

POLICY ON DEVELOPING HOUSEHOLD SOLAR ENERGY IN VIETNAM

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Abstract: In recent years, the demand for electricity for production and socio-economic development has been increasing, which is a tremendous challenge for the electricity industry in the context of primary energy supply in the world. Water such as coal, oil, and gas being exhausted is not enough to meet domestic demand, the development of solar power in general

Keywords: policy, renewable energy, solar power

Introduce

Vietnam is accelerating the process of industrialization - modernization of the country; the electricity demand is increasing, putting tremendous pressure on the electricity industry. While the hydroelectric power source is almost fully exploited, the development of new coal-fired power plants has not been approved by the public and local agencies. The Ninh Thuan, nuclear power project, has been suspended, the product of thermal gas and Renewable energy is an inevitable trend, and the development of solar power, especially rooftop solar power, is a "hot" issue not only in Vietnam but all over the world.

Therefore, to develop solar power, it is necessary to study and learn from the experiences of developed countries and go ahead in formulating policies and drawing successful lessons for Vietnam in developing solar power develop solar energy in the right direction, efficiently and sustainably.

Vietnam is encouraging the development of solar power

Solar radiation is an essential resource in Vietnam. On average, total solar radiation in Vietnam is about 5kWh/m²/day in the central and southern provinces and about 4kWh/m²/day in the northern regions. From below the 17th parallel, solar radiation is not only abundant but also very stable throughout the time of the year. The number of sunshine hours per year in the North is about 1500-1700, while in Central and Southern Vietnam, this number is around 2000-2600 hours per year.

In general, the amount of solar radiation in the Northern provinces is reduced by 20% compared to the Central and Southern regions. The amount of solar radiation is not evenly distributed all year round due to the drizzly rain in winter and spring. For a long time, the source of solar radiation was negligible, only about 1-2kWh/m²/day, a significant obstacle to installing solar power. Meanwhile, the southern provinces have the sun shining all year round, stable even in the rainy season. Therefore, solar radiation is an excellent resource for the central and south regions.

Legal documents related to solar power in Vietnam

Decision No. 11/2017/QĐ-TTĐ dated 11/4/2017 of the Prime Minister on the mechanism to encourage the development of solar power projects in Vietnam; Circular 16/2017/TT-BCT dated September 12, 2017, on project development and sample power purchase agreement applicable to solar power projects; Decision No. 02/2019/QĐ-TTĐ dated January 8, 2019, amending and supplementing several articles of Decision No. 11/2017/QĐ-TTĐ on the mechanism to encourage the development of solar power projects in Vietnam. Male; Circular No. 05/2019/TT-BCT dated March 11, 2019, amending and supplementing several articles of the Minister of Industry and Trade's Circular No. 16/2017/TT-BCT dated September 12, 2017, regulating project development and the Model Power Purchase Agreement applicable to solar power projects; Decision No. 2023/QĐ-BCT dated July 5, 2019, approving the Program to promote the development of rooftop solar power in Vietnam from 2019 through 2025; Decision No. 13/2020/QĐ-TTĐ dated April 6, 2020, on the mechanism to encourage the development of solar power in Vietnam.

After two years of implementing Decision No. 11/QĐ-TTĐ of the Prime Minister on the mechanism to encourage the development of solar power projects in Vietnam, the solar power industry in Vietnam has exploded, making Vietnam the leading country in Southeast Asia in the solar power market. According to the Electricity of Vietnam (EVN), by the end of May 2020, the total number of rooftop solar power projects will be 31,506, equivalent to an installed capacity value of approximately 652 MWp of output Electricity generated to the grid reached 185,683 million kWh. The industrial sector accounts for 56% of the total installed capacity of rooftop solar PV, followed by the household sector (28%), the commercial sector (11%), and the administrative and non-business sector (5%). The southern provinces and cities (including Ho Chi Minh City) remain the top localities in rooftop solar power installation, with the number of projects and the total installed capacity.

Recently, Decision No. 13/2020/QĐ-TTĐ, dated April 6, 2020, of the Prime Minister, on the mechanism to encourage solar power development in Vietnam (Decision 13) officially took effect effective from May 22, 2020, to replace Decision No. 11/2017/QĐ-TTĐ, which expires from June 30, 2019. Accordingly, rooftop solar power is expected to thrive in the coming time.

