Made in Vietnam Energy Plan 2.0

A business case for the primary use of Vietnam's domestic resources to stimulate investment in clean, secure, and affordable energy generation.

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Vietnam Business Forum

Power and Energy Working Group

Acknowledgements

This report was prepared through a collective effort representing the concerns, experience and interests of members of the Vietnam Business Forum, a consultative group whose members and affiliates include 14 foreign and domestic chambers of commerce. It is based on the groundbreaking 2016 edition of the Power and Energy Working Group's *Made in Vietnam Energy Plan* (MVEP 1.0). In November 2018, the VBF contracted Peter duPont, managing partner of Asia Clean Energy Partners and co-Chair of the Asian Development Bank's Asian Clean Energy Forum, to draft the first version of an update of MVEP 1.0. That report draft was completed in the early part of 2019. Within Vietnam's rapidly changing energy context, however, the executive committee of the Power and Energy Working Group realized that this initial draft would require extensive updates and revisions as information regarding government policies and research funded by foreign donors became available. Luong Ba Hung, PEWG director, played the key role in collecting and sharing government policy changes and research as well as donor funded research reports to other members of a small group who revised and edited the initial draft. This group included John Rockhold, PEWG chair, Gavin Smith, Vice-Chair of Eurocham's Green Growth Sector Committee, Virginia Foote, Vice-Chair of Amcham's Energy Working Group, and Dr. Michael DiGregorio, The Asia Foundation's Country Representative. A final draft was circulated to members of the VBF's Executive Committee. The authors wish to thank, Mr. Hong Sun, KoCham, Mr. Tetsu Funayama, JCCI, and Mr. Thanh Hai, SBG for their thoughtful insights and observations.

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Sincerely,

John Rockhold

for the Power and Energy Working Group

Executive Summary

An energy strategy that focuses on renewables, natural gas, energy efficiency and battery storage will attract private sector investment

This Made in Vietnam Energy Plan (MVEP 2.0) updates the previous report and has been developed during a time of fast-paced transition in global and local energy markets. The sustainable energy technologies of the future, such as solar, wind, and lithium-ion battery storage – once thought only to become economically feasible by the late 2020s or 2030s – have drastically decreased in cost and subsequently accelerated in scale. Today, they are now frequently outcompeting unsubsidized fossil-fuel-based power technologies across the world. Coal power plants that were once highly bankable and the lowest-cost option for rapidly developing economies are now harder to finance as investors see a trend in concerns over health and environmental degradation, the deterioration of plant load factors, and early plant retirements.

As sources of financing for coal thermal in Vietnam have declined, more reliable energy sources, renewables, and increased efficiencies have continued to advance. Accurate assessment of cost, tariffs, taxes and pricing can lead to a regulatory environment that mobilizes the private sector to meet Vietnam's energy goals of reducing energy intensity and increasing clean energy production. In fact, as the cost of solar and wind has declined relative to other energy sources, investor interest in renewables has increased, despite the financial risks associated with Vietnam's current regulatory environment. This report recognizes the rapid growth of solar and wind energy generation projected for Vietnam in 2019, but also recognizes the need to get the regulatory structure right in order to extend the current boom in renewables to battery storage systems, increased energy efficiency and natural gas.

According to data from the Ministry of Industry and Trade, more than 330 solar power projects with a total registered generating capacity of 26,000 MW are in various stages of approval and addition to the Power Development Plan. Among them, 121 projects, with a total generating capacity of 6,100 MW, have already been approved and added to national and provincial plans. Among these, one large private investment project located in Ninh Thuan province, with a cluster of three facilities and a capacity of 330 MW, was connected to the national grid in April 2019. This is the largest solar power facility in Southeast Asia, with a total of more than 1 million panels and a total investment of more than VND 7,000 billion, more than $300 million in current value. The project contributes to reducing nearly 304,400 tons of CO_2 emissions into the environment every year.[1]

This ignition of interest in renewables indicates the potential for rapid development under effective policies and current market conditions. However, any ambition to expand renewable energy generation further will be constrained by the barriers still facing both consumers interested in purchasing clean energy and producers seeking access to capital financing. This report addresses those barriers and suggests actions to overcome them in order to enable the

[1] Vietnam Biz (5 Jan 2019). *Private capital poured into renewable energy*. Accessed on 8 May 2019 at https://vietnambiz.vn/von-tu-nhan-do-vao-nang-luong-tai-tao-20190501142526585.htm

Vietnamese people to benefit from the lowest-cost energy technologies and domestic natural resources.

The target for coal power plants in Power Development Plan VII (PDP VII) was reduced by a modest 2.2 percent in the most recent revision, from 56.4% to 54.2% of total generation by 2030, increasing the current 19GW of coal power to 55GW. Rising generation costs suggests that the percentage of energy produced by coal can and should be reduced further. Currently, the expected cost of supercritical thermal coal power using imported coal exceeds 1,800 VND/kWh while the domestic coal wholesale price increased in 2019 to 1896 VND/kWh,[2] leaving both to now exceed the effective cost of solar energy installed from 1 July 2019.

Photo 1. A large solar facility in Ninh Thuan Province.

Given the relative cost advantage of renewable energy and energy efficiencies (costs are falling and can be fixed) to fossil fuels (costs are increasing and are unpredictable); the limited available financing for a large buildout of coal-fired power plants and the related risks and costs to health and the environment; the benefits of the current role of hydropower, and the diverse range of commercially available energy options in Vietnam, MVEP 2.0 makes a compelling business case that *the planned percentage of energy generated from renewable energy, saved by energy efficiency technologies, and generated by gas can and should be increased further in Vietnam's Power Development Plan VIII*.

[2] Voice of Vietnam (21 Feb 2019). *New prices announce for coal-fired power generation*. Accessed on 11 April 2019 at https://english.vov.vn/economy/new-prices-announced-for-coalfired-power-generation-392477.vov .

And critically, this report makes the case for an energy plan and policy framework that can substantially attract the private sector capital – both domestic and foreign – that will be needed to supplement government financing in order to build a robust power system for Vietnam.

In addition to economic sensibility, MVEP 2.0 draws its rationale from the significant threats to energy security and financial risks that would persist under a coal-focused energy plan. These concerns are related to the increasing need to import coal, threats to public health, environmental costs and degradation, and potential for abandonment of coal plants. Furthermore, the current coal-intensive pathway is at odds with global trends toward low-carbon economies, Vietnam's national commitments to reduce carbon emissions, and industry demands for fulfilling corporate sustainability goals. PDP VII runs counter to these efforts and interests, which will continue to contribute to environmental and public health crises related to poor air quality, smokestack emissions, the dispersal of fly ash, slurry ponds, and the siting of power plants.

This MVEP 2.0 report provides an alternative plan for Vietnam's energy future by recommending a cleaner, more affordable, and sustainable energy pathway with three primary goals:

1. Meeting the growing energy demand
2. Securing energy independence
3. Enabling consumer access to clean energy

MVEP 2.0 recommends a diversified energy system that prioritizes use of Vietnam's domestic energy resources

Based on consultations with business leaders and a careful review of national and international trends, MVEP 2.0 proposes six business-oriented recommendations that would improve the reliability and affordability of Vietnam's energy system:

1. Prioritize renewable energy in national power planning:

   There are alternative scenarios where renewables (excluding hydropower) could account for up to 30% of capacity by 2030.[3] These alternative scenarios, which are aligned with Vietnam's Nationally Determined Contribution (NDC) commitments, require regulatory support and incentives to leverage private sector investment now seeking opportunities to invest in Vietnam. Engaging the private sector, with their experience in market analysis, finance, and consumers' needs, in developing Power Development Plan VIII would increase the effectiveness of the planning process.

2. Increase use of natural gas as the current best-fit baseload for renewable energy:

   MVEP recommends tax levelization for the development of certified domestic offshore gas and the importation of LNG as the current best fit baseload for renewable energy. Gas-fired electricity can easily scale to the size necessary to meet the significant demands of Vietnam and can respond to intermittent load fluctuations and outages more rapidly than coal. Furthermore, while battery storage can potentially provide Vietnam with intermittent load options, offshore gas and LNG projects have the developers, investors

[3] McKinsey & Company (2019). Exploring and alternative energy pathway for Vietnam. Accessed on 1 May 2019 at https://www.mckinsey.com/featured-insights/asia-pacific/exploring-an-alternative-pathway-for-vietnams-energy-future

and financing to make them bankable now. Incorporating imported LNG supply into the energy-mix adds to Vietnam's energy capacity while long-term supply contracts for domestic offshore gas are developed. LNG is much cleaner than coal as it only produces roughly half of the CO_2 emissions compared to coal. When disease, death and coal-ash cleanup are also counted, gas becomes even more affordable than coal.

Under the current tax regime, the development of offshore gas fields in Vietnam can either provide significant revenues to the government through taxes and royalties – or if taxes and royalties are reduced the projects become more affordable for the consumers. The share of gas-to-power in the 2030 energy mix should be increased in PDP VIII.

3. Construct a regulatory and permitting environment that attracts private sector investment in clean energy generation and energy efficiency:

PPA: MVEP 2.0 recommends that the standard Power Purchase Agreement (PPA) for wind and solar energy projects be made internationally bankable by establishing Feed-in Tariffs (FITs) well in advance and reducing regulatory hurdles. We strongly urge transparency regarding any changes to FITs and encourage discussion on how to navigate the permitting process of master plan approval. Ultimately, these efforts should lead to a decline in investor risk and the ability to decrease FITs as renewable energy projects become simpler and more profitable. Additionally, definitive regulatory frameworks for floating solar, battery energy storage systems, offshore wind, and access to clean energy by direct power purchase agreements will unlock a much greater potential for renewable energy projects.

DPPA: MVEP 2.0 recommends Direct Power Purchase Agreement regulations that promote access to clean energy for end users by local power generation and storage. DPPAs can accelerate renewable energy development between buyer and seller and relieve pressure on EVN. This report encourages the government to seize the benefits of facilitating easy investment in *behind-the-meter* solar, battery, biomass, and waste-to-energy plants developed by power consumers and specialist suppliers. This regulation will develop a new dynamic market model while preserving a safe and reliable power supply.

TARIFFS: MVEP 2.0 recommends the publication of a Roadmap to Retail Electricity Tariffs to 2025 for Vietnam with particular focus on the commercial and industrial sectors. The Roadmap must describe the move towards market-based pricing and should specifically address the occurrence of peak load on the transmission system during business working hours (9.30am to 12.30pm and 1.30pm to 3.30pm) and incorporate a differential retail price for power across the regions. To compliment the Roadmap, it is also important to have a promotional campaign aimed to educate stakeholders on the need for, and benefits of, energy efficiency. Raising the awareness of residential consumers and industrial users regarding the efficient use of electricity, the availability of efficiency incentives, and the rationale for low-carbon power development will help electricity consumers engage with and understand the energy industry as tariff rates rise.

4. Construct a regulatory and permitting environment that attracts smaller scale off-grid investment in clean energy generation and energy efficiency

ROOFTOP: VBF recommended in its submission to the solar energy rooftop draft regulations in 2017 that the exemption from the requirement to obtain a Power Operation License should be increased from 1MW to 3MW. VBF continues to recommend that MOIT considers increasing the exemption to 3MW to fully capture the benefits of investment in solar rooftop energy systems.

BEHIND-THE-METER: VBF recommends that behind the meter clean energy power generation, that exports no power to the EVN grid are:
1. Exempted from the need to obtain an Operating License up to 30MW capacity
2. Not required to seek approval in the National Energy Development Masterplan
3. Required to give EVN reasonable notice of when the power plant is to be commissioned

EFFICIENCY: Vietnam's energy intensity per capita is among the highest in the region - for the period between 2009-2013 it was well above every country in the region, especially higher than those countries with a similar level of GDP per capita. In addition to a public education campaign, this report recommends the development and enforcement of regulations on building construction, appliances, and heavy machinery that reduces energy intensity at the manufacturing, commercial and residential level.

5. Invest in grid infrastructure to improve stability and capacity:
   As renewable and natural gas energy sources grow in contribution to the grid, there are challenges associated with incorporating more decentralized power plants that provide intermittent power supply. Given the surging increase in solar and wind generation, especially in the southern region, there is an urgent need for investment to strengthen and expand the transmission and distribution network. Further, there are likely opportunities to include and leverage private sector and international donor expertise in the area of renewable energy grid integration, battery storage, and flexibility.

6. Halt any new approvals for coal:

   Given the numerous concerns related to expanding coal capacity as proposed in PDP VII, we recommend halting the approval of any new coal thermal power plants and conducting a strategic review of those that are already approved but which do not have financing or power purchase agreements.

