American Journal of Sciences and Engineering Research
E-ISSN - 2348 -703X, Volume 4, Issue 3, 2021

The Determinants of Households' Adoptions of Solar Power in Bien Hoa City, Dong Nai Province, Vietnam

Huynh Nhu Yen Nhi
Faculty of Foreign Languages, Dong Nai Technology University, Dong Nai, Vietnam.

ABSTRACT: *Solar power is becoming more and more popular around the world and Vietnam. This article applied the Theory of Reasoned Action (TRA) the Technology Acceptance Model (TAM) of Davis (1989) and in order to analyze the determinants affecting households' adoptions of solar power in Bien Hoa city, Dong Nai province, Vietnam. The study used mixed methods with qualitative and quantitative analysis methods including group interviews, and surveys with questionnaire under 5-point Likert scale. The data was analyzed by SPSS software (Cronbach's Alpha, EFA, correlation, regression). Results showed that the factors affecting the households' willingness to use solar power involved (1) Perceived Usefulness; (2) State Policies; (3) Perceived Ease of Use; (4) Perceived Costs; (5) Household Trusts. These determinants helped the author propose policies for the government to promote solar power development.*

Keywords: *solar energy, solar power, household, policy, TAM model*

I. INTRODUCTION

1.1. Background to the study

In the current context, fossil energy sources such as gas, coal, and oil have been a major source of energy for electricity generation in many countries around the world as well as in Vietnam. Meanwhile, the use of fossil fuels is one of the main causes of climate change and seriously affects human health. Moreover, such non-renewable energy sources are also gradually being exhausted, while Vietnam is facing great challenges because conventional energy sources to meet power generation needs are out of supply capacity. Therefore, with the current growth in electricity demand of about 10% per year, the issue of promoting research and use of renewable energy sources like solar power is very urgent for Vietnam. Obviously, in order to succeed in the renewable energy development policy of Vietnam in general and Dong Nai province in particular, the participation of enterprises is in need of the companionship of households in using solar energy, at which households know the characteristics of solar power, understand appropriate State incentives to make possible use and investment decisions. If it is estimated that in Dong Nai there are 1 million households using solar power, electricity will certainly reduce a big burden on the current electricity industry and whether households are ready and intending to use solar power or not; That is a problem that the author wants to study to find out the factors affecting the intention to use solar power of households.

1.2. Problem statement

The objective of the paper is to measure and determine the impact of factors on the intention to use solar power on households in Bien Hoa City, Dong Nai Province. From there, contributing to proposing solutions, policy implications and supporting measures to develop solar power models as well as promote the role of clean and renewable energy sources in the future.

 Received- 10-05-2021, Accepted- 20-05-2021

1.3. Purpose of the study

This study aims to (i) Systematize theoretical bases and related studies to identify factors affecting the intention to use solar energy of households in Bien Hoa city, Dong Nai province; (ii) Measure the impact of factors on the intention to use solar power of households in Bien Hoa city, Dong Nai province; (iii) Propose management implications to perfect policies to encourage the use of renewable energy in general and solar power in particular, and to suggest some solutions for businesses trading in products of solar power.

1.4. Research questions

The research is to address the following questions:

1. What factors affect the household's intention to use solar power?
2. How is the impact of each factor on the household's tendency to accept solar power?
3. How do State management policies on solar power technology have an impact on households' intention to use solar power?

II. LITERATURE REVIEW

2.1 Defining of terms

2.1.1 The concept of solar power

Electricity is the form of energy generated from sources such as hydroelectricity, thermal power (coal power, gas power, oil power, solar power, nuclear power ...) and wind power. Electricity plays a very important role in society, because electricity is an important input for manufacturing industries and for human daily activities.

According to the Vietnam Energy Journal (2015), Solar power, also known as photovoltaics (PV) is the field of research and application of technology to transform sunlight; direct energy into electricity based on thermal motors and photovoltaic cells. Solar panels are pieced together into modules. The photon hitting the electron causes the electron's energy to increase and move to create an electric current.

