

Solutions to Establish Ninh Thuan as A Renewable Energy Centre in Vietnam

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Abstract: Ninh Thuan Province has the lowest annual rainfall in Vietnam with a short rainy season, a high-temperature environment, high wind speeds and solar radiation, as well as high evaporation. This harsh climate has made it Vietnam's most arid province. However, these unfavourable conditions have presented the province with a golden opportunity to develop renewable energy (also known as clean energy) sources. By leveraging the Government's policies on promoting this form of energy, Ninh Thuan is the leading locality in terms of the number of solar power projects nationwide, and it is in a position to become Vietnam's largest renewable energy centre. However, the rapid growth of renewable energy projects in the province is also facing bottlenecks in the dismantling of some outmoded mechanisms such as the existing power transmission infrastructure, which cannot meet demand. To ensure the sustainable development of renewable energy projects in Ninh Thuan Province, together with national energy security, it is essential to put specific mechanisms and policies in place.

Keywords: Solutions, mechanisms, policies, renewable energy centre.

Subject classification: Economics

1. Introduction

Ninh Thuan Province is located in the South Central Coast of Vietnam. Its harsh climate is characterised by low annual rainfall and droughts, with a short rainy season, heat, strong winds (some of the highest wind speeds in the country), high solar radiation, and strong evaporation. Such conditions have resulted in the largest

area of desert/arid land in Vietnam covering about 41,021 ha, which accounts for 12.21% of the whole country's natural land. On the other hand, these unfavourable climatic conditions have given the province the edge over other areas for developing renewable energy (solar-wind power). By making good use of the Government's clean energy policies and benefiting from specific mechanisms applied to Ninh Thuan Province's socio-

economic development (2015 to 2020), this locality leads the way in the number of solar power projects.

By the end of December 2019, the province boasted 17 grid-connected projects with a total capacity of 1,143 MW. In particular, after Resolution No.55-NQ/TW on the orientations of “Vietnam’s National Energy Development Strategy to 2030 with a vision to 2045” was issued by the Politburo on 11 February 2020, excellent opportunities arose for Ninh Thuan to become the largest renewable energy centre in Vietnam. During the construction and operation period, solar and wind power projects contributed greatly to socio-economic development, bringing about an impressive transformation for the province in terms of: contributing to the state budget; job creation; tourism, resort development, and real estate market development; contributing to social protection; and so on. However, this rapid growth of renewable energy projects is also being hindered by unproductive methods. These need addressing, such as an underperforming power transmission infrastructure with insufficient electrical capacity, conflicts in planning, issues with land funding for projects, the lack of an ecosystem to support renewable energy development, as well as environmental and social issues arising during project operation. Therefore, special mechanisms and policies must be put in place to ensure projects develop in a sustainable manner, and for Ninh Thuan Province to become Vietnam’s national renewable energy centre.

2. Literature review and methodology

According to the International Renewable Energy Agency [47, pp.13, 15], renewable

energy is generated from natural resources including: sunlight, geothermal heat, wind, tides, water, and sustainable biomass. Therefore, the supply of clean/renewable energy is infinite and constantly replenished over a short continuous period of time. Enjoying an economic growth rate of more than 7% from 2008 to 2019, Vietnam has joined the ranks of middle-income countries [42]. However, the nation still faces the challenge of unbalanced energy security due to the rising demand in energy for production and business/service activities, which is compounded by a limited power supply. By 2030, hydroelectricity may run out of room for further investments in, and thermal power sources will be scarce due to the exhaustion of coal resources and the environmental pollution caused by this kind of power. To ensure rapid and sustainable economic growth and avoid the middle income trap, Vietnam needs to diversify its power supplies. Hence, investment in renewable energy is inevitable, especially in the sources of wind, sunlight, biomass, and municipal solid waste. Accordingly, the Vietnamese Government has issued many policies to develop renewable energy and enhance national energy security. This not only ensures a sustainable supply, but also contributes greatly to local economies. Meeting the targets set for reducing global greenhouse gas (GHG) emissions in the 2015 Paris Agreement on climate change will depend heavily on the emerging economies. Building Vietnam’s roadmap for renewable energy will be the foundation for sustainable development in the future [25].

The potential of renewable energy in the country has been assessed by many organisations and individuals through various

publications such as those issued by the German Agency for Development Cooperation (GIZ) in 2013, the World Bank (WB) in 2018, and the United Nations Development Programme (UNDP) in 2016. Studies have shown that Vietnam has limitless renewable energy potential, especially solar, wind, and biomass. On this basis, in 2015 the Ministry of Industry and Trade (MOIT) initiated a project to develop renewable energy in Vietnam up to 2030. This initially put together methods and policies for the following sectors: market, electricity price policy, investment mechanism, payment mechanism, and preferential policies on taxation and land. Following on from this, the MOIT and the Danish Energy Agency published annual reports on Vietnam's energy prospects in the five consecutive years from 2015 through 2019 [8], [9], [10], [11]. These also mention the outlook for the renewable energy market. Studies of GreenID (2016, 2018a, 2018b, 2018c) and Bui Quang Tuan and Ha Huy Ngoc (2019) have discussed the transition to renewable energy in Vietnam and its contribution to energy security, as well providing scenarios for its development [19], [20], [21], [22], [43]. Many studies and articles have been published on Ninh Thuan Province's renewable energy potential [46], [32], [26]. Some other articles also discuss solutions and ways of promoting the province's renewable energy development [23], [41], [1], [3]. The aforementioned studies have raised issues about supporting mechanisms for wind and solar power, renewable energy planning, criteria for the establishment of a renewable energy centre, and environmental factors that pertain to the region's renewable energy development. An overview of these

studies shows that the potential of, and policy solutions for, renewable energy in this locality have been considered through a relatively diverse range of content and scope, which may serve as useful references for this paper. However, there is room for improvement. Specifically, in the field of research, most of the studies mention the potential for, and current status of, local renewable energy development. However, the "bottlenecks" and challenges that need to be removed to promote sustainable development of this inexhaustible resource have not been pointed out.

