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Vietnam's Solar Power Boom: Policy Implications for Other ASEAN Member States

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Vietnam now boasts the highest installed capacity of solar power in Southeast Asia, generating 16,500MW at the end of 2020. This photograph taken on April 23, 2019, shows solar panel installations and a wind turbine at the Phu Lac wind farm in southern Vietnam's Binh Thuan province. Photo: Manan VATSYAYANA, AFP.

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EXECUTIVE SUMMARY

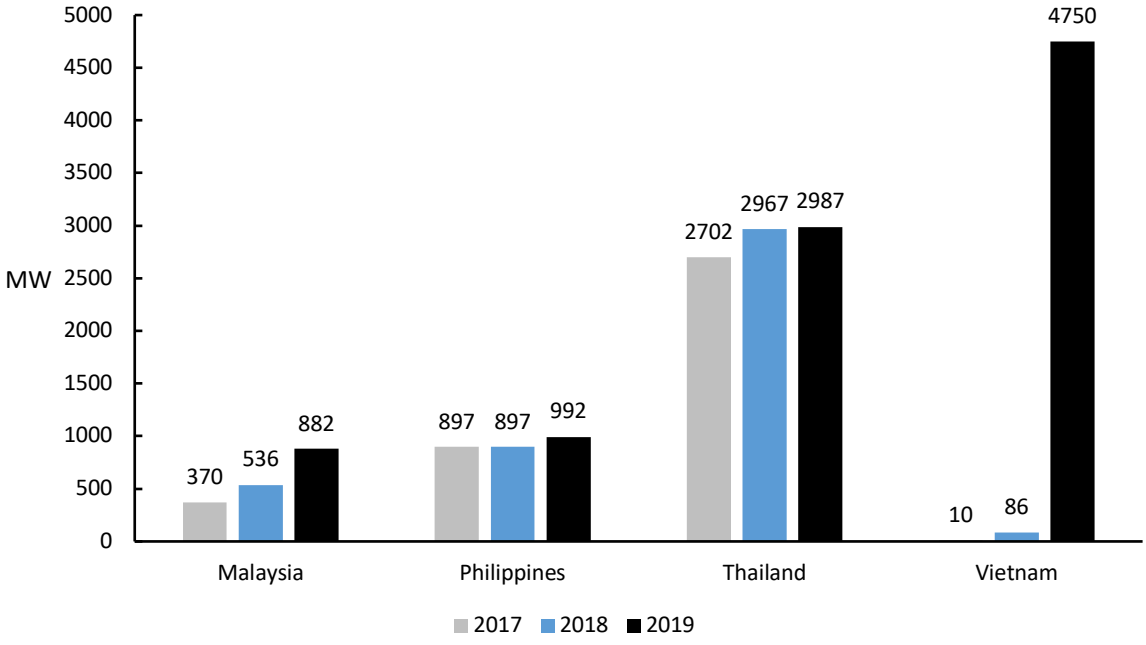
- Vietnam now boasts the highest installed capacity of solar power in Southeast Asia, generating 16,500MW at the end of 2020.
- Generous feed-in tariffs are a key proximate driver towards this achievement.
- Supporting policies include income-tax and land-lease payment exemptions for utility-scale investors.
- The government's commitment to boosting energy supply and strong public demand for improved air quality have been important underlying drivers in this direction.
- Vietnam provides relevant lessons for other ASEAN member states to realise their significant solar power potential.

INTRODUCTION

Vietnam has recently seen a remarkable solar photovoltaic (PV) boom, the first stage of a major and rapid energy transition in the country. The country's solar PV capacity increased from only 86 MW in 2018 to 4,750 MW in 2019 (Figure 1). With this, Vietnam passed Thailand to have the largest installed capacity for solar power generation among members of the Association of Southeast Asian Nations (ASEAN) (Do et al., 2020). By the end of 2020, its installed solar PV capacity reached about 16,500MW, around one quarter of the country's installed power capacity (Nhan Dan, 2021). This far surpasses its 2020 target of 850 MW (Government of Vietnam, 2016). Solar PV systems generated about 10.6 TWh of electricity in 2020, accounting for about 4% of all generation. Rooftop solar contributed about 48% of Vietnam's total solar capacity by the end of 2020.

ASEAN member states (AMS) have set an ambitious target of a 23% renewable energy share in the total primary energy supply by 2025 (ASEAN Centre for Energy, 2020). ASEAN countries have significant solar power potential to help achieve the target, but progress is mixed (Burke et al., 2019; Guild, 2019). The target may well be missed in some member countries. This paper discusses key drivers of Vietnam's solar power boom and highlights a number of policy implications for other ASEAN countries.