2.1.2 Feature of solar power

The production of solar power depends on solar energy, in other words, it depends on natural conditions. The production of solar power depends on the time of the light radiation and the intensity of the light radiation. Therefore, for countries and territories that have a long lighting time and high light radiation intensity, they will generate large amounts of electricity and vice versa. Moreover, solar power production also depends on the time of day, depending on the season. Sunlight is only available during the day, so it is difficult to have bright electricity at night but must have a battery charger. In the rainy season, there is very little sunlight, so the electricity generation by light is a challenge for the development of this energy source. Solar radiation also depends on the atmospheric layer, the cloud layer. Therefore, in cloudy places, radiation is worse.

Solar power generation does not cause environmental pollution. Solar power generation does not cause environmental pollution due to the use of solar panels to collect energy, so it does not exhaust gases that pollute the environment.

The efficiency of solar power generation depends on technology. Solar panels are used to convert sunlight radiation into electricity. With solar panels capturing as much heat as possible, the ability to generate electricity is higher. Therefore, the efficiency of generating solar power depends on the equipment and technology that converts solar energy into electricity.

The cost of generating solar power is often high and uncompetitive. Due to the high cost of equipment and technologies that generate solar power, it is mainly imported and the production of solar power requires a large amount of space. Therefore, the cost of solar power is often higher than that of fossil and hydroelectric power, so solar power is often less competitive in price compared to other types of electricity.

2.1.3 Models of solar power development in Vietnam

Solar Farm: A large-scale solar power system, built and operated by companies or large investors in unused land or areas. In these solar power plants, solar panels are concentrated on a large scale and mechanized to optimize solar energy, resulting in higher power output. Therefore, the solar farm is also often called a grid-connected solar power project, allowing direct connection to the national grid, instead of supplying directly to users, it will sell electricity to the Electricity Corporation. There are two types of investment in solar farm projects under Solar farm, including the Solar Land Project and the Floating Solar Power Project.

Rooftop Solar: Rooftop solar power is exploited and generated by photovoltaic panels installed on the roof of each house, this can be a house or business establishment or workshop. Permitted capacity of rooftop solar PV works must not exceed 01 MW and are directly or indirectly connected to the grid with a voltage of 35 kV or less. In most cases, homes that have attic systems don't use all of the energy generated by the panels; The excess electricity generated is then routed to the national grid, allowing homeowners to collect around the sale of the surplus electricity.

2.2. Overview of theoretical basis

2.2.1. Theory of Reasoned Action (TRA)

Theory of Reasoned Action was constructed by Ajzen and Fishbein in 1967 and has also known as the TRA Model (Ajzen and Fishbein, 1975). It is considered a pioneer in the field of psychosocial research (Mark, C. & Christopher JA, 1998). The TRA model shows that the behavior is determined by the intent to perform the behavior. The two main factors that influence intentions are personal attitudes and subjective norms. In particular, personal attitudes are measured by the individual's beliefs and appreciation of product attributes.

2.2.2. Theory of Planned Behavior (TPB)

Theory of Planned Behavior is the development and improvement of the Theory of Reasoned Action TRA. According to Ajzen (1991), the third factor influencing human intent is Perceived Behavioral Control. Behavioral control perceptions reflect how easy or difficult it is to perform a behavior and whether the performance of the behavior is controlled or limited (Ajzen, 1991).

2.2.3. Technology Acceptance Model (TAM)

Based on the Theory of Reasoned Action (TRA), Davis (1986) developed the Technology Acceptance Model (TAM Model) that was more specifically related to the prediction of a person's acceptability to a new system. The TAM model was modified twice by Davis et al in 1989 and 1993. The purpose of this model is to predict the adoption of a new system or technology and to define the modification must be incorporated into the technology system to make it acceptable to the users. This model shows that the acceptability of a technology system is determined by two main factors: Perceived Usefulness and Perceived Ease of Use. Therefore, this model is frequently used by researchers to explain and predict the adoption and use of a new technology. According to Legris et al. (2003), the TAM model successfully predicted about 40% of the use of a new system.

