An Empirical Study On Willingness To Pay In Taiwan

Chun-Ho Kuo[a,b*] , Cheng-Da Yuan[a], Fu-Kuang Ko[a]

[a] Institute of Nuclear Energy Research, Atomic Energy Council, Taoyuan, Taiwan;

[b] Department of Economics, National Tsing Hua University, Hsinchu, Taiwan

* Corresponding auther, Institute of Nuclear Energy Research, No.1000,Wenhua Rd., Jiaan Village, Longtan District, Taoyuan City 32546,Taiwan(R.O.C)

E-mail address: douglask@iner.gov.tw,

Abstract

In the policy of “nuclear-free homeland”, Taiwan will phase out all nuclear generations by 2025. Correspondingly, the share of renewable generation will be increased to 20%. However the cost of renewable energy is higher than traditional generation, and thus the electricity price will rise and the behavior of electricity expending will be changed. We used 41 5-point Likert-type items to evaluate the factors which will influence the behavior of electricity expending from 1200 respondents in 2016. By factor analysis, we extracted 6 factors from these 41 items and deployed linear regression on these 6 factors to find out their relationship. The empirical study shows that the perception of renewable energy, risk of climate change, risk of nuclear energy and the understanding to energy issue will influence the behavior of electricity expending. It was impressed that public trust in government had no effect on the behavior of electricity expending.

Keywords: Behavior of Electricity Expending; Factor Analysis; Renewable Energy

Introduction

In the policy of “nuclear-free homeland”, Taiwan will phase out all nuclear generations by 2025 and correspondingly the share of renewable generation will be increased to 20%. However, the cost of renewable is higher than traditional generation, and thus the electricity price will rise and the behavior of electricity expending will be changed. Per the statistics from Bureau of Energy, the residential sector consumed 18.53% of electricity in 2016. In 2017, we did one questionnaire survey to find out how the public supported the multi-sources of electricity and the Willingness-To-Pay (WTP) to different type of electricity generation by Contingent Value Method (CVM). We considered the electricity service as one product and electricity mix, carbon dioxide and electricity price are the product characteristics. The survey found the information disclosure would increase the willingness to pay more charge. The WTP increased from USD 0.09 per KWh to 0.107 per KWh. The perception of climate change was one important factor to influence the WTP. People were willing to pay USD 0.038 per KWh more to mitigate the climate change. In the questionnaire, we designed 41 5-points-Likert items to check the perceptions related to WTP. This study thus investigates the factors which will influence the behavior of electricity expending. The behavior of electricity expending implicates that people know how much the electricity is paid and they may try to save the electricity bill by using the high energy-efficient appliances or changing the habit of electricity consumption.

Kavousian et al. (2013) found weathers, location & floor area are the most important structural and behavioral determinants of residential electricity consumption and no significant correlation between electricity consumption and income level, home ownership, or building age. We also considered some variables, such like gender, ages, incomes, location, education and marital status in the study.

Huebner et al. (2016) tested four different types of variables (building factors, socio-demographics, appliance ownership and use, attitudes and self-reported behaviors) to explained electricity consumption in residential buildings. They revealed that appliance ownership, usage and house size were the most influential variables for gas-centrally heated building. Widely using of energy-efficient appliances will reduce electricity consumption. In this study, we will figure out the most important factors which will influence the habits. Jones et al (2015) used 62 factors, including 13 socio-economic factors, 12 dwelling factors and 37 appliance factors and found four of the socio-economic factors, seven of the dwelling factors, and nine of the appliance related factors had a significant positive effect on electricity use.