Six key policy and regulatory actions are needed to move toward a more financially, socially, and environmentally sustainable energy future

The recommendations of MVEP 2.0 outlined above, which can help Vietnam move rapidly toward a more financially, socially, and environmentally sustainable energy future, can be executed through the following six key actions:

1. Engage energy specialists from the private sector to assist in producing a PDP VIII with a strong prioritization on investment in domestic renewable energy, natural gas, battery storage and energy efficiency. With the exception of battery storage, which has only recently become an affordable option, this mirrors the objectives set forth in MVEP 1.0.
2. Implement regulatory frameworks and incentives that encourage investment in renewable energies, such as rooftop solar, battery storage, floating solar, and offshore

wind projects, with simplified approval processes, while still maintaining safe power systems.

3. Standardize the renewable energy PPA as an internationally bankable agreement and begin a pilot scheme of the Sleeved Direct Power Purchase Agreement (DPPA) in 2019.
4. Publish a Roadmap to Retail Electricity Tariffs to 2025 that depicts the move toward market-based pricing, revising the number of Peak Tariff hours, and consider a differential Retail Tariff in different power regions and for disadvantaged households.
5. Assess the urgent demands on the grid transmission system and the least-cost means of developing grid infrastructure to support increased renewable energy and increased distributed energy generation.
6. Assess the cause and solutions for Vietnam's extremely high and growing energy intensity as compared to regional neighbors with similar and higher GDP per capita and prepare a public education campaign on reducing energy waste.

These proposed actions will provide affordable, reliable, energy security

The action items of MVEP 2.0 outlined above will result in six major outcomes:

1. Enhanced energy security from the inclusion of natural gas, energy efficiency and renewables generation within the energy system. Redundancy and diversification are key to energy system security and resilience.
2. Reduced power system costs relative to a coal-focused energy plan by limiting vulnerability to volatile coal markets, avoiding the financial liabilities of stranded assets, and reducing costs associated with public health and environmental impacts.
3. Increased private investment in renewable energy projects that removes the generation burden from EVN and shares it with many power consumers and power producers in a distributed generation model.
4. "Socialized" electricity market that protects disadvantaged households with the least capacity to pay, but which is also financially sustainable for EVN and reflects a move to market-based pricing within the term of PDP VIII.
5. Reduced greenhouse gas emissions and air pollution and the other costs relative to a coal-focused energy plan and alignment with Vietnam's NDC commitments
6. Support SME and other private industry initiatives that reduce energy intensity, enable use of residential rooftop solar and increase energy efficiencies through public education and regulatory procedures

1 MVEP 1.0's focus on renewables as an alternative to coal remains valid

The revised PDP VII (2016) anticipated an annual average growth rate in demand between 8.0-8.7 percent per year. To meet forecasted demand, generating capacity of the system was planned to increase to 60,000 MW in 2020 and 129,500 in 2030. As generating capacity increased, the structure of energy sources within the system was expected to change dramatically. The share of hydropower in the energy system was expected to decrease from 38 percent in 2015 to 17 percent in 2030, and natural gas from 21 percent in 2015 to 15 percent in 2030 while coal generating capacity was expected to grow from 33 percent in 2015 to 43 percent

in 2030, equivalent to an increase of 40 coal fired power plants. The total capital requirement for these investments was estimated at US$9.8 billion per year, with the majority focused on coal power development.

In 2016, the Made in Vietnam Energy Plan (MVEP 1.0) was developed to offer both a critique and an alternative to PDP VII. MVEP 1.0 called for a more sustainable and domestically-oriented energy plan for Vietnam versus PDP VII forecasts, which prioritized significant growth in coal thermal power based on expectations of foreign direct investment and increasing coal imports. MVEP 1.0 argued that proceeding with implementation of PDP VII would entail financial, environmental, public health and energy security risks.

1.1 Coal thermal poses financial, security, environmental and public health risks

1.1.1 Under the forecast proposed by PDP VII (revision), Vietnam would require over 100 million tons of imported coal by 2030[4]—with important consequences.

Increased costs. The increasing number of coal thermal power plants proposed by PDP VII would require thermal (bituminous) coal that Vinacomin and Dong Bac cannot not supply. Anthracite coal, which is primarily used in metallurgy, is the highest quality coal. It has the highest carbon content and burns hotter than other types of coal. Anthracite comprises 67% of Vietnam's coal reserves.[5] While anthracite can be mixed with thermal coal in power plants, or blown as coal powder directly into furnaces, this decision generally is made in the design phase of power plant development. Anthracite is also a higher cost coal that is scarcer than either thermal coal or lignite. As a consequence of this imbalance of supply and demand, while thermal coal imports were rising, Vinacomin developed a surplus of unsold coal. In mid-2017, it had an estimated stockpile of 9.3 million tons, due primarily to loss of the Chinese market over quality issues.[6] Media reports suggested that Vietnam imported 14.5 million tons of coal at a cost of US$1.52 billion in the same year, an increase of 9.8% in terms of tons of coal over the previous year, but a 58.4% increase in terms of value.[7]

Less energy security. Increased reliance on coal imports and the possible need for energy imports from neighboring countries will result in less energy security for Vietnam. PDP VII projected the need to import roughly 100 million tons of coal per year by 2030, largely by ship through the East Sea into ports in Vietnam. In addition to the security of ships in the East Sea, Southern provinces are now rejecting plans to build coal ports adjacent to their current port facilities, which mainly export fruits, vegetables and rice. Finally, delays in the development of new coal thermal plants is leading to significant energy shortages in the south. As a result, in 2018, Hoang Quoc Vuong, Deputy Minister of Industry and Trade acknowledged the "real risk of power shortages in 2021-2023"[8] and proposed electricity imports from Laos and China to meet the demand-supply gap.

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[4] Ministry of Industry and Trade, General Directorate of Energy (April, 2017). *Vietnam's Power Development Plan*. Ha Noi, MOIT.
[5] Mijal, W. (2018). *Coal mining and coal preparation in Vietnam,* Journal of the Polish Mineral Engineering Society, Jan-Jun, pp. 275-286. Accessed on 3 Jun 2019 at http://potopk.com.pl/Full_text/2018_full/IM%201-2018-a40.pdf.
6VietnamNews (20 Jun 2017). Sell coal stockpile, cat rates: PM to Vinacomin. Accessed on 25 April 2019 at https://vietnamnews.vn/economy/378574/sell-coal-stockpile-cut-rates-pm-to-vinacomin.html.
[7] Vietnamnet (18 Apr 2018). Ministry defends high coal inventory. Accessed on 12 January 2019 at https://english.vietnamnet.vn/fms/business/199212/ministry-defends-high-coal-inventory.html.
[8] VNExpress (20 Aug 2018). V*ietnam eyes power imports from Laos*. Accessed on 11 Apr 2019 at https://e.vnexpress.net/news/business/vietnam-eyes-power-imports-from-china-laos-3790465.html.

Increased infrastructure costs. Importing coal will not only strain Vietnam's foreign exchange reserves it would also require additional investment in infrastructure such as terminals, ports, coal washing facilities, and local roads. These costs were not factored into the economic analysis of the planned buildout of thermal coal plants in PDP VII.

Financing risks. The global future for coal power plants is in serious threat due to concerns about limiting greenhouse gas emissions and the risk of stranded coal assets.[9] For both reasons, there is a smaller pool of financial institutions willing to finance coal power plants. Among those that are still willing, some charge increased borrowing costs and require the transfer of liability risk to either the operating company or the sovereign entity. Finally, projects funded under BOT agreements pose a particular risk.[10] When these plants are transferred to EVN after a cost recovery period of 20-25 years, they may have no remaining value as generation facilities.

1.1.2 Domestic sources of energy are under-utilized

While domestic hydropower has been, for the most part, fully utilized, the MVEP 1.0 laid out a clear pathway and rationale for increasing use of domestic natural gas, which is currently under-developed. Equally, PDP VII did not provide a clear pathway for development of renewable energy sources. In fact, PDP VII underestimated investor interest in solar, wind and biomass energy in favor of coal. The result has been a backlog of renewable projects seeking approval alongside a coal power development strategy that has been unable to attract investment. Finally, Energy efficiency, which can significantly reduce the need for new capacity, played a minor role in PDP VII. Efficiency incentives, including appropriate energy pricing and use of efficiency standards for appliances and building construction, can dramatically reduce the need for new energy sources while waste heat to energy could reduce operating costs and create new energy sources in the cement, steel and petroleum refining industries.

1.1.3 External, social and environmental risks were not fully considered

The planned build-out of coal power plants under PDP VII would have had significant social and environmental impacts that were not adequately considered. These include environmental impacts related to the settling of fly ash, which contains mercury, on farm land, fish ponds and villages near power plants and disposal of fly ash and slurry in landfills, as well as related acute and long-term health impacts from increased particulates in the atmosphere.[11] Since the approval of PDP VII, several provinces have refused new coal thermal plants and coal port facilities in response to these environmental and public health threats.

1.1.4 A reduction in the long-term competitiveness of Vietnam's energy sector

Renewable technologies are quickly replacing fossil fuels as the energy source of the future. Solar, wind, biomass and batteries now provide the least cost options for new generation in many energy markets. Despite these obvious trends, PDP VII provided few incentives to this growing industry. MVEP 1.0 promoted three core elements for a more sustainable energy system: greater energy efficiency, increased renewable energy in Vietnam's energy mix, and use of domestic

[9] IEEFA Asia (5 Feb 2018). ASEAN Coal Companies Are Shaking Their Stranded-Asset Cup at Debt Investors. Accessed on 15 Jan 2019 at http://ieefa.org/ieefa-asia-emerging-markets-asean-coal-companies-shaking-stranded-asset-cup-debt-investors.

[10] Vietnam Investment Review (11 Feb 2017). Electricity sector gets BOT boost. Accessed on 10 April 2019 at https://www.vir.com.vn/electricity-sector-gets-bot-boost-53395.html.

[11] A joint study by Harvard University and Greenpeace has concluded that air pollution, where coal fired power generation is one of key pollutant sources, would cause 4,300 premature deaths per year bringing the total to 21,000 by 2030. Greenpeace Southeast Asia 2015, http://www.greenpeace.org/seasia/Press-Centre/Press-Releases/Coal-expansion-in-Vietnam-could-claim-25000-lives-per-year/

natural gas as the best fit baseload for renewable energy. Each of these elements required policy support and regulatory frameworks that meet international accepted practice to allow leveraging of private sector domestic and foreign investment.

1.2 MVEP 2.0 makes an even stronger case for renewables, clean technologies, natural gas and energy efficiency

MVEP 2.0 is consistent with the vast majority of insights and recommendations from MVEP 1.0. However, the case for a low-carbon energy pathway for Vietnam's energy sector has only gotten stronger over the past three years. To be clear, global energy markets have begun to consolidate around a consensus that the costs of renewables and clean technologies will continue to decline rapidly and that these resources will outcompete other sources of energy on the basis of cost within the next five to ten years, if not sooner. Developments in global and regional energy markets over the past two years greatly increase the probability for a 2030 energy market that is much more focused on lower cost renewables and less dependent on fossil fuels leading to more diverse, secure, reliable and affordable energy systems.

2 The trend outside Asia has been towards increased renewables, a shift from coal to natural gas, and investment in new battery storage technologies and energy efficiency

The energy sector has witnessed significant technological, economic and financial changes since 2016, when MVEP 1.0 was written. This section provides a brief update of some of the most important developments.