The main methodology used in this paper is to review studies and conduct statistical and descriptive analysis, together with utilising data sources on renewable energy potential, assessing the current status of renewable energy in Ninh Thuan Province and other information collected by the authors from the MOIT, the Institute of Energy, Provincial People's Committee, Department of Industry and Trade of Ninh Thuan Province and other bodies in the period from 2013 until now.

3. Research findings and discussions

3.1. Existing mechanisms and policies for solar and wind power projects

Renewable energy mechanisms and policies can be classified into five main categories: (i) financial and credit incentives to fund projects; (ii) tax incentives for renewable energy projects; (iii) electricity price support and adjustment; (iv) mechanisms and policies specifically applicable to Ninh Thuan Province; and (v) national energy development strategy.

3.1.1. Financial and credit incentive mechanism for solar and wind power projects

- Decree No.75/2011/ND-CP: projects on all renewable energy sources (wind, solar, geothermal, bioenergy, micro hydro, and so on) will be supported with investment and export credits covering construction costs, up to 70% of the total investment in the project (excluding working capital). The credit is provided for up to 12 years with a similar interest rate as government bonds [13].

- Scientific research and technology development programmes for renewable energy will also be supported and financed by the Government through the following programmes: State-level key programmes, National Science and Technology Programme, Science and Technology Development Fund, National Technology Innovation Fund, and so forth.

3.1.2. Tax policy for solar and wind power projects

- Corporate income tax: on 26 December 2013, the Government issued Decree No. 218/2013/ND-CP, detailing and giving guidance on the implementation of the Law on Corporate Income Tax. Accordingly, the exemption or reduction of corporate income tax applies to newly established enterprises operating in the field of wind and solar power. These enterprises are entitled to a preferential tax rate of 10% (instead of the standard 20% tax rate in place since 1 January 2006). In addition, these enterprises may enjoy tax incentives including tax exemption for the first four years and a tax reduction rate of 50% for the next nine

years. The corporate income tax rates for renewable energy-based power generating enterprises can be summarised as follows: 0% during the first to fourth year, 5% during the fifth to 13th year, 10% during the 14th to 15th year, and 20% from the 16th year onwards [14].

- Import tax: for wind power projects, investors could be eligible for import tax exemption on equipment not produced in Vietnam. In the first 15 years, the corporate income tax rate can be applied at 10% and extended for a further 30 years; or the tax could be exempted for the first four years and halved during the next nine years. The depreciation is 1.5 times faster than for conventional projects, which can be followed by the exemption of land use taxes and fees, and environmental protection fees. Solar power projects can benefit from import tax exemption on imported goods used to create fixed assets for these projects, specified in Article 12 of Decree No.87/2010/ND-CP dated 13 August 2010 by the Government which detailed on the implementation of the Law on Import and Export Duties [12].

- Land rent: the State will lease land to be used for such projects where a site has been cleared ready for buildings to be constructed, using investment gathered from *xã hội hóa* (i.e non-State, often incorrectly translated into English as “socialised” - *translator’s note*) resources in the form of free or reduced land lease for the entire lease term as stipulated in Clause 3, Article 1 of Decree No.59/2014/ND-CP dated 16 June 2014. This amended and supplemented a number of articles in Decree No.69/2008/ND-CP dated 30 May 2008 issued by the Government regarding policies on encouraging the mobilisation of

non-State resources in fields of education, vocational training, health, culture, sports, environment, and renewable energy. In addition, solar and wind power projects, transmission line works, substations for grid connection are exempted from land use levy, land rent and water surface rent under the current land laws [15].

3.1.3. Support mechanism for solar and wind power purchase prices

- Solar power: Decision No.11/2017/QĐ-TTg dated 11 April 2017 promulgated by the Prime Minister relates to the incentive mechanism for solar power development in Vietnam, which set the power purchase price at the agreed location at US cents 9.35/kWh. The electricity price is applied to grid-connected solar power projects with the efficiency of solar cells of over 16%, or the efficiency of modules of over 15%. For rooftop solar projects with a net metering system, the excess power purchase price is the same as the grid-connected solar project price, paid at the end of the year or upon the completion of the Power Purchase Agreement (PPA). The power purchase price is adjusted annually according to the USD to VND exchange rate [36]. Subsequently, the Prime Minister issued Decision No.02/2019/QĐ-TTg dated 8 January 2019 to amend/supplement a number of articles of Decision No.11/2017/QĐ-TTg, dated 11 April 2017 also issued by the Prime Minister on the incentive mechanism for solar power development in Vietnam. The Decision amended regulations on electricity prices for rooftop solar power projects. The new regulations stipulated that generated power for rooftop solar projects would be

calculated separately by different meters at delivery and receipt points. The electricity seller shall pay for the amount of power received from the grid in accordance with the current regulations. The electricity purchaser shall pay for the amount of power generated from rooftop projects and fed to the grid at the power purchase price prescribed for grid-connected solar projects. Both parties are responsible for implementing the applicable provisions of the laws on taxes and fees. Power purchase price for rooftop projects for the subsequent year was calculated based on the VND to USD exchange rate announced by the State Bank of Vietnam on the last date of the preceding year's exchange rate announcement [38].

At the same time, in order to simplify administrative procedures and ensure transparency in project planning and power trading, the MOIT issued Circular No.16/2017/TT-BCT dated 12 September 2017, on solar project development and standardised Power Purchase Agreements (PPA) applied to solar power projects [5]. That was later supplemented with Circular No.05/2019/TT-BCT, of 11 March 2019 [6].