After the Fukushima nuclear accident in Japan, the issues of Taiwan's nuclear energy security and various types of power have been attracting more attention. The development of renewable technology such as wind powers, carbon capture and storage and hydrogen vehicles is rapid not because the replacement of traditional generation but also some environmental and societal issues. Huijts et al.(2012) argued "Environmental and societal problems related to energy use have spurred the development of sustainable energy technologies, such as wind mills, carbon capture and storage, and hydrogen vehicles." Public acceptance is the key to introduce those technologies to the society successfully. The acceptance of the technologies is determined by attitudes, social norms, perceived behavioral control, and personal norms. (Huijts et al., 2012). Schweizer-Ries (2008) argued that energy sustainability is reduced to a purely technical problem. Renewable energies and energy-efficient technologies are developed to solve the problem, but finally the end-users will decide how much and what kind of energy they are going to consume. Roe et al.(2001)

analyzed US consumers' demand for environmental attributes of deregulated residential electricity services and found some people were willing to pay significantly more to the renewable energy to decrease the air emission. Ma et al.(2015) had similar conclusion. They found WTP was significantly higher for electricity generated from solar or generic renewable energy. The WTP for renewable energy was positively associated with the renewable energy penetration in consumption and negatively associated with current electricity consumption level. Sundt and Rehdanz (2015) mentioned that people are willing to pay more for the green electricity. People in the country with high electricity consumption per capita but low energy have higher WTP per household, but a low WTP per kilowatt-hour. Kim et al. (2013) used the contingent valuation method to examined Korean persons the willingness to pay more for the renewable electricity and found the Korean customers recognize the renewable electricity is different to the traditional electricity generated from fossil fuels or nuclear energy. The customers can accept increased electricity charge if the price rise properly reflects their preference. Many other factors may affect the willingness to pay. Solino et al. (2012) presented a methodological test in relation to the payment timeframe and its effect on marginal willingness to pay and consistency of responses using choice experiments. Liao et al. (2010) conducted a modified double-bounded contingent valuation model to explore the attitudes and the willingness to pay (WTP) of a country and found out that the supporters and opponents of nuclear power are balanced both in terms of their numbers and in terms of their WTP. It meant people did not hope to change generation of nuclear power dramatically in 2010.

The government plays an important role to impel the use of new technology. Ahman said, “The Japanese Government has adopted a comprehensive strategy

including R&D, demonstration programmes and market support guided by long-term strategic plans. The role of the Government has been that of a conductor in the development process supplying both R&D support and artificially created niche markets, and easing the way for targeted technologies by means of legislation and standards."

Research methods and factor identification

In this study, we adopted the web-based questionnaire survey to gather Taiwan's information of willingness to pay in 2016. We chose 1200 samples from Online Access Panel database which includes 226,832 persons. All the samples we chose were more than 20 years old and knew how much their home paid for the electricity bill. Total valid samples are 1200 with 95% confidential level, sampling error +/- 2.83 and 2 weeks response time. We included some demographic questions, such as sex, age, location, marital and income in the questionnaire. The original sample size was 1200 and its structure is as table 1. From the table 1, 49.7% of the respondents were male and 50.3% were female. Most respondents (77.9%) were between 20 years to 50 years old. Item analysis, factor analysis, and linear regression as the research methods will be discuss as below (Chen, T.Y. et al., 2016).

Table 1. The composition of the sample

		Below 19	20-29	30-39	40-49	50-59	Over 60	Total
North	Male	0.4%	4.8%	7.2%	6.3%	5.8%	0.8%	303
	Female	0.5%	5.4%	7.3%	7.2%	3.9%	0.6%	298
Middle	Male	0.2%	2.5%	3.2%	2.3%	1.4%	0.2%	117
	Female	0.3%	2.7%	3.7%	2.3%	0.5%	0.8%	123

South	Male	0.8%	3.8%	4.7%	3.4%	1.6%	0.5%	176
	Female	0.9%	4.5%	4.1%	2.8%	2.3%	0.7%	183
Total		3.1%	23.7%	30.0%	24.3%	15.5%	3.5%	1200
		37	284	360	291	186	42	

