International Journal of Recent Engineering Research and Development (IJRERD)
ISSN: 2455-8761
www.ijrerd.com || Volume 04 – Issue 11 || November 2019 || PP. 102-108

Renewable energy in Vietnam

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Abstract: Vietnam has great potential in exploiting renewable energy sources such as hydroelectricity, wind power, solar power and biomass. In particular, hydropower is focused on developing almost maximum in Vietnam. By the end of 2018, hydroelectricity is the main energy source of our country, accounting for more than 40% of the total national electricity capacity. With the exception of medium and large scale hydropower, other forms of renewable energy (including small hydro) account for 2.1% of the total system capacity, however, there is nothing immutable to change. of time. By mid-2019, more than 80 solar power plants were operated and grided thanks to the FIT price support mechanism, while at the end of 2018, only two large scale solar power plants were connected. on the grid. At that time, the total solar power capacity was more than 4460 MW, accounting for more than 8% of the system's total generating capacity. Meanwhile, at the end of 2018, the total wind power capacity in Vietnam was only at 228 MW, but by 2019, the number of wind power projects is under construction with a total capacity of 2 times higher than 2018. For biomass energy, commercial electricity production is still developing slowly due to the price support issue for bagasse. However, the prospects for developing this energy source are still positive based on the increasing amount of urban and agricultural waste and forestry products to promote this source of energy.

Index Terms: renewable energy, biomass, solar energy

I. INTRODUCTION

Vietnam's renewable energy development strategy to 2030, with a vision to 2050, was approved by the Prime Minister in Decision No. 2068 / QD-TTg dated November 25, 2015. Accordingly, in September 2015 Vietnam has set specific targets, the amount of electricity produced from renewable energy sources will increase from 58 billion kWh in 2015 to 101 billion kWh in 2020 and 186 billion kWh in 2030; 452 billion kWh in 2050. The share of electricity produced from renewable energy sources will increase from 35% in 2015 to 38% in 2020 and 43% in 2050. With a geographical location, a long, dense coastline Due to tropical monsoon climate and agricultural economy, Vietnam has abundant and diversified renewable energy sources, which can be exploited for energy production such as: Hydroelectricity, wind power, solar power generation, energy generation. blocks, geothermal, biofuels ... Through research and assessment of renewable energy potential, by 2030 Vietnam is capable of developing about 8,000 MW of small hydroelectricity, 200 MW of wind power, 3,000 MW of electricity generation 30,000 megawatts of solar power. Regarding wind power, it is estimated that on land, Vietnam can develop about 30 GW of wind power. Along with the potential of offshore wind power, Vietnam can develop about 100 GW of wind power capacity. Solar potential is also appreciated when Vietnam is a country with a lot of sunshine time of year with high radiation intensity in the Central and the South. Meanwhile, the potential of biomass sources from agricultural wastes, animal wastes and organic wastes has a total capacity of about 400 MW. Hydroelectricity is still the highest renewable energy source, contributing about 40% to the total national electricity capacity. By the end of 2018, Vietnam has successfully promoted many renewable energy projects with 285 small hydropower plants with a total capacity of about 3,322 MW; 8 wind power plants, total capacity of 243 MW and 10 biomass power plants, total grid capacity of about 212 MW. Regarding solar power, more than 100 projects have signed power purchase contracts (PPA) with Vietnam Electricity (EVN), two projects came into operation with a total capacity of about 86 MW. The total capacity of renewable energy sources (excluding medium and large hydropower plants) accounts for 2.1% of the total system capacity.In modern life, the quality of human life depends very much on the sources of energy, so the exploitation and use of energy is of particular concern. Traditional energy sources such as fossil fuels, hydropower and nuclear power have largely met the needs of nations, but the use of these sources of energy has some drawbacks. Non-renewable fossil fuels and at the current pace of use, scientists predict that in about 70 years the fuel will be exhausted. The search for oil fields could lead to prolonged wars, the Gulf War in the 1990s as an example. For hydroelectricity, almost all favorable locations have been built hydropower plants. It is very difficult to build smaller hydropower plants in remote areas, and the construction of hydropower dams can affect the environment. China's large hydropower dams built on the LanThuong River (the headwaters of the Mekong River) have dramatically altered the flood-drought cycle of the lower Mekong, reducing the amount of water and Nutrients flow into river basins and coastal areas, which directly affect the lives of millions of people downstream. Nuclear power plants are potentially dangerous, the Chernobyl disaster in Ukraine in 1986 or the Fukushima nuclear accident in Japan in 2011 are examples.