One of the critical issues that people and electricity users are interested in is the price of rooftop solar power from June 30, 2019. According to Decision 13, Power Corporations will sign power purchase contracts and pay electricity bills for rooftop solar power projects with fixed meter readings to start delivering and receiving electricity and pay electricity bills from 1/7/2019.

Firstly, suppose the project has a commercial operation date before June 30, 2019. In that case, the purchase price of electricity from rooftop solar power projects shall be applied according to the Prime Minister's Decision No. 11/2017/QĐ-TTĐ. On 11/4/2017, is 9.35 cents/kWh, equivalent to 2,164 VND/kWh, excluding value added tax and applied within 20 years.

Second, suppose the project has a time of operation and confirmation of meter readings in the period from July 1, 2019, to December 31. In that case, 2020, the purchase price of electricity from rooftop solar power projects shall be applied according to Decision No.

13/2020/QD-TTg dated April 6, 2020, of the Prime Minister is 8.38 cents/kWh, equivalent to 1,943 VND/kWh, excluding value-added tax and applied within 20 five; central exchange rate of Vietnam dong to US dollar announced by the State Bank of Vietnam applied to the last day of the previous year to calculate electricity bill payment for the following year.

Decision 13 of the Prime Minister officially took effect as a "push" to create momentum for developing rooftop solar power. With many benefits brought to the investor and the community, the installation of solar power Rooftop sky in recent years has interested people and businesses.

Practical benefits of rooftop solar power

Including benefits for the people (Investor) and for the whole national power system, which is in a situation of scarcity of supply because many new power sources are planned to be built without public support, so construction has not yet commenced and many sources are under construction but behind schedule as planned.

- Benefits for the people

+ Reduce monthly electricity costs because electricity is produced and used directly at peak hours or lowers the price of higher-order electricity (prices of levels 4, 5, 6).

+ Increase income by selling excess, unused electricity to EVN at the price of 1,940 VND/kWh (8.38 cent), applicable to rooftop solar power projects that have time to take over and put into operation. From July 1, 2019, to December 31, 2020, the rooftop solar power purchase and sale contract is signed with the Electricity unit authorized by EVN for 20 years from the power generation operation. The converted dollar price is taken according to the data published by the State Bank of Vietnam on the last day of the previous year to calculate for the following year.

+ Does not take up the land area when installing (roof solar power accounts for 5-6 m² /1kWp; solar energy on the ground occupies about 11-13 m² of ground /1kWp) + Effective heat protection for the project.

- Benefits for the country and the national electricity system

+ Reduce the peak load of the power system at peak hours, thereby reducing the pressure to mobilize the power supply for the power system at peak hours, bringing into full play the efficiency of the generator at off-peak hours, reducing stress on the power system dispatching agency, increasing the ability to recover investment capital, ensuring social security.

+ Reduce overload for transmission lines during peak hours, and reduce investment pressure to upgrade transmission lines.

+ Contributing to environmental protection.

+ Reduce pressure in land use planning in localities.

Strategic directions for renewable energy and solar energy development

Over the years, the Party and State have paid particular attention to the development of renewable energy, including the policy of developing solar energy. Resolution of the Ninth Party Congress defining the orientation for renewable energy development: "*Prioritize the development of new and renewable energy sources such as solar power, hydroelectricity*"...

Research develop new and renewable forms of energy to meet the energy demand, especially for remote islands and mountainous areas far ".

The government has also issued many policies to encourage the development of renewable energy, set targets for the use of renewable energy, and aim for a competitive electricity market with diversified investment sources and business models. The government has also advocated the development of clean, recycled energy to raise a strong power quantity country family; copper time fit international cooperation, mobilize resources for exploitation and use of renewable energy, integrate renewable energy development program with other socioeconomic development programs. The 2013 Constitution clearly states: " *The State encourages all activities of environmental protection, development, and use of new and renewable energy "*.