Item analysis

The questionnaire with 41 questions was designed in 5-point Likert-type scales as table 2. All 1200 qualified respondents were asked to indicate their level of agreement to each question from 1 (strongly disagree) to 5 (strongly agree). We list the questions and their scales in tables. Since the questionnaire is in 5-point scale, the neutral point of the questions is 3. The respondents agreed to the question, if the points were more than 3. From the table 2, some summaries are as below:

(1) The mean value of 6 questions (No. 24, No. 30, No. 34, No. 35, No. 39 and No. 41) is below than 3. To be noticed, the mean value of No. 34 “I trust the ability of government to deal with nuclear disasters” was 2.86 and the mean value of No. 34 “I trust the government to deal with nuclear waste effectively” was 2.88. It implied most people did not trust the ability of government to take care of nuclear power plants. The mean value of similar question No. 35 “I trust the government's emergency response to energy disasters” is 2.86.

(2) About the share of “agree and strongly agreement”, there were 13 questions whose share were less than 40%. Among these 13 questions, No. 24 “I trust the ability of government to deal with nuclear disasters”, No.34 “I trust the government to deal with nuclear waste effectively “ and No. 35 “I trust the government's emergency response to energy disasters “ were included. It seemed that people do not trust government very much in the issue about nuclear waste and energy disaster.

(3) The category of "the behavior of electricity expending" includes Question No. 7-12. The responses of Question No.7- 12 demonstrate that people know how the electricity is pricing and they will try to save the expense. Question No. 28- 30 are included in the category of "the perception of renewable energy." The responses show the people are not active in the protection of environment.

Table 2. Questions, **their descriptive statistics and** Cronbach's alpha

No.	Description	Mean	Neutral (%)	Agree and Strongly Agree (%)	Cronbach's Alpha if Item Deleted	Extraction Communalities
1	I understand the issue of Taiwan's nuclear energy security and various types of power generation waste disposal	3.51	44.3%	48.8%	.936	.576
2	I understand what renewable energy I can use	3.71	35.0%	61.3%	.936	.598
3	The price of Taiwan's energy is relatively cheap	3.74	30.8%	63.8%	.937	.585
4	Restrictions on energy resources (such as water shortage, electricity rationing) will be a big problem	4.03	20.8%	77.3%	.937	.645
5	Renewable energy (such as solar energy, wind power) has limited success	3.77	26.5%	67.0%	.937	.754
6	Nuclear power generation is an important low-carbon power option in Taiwan	3.60	30.3%	58.0%	.937	.697

No.	Description	Mean	Neutral (%)	Agree and Strongly Agree (%)	Cronbach's Alpha if Item Deleted	Extraction Communalities
7	I know exactly how much the electricity is paid each time	4.03	21.3%	78.8%	.937	.567
8	I will study the electricity pricing method	3.41	44.2%	43.7%	.936	.634
9	I will understand the power consumption of household electrical appliances	3.57	36.1%	54.1%	.936	.658
10	I will be able to close the unused electrical appliances at home	4.19	15.1%	83.5%	.937	.578
11	I will use electrical appliances at off-peak hours	3.51	44.1%	46.9%	.936	.618
12	I will buy renewable energy equipment to save on electricity bill	3.50	44.6%	48.0%	.936	.574
13	I know carbon emissions will accelerate the climate warming	4.20	14.6%	84.5%	.937	.742
14	I know that all kinds of power generation methods may affect the ecological environment	4.10	15.7%	83.0%	.937	.664
15	I know that extreme weather can cause disasters (such as earth and rock flow)	4.22	13.6%	85.7%	.937	.800
16	I know that extreme weather can bring huge economic losses	4.20	14.3%	85.0%	.937	.817
17	I know abnormal weather will make the species disappear and	4.22	13.6%	86.1%	.937	.807