For the above reasons, we find it indispensable to supplement and replace traditional energy sources with safe and renewable energy sources. Many countries have paid special attention to this area, in Sweden, Denmark, Austria, France, in 2014 used renewable energy (RE) accounted for about 13.4% of total energy consumption. Vietnam is one of the countries with great potential for renewable energy development such as hydropower, wind energy, solar energy, biomass energy, geothermal energy ... However, the exploitation and use of renewable energy very limited.

The world's electricity industry, which is largely based on thermal and hydroelectric technologies, has brought humanity to the civilization of electricity, but has also exposed its downside to the Earth's environment. With the burning of fossil fuels (coal, heavy oil), thermal power plants have become the largest source of greenhouse gases for global climate change. Nuclear power technology is unsafe and causes radioactive dangers such as Checnobun (1986), Fukushima (2011) and long-term economic, social and environmental harm to the world.

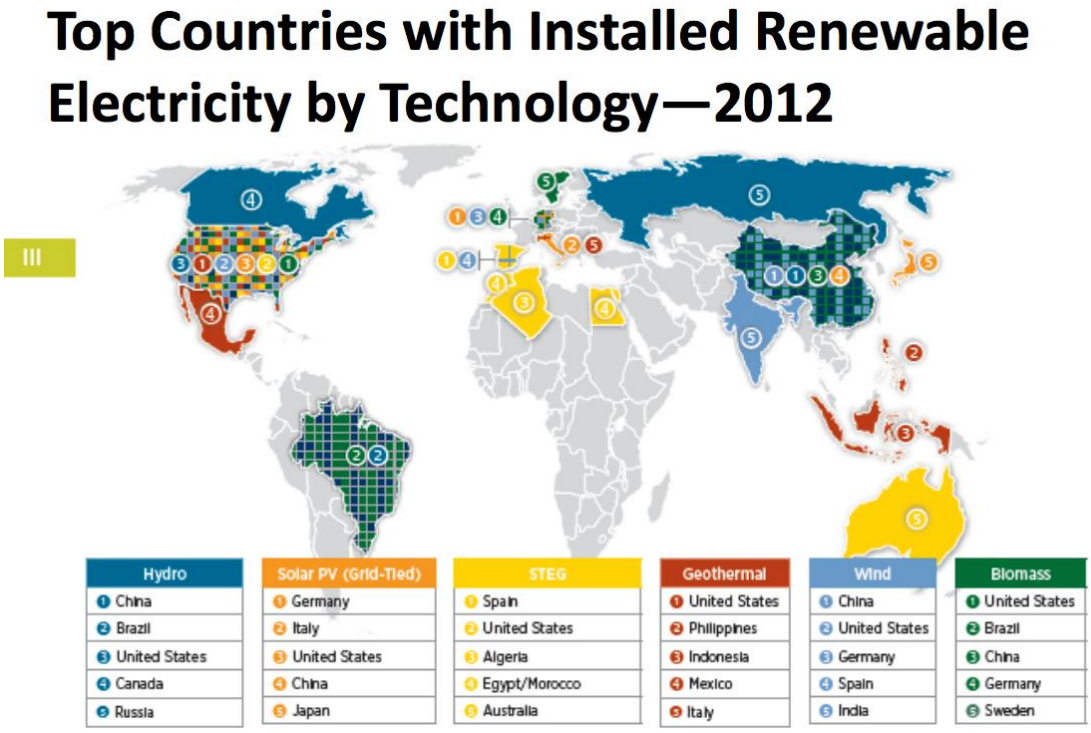

Fig.1. Using renewable energy in the world

II. RENEWABLE ENERGY DEVELOPMENT

As of June 2019, the total installed capacity of solar, wind and biomass projects in Vietnam will reach about 2.5 GW, expected by the end of June 2019, adding about 2 GW of solar power. is installed. The results are achieved thanks to the Government's commitment on development goals and policies to encourage energy development, the positive of localities and the coordination among ministries and branches in solving problems. In the process of implementing the project in order to create a good competitive environment, convenient for investors. The 21st century with sustainable global development strategies, especially the period of "green economy development", has begun to see new technologies to produce "cleaner" electricity, including electricity from endless renewable energy sources in nature or always arise in human life. These are the technologies that produce electricity from renewable energy sources in nature: wind; waves, tides; Sun; geothermal and marine heat. In particular, commercialization on a large scale is the wind power station (located on land, island or sea), solar power station, tidal power station and waves, sea heat. According to the International Energy Agency (IEA), in 2004, the total capacity of renewable energy sources worldwide was 160 GW (excluding large hydro), accounting for 4% of the total capacity of power plants, equivalent to one fifth of the total capacity of nuclear power plants in the world, with developing countries accounting for 44%, or 70 GW. The fastest growing renewable energy technology in the world is solar electricity connected to the national grid, with an average annual growth rate of 60 percent, covering more than 400,000 homes in Japan, Germany, USA (2000-2004). The second fastest growing source of wind power is the 28% annual increase. Currently, wind farms with a capacity of hundreds of MW have been completed in the UK, Denmark and many other countries such as USA, Japan, China, and Vietnam.