2.1 While Asia invests in coal, the rest of the world shifts to renewables, natural gas and battery storage

2.1.1 Coal Demand

Global coal production peaked in 2013. The following three years saw declines in demand of over 3 percent per year. In large measure, these declines were due to volatile prices, retirement of coal thermal power plants in developed countries, the growth of renewable energy sources, and a shift to lower cost and cleaner natural gas as the preferred fossil fuel for power generation. In April 2019, for example, the United States' renewable energy sector generated more electricity than coal-fired plants, about 240 gigawatts of generating capacity, for the first time ever. Natural gas overcame coal as the United States primary energy source in January 2018 when natural gas's share in the energy mix climbed to 35% while coal dropped to

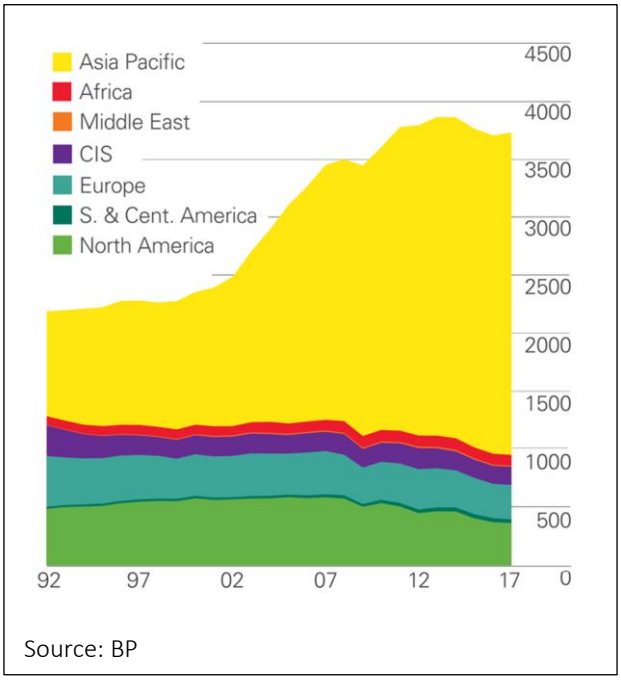


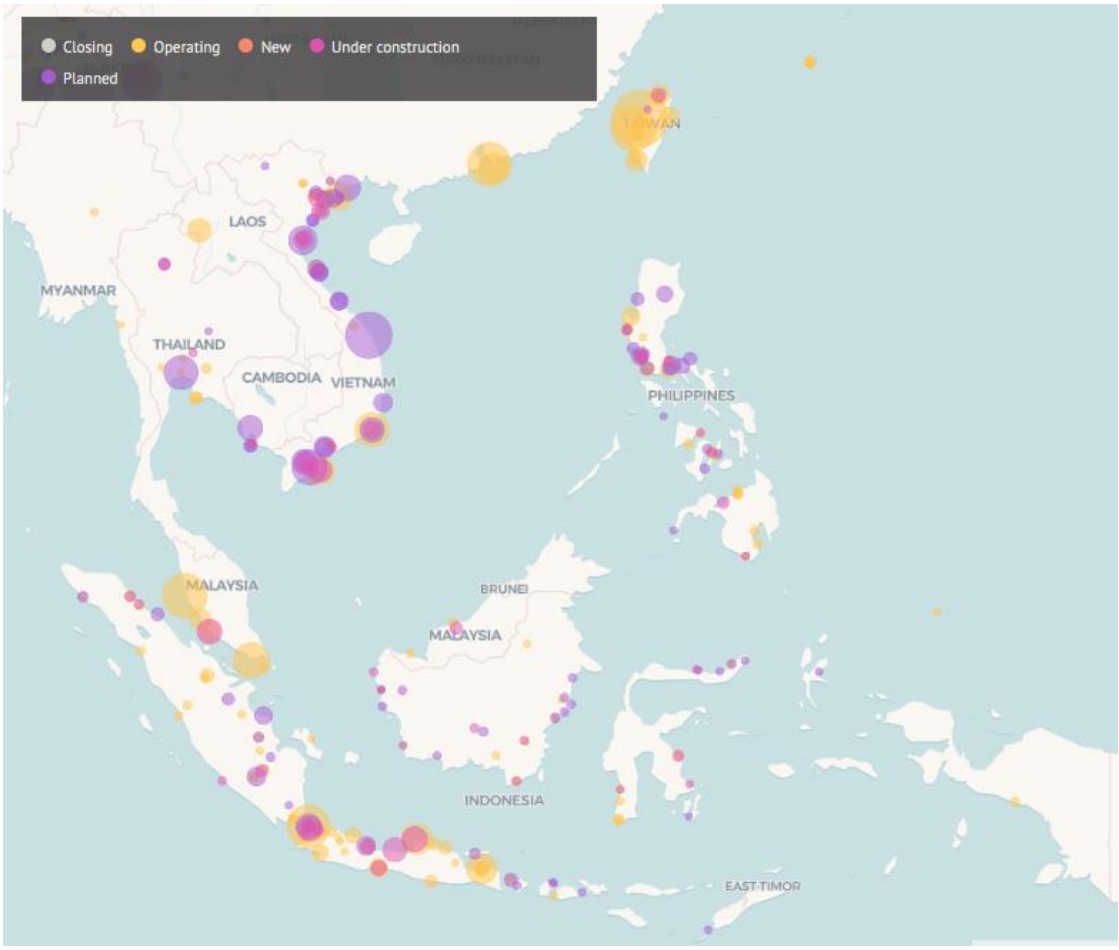
Figure 1. Global coal consumption

27%.[12]

As global coal prices declined in 2017, however, consumption increased by 1.0% (25 mtoe). This growth was driven largely by India (18 mtoe), with Chinese consumption also up (4 mtoe). *In all other regions outside Asia-Pacific, coal consumption declined.*[13]

2.1.2 Power plant construction

As the map below illustrates, Vietnam has more coal thermal power capacity planned or under construction than any other country in Southeast Asia.[14] In fact, Indonesia, which has overtaken Australia as the fifth largest exporter of thermal coal, has plans to increase coal thermal power generation by roughly 25 GW[15] while Vietnam, which imported more than 20 million tons of coal for energy generation in 2018, has plans to increase coal power generation by 36 GW by 2030. Indonesia's planned increase in coal generation is 20 GW *less* than planned just four years ago. In 2015, roughly at the same time Vietnam's PDP VII was approved, Indonesia planned for a 45 GW increase in coal thermal.



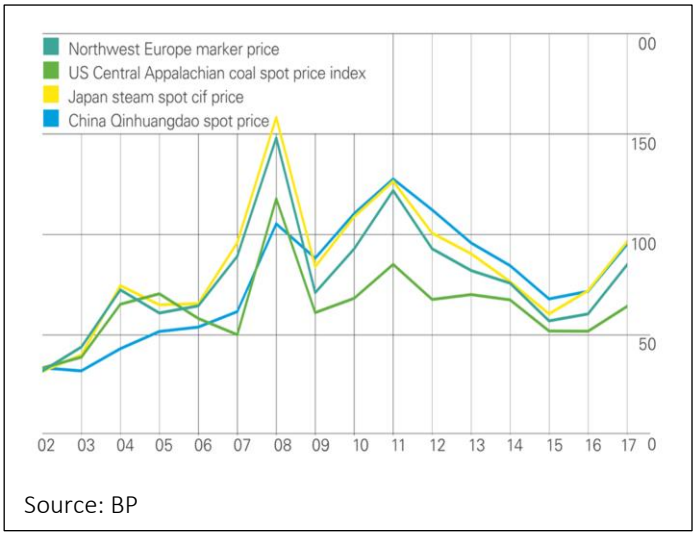
Source: Carbon Brief

Figure 2. Current, under construction and planned coal thermal power plants in Southeast Asia

[12] IEEFA U.S (25 Apr 2019). *April is shaping up to be momentous in transition from coal to renewables*. Accessed on 2 Jun 2019 at http://ieefa.org/ieefa-u-s-april-is-shaping-up-to-be-momentous-in-transition-from-coal-to-renewables/.
[13] BP. *Coal.* Accessed on 21 May 2019 at https://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy/coal.html.
[14] Carbon Brief. *Global coal power*. Accessed on 25 May 2019 at https://www.carbonbrief.org/mapped-worlds-coal-power-plants.
[15] Carbon Brief. *Profile: Indonesia.* Accessed on 25 May 2019 at https://www.carbonbrief.org/the-carbon-brief-profile-indonesia.

2.1.3 Price volatility

Coal spot market prices have seen dramatic volatility in the past 15 years, rising to roughly US$150 per metric ton in 2008, bottoming at US$50 in 2016, then rising to well over US$100 in late 2018. As with consumption, prices are largely driven by economic conditions and energy policies in India and China. While both India and China continue to rely on coal for electricity, both markets have overbuilt coal capacity leading to numerous plant halts and reduced average capacity factors for, at 56.7% and 52.5% respectively.[16] Nevertheless, demand in China and India are now the key factors determining the price of thermal coal on international markets, making coal markets dependent on economic conditions and stimulus policies in those countries.



Source: BP

Figure 3. Global coal spot market prices (USD/metric

2.1.4 Coal Financing

The environment for financing of coal power has shifted dramatically in the last two years. The below table summarizes the various financial institutions that have pulled back from financing coal power and/or coal mines.[17]

Table 1. List of banks ending finance of new coal power and coal mines

COAL POWER & COAL MINES[i]		
Banks that ended direct finance for both new thermal **coal mines and coal plants** (effective date)		
Natixis (August 2016)	Societe Generale (October, 2016)	ABN AMRO (May 2017)
ING (January, 2016)	Rabobank (January, 2017)	Lloyds Banking Group (Feb 2018)
Commerzbank (March, 2018)	BNP Paribas (November, 2015)	Standard Charter (May 2016)
KBC (December, 2017)	Deutsche Bank (May, 2018)	Santander (November 2018)
Credit Agricole (June, 2015)	USbancorp (June, 2016)	

[16] IEA (2018). Coal Information Statistics: Overview. Available for download at https://webstore.iea.org/coal-information-2018-overview.

[17] BankTrack (2019). *List of banks that have ended direct finance for new coal mines/plants*. Accessed on 2 Feb 2019 at https://www.banktrack.org/page/list_of_banks_that_ended_direct_finance_for_new_coal_minesplants.

COAL POWER ONLY		
Banks that ended direct finance for new coal plants only		
SEB (November 2016)	PNC (June 2017)	DZ Bank (November 2017)
NEDBANK (April 2018)		
COAL MINES ONLY		
Banks that ended direct finance for new thermal coal mines only		
JP Morgan Chase (March 2016)	Credit Suisse (March 2017)	DBS (January 2018)
HSBC (November 2016)*	NAB (December 2017)	Barclays (April 2018)

Source: BankTrack.org

*HSBC has pulled out of financing thermal coal globally, except for three countries (Vietnam, Indonesia and Bangladesh).

Importantly, these trends are also beginning to take shape in Japan and South Korea, two countries that have been a relatively consistent financier of coal power development in Southeast Asia.[18]

The latest report by the Institute for Energy, Economics, and Financial Analysis (IEEFA) suggests that nearly US$21.3 billion has been committed to build over 30 GW of new coal-fired power plants across 12 countries, with Vietnam ranking second in this list with commitments of nearly US$3.6 billion. Much of these commitments are by Chinese lenders including China Export-Import Bank, Bank of China and the Industrial and Commercial Bank of China. In fact, in 2016 coal power constituted 66 percent of the investments made by China's development banks.[19] And Chinese banks and financial institutions account for roughly half of all investments in coal power in Vietnam.[20]

2.2 Globally, wind and solar are becoming the lower cost alternative to coal and battery storage is becoming a competitive alternative to gas peaker plants

2.2.1 Wind and solar power

[18] For example, Japan's largest life insurance company, Nippon Life Insurance Co, announced in 2018 that it will no longer extend loans for, or invest in, coal-fired power plants due to environmental concerns. See Uranaka, Taiga (23 Jul 2018). *Japan's Nippon Life to stop financing coal-fired power.* Accessed on 1 Mar 2019 at https://www.reuters.com/article/us-japan-coal-divestment/japans-nippon-life-to-stop-financing-coal-fired-power-idUSKBN1KD08P.

[19] Wright, Helena (5 Dec 2017). *When will China's development banks go green?* Blog on E3G website. Accessed on 18 Dec 2018 at https://www.e3g.org/library/when-will-chinas-development-banks-go-green.

[20] Song Da (23/01/2019). Chinese investments flowing in Vietnam's thermal power plants. Accessed on 9 Jul 2019 at https://songda5.com.vn/en/news/chinese-investments-flowing-in-vietnam's-thermal-power-plants_n320.html

According to the International Renewable Energy Agency (IRENA), the average cost of electricity from onshore wind power has fallen dramatically from US$84/MWh in 2010 to US$55 in 2018. Further, the technology learning curves for onshore and offshore wind are 19% and 16%, respectively, suggesting substantial cost decreases in the years ahead.[21] During the past two years, wind power has already broken through "grid parity." Wind power projects can now offer competitive electricity with projects commissioned at or around US$0.04/kWh.[22]

Photo 2. An offshore wind farm in Hornsea, UK.

The average cost reductions from solar have been even more accelerated. Average costs have fallen from US$37 cents/kWh in 2010 to US$8.5 cents/kWh in 2018; and current auction prices suggest costs as low as US$5 cents/kWh in 2020.[23] Furthermore, the technology learning curve for the solar panel industry has been a robust 29%, suggesting even more cost cutting in the future.

