

Developing Renewable Energy in Vietnam

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ABSTRACT

Renewable energy development is becoming an inevitable trend in countries around the world towards sustainable development in the future. That is because the exploitation of fossil fuels has also reached its limit, there is a risk of pollution and a warning of disasters. In this article, the author approaches renewable energy in terms of wind power and solar power. The main content is researched by the author, which is the factor affecting the development of renewable energy (wind power, solar power) in Vietnam. The author builds a theoretical framework for research and conducts a survey of 250 managers of more than 100 enterprises operating in the energy sector in Vietnam. The research results show that enterprises evaluate Vietnam as having favorable natural conditions for the development of renewable energy such as wind power and solar power, but the State's policies are not suitable for energy development. From the above research conclusions, the author suggests policy solutions to leaders to develop renewable energy for national economic and social development.

Keywords:Renewable energy; Wind electricity; Solar power; Vietnam.

I. INTRODUCTION

Vietnam is located on the Indochinese peninsula, is a Southeast Asian country, near the equator and has a sea route of more than 3000 km; hot and humid climate with lots of sunshine a year (average 300 sunny days/year; about 1400-3000 hours/year); 39% of the territory has wind speeds greater than 6m/s (Van, T. et al., 2023). This is a favorable condition for Vietnam to develop renewable energy such as wind power and solar power for national economic and social development.

In fact, the growth rate of Vietnam's power source is assessed to be slower than that of the economy: Vietnam's electricity demand usually increases by 1.8-2.0 times the GDP growth rate; The period 2021-2030 is planned with an installed capacity of 47.000-130.000 MW, which means that 83.000 MW of new power sources are needed to be

put into operation from 2021 (47.000 MW) to 2030 (130.000 MW). That leads to the risk of electricity shortage, poses a problem of national energy management in the direction of increasing the development of renewable energy to supplement electricity to meet the needs of economic development.

The above fact sets out the requirements and tasks of developing power sources (production, exploitation and operation) of the state and enterprises in a sustainable way. In that context, it is necessary to study the factors affecting energy development in wind power and solar power in order to more objectively identify the reality of energy management and development in the country. This research is also not outside the goal of providing scientific information to identify the actual problem of management and development of renewable energy in the context of Vietnam.

II. RESEARCH OVERVIEW

2.1. Developing renewable energy (RE)

Renewable energy are known to be clean energy sources and they are in contrast to fossil fuels; created from continuously and almost infinitely formed sources such as sunlight, rain, wind, tides..., classified into solar energy, wind energy, tidal energy... (Wikipedia, 2023). Renewable energy development is the exploitation of clean energy sources to serve the economic and social development of each country. The exploitation of these energy sources is done mainly in the form of electricity, which is solar power, wind power... Solar power is exploited thanks to modern technologies such as photovoltaic, artificial photosynthesis. Wind power is generated by wind power through wind turbines.

Renewable energy, with the advantage of being clean energy, is emerging as a bright spot in the general energy picture of countries around the world. In Vietnam, emerging renewable energy is a development trend that will continue to play an important role in diversifying power sources and ensuring energy security in the future. Phuong, T. (2020) and Duong, N.D. (2023) affirm the development of renewable energy (solar power,

wind power) with content and meaning in economic and social development, designed by the author redundant in this study when building a research theoretical framework in the Vietnamese context, that is:

- RE1. Developing renewable energy helps diversify electricity sources and meet people's stable living needs. With a population of 100 million people, Vietnam faces the challenge of stably developing electricity for people's daily life, because the energy supply of many years ago was mainly based on fossil fuels and imports while coal, oil and gas in the world are finite and have many fluctuations. In fact, with Vietnam's favorable natural and climate conditions, the development of renewable energy such as wind power and solar power will be a sustainable solution for energy development for national economic and social development family.

- RE2. Developing renewable energy helps diversify power sources and meet production needs of enterprises. Vietnam is a developing country, the proportion of international enterprises that have been investing in production and trade in the past two decades has increased rapidly, enabling Vietnam to maintain a high growth rate and economic stability domestic society. This also poses a need for large and stable electrical energy for businesses to develop production and trade. Therefore, the development of renewable energy is the proposed and strategic solution for the state in the present and in the future.