2.3. Experimental studies related to the topic

In the current context, the emergence of solar power is one of the new technological fields of the renewable energy industry, to explain the intention to adopt a new product, the technology adoption model. TAM model by Davis (1989) is one of the most useful tools. Therefore, although in recent years, there are not many researches on the intention to use renewable energy in Vietnam, but most of these studies apply TAM model to form the theoretical basis. One of the prominent studies in this field is the research of Nguyen Van Duy et al (2017) on “Factors affecting the adoption of solar power in the coastal area” successfully applied the TAM model (Davis, 1989) and found three out of five factors of the research model that have an impact on the availability of solar power in households, including: ease of use; investment costs and reliability. The cost factor

is also of great interest in related research topics such as Pham Hong Manh and Duong Van Son (2017) studying "Factors affecting the intention to use solar power technology of households in Phan Rang - Thap Cham city" also hypothesized "Perceived costs have a negative impact (-) on the household's intention to use solar power "(Pham & Duong, p.4). As a result, the research has made policy recommendations to encourage households to use solar power. Besides, Nguyen Van Duy and Dao Trung Kien (2014) also included a policy factor in the research model to explore the impact of government decisions on the level of adoption of renewable energy by households in Hanoi, Vietnam.

2.4. Proposed research model

Based on the results of previous studies and the actual research situation in the surveyed area, this study proposes 7 factors affecting the intention to use solar power. In particular, this study combines and inherits 3 traditional elements of TRA model and TAM model including *Perceived Usefulness, Perceived Ease of Use, Subjective Norms*; at the same time, the study added 4 factors to the research model, including: *Household Trusts, Perceived Costs, State Policies and Diversity of supplier enterprises*. The proposed research model is shown in figure 2.4.1.

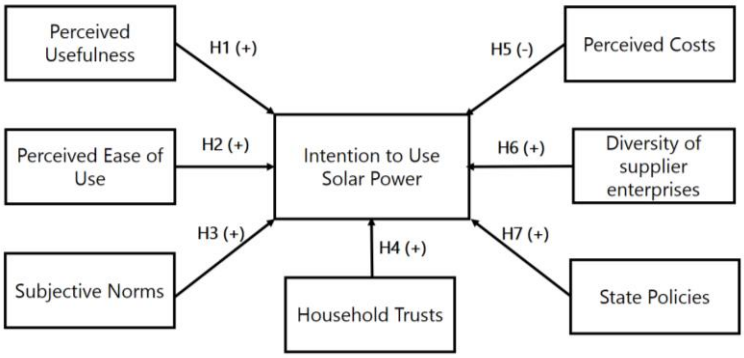

Figure 2.4.1. The proposed research model

III. METHODOLOGY

3.1. Research design

3.1.1. Preliminary research phase

Qualitative research was done through in-depth interviews technique of 10 participants, including: 03 experts and engineers with knowledge of solar power; 02 business units providing solar power systems and 05 subjects are people who are using solar power. In-depth interviews were conducted to confirm that the interviewees understood the content of concepts and the meaning of the terms, and provided appropriate suggestions for the questionnaire. In addition, the results of this preliminary study are used to adjust, explore and supplement observed variables to complete the research model and build a formal survey questionnaire.

3.1.2. Official research phase

Quantitative research was conducted through distribution of revised survey questionnaires during the preliminary research. The number of subjects participating in the official survey includes 200 households who have installed and used solar power or who intend to use the roof-top solar power model. The scale for the research paper is presented in the following table.

Table 3.1. The scale for the research

No.	Statements	Coding
Perceived Usefulness		SHI_X1
1	You think that solar power is a renewable, clean and safe source of energy.	SHI1
2	You use solar power to help reduce the environmental pollution problem.	SHI2
3	Using solar power helps you save the electricity expense in the long run.	SHI3