No.	Description	Mean	Neutral (%)	Agree and Strongly Agree (%)	Cronbach's Alpha if Item Deleted	Extraction Communalities
	endanger the living environment					
18	I know that countries signed the "Paris Agreement" to jointly agree on the reduction of greenhouse gas emissions	3.85	28.8%	67.3%	.937	.449
19	I believe that nuclear power generation can bring stable power supply	3.69	26.3%	64.8%	.937	.678
20	I trust the safety of nuclear power generation	3.20	34.8%	41.8%	.936	.840
21	I trust nuclear power plant safety measures	3.15	35.3%	39.6%	.936	.855
22	I know the environmental impact of nuclear waste	3.90	21.0%	73.3%	.937	.496
23	I trust the government to supervise nuclear power plants	3.04	34.6%	36.2%	.936	.812
24	I trust the ability of government to deal with nuclear disasters	2.81	34.1%	29.2%	.936	.825
25	I think the current power generation structure in Taiwan will bring about environmental pollution	3.77	29.6%	67.1%	.937	.410
26	I will save energy whether at home or going out	4.05	20.9%	78.3%	.937	.530
27	I know what devices or equipment can be used as	3.62	39.2%	55.3%	.936	.555

No.	Description	Mean	Neutral (%)	Agree and Strongly Agree (%)	Cronbach's Alpha if Item Deleted	Extraction Communalities
	alternative energy sources					
28	I have already purchased and used alternative energy	3.13	47.8%	31.3%	.936	.633
29	I use social media to promote green energy	3.25	46.3%	37.0%	.936	.668
30	I am a member of an environmental group	2.75	43.2%	19.4%	.937	.646
31	I think Taiwan has full use and good planning of energy	3.01	40.2%	31.2%	.937	.687
32	I accept the current energy prices (such as water, electricity)	3.51	39.7%	51.7%	.937	.601
33	I think the current energy laws and regulations are effective	3.09	43.3%	33.0%	.937	.714
34	I trust the government to deal with nuclear waste effectively	2.88	35.8%	30.3%	.936	.792
35	I trust the government's emergency response to energy disasters	2.86	36.5%	28.8%	.936	.794
36	I look forward to the government's new energy policy	3.67	31.1%	60.3%	.937	.492
37	I often pay attention to the energy news of TV or newspaper magazines	3.54	43.3%	50.6%	.936	.647
38	I often go online to search for relevant energy news or articles	3.24	49.2%	35.2%	.936	.715
39	I have joined the energy-related	2.90	43.1%	24.4%	.936	.744

No.	Description	Mean	Neutral (%)	Agree and Strongly Agree (%)	Cronbach's Alpha if Item Deleted	Extraction Communalities
	community (such as FB fans group)					
40	I will discuss energy issues with family and friends	3.17	47.3%	33.4%	.936	.665
41	I'll post energy articles in Blog, FB or Line.	2.77	43.3%	19.4%	.937	.751

Remark:

*1: Cronbach's alpha is 0.938

*2: Kaiser-Meyer-Olkin Measure of Sampling Adequacy: 0.944

*3: Bartlett's Test of Sphericity: Approx. Chi-Square:34720; df: 820; sig.:0.000

We used Cronbach's alpha to test the internal consistency of this questionnaire. Cronbach (1951) defined alpha was the estimate of the correlation between two random samples of items from a universe of items like those in the test. After performing the Cronbach's alpha for these 41 questions, we got the value of alpha. We hoped the value will be bigger than 0.9 or higher to guarantee the questionnaire is internal consistency (George & Mallery, 2003). If the value of "Cronbach's Alpha if Item Deleted" of the specific question is less than the value of alpha we got, we would delete this specific question. From the Table 3, since all the values of "Cronbach's Alpha if item deleted" are bigger than the Cronbach's Alpha, we keep all the items in the questionnaire.

