UNIVERSITY OF TAMPERE

School of Management

Sustainable Development of Clean Renewable Energy in Vietnam

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ABSTRACT

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Renewable energy plays an important role in meeting national targets for sustainable development, responding to climate change and environmental issues, and ensuring national energy security. Vietnam is considered to have potentials for developing renewable energy. In order to meet the demand for electricity for socio-economic development and to take advantage of natural resources and technological advances in renewable energy, the Government of Vietnam has issued the Strategy development of national renewable energy and mechanisms, policies and incentives to support it. In the process of implementing the strategy, regular assessment of internal and external environmental factors is essential to make appropriate adjustments. This is also the research target of this thesis.

By analyzing strengths, weaknesses, opportunities, and threats (SWOT) for renewable energy development in Vietnam based on collected data, opinions of experts, investors, renewable project owners, and a case study of PetroVietnam Power Corporation the thesis will make recommendations to achieve the set strategic objectives on renewable energy development in Vietnam.

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Chapter 1: Introduction

1.1. Research background

Electricity energy is a very important factor for the development of each country. The more developed a country is, the more energy it needs. As Harris, Aiden M. wrote in his book "Energy has always been the driving force behind economic and social developments in the history of humanity. With the advent of the industrial revolution and technological progress, energy demand has increased in an exponential way throughout the whole world. With the improvement of the standard of living, consumption has exceeded the stage of fundamental needs (Anker-Nilssen, 2003). Now, energy occupies a significant position in all human activities. It has become so much significant to the degree that the development of a country is measured by its level of energy consumption" (Harris A. M., 2011, p. 9).

There are various definitions and understandings about clean renewable energy but it is generally agreed and construed that clean renewable energy is the energy source which does not pollute the environment or discharge contamination into surrounding environment during electricity generation. According to Wikipedia, sources of clean renewable energy include biomas, wind, geothermal, solar and tidal energy. In his book, Peter Cook defines that"Renewable energy options include solar, wind, hydroelectricity, wave, tidal, biomass and geothermal" (Cook, 2012). This opinion is also agreed by (Dirk Assmann, 2006) as cited "in a broad sense, the term renewable energy sources refers to hydro energy, biomass energy, solar energy, wind energy, geothermal energy, and ocean energy". Vietnam's Power Development Master Plan VII approved by the Prime Minister under the Decision no. 1208/QD-TTg dated 21st July 2011 considered wind, solar, biomass and small hydro-electricity (under 30 MW) as clean renewable energy. Therefore, in the frame of this thesis, when I mention clean renewable energy, it will be the electricity generated from the sources named in Vietnam's Power Development Master Plan VII above.

In many countries, renewable energy has taken an important proportion in the total volume of energy produced. According to the WorldAtlas, "renewable energy exploration, development and demand has always been on an upward trend. Factors such as environmental impact, depleting fossil fuel stocks and volatile oil prices have had significant impact on the desire to increase the generation of renewable energy. Between 2010 to 2014, renewable energy consumption of the top

countries has effectively doubled from 168 million tons to 316 million tons of oil equivalent"[1] (Dillinger, 2017). Let's take Europe as an example."The primary production of renewable energy within the EU-28 in 2014 was 196 million tones of oil equivalent (toe) — a 25.4 % share of total primary energy production from all sources"[2] (Eurostat, 2017).

The pattern is similar to Asia and other parts of the world. China has become one of the world's biggest renewable energy producers and consumers in the manner of electricity."China is the world's leading country in electricity production from renewable energy sources, with over double the generation of the second-ranking country, the United States. China's renewable energy sector is growing faster than its fossil fuels and nuclear power capacity"[3] (Renewable energy in China, 2017).

As for Vietnam, the demand for energy of the nation is increasing very fast whereas the reserves of input fuels are limited and being exploited excessively. On the one hand, the use and consumption of the energy sources generated from fossil fuels have been causing serious environment issues like water and air pollution.Vietnam is one of the countries most vunerable and negatively affected by climate change. Recently this country has been suffering from a numbers of natural disasters caused by climate change such as droughts, typhoons, flood, soil erosion and salt intrusion leading to the damage of economy, human and society. That is why it is necessary to find a clean and environmentally friendly energy source to limit the use of traditional energy sources. On the other hand, Vietnam is considered to have rich potentials to develop renewable clanean energy resources including small hydroelectricity, wind electricity, biomass electricity, and solar electricity.The country has a long coastline with good wind speed. In addition, the tropical climate also makes the country have long hours of sunshine. The topography with lots of mountains, riveres and lakes is an ideal conditions for hydropower development. Moreover, this is an agricultural countries with high production of rice, farming and feeding which is a good source for biomass.

Having realized the importance of this type of energy in sustainable socio-economic development of the country, Vietnam Government has established the Development Strategy for Renewable

[1]- http://www.worldatlas.com/articles/top-15-countries-using-renewable-energy.html
[2]http://ec.europa.eu/eurostat/statistics-explained/index.php/Renewable_energy_statistics
[3]https://en.wikipedia.org/wiki/Renewable_energy_in_China

Energy (hereinafter referred as the Developmet Strategy) and preferential policies and given some favorable conditions for developing clean energy. In details, on 25th November 2015, the Prime Minister of Vietnam issued the Decision No.2068/QD-TTg on the approval of development strategy of renewable energy of Vietnam toward 2030 with vision to 2050. The Decision aims to support substainable develpment and green economy. It set up a goal to increase the electricilty volum generated from renewable energy from 58 billion kWh (equipvalent to 35% of the total national output) in 2015 to around 101 billion kWh (38%) in 2020, to 186 billion kWh in 2030 and up to 452 billion kWh (43%) in 2050. This Decision also stipulates that organizations and idividuals operating in the power sector have responsibilities for contributing to the development of the national renewable energy. Power generators that own the intalled capacity of more than 1,000 MW of all sources must have the electricity production from renewable energy (excluding hydroelectricity power plant with capacity of more than 30 MW) to be 3% of the total output in 2020 and not less than 20% in 2050. In order to achieve this goal, the Decision also defines mechanism and policies to ecourage the development of this type of energy. The most favorable policy is that of price and investment guarantee. For example, power companies are responsible for purchasing all of the electricity amount produced from renewable energy sources. All costs related to producing electricity are passed through and accounted into the electricity purchasing price. It means that renewable energy project owners are guaranted to retrieve all reasonable costs and gain profits. The Government also establishes separate power purchasing price for renewable power projects which are off-grid. Of cource, this price depends on each particular project.

A year later, The Prime Minister issued Decision No. 428/QD-TTg dated 18th March 2016 approving the Revised National Power Development Master Plan for the period of 2011 to 2020 with consideration of the year 2030. One of the main objectives of this Decision is to create a legal frame for renewable energy development through giving priorities for producing electricity from renewable sources. According to the Revised Master Plan, the proportion of renewable power plants should account for nearly 10% of the total installed capacity of the national power structrure. The Decision also gives some key solutions for implementation. For example, it assigns related bodies to establish mechanism and legal documents to accelerate the development of renewable energy by issuing supportive price policies and incentives. That is why several pricing policies on renewable sources like wind power, biomass and small-scaled hydroelectric power have recently been established. Besides, The National Substainable Development Strategy for the period of 2010 to 2020 approved by the Decision No. 423/QD-TTg dated 12th April 2012 and The National Action

Plan on Climate Change issued on 5th December 2011 by Vietnam Prime Minister highlighted the importance of developing renewable energy sources for electricity generation as a measure to tackle with climate change and promote green growth.

In conclusion, the world is now facing the exhaustion and fluctuation in prices of conventional fossil fuel energy as well as negative environmental impacts caused by the use of them. So most of countries have been looking for an alternative energy source or at least a solution for being less dependent on the traditional energy source. Clean renewable energy seem to be a good answer to this problem and become a global trend. "Renewable energy has received main attention during the last years as itbecomes a way to achieve environmental objectives" (Harris A. M., 2011, p. 14).

1.2. Research objectives and questions

As mentioned above, developing renewable energy sources is necessary and feasible in terms of legal basis and natural conditions of Vietnam. Developing and using this kind of energy source will contribute to reducing Green-house emission and meeting the increasing demand for electricity of the country. Therefore, electricity generated by using renewable energy is expected to be an ideal alternative energy source, especially in countries with rich potentialities and good natural conditions to develop it like Vietnam. Although some argue that the decrease in oil price in recent years may lead to the reduction of the use of renewable energy sources for electricity generation, the development and consumption of these sources have proved to be rising all over the world.

However, the fact shows that this source of energy in Vietnam has not been developing as well as expected. "Demand for renewable energy sources is rising thanks to wide gaps between current installed capacities and the set targets. But despite supports and incentives offered to the private sector, Vietnam's renewable energy subsector has yet to take off as planned"[4] (Margareth Sembiring, 2016). The main research question is what Vietnam Government should do to develop renewable energy sustainably. In order to answer this questions, the thesis will study how the Strategic Development of renewable energy is being implemented in Vietnam to find out the

[4]http://www.eastasiaforum.org/2016/08/12/vietnams-vision-for-a-renewable-energy-future/

reasons why the renewable energy has not developed as well as it planned. It means the thesis will concentrate on analyzing current state, potentialities, obstacles and factors influencing the development of renewable energy to recommend some solutions for sustainable growth of this source of energy.

1.3. Research organization

The thesis includes six chapters. The first chapter introduces the reasons and importance of the the topic. In this part, I also outline the global trend to choose renewable energy as a smart alternative source before I give an overview on the situation of Vietnam. A general introduction of natural and legal conditions for renewable energy development is mentioned to confirm that Vietnam has rich potentialities and coditions to develop the type of energy source. Finally, the current situation of renewable source development is added briefly just to show a contrast and to identify the gap. Chapter 2 is about literary review with researches related to the topic. In this chapter, I will show similar studies of other authors in the world including both developed and developing countries. Of course, the most important part of the chapter will focuss on the concepts and definitions of sustainable development and its connection with renewable energy. Chapter 3 presents theoretical framework including main theories on strategy and strategic management. Chapter 4 writes about the research methodolody. Of course, research method, material collection, data analysis, methodololgy and ethics will also be shown in this Chapter. It means that I will present how I collected and analyzed the data in this chapter. Chapter 5- one of the most important chapters will point out the result of the study. After analyzing data and materials in the previous chapter, this chapter will concentrate on my findings. Here, the research questions will be answered. Finally, conclusions and recommendations of solutions will be found out in the last Chapter 6.

Chapter 2: Literary review

2.1.Definitions and concepts of sustainable development

The topic of this thesis refers to the issue of sustainable development of renewable energy so it is very important to mention some key concepts and definitions of sustainable development as well as renewable energy. Actually, there are various definitions and ways of undertanding about substainable development. According to Gorden Mitchel, “even before the Rio Summit (1989), there were able to identify over 60 definitions of sustainable development” (Mitchell, 1996). (Robert W. Kates, 2005) added that “the concept of sustainable development is now enshrined on the masthead of Environment magazine, featured on 8,720,000 Web pages, and enmeshed in the aspirations of countless programs, places, and institutions”. Initially, when talking about sustainable development, people often focused on economic development with the goal of increasing productivity, creating more jobs and creating more wealth.At that time, “ a concept of sustainable development must remedy social inequities and environmental damage, while maintaining a sound economic base” (Harris J. M., 2000).

After that, thedefinition paid more attention to human development when it emphasised on how to prolong human’s life expectancy, create equality as well as provide better educational opportunities. In 1987, the World Commission on Environment and Development (WCED) issued its report “Our Common Future”, also known as the Brundtland Report showing the innitial official opinion of the United Nation on sustainable development. The report defines that sustainable development is the"development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Development, 1987). It means that while a country is trying to develop any aspect of its current society, it also has to consider the ability of long-term development of this aspect in far future. This opinion immediately gave humans a warning of serous environment consequences that may be caused if they do not change their behaviors and attitudes to the environment. As we can see from the above definiton, this concept made an emphasis on the interdependent relationship between economic development and protection of natural resources and human living environment.

A significant turning point in the opinion of sustainable development appeared in the United Nations Conferrence on Environment and Development in Rio De Janero (Braxin) in 1992. At the

conferrence, the representatives of 108 countries agreed to pass the Rio Declaration on Environment and Development Supports (Agenda 21) by regulating rights and responsibilities of nations in achieving sustainable development. The conference succeded in "coming to an understanding of "development" that would support socio-economic development and prevent the continued deterioration of the environment, and to lay a foundation for a global partnership between the developing and the more industrialized countries, based on mutual needs and common interests, that would ensure a healthy future for the planet"[5]. The Agenda also addressed six principles with the main idea such as considering the humans as the centre of concerns for sustainable development. Here, we can see that sustainable develpment not only refers to the feature of environment but also emphasises the importance of humans and social factors.

In a study by the Board on Sustainable Development of the U.S. The National Academy of Sciences named *Our Common Journey: A Transition to Sustainability*, itindicated three major factors comprising ofnature, life support systems, and communitys which should be developed as cited by (Robert W. Kates, 2005). In addition, sustainable development is also defined by the goals it expects to attain such as poverty reduction goals, peace-keeping goals, environmental protection, or Millenium goals and targets. Besides, sustainable development can be defined by indicators like Wellbeing Index, Environmental Sustainability Index or Sustainable Development Indicators (Robert W. Kates, 2005). For example, the World Bank presented indicators of sustainable development used in particular measures of genuine savings: "the true rate of savings in a nation after due account is taken of the depletion of natural resources and the damages caused by pollution" (Harris J. M., 2000).

