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Renewable energy policies for sustainable development in Vietnam

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Abstract. This paper analyzes four important issues related to national renewable energy policies including strategies for energy development, policies on financial supports for renewable energy development, use of taxes and fees for energy management, policies on energy consumption. Successful experiences of renewable energy policies of some other countries in the world are the basis of following suggestions: develop policies and strategies on renewable energy development, policies on financial support for researches on assessment of potential and technologies of renewable energy exploitation; issuing energy taxes or carbon tax, environmental fees for fossil fuels production and consumption in order to promote investment for improving renewable energy sources and consumption; increasing energy commercial price, especially electricity price, is a solution for widely use and exploitation of renewable energy in Vietnam.

Keywords: Renewable energy, energy policy, sustainable development.

1. Introduction

According to Prime Minister's Decision No. 53/2004/QĐ-TTg on 17th August 2004 about Strategic direction for sustainable development in Vietnam, some types of clean energy which are high potential and can be widely used in household scale such as solar and wind energy, small hydropower and biogas have not been properly studied, applied and generalized; there is a lack of policy for encouraging the use of clean and environmental friendly energy. Therefore, priority activities are: support for research, transfer and application of environmental friendly energy systems including new energy sources and renewable energy sources; encourage the use of less used energy technologies and energy saving programs; preferential financial support for renewable energy development. On 2nd August 2007, Prime Minister made a decision No. 130.2007/QĐ-TTg about financial policy for investment projects in clean development program (CDM) including projects for electricity generated from renewable energy sources. On 16th June 2009 World Bank signed the agreement on providing USD200 millions for increasing of renewable energy supply for national electricity network in Vietnam.

Vietnam has abundant and diversified sources of renewable energy [1], however there is only 1% of potential renewable energy has

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been used for commercial electricity production. Vietnam is facing several issues regarding to development policy and use of potential renewable energy in order to achieve the target of 3% of commercial electricity produced from renewable energy in 2010, 5% in 2020 and 11% in 2050. While many countries have made renewable energy use compulsory in their national power development strategy, Vietnam remains at the pilot project stage due to lack of capital and technology [21]. This paper firstly reviews renewable energy policies of some other countries in the world and current development of renewable energy in Vietnam. It then proposes solutions for improving renewable energy policy in Vietnam.

2. Overview of energy policies

A policy consists of viewpoints, solutions and skills in order to achieve specific goals in the defined future. According to [2], policy can be simply described in Figure 1. In fact, policy is a macro management tool which makes strong impacts on socio-economic activities during a given period of time. A perfect policy should comprise all contents: viewpoints, guidelines; methods and solutions for implementation; strategies and tactics to achieve goals. A policy without specific solutions and skills for realization is only seen as a desire or guideline. Thus, it is needed to consider all components of a policy.

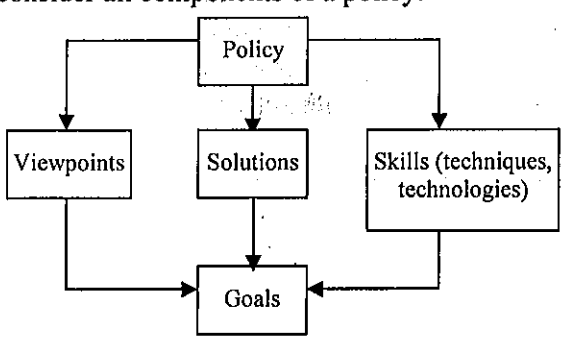

Fig. 1. A Policy Framework.

Energy is an important feature for national socio-economic development. In developing countries, in order to increase 1% of GDP, it is needed to increase 2% of commercial energy consumption. Therefore, developing appropriate and integrated policies for energy development is required for achieving sustainable development. Nations should determine goals and priority policies for development of renewable energy in accordance with the potential and their socio-economic conditions; draw up policies on financial support for development of renewable energy sources, and in some cases Governments need much investment in developing potential technologies for renewable energy exploitation and use; capital investment to build concentrated renewable energy exploitation stations; efficient use of economic tools for management, development and consumption of renewable energy; introducing consumption policies and green marketing for renewable energy production and use. Renewable energy policies should be accompanied by goals and specific solutions. Energy policies should be defined for a specific time in the future and also flexibly amended in accordance with national socio-economic development trends.

3. Renewable energy policies of other countries

The literature on renewable energy policies demonstrates that renewable energy policies of other countries consist of four important themes: selection of energy sources and development goals, policies on financial support for energy development, use of economic tool in management, and consumption policies (Table 1).