4	Using solar power helps you to be more active in living and production.	SHI4
5	In general, using solar power is beneficial.	SHI5
Perceived Ease of Use		DSD_X2
6	You think that the installation and maintenance of solar power equipment is easy.	DSD1
7	You can easily learn how to operate rooftop solar power.	DSD2
8	You can easily use solar power in the household proficiently.	DSD3
9	You think that using solar power as an alternative energy source for home appliances is not too difficult.	DSD4
Subjective Norms		CCQ_X3
10	Your family has an impact on your intention to use solar power.	CCQ1
11	Colleagues and friends have an impact on your intention to use solar power.	CCQ2
12	The city government has measures to encourage the use of solar power and that affects your intentions.	CCQ3
13	The media influences your decision to use solar power.	CCQ4
Household Trusts		NT_X4
14	You completely believe in consulting / providing services of local solar power suppliers.	NT1
15	You believe that the properties and quality of solar cells that the company provides are guaranteed.	NT2
16	You are assured of the policy for investment in energy infrastructure.	NT3
Perceived Costs		CP_X5
17	The cost of installing the solar power system is in line with your family's income.	CP1
18	You are supported with the cost of installing the solar power system.	CP2
19	You think that the current cost of installing solar rooftop systems for households is competitive compared to other renewable energy sources.	CP3
Diversity of supplier enterprises		DN_X6
20	There are many businesses supplying solar power in Bien Hoa city.	DN1
21	There are reputable businesses providing solar power services in Bien Hoa city.	DN2
22	You have a good assessment on warranty and customer care for solar power suppliers.	DN3
State Policies		CS_X7
23	You are interested in the electricity purchase and sale policy of the government for rooftop solar power households.	CS1
24	The government should facilitate the application of rooftop solar power for households.	CS2
25	The government should have financial support for encouraging the solar system for households.	CS3
26	The government should issue regulations on the development of solar power for households.	CS4
Intention to Use Solar Power		YD_Y
27	When appropriate (financial capacity, policy support, living / production requirements ...) You will use solar power.	YD1
28	You are serious about your intention to use solar power and will continue to use it.	YD2
29	You will introduce to others about solar power.	YD3

3.2. Research tools

3.2.1. Sampling method

Sampling method was carried out according to a convenient sampling method by handing out the questionnaire directly. The distribution of questionnaires directly was carried out in households in wards / communes of Bien Hoa city, Dong Nai Province.

3.2.2. Populations and samples

The regulation on the number of samples according to Bollen (1989) is the minimum sample ratio to the observed variable of 5: 1. Accordingly, the research paper proposes 29 variables, the minimum number of samples must be 145. However, in order to prevent the answers from being lost and the respondents who answer incorrectly, the author plans to issue 200 samples, to ensure minimum sample number as well as enhanced model reliability.

3.3. Data analysis procedures

The collected data was encrypted and cleaned. Next, it was processed by SPSS 26.0 software according to the process, starting from reliability analysis and factor analysis to draw suitable factors for regression analysis. After testing the hypotheses of the structural model and the suitability of the overall model, the results of regression analysis helped the author to answer the research questions.

IV. RESULTS AND DISCUSSION

4.1. Results

4.1.1 Cronbach's Alpha test results

Table 4.1. Summarizing of Cronbach's Alpha results

	Corrected Item-Total Correlation	**Cronbach's Alpha if Item Deleted**
Scale: Perceived Usefulness, Cronbach's Alpha = 0.781		
SHI1	.515	.754
SHI2	.633	.722
SHI3	.547	.746
SHI4	.575	.735
SHI5	.539	.747
Scale: Perceived Ease of Use, Cronbach's Alpha = 0.878		
DSD1	.771	.830
DSD2	.782	.826
DSD3	.654	.875
DSD4	.745	.841
Scale: Subjective Norms, Cronbach's Alpha = 0.754		
CCQ1	.601	.658
CCQ2	.636	.620
CCQ4	.528	.732
Scale: Household Trusts, Cronbach's Alpha = 0.892		
NT1	.800	.841
NT2	.748	.881
NT3	.831	.818
Scale: Perceived Costs, Cronbach's Alpha = 0.856		
CP1	.690	.833
CP2	.768	.764
CP3	.738	.791
Scale: Diversity of supplier enterprises, Cronbach's Alpha = 0.848		

DN1	.715	.808
DN2	.748	.771
DN3	.716	.788
Scale: State Policies, Cronbach's Alpha = 0.733		
CS1	.489	.693
CS2	.534	.669
CS3	.543	.662
CS4	.532	.669
Scale: Intention to Use Solar Power, Cronbach's Alpha = 0.729		
YD1	.523	.689
YD2	.650	.552
YD3	.508	.692

The test results of the scale in Table 4.1 show that all the influencing factors reached high reliability with Cronbach's Alpha coefficients from 0.7 to 0.8. In which, the highest is the household trusts factor and the lowest is the intention to use factor of the dependent variable, which shows that the independent variables are closely related to each other. Except for one unsuitable variable which was eliminated, that is CCQ3 variable, all the remaining total variable correlation coefficients were > 0.3, distributed from 0.552 to 0.881 and satisfied with the condition. Therefore, the remaining 28 variables are accepted and used in EFA factor analysis.