Finally, it is impossible to talk about sustainable development without mentioning the definition of the United Nations because this has been the most comprehensive concept on this issue so far. This organization shows that sustainable development must ensure stable economic growth in harmony with social progress and equality, reasonable exploitation and use of resources, protection and improvement of habitat environment.This opinion of the United Nation contains three important interdependent pillars including economic, social and environmental aspects. As (Harris J. M., 2000)stated"these principles clearly suggest new guidelines for the development process". It can be

[5]http://www.un.org/geninfo/bp/envirp2.html

understood that sustainable development is created by the sustainability of economy, society and environment. Economic sustainabilitly is the selection of a reasonable growth rate based on an appropriate and effective economic structrure whereas social sustainability focusses on social progress and human development. Environmental sustainability means rational exploitation of natural resources, protection, and prevention of environmental pollution. In conclusion, sustainable development can only be achieved if we gain the three above-mentioned targets.

Before and in early 1980s, development purpose of Vietnam focused on social equality more than economic growth. As a result, the country achieved significant progress in terms of society such as human rights, social welfare, and equality. However, its economy was very backward. In the middle of 1980s, Vietnam Government started its economic reform leading to aremarkable increase in economic growth. According to (Loi & Nhiem), during the period of 1995 to 2005, Vietnam became one of the fastest developing economies in the world with the average annual GDP growth rate of 6.5%. People's living standard improved noticeably. The GDP per capita almost tripled from 410 USD in 1995 to 1,138 USD in 2015 and the poverty headcount decreased from 60% to less than 20% accordingly. Neverthless, there have been lots of drawbacks behind this success. The economic development of the country mostly depends on the exploitation of the natural resources. Some of the resources have been exhausted or used ineffectively that has been causing serious contamination and disasters. Having recognized this status, Vietnam Government has gradually improved the awareness of sustainable development. In 2004, the Government of Vietnam issued the Decision No. 153/2004/QD-TTg establishing the strategic orientation for sustainable development in Vietnam, also known as Agenda 21 of Vietnam with the aim to the nation's sustainable development based on the close, rational and harmonious combination of economic development, social development and environmental protection. Basically, this opinion of Vietnam Government is similar to the one of the United Nations. Recently, there have been several opinions that there is "a need to review the basic components of the sustainable development definition in today's rapidly changing global environment and reinterpret its terminology to give it a more holistic and ecocentric flavor" (Sophia Imran, 2014). However, there have not been any new definitions accepted internationally. So far, it is still agreed that sustainable development must be based on the sustanaibility of the three aspects including economy, society and environment although theorists together with practitioners are still trying to transform the concept of sustainable development into reality as noted by (Harris J. M., 2000).

2.2. Renewable energy and sustainable development

First of all, it is undeniable that energy plays such an important part in sustainable development of countries that they are always trying to plan their energy programs or strategies in consistence with their sustainable development goals. Before studying the connection between energy in general and renewable energy in particular with sustainable development we shall learn how energy electricity is generated basically. In the book "Green energy: An A – to – Z guide", Muvaney defines that electrical energy in general can be understood as electricity generated "through multiple conversions between other forms of energy such as chemical, nuclear, thermal, mechanical, and gravitational potential. The general conversion is thermal to mechanical to electrical, but the operation can varygreatly depending on the resource used. Almost all power stations use turbines connectedby a common shaft to a generator to convert mechanical energy directly into electricalenergy via the principle of electromagnetic induction. Renewable resources like windpower, wave power, and hydropower flow through the turbines to generate mechanicalenergy directly. The chemical energy of fossil fuels and biomass and the nuclear energy ofuranium are converted into thermal energy, which drives the turbines through the heating of steam or gas. Geothermal and solar thermal collectors provide thermal energy directly" (Muvaney, 2010, p. 109). Also according to this author, "fossil fuels are the largest contributors to electrical energy generation because of their high energy content" and "provide two-thirds of the world's electrical energy demands" (Muvaney, 2010). However, combustion of fossil fuels during electrical generation realeases carbon dioxides which is known as the cause of greenhouse effect and environment pollution. That is why renewable energy has become an indespenable selection when comparing the impacts of this type of energy with traditional energy sources on the environment as (Bao, 2017) cited that non-renewable energy is a very important source of energy for humankind. Thanks to this energy source, human society has enough energy to survive and develop. However, it is time to take into account the solution of finding new sources of energy to gradually replace the sole role of none-renewable energyin order to reduce its damage, and even to save the survival of human species from the warming phenomenon of the earth. One of those trends is renewable energy - a source of energy that can guarantee sustainable development and human safety. All of the researches, scientists, and environmentalists have agreed that electricity generation from renewable resources has not caused negative impacts on the environments as much as electricity production from fossil fuels does. As (Jayant Sathaye, 2011) affirmed "renewable energy offers the opportunity to contribute to a number of important sustainable development goals: (1) social and economic

development; (2) energy access; (3) energy security; (4) climate change mitigation and the reduction of environmental and health impacts. The mitigation of dangerous anthropogenic climate change is seen as one strong driving force behind the increased use of renewable energy worldwide". This opinion is also agreed by (Cook, 2012) as he wrote that "the use of renewable energy as one of the simplest and most effective ways to reduce green house emission". This author used to be the Director of the PetroleumCooperative Research Centre (PCRC) in Australia so he was well - awared of climate changeand its connection to clean energy. Although his book mainly focused on clean energy technologies of CO2 capturing and storage (CCS) and the connection between CO2 and climate change, it provided a comprehensive outline of the status of clean energy development not only in Australia but also in OECDs and its related issues. The author also compared the costs, advantages and disadvantages of every single source of renewable energy like solar, wind or CCS. Finally, one of the most noticeable point of the book is that the author provided an outlook on political environment of clean energy.

In another book named "Clean Energy: Resources, Production and Developments", (Aiden, 2011) agrred with (Cook, 2012) that renewable energy sources would be substituted for primary energy sources in the aspect of CO2 emission reduction. Futhermore, his study also pointed out all related contents on clean energy. Readers can find through his research the answer why renewables should be chosen or how to produce sources of electricity generated from clean energy, what policies were implemented to encourage clean energy and current situation of developing this type of energy. Generally speaking, both (Cook, 2012)and (Aiden, 2011) added that "renewable environmentally friendly energy must be encouraged, promoted, implemented and demonstrated by full-scaleplan especially for use in remote rural areas" (Aiden, 2011, p. 3).

A different book on this topic is "Energy for Keeps: Creating electricity from renewable resources" by (Nemzer, 2010). The book of 5 chapters covers all matters of renewable energy sources and its connection to environment and technologies. The book is somehow like a textbook for people of all jobs and ages because it provides necessary and basical knowledge of how electricity is generated from renewables and nonrenewables and how it affects our health and environment. The most noticeable thing of the study is that the author gave a very clear guidance on the way we use energy. The message is "the less fossil fuel weuse, the less pollution we produce" (Nemzer, 2010, p. 144). Here, we can see that this point of view is totally similar to that of (Cook, 2012)and (Aiden, 2011).

The transition from traditional energy to renewable energy is not only meaningful to the environmental aspect but also to the economic area. First of all, this transition will help countries reduce energy imports, thereby increasing energy security as well as improving trade capacity. The development of renewable energy technology has made this type of energy more competitive in price when compared to traditional energy. This also creates new employment opportunities and other benefits like economic growth. Especially, after the Paris Agreement in 2015, investors began to realize the risks of continuing to invest in traditional energy. This frees up investment in renewable energy and has made a big leap forward in investing in fossil fuels to shift to renewable energy.

Looking back to the case of Vietnam, it is neccessary to confirm that the Government of this country has been well-awared of the importance of substainable development as well as the tight linkage between renewable energy and substainable development. In early 1990, the Government of Vietnam passed the National Plan on Environment and Substainable Development for the Period of 1991 to 2000. This was the first step of the country in this field. After that, in 2004, the Prime Minister issued the Decision No. 153/2004/QD-TTg on Strategic Orientation for Sustainable Development of Vietnam. This is a framework strategy including major orientations serving as a legal basis for related agencies to implement and coordinate to ensure sustainable development of the country in the 21st century. The orientation raised the challenges that Vietnam was facing with, set out guidelines, policies, legislative instruments and prioritized areas that need to be taken in order to obtain the goals. Ministries, agencies and competent units would base on this orientation to build their strategic plans in terms of sustainable development.

As regards to the connection between renewable energy and sustainable development in Vietnam, there have been lots of journals, articles and textbooks on this content directly or indirectly. One of a very good example is the textbook “Renewable Energy and Substainable Development” by (Bao, 2017), published by Ho Chi Minh City National University Publishing House in 2017. This publication also gave an outlook of substainable development and its relationship with renewable energy. Besides, the author gave an overview on the use and deployment of renewable energy in the world generally and in Vietnam particularly. More especially, it analyzed sharply the technologies of renewable sources like solar, wind, hydro, tidal and geothermal power as well as the potentials to

develop it in Vietnam. It is a pity that we have not found any contents on mechanisms, policies or development plans of renewable energy in Vietnam. He did not mention the practical implementation of the national strategic plan for the develpment of renewable energy as well as mechanism and preferential policies to encourage this type of energy to develop, either. In addition, there are several studies on the potentials of each type of renewable energy such as "Deploying Renewables in Southeast Asia" by (IEA, 2010) but there have not been any studies on the current state of development of renewable energy in Vietnam as well as the implementation of the Development Strategy of renewables in practice. It is also the research gap that this dissertation has to fill in.

In conclusion, "important socio-economic benefits of large-scale penetration of renewables include improvements in energy security and noteworthy reductions of air pollution and CO2 emissions, which would contribute to climate change mitigation. These co-benefits are associated with high cost savings, although no uniform methodology exists to quantify these savings" (IEA, 2010, p. 10). Therefore, the development of renewable energy will be an important element in each country's sustainable development strategy.

2.3. Influencing Factors of Renewable Energy

According to the Global Green Growth Institute report, four key factors affecting the development of renewable energy are Resources, Policy Framework, Economy and Technology (Instiute, 2016). It is clear that only countries with natural resources consistent with existing renewable energy technologies will be able to develop this type of energy. This means that the country must have practical access to use its natural resources for renewable energy development. Studies have shown that establishing national targets for renewable energy development along with the issuance of legal frameworks and support mechanisms is prerequisite for the development of renewable energy. These objectives must be appropriate to the natural, economic and social conditions to ensure sustainable development. The economic factor here is the competitive advantage of renewable energy in comparision with fossil fuel conventional energy. This is one of the biggest challenges that affect the choice of renewable energy in most countries. Several authors pointed out that electricity production cost from renewable energy is higher than that of fossil fuels so it shall not be used widely by countries. It may be true in terms of investment cost. As (Cook, 2012) analyzed that

cost per unit of generating capacity of a power plant, range from a base case of $1200-$1300 per kilowatt for a combined cycle gas turbine with no carbon capture and storage (CCS) to $1900-$2300 per kilowatt with CCS. The capital cost for black coal (supercritical) power station with CCS is estimated by Burgess at 2900-$4500 per kilowatt compared to $2100-$2900 per kilowatt for wind. Solar PV ranges from $4600-$5700 per kilowatt depending on thetype of PV system and geothermal is in the range $4000-$6300 per kilowatt (Cook, 2012). This is also agreed by (Shen, 2014) when he calculated that "unit generation cost of coal-fired power was 350 Yuan/kWh, while unit generation costs of wind power and solar power were 620 and 1900 Yuan/kWh separately (1 Chinese Yuan is equal to 0.16 US Dollar roughly in 2013)" (Shen, 2014). Of course, if countries only look at these figures, they will not choose renewable energy to develop. However, a study carried out by experts of International Renewable Energy Agency (IREA) showed an opposite viewpoint. After analyzing all related costs of a renewable power plant (solar and wind) such as investment cost, operation and maintanance cost, insurance and interest, the calculation proved that "Biomass for power, hydropower, geothermal and onshore wind can all now provide electricity competitively, compared to fossil fuel-fired power generation. It is growth in the "new" renewable power generation technologies of solar and wind, however, that has pushed renewable power generation capacity additions to record levels. A virtuous circle of support policies driving increased deployment, technological improvements and cost reductions has seen onshore wind become one of the most competitive options for new generation capacity. The levelised cost of electricity (LCOE) of solar PV fell 58% between 2010-2015, making it increasingly competitive at utility scale. Despite the fact that concentrating solar power (CSP) and offshore wind are in their deployment infancy, these technologies are already attractive in some markets, with costs continuing to fall" (IRENA, The Power to Change Solar and Wind Cost Reduction Potential to 2025, 2016, p. 10).

Another important factor influencing the development of renewable energy is that of technology. In 2008, the World Bank published a very interesting working paper on clean energy named "Accelerating Clean Energy Technology Research, Development and Deployments" by (Avato, 2008). The publication presented valuable lessons from non-energy sector. First of all, the authors of this work confirmed that "better and broader use of existing clean energy technologies can play an important role in climate change mitigation" (Avato, 2008). However, they complained that most of these technologies were too expensive or unreliable for spread deployment whereas spendings on

research, development and deployment of clean energy technology trend to be cut down or not enough to meet the demands. The reasons for this situation are numerous. One of them is that technology of renewable energy remains in the first stage of developement or not fully-commercialized. Costs for research and development are huge. In order to overcome the barriers, the authors carried out case studies of four non-energy sectors to find out the solutions. As the authors stated "although each of the case studies examined has its own set of circumstances that differ from the clean energy sector, the similarities and the creative approaches used in Research, Development and Deployment can provide valuable lessons" (Avato, 2008, p. 28). Surprisingly, one of these solutions is financing mechanism and incentives in order to encourage entities of both public and private sectors to take part in research and development of this type of energy. We can see that this option has been accepted and applied in many countries of the world. Additionally, (Muvaney, 2010, p. 9) also holds the same point of view that "the extractions and transformations of fossil fuel energy come at a considerable cost and raise many questions about the sustainability of our energy supply as the conventional energy system confronts the realities of climate change, materiallimits, and environmental degradation".