Table 1. Analysis of renewable energy policies of other countries

Nation	Energy sources and goals for renewable energy development	Policies on financial support for energy development	Use of economic tool for management	Consumption policies	Ref.
Sweden	Bio-energy will reach 15.3% of total energy use in 2010	Investment subsidy for industries burn peat and biomass at 4000 Sek/KW	Carbon tax for fossil fuels, tax exemption for bio-fuels	Taxes for electricity use, tax exemption for electricity production	[8,15]
United Kingdom	Wind, solar, wave and tidal energies will reach 15% of total electricity produced from renewable energy in 2020	Financial support through scientific and technological programs for development of renewable energy sources	Regulation on electricity supply from renewable energy sources, renewable electricity quota, exemption of carbon tax for industries use renewable energy	Consumers have to pay buy out price for electricity produced from renewable energy sources higher than production costs	[9,15,19]
Finland	Bio-energy will achieve 19.4% of renewable energy in 2010	Investment support for industries use peat and biomass	Carbon tax for coal, petroleum	Taxes for domestic use of electricity is higher than industrial use of electricity	[8]
Netherlands	Wind and solar energy will reach 9% of electricity produced from renewable energy in 2010				[17,25]
Denmark	Wind energy	State invests in wind turbines and buy electricity produced from wind at price of 85% of producers' price	A subsidy of 30% of investment capital; individual tax exemption for industries produce 7,000KWh; environmental reward of 0.013 euro/1kwh since 2001		[19]
Germany	Hydropower, biomass, geothermal, wind, photovoltaic energies	Low rate loans for wind energy projects, investment support for household solar energy projects	Taxes for fossil fuels, eco-tax compensates for industries produce renewable energy	Taxes for electricity consumption	[19]
Spain	Wind turbines, photovoltaic, biomass, hydropower energies will reach 30% of electricity produced from renewable energy sources in 2010	State supports for electricity bought from renewable energy sources at the price of 80-90% of normal electricity price	Support and reduce taxes for industries produce electricity from renewable energy sources		[13]

Greece	Solar heat, wind turbines, geothermal and biomass energies will reach 30% of electricity produced from renewable energy in 2010				[14]
Ireland	Hydropower and wind turbines are currently reach 5% of electricity produced from renewable energy				[18]
Czech Republic	Biomass energy and agricultural wastes will reach 3-6% of electricity produced from renewable energy in 2010	State invests approximately USD7.6 billions to produce electricity from renewable energy		Policy on energy and electricity saving	[16]
United States	Bio-fuels, solar energy		Financial aids for distribution of renewable energy	Green marketing program for renewable energy	[6,27]
Brazil	Hydropower and bio-fuels (ethanol and palm oil) will attain more than 90% of electricity produced from renewable energy	State investment for ethanol production programs (USD18 billions)			[11,23]
Japan	Photovoltaic, wind energy, biomass and small hydropower energies will reach 1.35% of electricity produced from renewable energy in 2010	Investment support for scientific research on renewable energy	Quota and certificates of electricity produced from renewable energy		[20]
China	Wind turbines, solar energy, small hydropower, methane received from coal mines, agricultural wastes and biogas will reach 10% of electricity produced from renewable energy in 2010	State investment in development of renewable energy	Grants for electricity produced from coal gas and other renewable energy types; carbon tax		[7,10,28]

Bangladesh	Photovoltaic, wind turbines and biogas	Tax exemption for 15 years for industries produce electricity from renewable energy, tax exemption for import and export of equipments for renewable energy production	[24]
South Africa	Target to achieve 15% of electricity produced from renewable energy in 2020		[26]
New Zealand	Water boiled by solar energy systems		[12]
The Gulf States	Solar energy		[22]

3.1. Solutions for development of renewable energy

According to Table 1, depending on its potential renewable energy and development degree, each country decides its priority renewable energy alternatives with the proportion of renewable energy in the total national energy production increasing over time. Countries of low development degree often choose small investment sources, less complicated technologies, production price is equivalent to the price of fossil energy such as small hydropower, solar radiant heat (water boiled by solar heat, stoves and driers used solar light), bio-energy, biogas and vegetable oil. Countries which have high degree of economic and technological development often choose high investment projects, complicated equipments such as wind turbines, photovoltaic, bio-fuels (ethanol, methanol), geothermal electricity, tidal electricity or ocean wave electricity.

3.2. Financial support policy

In order to develop renewable energy, especially commercial electricity produced from renewable energy, several policy solutions have been studied and applied: State funds for scientific and technical researches on renewable energy; low rate loans for projects of renewable energy sources development; exemption or reduce of taxes for investors of renewable energy projects; subsidy for buying commercial electricity with high price (85-90% of price for consumption electricity) applied for projects of electricity generation from renewable energy; subsidy or financial support for projects of local renewable energy exploitation and use. Financial support for renewable energy development solutions have been used in different countries with different economic development degrees. However, in developed countries such as United Kingdom and Japan, State supports have been provided through investments for scientific and technological institutions instead of direct supports for investors. In some cases, in order to promote a specific renewable energy, State focuses on scientific researches as well as supports for private investment such as: wind energy in Denmark and Spain, ethanol program in Brazil, biomass energy development program in Czech Republic or renewable energy development program in China.