There are 45 countries (2011) identifying renewable energy development targets for the coming years, including 25 EU countries, many states and cities of the United States, Canada and 10 developing countries. Most growth targets are 5-30% in the period from 2010 to 2020, with the EU alone accounting for 21% by 2010. China aims to reach 10% of total capacity by 2010, equivalent to 60 GW now 37 GW). The first tidal power plant Rance (France), in 1967 with a capacity of 240 MW, Sihwa (South Korea), 2011 with 254 MW. New Zealand is also building a 200 MW renewable power plant, in addition to other projects in the UK, Russia, USA, Canada and China. At present, Vietnam's economic growth has led to a 15-20% increase in electricity demand, while the price of oil, coal and gas has increased, diversification of power supply, of which renewable energy sources are needed. Global climate change is increasingly serious. The most manifestation is the warming of the earth, the melting ice, rising sea levels; These are unusual weather phenomena, typhoons, floods, tsunamis, earthquakes, droughts, and long-lasting cold weather ... leading to a shortage of food and foodstuffs. ... Vietnam is a coastal country should be directly affected by the phenomenon of sea level rise. Objective causes of climate change are changes in atmospheric radiation, including processes such as changing solar radiation, orbital deflection of the Earth, tectonic formation, tectonic continental drift and change in greenhouse gas concentrations. The main cause of climate change, however, is human impact, which is the increase in atmospheric CO2 from fossil fuel exploitation and. Meanwhile, most renewable energy related activities include production, installation, operation and maintenance, removal of very little greenhouse gases compared to fossil fuel sources. So, in order to reduce the effects of global warming, the world's energy system needs to shift from unsustainable to sustainable energy.Fossil fuel sources are finite and humans consume a significant amount of them. Every year the world consumes a fossil fuel equivalent to 11 billion tons of oil. If we continue to consume at such a rate, crude oil will be exhausted by 2052, natural gas will be exhausted by 2060 and coal resources will be exhausted by 2088. However, the rate of consumption of fossil fuels will increase as the world population grows, as well as rising living standards. As a result, fossil fuel sources will be depleted earlier if no alternative sources of energy are found. Even with the current rate of fossil fuel consumption, electricity only meets 4/5 of the world's population. Meanwhile renewable energy sources are endless and can replenish and replace fossil fuels in the future. According to the World Wide Fund for Nature (WWF), the world can be supplied with energy from 100% of renewable energy sources by 2050.Generating electricity from fossil fuels causes great harm to public health. The pollution of air and water from coal and gas-fired thermal power plants is linked to human health problems such as respiratory, neurological, cardiovascular and cancer. From the Vinh Tan thermal power plant in BinhThuan province in the past has seriously affected the health as well as the lives of the surrounding people as an example. Replacing fossil fuel sources with renewable energy will alleviate these problems.