Figure 1. Solar installed capacity in key ASEAN markets, 2017–2019.



Sources: BP (2020); DEVI (2019).

DRIVERS FOR VIETNAM'S SOLAR PV BOOM

Proximate drivers

Do et al. (2020) applied an economic, social, and institutional framework to investigate underlying drivers for Vietnam's impressive solar boom. They found that attractive solar feed-

in tariffs (FIT) have been the key proximate driver. The first FIT was issued in 2017 by Prime Minister's Decision 11/2017/QD-TTg (Government of Vietnam, 2017). Solar power projects – both utility-scale and rooftop – that started operation prior to 30 June 2019 are able to sell their electricity to the state-owned Vietnam Electricity and its subsidiaries at a FIT of US$93.5/MWh for 20 years.

In April 2020, the Prime Minister issued Decision 13/2020/QD-TTg to usher in reduced feed-in tariffs of US$83.8/MWh for new rooftop solar projects, US$70.9/MWh for new ground-mounted solar PV, and US$76.9/MWh for new floating solar projects. Projects that entered commercial operation by 31 December 2020 were eligible, with the feed-in tariffs covering electricity generated over the next 20 years. At the time of writing, no FITs or other incentive mechanisms exist for solar PV projects starting from 2021.

These FITs are generous. Lee et al. (2019) estimated that the average levelised cost of electricity (LCOE) for solar PV in Vietnam – when excluding protected areas, water bodies, forested areas, agricultural areas, urban areas, and areas with a slope greater than 5% – was around US$87.5/MWh in 2018. Using an annual reduction rate of 13% (International Renewable Energy Agency, 2019), these LCOEs would roughly be about US$76/MWh in 2019 and US$66 in 2020. Therefore, the FITs of US$93.5/MWh before June 2019 and US$70.9–83.8 per MWh thereafter have been attractive to project developers, especially given that they have focused on the best available sites in the southern part of the country.

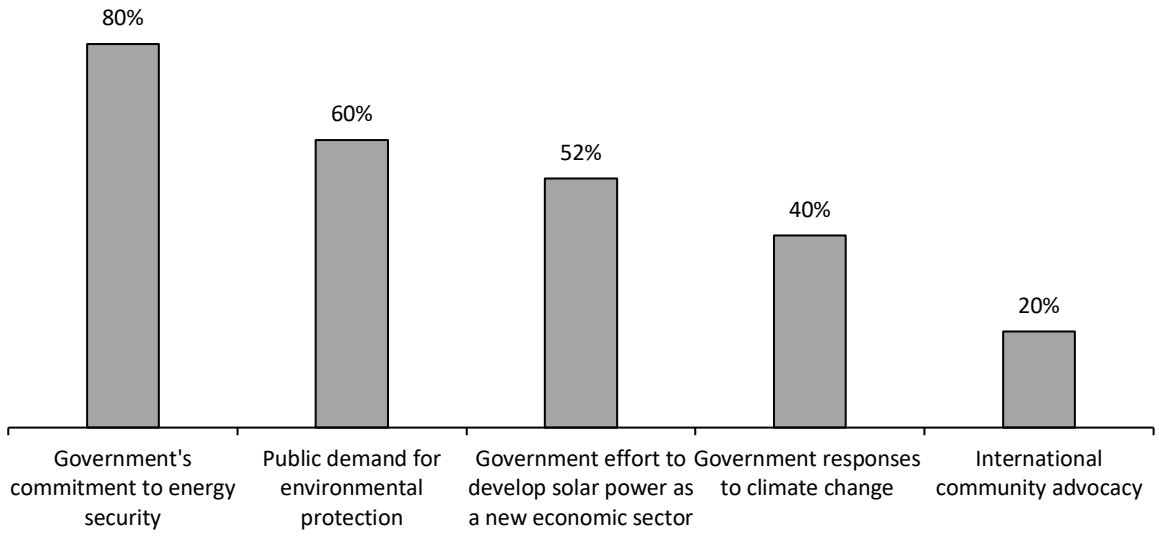
Other government policies have also played important roles. Utility-scale solar PV developers have been given flexibility to mobilise funding from all sources, including foreign funding, and have been exempted from income tax for the first four years. The income tax will then be reduced by 50% in the following nine years, and thereafter 10% until the 15th year of operation. Imported equipment has also been exempted from import tariffs. Solar PV projects have also received land-lease payment exemptions ranging from 14 years to the entire project life, depending on the location (Do et al., 2020).

