Solar Energy Development in Viet Nam: Opportunities and Challenges

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ABSTRACT

Nowadays Viet Nam's energy supply which is mainly produced by fossil fuels energy such as coal, gas, and oil. However, the operation of fossil fuel power plants is one of the major causes of environmental pollution and climate change as well. It has a serious impact on the survival of human beings in general. As can be seen, the manufacturing industry is strongly invested, the demand for energy is also increasing. As traditional fossil fuels are being depleted and to minimize environmental pollution, renewable energy is the solution widely used by many countries in the world. Therefore, renewable energy has a significant role in maintaining the sustainability of world economy. Renewable energy sources such as solar energy, wind energy, biomass energy, geothermal energy can supply clean and nature–sourced energy to replace fossil fuels. Encouraging development of renewables is a general trend in the world today, which is also a common goal of COP21 commitment on global GHG reduction. The objective of this study is to assess the opportunities and challenges for renewable energy development in Vietnam, particularly for solar power. This study also discusses policies to promote the

development of solar energy in Vietnam. While solar power provides ecological, economic and social benefits, it is exploited very modestly in Vietnam, where there are many barriers to slow down the development of renewable energy.

INTRODUCTION

NOWADAYS the Government of Vietnam encou-rages clean energy development to fulfill obligations and commitments under the United Nation Framework Convention on Climate Change (UNFCCC) and Paris COP21 agreement, continuing to implement the national strategy, programs, and plans in response to climate change. The government aims to mitigate greenhouse gas emissions in the energy activities compared with business as usual plan around 5% by 2020, 25% by 2030 and around 45% by 2050. Prime Minister's Decision No.2068/QD-TTg approves Vietnam's Strategy for renewable energy development up to 2020, with a vision towards 2050. The renewable energy rate (which include small hydro) in the total primary energy consumption in 2015 is expected to reach approximately 31.8%, about 31% in 2020, about 32.3% in 2030 and increase to 44% in 2050. As projected in the approval of revisions to the National power development for the period 2015-2020 with vision extended to 2030 by the government, renewable energy-based power aims to make up 9.9% by 2020, increase to 15,6% in 2025 and finally up to 21% of total capacity of power plants. Among them, solar power has the important role in implementing the huge purposes that had presented.

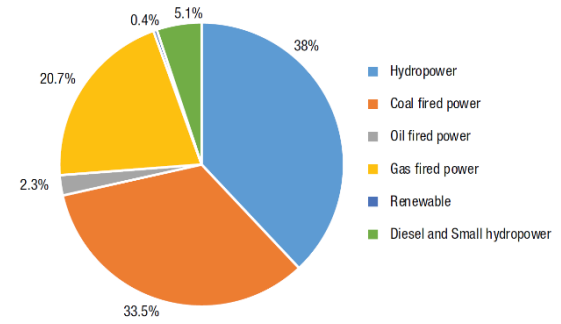
For a country of more than 3,000km of coastline, Vietnam has a great potential for developing solar power, especially when compared to other countries in the region such as Thailand, Laos, and Cambodia. Renewable energy will make many benefits to Viet Nam economy and solve many issues which Vietnam is facing such as electricity shortages, households that do not have access to electricity, jobs, lands-caping, environmental and social welfare factors. However, solar and wind energy in Vietnam has not yet developed according to its inherent potential. In the last decade, from 2007 to 2017, the government of Vietnam has spent great attention to the develo-pment of renewable energy in general and solar energy in particular. The Vietnamese government has officially promulgated a mechanism to encourage the development of solar power projects in 2017, approving the development strategy of renewable energy of Viet Nam by 2030 with a vision to 2050. With incentives mechanisms on purchase, land and electricity price of solar power projects such as exempted import tax equipment, exemption or reduction of income taxes for projects on investment incentives. On land, solar project's transmission lines and transformer stations which are connected to the grid shall be exempt or reduce land use fees, land rents and water surface rents according to current regulations. It means Vietnam has a huge potential for exploiting solar power projects. Also, the market has specific disadvantages in development and operation of solar power projects.

The purpose of this study is to deliver useful information of solar opportunities and challenges to investing in the Vietnamese market.