Factor Analysis

Factor analysis is a statistical method used to describe variability among observed, correlated variables in terms of a potentially lower number of unobserved variables called factors (Wikipedia). From the Cronbach's alpha test, we kept all 41 intems in the questionnaire, since internal consistency held. We then deployed factor analysis to extract the underlying factors from these 41 items. Using factor analysis, we can identify extracted factors to explain most of the variance observed in a large number of variables. The criteria we used are as below:

(1) Kaiser-Meyer-Olkin (KMO) Test for Sampling Adequacy

The KMO value is a statistic that indicates the portion of variance in the variables that might be caused by the underlying factors. The KMO value is between 0 and 1. If the KMO value is bigger than 0.9, it means KMO is "marvelous" and the sampling is adequate. Our KMO value was 0.944 (close to 1). It meant that factor analysis was useful and we could extract some reliable factors from the items.

(2) Barlett's test of Sphericity:

We used Barlett's test of Sphericity (Snedecor & Cochran, 1989) to test if the variables were not related and suitable to the structure. The null hypothesis is the correlation matrix of the samples is identity matrix. If the test rejects the null hypothesis, the correlation of variables will not be zero and we can analyze the relationship between variables. The significance level in our data is 0 which showed our factor analysis is suitable.

(3) Principal Components Analysis extraction method:

The principal components analysis extraction method can form uncorrelated linear combinations of the observed variables (Pearson,1901). We found extraction communalities of 4 items (No. 8 "I will study the electricity pricing method", No. 22 "I know the environmental impact of nuclear waste", No. 25 "I think the current power generation structure in Taiwan will bring about environmental pollution " & No. 36 "I look forward to the government's new energy policy") are smaller than 0.5. It implied that the extracted components could not represent the variables well. We deleted these four items from the questionnaire before doing the rotation method and ran the whole process again.

(4) Varimax with Kaiser Normalization rotation method

We implemented Vaimax rotation in the principal component analysis to reduce the dimensions. The varimax criterion for analytic rotation in factor analysis determines a factor matrix, representing uncorrelated factors, where the variance of the squared loading of a column of the factor matrix is maximized, summed over columns (Kaiser, 1958). Six factors with Eigen Values greater than 1 were found. Since Item No. 1 "I understand the issue of Taiwan's nuclear energy security and various types of power generation waste disposal " and No. 2 "I

understand what renewable energy I can use " has small and cross loading, we deleted these two problems and got six dimensions as Table 3.

Table 3. Six dimensions, their components and dummy variables

Variables	Dimension Name/ Characteristics	Content (Item No.)
G1 (Renewable)	The perception of renewable energy	27, 28, 29, 30, 37, 38, 39, 40, 41
G2 (Ecological)	Perception of the risk of ecological environment	10, 13, 14, 15, 16, 17, 26
G3 (Nuclear)	The risk of nuclear energy	6, 19, 20, 21, 23, 24, 34, 35,
G4 (Consumption)	The behavior of electricity expending	7, 8, 9, 11, 12
G5 (Trust)	Public trust to government	31, 32, 33
G6 (Understanding)	Understanding to energy issues	3, 4, 5
Sex	Sex	=1 if male; =0 otherwise
Marital	Marital	=1 if married; =0 otherwise
Age29	Age	=1 if age below 29, =0 otherwise
Age39		=1 if age between 30 and 39, =0 otherwise
Age49		=1 if age between 40 and 49, =0 otherwise
Age50		=1 if age more than 50, =0 otherwise
Middle	Location	=1 if living in the middle part of Taiwan, =0 otherwise
North		=1 if living in the north part of Taiwan, =0 otherwise
South		=1 if living in the south part of Taiwan, =0 otherwise
U_40K	Income more than 40000 NT dollars per month	=1 if income more than 40000 NT dollars per month
U_Bach	Bachelor degree or upper degree	=1 if educated in bachelor degree or upper degree, =0 otherwise

Regression Results

We used the linear regression to find out the relationship of these six dimensions. In model 1, we took G4 “the behavior of electricity expending” as the dependent variables and G1 “The perception of renewable energy”, G2 “Perception of the risk of ecological environment”, G3 “The risk of nuclear energy”, G5 “Public trust to government“ and G6 “Understanding to energy issues” as the explanatory variable. In model 2, the demographic characteristics, such like sex, marital status, income per month and educated level were considered as the dummy variables.