In fact, according to Bloomberg New Energy Finance's 2018 New Energy Outlook[24], solar and wind power prices are expected to fall by 71% and 58% respectively by 2050. There is no international agency or institute forecasting such similar forecast for reductions in the price of fossil fuel-based power plants. As a result, on a global basis, renewables from solar and wind have steadily increased their share of new capacity, and in 2017 represented 64% of the world's net additional generating capacity.[25]

2.2.2 Battery storage

Similarly, battery storage has the ability to dramatically improve the economics and reliability of renewable energy. The costs for lithium-ion battery costs have fallen below US$200 per kWh of capacity, and costs are expected to fall a further 50%, to US$100 per kWh, within the next five to seven years. A December 2018 study by Credit Suisse illustrates that solar plus storage can be

[21] Learning curves express the concept that the cost of a technology decreases with a constant fraction for every doubling of installed capacity or exercised activity, and that as technology is produced there is accumulated and experienced learning that will affect costs. We note that there are no such technology learning curves for coal-fired power plants, and in fact the need to have "cleaner coal" plants will actually put upward pressure on costs for thermal coal plants.
[22] IRENA (2019). *Renewable Power Generation Costs in 2018—key findings and executive summary*.
[23] IBID.
[24] Bloomberg NEF (2019) *New energy outlook*. Accessed on 7 Jun 2019 at https://about.bnef.com/new-energy-outlook/ .
[25] Rundell, S. *Fossil Fuel on last legs*. Accessed on 6 Jun 2019 at https://www.top1000funds.com/2018/10/fossil-fuel-on-last-legs-lovins/amp/

more cost effective than natural gas peaker plants in many locations.[26] According to Bloomberg New Energy Finance, the industry has a technology learning curve of 18% and has seen prices declining annually by 21% since 2010.[27] This growing market has attracted many prominent power plant, transmission and engineering companies. One example is the partnership between AES and Siemens in the development and marketing of battery energy storage systems.

Solar-plus-storage PPAs: Lessons from Hawaii

Earlier this year, the Hawaiian Electric Company announced seven new solar-plus-storage contracts that were a landmark—in terms of both pricing and size. Six of these projects were at record-low PPA prices for the state, under US$10 cents/kWh. These new projects will add 262 MW of solar and 1,048 MWh of storage across three of Hawaii's islands. The hybrid storage systems in these projects will eventually provide the utility a means to operate the combined solar-plus-storage asset like a dispatchable traditional asset in a cost-effective way. This is a significant shift in the perception of Hawaii's energy future and sends out a strong market signal. Significantly, from 2016 to 2019 solar-plus-storage PPA prices in the state have dropped by 42 percent.

Photo 3. Solar plus battery peaker plant in Kauai, Hawaii.

Hawaii, with eight major islands and six grids, formerly relied primarily on imports of diesel fuel to meet its energy demand. This was followed by solar rooftop projects which today meet nearly 57% of the energy demand on the main island of Oahu. However, growing solar rooftop penetration led to grid management challenges, resulting very low capacity usage of diesel fuel power plants at peak hours. The new solar-plus-storage PPAs will avoid curtailment of solar as the plants will be able to respond to and support the grid on an as-needed-basis.

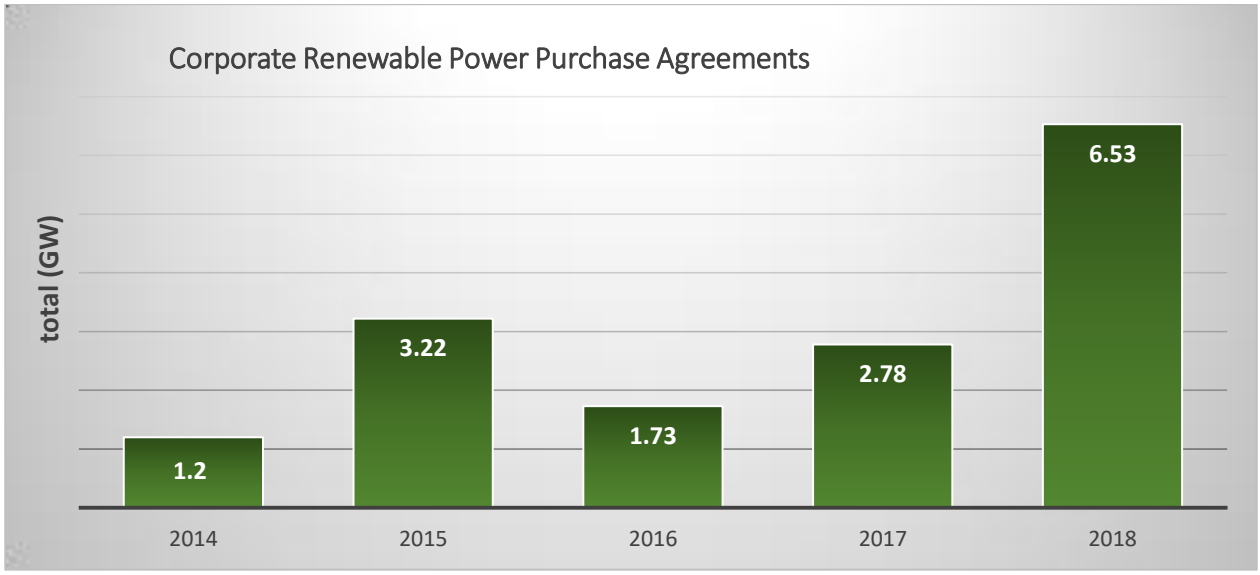
[26] Coren, M. (12 Jan 2019). *Solar plus batteries aim to retire natural gas plants in 2019*. Accessed on 28 May 2019 at https://qz.com/1521660/solar-and-batteries-are-retiring-natural-gas-plants/.

[27] Goldie-Scot, L. (5 Mar 2019). *Bloomberg New Energy Finance*, A behind the scenes look into lithium-ion battery prices. Accessed on 3 Jun 2019 at https://about.bnef.com/blog/behind-scenes-take-lithium-ion-battery-prices/.

2.3 *A growing number of global corporations are directly purchasing renewable energy from independent power producers*

A major global trend, with implications for Vietnam, is the active procurement of renewable energy by a growing number of global corporations. There are now 174 companies, including some of the world's best known brands, that have signed the RE100 pledge to use 100% renewable energy.[28] These members create a combined renewable energy demand of 188TWh.[29] In the US alone, corporate renewable PPAs totaled 6.43 GW (as of Dec 14, 2018), a year over year increase of 131% and a 436% increase from the total in 2014.[30]

Global corporations represented in Vietnam have signaled their interest in procuring renewable energy via the proposed Direct Power Purchase Agreement, particularly the Sleeved Model, where power producer and power end user can directly contract for the supply of clean energy. End users can now expect to receive long term supply contracts for renewable energy at a cost equal to or less than the cost of electricity from mixed energy sources provided by the power utilities. The DPPA proposal is a key step in providing greater market access for independent power producers and end users.



Source: Business Renewables Center

Figure 4. Corporate Renewable Power Purchase Agreements in the US, 2014 to 2018.

3 A diversified energy system, less dependent on coal, with increasing shares of energy produced by renewables, natural gas, and battery

[28] RE100 (2019). *185 RE100 companies have made a commitment to go '100% renewable*. Accessed on 15 Mar 2019 at http://there100.org/companies.
[29] RE100 (2019).*Reports and briefings).* Accessed on 20 May 2019 at http://there100.org/reports-briefings.
[30] Business Renewables Center (2019). *Corporate renewables deals*. Accessed on 10 Jun 2019 at http://businessrenewables.org/corporate-transactions/.

storage will create a more secure, affordable and reliable energy system

Vietnam's energy system is imbalanced with generation largely in the North and demand growing in the South. PDP VII proposed constructing new coal thermal power plants in the South to resolve that imbalance. MVEP 2.0 proposes a more diverse energy system that includes a greater focus on renewable energy, particularly in the South where new energy sources are needed, combined with adequate new LNG terminals and power plants using imported LNG as Vietnam's domestic sources are brought online. MVEP 2.0 also proposes increased investment in grid infrastructure to match new energy sources, particularly in the Mekong Delta, Southeast and South-Central regions. In PDP VII, the National Power Transmission Corporation (NPT) estimated that buildout of the grid to meet projected demand would cost roughly $5 billion, with a high initial cost declining 10-15% per year from 2019-2023.[31] This level of investment in grid infrastructure was based on the location of large-scale thermal coal plants. In order to meet the needs of more distributed network that includes renewables, integrated grid battery storage and new LNG power plants, MVEP 2.0 recommends that PDP VIII, now under development, creates opportunities for private sector investment in grid infrastructure. The combination of private investment in renewables, LNG and grid infrastructure could meet much of Vietnam's investment costs through the next power planning period.

3.1 The proposed expansion of coal thermal power in Vietnam has failed to find financial support

In 2018, coal represented 38% of Vietnam's total installed capacity, 18.516 GW out of a total of 48.563 GW.[32] While coal thermal is currently the predominate energy source, to retain that dominance under conditions of increasing new generation would require enormous investments in power plants, infrastructure, and a recurring burden on foreign reserves for the cost of coal imports.

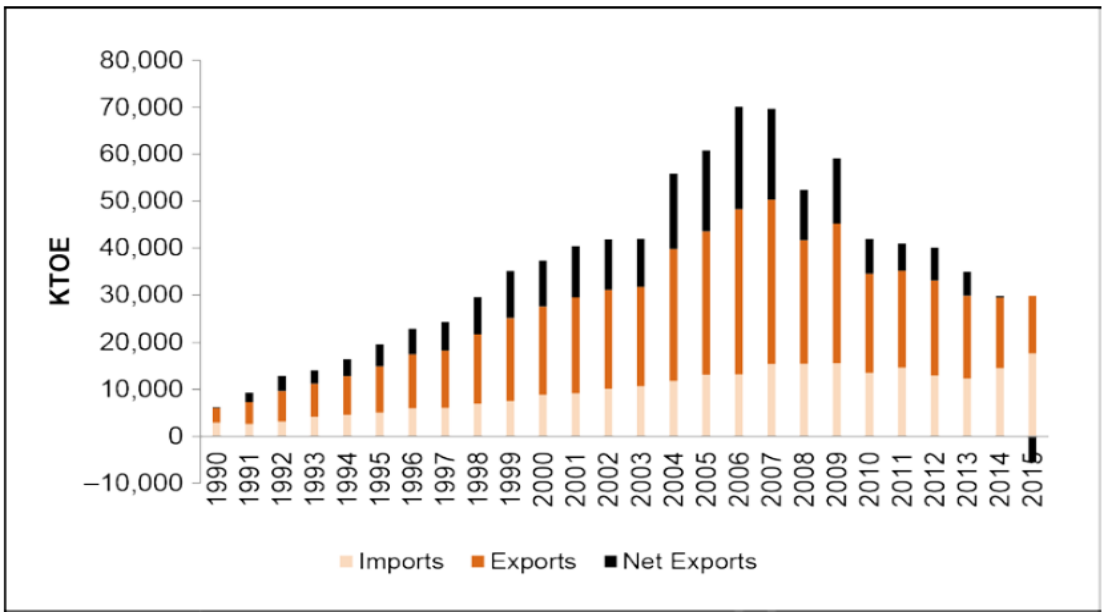
Vinacomin reported that Vietnam's coal import volume reached more than 11.7 million tons in 2017, would reach 21 million tons in 2018, and rise to 100 million tons in 2030 under current plans[33]. Clearly, this demand cannot be met by domestic output, estimated at roughly 40 million tons per year.

1. The best of Vietnam's currently exploited coal reserves are better used in metallurgy while the country's lower quality coal is inferior to thermal coal imports.
2. Thermal (bituminous) coal required by power plants is sold on volatile global markets that are highly indexed to economic conditions outside Vietnam.
3. Since the global coal market is a US dollar market, growing imports will place pressure on Vietnam's foreign currency reserves.

[31] National Power Transmission Corporation (2019). *Power Transmission Opportunities and Solutions*. EVN-NPT roundtable discussion hosted by the United States Embassy in Hanoi, Vietnam, 30 May 2019.
[32] MOIT, *Renewable Energy Development in Vietnam*, presented at the Second Energy Security Dialogue, Washington, D.C. April, 2019.
[33] Voice of Vietnam (19 Apr 2018). *Vietnam's Coal Imports Grow Despite Large Reserves*. Accessed on 20 Dec 2019 at https://english.vov.vn/economy/vietnams-coal-imports-grow-despite-large-reserves-373000.vov.

4. Foreign-owned coal plants set up on Build-Operate-Transfer (BOT) basis or a Build, Own, Operate, Transfer (BOOT) basis, both of which may have cost recovery periods greater than 20 years,[34] are especially vulnerable to changes in the cost structure of energy. The concessionaire may face rising operational costs that make cost recovery more difficult during the concession period or the plant itself may have become a stranded asset when it is turned over to the Ministry of Industry and Trade at the end of the concession.

In the chart below, starting in 2015 Vietnam became a net importer of energy; and under current plans, this trend will accelerate as coal increases its share of power capacity.