4.1.2. EFA factor analysis results

Table 4.2. KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.724
Bartlett's Test of Sphericity	Approx. Chi-Square	2387.086
	Df	300
	Sig.	.000

Table 4.3. Rotated Component Matrix [a]

	Component						
	1	2	3	4	5	6	7
DSD3	.843						
DSD2	.843						
DSD1	.744						
DSD4	.733						
SHI2		.759					
SHI3		.747					
SHI4		.743					
SHI5		.732					
SHI1		.648					
NT1			.895				
NT3			.894				
NT2			.866				
CS1				.736			
CS3				.684			
CS4				.674			
CS2				.610			
CP2					.885		
CP3					.871		

CP1					.845		
DN2						.885	
DN3						.872	
DN1						.859	
CCQ2							.806
CCQ1							.798
CCQ4							.791

Factor analysis results of the independent and dependent variables in the model both reach convergent value and discriminant value, EFA analysis is appropriate with research data. The analysis results with 8 factors are extracted. All observed variables in each factor are extracted satisfactory and used in the next analysis. Therefore, the proposed research model, after surveying, testing and evaluating shows that the scales satisfy the statistical standards and the study continues to be performed linear regression analysis with 8 factors to test models and hypotheses.

4.1.3. Correlation analysis results

Table 4.4. Pearson Correlation analysis results

Correlations									
		YD_Y	SHI_X1	DSD_X2	CCQ_X3	NT_X4	CP_X5	DN_X6	CS_X7
YD_Y	Pearson Correlation	1	.485**	.365**	.195**	.158*	-.159*	.049	.425**
	Sig. (2-tailed)		.000	.000	.009	.036	.034	.518	.000
SHI_X1	Pearson Correlation	.485**	1	-.144	-.001	.089	.008	.042	-.035
	Sig. (2-tailed)	.000		.054	.986	.237	.912	.577	.639
DSD_X2	Pearson Correlation	.365**	-.144	1	.196**	-.017	.000	.072	.568**
	Sig. (2-tailed)	.000	.054		.009	.825	.998	.338	.000
CCQ_X3	Pearson Correlation	.195**	-.001	.196**	1	-.217**	-.143	-.034	.209**
	Sig. (2-tailed)	.009	.986	.009		.004	.056	.654	.005
NT_X4	Pearson Correlation	.158*	.089	-.017	-.217**	1	.201**	.179*	-.025
	Sig. (2-tailed)	.036	.237	.825	.004		.007	.017	.741
CP_X5	Pearson Correlation	-.159*	.008	.000	-.143	.201**	1	-.068	.025
	Sig. (2-tailed)	.034	.912	.998	.056	.007		.370	.736
DN_X6	Pearson Correlation	.049	.042	.072	-.034	.179*	-.068	1	.060
	Sig. (2-tailed)	.518	.577	.338	.654	.017	.370		.430
CS_X7	Pearson Correlation	.425**	-.035	.568**	.209**	-.025	.025	.060	1
	Sig. (2-tailed)	.000	.639	.000	.005	.741	.736	.430	

The above results show that the correlation matrix of each factor to the dependent variable YD_Y. The results show that the variable DN_X6 has the coefficient Sig = 0.518; that means DN_X6 is not statistically significant for the dependent variable YD_Y. Therefore, this factor is excluded and not included in the multivariate regression analysis. The remaining factors all have Sig coefficients. <0.05, these variables are eligible for regression analysis.

4.1.4. Results of linear regression analysis

Table 4.5. Coefficients [a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-.044	.393		-.112	.911		
	SHI_X1	.486	.049	.522	9.916	.000	.968	1.033
	DSD_X2	.175	.041	.274	4.302	.000	.661	1.512
	NT_X4	.119	.039	.164	3.092	.002	.951	1.052
	CP_X5	-.111	.029	-.204	-3.859	.000	.958	1.044
	CS_X7	.381	.081	.298	4.714	.000	.674	1.484

a. Dependent Variable: YD_Y

Table 4.5 shows that the factors in the research model have the coefficient Sig. < 0.05 that should affect YD_Y. Factors affecting YD-Y are: SHI_X1, CS_X7, DSD_X2, NT_X4, CP_X5 corresponding to the standardized regression coefficients respectively: 0.522, 0.298, 0.274, 0.164 and -0.204. In which, the factor with the most important influence is *Perceived Usefulness* because the Beta coefficient of SHI_X1 is 0.522 which is the largest, so it will have the strongest influence and the next factor is *State Policies* that has the second influence with a Beta coefficient of 0.298. *Perceived Ease of Use* and *Household trusts* also affect in the same direction on YD_Y, but the effect is lower with Beta coefficients of 0.274 and 0.164 respectively. In addition, CP_X5 has a Beta coefficient of -0.204 which has a negative sign, meaning that this *Perceived Costs* factor has a negative impact on YD_Y. From the analysis results obtained by the author, the linear regression equation presents the relationship of factors affecting the intention to use solar power of households as follows:

YD_Y = 0.522 SHI_X1 + 0.274 DSD_X2 + 0.164 NT_X4 – 0.204 CP_X5 + 0.298 CS_X7

4.2. Discussion

The results of the study show that the research model has explained 53.1% of the change of the dependent variable by 5 independent variables. The suitability of the model is 53.1% and the set of F ≠ 0 test has Sig. = 0.000 <0.05 proposed research models were identified as appropriate for the data set. The research model identifies 5 factors that affect the intention to use solar power of households in Bien Hoa city, Dong Nai province includes: *Perceived Usefulness, State Policies, Perceived Ease of Use, Perceived Costs* and *Household Trusts*. Thereby, the first research question of the topic has been answered. The impact level of each factor on the intention to use solar power of the households, respectively from high to low is: 0.522, 0.298, 0.274, -0.204 and 0.174 in order of factors: *Perceived Usefulness, State Policies, Perceived Ease of Use, Perceived Costs* and *Household Trusts* and this is the answer to the second research question of the topic. The results from the regression equation show that there are 4 factors with uniform regression coefficients > 0, representing the covariance correlation with a positive effect (+) on the intention to use solar power at the significance level of 5% and has a confidence level of 95%, except for 1 factor Perceived Costs has a regression coefficient < 0, which represents the inverse correlation.

IV. CONCLUSION

5.1 Contributions and implications of the research

The research results of the topic are quite similar to those of previous studies of Davis (1989) and Pham Hong Manh et al (2020). These studies all use the technology adoption model (TAM) as the basis model. In the study of Pham Hong Manh et al (2020), there are factors of Perceived Usefulness, Perceived Ease of Use, Household Trusts which are similar to the research results. In which, these determinants have a positive influence on the household's attitude and intention in using solar power technology. The Subjective Norms and Diversity of supplier enterprises were not statistically significant and were excluded from the research model. The obtained research results have been analyzed as a support for the author to propose management

implications in promoting the development of renewable energy sources to ensure sustainable development, and minimize risks in State management. This also helps people to be more aware of the solar power in the current context. Thus, the recommendations are presented below.

5.2. Recommendation

Firstly, the government should propagate about the usefulness of solar power technology. Promoting propaganda and dissemination of knowledge, documents, leaflets, organizing seminars and training on the usefulness and ease of use of solar power technology for civil servants, public employees and all business sectors in the city. Besides, propagating the great importance of economic, social and environmental protection of the development and use of renewable energy in the sustainable development process, so that there is practical action to contribute to the development and use of renewable energy.

Secondly, the government should support the household investment in solar power equipment. There are still many problems in the development of rooftop solar, such as high investment costs; lack of information about product quality, construction unit, installation and operation and maintenance. In the coming time, the authorities or regulators need to promote propaganda, so that each household understands economic benefits as well as investment capital, usefulness, ease of use of the solar technology and environmental friendliness. Hence, the government should have mechanisms and policies to support the cost of investing in rooftop solar power equipment for households. In addition, it is advisable to promulgate a policy of preferential loans (low interest rates), simple and convenient loan procedures for all households; facilitate domestic and foreign donors to support households to install rooftop solar power.

Thirdly, there should be a policy of buying - selling electricity for households using rooftop solar. In the context that the power system is under a lot of pressure to ensure electricity supply, especially after 2020, when the whole country does not have a new source of exploitation, the development of rooftop solar power can be enjoyed by households. considered as one of the solutions contributing to reducing the pressure on the electricity industry; At the same time, this is also a favorable condition to accompany the country's economic development in the future.