For the policy on solar power to be put into practice, the Prime Minister issued Decision No.13/2020/QĐ-TTg dated 6 April 2020 on the incentive mechanism for the solar power development in Vietnam. The Decision stipulates on: (i) responsibility for buying power from grid-connected solar projects; (ii) specific regulations on power purchase price for grid-connected solar projects; (iii) development of grid-connected solar projects; (iv) responsibility for connecting solar projects to the grid system; and (v) power purchase price and standardised PPA [39]. To make the latter

for grid-connected solar power obligatory in the power purchase between the buyer and seller, the MOIT issued Circular No.18/2020/TT-BCT dated 17 July 2020 clarifying the regulations on solar project development and standardised PPA for solar projects [7]. At the same time, to specify the incentive mechanism for rooftop solar power in localities and guidance, the MOIT issued Document No.7088/BCT-DT dated 22 September 2020.

- Wind power: Decision No.39/2018/QD-TTg dated 10 September 2018 issued by the Prime Minister amended and supplemented a number of articles of Decision No.37/2011/QD-TTg dated 29 June 2011 also issued by the Prime Minister on the supporting mechanism for wind power development. This Decision adjusted the selling price of grid-connected power to US cents 8.5/kWh for onshore wind power and US cents 9.8/kWh for offshore wind power. Power generation projects which came into operation prior to the effective date of Decision No.39/2018/QD-TTg could benefit from the new Feed-in-Tariff (FiT) policies from 1 November 2018 [43].

3.1.4. Special mechanisms and policies for Ninh Thuan Province

The National Assembly issued Resolution No.31/2016/QH14, dated 22 November 2016, on suspending the policy on investment in Ninh Thuan's nuclear power project. To solve difficulties for the province when implementing the Resolution, the Government issued Resolution No.115/NQ-CP dated 31 August 2018, on the implementation of a number of special policies and mechanisms to support Ninh Thuan Province's socio-

economic development, stabilisation of production and people's lives in the period 2018 to 2023 [28], [16].

Specifically, the Government approved the policy to develop Ninh Thuan Province as Vietnam's national renewable energy centre (for solar and wind power). Through this the province could benefit from the solar power pricing policy and connectivity infrastructure in accordance with Decision No.11/2017/QD-TTg until the end of 2020. That is also to enable Ninh Thuan Province to pilot the selection of private investors who would participate in constructing the power transmission system to release solar power capacity; to develop supporting mechanisms for investment in industrial and export processing zones, the transportation system, and key local power infrastructure; to agree for the central budget policy to allocate 100% of counterpart fund for ODA projects to be implemented in the province, and to prioritise the allocation of medium-term public capital investment for key projects in Ninh Thuan Province [36].

To gradually realise the policies stipulated in Resolution No.115/NQ-CP on special mechanisms to develop solar energy in Ninh Thuan Province, the Government prioritised the special solar power purchase price for the province, regulated in the aforementioned Decision No.13/2020/QD-TTg the price for power purchasing from grid-connected solar projects included in the Power Development Plan (PDP) at all levels with a commercial operation date before 1 January 2021, and the accumulative capacity of no more than 2,000 MW set at VND 2,086/kWh. This price applies to the 20 years of their commercial operation dates [16], [39].

3.1.5. Resolution No.55-NQ/TW on the orientations of Vietnam's National Energy Development Strategy

Resolution No.55-NQ/TW (mentioned in this paper's Introduction) has made a breakthrough in national energy development. It is a "key" to encouraging private sector investment in the power market in Vietnam in general and Ninh Thuan in particular. It not only provides direction for further removal of barriers, but also helps all economic sectors, especially the private sector, to participate in Vietnam's energy market. For renewable energy, the Resolution clearly defines the breakthrough mechanisms and policies to create favourable conditions for private sector engagement. These are new, innovative and decisive ways to establish Ninh Thuan Province as Vietnam's renewable energy centre, based on the foundation and advantages of technology, geographical location, capabilities, and so on [2].

3.2. Current status of solar and wind power projects in Ninh Thuan Province

3.2.1. Solar projects

By October 2019, Ninh Thuan People's Committee had approved in principle allowing investors to survey and prepare additional documents to the national/provincial PDP, including 55 solar power projects with a total capacity of 3,618.34 MW~4,522.92 MWp), in which:

- 30 solar power projects had been approved by the Prime Minister/MOIT to be added to the national and provincial PDP (total capacity of 1,966.79 MW~2,458.49

MWp). On this basis, Ninh Thuan People's Committee issued the decisions on key contents of the investment projects (*quyết định về chủ trương đầu tư*) for 31 projects with a total capacity of 1,816.78 MW~2,271 MWp and total registered capital of VND 45,717.8 billion. Specifically, the Xuan Thien solar project was granted with two investment decisions, and Phuoc Thai solar power project was approved for Phase 1 of 50 MW [44]. Among the 31 projects granted the above-mentioned decisions, most of them have had investment procedures implemented and completed. This includes: payment of deposit; preparation of the total construction ground area and submission for its approval; formulation of the direction of connection to supply power for construction to be submitted to the provincial People's Committee for approval; approval of environmental impact assessment (EIA) reports; appraisal of fire safety and prevention; grid connection agreement, application of the Supervisory Control and Data Acquisition (SCADA) system, power metering, protective relays and negotiation for signing a PPA with the power sector; basic design appraisal and construction design; measurement; and owner identification and preparation of compensation plans to be submitted to the competent authorities for approval and land lease. Specifically, 27 of the 31 projects have fulfilled the obligation of project deposit payment, and 28 have had a PPA signed with the Vietnam Electricity (EVN). By October 2019, the basic designs for 28 of the 31 projects had been appraised by the MOIT and the provincial Department of Industry and Trade. By the end of December 2019, 17 out of the 31 projects

had been put into commercial operation with a total capacity of 1,143 MW; the remaining 14 projects were scheduled to come into operation in 2020 with a total capacity of 673.78 MW [31]. Moreover, by December 2019, the province had recorded more than 430 under 1 MW solar projects and rooftop solar projects with a capacity of about 59,200 KWp that have been completed in terms of construction and acceptance, meter installation, and PPA signing. In addition, 25 projects had been submitted to the MOIT by Ninh Thuan People's Committee with a total capacity of 1,651.55 MW~2,064.44 MWp.

