

Vietnam Electricity Case Study

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1. Introduction

Comprehensive reforms since 1986 (known as ‘Đổi Mới’) have put Vietnam on a stable economic growth trajectory, transforming the country from a low- to a middle-income economy in one generation.

Vietnam has one of the most energy-intensive economies in the world. Since 2010, electricity consumption has increased by approximately 10% per annum. This is attributed to strong economic growth and increasing industrialisation, universal electrification and modernisation. Installed electrical capacity grew 10 fold from 5GW in 2000 to 55GW in 2020. Access to electricity increased from 14% in 1993 99% in 2020.

To meet the growing demand, Vietnam would need about 130 000MW installed capacity by 2030. The installed capacity would have to double in size in the next 10 years and EVN (Electricity of Vietnam) estimates an investment close to US\$148 billion.

In the past, Vietnam has been dependant on low cost hydropower and State subsidised fossil fuels to generate electricity. The potential for additional big scale hydro projects has almost reached its limits, coal reserves are declining, leading to a marked increase in coal imports and both coal and oil prices are increasing. These reasons, together with increased electricity demand have led Vietnam to look for alternative power generation sources.

To address the growing demand, the government has adopted a programme to restructure the electricity sector through privatisation of power generation facilities, allowing IPP (Independent power producer) participation, forming PPPs (Public private partnerships), and by shifting the energy mix away from coal-fired electricity generation in favour of electricity from renewables and LNG (Liquified natural gas).

Vietnam has done an excellent job of controlling the impact of the COVID-19 pandemic, achieved a positive net GDP growth of 2,91% in 2020. Growth is expected to bounce back to forecasted growth levels of 6,8% in 2021 (World Bank). Nonetheless, due to COVID-19, the forecasts for the next couple of years will be subject to higher-than-normal forecast risk. The electricity sales growth in 2020 was constrained at 2,2% but is forecast to return to 9% growth levels in 2021.

(EVN. Assessment of Power Supply Situation in the Last Four Months of 2020 and Preliminary Outlook for 2021. 31 August 2020).

2. Structure of the Electricity Market

2.1. Regulatory Authorities

Under the leadership of the Ministry of Industry and Trade (MOIT), steady legal and regulatory reform has been carried out to gradually introduce competition into the electricity market without adversely affecting supply.

This reform has been executed by the vertically integrated, state-owned Vietnam Electricity (EVN). EVN was established as a limited liability company in 2010 through reorganisation of the departments of the Ministry of Energy and has since been unbundled into specialised units. Parts of EVN have been privatised. The Electricity Regulatory Authority of Vietnam (ERAV), which oversees the implementation of the reforms, was established.

The power generation market is being successfully opened to competition, but EVN still holds the monopoly in electricity transmission, retail and wholesale buying of electricity.

Laws govern participation of 8 parties in the electricity market, namely: Electricity-generating units, Electricity-transmitting units, Electricity-distributing units, Electricity-wholesaling units, Electricity-retailing units, National electric system-regulating units, Electricity market transaction-administering units, and customers.

2.2 Structure of Power Generation

The main entities involved in electricity generation are:

2.2.1 *EVN and its subsidiaries*

Due to power sector liberalisations, in the past 5 years, EVN's own generation capacity has shrunk from 61% of Vietnam's total installed capacity to 52%. EVN owns three generation companies, Genco 1, 2 and 3. Genco 2 owns both hydroelectric (100% of Trung Son Hydropower plant with the designed capacity of 1 billion kWh per year) and thermal generating units accounting for 50.7% of its total generation capacity. Genco 2 has actively invested in renewable energy projects, both solar and wind.

- **Power Generation Corporation 3 (Genco 3)** had an Installed capacity of 6 304 MW (2018). Only 2,8% of the 49% stake offered in the initial public offering (IPO) in 2018, was sold.
- **Power Generation Corporation 2 (Genco 2)** had an installed capacity of 4 461 MW (end 2020). Genco 2's IPO in early 2021 was also unsuccessful.

2.2.2 *Privatised or partly privatised generation companies*

These are Power Plants previously wholly owned by EVN, that have been publicly listed.

2.2.3 *Independent power producers (IPPs)*

The largest IPPs are state owned:

State owned PVN (The Vietnam Oil and Gas Group) is responsible for all oil and gas resources in the country and has become its country's largest oil producer and second-largest power producer.