Underlying drivers

A survey of experts identified the government's commitment to energy security as the most important motivation for the introduction of Vietnam's FIT (Figure 2; Do et al., 2020). Delays in new coal and other power projects amid rising electricity demand have meant that securing new electricity generation sources has been a priority. Solar PV has become highly viable due to rapid technological improvements and associated cost reductions.

Public demand for environmental protection was identified as the second-most important driver (Do et al., 2020). Serious air pollution in urban areas has triggered public opposition to the development of new coal power plants, and local issues related to water and other resources have also become concerns. Some local authorities have refused to approve new coal power projects on account of their environmental implications (Vietnam Ministry of Industry and Trade, 2019).

Figure 2. Key drivers for Vietnam's solar PV FIT policy (% of respondents).



Source: Do et al. (2020).

Another important driver for the introduction of the solar FIT has been the government's intention to develop solar power generation as a new economic sector. The National Strategy for Green Growth 2012 sets out the specific objective of restructuring the economy by greening current sectors and promoting a renewable energy sector. Following this, the Renewable Energy Development Strategy 2015 detailed targets for developing the renewables sector. The importance of this sector has been re-emphasized in the recent Political Bureau Resolution no. 55 on National Energy Development Orientations (Vietnam Political Bureau, 2020).

The government's commitment to climate change response, along with the renewable energy advocacy of certain foreign organisations have also played catalyst roles in solar PV diffusion (Do et al., 2020). In 2020, Vietnam adjusted its nationally determined contribution as a commitment with the goal to reduce greenhouse gas emissions in 2030 relative to business as usual, by 9% or 27%, without and with international assistance, respectively (Government of Vietnam, 2020). For the energy sector, targets are for emission reductions of 5.5% (unconditional) and 11.2% (conditional) relative to business as usual.

POLICY IMPLICATIONS FOR ASEAN MEMBER STATES

Potential drivers for solar PV development in ASEAN

ASEAN has significant potential for solar power, particularly in the Mekong countries of Myanmar, Thailand, and Cambodia. The potential for solar PV at sites with an LCOE of less than US$150/MWh has been estimated to exceed 30 TW (Lee et al., 2019). This is about 130 times ASEAN's total installed generation capacity (234 GW) as of 2017 (ASEAN Centre for Energy, 2020). Solar power could play a major role in helping AMS achieve the renewable energy target of 23% by 2025, with wind, geothermal, and other renewable technologies also able to contribute.

To tap this potential, AMS could follow Vietnam to focus on domestic drivers in motivating policy change, noting that the political economy behind new policy directions is important for policy success. These include the local health benefits associated with zero-emission electricity generation from sources such as solar PV. Similar to Vietnam, AMS are facing serious air pollution due to combustion of fossil fuels. The annual number of premature deaths associated with air pollution in ASEAN is projected to rise from 450,000 in 2018 to more than 650,000 by 2040 if the current trajectory for fossil fuel reliance continues (International Energy Agency, 2019a). Outdoor air pollution – predominantly from fossil fuel combustion, and also construction, agriculture, and other sources – is estimated to reduce average life expectancy by about 2 years in Indonesia, 1.7 years in Malaysia, and 1 year in Thailand (Energy Policy Institute at the University of Chicago, 2020). A focus on the local air quality benefits of solar power would potentially cultivate political and public support.

There are many other potential motivations to pursue solar PV in ASEAN. Developing a solar PV industry would provide a new economic benefit to the economy and help AMS pursue a greener post-pandemic recovery. Solar PV offers an opportunity to generate revenues and economic benefits from otherwise underutilised spaces such as rooftops. Countries could also reduce risks they face in terms of new investments in what may well become stranded fossil fuel assets. AMS could also use broader motivations such as global climate change and improving national positions in the international arena to motivate the adoption of solar PV policies.

Suitable policy instruments

Vietnam's case is an example of FITs having a strong effect on uptake. Thailand and Malaysia started solar PV FITs in 2007 and 2011, respectively – much earlier than Vietnam. However, recent FITs in these countries have been less generous than Vietnam. For example, the rooftop FIT in Thailand in 2019 was only about US$57/MWh (Pugnatorius 2019). Before ending in 2016, Malaysia's solar FITs was subject to strict conditions, including a maximum eligible installed capacity of 30 MW and annual reductions in FIT rates based on government-set quota (ASEAN Centre for Energy and China Renewable Energy Engineering Institute, 2018). Indonesia's solar FITs have recently been capped at 85% of the regional average cost of electricity generation in many regions, which in some areas is quite low and disadvantages solar PV *vis-à-vis* generation from fossil fuels (Burke et al., 2019). Vietnam also does not impose local content requirements as a condition for preferential FITs as is used in Indonesia and Malaysia (Guild, 2019; SEDA, 2019). This enables a level playing field for investors and reduces technology costs.