Source: IEA (2015)

Figure 5. Vietnam energy imports - exports position

According to IEEFA, Vietnam has a proposed pipeline of 13,380 MW of coal-fired power plants, ranking second in the list of the countries with the most proposed coal power projects globally[35]. Nearly 42% of these projects have secured funding commitments. Most of the coal-fired projects in Vietnam have been built with funding from Chinese banks and, in fact, many of the new proposed coal projects are an additional phase of the completed projects. The report suggests that since most of the coal projects in Vietnam are built on BOT basis, the strategic relationship with the Chinese banks takes precedent over the sponsorship of the company.

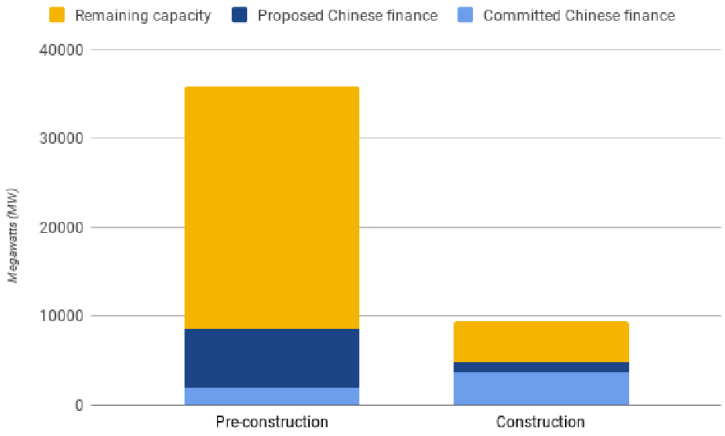
Export Credit Agencies (ECAs) bear a huge responsibility for continued large investments into coal power plants across Southeast Asia, especially in Vietnam. Foreign investors in large infrastructure projects in countries that do not have an investment grade rating require some form of insurance against the risk of default. ECAs "guarantee" projects on behalf of their domestic investors, including engineering and construction firms. In a recent workshop, the

[34] In practice, governments rely on the Pay Back Period (PBP) under the minimal Internal Rate of Return (IRR) as expected by the concessionaire to determine the concession period.

[35] Shearer, C., Brown, M. and Buckley, T. (2019). *China at a Crossroads: Continued Support for Coal Power Erodes Country's Clean Energy Leadership*. Accessed on 5 Jan 2019 at http://ieefa.org/wp-content/uploads/2019/01/China-at-a-Crossroads_January-2019.pdf.

representative of a Singapore-based bank said that without ECAs, many coal power projects would not exist as no bank would consider financing them without guarantees.[36]

It is also important to note that while Chinese, Japanese and Korean banks and financial institutions are reducing support for coal power plants and promoting renewable energy domestically, they continue to finance the expansion of coal power plants in Southeast Asia. This is clearly a geographic shift in coal thermal energy as opportunities in home countries become constrained and engineering and construction firms seek work abroad. While the OECD and European Union have pressured both Korea and Japan to end financing coal, the reality of family owned, politically influential conglomerates makes both international and shareholder activism difficult. In the absence of sovereign guarantees from home countries, financial risk would limit the likelihood of these influential corporations investing in coal energy. It may take a series of losses to ECAs for governments to recognize their own risk and for citizens to recognize their cost.



Source: IEEFA (2019)

Figure 6. Coal-fired capacity under development in Vietnam with Chinese finance (MW)

3.2 Private sector investors have shown a rapidly growing interest in renewables over the past three years

There have been substantial changes over the last two years within Vietnam that largely align with trends that can be observed globally.

Wind Energy

Over the last four years, the levelized cost of electricity (LCOE) for wind in Vietnam has fallen by 30%. The average cost of construction (in 2018) for onshore wind energy plants in Vietnam is US$ 1,980,000 per MW with annual operating expenses at US$33,190 per MW. Between 2025 and 2030, it is anticipated that wind construction costs will fall to US$1,800,000 per MW while

[36] Personal communication, Peter duPont.

operating expenses will remain the same.[37] By 2022, it will be cheaper to invest in onshore wind in Vietnam than to invest in new coal.[38]

Photo 4. Wind turbines on farmland in the UK

Solar PV

The levelized cost of electricity (LCOE) for solar in Vietnam has fallen 106% over the last four years, and there is a much greater supply of projects and investment than needed to meet national targets for solar PV. According to the PDP VII, the projected capacity for solar is 850 MW by 2020, 4,000 MW by 2025 and 12,000 MW by 2030. In fact, as of June 30, 2019, there were 82 solar power plants, with a total capacity of about 4,464 MW approved and online. As a result, solar power accounted for 8.28% of the installed capacity of Vietnam's electricity system.[39] Many further licenses have been issued to companies who have no experience developing power plants in Vietnam, including some of the country's largest conglomerates, have limited access to finance and whose projects may create significant negative land use impacts and undermine the security of the transmission grid.

Photo 5. Floating Solar in Lam Dong province

Floating PV

Floating solar farms are fast gaining popularity. From the first floating solar plant larger than 10 MWp installed in 2016 to the latest 150 MWp floating solar plant being developed by China's Three Gorges Corporation, the sector has witnessed exponential growth in the last two years. As of mid-2018, the cumulative installed capacity of floating solar was nearly 1.1

[37] Green ID (2018). *Analysis of Future Generation Capacity Scenarios for Vietnam*. Accessed on 21 Oct 2018 at http://en.greenidvietnam.org.vn/app/webroot/upload/admin/files/060618_GreenID_Study%20on%20future%20power%20sources.pdf.

[38] Carbon Tracker Initiative (2018). *Economic and Financial Risks of Coal Power in Vietnam*. Accessed on 12 May 2019 at https://www.carbontracker.org/reports/economic-and-financial-risks-of-coal-power-in-indonesia-vietnam-and-the-philippines/.

[39] Năng Lượng (02/07/2019). *Điện mặt trời chiếm 8,28% công suất hệ thống điện Việt Nam*.

(GWp).[40] There is great potential for floating solar power plants in land-scarce Southeast Asia since the solar plants can be constructed on water bodies such as dams, lakes and even the ocean. With such projects, utilities can better utilize their existing transmission infrastructure (since most facilities are set up on hydropower reservoirs) and ensure more efficiency (since the water's cooling effect helps reduce thermal losses). The Electricity Generating Authority of Thailand (EGAT) recently announced its plans to build 16 floating solar PV farms with a combined capacity of more than 2.7 gigawatts in nine of its hydroelectric reservoirs by 2037. Several of the proposed projects are more than double the size of the world's largest floating system now and the planned 2.7 GW of capacity is more than double the 1.3 gigawatts of generation installed globally as of October 2018.[41]

As per IRENA's 2019 report on "Scaling Up Renewable Energy in Vietnam: Industry Perspectives on Key Challenges and Opportunities" Vietnam needs to mobilize nearly US$10 billion in investment each year to 2030 to meet targets set in the current power development plan. In terms of renewable energy, including hydropower the country's annual investment since 2012 has been an average of nearly US$290 million, far below the potential.

On 29 January 2019, the Ministry of Industry and Trade of Vietnam released the third draft of Decision of the Prime Minister on the mechanism for encouraging the development of solar power projects in Vietnam, for application from 1 July 2019. Unlike the earlier standard tariff for all solar power projects, MOIT has now proposed different tariffs for different regions as per their solar radiation potential. Region 1 includes 28 northern provinces with lower solar radiation potential; Region 2 includes 6 central provinces with medium solar radiation potential; Region 3 includes 23 central highlands and southern provinces with high solar radiation potential, and region 4 includes 6 south central provinces with very high solar radiation potential.

Tariffs for grid connected solar vary by installation type: floating, ground mounted and rooftop and are valid for projects with a commercial operation date (COD) between July 1, 2019 and December 31, 2021. Tariffs apply for 20 years from the COD. Integrated battery storage is treated separately and while no tariff has been published at the time of this writing, it is expected to be higher than grid connected solar.

Table 2. Solar power tariffs proposed in April 2019[42]

	Region 1 Tariff	Region 2 Tariff	Region 3 Tariff	Region 4 Tariff
Floating solar power projects	9.98	8.59	8.05	7.65
Ground-mounted solar power projects	9.20	7.91	7.89	7.5
Rooftop solar power projects (power selling and power consuming household model)	10.87	8.86	9.36	7.62

Units: US cents/kWh

[40] Voice of Vietnam (19 Apr 2018). *Vietnam's Coal Imports Grow Despite Large Reserves*. Accessed on 23 Feb 2019 at https://english.vov.vn/economy/vietnams-coal-imports-grow-despite-large-reserves-373000.vov.
World Bank and SERIS (Solar Energy Research Institute of Singapore). 2018. *Where Sun Meets Water; Floating Solar Market Report*. Accessed on 20 Mar 2019 at http://documents.worldbank.org/curated/en/579941540407455831/pdf/131291-WP-REVISED-P161277-PUBLIC.pdf.

[41] Bangkok Post (5 Mar 2019). *Thailand to Build World's Biggest Floating Solar Farms*. Accessed on 5 Mar 2019 at https://www.bangkokpost.com/business/news/1639562/thailand-to-build-worlds-biggest-floating-solar-farms

[42] Proposed third draft of Decision of the Prime Minister dated 11 April 2019.

These tariffs could be even lower, roughly US$7.5 cents on average, if the model PPA for solar were revised to remove current off-taker risks to solar investors, such as the curtailment and termination clause. With reduced risks, the sources of finance -banks and fund managers – would be able to offer lower interest rates, meaning the cost of generation would also be lower. Further, as the market develops, FITs would become unnecessary.

Leveraging the solar potential in Vietnam

Vietnam, and specifically South and South-Central Vietnam, holds tremendous promise for a solar-based energy system. Utility-scale solar projects now have attractive economics but are currently held back by a lack of grid infrastructure. Likewise, the market for onshore and offshore wind projects are financially attractive and are similarly held back by a lack of grid capacity in certain regions. In addition to the need for a more rapid build-out of capacity to support renewables, MOIT and related agencies should prioritize grid stability solutions, including battery storage, and consider inclusion of private sector players that can leverage expertise.

One great example of how sector prioritization and support by the Government can help scale up markets is the solar energy industry in the United Arab Emirates (UAE). The region had no operational solar power until 2013 and yet today it has established itself as a key solar market with several iconic projects such as the Dubai Mohammed Bin Rashid Al Maktoum Solar Park. A landmark PPA of US$0.0585 /kWh was signed for the second phase of this solar park in 2014, followed by US$0.0299 /kWh for the third phase until 2020[43]. The solar sector in the UAE is booming due to the combination of favorable FITs, secure grid connection, land availability, bankable PPAs and risk sharing mechanisms offered by the government.

3.3 Natural gas is the current best baseload for renewable energy

During the first quarter of 2019, LNG power plants took center stage in discussions of Vietnam's energy future as representatives of foreign investors, utilities and development finance institutions made appearances in Hanoi. Between 1 January and 23 March 2019, representatives from Thailand's Gulf Energy Development Public Company Limited (Gulf), Korea Electric Power Corporation (KEPCO), the German Development Bank (KfW), Sumitomo Mitsui Banking Corporation (SMBC), and Japan's JERA Co., an energy developer, held meetings with national political leadership and energy executives with the aim of increasing the number and capacity of gas fired power plants and LNG terminals in Vietnam.[44] This shift from coal to gas in energy planning is important in terms of Vietnam's energy security, reliability of the electricity system, and greenhouse gas emissions reductions. But LNG should not be regarded as a replacement for all planned and proposed coal power plants. MVEP 2.0 proposes a balanced strategy that integrates an adequate supply of LNG power generation within an electricity development strategy that is renewables led.

Vietnam's gas reserves, which are primarily in offshore basins within the country's Exclusive Economic Zone, are estimated at around 202 bcm. Annual out-put, which reached 9.8 bcm in

[43] United Arab Emirates (23 Apr 2018). *Renewable Energy*. Accessed on 20 Jun 2019 at https://www.export.gov/apex/article2?id=United-Arab-Emirates-Renewable-Energy.

[44] Hoang Hung, 23 Mar 2019. *VNExpress*, LNG power plants take centre stage in Vietnam, investors keen. Accessed on 10 Jul 2019 at https://e.vnexpress.net/news/business/industries/lng-power-plants-take-centre-stage-in-vietnam-foreign-investors-keen-3898898.html.

2017, is split between the power sector, which consumes about 80 percent of output, and the fertilizer and industrial sectors, which consume about 10 percent each.[45] While development of these domestic resources has been a priority for the Government of Vietnam and its Oil and Gas Industry, actual utilization for power generation has been much slower than desired due, in part, to ongoing conflict in the East Sea, increasing cost of drilling in deeper water and complex geology,[46] and investor fatigue. In the meantime, growth in demand for electricity has outstripped growth in supply, particularly in the Southeast region.