3.2.2. Wind power projects

Based on potentialities and a list of 12 projects approved by the MOIT in Decision No.2574/QD-BCT dated 23 April 2013, the provincial People's Committee issued decisions on key contents of the investment project for 12 wind power projects with a total capacity of 632 MW and a total capital investment of VND 25,855 billion [4].

By October 2019, six projects had begun³, in which three⁴ were completed and put into commercial operation with a total capacity of 116.925 MW.

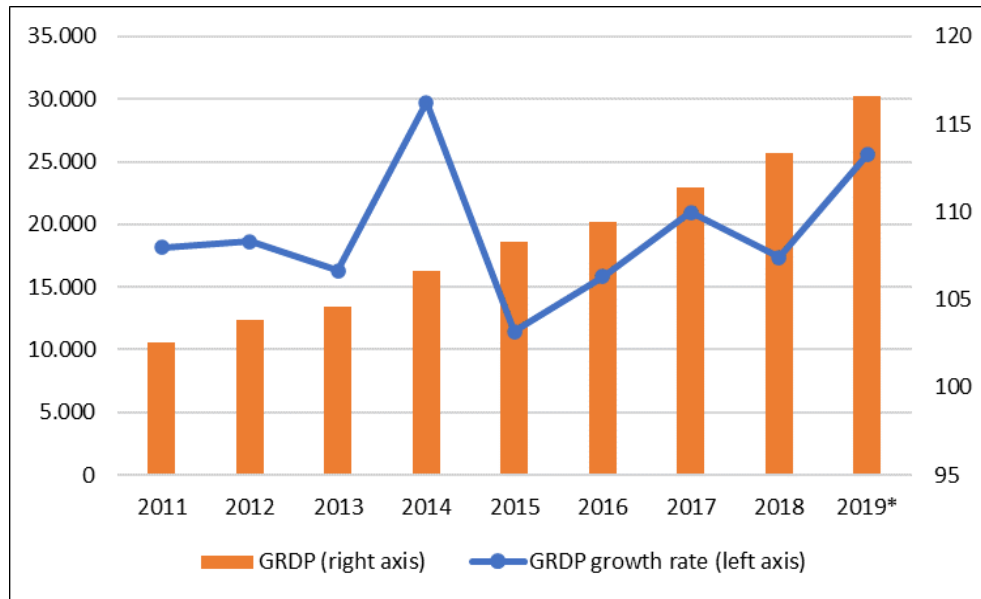
- Ninh Thuan People's Committee approved in principle five projects, with a capacity of 462.98 MW, so that investors could survey and prepare documents for the addition to the PDP and submit to the MOIT for appraisal. In addition, the province approved in principle, and reviewed and developed documents for the inclusion of, four projects⁵ into the PDP with a total capacity of 412.98 MW [44].

3.2.3. Contribution of solar and wind power projects to the local socio-economic landscape

The solar and wind power projects in the process of feasibility study, construction, and operation have contributed to creating a positive socio-economic change in the locality. The province's total state budget contribution reached VND 2,640 billion in 2018 (an increase of 14.8% compared to the same period in 2017) and VND 2,416 billion in the second quarter of 2019, an increase of 90.9% compared to the same period in 2018. The industrial and construction value also increased significantly by 15.6% compared to the same period in 2018, and 31.4% in the second quarter of 2019. Thanks to the contribution of investment from renewable energy projects, the construction sector value has also increased sharply, with a 19% rise in 2018 and 53% in the second quarter of 2019. The boom in renewable energy projects has also led to strong development of the real estate market, tourism and resort projects, especially major complexes such as Sunbay Park Hotel & Resort Phan Rang, and Mui Dinh Ecopark. At the same time, investors of the renewable energy projects partner with the local government to construct roads in rural areas, contribute to realising social protection objectives, and create direct jobs for more than 8,000 unskilled workers [30].

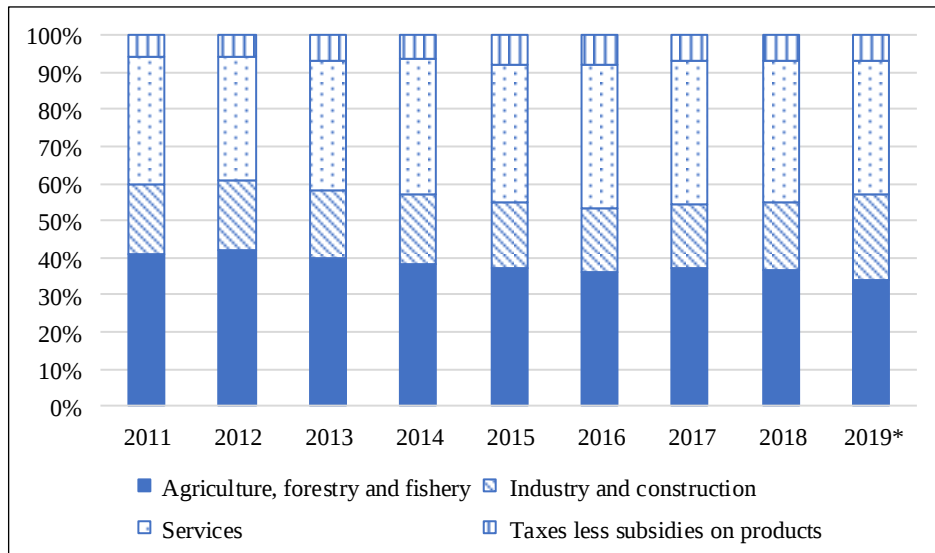
From 2011 to 2019, Ninh Thuan Province experienced good economic growth. In 2019, the province's Gross Regional Domestic Product (GRDP) was estimated to be VND 30.228 trillion, three times higher than that of 2011, which was VND 10.541 trillion. Ninh Thuan's average annual GRDP growth rate of 8.8% compared favourably with the country's GDP rate (Figure 1) [17].