3.3. Use of economic tool

Economic tool has been seen as a powerful management solution in the market economy. Use of economic tool in development of renewable energy has not become popular in different countries with different economic development degrees. There are 3 main economic tools including: taxes (carbon tax, fossil fuels tax, income tax); quota of electricity produced from renewable energy (UK, Japan); financial aids for commercial electricity or energy produced from renewable sources (China, US). The function of these economic tools is to adjust the advantage of price of commercial energy produced from fossil fuels in comparison to ones produced from renewable energy.

3.4. Policies for consumers

Policies for renewable energy's consumers include 3 groups in order to reduce commercial electricity use: apply higher taxes for domestic electricity consumption than industrial electricity consumption; policies on energy saving and commercial electricity saving in particular; green marketing for commercial electricity production and consumption. The efficiency of these policies depends on community's educational level and awareness of environmental protection as well as electricity consumption per capita.

4. Recommendations for renewable energy policies towards sustainable development in Vietnam

According to the goals for sustainable development mentioned in QĐ 153/2004/QĐ-TTg, potential renewable energy of Vietnam [1], actual development of renewable energy in Vietnam in recent years, and lessons and experiences learnt from other countries; several recommendations for renewable energy policies for Vietnam have been made as follows:

Strategies for renewable energy development: Differ from some other ASEAN countries, Vietnam has diversified potential fossil fuels (coal, lignite, peat, petroleum, gas and nuclear energy). Vietnam is on the way to build a market economy, thus the selling price of commercial energy is decided by the Government. Therefore, it is difficult for renewable energy to compete with the price of fossil fuels, especially the selling price of electricity generated from hydropower plants. If the Government does not develop policies and strategies supporting for investment in production, control selling price of commercial electricity and energy produced from fossil fuels and hydropower, it is difficult for renewable energy projects to be efficiently performed in Vietnam. Hence, it is impossible to achieve the goals of 3% of renewable energy in 2010 (exclude large and medium hydropower more than 30MW) and 5% in 2020.

On the other hand, Vietnam has diversified potential renewable energy and selection of priority renewable energy for development should be considered based on available technologies and production costs. Besides small hydropower, solar radiation, biomass energy generated from agricultural and domestic wastes (biogas, agricultural by-products), other energy sources have high investment rate and production costs and do not attract private and foreign investors. Types and development directions of renewable energy sources in Vietnam have emerged as follows:

- Potential capacity of small hydropower in Vietnam is about 2,000MW and currently exploited about 300 MW. Mountainous areas in the North, central part and Tay Nguyen are suitable for development of small and cheap

hydropower thanks to subsidy for clean development. If development of small hydropower is coupled with water reserves, the environmental economic benefits of those small hydropower projects will be increased.

- Solar energy is potential in the south of the central part and Tay Nguyen and it can be developed by building solar electricity plants based on the principle of conversion of solar energy to commercial electricity in the areas which are not suitable for agro-forestry development. In other areas, solar energy is preferred to be used for equipments collecting solar radiant heat (hot water tank used solar energy; equipments used solar energy to dry agricultural, forestry and fishery products).

- Wind energy is potential in the central part, coastal zones and islands but there is a lack of information about the wind intensity at the height suitable for installation of wind turbines. Furthermore, investment expenses and production costs of wind electricity are high in comparison to the current price system, therefore wind turbines can only be installed for test electricity generation. In the future, investigation and planning for wind electricity projects in the potential areas as well as transfer of wind electricity technological from developed countries are necessary. At the moment, there are some wind electricity stations at industrial scale have been built in Phu Quoc island, Ly Son island and Binh Dinh province.

- Biomass energy generated from agricultural wastes can be converted to solid fuels for domestic use and heat in the plains and midland areas of Vietnam. In the rural areas, biogas technology can be widely developed to provide domestic fuels for farmers, however further studies on electricity generation from large biogas stations should be carried out (agricultural, fishery and forestry farms; or waste treatment system of paper-mills, sugar-mills and landfills). Currently, "Biogas for animal husbandry 2007-2011" program is carrying out with the goals for production capacity of renewable energy of 2.800 TJ/year. Moreover, there are several spontaneous researches on electricity generation from biogas have been carried out in Da Nang and Tien Giang provinces.