Regarding developing electricity sources using renewable energy such as solar power or some type of power quantity other, Country festival is already your onion. The law Electricity force 2004 and Electricity Law force five 2012, Cut fig, fix change one number thing of the law Electricity force five 2004. In there, Thing 4, clause first of the law rules determined like after: "*Phat develop durable steady above muscle department optimally exploit all resources, meet the electricity demand to serve the people's life and socio-economic development, contribute to ensuring national defense and energy security quantity*"; "*Push intense job to declare waterfall and history use the source recycled energy to develop "*. Article 16, Clause 1, Investment Law 2014 stipulates preferential policies to create recycled energy speak shared and electricity face God speak privately. Follow these, job head personal product export new energy, clean energy, renewable energy in the top priority industries private.

To realize the policies of the Party and State, the Prime Minister, together with the Ministry of Industry and Trade, has also issued many strategic decisions on the development of specific solar power sources. Vietnam's National Renewable Energy Development Strategy to 2020 with a vision to 2050 approved by the Prime Minister to encourage the development and use of new energy, with a financial support mechanism for research and pilot production and build a pilot model of renewable energy, import tax exemption, and reduction, production tax and circulation of machinery, equipment and spare parts for renewable energy development.

Vietnam's national energy development strategy to 2020 and vision to 2050 also stated the viewpoint of synchronous and rational development of the energy system, including electricity, oil, gas, coal, and new and renewable energy; in which the development of clean energy, new and renewable energy is concerned.

In these strategic directions, the goal of solar power development has been gradually adjusted to increase and become more specific for each industry and each priority area. Especially, distributed (rooftop) solar power has been included as a strategic development objective.

Enforcement policies related to solar energy God

Time near this, Main Government Vietnamese male already works dynamically arrive to submit clean energy transition in the following main directions:

1) Macro policy: market formation of recycled energy 2)

Economic policy: support, incentives by price, fee, tax...

3) Approach to raise awareness, information - propaganda transmission

In which the most recognizable and prominent is the second group of policies. 2017 is an essential milestone in implementing procedures to promote solar power in Vietnam with the Prime Minister's Decision No. 11/2017/QĐ-TTg dated April 11, 2017, on the incentive mechanism for solar power generation encourage the development of solar power projects in Vietnam. To concretize this Decision, the Ministry of Industry and Trade has issued Circular 16/2017/TT-BCT dated September 12, 2017, providing detailed guidance on project development regulations and a Model Power Purchase Agreement applicable to grid-connected solar power projects or electricity power quantity face God draw the net. Pine private yes brand force tell are from day October 26, 2017, and specific regulations on: (i) Planning and development of solar power projects God;

(ii) Electricity selling price of grid-connected solar power projects and rooftop solar power projects; (iii) Sample Power Purchase Agreement applicable to grid-connected and rooftop solar power projects; (iv) Regulation of responsibilities of relevant organizations and individuals. The promulgation of the circular has helped transparent investment procedures for solar power development, promoting investment in solar power, helping to add electricity capacity to the power system, help get a raise Billion important recycled energy in soy sauce hybrid, term processing extra belong source power fossil fuels, help ensure energy security, reduce greenhouse gas emissions, protect the environment and develop sustainably steady.

The specific support mechanisms for renewable energy in Vietnam are a combination of financial incentives, tax incentives, and market price support. These include: 1) Information allowance via Fund tell guard lip school Vietnamese male (VEPF) and exempt fee tell guard lip school; 2) Chi fee avoid Okay (ACT); 3) Price buying electricity pros treat (FIT) and 4) the pros treat other on land use rights, access to concessional capital, tax exemption, lending and credit provision for investment through the Vietnam Development Bank (VDB) and regulations such as power purchase agreements (SPPA).

- *Group of economic policy tools economy*

Take awake Okay range mandarin essential, profit position and profit use of the source recycled energy in the face of increasing electricity consumption demand for economic development (with an increase in consuming electricity row five are from 10-15%), near this Main government Vietnamese male already, see review job research, survey close, recommended encourage and support the home head private, chief in and outside country, head invest in the attend sentence recycled energy pine via labor tool support talent support price nice support grant. In the type pros treat, floating turn on best prominent pine via plain price buying electricity pros treat (FIT) with the highest preferential purchase price per 1kWh for solar energy of 9.35 US cents (2,174 equivalent). VND/kWh).