VIET NAM ENERGY MARKET OVERVIEW

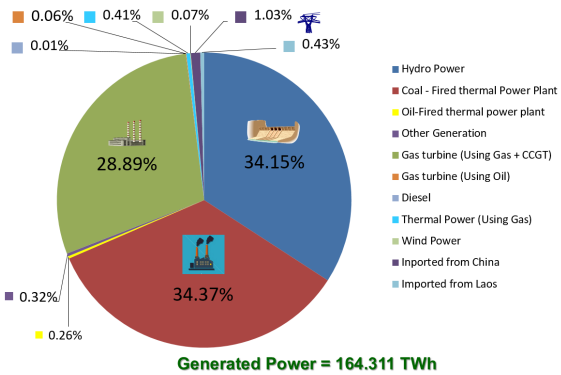
Viet Nam has large reserves of primary energy resources, such as coal, oil, natural gas, and water for hydropower generation. It also has a high potential for renewable energy resources, such as biomass, solar, and wind. In 2015, the share of total national power generation by fuel type was coal fired power (33.5%), gas fired power(20.7%), oil fired power (2.3%), hydropower power(38%), diesel and small hydro power 5.1% and renewable energy (0.4%). Figure 1 shows the power generation by fuel type in 2015.

In recent years, Vietnam has prioritized the development of fossil fuel sources such as coal, oil and natural gas. Therefore, it explains why renewable energy accounts for only 0.4% of the system's total installed capacity in 2015.



Source: *EVN Annual Report 2016*

Figure 1. Power generation by fuel type in 2015



Source: *Summary report on system operation in 2015 issued by NLDC*

Figure 2. System's Generated Power in 2015

In system's generated power in 2015, only wind power is put into commercial operation. Generated electricity from wind power accounts for 0.07% of the 164,311 TWh of the total generated power in 2015. It is a tiny number compared to its inherent potential. Figure 2 shows system's generated power in 2015.

Although the government of Vietnam has policies to encourage the development of renewable energy, especially in the period from 2011 to 2015, there are still many barriers to renewable energy development that lead to the slow development of renewable projects. As a summary report on system operation in 2015 issued by NLDC (Table 1), total investment capital on renewable energy only accounts for 2.3 % of total investment capital for the whole market. The biggest obstacle at present is the policy of developing, arranging the source of capital, especially the selling price of electricity. The absence of high-level legal documents (such as laws, decrees) to encourage investors to develop renewable energy. There is also no specific strategy/plan for developing this source of energy at the national level is seen as a

Table 1. Historical Data of Total Investment Capital In The Period 2011-2015

No.	Generation Type	%
1	Coal Fired	37.1
2	Hydropower	18.3
3	Pump Storage	0
4	Oil and Gas	10.9
5	Nuclear Power	6.6
6	Renewable Energy	2.3

Source: Summary report on system operation in 2015 issued by NLDC

challenge, leading to the delay in the implementation of licensed projects and the attraction of new investments.

SOLAR OPPORTUNITIES IN VIETNAM

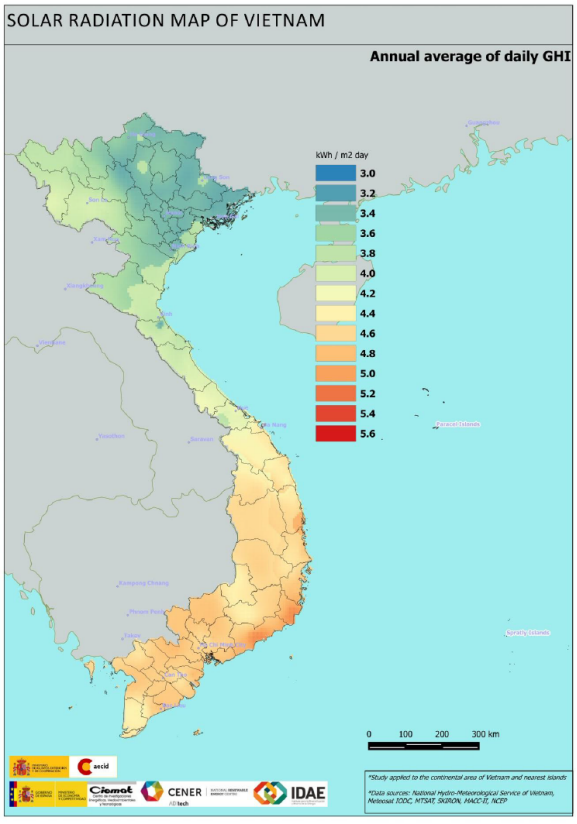
Solar Potential

Solar map

Vietnam is considered a country with great potential for solar energy, as rated as 66/248 strong potential country in the world. (By National Renewable Energy Laboratory NREL). Vietnam has had a variety of solar power projects in recent years, but there are no solar power projects to commercially operate because there is no mechanism to support the development of solar power projects.