Of course, it is very crutial to mention the socio-environmental impacts of renewable energy in terms of sustainable development. As analyzed above, generating electricity through using fossil fuels has been causing lots of harm to the evironment such as acid rain, stratospheric ozone depletion, green house effect or global climate change because "electric power generation, residential heating and industrial energy use account for 80% of SO2 emissions, with coal use alone accounting for about 70% of SO2 emissions. Another source of acid precipitation is sour gas treatment which produces H2S that reacts to form SO2 when exposed to air" (Dincer, 2010). And these things are making seriously negative influences on people's health as well as ecology. Water and air pollution are blamed to human respiratory, digestion diseases even cancers as cited by (Jayant Sathaye, 2011) that "the most important energy-related impacts on human health are those associated with air pollutantemissions by fossil fuel and biomass combustion (Ezzati et al., 2004; W. Paul et al., 2007). Air pollution, even at current ambient levels, aggravates morbidity (especially respiratory and cardiovascular diseases) and leads to premature mortality". Furthermore, global climate change is proved to cause natural disasters such as flood, drought, and salt envasion. As a result, they are destroying and damaging forestry and agricultural crops, fish and aquatice life, too. In order to avoid or immigate these harmful effects, people shift to use renewable energy.

2.4. Experience of renewable energy development in several countries

So far we have been able to find the neccessity of developing renewable energy for the purpose of sustainable development. However, the matter here is how to develop it and more importantly what a country should do to develop it sustainably. In order to overcome the barriers of economic, technological and social acceptance, countries have applied different approaches. Let us have a look at the Europe where renewable energy has developed a lot as an example. “The first initiatives for introducing renewable energy started in 1988, when the British Government presented plans for the development and exploitation of renewable energy sources. These early plans were to be attained by extending the scope of an already existing policy to the area of renewable energies, i.e. The Non Fossil Fuel Obligation—NFFO for Nuclear Power Generation. The NFFO was established in 1990. This system was initially created to ensure the purchase of electricity generated from nuclear and renewable sources. This system was financed by the “Fossil Fuel Levy (FFL)” and paid by the end consumer. Nevertheless, a small amount of the budget was intended to support renewable energy generation. Until 1996, more than 90% of the budget was used to subsidize nuclear energy (Nuclear Obligation). In 1996, the EC threatened not to approve the FFL, because in European law, such a substantial subsidy would only be justified in certain cases, such as, for environmental reasons. As a result, in 1998, 49% of the FFL budget was applied to renewable energies” (Claudio do Valle Costa, 2008).

Another policy used to promote renewable energy is via tax policy. For instance, in 1996 Netherland “introduced a regulatory energy tax (Regulerende Energie Belasting, REB or Ecotax), which is a tax applied to the consumption of electricity, natural gas and heat oil—for small and medium-scale energy users. A share of this tax was paid back to renewable energy generators as a production subsidy. The RES-E included were wind, solar energy, hydropower with capacity of less than 15 MW, biomass and biogas. Imported electricity from these sources were also eligible to receive this subsidy” (Claudio do Valle Costa, 2008). Some countries also established “tax exemption for all domestic generators of renewable energies and for sale of imported energy” (Claudio do Valle Costa, 2008).

As for developed countries, they “have been designing and implementing diverse types of price and quota-based mechanism to promote renewable energy development from the late 1970s. For

instance, the United States implemented its first feed-in tarrif policy (FITP) in 1978 and a quota mechanism known as Renewable Porfolio Standard (RPS) since 1983" (Gabriela Elizondo Azuela, 2012). FITP and RPS have then been applied commonly in many countries in the world as the most effective intrument to encourage the development of renewable energy. This pattern is similar to developing countries when "the first four countries to introduce some type of preferential tarrif or FITP were India (from 1993), Sri lanka (from 1997), and Brazil and Indonesia (from 2002)" (Gabriela Elizondo Azuela, 2012). In addition, a very effective method used by countries is to apply power projects for Clean Development Mechanism (CDM) under the framework of Kyoto Protocol which was launched in 1997 (Nations, 1992). According to this mechanism, when a power project has successfully been approved as a CDM project, it can sell Certified Emission Reductions (CERs) also known as Carbon Credits. In this case, money obtained has improved the cash-flow of the project and made it much more feasible. Unfortunately, the Kyoto Protocol expired in 2012 and has not been replaced by any other agreement leading to the collapse of carbon trading market. This is a big challenge for renewable energy projects. Hopefully, countries will achieve consensus soon and find out feasible measures to tackle with this problem before it is too late.

In the end, there will be a major mistake in addressing the development of renewable energy without mentioning China's experience. It can be said that this is a country with the fastest growth rate of renewable energy in the world. According to the the report of IRENA, "China has become a global leader in renewable energy. It has vast resources and great potential for future development. In 2013, China installed more new renewable energy capacity than all of Europe and the rest of the Asia Pacific region"[6] (IRENA, Renewable Energy Prospects: China, REmap 2030 analysis. , 2014). To gain these remarkable achievements, this country has adopted many preferential policies and incentives to support renewable energy. Take wind power as an example. Since 1994, China has set up the strategy for the development of wind power. This is a very important and hard decision because at that time the wind power industry did not develop, coal thermal power was still relatively cheap and coal supplies were plentiful. This strategy pave the way for wind power development. After that, the Chinese government established a number of support policies such as "mandatory market share for renewables by sector and technology, tariff based support mechanisms or government financial support for renewable energy projects" (IRENA, Renewable Energy Prospects: China, REmap 2030 analysis. , 2014, p. 36). Thanks to these effective policies, China

[6]http://www.irena.org/remap/IRENA_REmap_China_report_2014.pdf#page=109

has gained remarkable achievements in the development of renewable energy. In Asia, “most Southeast Asian countries have, through policy implementation, fostered deployment of renewable energy technologies in a more concerted manner. Chief among the driving forces are rising dependency on fossil fuel imports and the environmental impacts of fossil fuel use, including the potential effects of climate change” (IEA, 2010, p. 8).

To sum up, this chapter presented basic definitions and concepts about sustainable development and its connection with renewable energy. Furthermore, it analyzed the necessity of developing renewable energy and experience applied by both developed and developing countries to support renewable energy. The lesson withdrawn from this experience is that it is impossible to develop renewables without support policies and incentives of governments.

Chapter 3: Theoretical framework

3.1. Theories on strategic management

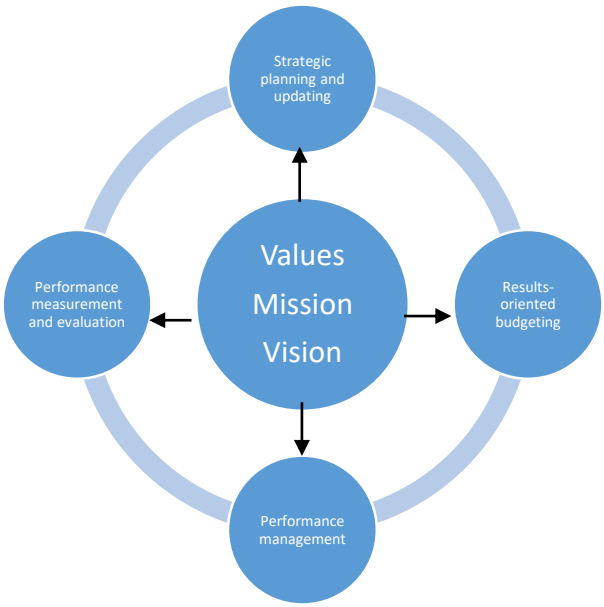
As presented above, this thesis aims to recommend solutions for the sustainable development of renewable energy in Vietnam. Having realized the importance of renewable energy in the aspect of sustainable development, the Government of Vietnam has issued the Development Strategy for renewable energy. At the same time, some preferential policies and mechanisms have also been set up to support it. Nevertheless, this source of energy has not developed as planned. What are the reasons for this status? Is it because of strategic planning or strategic implementation? What can be done to achieve the set targets? Before looking for the answer to these questions, let us review the theoretical framework on strategy and strategic management.

The term “strategy” is firstly used in the military aspect involving the method used to gain victory over enemies. In the business world, “strategy is a means to make growth happen, and to make more money than you use” (Manning, 2002). Today, strategy is construed to be a set of long-term objectives and guidelines of operations to achieve these objectives. It means that strategy plays a vital role in the survival and development of an institution, especially in the context of severe competitiveness of the world today as agreed by (Drumaux, 2014, p. 12) that “strategy and strategic management have increased their influence within the public sector since the mid-1990s”. However,

it is necessary to distinguish the concepts of "strategic planning" and "strategic management" because in some cases they are often used interchangeably. While the former term is often associated with the goals, mission, or vision that an organization want to obtain in the future, the latter one is “the larger process that is responsible for the development of strategic plans, the implementation of strategic initiatives, and the ongoing evaluation of their effectiveness” (Poister, 2003, p. 159). Strategic management is regarded as an art and science of building, implementing and assessing comprehensive decisions to help organizations obtain their objectives. It is “a process that involves leadership, creativity, passion and analysis, building an organization that both generates and responds to change, developing compensation systems to reward staff, devising appropriate structures and systems, competing for funds in global financial markets and ensuring necessary resources are developed and allocated to worthwhile opportunities” (Peter Fitzroy, 2012). It means that this process serves as guidelines of operation for organizations and thanks to these guidelines the organization can adapt changes well and overcome obstacles actively. There is a variety of processes of strategic management. They can be “formal or informal, intuitive or analytical” (Peter Fitzroy, 2012). In a simple way, it is a cycle starting from understanding the internal and external environment to developing the strategy and having it implemented. In a broader sense, is illustrated in the Figure below

Figure 1: Strategic Management Process

Source: (Poister, 2003)



As we can see from the illustration above, strategic management process involves some essential components such as strategic planning and updating, results-oriented budgeting, performance management and performance measurement and evaluation (Poister, 2003). Much more

importantly, all of these elements must be combined closely and aligned to serve for the set vision, mission, and values.

According to the lectures by Prof. Jari Stenvall, there are numerous types of strategies such as group strategies, regional strategies or institutional strategies. However, there is one thing in common is that strategies are set up to manage external and internal factors and their interaction to make sure that "the objectives of profitability, continuity, and development will be achieved" (Stenvall, 2016). He also cited that there were several groups of strategic schools including Prescriptive school, Designing School, Planning school, and positioning school. Prescriptive school focuses on the function of an organization and the way of implementing its strategies while Designing school takes into account of the internal and external factors of the organization during the process of formulating strategies. The Planning school divides strategies into five phases. The first phase is long-term planning based on economic circumstances and budget. In the second phase, a strategic plan will be set up usually by top management with the concentration on practical operation. A long-term strategy always comprises of long-term objectives. These objectives of strategies should be SMART (Specific, Measurable, Achievable, Reliable and Time-bound). This opinion also receives consensus of other scholars. For instance, (Bai, 2011, p. 54) mentioned that "goals must be long-term and forward-looking. They should also be comprehensive and implementable (i.e., realistic, down-to earth, and attainable). And they should be challenging". The third phase, strategic management, points out three important steps "from the point of planning, implementation, and supervision" (Bai, 2011). As we all know that internal and external environment is always changing so it needs the fourth phase of strategic thinking. After having recognized differences between planning and operational work, adjustments and changes may be made. At the final phase of strategic interactive management, we will see the interaction between managers, staff and stakeholders or publicity. As for the Positioning school, it bases on the comparison between organizations to create differences. Generally speaking, it is very difficult to access which school is better so we should base on the practical situations to apply.

During the process of establishing strategies, it is very important to consider whether internal and external factors are sufficient enough to guarantee the success of strategies. And of course, these factors should be considered in the time dimension of the strategies because strategies are usually set up for a particular period of time. Normally, a strategy process includes three steps: strategic

formulation, implementation, and evaluation. In the manner of strategic formulation and implementation, Whittington identifies four distinct perspectives on strategy (Whittington, 2001). They are the classic perspective, the processual perspective, the evolutionary perspective, and the systemic perspective (Robert L. Heath, 2009). As analyzed by (Drumaux, 2014), theclassic perspective on strategies just pays attention to profit maximazation and regards it as the only outcome of stategy. This attitute had also been presented by several scholars like (Alfred D. Chandler, 1990) and used as a prominent approach to public strategies in the USA, UK or Ireland (Robert L. Heath, 2009) when they stated that the processual perspective on strategy focusses on multiple outcomes of strategy and views it as an outgoing process informed by strategic intent. The evolutional perspective on strategy focusses on both profit maximization and efficiency of production. Finally, the forth perspective takes a systemic view with the idea that "desired strategic outcomes are plural". Actually, approach to strategic formulation and implementation is influenced by all of the four perspectives. For instance, the classis perpective often uses the mandatory approach to strategic formulation like SWOT matrix (Strengths, Weaknesses, Opportunities and Threats) with the interaction of internal and external factors while processual perspective allows to formulate strategies through developing internal values. The process of strategic formulation oftern comprises of three stages: information collection, strategic analysis and strategic decision. At the stage of information collection, it is very important to obtain all related factors including internal and external factors. Several tools can be used such as EFE, CPM, and IFE. Information collection can be based on the statastical data of past performance, surveys, questionaires, interviews or observation. When information has been collected, we will move to the second stage of strategic analysis. The purpose of this work is to "provide conditions for creating, implementing, and reforming strategies" (Stenvall, 2016). Before carrying out analysis work, those who are in charge of doing it should understand clearly what to be analyzed and how to implement it. In order to acomplish this work well they must have good knowlege and skills of this field. It also requires several particular characteristics and qualities such as"vision, eloquence, and consistency; articulation of a business model; commitment; being well informed; willingness to delegate and empower; astute use of power and emotional intelligence" (Charles W.l. Hill, 2013). There are some useful tools to use during this phase including SWOT, Politics, Economics, Society, Technologies and Ecology (PESTE), Boston Consulting Group (BCG)...or using scenarios. SWOT matrix is widely used to analyze a company's internal factors (Strengths and Weaknesses) and external factors (Opportunities and Threats). Through SWOT analysis, the company will determine influencing elements that may affect negatively or possitively its success.The main purpose of

SWOT analysis is to exploit external opportunities, counter threats, maintain internal strenghts and eradicate weaknesses (Charles W.l. Hill, 2013). This work can be explanained as belows:

Strengths (S): Analyzing possitive factors inside the organization such as financial capacity, workforce, compatitive advantages.