In principle, organizations and individuals participating in developing clean and renewable energy are supported with tax, capital, and land incentives to build production

facilities using renewable energy, clean energy, and environmentally friendly energy. Environmentally friendly are incentives beyond the price. For example, different economic sectors are also facilitated for investment and development recycled energy are not cause umbrella infected lip school, special bye live area shallow village, domain mountain, sea island and recommended encourage head private build network net electricity or the station play electricity use recycled energy.

Decision No. 11/2017/QĐ-TTg issued on April 11, 2017 by the Prime Minister on the mechanism to encourage the development of solar power projects in Vietnam also shows the State's view on prioritizing the development of solar power projects incentives for business investors for projects using solar energy. Specifically, investors are directed to investment incentives in related issues such as:

(i) Investment capital and tax incentives, whereby organizations and individuals are participating in the investment and development of solar power projects, can legally mobilize capital from domestic and foreign organizations and individuals according to the provisions of law. Current law; Okay exempt tax import password opposite to with the row chemistry import password to create the asset try determined, absolute presently follow the rules determined of France the law presently onion about tax export Import duties and taxes on goods imported to serve the project's products are raw materials, supplies, and semi-finished products that cannot be produced domestically.

(ii) Land incentives: projects connected to the solar grid are exempted from land use fees, land rents, and water surface rents following current laws applicable to projects with investment incentives; create the most favorable conditions in job collect arrange fund soil to the owner head private yes can real presently the attend electricity project face God copper time the excuse France waiter often, support prize launch face The degree shall be carried out in accordance with the provisions of the current law on the land band.

Decision 130/2007/QĐ-TTg dated August 2, 2007, on several mechanisms and finance for investment projects under the clean development mechanism, considering solar energy projects and wind like to be the attend sentence follow muscle processing play develop clean. Do so, then attend sentence still take supported grant are from Home country pine via Fund Tell guard Lip school Vietnamese male give events difference between spend fee real economy head enter and price sell electricity follow satisfied favorable in fit copper to provide generated energy out.

Circular 16/2017/TT-BCT dated September 12, 2017, of the Ministry of Industry and Trade on tax exemption and subsidy incentives for the use of solar energy in the development of solar power projects, is also mentioned. Specifically, the attached Appendixes include the following points: (i) Contents of the local solar power development planning project; (ii) Sample power purchase and sale contract applicable to grid-connected solar power projects ; (iii) Sample Power Purchase Agreement for rooftop solar power projects. In addition, investors, construction contractors of power projects quantity face God still Okay enjoy the pros treat about tax collect

import business Karma, tax import of solar power equipment, exemption and reduction of land use fees, land rents etc.. according to current regulations on investment private.

Most recently, the Ministry of Industry and Trade issued Decision 2023/QĐ-BCT dated July 5, 2019, about Chapter submit end to push play to develop electricity face God pressure roof in Vietnamese male stage 2019-2025 with period hope yes more about 1000.00 household family greed family. The Program aims to support the implementation of the National Strategy on Renewable Energy Development via prize France about play develop market school labor turmeric electricity face God above roof home in Vietnam and encourage organizations and individuals to invest in this field. With muscle processing subsidies, each household can be supported from 3-10 million VND when installing the system at home.

- *Non-economic policy tools economy*

In addition to the use of economic incentives, tools for knowledge dissemination, awareness raising, and propaganda are also emphasized in the determined direction war comb (board twelfth). The chapter submit elevate high take awake, luck Propaganda activities were also carried out targeting 1) areas with difficult electricity connection like live region deep, region distant, record gender sea island, 3) the group People history use/home head distributed solar power; 3) mainstreaming the use of new and renewable energy into energy saving and other national target programs such as rural electrification, afforestation, poverty alleviation, clean water, VAC.

The goal is to encourage people and households to increase electricity savings, and history use power quantity face God like one source replace position ability exam. This tool is mainly implemented in the form of programs and projects at the local level, in addition to the Decision 2023/QĐ-BCT dated July 5, 2019, applied nationwide above.