In 2014, with the support of the Spanish Government, a report on the assessment of the potential of solar energy in Vietnam by the leading Spanish research institutes had been completed and issued (Figure 3). The report uses data from satellite images for five years, combined with data from 127 local meteorological and hydrological monitoring stations for 30 years and data from weather patterns around the world. The results of the report indicate the potential of solar energy as follows:

- The average annual radiation by day in the northern coastal area is about 3.8 kWh/m^2/day.
- Total annual average radiation in the South, Central Highlands and Central Coast reaches about 4.8 kWh/m^2/day.



Source: *CIEMAT report, 2014*

Figure 3. Solar Resources Assessment in Viet Nam

Current Development Status on Solar Energy

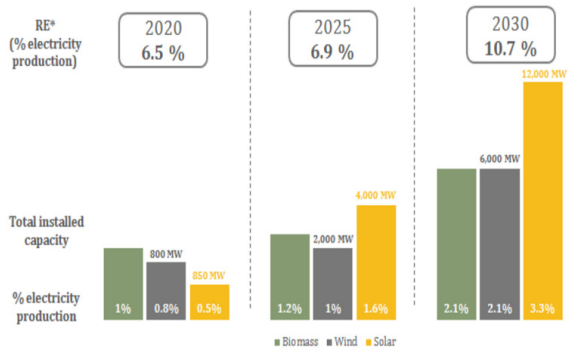
Most recently, in 2017, the Government of Vietnam has officially promulgated a mechanism to encourage the development of solar power projects(No. 11/2017/QD-TTg). There are several large-scale PV projects were announced in Vietnam over the past months. In April, the government of the Vietnamese region of Binh Phuoc revealed that Indian module manufacturer and project developer Tata Solar was planning the construction of a 100 MW solar park in the region. In mid-March, the Country's Dak Lak province granted series of MoUs and licenses for a raft of solar PV projects, including a reported 300 - 500 MW solar farm to be developed by U.S. power firm AES Corporation and a mooted 2 GW project by local firm Xuan Thien Daklak. At the end of March, the government of the Yen Bai province announced

it was teaming with South Korean renewable energy developer Solkiss to finalize plans to develop 500 MW solar project at Thac Ba Lake. In January, the U.S. hetero-junction PV cell specialist Natcore secured initial approval to oversee construction of 200 MW of solar capacity in Binh Thuan province.

On the Vietnamese side, the Government, Ministries and People's Committees of provinces/cities are ready to provide full support information related to the investment field of solar power projects to investors, especially to foreign investors in researching, evaluating and launching investment projects. Also, Vietnam has created preferential mechanisms for foreign investors such as the abolition of investment license for FDI enterprises which holding less than 51% of authorized capital, shorten the time of issuing investment certificates which are based on the Law on Investment, Enterprise Law, and other regulations. Besides support from the government, organizations such as Vietnam Energy Association, Vietnam Clean Energy Association are willing to support foreign investors to seek partners in Vietnam for solar power investment projects.

Solar Energy Targets to 2030

Spur the development of solar power sources, including ground-mounted and rooftop solar power sources, for total output of solar power to surge from inconsiderable amount at present to about 850 MW by 2020, about 4,000 MW by 2025 and about 12,000 MW by 2030 (Figure 4). The ratio of solar power shall be about 0.5% by 2020, about 1.6% by 2025 and about 3.3% by 2030. (Decision 428/QD-TTg).



Source: *Decision 428/QD-TTg dated 18th March 2016*

Figure 4. Renewable target in the period 2020-2030

Mechanism for Encouragement of Solar Power Development in Vietnam

All renewable energy power projects can also benefit from the tax exemption for import duties for imported goods to establish project fixed assets, materials, and semi-finished products that are not domestically produced. Tax holidays for corporate tax which are 0% applied for the first four years followed by a 50% reduction in the next nine years. Other financial incentives worth mentioning include support on land use, capital, and fees for environmental protection activities. (Article 16 of Decree 04/2009/ND-CP).