Finally, the government should ensure that the risks associated with solar power are minimized. In fact, there are many domestic and foreign factories now producing solar panels. Therefore, for households that intend to invest in rooftop solar, the choice of solar panels is a difficult problem for them, because there is not enough information to confirm. What are the good or not good quality products? Households should pay attention to the following information: (i) Quality insurance certificate issued by independent insurance companies. This is a practice in international trade, especially applicable to high-tech products; (ii) Manufacturers of solar panels must be certified with international standards IEC (International Electro-Technical Commission) and UL standards (Underwriters Laboratories Inc.). The IEC and UL standards differ greatly. The IEC standards specify minimum equipment safety requirements. UL standards in contrast point to the comprehensive specifications of product safety and application; (iii) Solar panels must have a design solution against Potential Induced Degradation (PID); (iv) For each shipment of solar panels, upon delivery the seller must provide the buyer with a release validation report for each sample that contains the serial number of the product; (v) After the sale-purchase contract is signed, the seller must provide the buyer with the opportunity to visit or survey at the manufacturing plant at the right time of the output test and final packaging of the solar panels.

V. REFERENCES

1. Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2), 179–211.
2. Ajzen, I., & Fishbein, M. (1975). *Belief, attitude, intention and behavior: an introduction to theory and research,* Reading, MA: Addison-Wesley.
3. Blaschke, T., Biberacher M., Gadocha S. and Schardinger I., (2013). Energy Landscapes: meeting energy demands and human aspirations*. Biomass-Bioenergy*, 55(1), 3-16
4. Bollen, K. A. (1989). Wiley series in probability and mathematical statistics. Applied probability and statistics section. Structural equations with latent variables. John Wiley & Sons. https://doi.org/10.1002/9781118619179.
5. Chandan. (2020). A study on the factors affecting household solar adoption in Kerala, India*. International Journal of Productivity and Performance Management*, DOI 10.1108/IJPPM-11-2019-0544.
6. Chuttur, M. Y. (2009). *Overview of the Technology Acceptance Model: Origins, Developments and Future Directions*, Indiana University, USA.
7. Davis, F.D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3). 319-340.
8. Guta, D. (2018). Determinants of Household Adoption of solar home system in Rural Ethiopia. *Journal of Cleaner Production*, doi: 10.1016/j.jclepro.2018.09.016.
9. Jeffrey, W., Jessica, K. & Lawrence, G. (2018). A Systems Analysis of Factors Influencing Household Solar PV Adoption in Santiago, Chile. Journal of Sustainability, doi: 10.3390/su10041257.
10. Jenny, P. & Elina, E. (2018). Residential solar electricity adoption: how households in Sweden search for and use information. *Energy, Sustainability and Society*. 8(14), doi: 10.1186/s13705-018-0156-1.
11. Legesse, W. (2016). Determinants of Adoption of Renewable Energy Sources towards Reducing Deforestation in Ambo district, West Shoa, Oromia Regional State, Ethiopia. *Journal of Energy Technologies and Policy*, 6(11), 27-33.
12. Legris, P., Ingham, J., & Collerette, P. (2003). Why do people use information technology? A critical review of the technology acceptance model. *Information & Management*, 40(2), 191-204.
13. Le Tran Thanh Liem and Pham Ngoc Nhan. (2020). Factors affecting the application of solar power model on rooftops of households in Ca Mau. *Science Journal of Can Tho University*. 56 (2C). 161-167.
14. Mark, C. and Christopher, J. A. (1998). Extending the Theory of Planned Behaviour: A Review and Avenues for Future Research, *Journal of applied Social Psychology*, 18(15), 1429-1464.
15. Nguyen Van Duy, Dao Trung Kien. (2014). Research on factors affecting the use of renewable energy. Vietnam Energy Magazine.
16. Pham Hong Manh and Duong Van Son. (2020). Factors affecting the household's intention to use solar power technology in Phan Rang - Thap Cham city. *Journal of Industry and Trade*.
17. Patrick, W., (2007). Reconsidering Public Attitudes and Public Acceptance of Renewable Energy Technologies: A Critical Review.
18. Tahir Masood Qureshi, et al. (2017). Factors responsible for solar PV adoption at household level: A case of Lahore, Pakistan. *Renewable and Sustainable Energy Reviews*, 78(1), 754-763.
19. Wilson, T. (1986). Qualitative "versus" Quantitative Methods in Social Research. Bms: *Bulletin of Sociological Methodology*, (10), 25-51.