Figure 1: GRDP and Growth Rate



Source: Ninh Thuan Statistical Office (2020), *Ninh Thuan Statistical Yearbook 2019*, Ninh Thuan.

Figure 2: GRDP Structure by Sector



Source: Ninh Thuan Statistical Office (2020), *Ninh Thuan Statistical Yearbook 2019*, Ninh Thuan.

In terms of economic sectors, agriculture accounted for the largest proportion, with the average figure of 38.2% per annum from 2011 to 2019; second highest was the services sector with 36.4%; while, in comparison, the industry and construction sectors accounted for only 18.8% (Figure 2) [17].

The increasing contribution of both the services and construction industries shows the shift towards economic modernisation. From 2015, the services sector overtook its agricultural counterpart to become the largest contributor to the local economy. However, the pace of structural change is slow; agriculture, forestry, and fishery still maintain a significant presence in the economy; and the industry contributes only about 10% to Ninh Thuan's GRDP [17].

3.3. Inadequacies faced by renewable energy projects in Ninh Thuan Province

3.3.1. Inadequacies encountered when implementing the Law on Planning related to wind and solar power, and other guiding documents

- Difficulties in implementing the Law on Planning:

In addition to those projects approved by the Prime Minister and MOIT to be included into the national/provincial PDP, Ninh Thuan People's Committee is currently submitting documents to the MOIT for review and approval of 24 solar power projects. As of November 2019, these projects had not been approved, partly because the regional grid connection infrastructure of Ninh Thuan and Binh Thuan Provinces could no longer handle additional capacity, and partly because of the Law on Planning No.21/2017/QH14. In

general, the 24 projects were submitted to the MOIT for approval and supplementation to the PDP when specific guidance for implementation of the Law on Planning No.21/2017/QH14 had not been issued. What is more, the implementation of the Law on Planning then exposed many problems (on the order and procedure for drawing up, evaluating and approving the PDP; and, the scope, formulation, appraisal competence and progress of the PDP). Unclear determination of the scope of power sources and grids integrated into the national and provincial PDP makes it difficult to appraise and supplement the plan, especially for power source projects with a capacity up to 50 MW and grid projects with a maximum voltage of 110 kV. Therefore, the addition of projects to the PDP has been delayed, making it hard to meet the operational progress of renewable energy projects under the solar power price mechanism stated in Decision No.11/2017/QD-TTg of 11 April 2017 (before 30 June 2019) [29], [36].

- Difficulties and issues in implementing the MOIT's Decision No.2574/QD-BCT dated 23 April 2013, on the approval of the wind power development plan for Ninh Thuan Province for 2011 to 2020 with a vision to 2030 and Official Dispatch No.56/DL-KH & QH dated 9 January 2019, of the Electricity and Renewable Energy Authority under the MOIT: In accordance with Decision No.2574/QD-BCT, the MOIT approved the development capacity of wind power projects of 220 MW for the period up to 2020, in Vietnam's three regions, distributed in districts. It also approved the development of 12 wind power projects during the period up to 2020 in the three regions. Gaining ground, Ninh Thuan People's Committee issued decisions on key contents

of the investment for these 12 projects [4]. However, according to Official Dispatch No.56/DL-KH&QH, the instructions were: “List of wind power projects to be developed up to 2020 in Clause b, Point 3.3, Article 3 of Decision No.2574/QĐ-BCT dated 23 April 2013, only states the surveyed area, and does not approve of the specific capacity and connection plan; therefore, before the implementation of projects in this list, it is necessary to carry out procedures for adding power plants and the connection plan to the Power Development Plan”. Thus, according to this official dispatch, although some projects were granted with decisions on key contents of the investment, and implementation of some basic investment procedures (such as deposit payment, site clearance compensation, formulation and approval of basic design, environmental processing, grid connection agreement, and PPA signing with the EVN) have been made, they still had to revert to the document preparation stage for addition to the PDP. This made the planning process meaningless, wasteful and costly for enterprises, leading to excessive waiting time in carrying out procedures. That affected the progress of project implementation that had been set out in the decision on key contents of the project, which also impacted on the province’s ability to attract investment. So far, dossiers of seven wind power projects with the capacity of 534.48 MW have been submitted to the MOIT for appraisal and supplementation to the PDP in accordance with Official Dispatch No.56/DL-KH & QH, but they are yet to be approved of.

3.3.2. Failure to secure infrastructure for connection and release of capacities of solar and wind power projects

Assessing the current status of Ninh Thuan Province’s grid infrastructure reveals it can only meet the evacuation demand of a capacity of about 777 MW or more. Therefore, in recent years, Ninh Thuan People’s Committee has liaised with relevant ministries and central agencies to counsel the Government on amending and supplementing the PDP VII in order to adjust the list of transmission grids connected to solar projects. Although the Government gave approval, the new grid projects planned to release the capacity of solar power plants were all expected to be implemented after 2020; therefore, the release of the capacity of more than 2,000 MW by the end of 2020 has faced difficulties due to a lack of synchronous investment in transmission infrastructure.

