (2013). "*Marketing research, an applied orientation"*. 6th edition. India: Dorling Kindersley.

Martinot, E., Chaurey, A., Lew, D., Moreira, J. R. and Wamukonya, N. (2002). "Renewable energy markets in developing countries", *Annual Review of Energy and the Environment.* Vol. 27, pp. 309-348. Available from: http://www.annualreviews.org [Accessed 5th April 2014]

Menanteau, P., Finon, D. and Lamy, M. L. (2003). "Prices versus quantities: Choosing policies for promoting the development of renewable energy", *Energy Policy*.Vol.31, No.8, pp. 799–812. Available from http://www.sciencedirect.com [Accessed 5th April 2014]

Ministry of Energy and Renewable Resources (2002). "*Renewable Energy Policy of Bangladesh"*, Draft, Government of People's Republic of Bangladesh. Available from: https://www.google.com.bd [Accessed 5th April 2014]

Mondol, M.A.H., Kamp, L.M. and Pachova N. I (2010). "Drivers, barriers, and Strategies for implementation of renewable energy technologies in rural areas in Bangladesh- An innovation system analysis", Energy Policy, Vol. 38 No. 8, PP. 1869-1874.

Mondol M. A. H., and Islam A.K.M. S. (2011). "Potential and viability of grid-connected solar PV system in Bangladesh", *Renewable Energy*. Vol. 36, No. 6, pp. 1869–1874. Available from: http://www.sciencedirect.com[Accessed 10th April 2014]

Nalan, C. Z., Murat, O. and Nuri, O. (2009). "Renewable energy market conditions and barriers in turkey", *Renewable and Sustainable Energy Reviews*. Vol. 13, No. 6–7, pp. 1428–1436. Available from: http://www.sciencedirect.com[Accessed 5th April 2014]

Neji, L. (1997). "Use of experience curves to analyse the prospects for diffusion and adoption of renewable energy technology", *Energy Policy*. Vol. 25, No.13, pp. 1099–1107. Available from: http://www.sciencedirect.com[Accessed 10th April 2014]

Nuery, N. (2013). "Factors influencing the demand of renewable energy in Bangladesh: A focus on government and business market", *D. U. Journal of Marketing, University of Dhaka*. Vol. 16, No. 1, pp. 23-39.

Power Division (2011). "Renewable energy: Renewable energy in Bangladesh", Available from: http://www.powerdivision.gov.bd [Accessed 14th June 2014]

Sarkar, M.A.R. , Ehsan, M. and Islam M.A. (2003). "Issues relating to energy conservation and renewable energy in Bangladesh", *Energy for Sustainable Development*. Vol. 7, No. 2, pp. 77–87. Available from: http://www.sciencedirect.com[Accessed 10th April 2014]

Saunders, M., Lewis, P. and Thornhill, A. (2013). *"research methodology for business students"*, 5th edition. India: Dorling Kindersley.

Voivontas, D., Assimacopoulos, D. and Mourelatos, A. (1998). "Evaluation of renewable energy potential using a GIS decision support system", *Renewable Energy*. Vol. 13, No. 3, pp. 333–344. Available from: http://www.sciencedirect.com[Accessed 10th April 2014]

The World Bank (2014). *"Latest Bangladesh poverty maps launched"*,[Online]Available from:www.worldbank.org [Accessed 12th October 2016]

The World Bank (2016). *"Solar program brings electricity to off-the-grid rural areas in Bangladesh"*, [Online] Available from:www.worldbank.org [Accessed 16th October 2016]

Wüstenhagen, R.,Wolsink, M. and Bürer, M. J. (2009). "Social acceptance of renewable energy innovation: An introduction to the concept", *Energy Policy*. Vol. 35, No. 5, pp. 2683–2691. Available from: http://www.sciencedirect.com [Accessed 5th April 2014.