- RE3. Developing renewable energy helps to diversify power sources and ensure national energy security. In Vietnam's socio-economic development strategy for the 2021-2030 period, renewable energy development is identified with the goal and task of ensuring national energy security in the context of the limitation of renewable energy sources fossil energy (CPV, 2020; CPV, 2021). This is the common spirit of the central leaders and has been implemented into the tasks of sectors, localities and businesses operating in the energy sector.

With the above content and meaning, the development of renewable energy has both contributed to ensuring national energy security; providing stable, high-quality electrical energy at reasonable prices for rapid and sustainable economic and social development; contribute to meeting the living needs and improving the people's living standards, protecting the ecological environment.

2.2. Factors affecting the development of renewable energy

Developing renewable energy is an inevitable trend, but each country has different advantages to develop renewable energy for their development. These are factors that affect the development of renewable energy, confirmed and analyzed by many studies, including: Natural conditions; socio-economic development characteristics; Technology; government policies... (Hung, H. et al., 2023; Dung, D., 2023; Huong, L.T, 2023). In this study, the author focuses on analyzing two factors that directly affect the development of renewable energy when placed in the context of Vietnam, namely: Natural conditions and State policies on energy development renewable quantity.

a) Natural conditions (NC)

The development of renewable energy such as solar power and wind power depends mainly on the natural conditions of the country. Accordingly, the sun and wind factors that have the most direct impact on the development of renewable energy are solar power and wind power, which are emphasized in the following aspects:

- NC1. The time is sunny, the intensity of solar radiation is high. In countries near the equator like Vietnam, sunny time/day or sunny day/year with high quantity and high intensity of solar radiation. It is a good condition for the country to develop solar power thanks to modern technologies such as photovoltaic, artificial photosynthesis.

- NC2. High wind volume, high wind speed. In countries with climate conditions with high, stable wind volume and high wind speed, the construction and operation of wind turbines for wind power development will be an advantage. From there, it will create a clean energy source from exploiting wind sources, supplementing electricity sources for economic and social development and improving people's quality of life.

- NC3. The terrain is flat. A country with a plain topography, especially a large proportion of coastal plains, will inevitably have more and more stable winds in mountainous areas and inland areas. This is a favorable natural condition for the development of renewable energy, especially the development of wind power to serve the development of the country.

Vietnam is located in the Indochinese peninsula, adjacent to the East Sea with a large coastal plain, extending for 3000km; near the equator and the climate is hot, humid, and windy. This is a favorable condition for the development of renewable energy such as solar power and wind power.

Hypothesis 1 (H1): Vietnam’s natural conditions are suitable for renewable energy development, namely solar and wind power.

b) State’ policy (SP)

According to Thai, P.H. (2014), policies and laws are necessary and directional factors for all behaviors of individuals and organizations. Therefore, the provisions of the law, the content of policies issued in accordance with the characteristics of the country, the locality and the field of professional activity, will be factors that affect the development of the country. of social aspects and domains governed by those policies and laws. For the field of energy management and renewable energy development, many studies (Co, N., 2023; Thanh, L.X, 2023) confirm that the appropriate policy promulgation is reflected in the following contents.

- SP1. The State creates an equal mechanism for state-owned enterprises and private enterprises in renewable energy development. With an equal policy in renewable energy development, businesses will actively research and invest resources to exploit clean energy sources such as solar power and wind power. Since then, the nation's electrical energy has been increased in output, stabilizing the supply for people's needs and production activities of the economy.

- SP2. The State encourages private enterprises to develop renewable energy. To mobilize the participation of businesses in renewable energy development, the state needs to have policies to encourage businesses, especially private enterprises, because this is a risky field to invest in. high level, so little interest of this business sector.

- SP3. The State supports private enterprises to develop renewable energy. Investment in

renewable energy development requires large funds and high technology, while the number of large enterprises in each country is usually not much. Therefore, supporting private enterprises to participate in renewable energy development is a strategic solution, even for developed countries, for each country to achieve the goal of energy stability for the development.

Vietnam has the advantage of natural conditions for renewable energy development. Like other countries, it is always necessary to issue an appropriate renewable energy development policy in Vietnam. When the government's policies are issued to create equality and encourage and support businesses to develop renewable energy, businesses will pay attention to research, invest in exploiting clean energy sources, especially is solar power and wind power to serve energy development and ensure national energy security.