- Ethanol bio-fuel has been developed and produced from manioc starch, wastes of sugar-mills and some other agricultural by-products (potato, corn, peas). Nowadays, Vietnam has 3 bio-ethanol factories with production capacity of 320 million liters per year. Among them, Dong Xanh joint stock company has production capacity of 120 million liters per year. However, bio-fuel development in Vietnam is limited due to productive agricultural land has been narrowed by urbanization, industrialization and climate change. Production of vegetable oil from coconut, palm, Jatropha and other plants is also limited due to available land for growing these plants is not plentiful and constraint by other land use demands including use for the above projects of renewable energy.

- Geothermal energy has not been considerably studied. At the moment, there are only 5 sites for high temperature hot water have been found which are suitable for building 40-50MW geothermal plants. Other hot water sites have low and normal temperature which are only suitable for medical treatment or drying of agricultural products. A research on assessing potential geothermal and efficient use of geothermal for socio-economic development is highly required. Several hot water sites have been exploited and used for bathing, medical treatment or algae-culture.

- Other renewable energy sources such as ocean wave and tidal energy, energy created by the interaction between salt water and

freshwater, or ocean heat have not been assessed and there is a lack of specific technology for these sources. However, these sources could not become an economic valuable commercial energy because investment costs may be too high.

Financial support policies for renewable energy sources: State financial aids for development of renewable energy sources in Vietnam should be focused on scientific researches and technologies for assessing potential and exploitation methods; investment for renewable energy exploitation projects. The National Energy Efficiency Program (NEEP) for the period 2006-2015 is implementing. On 20th November 2007, Vietnamese Government issued Decision No. 177/2007/QĐ-TTg about project of bio-fuels development to 2015 and vision to 2025. Objectives of this project include development of bio-fuels production and widely use of bio-fuels in order to partially replace traditional fossil fuels; development of planned material areas; trying to achieve 250,000 tons of ethanol and vegetable oil produced in 2015 (mix for 5 million tons of E5, B5) which supplies 1% of the total national demand of gasoline; striving for reaching advanced technologies of bio-fuel production and achieving 1.8 million tons of ethanol and vegetable oil in 2025 which can provide 5% of the total national demand of gasoline. NEEP and Decision No.177/2007/QĐ-TTG are providing efficient financial supports for renewable energy projects. However, there is no financial support for researches on potential sources and exploitation technologies for renewable energy.

Use of taxes and fees for renewable energy development: Renewable energies, especially commercial electricity energy often need higher investment rate and production cost than which of electricity produced from fossil fuels (coal, petroleum, gas). Therefore, if there is no preferential policy on taxes and fees, electricity produced from renewable energy will not be able to compete with electricity produced from fossil fuels and hydropower. Issuing taxes for electricity produced from fossil fuels and hydropower and integrating environmental fees in commercial electricity price are necessary for investment in electricity generation from renewable energy. At the moment, Vietnam has no environmental and energy tax for fossil fuels exploitation and use. Tax for exploitation of fossil fuels is low (1-10%), transportation fee integrated in petroleum price is approximately 3% of selling price, environmental fees for exploitation of fossil fuels are guesstimated based on the quantity of exploited resources. These issues are constraints for investment and use of renewable energy. Recently, National Assembly is considering the draft of Resources Tax Law. It is expected that once this Law becomes effective, it will help to promote efficiency exploitation and use of non-renewable energy which in turn will promote development of renewable energy.

Policies on energy consumption: According to NEEP, the target for the period 2006-2010 is to saving 3-5% of energy consumption, and 5-8% for the period 2011-2015. However, this program is facing several difficulties such as: lack of energy taxes or carbon tax; low energy price, especially electricity price is lower than market price; low developed technologies; low efficiency in energy use of equipments; insufficient capital for technology innovation. These obviously limit the demand for energy efficiency and conservation services. Reduce in government's subsidies for electricity price can be considered as a policy to influence energy consumption.

5. Conclusions and recommendations

Although Vietnam has abundant and diversified sources of renewable energy such as solar energy, wind energy and small hydropower, these sources have not been efficiently exploited and used. The National Energy Efficiency Program (NEEP) is targeted to produce 3% of commercial electricity from renewable energy by 2010, 5% by 2020 and 11% by 2050. These targets seem difficult to be achieved if Vietnamese Government does not develop appropriate policies on renewable energy.

Following recommendations have been drawn out from the above analysis:

1. Government should develop policies and strategies for renewable energy development in which deciding priority energy to be invested in each period is required.

2. Besides policies on financial supports for commercial renewable energy projects, it is needed to develop policies on financial supports for researches on potential and technologies for renewable energy exploitation.

3. Government has to issue energy taxes or carbon tax as well as charge environmental fees for fossil fuels production and consumption in order to promote investment for and use of renewable energy.

4. Adjusting energy price, especially electricity price and reducing government's subsidies for electricity price is a solution for saving and efficient use of energy, as well as widely exploitation and use of renewable energy in Vietnam.

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