Given this situation, the Prime Minister agreed to allow Ninh Thuan Province to follow specific ways for mobilising non-State resources for a number of transmission grid projects that had been added to the PDP. Accordingly, investors in wind and solar power projects will contribute capital to jointly invest in transmission grid works coinciding with the transmission needs of projects. Therefore, in order to speed up investment in transmission works to ensure that the projects were fully operational before 2020 for the capacity of renewable energy projects to be released, the provincial People’s Committee called for investment and issued investor selection criteria in order to build transmission infrastructure. Trung Nam Construction Investment Joint Stock Company (Trungnam Group) was selected, approved, and licensed to invest in the construction of the 500 kV Thuan Nam substation and the connection line associated

with Trung Nam-Thuan Nam solar power plant project, the capacity of which is 104 MW. However, this is an investment project for the transmission network infrastructure with capital raised from a non-EVN affiliated enterprise; hence, the province is waiting for the MOIT and EVN to provide specific guidance on the order of and procedure for investment, development, management, and operation of grid projects.

3.3.3. Power purchase price mechanism

The FiT, which is to encourage the development of renewable energy, is higher than the price of electricity generated from traditional thermal power sources. Increasing solar and wind power means the overall cost of electricity production increases significantly (because the current power price is calculated based on financial costs without taking into account avoided economic, social and environmental costs). Decision No.37/2011/QD-TTg allows the State to subsidise the price of electricity at one US cent of out of the US cent 7.8 per kWh of wind power (taken from the Vietnam Environment Protection Fund). Nevertheless, Decision No.39/2018/QD-TTg, makes no fund provision to subsidise the EVN while the FiT increases to US cents 8.5/kWh for onshore wind and US cents 9.8/kWh for offshore wind [34], [37]. As a result, the price subsidisation mechanism for the EVN has to be incorporated into the input costs of electricity production; this in turn may lead to an overall price increase. The lessons learnt from countries with developed renewable energy industries show that after the first period using the FiT mechanism to support development, they have turned to the project

auction mechanism to reduce costs and enhance the competition in an effective manner. Vietnam is also following this roadmap. Specifically, Article 13 in Decision No.11/2017/QD-TTg on the FiT mechanism for solar power outlines the MOIT's tasks as follows: "Research the auctioning process for the implementation of solar projects and an appropriate roadmap to improve the efficiency and reduce the cost of solar projects" [36]. Decision No.39/2018/QD-TTg on the FiT mechanism for wind power (Article 14) also states: "The Ministry of Industry and Trade is responsible for proposing and submitting an auctioning mechanism for wind power development and wind power purchase price to the Prime Minister for consideration and decision in order for the mechanism to be applied from 1 November 2021" [37]. With a rapid increase in the capacity of solar and wind power sources, if there is a delay in the application of an auctioning mechanism for renewable energy projects, consumers will have to continue to bear high power prices.

3.3.4. Lack of an ecosystem and technical infrastructure system for renewable energy development

- Implementation procedures for project investment are complicated; data on potentialities at the locations and resources are lacking; difficulty in accessing financial sources is acknowledged; the interest rate remains high; the market for renewable energy equipment is in its infancy, most equipment has to be imported, which brings about many quality risks.

Ninh Thuan Province lacks an ecosystem (a specific legal system for renewable energy;

consulting agencies for project formulation; and equipment suppliers for a renewable energy project) for the development of renewable energy. There is no centre for testing wind and solar power equipment and technologies, and human resources for renewable energy projects are insufficient. Units providing services for renewable energy and supporting industries for renewable energy have not been established yet.

3.3.5. Social and environmental issues arise

- Ninh Thuan Province has not taken enough initiative in supporting the development of wind and solar power. Land use planning for this new type of energy has not yet been carried out; the additions to the planning and related procedures are time-consuming; and there are not yet procedures for the disclosure of project information to investors. Consequently, it is often the latter who have to find locations to apply for investment licenses. And, sometimes there is an overlap in the spatial/construction planning, making it difficult to implement projects.

- In renewable energy projects, local unskilled labour is employed only during the construction and installation phase. When it comes to the project operation phase, which requires skilled technical workers, the locals cannot meet the requirements.

- Environmental risks and challenges: When a wind power project is operated, noise pollution during operation is the main concern of communities living in areas where ground-mounted wind turbines are located. In fact, the sound of wind turbines has affected the growth, development, and migration of swiftlets (swiftlet refers to any of the four types of tropical birds of the

swift family) in the project area and surrounding areas.

Such solar power projects occupying a sizable land area affect the livelihoods of households whose land has been acquired for these projects, and they may also impact on the flora and fauna ecosystems located beneath the PV panels. In addition, the disposal of PV panels after their expiration date is considered extremely environmentally hazardous, something which cannot be measured. PV panels usually have an extremely short service life, only 20 to 25 years, which often makes their disposal or recycling difficult. In Ninh Thuan Province, solar energy equipment producers must comply with the environmental protection standards prescribed by applicable laws. However, for equipment to be disposed of after its expiry date, there are currently no binding regulations on manufacturers, importers or project investors to collect, recycle and dispose of the thousands of tonnes of expired PV panels that are discharged into the environment. Therefore, Ninh Thuan Province will have to face the risk of environmental pollution caused by hazardous solid waste [1].