(1) These two models are high goodness of fit since the F-Value of two models were significant. The variation inflation factor (VIF) of these two models are small and it implies that there are no multicollinearity problem (James et al., 2017). The Durbin-Watson statistics of these two models are close to 2, so there is no significant autocorrelation for error terms in our models.

(2) We deployed White test to examine the heteroscedasticity of variance of error term. Since the statistics of these two models were significant, we corrected the heteroscedasticity of these two models by weighted linear square (WLS) and show the result in Table 4.

Table 4. Regression Result

Independent variables	Dependent Variable: Consumption			
	Model 1	Model 1_WLS	Model 2	Model 2_WLS
C	0.293287*	0.24127*	0.284167*	0.260843*
	(0.003)	(0.000)	(0.010)	(0.000)
G1 (Renewable)	0.505874*	0.477858*	0.502215*	0.48554*
	(0.000)	(0.000)	(0.000)	(0.000)
G2 (Ecological)	0.330253*	0.332229*	0.326705*	0.404715*
	(0.000)	(0.000)	(0.000)	(0.000)
G3 (Nuclear)	0.050019*	0.028392*	0.040392*	0.04669*

	(0.004)	(0.006)	(0.020)	(0.000)
G5 (Trust)	-0.018512	0.032585*	-0.010079	-0.037537*
	(0.341)	(0.000)	(0.608)	(0.005)
G6 (Understanding)	0.06222*	0.091521*	0.068956*	0.053251*
	(0.008)	(0.000)	(0.004)	(0.004)
SEX			0.026167	0.0346*
			(0.278)	(0.002)
MARRIED			0.052989	0.064319*
			(0.060)	(0.000)
Y29			-0.06928	-0.102181*
			(0.101)	(0.000)
Y39			-0.024318	-0.074541*
			(0.498)	(0.000)
Y49			-0.005142	-0.060636*
			(0.886)	(0.009)
MIDDLE			0.012329	0.033874*
			(0.714)	(0.010)
NORTH			0.00653	0.019877
			(0.815)	(0.139)
U_40K			-0.015599	-0.035081*
			(0.554)	(0.003)
U_BACH			0.003016	-0.002621
			(0.910)	(0.841)
Sample sizes	1200		1200	
Adjusted R Square	0.5629		0.565186	
F(P-Value)	307.5433		112.3215	
	0.0000)		(0.000)	
Durbin-Watson statistic	2.083454		2.080242	
Max. VIF	1.704306		2.614444	
White Test	5.679694		2.483329	
	(0.0000)		(0.0000)	

Note.

1. Numbers in parentheses are p-value.

2. * means significant.

3. Max. VIF: Maximum value of all centered variance inflator factors.

Based on the regression result listed on Table 5, the main results are as below:

(1) All the demographic characteristics, except the age below 29 years old (Y29) in Model 2_WLS were not significant or their effects are small. The negative significant coefficient of Y29 in the Model 2_WLS meant the respondents who were younger than 29 years old were less conscious to save energy or not aware how much of the bill they pay.

(2) The dimension G5 (Trust) was not significant to the explained variable, dimension G4 (Consumption). It seems the public do not trust the ability of government to take care the energy disaster issus.

Conclusion

We used web-based questionnaire to investigate the the behavior of electricity expending. By factor analysis, we get 6 dimensions from 41 items. The regression result showed that the most important positive factors to influence people's the behavior of electricity expending were "the perception of renewable energy" which implies the knowledge of renewable knowledge and "the perception of the risk of ecological environment" which implies people know the generation will affect the environment. The rest dimensions did not have much effect on it. Regarding the demographic characteristics, only the age younger than 29 has negative effect on "the behavior of electricity expending" and other characteristics do not have any influence on it.