Renewable sources such as wind, solar and hydropower do not cause air pollution. In that gas, geothermal and biomass energy produce a small amount of air pollutants, but much less than the pollution caused by coal and gas fired plants. In addition, wind and solar energy operate without water and therefore do not pollute water sources or compete with agricultural water, drinking water or other essential water-related needs. In contrast, fossil energy sources have a significant impact on water resources. For example, mining or oil drilling, natural gas can contaminate drinking water. In addition, coal, gas and oil plants consume large amounts of water for cooling purposes during operation. As a result, water shortages for living, agriculture, etc.Hydroelectricity is the source of electricity produced from water energy. Most of the hydroelectric power is derived from the potential energy of water stored in dams that spin the turbine and generate electricity. Water can be from a river or man-made, such as streams flowing from a lake overhead through pipes and out of a dam. Hydropower is a popular renewable energy source. It plays an important role in today's integrated electricity system (contributing more than 16% of total electricity production worldwide and about 85% of global renewable electricity). Moreover, hydropower helps to stabilize fluctuations between supply and demand. This role will become more important in the coming decades, as the share of renewable energy sources - mainly wind and solar energy - will increase dramatically. The contribution of hydropower to carbon sequestration is twofold: providing clean renewable electricity and contributing electricity to the national grid. In addition, the hydropower pedal helps control water supplies, floods and droughts, water for irrigation. However, hydropower development should also take into account waterway and recreational activities. These goals can cause conflicts at different times but are often complementary to one another.