Hypothesis 2 (H2): The policy of Vietnam suitable for renewable energy development is solar and wind power.

From the content of the above overview research, the author builds a theoretical framework to study the factors affecting the renewable energy developments. The research model consists of 3 scales: The scale “Favorable natural conditions”, the scale “Appropriate state policy” (two independent variables) and the scale “Developing renewable energy” (01 dependent variable). The above scales include 9 observed variables, designed by the author into 9 questions in the survey questionnaire and measured by the Likert measure with 5 levels: 1 - Strongly disagree; 2 - Disagree; 3 - No comments; 4 - Agree; 5 - Strongly agree (Table 1, Figure 1).

Table 1. Research theoretical framework

No	Scales	Encode	Rating levels				
			1	2	3	4	5
I	Favorable natural conditions	NC					
1	Vietnam has a lot of sunshine, the intensity of solar radiation is high.	NC1					
2	Vietnam has a lot of wind, high wind speed.	NC2					
3	Vietnam has a flat topography - a large delta area.	NC3					
II	Appropriate state policy	SP					
1	The State creates an equal mechanism for state-owned enterprises and private enterprises in renewable energy development.	SP1					
2	The State encourages private enterprises to develop renewable energy.	SP2					
3	The State supports private enterprises to	SP3					

	develop renewable energy.						
III	Developing renewable energy	RE					
1	Developing renewable energy helps diversify electricity sources and meet people's stable living needs.	RE1					
2	Developing renewable energy helps diversify power sources and meet production needs of enterprises.	RE2					
3	Developing renewable energy helps to diversify power sources and ensure national energy security.	RE3					

Source: Compiled by the author through the review

Research model

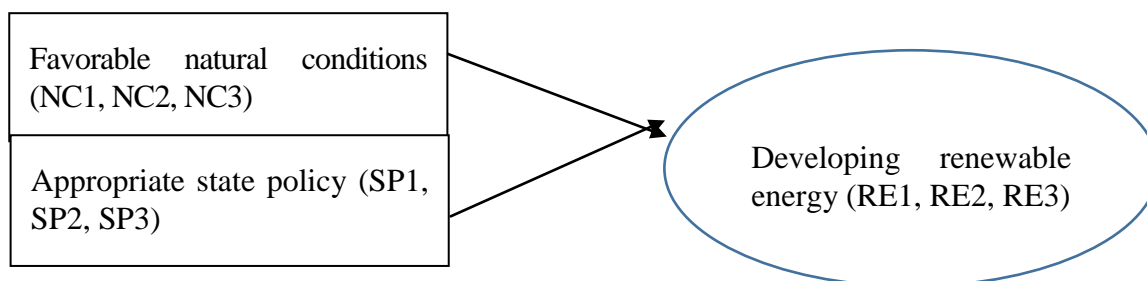


Figure 1. Research model

III. RESEARCH METHODS

This study uses a quantitative method: Collecting and analyzing primary data in the form of a survey. The author conducts correlation analysis to test the relationship of the scales, test the proposed research hypothesis. According to Hai, D.H. (2019), the minimum sample size needed to perform the above analysis for the 3-scale model and 9 observed variables of this study is $N = 9 \times 5 = 45$.

In fact, the author conducted a survey of managers of more than 100 enterprises operating in the energy sector in Vietnam with a sample size of $N = 250 > 45$ to ensure the reliability of data collection. The survey results are: 250/250 people agree to answer and 250/250 valid answer sheets, achieving 100% valid response rate. The characteristics of the study sample showed that the majority (201/250 people, accounting for 80.4%) of the survey respondents had more than 3 management experiences (Table 2).

Table 2. Descriptive statistics of the study sample

Gender * Time Crosstabulation						
			Time			
			< 3 years	3-5 years	> 5 years	Total
Gender	Male	Count	33	85	34	152
		Gender	21.7%	55.9%	22.4%	100.0%
	Female	Count	16	44	38	98
		Gender	16.3%	44.9%	38.8%	100.0%
Total	Count		49	129	72	250
	Gender		19.6%	51.6%	28.8%	100.0%

Source: Author's survey results

With the data collected from survey activities, the author tests the reliability of the scale

and observed variables; Correlation analysis to test research hypotheses and draw research conclusions.