To help address Vietnam's energy needs within the timeframe of pending shortfalls in energy capacity will require the rapid development of a wide spectrum of renewable energy sources and modalities. In the future, battery storage and hydropower may also be able to resolve problems related to intermittency of these sources. However, dispatchable generation capacity that is capable of maintaining grid voltage and frequency under a variety of demand and climate conditions will need to be met with a lower carbon source of energy than coal, the energy source choice of PDP VII. This need can be met by imported LNG.

Asia is already driving strong demand growth for LNG. By 2035, nearly 50% of total global LNG demand growth, and 80% of power and industry demand growth, is expected to come from Asia. For this reason, the global power market is shifting towards better alignment and planning for increased use of LNG as fuel for gas-fired power projects. An additional commissioning of 132 bcma of liquefaction capacity is expected by 2022, with the US and Australia representing ~70% of new capacity. The US is expected to continue increasing its share in global liquefaction capacity by 70 bcma alone.

New supply from the US and Australia are disrupting historical LNG flow patterns, while simultaneously introducing new pricing metrics for LNG based on US Henry Hub (HH) index pricing schemes rather than traditional oil-linked contracts. Since the global oil crash in 2014, and the subsequent recovery, the LNG market is beginning to observe a delinking in the relationship between long-term contract price tied to crude oil and spot prices. Contract terms for LNG supply are evolving to include greater flexibility with removal of restrictive destination clauses and shorter terms, resulting in a more competitive spot market in Asia. Market liberalization and deregulation in Japan have increased pressures associated with competitive procurement practices and now many buyers in Japan are looking for alternatives to oil-linked formula for their LNG contracts as Japanese utilities diversify their pricing exposure to include both hub-indexed and spot-indexed LNG. Some of the largest investors in US LNG are Japanese and Korean firms that recognize the long-term value and potential of the competitive US LNG market.

Burning natural gas in power plants rather than coal could help provide public health and environmental benefits by reducing air pollution. Cleaner burning than other fossil fuels, the combustion of natural gas produces negligible amounts of sulfur, mercury, and particulates. Because combined cycle natural gas generators can be ramped up and down 600 MW within 10 minutes, they could support the integration of wind and solar. Natural gas can also play an important role in meeting peak electricity demand and fueling cogeneration plants that generate both heat and power—which are up to twice as efficient as plants that only generate electricity.

However, natural gas is not a panacea. Poor management of drilling, extraction and pipeline transportation can result in the leakage of methane, a greenhouse gas that is 86 times stronger than CO_2 at trapping heat over a 20-year period. These "fugitive" methane emissions can equal 1

[45] World Bank Group (2019). *Vietnam: Maximizing finance for development in the energy sector*. World Bank: Washington, D.C.
[46] Ibid.

to 9 percent of total life cycle emissions of a LNG power plant.[47] Technologies are available to reduce leaking methane, but deploying such technology requires policy action and investment in both exporting and importing countries.

Given Vietnam's offshore gas reserves, the ability to import LNG at favorable terms into the foreseeable future, the preferability of LNG over coal, the reduced impacts on public health and the environment, and the possibility of reducing climate change impacts, LNG is or ought to be considered a preferable competitor to coal. Since gas is both used for baseload and quickly responsive to changes in demand or renewable supply, it is a strong contender to be a larger part of Vietnam's energy mix. PDP VII planned for 10 gas fired power plants, including six combined cycle power plants, with a total capacity of roughly 24.2 GW, located in the Central, Southeastern and Mekong Delta regions. Investor interest suggests that there are likely to be more proposed as substitutes for planned coal thermal power.

The expansion of LNG as a fuel source for power stations will be dependent on the creation of a network of regassification terminals. A recently completed report for the International Finance Corporation (IFC) demonstrates that the Vietnamese coastline has many suitable locations for use of Floating Storage and Regasification Units (FSRU) and the installation of LNG import terminals, both onshore and offshore.[48] Whether and how Vietnam uses FSRUs, should be determined based on financial feasibility studies matched to geography, expected size, and throughput capacity. None have so far been planned. Their value is in their capacity for rapid deployment, especially to existing gas power plants.

Vietnam's most recent oil and gas sector plan proposed construction of six LNG terminals. As of the early part of 2019, ten have been proposed and one, Thi Vai, is under construction. The creation of storage facilities will allow for utilization of LNG shipped via truck to other industries outside the power sector. The ability for LNG to displace use of LPG represents long-term cost savings to end users by direct supply.

[47] Union of Concerned Scientists (2019). *Environmental impacts of natural gas.* Accessed on 12 Jul 2019 at https://www.ucsusa.org/clean-energy/coal-and-other-fossil-fuels/environmental-impacts-of-natural-gas#references.
[48] COWI, (2019). *FSRU siting and configuration options report.* COWI: Kongens Lyngby, Denmark.

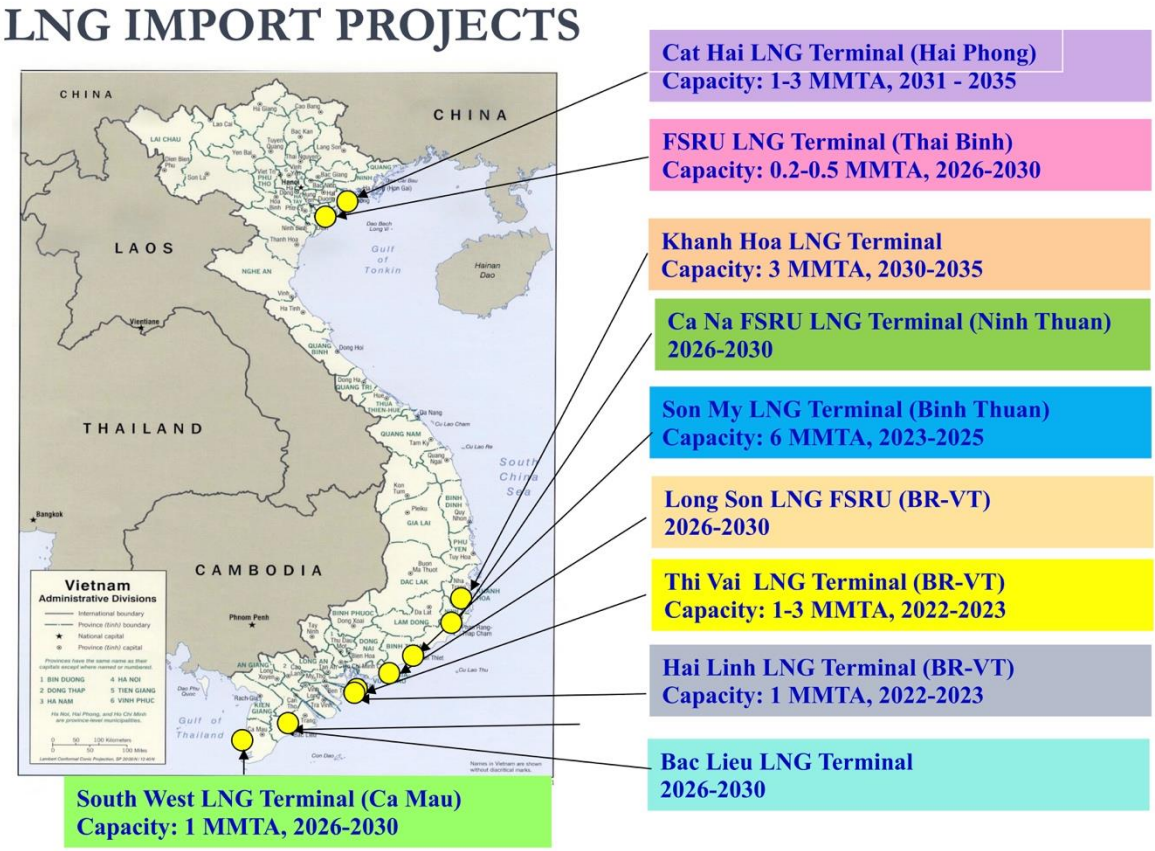


Figure 7. LNG terminals proposed or under construction, 2019.

3.4 Battery storage offers new opportunities for the maintenance of grid stability

The rapid improvement of efficiency and reduction in cost of batteries has seen a rapid rise in their use in advanced electricity markets. Bloomberg New Energy Finance reported that:

"the benchmark levelized cost of electricity, or LCOE, for lithium-ion batteries has fallen 35% to $187 per megawatt-hour since the first half of 2018"[49]

This dramatic advance creates three opportunities for applying battery storage in Vietnam electricity markets:

1. Grid Stabilization and Capacity enhancement via large utility battery plants on the transmission grid. A recent study determined that 200 MW of battery storage placed within the grid would allow EVN to transfer 500MW to the Southeast region, where supply barely meets demand.[50]
2. Power Production and Storage at the site of generation enhancing the renewable power producer's ability to meet grid demand when it is needed

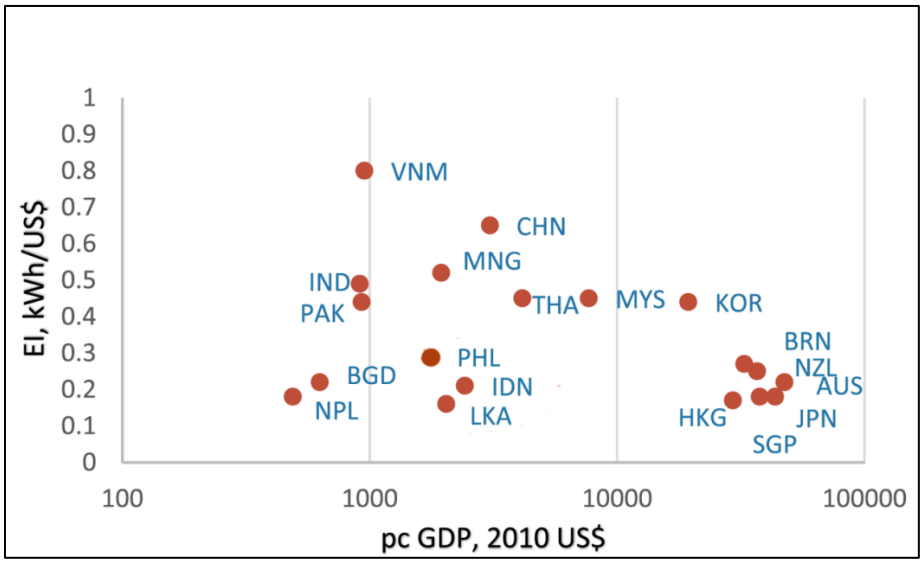
[49] Bloomberg New Energy Finance (26 Mar 2019), *Battery Power's Latest Plunge in Costs Threatens Coal, Ga7*. Accessed on 6 May 2019 at https://about.bnef.com/blog/battery-powers-latest-plunge-costs-threatens-coal-gas/
[50] Personal communication, AES commissioned study for EVN.

3. Distributed Solar power generation and storage at the point of consumption. Commercial, industrial and residential power consumers have embraced the chance to combine batteries with local renewable power generation, particularly solar power, which reduces the transmission load on the local grid.

3.5 *Vietnam's electricity tariff does not recover full costs and represents a risk for the future of the electric power system*

According to the World Bank, the electricity tariff in Vietnam is among the lowest in the region, even compared with the countries with low income per capita such as Cambodia, Indonesia, the Philippines, Laos and Myanmar (see Table 1).[51] The result of low energy tariffs can be seen in the country's high level of energy inefficiency and growth rate in demand. Energy intensity, the cost of energy relative to GDP, is the most common measure of energy efficiency. As seen in the figure below, Vietnam's energy intensity per capita for the period between 2009-2013 is well above every country in the region, especially higher than those countries with a similar level of GDP per capita, including the Philippines, Indonesia and Sri Lanka.[52]

Rapidly growing demand is one outcome of Vietnam's high level of energy intensity. During the 2011-2015 period, national electricity consumption grew at the average rate of 10.6%/ year, which was lower than the average growth of the period 2006-2010 at 13.4%/year. That's good news for energy planners. But, at the same time, electricity is taking up an increasing share of total energy consumption, and electricity demand is expected to grow by 8% annually on average until 2035, corresponding to a need for an additional 93 GW in power generation capacity during the period.[53]



Source: Hien, 2019

[51] Arlet, J. (2017). *Electricity Tariffs, Power Outages and Firm Performance: A Comparative Analysis*. Accessed on 10 Mar 2019 at http://pubdocs.worldbank.org/en/444681490076354657/Electricity-Tariffs-Power-Outages-and-Firm-Performance.pdf.

[52] Hien, P. D. (2019). *Excessive electricity intensity in Vietnam: Evidence from a comparative study of Asia-Pacific countries,* in Energy Policy vol. 130, pp. 409-417.