Weaknesses (W): Analyzing negative aspects and limitations inside the organization that may cause bad effects on the operation of the organization.

Opportunities (O): Analyzing external favourable elements that help to increase the value or provide benefits to the organization.

Threats (T): Analyzing external factors that may place the organization at risks. These factors exist outside the organization so they are uncontrollable.

Here below is an example of SWOT model used to analyze internal and external environment of a company for strategic formulation.

Figure 2: An example of SWOT matrix

	S	**W**
O	**S/O**	**W/O**
T	**S/T**	**W/T**

Thus, this analytic model is very useful for organizations or companies to understand their capacities and determine obstacles to overcome in order to achieve their objectives.

Another analytic tool which is also very popular is PESTE. This model focusses on analysis of policitcal, economic, social, technological and ecological factors which are related to outside environments. Jari S. (2016) listed them in each of categories as followings:

Political factors: Legislative factors, tax policies, international issues, party polictics.

Economic factors: Economic growth, trends, development of workforce.

Social factors: Social structures, values, attitudes, lifestyle and change in habits of consumption.

Technological factors: Information technology, technological products.

Ecological factors: Land use, preservation of nature, bodies of water, waste and noise

In the field of renewable energy development, this model is very helpful and used widely because "SWOT analysis helps to formulate right strategies" (Rao, 2009). They help decision makers understand potentials and barriers, opportunites and challenges to choose the most suitable and realistic for sustainable development. It is also because all of the above-mentioned factors make a significant effects on sustainable development of renewable energy. In fact, different tools have been combined to analyze and select the most appropriate and feasible strategy because not all of the strategies have been chosen. Of course, top managers are the people to make decisions on this matter. In this case, accuracy of information and quality of assessment and analysis play a vital role in making decisions. And it is also related to the importance of the leadership skill of the managers. According to (Peter Fitzroy, 2012), this is the way to make others understand what they should do and how to do it to obtain the set objectives and there are six different styles of leadership including Coervive (demands immediate compliance, Authoritative (mobilizes people towards a vision), Affiliative (creates harmony and builds bonds), Democratic (forges consensus through participation), Pace-setting (sets high performance standards and Coaching (develops people for the future).

Once strategies have been formed and chosen, they will be put into the stage of strategic implementation. According to (Bai, 2011), "Strategic implementation requires a broad systematic integration. Any strategy, no matter what level it is at, will inevitably form a "dynamic interaction of a multi-element complex system" as defined by Karl Ludwig von Bertalanffy, the founder of General System Theory in modern science. A long-term development strategy is, without doubt, a complex system: It involves various multi-levels, is interdisciplinary, and crosses domains, sectors, and systems. A successful strategy must be the result of broad systematic integrations among different domains and different systems" (Bai, 2011). Actually, this is the way of transforming designated objectives and plans into actions because "strategy is change management. Thinking and acting are tightly intertwined activities. To separate them is to court trouble" (Manning, 2002, p. 83). This work may involve in the implementation of projects or programmes. That is why the

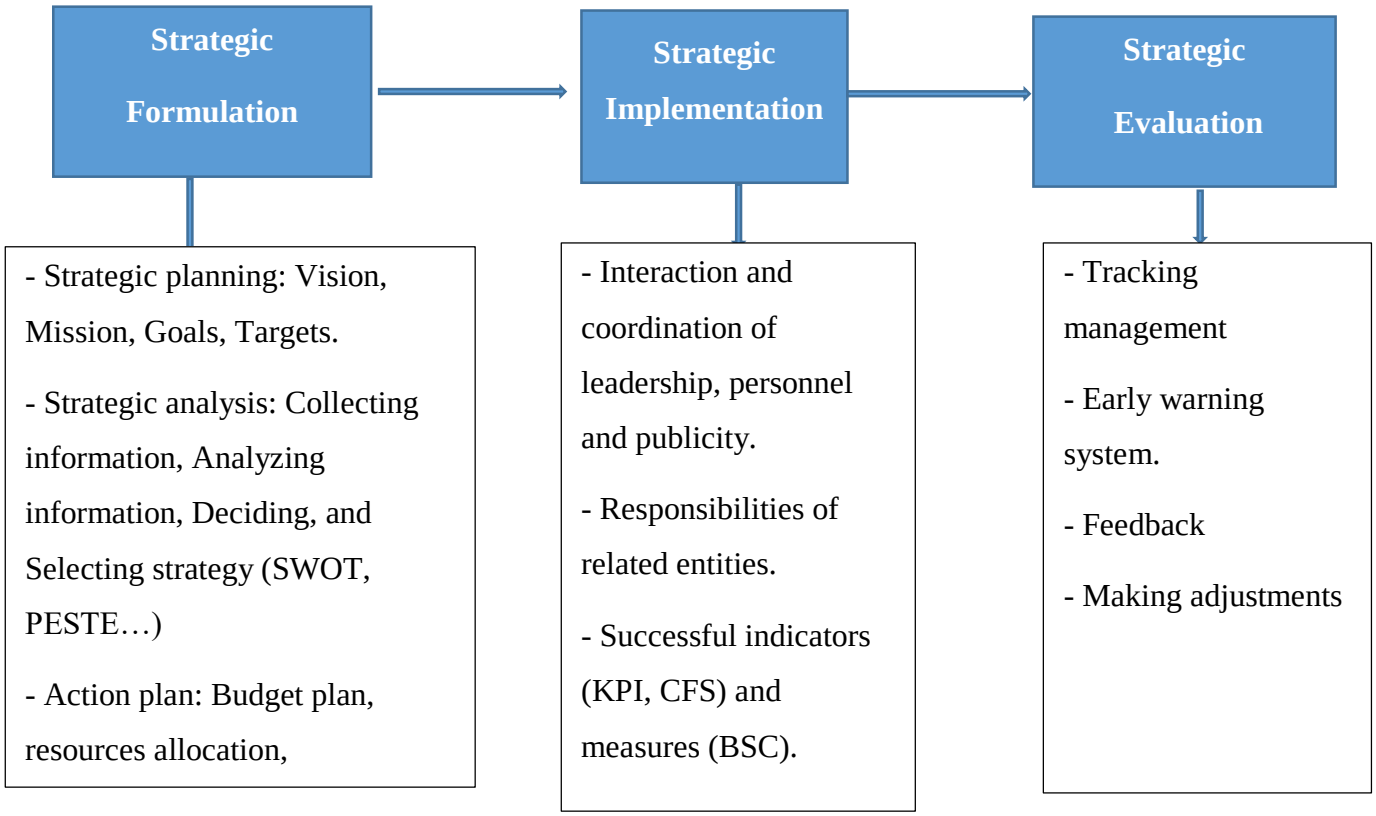
thesis will focus on analyzing and assessing the implementation of existing renewable energy projects in practices when evaluating the implementation of the Development Strategy of Renewable Energy in Vietnam in the following chapters.

In order to evaluate how strategies are actually implemented, there are some schools such as the Enterpreneurial school, Cognitive school, Learning school, Power school, Cultural school and Environmental school (Minzberg 1990). Strategic evaluation aims to determines differences in objectives, contents, practical operation and outcomes compared to the initial plans in order to understand current status, find out reasons and give solutions to adjust the strategies. As (Bai, 2011, p. 49) stated "long-term development strategy has long-term objectives. But it is changing continuously, and its domestic and international environments are never certain. Since the main body and resources of strategic implementation also changes continously over time, it is neccessary to implement a mechanism for tracking, management and feedback, so that appropriate adjustments to keep up with events can be made". However, monitoring and evaluating strategies must be carried out reasonably in every stage of strategic process. This work requires flexibitity to help organizations adjust their strategies timely and therefore, to increase the outcomes and effetiveness of strategies. And this work can be implemented periodically or suddenly. Theoretically, Strategic performance evaluation is the measurement of results, identifying discrepancies to make timely and appropriate adjustments to ensure the desired outcomes. In order to measure the stretegic performance of a bussiness firm, a number of models (such as Balanced Scorecard by (Kaplan, 1996)) or indicators including financial and non-financial mesurement (such as economic profits, net income, rate of returns, cash flow or net present value) can be used or a new system of performance measurement can be created. However, it should be noted that this study focuses on assessing the practical implementation of the Development Strategy of Renewable Energy in Vietnam. This assessment is mainly based on the assessment of the current status of the implementation of renewable energy projects, the advantages and disadvantages of the project implementation process, the external and internal factors affecting the implementation of the project to make recommendations.

In short, along with the rapid changes of the world nowadays, the trend of strategies has also been changing. These new trends are, for example, Agile strategies and Relationship – based strategy. The former trend bases on the best conditions to establish operations so it allows organizations to

mobilize resouces quikly and flexibly. The latter one sets up strategies on relationship. In spite of these changes in the trend of strategies, strategies are basically similar in terms of process and contents which are described in the Figure below:

Figure 3: Strategic process and contents



In terms of structure, a typical strategy often consists of several main parts such as vision, mission, goals/targets, action plans and responsibilites. In the aspect of sustainable development, the long-term strategic management model by (Bai, 2011) is a very good reference. Because of similarities between China and Vietnam in many fields, I myself find theseperspectives very valuable and applicable to sustainable development of renewable energy in Vietam, both theoretically and practically. The authors designed a long-term strategic management system (LSSIM) with three phases and six level as followings:

SSIM (Three-Phase and Six-Level Long-Term Strategic System Integration Model)

- **Three phases:**

- ✓ Definition of strategic goals: based on a long-term future perspective, to describe the sustainabledevelopment vision.
- ✓ Establishment of strategic plans: strategic deployment and support systems that fit the goalsand strategy.
- ✓ Strategy implementation, and evaluation: process management of projects, project managementsystem, integration, coordination and integration, implementation capacity management; monitoring, feedback, and evaluation.

- **Six levels:**
  - ✓ Definition of development goals: Future studies, strategic analyses, strategic choice.
  - ✓ Design strategy-based roadmaps: Compare and examine various aspects of strategic deployment, "hard" and "soft" support systems, discover and supplement the inadequacies and problems of the plan.
  - ✓ Project Implementation and project management system integration: Coordinated andintegrated implementation—"macro-strategic command instrument"—an integrated quadruplebottom-line strategic management and early-warning system.
  - ✓ Beyond GDP: Establishing a Genuine Progress Indicator (GPI) management system to improve the performance evaluations of governments.
  - ✓ Encourage holistic innovation of enterprise management: Introduce green businessmethods.
  - ✓ Increase the transparency of strategic plans: Increase public participation and civic involvement.

Generally, this model has a lot of common things with that of other scholars as presented above but it shows clearly steps and detailed contents in strategic process. Especially, this model was based on the situation of China - a country having a lot of things in common with Vietnam from history and culture to environment. That is why my thesis has refered to the theories of these authors a lot.

3.2. Problems of strategic management

The most obvious problem in strategic management is the lack of intergration and coordination (Bai, 2011). Every agency or specialized unit usually just pays attention to its own strategy. While building strategy, the conjunction and importance of other strategies are ignored or eased. This

piecemeal phenomenonin strategic management has been existing at all levels, from national to regional level, leading to the reduction in comprehensive effectiveness of strategies.

Another problem is that of sustainable development. In several countries, especially developing countries, they pay more attention to economic value than environmental and ecological benefits. In some cases, they are willing to sacrify or ignore negative impacts on environment to gain short-term economic profits.

The third problem is the lack of management skills and knowlege of strategic management. This problem is easily recognized in developing countries. As the result, some strategies which were just established, have become unfeasible or unsuitable. During there phases of strategic process, the first phase of startegic formulation is often emphersized but the phases of strategic implementation and evaluation are neglected. That is why adjustments are rarely made in time and outcomes are not obtained as expected. Having recognized these shortcomings, policy makers will find out the best approach to plan and manage their strategies successfully.

As discussed in Chapter 1, this thesis aims to provide recommendations for the sustainable development of renewable energy in Vietnam. In fact, the objectives of renewable energy development have been promulgated by the Government of Vietnam in Development Strategy of the Renewable Energy. Therefore, what this dessertation needs to do is to evaluate how the Development Strategy is being implemented in practice. By evaluating the practical implementation of the Development Strategy, external and internal factors influencing the implementation of the Development Strategy will be exposed. From there, the thesis will present the solutions or adjustments if necessary to achieve the set strategic objectives. Based on the knowledge that is addressed in this Chapter,it turns out to be strategic management process. Thus, the thesis bases on the theoretical framework of strategic management to carry out the research.

In conclusion, the chapter has presented briefly theoretical framework on strategic management including concepts and definitions, schools and trends of strategy, structure and contents of strategy, the process and tools applied to formulate, implement and evaluate strategies. Of all these theories, I have selected the model of (Bai, 2011) to carry out my research and analysis. In the last part of the

chapter, strategic management problems have been shown as experience lessons. The most important thing is that the Chapter explains why I have chosen theories on strategic management for my study.