IV. RESEARCH RESULTS

The author conducts Cronbach' Alpha test to identify the reliability of the scales and observed variables in the research model. According to Hai, D.H. (2019), the conditions for the scales to achieve

reliability are: Cronbach' Alpha > 0.6; The condition for the observed variables to be reliable is: Corrected Item-Total Correlation > 0.3. The test results show that all 3 scales and 9 observed variables are reliable (Table 3).

Table 3. Scale test results

No	Scales	Observed variables	Reliability coefficients (Cronbach' Alpha)	Corrected Item-Total Correlation
1	Favorable natural conditions (NC)	NC1, NC2, TCN3	.664	NC1 = .535 NC2 = .579 NC3 = .567
2	Appropriate state policy (SP)	SP1, SP2, SP3	.607	SP1 = .479 SP2 = .463 SP3 = .449
3	Developing renewable energy (RE)	RE1, RE2, RE3	.639	RE1 = .578 RE2 = .536 RE3 = .560

Source: Author's survey results

With the standard test value (Cronbach' Alpha > 0.6; Corrected Item-Total Correlation > 0.3), all 3 scales and 9 observed variables in the

research model continue to be used to perform correlation analysis. The results of the correlation analysis are shown in Table 4 below.

Table 4. Correlation test of the scales

Correlations				
		NC	SP	RE
NC	Pearson Correlation	1	.669**	.775**
	Sig. (2-tailed)		.000	.000
	N	250	250	250
SP	Pearson Correlation	.669**	1	.329**
	Sig. (2-tailed)	.000		.000
	N	250	250	250
RE	Pearson Correlation	.775**	.329**	1
	Sig. (2-tailed)	.000	.000	
	N	250	250	250

** . Correlation is significant at the 0.01 level (2-tailed).

Source: Author's survey results

Table 4 data shows:

+ The correlation coefficient of the scales reached the value $0 < r < 1$, showing that there is a positive relationship between the two independent variables "Favorable natural conditions" (NC), "Appropriate state policy" (SP) and 01 dependent variable "Developing renewable energy" (RE).

+ Based on the values r [r (NC) = .775 and r (SP) = .329], it can be confirmed that the correlation level of the independent variables and the dependent variable in ascending order is: "Appropriate state policy" (SP) and "Favorable natural conditions" (NC).

V. CONCLUSION

With the above analysis and testing results, the research conclusion is confirmed, that: Enterprise managers underestimate the factor "Appropriate state policy" (SP). That shows, the state needs to adjust policies appropriately to encourage and support businesses to develop renewable energy such as solar and wind power. In fact, many reviews discussed on scientific and management forums are similar to the author's research conclusions:

- Vietnam currently does not have a full legal basis, a lack of comprehensive and complete research on energy transition and in-depth component studies for each type of energy, which

has created many problems before. eye and long term for the energy supply system and society as a whole; lack of separate legislation on renewable energy; the mechanism for implementing renewable energy bidding has not been completed; Renewable energy sources with great potential and high stability such as offshore wind power are currently facing difficulties from surveying to project investment implementation (Van, T. et al., 2023).

- Vietnam is still short of electricity. In the context of electricity shortage, the call to save electricity is a necessary measure to reduce pressure on the power system and ensure stable electricity supply for people and businesses. At the same time, the state needs to have specific policies to develop renewable energy to ensure national energy security (Hung, H. et al., 2023).

From this research conclusion and practice, the author suggests innovative content in policy making, which is to promulgate specific laws and policies on renewable energy development with a diversity of types of energy renewable energy (solar power, wind power...) and encourage and support businesses to develop renewable energy, namely:

- Encourage electricity-intensive industries to switch to clean and renewable technology. That is the investment in solar power, wind power; although the initial investment can be high, the use of renewable energy sources can help reduce electricity costs in the long run and benefit the environment.

- Encourage and financially support organizations and enterprises to innovate technology and use clean energy sources; invest in energy-saving technology to promote sustainable development and protect the environment.

- Limit inefficient energy-intensive manufacturing and equipment industries to enhance energy savings and efficiency.

The implementation of the policy to develop renewable energy will help energy businesses have a mechanism to support and encourage development; creating a lot of clean energy to serve the production of the economy and people's needs, contributing to ensuring national security. With that in mind, this study has helped the author and managers of enterprises and state agencies better see the reality and solutions to develop renewable energy in Vietnam in the future.

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