The Electricity of Vietnam Group also implemented many activities and programs to announce transmission; advertising ba arrives people, the household family family history use power quantity face heaven, pepper expression to be "*Chapter submit advertising ba jar heat country hot plain power quantity face heaven*". EVN implements this Program under the National Target Program on economical and efficient use of energy (launched by the Ministry of Industry and Trade) with the funding support of VND 77 billion, of which the beneficiaries are: and support scale includes households with small-scale, the capacity of 120 liters - 250 liters, supported 1 million VND/set and the Sick institute, home young sample spear, school learn, home row, ahh hotel yes industrial scale, capacity 500 liters or more, supported 1 million VND/200 liter.

The impact of this Program is very significant and has brought many practical effects, stimulating the market for solar panels in Vietnam. Currently, the country has about 600,000 solar water heaters being consumed on the market, contributing to part cut reduce labor rate top about 360MW, price treat period thrifty about 1.512 billion dong, the average annual growth rate of the energy water heater market face God than 40%. Outside out, chapter submits still yes idea means about tell guard lip environment and economic and social development of the

country, contributing to the completion of the Government's National Target Program on economical and efficient use of energy government.

Recent preferential policies on rooftop solar power have stimulated the interest of the end consumer group, households/small businesses, to i) take aware about brand fruit power quantity; ii) brand fruit terrible economy are from job head private electricity Sun; iii) transforming the role of consumers into producers in the energy sector quantity face God. One number geography direction Go head like TP Ho Chi Minh City, Da Nang...have very active in promoting and supporting people in installing and using rooftop solar power. This is a very effective supplementary tool for the economic incentives policies to help pillar.

Overview of household solar power system family

The installation of a rooftop solar power system, in addition to saving the maximum electricity costs for the family, the highlight of this power system is that when there is excess electricity that is not in use, customers can sell it back to the Electricity industry, with an average price of 2,068 VND/kWp (According to Decision 11/2017/QD-TTg of the Prime Minister). Because so, history uses electricity face God is not only period thrifty spend fee, tell guard lip school but also see to be prize France period thrifty electricity power worth head private brand fruit in time the point Currently.

Advantages of installing a solar power system: Suitable for areas with no electricity grid, an unstable electricity grid, or you want to use energy to save daily electricity consumption.

- Create an independent, green, clean power source, reduce CO2 emissions, and protect the school environment.
- Provide uninterrupted power supply, reduce excessive dependence on the national grid, and reduce the risk of power shortage in place
- Quy tissue small, install put feces canopy, fight to connect convenient profit enter generation system Summer pressure and existing central voltage, no additional investment in transmission system is required load.
- Cut reduce dark multi spend fee electricity give family and special bye live frames price electricity step high (2,927 VND/Kwh).
- Increase heat resistance for existing houses and buildings possessive - Ease of installation, long-term maintenance, and single operation simple - Pretty long life, about 30 five.
- Time collect anise capital relatively fast (about eight years), create source manage import tree move for a long time after there
- Active dynamic saddle static and in heal, are not claim to ask more any keep source course Is it different?

Disadvantages of installing a solar power system:

- The initial cost is still very high compared to the average income of Vietnamese workers. Although the theoretical durability is about 30 years compared to the original private

and level degree, collect anise capital to be physically fit. However, the course spending fee is private. The initial installation of this system is also a big obstacle for households.

- The system's performance in delivering sufficient electricity depends on the area and the location of the solar panel installation that receives suitable sunlight. If like live home area little sunny, direction to pick up sunny are not standard, taste wisdom hidden High-rise buildings, trees can hardly receive good energy best.

Specification of household solar power system family

Currently, on the market for rooftop solar power systems installed in residential areas, there are two essential technical solutions:

(i) **Solar power connected to the grid, also known as rooftop solar**, is directly related to the grid and can sell excess electricity to the electricity industry. A solar panel system was installed on the roof. Solar system and create outsource electricity clean to draw net electricity bow grant on duty next give the set electrically. Because the system does not use batteries, families do not have to pay extra fees to head private, tell maintenance, tell nursing. Outside out, copper lake two-afternoon buying sell electricity of EVN is the ideal solution to replace the investment in storage system electricity.

(ii) **Electricity power quantity face God hybrid** spend guest row would like history use electricity even when the bag passes electricity net country family do yes more the set charging battery rules attend store. Here to be prize the method used to maintain backup power for electrical equipment prioritized for use in the household at night or during a power outage; suitable for the area not/not meshed.