Chapter 4. Research material and methods

4.1 Research procedure

In order to find out the answer to the research question, I first reviewed the existing Development Strategy and related policies on renewable energy in Vietnam. Fortunately, these materials were avalaible and published officially on mass-media as well as on the website of the Government and related agencies. After that, an in-depth interview of nearly one hour was conducted with an expert from the Institute of Energy of Vietnam in February 2017. He was the person who directly took part in formulating the Development Strategy of Renewable Energy in Vietam. A list of semi-structured questions and main talking points was sent to him before the interview. Meeting arrangement and the interview was taking place smoothly because of good preparation and relationship between the interviewer and interviewee. This interview focussed on the orientation, perspectives and other issues related to the formulation and establishment of this strategy. For a sensitive reason, this interview was not recorded. This interview helped me understand more about the background and opinion of the Vietnamese Government on this matter.

The second step is making assessment of the strategy implementation. A list of renewable projects under development and operation was made. Data and information about the current status of these projects were collected. All of preferential polices and mechanism issued to support these projects have been studied. Two face-to-face interviews with the project owners (Phu Quy Windfarm project and Nam Cat Hydropower projects) were implemented to get to know about difficulties, obstacles and related problems they were facing when developing these projects.

At the same time, another in-depth interview was conducted with one of the top leader of Petrovietnam Power Corporation, which I used as a case study formy research. This is the second largest power generator in Vietnam. The project porfolio of this company comprises of various types of energy sources from coal-fire power, gas-fired power, hydropower (large and small-scale) to wind power. The interviewee is in charge of investment and development field of the

Corporation so he has had a lot of practical experience of the project implementation. The inverview was very open and recorded. The main talking points was about advantages and disadvantages of the existing policies and machanisms eligible to renewable projects on the stance of a project' owner. Valuable practical experience of renewable project development was revealed. We also talked about the development strategy of this company. The questions were made semi-structured and open-ended, especially the ones about individuals' perspectives, opinions and experiences in the aspect of renewable energy development. It is alo the company that provided me with a huge amount of materials and documents relating my dissertation by letting me to use its data room and talking with the staff.

During the time of this study, I had a wonderful opportunity to attend Vietnam Renewable Energy Week 2017 organized in August 2017 in Hanoi by Vietnam Sustainable Energy Alliance (VSEA). On this occasion, lots of workshops took place with the participations of more than 1000 delegates from Vietnam and overseas. They were representatives of NGOs, Vietnam Ministerial Agencies, Financial Intitutions, Investment Funds, power companies and renewable equipment manufacturing companies. This was a great chance for me to update information about current status of renewable projects in Vietnam, new technology in this field and global trend on this issue. At the workshop, the participants exchanged their experience and information. Taking the advantage of this opportinity, 03 group discussions and face-to-face interviews with participants were conducted. They were asked about the necessity of renewable energy for sustainable development of Vietnam, the effectiveness and efficiencies of policies and incentives to support renewable energy as well as difficulties and obstacles they were facing during practical implementation. Of course, some phone calls with these projects' owners were made to collect information. However, information collected was not much.

And of course, an extremely useful source of references, especially international studies on renewable energy and sustainable development, has been collected through using the Tampere University Library Online.This is a great searching engine without that I would be unable to complete my research.

Additionally, I myself have been working for a power company for more than ten year and spentt 5 years working directly in investment and development division of this company. At that time, I had

an good chance to take part in a renewable project from the stage of project formulation to project implementation and operation. This work provided me with valuable empirical observations to carry out the research.

At the next step, all of the information and data collected were catagorized and analysed with the use of model SWOT to assess the internal and external factors affecting the development of renewable energy and finally, to propose solutions to support this kind of energy source to develop.

4.2 Research methodology

As you can see from the sub-chapter 4.1 above, this research mainly bases on in-depth interviews, group discussions, observations, collection of documented materials, collection of narrative and open ended questions. According to (Beverley Hancock, 2009), the research method applied for this thesis is qualitative method. As Paul J. and Anne D. (2014) cited "applying a management-by-objectives model, tempered with a commitment to the fostering of mutual interest, assessment entails the generation of empirical data to determine whether resources expended in the implementation process were sufficient enough to achieve the goals and whether the goals were met. Analysis also needs to be qualitative".

Another reason for choosing qualitative method for this thesis is that it analyzed the renewable energydevelopment of PetroVietnam Power Corporation (PV Power) as a case study. This approach is in consistence with (Starman, 2013, p. 42) "we must also recognize that a case study is more than just a type of qualitative research. It is a ticket that allows us to enter a research field in which we discover the unknown within well-known borders while continually monitoring our own performance; scalability; and our own, as well as general, existing knowledge. We hope this article supports and fosters the view of case studies as a type of qualitative research". Furthermore, the aim of this thesis is to find the reasons for the research gap and recommend solutions to support the sustainable development of renewable energy in Vietnam. These solutions and recommendation are subjective and non-quantitative. This is in line with (Kothari, 2004, p. 5), who defined that "Qualitative approach to research is concerned with subjective assessment of attitudes, opinions, and behaviour. Research in such a situation is a function of researcher's insights and impressions.

Such an approach to research generates results either in non-quantitative form or in the form which are not subjected to rigorous quantitative analysis. Generally, the techniques of focus group interviews, projective techniques and depth interviews are used".

One important reason why I have selected qualitative methods in stead of quantitative method is that renewable energy projects that have been successfully implemented in Vietnam are not so numerous and typical. This leads to the difficulty in selecting samples. In addition, the types of renewable energy are also very different so it is difficult to come up with criteria or benchmarks for comparison. However, if there is an opportunity to further develop this research in the future, comparisons with similar renewable energy projects in countries that have successfully developed renewable energy will be a good method to improve the quality of the study.

4.3 Research ethics

Firstly, as presented in the Research procedure (4.1), the existing Development Strategy for Renewable Energy in Vietnam as well as preferential policies and incentives were reviewed to understand about objectives and outcomes. This review neither aim to assess the quality of this strategy nor criticize anyone involving the process of this strategy. All of us have understood that there are a lot of strategies in a country and the government of this country has to balance them and base on the factual circumstances to make decisions due to rare budget and limited resources. That is why the information related to formulating and deciding this strategy has not been revealed and analyzed except for its objectives and action plan.

Secondly, lots of interviews and discussions were conducted to collect data for the thesis. All of them were only done after having permission of the interviewees and participants with clear prior notices of purposes and reasons. This was the same as recording used for in-depth interviews. Names of these people were not mentioned to avoid any conflicts and misunderstandings because they were asked to give opinions about the effectiveness of the existing policies and mechanisms.

Finally, the thesis used information collected from PV Power as a case study so sensitive information, especially information related to competitive advantages or can be harmful to the

company was kept confidential. And of course, citations and quotes in this thesis have to follow the regulations.

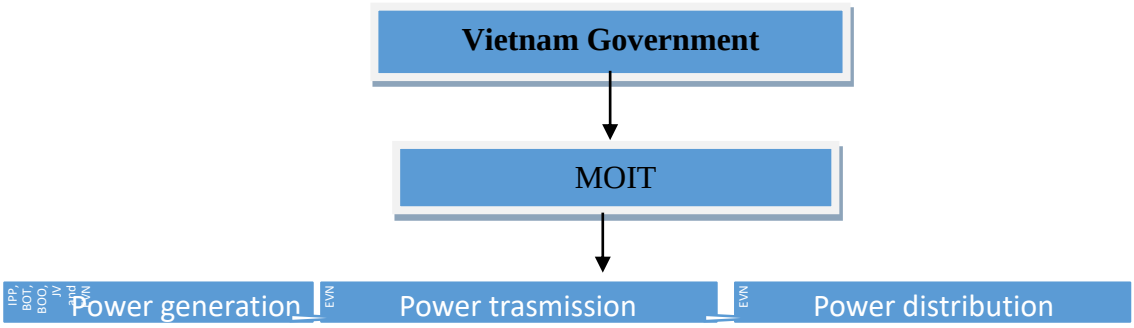
Chapter 5.Analysis and Findings

5.1. Renewable Energy in Vietnam: Strategy and practical implementation

5.1.1. Development strategy of renewable energy of Vietnam

Vietnam Power Sector is under the management and instruction of Vietnam Government via Ministry of Industry and Trade (MOIT). The structural and organizational chart of Vietnam Power Sector is illustrated as followings:

Figure 4: Organizational structure of Vietnam Power Sector

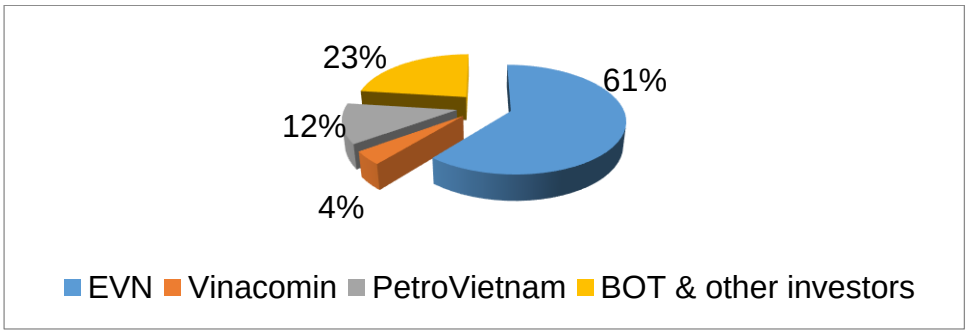


As you can see from the illustration, MOIT on behalf of Vietnam Government directly manages and coordinates all the operation of Vietnam power sector. This organization acts as the advisory body for the Government in almost aspect of power business, from development strategic plan, market regulation to investment activities. This super-Ministry is also responsible for regulating electricity prices, monitoring, and balancing power supply and demand, granting licenses and supervising power market. Currently, Vietnam Power Sector is divided into 03 fields including Power generation, Power transmission, and Power distribution. Power generation was put into competitive market in 2014 with the participation of Independent Power Plants (IPPs), Build-Operate-Transferred Power Plants (BOT), Build-Operate-Owned Power Plants (BOO), Joint- Ventures (JV) and Electricity of Vietnam (EVN). Among these power generating entities, EVN and its subsidiaries hold the biggest proportion of the national capacity with 61%. The remaining fields

including Power Transmission and Distribution have still been controlled monopolistically by EVN. It means that EVN is the only company allowed to manage power transmission system and to be the sole buyer in the power market. According to the road-map towards liberalization of power market approved by Vietnam Government, the field of Power distribution will be allowed to enter competitive market after 2020.

In terms of ownership, EVN, a State-owned company and its subsidiaries holds 61.2% (equivelent to 23,580 MW) of the total electricity generation capacity of the whole country while foreign and individual investors (BOT and other investors) control 23.3% (accounting for 8,980 MW) and the remaining share belongs to Vietnam National Oil and Gas Group (PVN) with 12%and Vietnam National Coal, Mineral Industrial Group (Vinacomin) with only 4%. The ownership structure of Vietnam Power Sector is shown below:

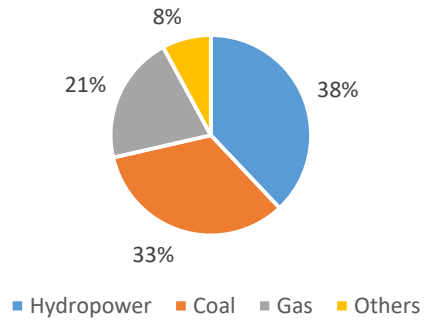
Figure 5: Ownership of Vietnam Power Sector



Source: EVN (2015)

In the aspect of power sources, hydropower is still the main source of power supply in Vietnam, accounting for around 38% of the total capacity of the country. Coal-fired power is in the second position with 33% followed by gas-fired power with 21.9% of the national installed capacity. The remaining portion of 8% is shared by renewables (5%) and imported (3%). The power source structure of Vietnam Power Sector is illustrated as followings:

Figure 6: Structure of Vietnam Power Sector by sources



Source: EVN (2015)

In 2015, the Prime Minister of Vietnam approved the Development Strategy for Renewable Energy of Vietnam towards 2030 with a vision to 2050 (referred as "The Development Strategy"). By this strategy, the viewpoint of the Government is to prioritize to develop rapidly renewable energy sources which have rich potentials and good commercial prospect including wind, solar and biomass. Also according to this strategy, the particular goals of every type of renewable sources are described in the Figure below:

Figure 7: Strategic objectives of Renewable Energy

Renewable sources	**2015 (billion kWh)**	**2020 (billion kWh)**	**2030 (billion kWh)**
Small-scaled hydro power	50	90	96
Biomass	0.6	7.8	37
Wind power	0.18	2.5	16
Solar	0.1	1.4	35.4

Source: The "Development Strategy"

The strategy also includes some preferential policies and mechanism to promote renewable energy.

- Policies on power tariff: The preferential policy on selling price stipulates that the selling price of electricity is set up in line with the conditions of different regions and the characteristics of the technology used for generating electricity of different renewable sources aiming to promote the development and use of renewable energy and ensure that investors will be able to recover their

costs and gain reasonable profits; Electricity selling prices should be adjusted in time and in line with the development of technologies used. Furthermore, renewable energy projects are given priority in connection with the national electricity system. Connection costs and other related reasonable costs are included in the cost of transmission and distribution of power grid units. It means that the renewable energy projects do not have to bear these costs.

- Policies on investment encouragement: The investors shall elaborate a scheme on electricity prices and propose the total amount of subsidy before submitting them to the Ministry of Industry and Trade for appraisal. Then, MOIT will report it to the Prime Minister for approval. The total amount of subsidy is extracted from the Sustainable Energy Development Fund. In order to raise money for this Fund, it is stipulated that organizations and individuals using fossil fuels for energy purposes must pay an environmental charge corresponding to the volume of fuel used. A part of the environmental fee will be used to encourage the development and use of renewable energy through the Sustainable Energy Development Fund.