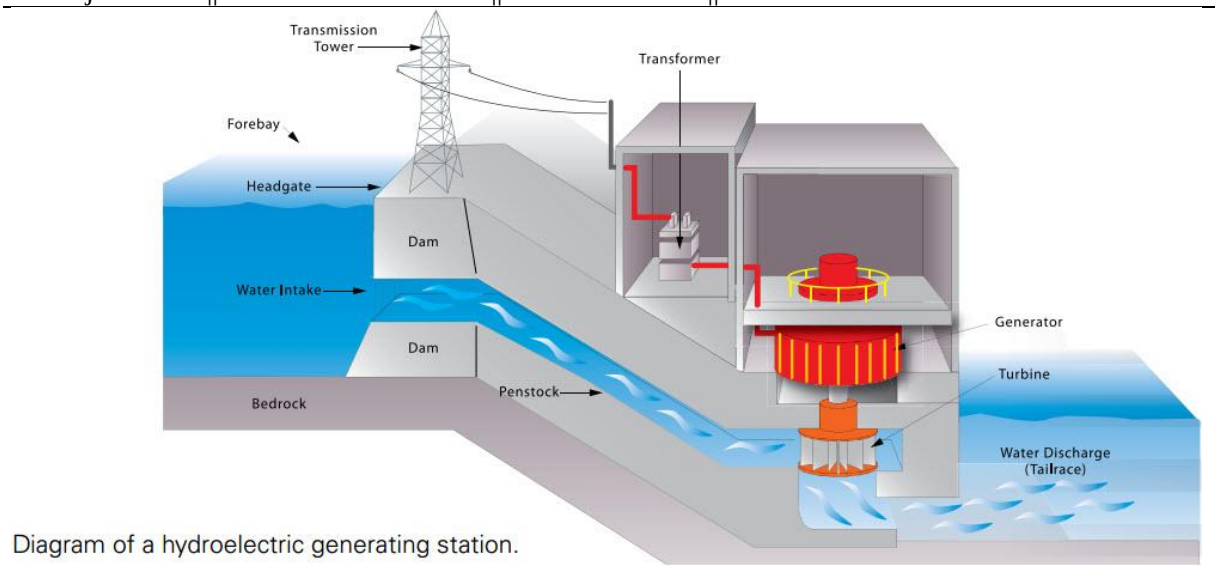

Fig.2. Using Hydroelectricity in the

Based on the most recent assessment reports, over 1,000 sites have been identified that have the potential for small hydropower development, ranging in size from 100 kW to 30 MW with a total installed capacity of over 7,000 MW and currently only exploits about 50% of potential. At present, 114 projects with a total capacity of 850 MW have been basically completed, 228 projects with a capacity of over 2600 MW are under construction and 700 projects Project is in the research phase. In addition, micro hydro projects with a capacity of less than 100 kW are suitable for deep-lying and remote areas, where terrain is difficult to self-subsist on small grids and households are also being reported waterfall.

The field of renewable energy development in Vietnam is small hydropower in the northern mountainous provinces, Central Vietnam, the Central Highlands and the Southeast. However, the amount of electricity produced by the whole The country has only a modest amount of electricity, according to preliminary estimates, could develop over 4000 MW of small hydropower with an output of about 16 billion kWh. In addition, Vietnam has more than 1 million points that can develop micro hydro (capacity from 200 W-100 kW).Solar energy is the process of converting sunlight into usable forms of energy. Solar photovoltaics, solar thermal, solar heating and cooling are also made possible by solar technologies.Solar Photovoltaic: The photovoltaic system is a system that directly converts solar energy into electricity. The basic building blocks of solar photovoltaic systems include solar photovoltaic cells, a semiconductor device used to convert solar energy into direct current. Solar photovoltaic cells are connected together to form PV modules, typically up to 50-200W. Solar photovoltaic modules are combined with other applications such as inverters, batteries, electrical components, and installation systems), forming a solar photovoltaic system. The modules can be linked together to supply power from a few W to hundreds of MW. Most solar photovoltaic technologies are silicon-based systems. Thin-film modules may also include non-silicon-based semiconductor materials, which account for about 10% of the global market. Centralized solar photovoltaic, in which sunlight is focused on a small area, began to be deployed in the market. Solar cell photovoltaic cells bring about a very high efficiency of up to 40% - but only for normal direct radiation. Other technologies such as solar photovoltaic cells are still in the research stage. Because solar photovoltaics generate electricity from sunlight, so the output is limited by the time it takes for the sun to shine. The IEA has emphasized, however, that the GIVAR (Unstable Renewable Energy Source) project offers a number of options (demand-responsive, flexible production, grid infrastructure, cost-effective, while addressing energy challenges.Vietnam is considered a country with great potential for solar energy, especially in the central and southern regions of the country, with the total number of sunshine hours in the year ranged from 1,400 to 3,000 hours, the average solar radiation intensity is about 4-5 kWh / m2 / day increasing from the North to the South. Solar energy in Vietnam is available year-round, quite stable and widely distributed across different regions of the country. In particular, the average number of sunny days in the central and southern provinces is about 300 days per year. The potential for development is the same, but the exploitation and use of this energy source is limited to about 3 MW.