- The system prioritizes using solar energy to convert into electricity turn afternoon bow grant give the set bag electricity Okay family family pros fairy history used, copper time charging provide battery regulation. If source power quantity faces God, residual will Okay draw enter grid to supply electrical equipment and charge batteries. In case of power failure, the system uses solar power and battery power to provide priority equipment.

- The solar power storage system charges the battery to ensure 24/7 energy security for priority electrical equipment. The system is not dependent much enter electricity net Candlestick when the net electricity meets events try, Hentai dynamic of the family is not affected enjoy.

Depending on user needs and financial ability, households will choose a solution to install, but currently, the most commonly installed system is the grid-tied solar power system. *The equipment in the grid-tied solar power system includes:*

1. Solar Panels (Solar Panels)

Some basic information about solar panels used in natural solar power systems:

- * Efficiency: from 16% – 20%
- * Standard power: from 275Wp to 400 Wp
- * Number of cells per panel: 60 & 72 cells

- * Cell Size: 5" – 6"
- * Cell type: monocrystalline and polycrystalline
- * Material of frame: aluminum
- * The average life of panels: more than 30 years (level high)

In a sunny day, the sun provides about 1 kW/m²/1 hour to the ground (when the sun is standing in the shade and clear of clouds); every hour, each kWp solar cell will produce 1kWh electricity, central jar every day yes are from 4-5 hours like so. Whether good or not, the Labour rate of the one-generation system depends on how we connect the solar panels, the orientation of the meetings, related equipment such as wires, etc.

Solar panels installed outdoors to receive the best sunlight from the sun should be designed with unique features and materials, able to withstand extremes of weather and gases. Afternoon, temperature...

2. Solar grid adapter God
3. Security cabinet DC/AC
4. 2-way electric meter power
5. Magnetic monitoring system distant

Some solutions to develop solar power

However, the development of renewable energy, especially solar power, including rooftop solar power, still has certain limitations and is not commensurate with its great potential, especially in central and southern regions.

For rooftop solar power, although it is straightforward to do, it has not been achieved as expected because the initial investment costs are still relatively high, and there has not been strong participation and support from financial institutions; The market for solar power products and services is quite diverse, but there are no specific technical standards, causing difficulties for people and businesses wishing to invest.

For rooftop solar power to continue to develop, successfully implement the goals of Resolution No. 55-NQ/TW dated February 11, 2020, of the Politburo on orientations of Vietnam's National Energy Development Strategy to In 2030, with a vision to 2045, the author of the article would like to propose some additional solutions to develop rooftop solar power as follows:

To the Government

Firstly, it is necessary to prioritize the development of rooftop solar power in the general structure of solar power development (analyzed in section 4.2 above).

Second, the government urgently directs the authorities to issue specific technical standards for rooftop solar power installations.

Third, it is necessary to extend the time for rooftop solar power and have a clear roadmap on mechanisms and policies for this segment.

Fourth, there should be a mechanism to support the installation price (initial) of rooftop solar power for each region because regions have different amounts of solar radiation, so rooftop solar power develops evenly throughout the country. .

Fifth, at present, many people still do not fully understand the installation and benefits of rooftop solar power, so the government, as well as businesses, should diversify the organization of communication to the community, primarily to communicate to each household from the investment ability as well as the benefits achieved of this model. *On the business side*

Stemming from the common interests of society and the interests of people and businesses, EVN has been implementing many support and encouragement activities, especially with rooftop solar power, simplifies registration procedures, and provides online rooftop solar power purchase and sale registration services.

Currently, connecting and buying solar power is straightforward; after installation, investors who want to sell electricity need to contact EVN's Customer Care Center for free inspection support fees for grid conditioning, 2-way galvanometers, and signing of solar power purchase and sale contracts.

EVN is continuing to build and perfect the website solar.evn.vn to create favorable conditions for all people and businesses to learn and access all relevant information about rooftop solar power on applications using information technology and customer care websites of EVN.

With the great potential for rooftop solar power development in Vietnam, EVN identifies supporting the development of rooftop solar power as one of the essential policies because it is an adequate power supply, a solution to the problem practical to meet the increasing electricity demand.

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