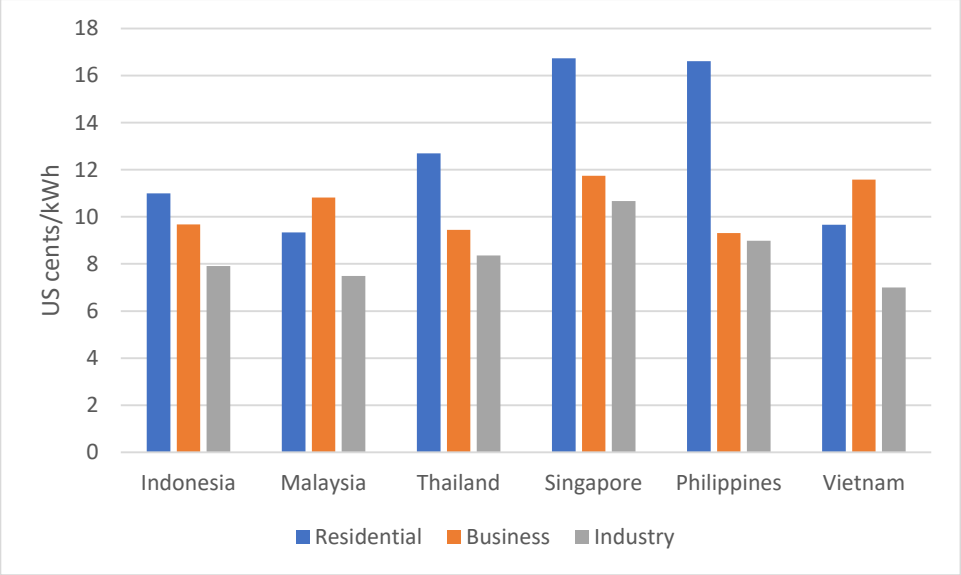
[53] MOIT (2018). *Vietnam Energy Outlook Report, 2017*. Hanoi, MOIT.

Figure 8. Energy intensity for Asia Pacific countries averaged over the 2009-2013 period.

Public statements of EVN and the government indicate the need to have consumer tariffs reflect full cost. However, the details of how this will happen, and the pathway for tariff increases, remain unclear. The Prime Minister released Decision 34 in 2017, setting the tariff framework for average electricity retail prices for 2016 - 2020. It spans from a low VND1,606.19 (6.9 US per cents) kWh to a high of about VND1,906.42 (8.2 US cents) per kWh, VAT excluded.[54]

The head of the Electricity Regulatory Authority of Vietnam has indicated that in all four of its current planning scenarios, the total electricity generated by coal-powered thermal power plants would increase substantially, putting pressure on EVN to increase electricity prices.[55] Additionally, a 5 percent increase is expected in coal prices in 2019, and since coal accounts for a significant proportion of electricity's production cost, this will exert significant pressure on the electricity industry.[56]

One recent report recommended that EVN would need to raise the electricity tariff by 7% annually on average, in order to achieve full cost recovery.[57]



Source: Epifany 2018.[58]

Figure 9. Comparison of Electricity Rates across ASEAN, 2018

In general Vietnam electricity consumers enjoy some of the lowest prices in ASEAN with industrial consumers enjoying a price 14% below the average price paid by consumers in Vietnam. Yet industrial consumers surveyed by IISD in 2015 indicated that low power prices was hardly a reason for them to locate their FDI businesses in Vietnam at all and their clear and obvious priority from the electricity supplier was to ensure a safe, high quality and reliable power

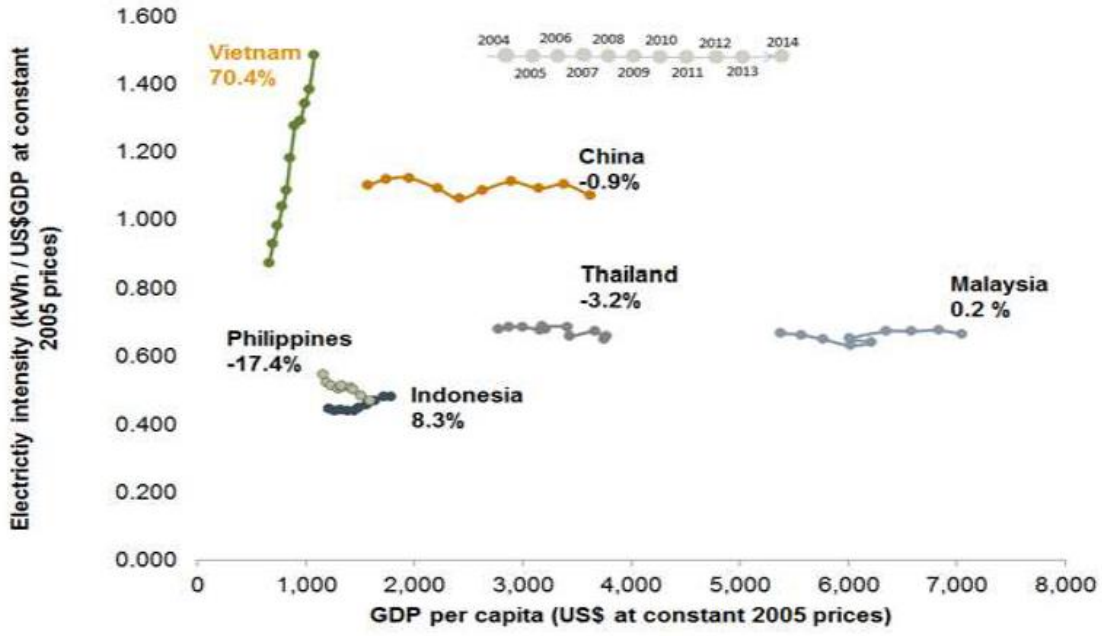
[54] VBF (12 Jun 2018). Meeting between Electricity Regulatory Authority of Vietnam and Vietnam Business Forum. Summary of meeting prepared by VBF's Power and Energy Working Group.
[55] Minh, Anh (2 Dec 2018). *Vietnam may increase electricity prices next year*. Accessed on 7 Jan 2019 at https://e.vnexpress.net/news/business/industries/vietnam-may-increase-electricity-prices-next-year-3847868.html.
[56] IBID.
[57] VLEEP (Personal Communication)
[58] Epifany, S. (31 Jan 2018). *Indonesia Electricity Tariff Still Competitive in ASEAN Region*. Accessed on 20 Jun2019 at https://www.infrastructureasiaonline.com/government/indonesia-electricity-tariff-still-competitive-asean-region.

supply at all times. With a few exceptions (in the cement and fertilizer sectors) respondents to the survey indicated that they were not price sensitive and would like the opportunity to buy renewable energy. The conclusion of this report is that the subsidies and cross subsidies that the power utility is providing industrial consumers in Vietnam provides an electricity supply priced below cost, that the industrial consumer does not value or need.

3.6 Improved energy efficiency can lower the growth in demand, reduce carbon emissions, and raise productivity

The growth rate in Vietnam's electricity demand has been much higher that the GDP growth rate for the past two decades and Vietnam's energy intensity, reaching 0.94 kWh/US$ in 2014, is the highest in the Asia Pacific region. This lack of coherence between economic growth and energy intensity undermines the assumption that Vietnam high level of energy intensity is justified as necessary to promote economic growth.

In a developing economy, the general trend is for energy intensity to increase as consumers transition from electric fans to air conditioners, purchase refrigerators and television, and lay aside their hand appliances for the convenience of electric tools. In Vietnam, however, the major driver of energy intensity is in manufacturing.[59] From 1994 to 2014, the industrial sector in Vietnam consumed ten times more electricity than the service sector but generated less GDP value added. Manufacturing and processing bear the burden for Vietnam's highly inefficient electricity use, not consumers. A recent article by Dr. P. D. Hien of Vietnam's Atomic Energy Institutes attributes the blame to outdated technology in the production process, whose use is an outcome of tariffs that have been kept below cost recovery and, in fact, set lower for industry than the service sector.[60]



Source: ECA calculations using data from BP Statistical Yearbook (electricity generation) and World Bank (real GDP and GDP per capita).

[59] Ibid.
[60] Ibid. p. 415.

Figure 10. Change in energy intensity between 2004 and 2014

The Made in Vietnam Energy Plan 1.0 noted that 11% of the total new power generation planned to be built by 2030 would not be needed if investment in energy efficiency was stimulated. The low cost of electricity and confusing tariff structures encourages waste and deters investment in energy efficiency while many consumers believe that their electricity tariffs will remain heavily subsidized by the public budget. Decision No. 34/2017/QD-TTg issued on 25 July 2017 on the framework on average retail electricity pricing in the period of 2016 - 2020 and the "pricing framework" that was published in December 2017 is not clearly linked to a market-based pricing system for electricity and suggests that electricity prices will increase at a rate less than current CPI. This price signal will deter investment in energy efficiency, not stimulate it.

4 A more diversified energy system that relies on domestic sources can provide a more secure, robust and resilient energy development pathway

4.1 Strategic Energy Priorities

Our MVEP 2.0 is a business-led plan that calls for an energy pathway to the future that offers Vietnam an affordable and bankable means of

1. Meeting the growing energy demand
2. Securing energy independence
3. Enabling consumer access to clean energy

Two recent reports—done by very different organizations—have recently been carried out and come to similar conclusions: that a pathway that is energy-efficient, renewables led, and has a significant gas component to replace coal, is a better pathway for Vietnam's power sector. We support the basic thrusts of these two pathways and summarize the significant benefits below.

4.2 A renewables led pathway, backed by hydropower and natural gas, is Vietnam's lowest cost option to rapidly meet energy demand

A recent McKinsey report on Vietnam's energy sector provides timely analysis to evaluate the financial, environmental and social trade-offs between the current pathway and a renewable-centric pathway. In particular, it highlights a "Renewables-Led Pathway" for Vietnam's energy future.[61] The Renewables-led Pathway is the optimal low-cost case based on an hourly model of dispatches to meet energy demand over the next 15 years; economic dispatch of hydropower resources; and build-out of Vietnam's gas infrastructure. A key driver in this model is a bankable power-purchase agreement (PPA) that can be used to attract debt financing and thus significantly reduce the cost of capital for Vietnam's power sector.

McKinsey's scenario models indicate quite different potential futures for Vietnam's power sector.

The Renewables-led Pathway would have significant benefits:

[61] Mckinsey & Company (2019). *Exploring an alternative pathway for Vietnam's energy future.* Accessed on 1 May 2019 at https://www.mckinsey.com/featured-insights/asia-pacific/exploring-an-alternative-pathway-for-vietnams-energy-future

1. **Cleaner:** 32% reduction in greenhouse gas emissions
2. **More secure:** 70% reduction in million tons of imported coal
3. **Cheaper:** 10% cheaper compared to the current plan
4. **More employment:** this path could create an additional 465,000 jobs in Vietnam between 2017 and 2030

Table 3. Key Results from McKinsey "Renewables-led Pathway" for Vietnam's Energy Future[1]

	Current Plan	Renewables-led Pathway	Highlights
Cleaner Total emissions (2017-2030), CO_2 equivalent	3.5 gigatons	2.4 gigatons	• Renewables-led pathway reduces key emissions o 1.1 gigatons (32%) reduction in greenhouse gas emissions o 0.58 megatons (33%) reduction in particulate emissions
More secure Total fuel imports (2017-2030), MMBtu[2]	18 billion	7 billion	• Renewables-led pathway limits imported fuels o 440 million fewer tons of imported coal (~70% reduction) o Creates 465,000 jobs
Cheaper Total costs[3] (2017-2030)	$230 billion	$207 billion	• Renewables-led pathway is 10% cheaper ($23 billion) vs. Current Plan: o $5 billion increase in levelized capital expenditures o $2 billion increase in operations and maintenance o $6 billion reduction in interest payments

[1] Model run over 2017-2040 assumes no increase in power demand beyond 2030 in order to compare with Current Plan, while optimizing capacity for this period.
[2] One million British thermal units
[3] Adjusted for terminal value of assets by end of 2030 or end of 2040, depending on run, assuming sinking fund depreciation; in 2015 dollars (includes capital costs, fixed and variable operations and maintenance, fuel costs, implied fuel subsidies, and interest payments).
Source: McKinsey 2019

4.3 A renewables led development scenario will reduce growth in CO_2 emissions and allow Vietnam to exceed its NDC commitments

In 2017, the Green Innovation and Development Center commissioned an analysis that did least-cost optimization for Vietnam's power sector through 2030, accounting for the public health and environmental costs of pollution from fossil-fueled power plants and CO_2 emissions.

The Green ID scenario has benefits similar to those of the McKinsey, Renewables-led Pathway:

1. **Increased energy security** due to less reliance on imported fuel;
2. **Reduced financial pressure** of mobilizing US$ 60 billion investment for construction of coal thermal power plants;
3. **Avoided cost** of constructing 30,000 MW of new coal power by 2030;

4. **Avoided burning 70 million tons of coal per year**, resulting in foreign reserves savings of $7 billion/year;
5. **Cut 116 million tons of CO_2 emissions annually** compared to the PDP VII revision, ensuring that Vietnam will be in line with the Paris Agreement targets; and
6. **Reduced air and water pollution**, avoiding approximately 7,600 premature deaths annually by 2030 compared to PDP VII revision.