4. A number of solutions proposed to promote the development of Ninh Thuan Province as a renewable energy centre of Vietnam

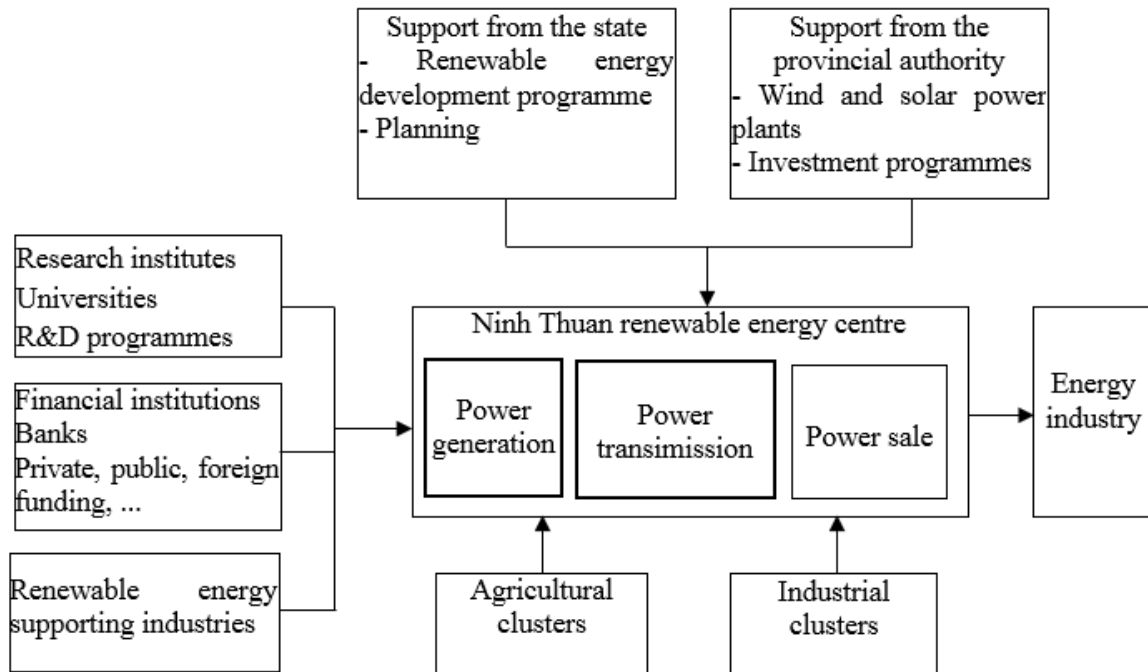
4.1. Establishment of an ecosystem for renewable energy in Ninh Thuan Province

Firstly, it is needed to draw up the criteria to develop the model of the National Renewable Energy Centre of Ninh Thuan Province, including the following steps:

defining a strategic vision for building a renewable energy area in the province; identifying areas with technical potential; evaluating economic potential and commercial

benefits; formulating capacity transmission plans; and selecting transmission options which satisfy technical, economic, environmental, and social criteria [27].

Figure 3: Outlining the Model of the Renewable Energy Centre in Ninh Thuan Province



Source: Tran Thi Lan Huong (2019), “Advantages, Opportunities and Prospects to Develop Ninh Thuan Province to Become National Renewable Energy Centre”, Workshop on *Establishing Ninh Thuan Province to Become National Renewable Energy Centre*, Ninh Thuan.

Secondly, it is important to promulgate policies to attract foreign direct investment (FDI), especially from large global energy corporations, in research and development, and the transfer of renewable energy technologies, thereby promoting the industry and services that support the growth of renewable energy. Regarding the supporting industries for renewable energy generation, most of Vietnam’s equipment used in the

renewable power sector is currently imported from China, Germany, India, the US, and Australia. In the future, Ninh Thuan Province needs to attract investment in solar and wind power-supporting industries and become a link in the global renewable electricity value chain. In the immediate future, it is needed to focus on services that support renewable energy and technical schools to train managers and

technicians involved in the production and operation of wind and solar power, design consultancy, construction, installation, and maintenance and logistics services [33].

Thirdly, to create a renewable energy database complying with international standards and to build a renewable energy research and development centre in Ninh Thuan Province; develop mechanisms to connect with other localities in terms of renewable energy, financial mechanisms, and mechanisms for human resource training for renewable energy.

4.2. Development of the renewable energy plan

- The Government allows Ninh Thuan Province to develop a renewable energy plan for the period 2021 to 2045, and a land use strategy, taking into account the priority for renewable energy development, proactively securing suitable locations for projects and updating investors with information on the locations, as well as supporting them in project implementation.

- It is mandatory to develop the planning for power sources and attached grids at the same time, which calculates the maximum demand for energy transmission from renewable energy sources to ensure a scientific and legal basis to support renewable energy sources. It is also essential to consider a special mechanism for grid projects that are synchronous with renewable energy sources to accelerate the progress of these grid projects [27].

4.3. Solutions for releasing transmission infrastructure and capacity of solar and wind power

In order to boost investment in power transmission infrastructure to release the capacity of wind and solar power projects, it is crucial to complete the following steps:

Firstly, the MOIT and EVN have a plan to allocate capital, adjust and accelerate the progress of construction to complete the transmission projects for the following: (1) Ninh Phuoc 220kV substation; (2) Thuan Nam 500/220kV substation; (3) 500kV line connecting Thuan Nam 500kV substation to a 4-circuit transition point of the Van Phong-Vinh Tan 500kV line; (4) Thuan Nam - Chon Thanh dual circuit 500kV transmission line; (5) 4-circuit 220kV line connecting to the 220kV busbar of Thuan Nam 500kV substation and transiting on two circuits of the Vinh Tan - Thap Cham 220kV line; (6) Ninh Phuoc - Vinh Tan 220kV dual circuit 220kV transmission line; (7) Ninh Phuoc - 500kV Thuan Nam substation dual circuit 220 kV line.

Secondly, the MOIT needs to promulgate regulations guiding the order of and procedure for investment, management, and operation of power grid projects implemented by private renewable energy investors, for submission to the Prime Minister to provide Ninh Thuan Province with the mechanism to comply with the regulations.

4.4. Mechanisms proposed for power price and power purchase

For the immediate future, the Government is proposed to issue a new FiT mechanism for solar power to avoid the interruption of investment mobilisation. The MOIT should also urgently study the auctioning mechanism for renewable energy projects and report to the Government on its application, after the

expiration of the FiT application period, in line with the electricity market roadmap after 2020. However, in the long term, to develop sustainable renewable energy projects in Ninh Thuan Province, it is crucial to:

Firstly, propose to the Government to allow Ninh Thuan Province to pilot the direct power purchase mechanism.