- Incentives on taxes and fees: Projects for development and use of renewable energy sources are exempted from import tax on goods imported to create fixed assets for the project. The exemption and reduction of enterprise income tax on renewable projects shall be the same as for projects being eligible for investment preferences. Moreover, these projects shall be exempted or reduced the land-use fees or land rent according to current law provisions applicable to projects being eligible for investment preferences.

Additionally, The Prime Minister of Vietnam Government also issued the Decision No. 428/QD-TTg to revise the Power Development Master Plan for the period from 2010-2020 and vision to 2030 (Power Master Plan VII established in 2011). The Revised Power Master Plan set up specific targets such as prioritizing the development of renewable energy sources, increasing proportion of electricity produced from renewable energy to 7% in 2020 and over 10% of the total electricity production in 2030. This target is illustrated in the following table:

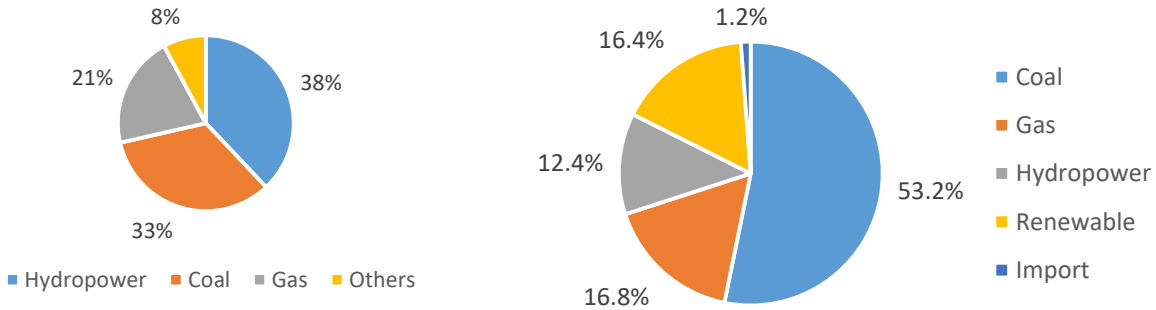
Figure 8: Targets of Vietnam Power Sector

Source: Revised Power Master Plan VII

Power source	2020			2030		
	Installed capacity (MW)	**Percentage of total capacity (%)**	**Total of total electricity output (%)**	**Installed capacity (MW)**	**Percentage of total capacity (%)**	**Total of total electricity output (%)**
Coal-fired power	25,620	42.7	49.3	55,167	42.6	53.2
Natural gas and LNG thermal power	8,940	14.9	16.6	19,037	14.7	16.8
Hydropower	18,060	30.1	25.2	21,886	16.9	12.4
Renewable power	**5,940**	**9.9**	**6.5**	**31,857**	**24.6**	**16.4**
Import	1,440	2.4	2.4	1,554	1.2	1.2
Total	60,000	100	100	129,500	100	100

According to the Revised Power Development Plan VII (referred as "Revised Power Master Plan VII"), the Vietnamese government aims to increase the share of capacity from renewable energy from 5% in 2015 to around 10% in 2020 and up to 16,4% of the national installed capacity in 2030. Here below is the chart of Vietnam Power Structure in 2030:

Figure 9: Vietnam Target Power Structure by 2030



Source: Revised Power Master Plan VII

If in 2015, hydropower was the main source of power supply in Vietnam with 38% followed by coal-fired power (33%) and gas-fired power (21%). Other sources including renewable (5%) and imports (3%) took up minority of the power supply. This pattern will change a lot by 2030 as presented above and the share of renewable power is the most noticeable point.

It can be seen that the Government of Vietnam has given top priorities to develop renewable energy and made great efforts to create a legal corridor to support this source of energy to develop.

5.1.2 Practical implementation of renewable energy in Vietnam

A list of renewable projects including both projects under operation and project under investment preparation was made based on information published on the website of provincial planning and investment departments as well as reports of some organizations in this field incorporated in Vietnam such as GIZ, IDGreen, Institute of Energy. According to (IRENA, Renewable energy statistics , 2017) and the Report of Vietnam Institute of Energy, the total capacity of renewables is about 2,340 MW (excluding large hydropower plants of more than 30 MW) and illustrated as follows:

Figure 10: Installed Capacity of Renewable Enery in Vietnam

Source	**Small hydro**	**Wind**	**Solar**	**Biomass& others**
Capacity (MW)	1920	159	7	255

Source: Vietnam Institute of Energy

It is reported that among 48 wind power projects registered in the whole territory of Vietnam with a total capacity of nearly 5,000 MW, only three projects have been completed and put into operation. As for small hydropower projects, there are 720 small hydropower projects (total installed capacity of 6,109 MW) in the whole country registered including 230 projects are under operation (total installed capacity is 1,920 MW); 177 projects are under construction (total installed capacity is 1,900 MW);236 projects are under feasibility study (total installed capacity is 2,019 MW) and 77 projects (total installed capacity of 270 MW) are being reviewed and considered.

As for biomas and other type of renewables including co-generation biomass and waste power plants, the total capacity is standing at 255 MW. These data on the development status of renewable energy in Vietnam show that the gap between the actual situation and the set targets is very big and there is a lot of work to be done to achieve the set objectives.

5.1.3. A case study of Petrovietnam Power Corporation (PV Power)

PV Power is a state-owned enterprise established in 2017 with a core business of producing and trading electricity. According to PV Power's 2016 Annual Report (PVPower, Annual Report, 2016), the company owns and operates power plants with a total capacity of 4802 MW, accounting for 12% of the total national installed capacity. In 2016, PV Power's power plants supplied over 21 billion kWh of electricity to the national grid, equivalent to about 13% of the country's total electricity output.In terms of installed capacity, PV Power is the second largest power producer in Vietnam. The power plants of this company are relatively diverse, from thermal gas-fired power plants, coal-fired power plants to hydropower plants which are illustrated below:

Figure 11: Project porfolio of PV Power

Project name	Capacity	Status	Location
Ca Mau 1 & 2 gas-fired power plants	1500 MW	Operation	South of Vietnam
Nhon Trach 1 & 2 gas-fired power plants	1200 MW	Operation	South of Vietnam
Hua Na Hydropower plant	180 MW	Operation	Centre of Vietnam
Dakdrinh Hydropower plant	125 MW	Operation	Centre of Vietnam
Nam Cat Hydropower plant	3.2 MW	Operation	North of Vietnam
Vung Ang 1 coal-fired power plant	1200 MW	Operation	Centre of Vietnam

Source: PV Power

PV Power established its development strategy with the vision to become a dynamic and competitive enterprise in electricity production and supply. Its overall objective is actively investing and developing gas-fired thermal power plants to take the full use of natural gas of the parents company; cooperating with partners in the implementation of hydropower and coal-fired power projects; consideringthe investment intorenewable projects if they are really effective to ensure the

balance of power sources. The development strategy of PV Power also set the target that total installed capacity of PV Power's power plants will reach 9,200 MW by 2020, an increase of nearly 5000 MW compared to the current capacity. The figure will be 11350 MW by the end of 2025 and 13600 MW by the end of 2030.

Figure 12: Capacity targets of PV Power

Period		**2011-2015**	**2016-2020**	**2021-2025**	**2026-2030**
Total installed capacity by the end of the period (*MW*)	Nationwide	37,543	64,577	93,823	129,780
	PV Power	**4,208**	**9,201**	**11,351**	**13,601**
	Percentage (%)	11.21%	14.25%	12.10%	10.48%

Source: PV Power's Development Strategy approved, 2015

It is noticeable that proportion of renewable power plants in the current total capacity of PV Power is very small with 0.07% (3.5 MW of Nam Cat Hydropower plant). The (PVPower, Annual Report, 2015) of this enterprise shows that it invested and operated an off-grid wind power plant (Phu Quy Wind farm) with a capacity of 6.2 MW in the South of Vietnam and studied investment opportunities into another wind power project (Hoa Thang Wind power project and a geothermal power project (Quang Ngai Geothermal power project) in the central region of Vietnam. After that PV Power transferred Phu Quy Wind Farm to another investor and did not invest in the remaining two renewable energy projects.

The Development Plan of this Corporation reveals that it will invest in two gas-fired thermal power plants with total capacity of 1,500 MW and receive some coal-fired thermal power plants (2,400 MW) transferred from the parent company for management and operation. This means that in the short term, the company will not invest in more renewable energy projects. This is a gap between the development strategy and the actual implementation of this company. So, what is the reason for this situation? In the analysis below, we will find the answer to this question.

5.2. Analysis and findings

All the information obtained through documentation and interviewswas categorized and classified into four categories including Strengths, Weaknesses, Opportunities and Threats to serve for SWOT Analysis because this is the best way to understand the internal and external environments (Poister, 2003) influencing the development of renewable energy in Vietnam. Only by understanding these influencing factors can we find the reasons for the research gap and propose solutions to fill this gap.As it is confirmed that“once the strategy is formulated and implemented, there is no guarantee that the strategy is implemented as it is designed and the strategy generates the results as aimed at. Therefore, the strategists has to evaluate the strategy and its programme to assess whether the implementation of the strategy is as per the strategic plan. Further, a number of deviations either in the external environment or in an organizational environment may take place” (Rao, 2009, p. 152).

- **Strenghs**:

According to (Prasoon Agarwal, 2016), there are several important factors that affect the development of renewable energy including policy frameworks, socio-economic conditions, natural conditions, and technology.Interestingly, the policy framework is also Vietnam's strength in developing renewable energy. First of all, The Vietnamese Government has been well-awered of importance role renewable energy for the purpose of sustainable development so it has paid a lot of attention to developing renewable energy. Priorities and incentives have been given to support it. The envidence is the establishment of “the Development Strategy”, the Revised Power Master Plan VII and some preferential policies and incentives to create legal frame and favourable conditions for the development of this kind of energy. Moreover, this country has been trying to reform its legal environment on the principle of equality, transparency and efficiency. This is a good condition making investors, especially foreign investors feel secure when investing in Vietnam. For instance, Law on Environment Protection established in 2005 stipulates that organizations and individuals investing in the development and use of clean energy, renewable energy and production of environmentally friendly products are entitled to tax and capital support from the State for building production facilities. The Decree 04/2009/ND-CP in 2008 on incentives and supports for environmental protection activities allows renewable energy projects to be entitled to the incentives including preferential corporate tax rates, exemption from import tax on equipment, facilities, and

materials imported for activities related to production, and exemption from environmental protection fees. Following that, the Prime Minister also issued Joint Circular 58/2008/TTLT-BTC-BTN&MT on Subsidy for CDM projects. The joint Circular was the guidance on implementing financial mechanisms and policies for investment projects complying with the clean development mechanism (CDM). Renewable energy power plants would be entitled to support measures relating to electricity tariffs like FITP and taxes (e.g. import tax and land fee exemptions during a designated period). In order to encourage investment in the electricity sector, especially renewable energy, the Government of Vietnam has provided some incentives for investors such as exemption from applicable land use fees or land rent, exemption from import duties and goods imported to implement the project or preferential loans up to 80% of investment cost. In particular, they are exempted from corporate income tax for the first four years and a 50% reduction in corporate income tax for the next five to nine years. Thus, it can be said that the promulgation of the above legal documents and policies has created a solid foundation for the development of renewable energy.

Next, Vietnam is regarded to have rich potentials and good natural conditions for developing renewable energy. In terms of wind potentials, "good to excellent wind resource areas for large-scalewind generation can be found in the mountains of central and southern Vietnam, central Laos, and central and western Thailand, as well as a few other locations. Furthermore, coastal areas ofsouthern and south-central Vietnam show exceptional promise for wind energy both because ofstrong winds and their proximity to population centers. On a land area basis, approximately28,000 square kilometers of Vietnam (8.6% of the total land area) experience good to excellentwinds, while the corresponding figures for Cambodia, Laos, and Thailand are 345 sq. km (0.2%),6776 sq. km (2.9%), and 761 sq. km (0.2%), respectively" (TrueWind Solutions, 2001, p. VII). Also according to (TrueWind Solutions, 2001) for World Bank, the total wind energy potential in Megawatts (MW) was illustrated in the table below:

Figure 13: Potentials of Wind Energy of Vietnam

Country	*Characteristic*	*Poor (< 6 m/s)*	*Fair (6-7 m/s)*	*Good (7-8 m/s)*	*Very Good (8-9 m/s)*	*Excellent (> 9 m/s)*
Vietnam	Land Area (Sq. Km)	197342	100361	25679	2187	113
	MW Potential	NA	401444	102716	8748	452

Source: World Bank

It is noted that “the MW potential should not be construed as a realistic estimate of how much wind energy could be developed in the future, but rather as an extreme upper bound on the wind energy resource in each country. The much smaller developable potential depends on many factors, such as electricity demand, availability of transmission lines, road access, the economic and industrial infrastructure of the country, and avariety of topographical and sitting constraints. Even so, it is clear that there may be significantopportunities for large-scale wind energy development, especially in Vietnam” (TrueWind Solutions, 2001, p. 18). In the aspect of small hydro power, “river network of Vietnam is densely presented in which 2,400rivers are longer than 10km. Almost all rivers in Vietnam flowinto the East Sea. Gross Run-off Volume is 870 bil. m3/year, presented as AnnualAverage Discharge as of 37,500 m3/s.Theoretical Potential is about 300 billion kWh (onlyaccounting for rivers with length of over 10km). Technical Potential is about 123 billion kWh, referredto as installed capacity of 31,000 MW.Technical potential is identified assome of 75-80 billion kWh, equivalent to the capacity of 18,000-20,000MW. Total technical potential of hydropower projects of less than 30MW is standing at 2,500-3,000 MW” (Dai, 2007). Up to now, Vietnam has exploited around 2000 MW of small-scale hydro power plants. This is a very good condition for hydropower development. According to Mr. Dang Huy Cuong, General Director of Energy Department of MOIT, theoretical potential for biomass is 2000 MW. This figure for waste power is 300 MW and for solar is 4-5 kWh/m2 (MOIT/GIZ, 2017).