4.4 VBF recommendations are consistent with these approaches, with some caveats

While the technical assessments and projections that have informed both of the above studies can be debated, both conclude that a renewables led approach would be cost-effective (and therefore affordable), increase energy security, reduce pollution and related deaths and health impacts, and create a significant number of job opportunities for Vietnamese. These are consistent with recommendations in this report. We differ with McKinsey's assessment of the role that hydropower can play in enhancing grid stability. Vietnam's monsoonal climate creates havoc for hydropower dam managers who must be careful not to allow water levels to fall too low during dry seasons, or too high in wet seasons. Furthermore, given that the largest hydropower dams are in the North and the energy deficit is in the South, management of hydropower for storage and grid stability will not be easily achieved. Floating photovoltaics on hydropower reservoirs, particularly in the South, offers a partial solution to this problem by first locating energy sources where they are needed and second, by relieving some dry-season generating pressure on dam operators. We also differ with Green ID's estimates of avoided costs. We cannot assume that halting new approvals for coal fired thermal plants will result in the savings Green ID forecasts. First, we cannot assume that all of the forecast coal capacity will be replaced by renewables, and second, given that LNG terminals will need to be constructed and LNG imported to fuel power plants, investment and ongoing purchases of imports will still be necessary. For these reasons, we recommend that Vietnam's LNG strategy includes construction of an appropriate level of import infrastructure while Vietnam's own offshore deposits are brought into production.

5 VBF recommends a renewables led energy strategy that draws on diverse sources of energy to produce a safe, secure, reliable and low-carbon electricity system

MVEP 2.0 acknowledges the near-term issues and complexities that must be considered and administered by the Vietnamese agencies, power producers and related stakeholders: namely, cost-effectively meeting near term demand that grows 8% plus per year, while navigating the right infrastructure and technology choices in an energy industry undergoing rapid change. Our opinion is that, given the current cost structures, a renewables led pathway would provide Vietnam not only with a means of meeting its energy needs, but also provide affordable and reliable energy that also meets the country's social and environmental goals

5.1 VBF recommends six key policy areas that would create a more financially, socially and environmentally sustainable energy system

The Made in Vietnam Energy Plan (MVEP 2.0) recommends a similar bold move towards a more financial, social and environmentally sustainable energy system underpinned by the following key policy decisions:

1. Prioritize renewable energy in national power planning
2. Increase use of natural gas as the current best-fit baseload for renewable energy
3. Construct a regulatory and permitting environment that attracts private sector investment in clean energy generation and energy efficiency
4. Construct a regulatory and permitting environment that attracts smaller scale off-grid investment in clean energy generation and energy efficiency
5. Invest in grid infrastructure to improve stability and capacity
6. Halt any new approvals for coal

5.2 To achieve these goals, VBF recommends the following polices:

Create a fairer allocation of risk between private sector investors and the state counter-parties/partners.

If the solar PPA is improved to meet the standard acceptable to international and domestic banks, the financing costs of solar power plants can immediately reduce, and a Feed in Tariff of US$7.5 cents would attract $2 billion in FDI for solar energy by 2021.

1. MOIT makes the three most important improvements and amendments to the model solar PPA on 1st July 2019 (including: (i) Termination payments, (ii) Curtailment and Failure to take and pay by EVN, (iii) Dispute Resolution / Arbitration Clauses and extends the application of the Feed-in-Tariff for 20 years from the commercial operation date under the PPA for new solar projects which reach their commercial operation date by 30th June 2021 with a reduced Feed in Tariff
2. It would be logical to also make similar improvements and amendments to the standard PPAs for wind power, biomass and waste to energy.
3. The solar Phase 1 development in 2017/2018 will achieve initial success at 500mw to 750mw installed capacity, but local bank finance resources are now fully utilized. We recommend policies that support local banks to cooperate with international banks and investors to co-invest to with local developers with the bankable solar projects.

Stimulate energy efficiency investment and distributed electricity generation by power consumers.

The current tariff structures do not recover the cost of making and delivering electricity to consumers and may require an increasing amount of public subsidy due to the unavoidable increase in the cost of making and delivering new electricity from 2018 to 2020.

MVEP 2.0 recommends that the Government of Vietnam create a market-based electricity pricing system under PDP VIII which:

1. Continues the socialized pricing system with support for low income citizens
2. Reduces the need for government loan guarantees

3. Discourages electricity wastefulness thereby lowering the burden to develop new electricity sources
4. Attracts private sector investment in Distributed Clean Energy Generation and Energy Efficiency
5. Has fair and transparent tariffs for those consumers who can afford to pay the full cost of electricity
6. Protects key industries with national importance, such as fertilizer, steel and cement production

To achieve these goals MVEP 2.0 proposes three key policy actions, including:

1. Redesign the daytime hourly tariff for Commercial and Industrial (C and I) consumers to reduce the peak demand and the peak load on the transmission system and reduce transmission losses.
2. Create regional variation in retail tariffs to reflect the different regional prices in the wholesale electricity market.
3. Publish a roadmap to market-based electricity tariffs to 2020 and 2025 for Commercial and Industrial consumers. This would provide a signal to the market to improve energy efficiency ahead of tariff increases while also providing transparency to new entrants to the Vietnamese economy.

In development of PDP VIII, the Government of Vietnam and Multilateral Development Partners should focus on areas of investment that can leverage the private sector.

In principle, public sector investments should focus on areas of the energy system with high social and environmental benefit, but unclear or very long-term return on investment. These area areas where private sector investment is not feasible. Under current policy condition, such investments include:

1. Upgrading and expanding transmission and distribution networks
2. Improving management of the energy system to accommodate a greater role for renewables and battery energy storage systems (BESS)
3. Improvement of energy related data collection and distribution including solar radiation mapping, wind resource mapping, and land suitability analysis
4. Promote policies that encourage public institutions and residential households to use bio-mass, solar, wind and other clean sources of power generation.
5. Speed up decision-making and coordinate regulations to encourage development of off shore gas, LNG, energy efficiency, and renewables.

Provide net metering credits for rooftop solar power delivered to EVN

Many VBF members have signed PPAs with EVN to deliver excess electricity from rooftop solar systems to EVN they have also reported delay in the implementation of the payments under the net metering PPA. EVN has indicated to VBF that the treatment of VAT on the PPA power sales between building owner and EVN has caused a barrier to paying for electricity supplied to EVN from rooftop solar systems and indicated that it is trying to resolve the matter.

Under Official Letter No. 1337/EVN-KD of Vietnam Electricity (EVN) dated 21 March 2018 sent to local power corporations regarding temporary guidelines for rooftop solar power projects/systems,

- For excess power output generated by generators to the grid systems of EVN's local power entities, the payment and finalization will be implemented only after the Ministry of Industry and Trade and the Ministry of Finance issues their specific guidelines (Item 3.c); and
- The rooftop solar power purchase agreement (according to the model templates under Circular No. 16/2017/TT-BCT) will be officially signed between the power seller/generator and EVN's relevant power entity after the Ministry of Industry and Trade and the Ministry of Finance issues their specific guidelines (Item 5).

The VBF submission to the solar energy rooftop regulations was that a 3MW capacity plant could be implemented without a Power Operation License. VBF recommends that MOIT considers increasing the exemption in Circular 12/2017 from 1MW to 3MW to fully capture the benefits of investment in solar rooftop energy systems.

We understand that the MOIT has been working on a draft Circular to replace Circular No. 12/2017/TT-BCT on Power Operation License. According to the draft Circular, however, we understand that the threshold of 1MWp remains unchanged. Thus, we continue to suggest the MOIT take into account our recommendation of 3MW as the threshold in the new draft Circular.

Request urgent attention of the Ministry of Finance and the Ministry of Industry and Trade to resolve the issue and to clarify when payments/credits will be made for electricity supplied.

Create a regulatory environment that supports development of offshore wind energy.

Global offshore wind power is growing rapidly as it is one of the lowest cost renewable energy solutions. Investors see great potential to develop offshore wind power in Vietnam as part of a sustainable energy market. With a long coast line, Off-Shore Wind can help Vietnam build Power Plants closer to high demand locations and avoid having too many plants at low demand provinces like Ninh Thuan and Binh Thuan.

VBF recommends that MOIT consider developing for large scale offshore wind:

1. Internationally Bankable PPA
2. Synchronized Permitting, Licensing and Master-planning process in a single one-stop shop
3. Including EVN NPTC and all stakeholders in a developing a Strategic Grid Transmission Plan. and consider allowing developers to build their own 220kv and 500kv transmission lines
4. Define the FIT that will be available until 2025

Allow "behind the meter" power plants up to 50MW capacity.

Producing electricity close to the consumer, behind the meter, for own consumption, using solar, wind, waste heat to energy, or biomass technology is a cost-effective solution to meet local power demand. It removes pressure on the local power distribution grid and benefits EVN by reducing the need for further capital investment in the transmission and distribution network. As no electricity is exported to the grid there are no safety concerns for EVN.

VBF recommends that behind the meter clean energy power plants that export no power to the EVN grid are:

1. Exempted from the need to obtain an Operating License up to 50MW capacity
2. Not required to seek approval in the National Energy Development Masterplan
3. Required to give EVN reasonable notice of when the power plant is to be commissioned

Provide FITs for solar and battery combinations.

The provisions for solar/battery were removed from the latest draft of the Prime Minister's decision on solar tariffs. Solar and Battery Storage in combination are an extremely effective way to generate and supply electricity and to avoid high variation in the amount of electricity exported to the grid. We understand that one study conducted by AES has been completed and that two additional studies funded by USTDA and ADB are underway. VBF understands EVN's interest is waiting for these studies to be completed in order to assess the role and pricing of battery power.

However, VBF recommends that solar and battery storage combinations are included in the final draft of the Solar Power Decision in 2019

Raise FITs in the 2019 Solar Power Decision or provide a bankable model PPA.

VBF PEWG anticipates and welcomes the Draft Solar Power Decision to be finalized and issued in 2019. However, the new FIT tariff was cut by up to 30% and may be too low to attract investors to invest in solar. The net profit to investors is lower than a one-year deposit account in a Vietnamese bank. There is a risk that due to the low profit offered, high cost of development, uncertainty of grid connection, and the internationally unbankable PPA, that most of the remaining solar power projects (~363 projects) may never be commissioned.

VBF recommends that in Annex 2:

1. The proposed price should be increased, or a new draft PPA should be issued which is bankable for international financing.
2. Khanh Hoa, Dak Lak, Gia Lai and Phu Yen have a similar yield comparable to most provinces in Region 3, according to the solar yield map of Vietnam. These provinces should be in Region 3 not Region 4

Prioritize floating solar and promote it extensively.

Floating solar has none of the problems of overloaded grid capacity (they are located on reservoirs belonging to hydropower installations) and no or very limited negative land use impacts

VBF recommends that the floating solar:

1. FIT be increased to US 9 cents/kWh until 2022, to incentivize investment in floating solar and to compensate investors for higher cost of the equipment
2. Be given priority in the National Masterplan over other power projects

Move forward with market transformation and liberalization.

Vietnam has committed to improve market access for private sector power developers and allow competitive energy markets to be established. However, there has been little progress on

equitization of the EVN GENCO companies. Implementation of the Vietnam Wholesale Energy Market, which is the next key step in the liberalization of energy markets, has been postponed from the original implementation date in 2016.

VBF Recommends that MOIT

1. Proceed with the GENCO equitizations in 2019
2. Implement the Wholesale Energy Market in 2020

Clarify the impacts of the 2018 Planning Law on power investment.

The Planning Law of 2018 is causing power investors great concern. Under the provisions of the Law, national master planning will serve as a basis for the formulation of all other master plans nationwide, including sectoral master plans such as the Power Development Master Plan. In a recent online conference, government stakeholders expressed concern that the law required a high level of integration between central, provincial and ministerial authorities leading to confusion and delays.[62] These delays are affecting the power sector negatively. Given the discussions now going own between government stakeholders, VBF requests clarification of the process for approval of new grid-connected electricity generating plants in Vietnam, which VBF hopes will be designed to minimize and simplify the permitting, approval and licensing processes.

[62] Nhân Dân (15 Jul 2019). *Hội nghị trực tuyến toàn quốc về thực hiện Luật Quy hoạch.* Accessed on 16 Jul 2019 at https://www.nhandan.com.vn/nation_news/item/40871902-hoi-nghi-truc-tuyen-toan-quoc-ve-thuc-hien-luat-quy-hoach.html