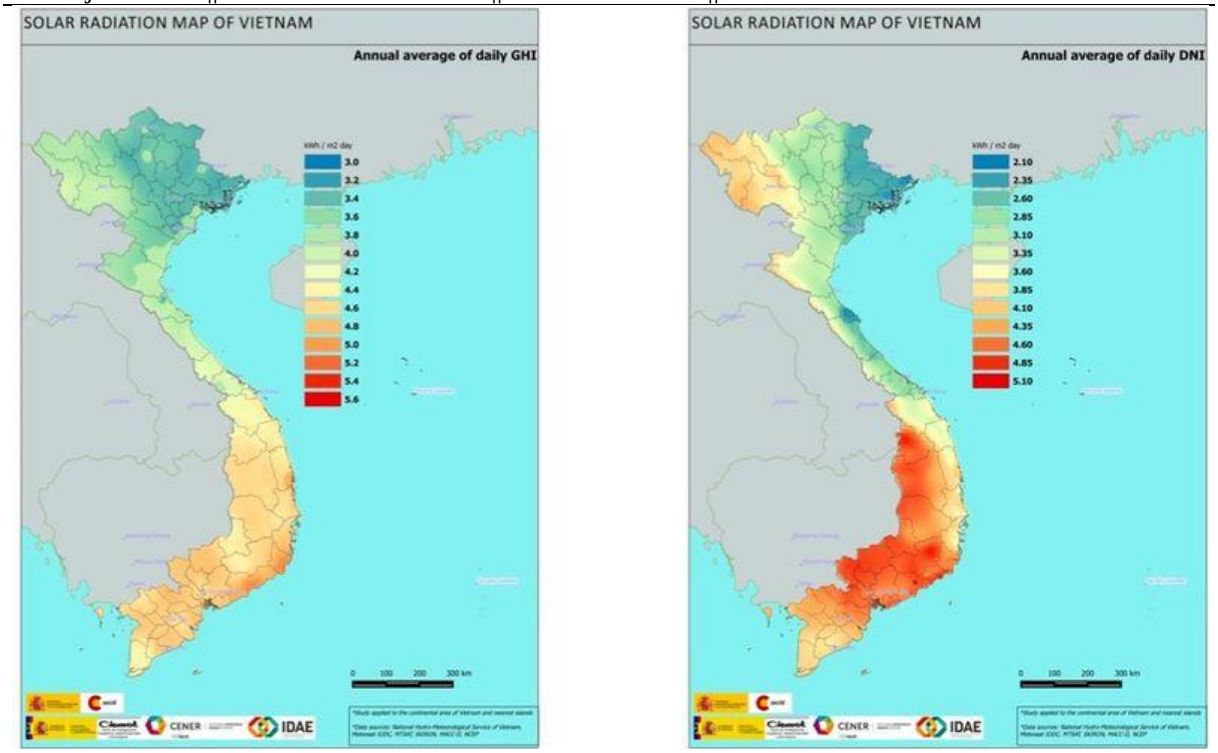

Fig. 3. Solar potential in Vietnam Bioenergy

Bioenergy is the energy derived from biomass conversion, in which biomass can be used directly as fuel or treated into liquids and gases. Biomass is a biodegradable organic substance derived from plants or animals. Biomass includes wood and agricultural crops, herbaceous and woody crops, urban organic wastes, as well as fertilizers. Bioenergy is the largest renewable energy source, providing 10% of the world's primary energy supply. It plays an important role in many developing countries, such as providing energy for cooking and heating, but it often causes health and environmental impacts. The development of clean fuels from biomass such as biofuels in developing countries is the main solution to improve the current situation and achieve the target of access to clean energy by 2030. At present, Biotech accounts for about 10% (50 exajoule (EJ = 1018 joules)) of the world's major energy. Most of this is in developing countries used for cooking and heating. The use of biomass for rudimentary and inefficient stoves has a significant impact on health (smoke pollution) and the environment (deforestation). In the construction sector, modern bioenergy used to provide heat has reached about 5 EJs in 2012. In addition, 8 EJs are used in industry, mainly for paper and pulp production as well. Food processing sector to provide heat for processing at medium and low temperatures. In 2012, total electricity produced from bioenergy is 370 TWh, equivalent to 1.5% of the world's total electricity output. Technologies for generating electricity and heat from biofuels have existed from heating systems for buildings to biogas digesters for electricity generation, biomass gasification plants and biomass great. Combined biomass in existing coal-fired power plants can also be an option to achieve short-term emission reductions and more sustainable use of existing assets. In addition, new bioenergy plants are playing an increasingly important role in meeting the demand for electricity and heat.In the medium term, capacity and output of bioenergy are expected to increase significantly. Global bioenergy yield is expected to reach 560 TWh by 2018 (370 TWh in 2012-an average increase of 7% per year), which is driven by renewable energy targets in other countries. , as well as rising energy demand in some emerging economies with the availability of biomass and renewable resources.