- **Weaknesses:**

Obviously, there are a number of significant weaknesses that affect the development of renewable energy in Vietnam. First of all, it's the issueof power tarrif. All of the interviewees who are the owners or developers of renewable projects stated that the existing electricity price in Vietnam is so low thatit makes investors unable to recover their investment cost, especially for renewable energy projects, which usually have higher LCOE in comparison with the conventional fossil fuel energy projects. It means that the existing preferential policies and mechanisms are not powerful enough to promote the development of renewable energy in Vietnam. This leads to less competitiveness of renewable energy compared with other sources of energy.According to the report of (BNEF, 2015), LCOE for each type of energy sources is presented as follows:

Figure 14: LCOE of Energy Sources

Unit: US$/MWh

Source: BNEF 2015

Gas-fired	Coal-fired	Nuclear power	Onshore wind	Offshore wind	Biomass	Small Hydro	Wave	Tidal	Solar
120	145	230	220	355	220	290	495	495	315

As we can see from the Table, LCOE for all of renewables is higher than that for primary energy sources. That is why PV Power transferred Phu Quy Wind Farm to another investor.This also accounts for the fact that only a very small part of the registered wind power projects has been implemented during the past time in Vietnam. Most of the investors interviewed said they did not want to carry out these projects and they were waiting for new mechanisms and policies of the Government. It is also explained why EVN, the biggest power generator of the country, is suferring a loss in its profit.

The level of science and technology of Vietnam is also a major constraint for the development of renewable energy. It is known that Vietnam has not been able to manufacturemajor equipments for renewable energy plants so it has to import themfrom abroad. The cost of importation and transportationhas led to the rise in the investment cost of renewable energy projects. Moreover, the cost of grid connection and upgrading of switch-yard makes the total investment cost of the power projects increase. Meanwhile, the investment capital of the power projects is very large. Therefore, most of the electricity projects in general and renewable energy projects in Vietnam in particular have to borrow from financial institutions and foreign banks. At the workshops of the Vietnam Renewable Energy Week 2017, many speakers reported that access to foreign loans was very difficult due to the limited availability of government guarantee in order to decrease public debts.The weakness of technology is also the cause of low availability and effeciency of renewable power plants. For instance, wind farms will not be able to operate without wind and solar power plants will also stop working when the amount of sunlight is insufficient.At present, there is no technology to store electricity output from these plants.

The another problem is that the regulations on investment and administrative procedures in Vietnam remain complex and time-consuming. For example, the government has set a price for electricity for wind power of 7.8 US cents per kWh, of which the project developer will earn 6.8 US cents from the buyer and 1 US cents from the Sustainable Energy Development Fund. However, in practice, all of the three wind power projects under operation are currently selling electricity at a temporarily

calculated price. The negotiation of a power purchase agreement (PPA) is a long and ongoing "struggle" especially when there is only one buyer. The owners of Nam Cat Hydropower Plant and Phu Quy Wind Farm said they had to work with a variety of agencies to obtain investment certificates and other administrative paperwork. Moreover, the regulations on compensation and site clearance in different localities are also different making it very difficult for investors to implement the project. This opinion is also agreed by many interviewees in group discussions. This is really a huge barrier to the development of renewable energy.

- **Oportunities:**

In the power structure of Vietnam, coal-fired and gas-fired thermal power is holdingthe biggest proportion accounting for about 55% of the total installed capacity of the nation. Accoriding to the Revised Development Plan of the Coal industry of Vietnam up to 2020, with prospects to 2030 approved by the Prime Minister under the Decision No. 403 / QD-TTg dated 14/03/2016 (QH403), the demand for coal in general and for thermal power in particular in 2017 is 55.2 million tons (coal for thermal electricity accounts for 39 million tons, equivalent to 71%), 86.5 million tons in 2020 (coal for thermal electricity accounts for 64.1 million tons, equivalent to 74%) and the demand for coalin the period from 2025 to 2030 will be 120 to 150 million tons whereas the commercial coal production capacity of the whole industry in the period 2017 - 2020 can reach from 42.6 to 56.6 million tons. It means that coal production does not meet the domestic demand in general and electricity production in particular. Meanwhile, the cost of producing electricity from natural gas is much higher than from hydro and coal.In order to ensure national energy security and meet the electricity demand for socio-economic development, Vietnam will have to develop new energy sources. This has opened up a huge opportunity for renewable energy.

Additionally, Vietnam's population and economic growth have been increasing fast resulted in the rise in electricity demand. Vietnam has been one of the fastest developing economies in Asian region with an average annual GDP growth rate of 6.5% over the last 20 years (1995-2015). Over the last 20 years, the GDP per capita almost tripled from US$410 in 1995 to US$1,138 in 2015.

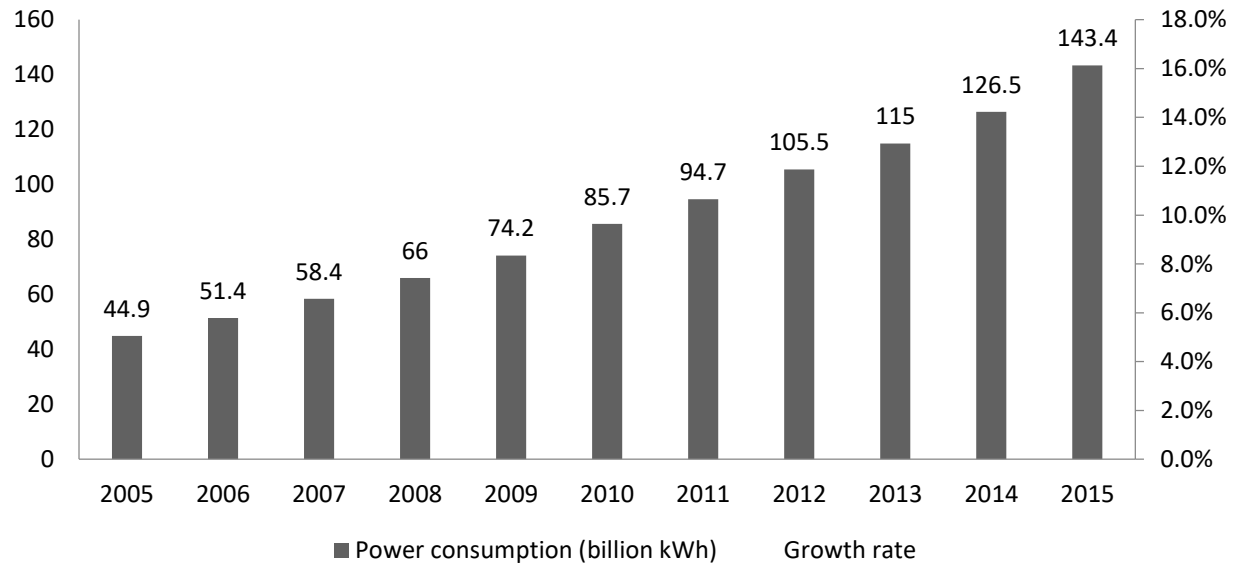
Figure 15: Vietnam's GDP per Capita (2005) and GDP Annual Growth Rate (%), 1990-2015

Source: World Bank

Studies have indicated that this trend is set to continue. In a research on the G3G countries in 2011, Vietnam was rated with the highest index of all countries worldwide, which implies excellent economic perspectives for the country. Vietnam, still a developing country, is expected to generate high GDP growth. Stable economic growth of over 5.0% till 2020 is expected and will be driving the growth of electricity demand to approximately 360 billion kWh in 2020.With 91.7 million inhabitants as of the end of 2015, Vietnam has the 3rd largest population in the ASEAN. About two thirds of the population are living in rural areas and one third in urban areas. In the last few years the share of urban population in total population increased constantly by 0.6% to 0.7% per year.

The population is concentrated along the two major river deltas, the coastline and the two major cities, Ho Chi Minh City and the capital Hanoi. The population size in Ho Chi Minh City and Hanoi was 7.7 million, respectively, 6.8 million.According to the report of the General Statistics Office, Vietnam is having the "golden population structure" with nearly 70% of its working-age population. This is the main human resource for the labor market in Vietnam although a majority of it is manual labor. Economic growth and population increase are the main reasons for the surge in demand for electricity.

Figure 16: Power consumption per capital of Vietnam



Power consumption per capita per annum has risen from 156 kWh in 1995 to 983 kWh in 2010 and achieved 1415 kWh in 2014. Total installed capacity of power plants increased from 11.6GW (2005) to 34.1GW (2014) with average growth rate of 12.6% per year. The Revised Power Development Plan VII forecasts that power demand in Vietnam will reach 265 billion kWh in 2020. These are good opportunities for renewable energy.

Furthermore, some investors are very optimistic about the future of Vietnam's renewable energy sector considering the country's roadmap for electricity price increase. Currently, Vietnam's electricity prices are low compared to other countries in the region. Raising electricity prices sooner or later is inevitable to ensure the interests of investors as well as attract investment in the power sector.

Figure 17: The average electricity price of Vietnam and several countries in the region

Unit: US cent/kWh

Vietnam	China	India	Indonesia	Japan	Malaysia	Philippines
5.5 – 7.0	7.5 – 10.7	9.0 – 12.0	8.75	20.0 – 24.0	7.09 – 14.76	30.46

Source: EVN 2017

Finally, it is impossible not to mention the advance of technology. Along with the technological achievements, especially in the field of renewable energy, it is absolutely believed that the development of renewable energy will be realistic in the very near future. Thanks to technological improvements, the efficiency of renewable energy plants will increase, and equipment prices will decrease. This will make renewable energy more competitive and effective. Although the current LCOE for renewables remains high, experts are predicting that this cost will fall sharply in the upcoming time. "The 2016 setback in global investment partly reflected sharp falls in equipment prices: cost-competitiveness improvements in solar and wind power mean that more megawatts can be installed for the same price"[7]. It is forecast that "the LCOE from solar PV, which is now almost a quarter of what it was just in 2009, is set to drop another 66% by 2040. By then a dollar will buy 2.3 times of solar energy than it does today. Solar is already at least as cheap as coal in Germany, Australia, the U.S., Spain and Italy. By 2021, it will be cheaper than coal in China, India, Mexico, the U.K., and Brazil as well. Offshore wind LCOE will slide a whopping 71% by 2040, helped by development experience, competition and reduced risk, and economies of scale resulting from larger projects and bigger turbines. The cost of onshore wind will fall 47% in the same period, on top of the 30% drop of the past eight years, thanks to cheaper, more efficient turbines and streamlined operating and maintenance procedures"[8].These forecasts are similar to studies by Asian Development Bank (ADB) or IRENA "Like solar PV panels a decade earlier, battery electricity storage systems offer enormous deployment and cost-reduction potential, according to this study by the International Renewable Energy Agency (IRENA). By 2030, total installed costs could fall between 50% and 60% (and battery cell costs by even more), driven by optimization of manufacturing facilities, combined with better combinations and reduced use of materials"[9].This is an excellent opportunity for renewable energy not only in Vietnam but also in all parts of the world. That is why when answering at the interview Mr. Nguyen Duy Giang, vice president of PV Power, said that "the development of renewable energy is a compulsory responsibility and consistent with the global trend. Current difficulties are just temporary. It is certain that in future the Government of Vietnam will have solutions to overcome these difficulties. In the short term, PV Power will invest

[7]https://about.bnef.com/clean-energy-investment/
[8]https://about.bnef.com/blog/global-wind-solar-costs-fall-even-faster-coal-fades-even-china-india/
[9]http://www.irena.org/menu/index.aspx?mnu=Subcat&PriMenuID=36&CatID=141&SubcatID=3879

in gas-fired projects to take the advantage of natural gas source from its parent company (PetroVietnam) and to increase the value chain of PetroVietnam. However, in the future PV Power will study to invest in renewable energy. Right now, PV Power is building the strategy to develop this energy source".

- **Threats:**

One of the biggest challenges for renewable energy sources in Vietnam is the infrastructure problem, especially the technical infrastructure. Connection of renewable power plants to the national existing grid is a complicated issue requiring big investment and technical upgrading.This is not only true in Vietnam but also in many countries around the world as reported by (UNEP, 2015) that "there are also structural challenges in the electricity system as grids and utilities in many countries struggle to cope with the increasing penetration of wind and solar in the generation mix. Coping with 25% or more variable generation is more difficult for grids and utilities than managing a 5% proportion. Governments have often struggled to produce policy measures that keep up with the advance of renewable power and its knock-on effect on the rest of the electricity system". This idea is in consistence with (Lerch, 2010, p. 1)as quoted "integration of alternatives into our current energy system will require enormous investment in both new equipment and new infrastructure along with the resource consumption required for their manufacture at a time when capital to make such investments has become harder to secure. This raises the question of the suitability of moving toward an alternative energy future with an assumption that the structure of our current large-scale, centralized energy system should be maintained".

Another big challenge is the issue of capital investment. Energy projects in general and renewable projects in particular often require huge investment capital with a long payback period. To solve this problem, domestic investors often seek loans from financial institutions and foreign banks. However, it has recently been very difficult to persuade Vietnam government to provide guarantees for foreign loans as a result of public debt reduction policy.