The Direct Power Purchase Agreement (DPPA) is a mechanism that allows direct transactions between power generators and buyers. Normally, power producers do not sell electricity directly to end-users but deal with accredited power buyers in accordance with regulations. In general, this mechanism helps the market operate efficiently, reduce costs, and make good use of electricity infrastructure. For renewable energy, countries around the world have practiced the direct purchase mechanism, whereby the renewable energy producers will be allowed to make direct transactions with customers. For international corporations investing in Vietnam and Ninh Thuan Province, the expectation for the DPPA mechanism is extremely high because its application will help their Vietnamese subsidiaries meet the sustainable development goals that they have assigned. In addition, the corporations will also have more flexible options in terms of energy sources and how to utilise them, as well as long-term electricity pricing strategies. For international corporations that have not made direct investments in Vietnam, that will be also one of the factors to be considered in future investment decisions in Ninh Thuan and other provinces [49].

Government permission for Ninh Thuan Province to pilot the implementation of the DPPA mechanism will also be a breakthrough

in the mechanism, openness, and transparency of the local electricity market in the context of Vietnam transiting from the monopoly to competitive wholesale electricity market, and moving towards a competitive retail electricity market. As a result, local energy projects can attract greater cash flow investment from the private sector and FDI [24].

Secondly, allow Ninh Thuan Province to pilot the auctioning mechanism for renewable energy.

A renewable energy auction is also known as a “demand auction” or a “procurement auction”, whereby a government issues a call for tenders to develop a renewable energy-based power project. Project developers who participate in the auction submit a bid with a price per unit of electricity at which they can realise the project. The government evaluates the offers based on the price and other criteria, and signs a PPA with the bid winners.

Renewable energy auctions, despite some implementation difficulties in the past, have become a popular policy tool in recent years [48]. This is also considered a way to bring better efficiency and benefits to all parties. The feasibility of auctioning programmes has recently increased due to the development of energy technologies and a rise in the number of project developers and better supporting policies. A sealed bid is the most common type of auction. In this scenario, bidders simultaneously submit their bids with an undisclosed offer of price and quantity. These will be ranked and awarded with projects until the total power yield that needs to be supplied (bought) is achieved in accordance with the Government’s plan. Another type of auction is the descending clock format based on many

rounds. In the first round, the auctioneer puts forward the standard price and bidders offer the electricity volume that they are willing to supply at such a price. In the next round, the auction price reduces and the auction ends when enough of the expected volume of electricity has been bought. The hybrid model can use the descending clock auction method with many rounds in the first stage and the sealed-bid format in the second stage.

4.5. Solutions to minimise negative social and environmental impact

It is necessary to develop and issue legal documents on the lease, rent, sale, and use of land use rights as capital contributions to renewable energy projects. General regulations on land management have been approved in the Law on Land and its by-laws. However, these regulations need to be realised promptly to fit the conditions of the province.

To ensure the livelihoods of households whose land is acquired for renewable energy development, it is important to pilot models of combining renewable energy with animal husbandry (e.g. sheep, cows and so forth), crop production, aquaculture (in coastal areas and irrigation reservoir areas), and ecotourism at the levels of the communes and cooperatives and the inter-household level. In this model, the renewable energy investor is responsible for giving up a portion of the investment capital, installing, operating, and maintaining the equipment. Local communities need to be linked into cooperatives, inter-family groups, or joint-stock companies to participate in the renewable energy projects to protect the area where there are renewable energy

works, and grow crops, raise livestock and fishes in the area in a manner that is suitable for the installation of renewable energy devices on the ground and lake and sea surfaces [1].

Given the trend of promoting the development of wind and solar power projects, the locality also needs to closely and seriously monitor the environmental impact assessment and strategic environmental assessment of the project and substantially consult with the community and experts so as to take remedial measures when dealing with negative environmental impacts. It is also imperative to regulate on and monitor the exercise of environmental social responsibilities by the suppliers of solar power equipment and owners of wind and solar power projects during both the construction and operation phases [33].

5. Conclusion

The fourth industrial revolution is creating new prospects in the medium and long term for Vietnam in general and Ninh Thuan Province in particular. For the locality this offers a “dual-action programme”, which must, on the one hand, deal with the vulnerabilities of the rapid growth period, and seize opportunities and address new challenges of the current globalisation and technological revolution on the other hand. In the interaction with globalisation and the fourth industrial revolution, the renewable energy industry benefits greatly from breakthroughs in energy technology. Solar technology has also improved a lot in some advanced countries, reducing the cost of renewable energy equipment. A poor

province, Ninh Thuan hardly possesses advantages in the traditional agricultural or industrial production. It only has sunlight, wind and land, which are actually great opportunities to bridge its gap with developed provinces. Therefore, Ninh Thuan needs to make best use of the opportunities to restructure the economy and direct the growth model towards sustainability based on the development of the renewable energy industry and tourism services.

Notes

^{1, 2} This paper was published in Vietnamese in *Nghiên cứu Kinh tế*, số 8, 2020, then developed into this English version. Translator: Vu Xuan Nuoc. Language editor: Stella Ciorra. The paper is part of the ministerial-level research project “Sustainable employment as in close linkage to renewable energy development in Ninh Thuan Province” of the Vietnam Academy of Social Sciences.

³ Trung Nam, Mui Dinh, Dam Nai, Wind Energy Chien Thang, Cong Hai 1, and Cong Hai 2 wind power plants.

⁴ (1) Trung Nam wind power plant with a capacity of phase 1 of 39.95 MW; (2) Dam Nai wind power plant with a capacity of 39.375 MW; (3) Mui Dinh wind power plant with a capacity of 37.6 MW.

⁵ Dam Nai, Dam Nai 4, Ho Bau Ngu and BIM wind power plants.

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