References

1. Ahman, M., 2004. Government policy and the development of electric vehicles in Japan. Energy Policy, 34(2006): 433-443.
2. Bureau of Energy, MOEA, R.O.C., 2016. Energy statistics handbook 2016, Taipei, R.O.C.
3. Chen, T.Y., Huang, D.R. & Huang A.Y.J., 2016. An empirical study on the public perception and acceptance of hydrogen energy in Taiwan. International Journal of Green Energy, 13(15): 1579-1584.
4. Cronbach L.J., 1951. Coefficient alpha and the internal structure of tests. Psychometrika, 16 (3): 297–334
5. Factor Analysis, Wikipedia, https://en.wikipedia.org/wiki/Factor_analysis
6. George, D., & Mallery, P., 2003. SPSS for Windows step by step: A simple guide and reference. 11.0 update (4th ed.). Allyn & Bacon, Boston.
7. Guo, X., Liu, H., Mao, X., Jin, J., Chen, D. & Cheng S.,2014. Willingness to pay for renewable electricity: A contingent valuation study in Beijing, China. Energy Policy, 68 (2014) 340-347.
8. Kaiser, H.F., 1958. The varimax criterion for analytic rotation in factor analysis. Psychometrika, 23 (3):187-200.
9. Huebner, G., Shipworth D., Hamilton, I., Chalabi, Z. & Oreszczyn T., 2016. Understanding electricity consumption: A comparative contribution of building factors, socio-demographics, appliances, behaviours and attitudes. Applied Energy, 177: 692-702.
10. Huijts, N.M.A., Molin, E.J.E. & Steg, L., 2012. Psychological factors influencing sustainable energy technology acceptance: A review-based

comprehensive framework. Renewable and Sustainable Energy Reviews, 16: 525-531.

11. James, G.,Witten, D., Hastie, T. & Tibshirani, R., 2017. An Introduction to Statistical Learning. Springer, New York, USA.
12. Jones, R.V., Fuertes, A. & Lomas K.J., 2015. The socio-economic, dwelling and appliance related factors affecting electricity consumption in domestic buildings. Renewable and sustainable Energy Reviews, 43:901- 917.
13. Kavousian, A., Rajagopal, R. & Fischer, M., 2013. Determinants of residential electricity consumption: Using smart meter data to examine the effect of climate, building characteristics, appliance stock, and occupants' behavior. Energy, 55: 184-194.
14. Liao, S.Y., Tseng, W. C., Chen C. C., 2010. Eliciting public preference for nuclear energy against the backdrop of global warming. Energy Policy, 38(2010): 7054- 7069.
15. Ma, C., Rogers A.A., Kragt M.E., Zhang, F., Polyakova, M., Gibsona, F., Chalaka, M., Pandit, M. & Tapsuwana, S, 2015. Consumers' willingness to pay for renewable energy: A meta-regression analysis. Resource and Energy Economics, 42(2015): 93-109.
16. Pearson, K.,1901. On Lines and Planes of Closest Fit to Systems of Points in Space. Philosophical Magazine. 2(11): 559–572
17. Roe, B., Teisl,M.F., Levy, A. & Russell, M.,2001. US consumers' willingness to pay for green electricity. Energy Policy, 29(11):917-925.
18. Solino, M., Farizo B. A., Vazquez M. X. & Prada A., 2012. Generating electricity with forest biomass: Consistency and payment timeframe effects in choice experiments. Energy Policy, 41(2012): 798- 806.

19. Sundt, S. & Rehdanz, K., 2015. Consumers' willingness to pay for green electricity: A meta-analysis of the literature. Energy Economics, 51 (2015) 1-8
20. Schweizer-Ries, P., 2008. Energy sustainable communities: environmental psychological investigations. Energy Policy, 36 (2008): 4126-4135
21. Snedecor, G. W. & Cochran, W. G., 1989. Statistical Methods, Iowa State University Press, Iowa, USA.