In addition, the uncertainty in government support policies for renewables is also a great concern of investors. (UNEP, 2015) Analyzed that "Europe was the first mover in clean energy, but it is still in a process of restructuring those early support mechanisms," notes Michael Liebreich, Chairman of the Advisory Board for Bloomberg New Energy Finance. "In the UK and Germany we are seeing a move away from feed-in tariffs and green certificates, towards reverse auctions and subsidy caps, aimed at capping the cost of the transition to consumers." Southern Europe is still almost a no-go area for investors because of retroactive policy changes, most recently those affecting solar farms in Italy". Recently, changes in the development orientation of some countries, especially the United States and China, the two largest economies in the world also greatly affect the development of renewable energy in Vietnam particularly and other countries generally. President Trump's announcement to withdraw from the Paris Climate Agreement or China's refusal to participate in climate change treaties will more or less affect the country's investment and development policies.

The above SWOT analysis has shown the internal and external factors influencing the development of renewable energy in Vietnam. Some conclusions and findings have been drawn and will be presented in the next chapter.

Chapter 6. Conclusions and Recommendations

6.1. Conclusions:

After analyzing the materials and data collected, this chapter will present conclusions both theoretically and practically. As mentioned in the Chapter 3 of Theoretical Framework, this study is based on the SSIM with three steps and six levels designed by (Bai, 2011). Therefore, the findings will be pointed out based on this Model.

First of all, it can be said that the objectives set out in the Development Strategy are relatively "specific, measurable and time-bound" (Stenvall, 2016). The Government of Vietnam has set detailed targets in terms of both installed capacity and output of each type of renewable energy for

every five-year period. However, the execution time of this strategy is relatively short (10 years) when viewed in the perspective of (Bai, 2011) because he stated that “a planning timeframe of 5 to 10 years for a regional development strategy is probably too short”. As presented in Chapter 3, “results-oriented budgeting” (Poister, 2003) is a very crucial component of strategic management process but this Development Strategy lacks this one. That is why stakeholders of the Development Strategy are facing budget constraints. Specifically, the Buyer (EVN) has not been able to arrange enough subsidies to pay for the renewable project owners and it is also the biggest difficult point when negotiating the PPA. The owners of the three wind projects under operations said that they were selling electricity at temporary prices without the subsidies from the Environment Protection Fund. In terms of feasibility, the development of renewable energy in Vietnam is in line with the needs and conditions of the country. The evidence is that Vietnam is still suffering from electricity shortage and has to import electricity from China. This means that the current supply does not meet the demand for electricity of the country. And the demand for electricity is forecast to continue increasing in the upcoming time. Thus, the goals designated in the Development Strategy are completely realistic.

Secondly, the Government of Vietnam has been full-aware that “strategic implementation requires broad systematic integration” (Bai, 2011) and “the strategy support system is the key area of strategic management so it has established a number of supportive policies and mechanism. Although all of the interviewees share the same view that current mechanisms, policies and incentives are not strong enough to encourage the development of renewable energy in Vietnam, the promulgation of legal frameworks and incentives for renewable energy development during the past time has shown the determination and direction of the Vietnamese government as well as created significant motivation for renewable energy development. It is undeniable that tax incentives, government’s subsidies for wind power, small hydropower and solar power are the key factors that make investors decide to invest in this sector. However, it should be noted that the support system also includes relevant regulations and policies. For example, in order to support this Development Strategy, there is a need for a harmonious combination of mechanisms, policies, regulations on investment, technology transfer, environment, and even administrative procedures. The information gathered indicates that there is a very weak integration between this Development strategy and the "supportive policies". As a result, all interviewed energy project developers complained that they

had to deal with so many administrative procedures and paper work.

Thirdly, renewable projects, except for small hydropower, have only been implemented in Vietnam during several recent years. This means that Vietnam does not have much experience in management and implementation of renewable energy projects from the stage of project formulation to the stage of evaluating effectiveness to select the project and the final phase of project development and operation. Take Phu Quy Wind farm as an example. During the process of project formulation, the local demand for electricity was wrongly forecast. The delay in time schedule made an adverse effect on the cash-flow of the project. As a result, this project has not been effective as calculated in the feasibility study.

Fourthly, it is necessary to set up a system of indicators or guidelines for renewable projects. At present, the MOIT has issued a manual for implementation of biomass projects. This is a very useful material for project development. Unfortunately, there have not been similar guidelines for other types of renewable energy projects.

Fifthly, there is a lack of green business models or green credit to support the implementation of this development strategy. In fact, countries that have successfully developed renewable energy, have been adopting green economic methods or green credit as an effective way to support renewable energy development. Actually, enterprises often pay much attention to economic benefits but neglect the environmental and social benefits. That is why the Development strategy stipulated "Organizations and individuals operating in the electricity sector are responsible for contributing to the development of the country's renewable energy sector. For power generation units with the installed capacity of more than 1,000 MW (excluding BOT energy sources), the proportion of electricity produced from renewable energy sources (excluding hydropower with a capacity of more than 30 MW) will be not less than 3% by 2020; 10% by 2030 and not less than 20% by 2050 ". Nonetheless, it can be sure that these generators will not make investment in renewable energy if they do not make profits from it. The collected data show that only 3/48 wind power project registered have been developed completely. Thus, the macroeconomic role of government along with supportive policies is extremely important to ensure the harmony of stakeholder’s interests.

Finally, strategic implementation requires the support of society and community to ensure its success. The information obtained through the group discussions and interviews reveals that there is a lack of public participation in implementing the Development Strategy. Many people think that the development of energy in general and renewable energy in particular belongs to the public sector and do not fully understand the importance of renewable energy in terms of sustainable development. Only a few bankers, donors, and investors are provided with information on the policies, procedures, and legal regulations relevant to this area. This is the reason why the Government of Vietnam has not mobilized financial resources from the private sector to invest in renewable energy.

To sum up, strategic goals are often built for a long period of time in future. Thus, the analysis of data and methodology applied play an important role in assuming future scenarios. This requires policy-makers to have a strategic vision, strategic thinking, and in-depth knowledge of strategic management. Of course, no one can predict exactly what will happen in future so "at each stage and at all levels of strategic management, there are important decisions and actions to be made. Therefore, a mechanism must be established, a road-map should be laid out, and a team built to focus on the entire strategic plan. This team should take on the roles of supervision, regular evaluation, early warning, feedback, and occasional adjustments to ensure the strategic mission's realization" (Bai, 2011). Although the Development Strategy has newly been promulgated, it is extremely important to evaluate its practical implementation in order to make adjustment timely. The evaluation of the implementation of the Development Strategy in practices will point out difficulties, hindrances, or obstacles and to provide solutions to achieve the stated strategic objectives. This is also the purpose of this thesis.

6.2. Recommendations

After studying the theoretical framework and practical implementation of the Sustainable Development Strategy of Renewable Energy in Vietnam, this thesis has come up with following solutions.

- **Solutions on mechanisms and policies:**

A clear and consistent renewable energy policy will be the foundation for achieving the planned strategic goals. Therefore, the Government of Vietnam needs to create an appropriate investment environment to maximize the deployment of renewable energy through the establishment of visionary policies and a stable regulatory framework. In the short-term, the Government should review and evaluate the effectiveness and efficiency of existing mechanisms and policies to make timely adjustments. In addition, the Government should study and apply renewable energy support policies that have been successfully implemented in other countries like such as Renewable Purchase Obligations of India ("Renewable Purchase Obligation (RPO) is the single most important policy driving renewable energy installations in India towards achieving the aggressive goal of installing 175 GW by 2022 with solar making up 100 GW, according to Mercom Capital Group"[10]) or issue regulations on negotiation duration and payment termsin the PPA.At present, the government has issued the official price for wind power (7.8 US cent / kWh) and the price of solar power (9.5 US cent / kWh). However, according to calculations, this price is still lower than the actual production cost of these sources. In order to ensure reasonable profit for investors, the government should study and promulgate additional incentives such as assisting investors in process of investment preparation. For example, if the government conducts a comprehensive study of the potential for renewable energy development in the whole country, investors will not have to spend the cost on prospecting and evaluating potential and thereby will help to reduce investment costs and reduce electricity production costs.

As discussed above, project developers are facing many difficulties in the process of project implementation because investment licensing procedures, compensation procedures for site clearance, negotiation of power purchase agreements remain complicated and time consuming. To solve this issue, the government should issue specific guidelines and continue to implement administrative reforms towards creating convenience for investors. Simplification and transparency in land allocation procedures will attract investors involved in the field of renewable energy. This can be achieved through open bidding or public auctions. At the same time, the government also needs to clarify the responsibilities of related stakeholders in implementing the strategy and assign a coordinating body for better coordination and interaction between them. Establishing an independent regulatory body to supervise the implementation of the strategy and advise the

[10]http://asian-power.com/power-utility/in-focus/india-urged-improve-renewable-purchase-obligation-policy-fast

government on measures to promote renewable energy development will help create transparency and accountability. In the longer term, the government should issue a legal framework for the competitive electricity market. The actual situation with only one buyer (sole Buyer) will create inequality and monopoly. Soon transition into the competitive electricity market will contribute to encouraging investment in renewable energy.

- **Solutions on economics and finance**

As renewable energy projects often require a large amount of investment capital, the government should support domestic investors and project developers to access low-interest loans from foreign banks and financial institutions and provide guarantees for these loans. In addition, the project investors also need to calculate the interest rate, inflation, or exchange rate differences to ensure effective investment. The experience in dealing with these risks in India shows that the country has set up a Money Guarantee Fund through the use of a term contract that includes a currency swap agreement allowing the project developers to borrow directly from international financial markets without any risks of currency or take risks at a minimum rate.

The current economic condition in Vietnam shows that the government and SOEs do not have enough funds to invest in renewable energy. Therefore, attracting new funding sources from the private sector and their involvement in renewable energy projects is extremely important. The adoption of public – private partnerships or the issuance of "Green Bonds" (some kind of Green Credit) of China will be good examples for Vietnam.

- **Solutions on science, technology and communication:**

Connecting the national grid of renewable energy plants is a major limitation in Vietnam. To solve this problem the Government should upgrade existing transmission systems and invest in new terminals and stations. The application of information technology to optimize the mobilization of electricity from power plants, especially renewable energy plants will also be a driving force for renewable energy development. In addition, the Government should pay more attention to investment in research and development by funding for scientific research projects on techniques

and technologies of renewable energy forms. Domestic institutes and experts should take the initiative in approaching new knowledge and technologies that have been applied in the world, researching, and evaluating the feasibility of applying these technologies in Vietnam. Project developers need to actively seek opportunities to participate in practical topics on renewable energy development in Vietnam carried out by foreign research institutions. The Government formulates mechanisms for cooperation with foreign equipment manufacturers in researching and training human resources and receiving technology transfer after construction investment. In the process of studying the investment project formulation, project developers should focus on surveying, selection of project sites and application of suitable technology, taking into account factors such as geological potentials, natural conditions, location and transportation, transmission and connection systems to the power grid, issues related to technical characteristics and technology of each type of project ... Selecting competent and qualified consultants in the field of renewable energy is necessary to ensure the success and avoid risks. The connection to the power system early will help the plants save time of commissioning and put the plants into commercial operation early to get revenue and shorten the time of paying interests.

As a part of strategic management, a detailed communication plan should be set up to make the Development Strategy be announced widely in the public and to improve the awareness of related bodies. Frequent updating and notification of changes in policy mechanisms and administrative procedures will enhance the transparency and confidence of investors, financial institutions, and donors.

6.3. Research limitation

The biggest limitation of this thesis is that the research time is too short while the scope of research is quite wide, including the types of renewable energy in Vietnam such as wind power, solar power, small hydropower ... biomass electricity. This will lead to the fact that the research content has not been presented in depth.

As described in the Chapter of Theoretical Framework above, measurement of strategic performance often uses financial or non-financial indicators or the application of specific strategic

performance system which can be quantitative. However, this study assesses the implementation of the Development Strategy of Renewable Energy in Vietnam is mainly based on observations and qualitative analysis without developing or applying a particular system of strategic performance measurement. This is a great limitation of this study. In the future, if I have the opportunity to continue this topic, I will try to create or apply a quantitive measurement system to make the the study more persuasive and realiable.

Due to time constraints, this thesis has not exploited many foreign references, especially the studies of other authors on renewable energy development strategies in the countries which have been successful in the renewable energy sector as well as on the mechanisms, policies and incentives that those countries have adopted to achieve their objectives. This practical experience would be useful for making recommendations.

6.3. Thesis contribution

The research and development of renewable energy projects is essential to the development strategy of Vietnam's power sector. With the advantage of environmentally friendliness, no greenhouse gas emission, renewable energy will contribute to reduce environmental pollution caused by the use of fossil fuels (coal, oil, gas) to generate electricity. Successful implementation of this development strategy will contribute to creating a premise for green growth and sustainable socio-economic development. Moreover, renewable energy will also contribute to ensuring national energy security, creating jobs for workers, improving the scientific level when implementing technology transfer, as well as creating good landscapes for surroundings. Practical experience in some countries around the world shows that several wind power projects can be combined as ecotourism sites.

Despite some of the weaknesses such as high production costs, low efficiency due to weather conditions, the development of renewable energy is a good choice and the right way to go because of the advances in science and technology and government efforts.

The solutions proposed by this research will help to ensure that strategic objectives for sustainable development of renewable energy in Vietnam will be achieved. Thus, the research questions of the study have been answered.

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Appendix

Appendix 1: INTERVIEW QUESTIONNAIRE

1. How do you perceive the concept of renewable energy?
2. How do you perceive the concept of sustainable development?
3. What do you think of the connection between renewable energy and sustainable development?
4. What are advantages and disadvantages of renewable energy?
5. How do you assess the Development Strategy of Renewable Energy in Vietnam?
6. What do you think about the preferential policies and incentives given to renewable energy?
7. What are the difficulties and obstacles you are facing while implementing renewable projects?
8. What are the key factors influencing the development of renewable energy in your opinion?
9. What should Vietnam Government do to encourage renewable energy to develop sustainably?

(Note: These are some key questions. Because the interviews are open-ended, questions are made flexible and depend on the interviewees).