Furthermore, regarding investments, owners of renewable energy projects can obtain loans of up to 70% of the total investment cost from the Vietnam Development Bank (VDB) at an interest rate equivalent to that of a 5-year government bond plus 1% per year. (Decree No. 151/2006/ND-CP dated 20 December 2006 by Government on state investment development credit and export credit and Decree No. 106/2008/ND-CP dated 19 September 2008 by Government on amendments, supplements of some articles of Decree No. 151/2006/ND-CP)

In 2017, the Government of Vietnam has officially promulgated Decision No. 11/2017/QD–TTg with an incentive mechanism to encourage the development of solar power projects in Viet Nam. The new regulation, which introduces a Feed–in Tariff (FIT) scheme for solar plants and a net metering mechanism for residential PV, will come into force on Jun. 1, 2017 and will expire on Jun. 30, 2019. Under the new scheme, owners of grid–connected PV power plants will be granted a 20–year FIT of 2,086 ($0.091)/kWh excluding VAT. This rate, however, is subject to changes based on the VND/$ exchange rate. FIT calculation based on the key parameters, cost per unit, O & M costs, solar cell power generation rate, corporate income tax, project life cycle, loan/equity ratio, interest rate and equity IRR. The Viet Nam Ministry of Industry and Trade referred the results of a cost–per–unit study from many countries over the world, the financial condition and the use of commercial loans under Vietnam's Law to calculate 9 FIT for solar grid connected projects with variable input parameters (cost per unit, interest rate, IRR). The results are summarized in Table 2.

The power generated by all grid–connected PV installations will be sold to local power utility Electricity Vietnam (EVN). Furthermore, solar power producers will also be exempted from paying taxes on importing goods for their fixed assets. As for net metering, Vietnam's Ministry of Trade and Industry will be in charge of annually issuing the related buying and selling prices for rooftop grid–connected PV systems based on the VND/$ exchange rate. (Decision No. 11/2017/QD–TTg).

Table 2. FIT Calculation

No	Cost per unit (USD/kW)	FIT US cent/kWh (equity IRR)		
		11%	12%	13%
I.	Interest rate: 8.5%/year			
1.	1,000	8,10	8,38	8,66
2.	1,100	8,82	9,13	9,44
3.	1,200	9,54	9,88	10,21
II.	Interest rate: 9.5%/year			
1.	1,000	8,29	8,58	8,86
2.	1,100	9,03	9,35	9,66
3.	1,200	9,77	10,11	10,46

SOLAR CHALLENGES IN VIETNAM

The development of renewable energy, especially for solar power, which is getting a special concern in Vietnam from both government and investors. Along with the development of the available resources as solar resources, the removal of existing difficulties by creating incentives for solar energy development for investors is very necessary. Because Vietnam has not been able to produce domestic equipment for renewable energy projects, investors are facing many difficulties in accessing preferential loans. Some of them have access to preferential loans, but they had other problems such as having to buy the technology specified by the lender. Vietnam does not have a specific and transparent policy for the development of renewable energy. The support mechanism, which still depends on each project, led to many shortcomings in electricity purchase price and mobilization capacity.

Another problem is the management of renewable energy projects. The overlap management makes many difficulties for investors to access investment processes. The Ministry of Industry and Trade is the core unit for management, planning and licensing

renewable energy. Ministry of Science and Technology appraises them accordance with national standards. The Ministry of Construction manages buildings using renewable energy. The Ministry of Agriculture and Rural Development manages biomass energy.

In recent years, the government of Vietnam has made great strides in supporting the development of solar power. Besides the incentives mechanism for solar power development, at the same time, there is great interest from foreign investors for solar power projects. However, there are many other obstacles. There are currently areas that attract a lot of registered projects, but transformers in the project site do not have sufficient capacity to absorb electricity from solar power projects. It is a good example to explain the obstacle.

CONCLUSION

With the advantage of the solar radiation of the tropical monsoon country, Viet Nam identifies solar power as one of the main sources for clean energy development. The revised of Viet Nam master power plan VII affirmed the importance of clean energy sources for securing electricity for socio-economic development associated with the environment, especially when the government commits to mitigate greenhouse gas emissions by reducing the coal-fired power plants development at COP21. At the same time by creating incentive policies to encourage the development of solar energy, Viet Nam also needs to solve current problems such as reducing loan interest rates for investors, support investors to access the PV market and together with foreign investors who are looking for the local partner and so on. Therefore, there will be more extensive market research requested. Along with that, policy-makers can help develop the market with awareness campaigns, set quality standards for components, installations and improving the capacity of all related parties in the market.

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[6] Decree No. 106/2008/ND-CP dated 19 September 2008.

[7] Decree 04/2009/ND-CP dated 14 January 2009, Article 16.

[8] Decision No.2068/QD-TTg dated 25 November 2015.

[9] Decision No.428/QD-TTg dated 18 March 2016, Article 1.

[10] Decision No.11/2017/QD-TTg dated 11 April 2017, Article 9, 10, 11 and 12.