The case of Vietnam has also demonstrated that reforming regulations is also a priority. For example, a new investment law and an amendment to the current Electricity Law have been proposed to tackle transmission capacity issues that have led to curtailment of solar power (Bao Dau Tu, 2020). In the meantime, the Prime Minister issued an *ad hoc* decision in 2020 to allow the private sector to invest in transmission lines to connect their plants and other projects in the same area to the main grid (Nang Luong Vietnam, 2020). Vietnam is also developing a mechanism for direct power purchase agreements to enable solar power generators to sell electricity directly to consumers.

Recycling of solar panels has received policy attention in Vietnam. According to the Law on Environmental Protection 2020, producers and importers of solar equipment will be responsible for its recycling. They will either organize the recycling or pay a premium to the Vietnam Environmental Protection Fund. This is part of a circular economy policy that is in place in Vietnam.

Room for improvement

Despite strong initial successes in solar PV uptake, Vietnam's policy framework for solar PV diffusion has not been flawless. One notable limitation has been the use of short FIT windows, with high and extended uncertainty over the FIT regime that will apply for new projects at the expiry of any window. This has led to installation rushes to meet FIT deadlines rather than a smooth development of the industry. Uncertainty also increases financing and project costs and introduces difficulties for national electricity sector planning and grid development (Doanh Nghiep & Tiep Thi, 2020). Smoother and more foreseeable processes would be preferable.

Another issue has been transmission grid planning. A sudden solar boom in provinces such as Ninh Thuận has led to curtailment of output. Now that solar PV has entered the mainstream in Vietnam, it is important that transmission planning starts to catch up so that the cheapest electricity can be easily transmitted to major demand centres such as Hồ Chí Minh City. Time-of-day price flexibility and the use of energy storage are also becoming increasingly important as priorities for effective management of the intermittent (day-time) nature of solar PV generation. The experience of Vietnam, the frontrunner in ASEAN, is useful for other AMS in their own preparations to move toward higher solar uptake.

There are other opportunities for Vietnam. A quantity-focused mechanism in the form of a renewable portfolio standard (RPS) is an option to more smoothly guide the way towards high levels of renewable energy use, and to reduce uncertainty. A mandatory RPS could also encourage the national electricity utility to develop a more renewables-oriented transmission planning approach. Vietnam is also considering the use of reverse auctions, a mechanism through which long-term PPAs are signed based on a feed-in price decided on the basis of the lowest submitted bids. This policy instrument has become increasingly popular for new solar-sector projects around the world. While reverse auctions can help to achieve cost reductions, careful preparation is needed to make sure that auctions are a good fit in the local institutional context.

In November 2020, Vietnam's National Assembly passed a revised Law on Environmental Protection that legalises an emission trading scheme. The law will take effect on 1 January 2022 (Do, 2020). Singapore already has a carbon tax, but there are opportunities for other AMS countries to follow Vietnam's move. Vietnam and other AMS could also further reform fossil fuel subsidies. Removing fossil fuel subsidies in ASEAN's electricity sector would not only enable solar PV development but also potentially free up about US$8.3 billion per annum (International Energy Agency, 2019b). This sizable resource could instead be used for the development of transmission lines or to meet other priorities. The COVID-19 recovery period is an ideal time for such reforms, given the relatively low international fossil fuel prices and the need for efficiency-enhancing public investments.

CONCLUSION

Generous FITs, together with income and land-lease payment exemptions, have been key aspects of the policy framework that has spurred Vietnam's solar PV boom. Underlying drivers include the government's determination to ensure sufficient local electricity supply to cope with increasing power demand, public demand for local environmental quality, and the government's intention to develop solar power as a new economic sector. Other factors such as climate policy and advocacy from international organizations have also played contributing roles.

Vietnam's first stage of solar success confirms that the solar PV sector is able to develop rapidly in a developing country context when suitable financial and institutional conditions are in place. Strong solar PV development has also been seen in other developing countries such as India.

The key lesson from Vietnam's experience is the importance of price signals for solar PV and an adequate degree of government prioritisation and support. However, there is room to improve on Vietnam's approach; a more stable and foreseeable FIT regime would allow reduced investment uncertainty and help to smoothen the industry's expansion path. Better system planning and greater focus on system flexibility and power storage, plus enhanced private sector participation in transmission development to connect their projects, would also facilitate more efficient integration of solar PV into the electricity system.

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