Particularly in the field of construction in non-OECD countries, traditional biomass will be reduced and replaced by more efficient and cleaner fuels. Biofuels are fuels that exist in liquid form and are produced from biomass (organics derived from animals or plants). Global biofuel production has steadily increased over the past decade from 16 billion liters in 2000 to about 110 billion liters in 2013. Today, biofuels provide about 3.5 percent of the total transport fuel. Roads around the globe. In Brazil, for example, biofuels now account for about 25% of the country's road transport fuel needs.In the medium term, world production of biofuels is expected to reach nearly 140 billion liters in 2018 (on a revised basis, biofuels will provide 1.6 million barrels of oil per day (mboe/d)), slightly less than the 2011 European Union crude output. As a result, biofuels can meet 4% of global road transport fuel demand by 2018, but uncertainty over European Union and U.S. aid policies in the case Potential risks may undermine the development potential of the sector, although biofuels increase in

some developing countries to reduce oil imports.The recent rapid development of renewable energy sources is creating a number of inadequacies and challenges such as: High investment costs, grid infrastructure in some potential areas of energy. Renewables are not ready to release capacity, require large land use (especially solar power projects), difficulties in control and moderation of electricity systems when the proportion of electricity from renewable energy in the system increased. Specifically, the report of Electricity of Vietnam, developing renewable energy is facing a number of challenges in the operation system. Especially with rooftop solar power, Vietnam Electricity has not been able to sign solar power trading contracts with customers because there is no official guidance on how to pay for electricity. In addition, there are also no national standards or technical regulations on rooftop solar power systems or regulations on licensing electricity activities for third parties to install. A major barrier to renewable energy development lies in investment. The electricity tariff is currently applied uniformly to all regions, making it less competitive and difficult to encourage investors to develop infrastructure. Moreover, electricity tariffs are completely controlled while renewable energy or fluctuations lead to lack of investment capital. Although there has been considerable international interest in renewable energy in Vietnam, the expansion of wind and solar power needs favorable investment environment as well as removing some barriers to market entry. Typically, in 2017, the Ministry of Industry and Trade issued Circular 16/2017 / TT-BCT including sample power purchase agreement (PPA) for solar power. This Circular and the model contract are similar to the previously issued draft and are considered compulsory contracts for large-scale solar and rooftop solar power projects but the current model contracts. cannot attract international capital. A number of solar power projects, using domestic loans or equity, signed PPA in 2018, but still face risks related to electricity purchase guarantee.

III. CONCLUSION

In 2015, electricity production from renewable energy, excluding hydroelectricity, accounted for 6.8% of global electricity output, including 3.5% of wind power, 1.9% of biomass and 1.0% solar power (photovoltaic). If including hydroelectricity (16.0%), the electricity output from renewable energy sources reaches 22.8%. Global renewable energy capacity including hydropower is expected to increase from 2,130 GW at the end of 2016 to over 2,400 GW by the end of 2018, including 1,300 GW of hydropower and 1,100 GW from power sources amount of renewable electricity outside hydropower. Annual growth in renewable energy capacity has reached a record high of over 160 GW in 2016 and is expected to stand at that level in 2017 and 2018. This accounts for about 60% of global renewable energy capacity growth. China's renewable energy capacity growth from 2015 to 2016 reached nearly 70 GW, accounting for about half of global growth. The country's 2017 growth is expected to be close to 70 GW, including more than 40 GW of PV solar power. However, in 2018, although PV solar PV growth will remain at the previous year's level, the growth will be uncertain due to the shift from Feed-in-Tariff (temporary), support according to the prescribed tariff) to The Renewables Portfolio Standard policy, expand project auctions and improve stability. In India, since the inauguration of the Narendra Modi government in 2014, the country has rapidly increased the capacity of renewable energy sources, including PV solar power supported by surface radiation abundance, according to the national target of 175 GW (excluding large-scale hydropower plants) by 2022. The annual growth capacity will double from 8 GW in 2016 to about 15 GW in 2017 and 2018, focusing on PV solar PV. By the end of 2018, India could reach 120 GW of renewable energy capacity, surpassing that of Japan. The United States announced a record increase in renewable power capacity of more than 20 GW in 2016. The growth of renewable energy capacity in 2017 and 2018 will be about 20 GW due to the expansion of PV solar power source thanks to the state's policy of promoting renewable energy and rapidly reducing costs.

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