State owned Vinacomin (Vietnam National Coal-Mineral Industries Holding Corporation Limited)

State owned PVG has been granted the exclusive rights to import LNG via its Thi Vai terminal to fuel the group's gas-fired power plants, but it remains unclear if those rights will apply elsewhere.

Some of the largest privately owned IPPs are:

AES Corporation (U.S.) has invested in \$2,1 billion coal-fired Mong Duong 2 Power Plant (capacity of 1240MW) in Quang Ninh Province. This project is currently the largest foreign invested power project. AES holds 51%. AES is also developing the 2.2 GW Son My 2 power plant project in Binh Thuan province and is negotiating to develop the Son My terminal with PVGas.

Delta Offshore Energy (Singapore-based) has been granted a licence for the first of the LNG (liquefied nitrogen gas) projects, LNG Bac Lieu, a USD4.0 billion project involving a floating storage regasification unit (FSRU), a gas pipeline, and a 3.2 GW power plant.

2.2.4 *PPPs (Public-Private Partnerships)*

These are projects in the form of BOT (build-operate-transfer) projects where a foreign investor builds a power generation project, operates it for certain period of time to gain profits, and then transfers it to the Vietnamese Government. As of February 2020, there were 19 BOT thermal power plant projects, with a total capacity of about 27,000 MW.

Although, there are no restrictions concerning the foreign ownership of electricity companies or assets that are involved in electricity generation, currently most foreign generation companies invest in the electricity sector through PPP in the form of BOT projects. This is to minimise risks and take advantage of government guarantees and incentives, which include:

- Zero import duty for assets forming the fixed assets of a renewable energy project and for materials unavailable domestically.
- Corporate income tax exemption or reduction.
- Land rental exemption or reduction.
- Government funding for research and technology of pilot projects.
- Preferential credit loans.

2.3 Structure of Transmission, Distribution and Retail

Electricity is transmitted by the National Load Dispatch Centre (NLDC) through the transmission grid of the National Power Transmission Corporation (NPTC) via 500kV, 220kV and 110kV lines to the Electricity Purchase and Trading Corporation (EPTC). These organisations are all subsidiaries of EVN.

EPTC (subsidiary of EVN) was the only buyer of electricity generated from on-grid IPP projects, where PPA (Power Purchasing Agreements) were negotiated with the generators. However, as from January 2019, 5 large IPPs started selling electricity directly on to the grid. EVN is also no longer the sole buyer of electricity from solar power projects in Vietnam with the pilot phase of solar auctions having started in 2021.

The Vietnamese government does, however, regulate trading through price and conditions of sale.

Electricity is traded between generators and buyers in one of two ways:

- PPAs
- Spot dealing using electricity market transaction-administering units. These units regulate, control and co-ordinate electricity transactions between electricity market players to ensure they adhere to regulations.

EPTC, in turn, sells electricity through the distribution grids to five power corporation subsidiaries (or their local subsidiaries): North Power Corporation, Central Power Corporation, South Power Corporation, Hanoi Power Corporation, and Ho Chi Minh City Power Corporation.

These 5 power corporations then sell electricity to end-consumers.

The distribution charges and conditions are also regulated by the Vietnamese government.

3. Regulatory Framework and Reform Objectives

3.1 Regulatory Framework

The Electricity law of 2004, amended in 2012 and 2018, and various decrees, resolutions, decisions, and circulars continually being issued by government, is formalising the shift of the electricity sector to a market economy with diversified forms of ownership and management.

The Vietnamese government produces PDPs (National power development plans) which are used to shape policy choices to advance the sector. These plans forecast growth in demand and map out the development of the power industry to meet this demand. Laws require National Power Development Master plans to be adopted for 10 year periods. Plans are aspirational in nature and should be seen as a directional roadmap rather than a rigid masterplan. Plans are revised as long as the investment makes socio-economic sense.

3.2 Reforms and Reform Objectives

While PDP 7 Powder Development Master Plan (approved in 2016 and revised in 2017) focused primarily on coal power generating investments (about 45 additional GW by 2030) and to a lesser extent on renewables (18 GW by 2030), PDP 8 details aggressive expansion driven by renewables and gas-fired generation, coupled with grid development and system flexibility and increase in imports until renewable sources mature.

EVN is expected to own only 20% of power generation assets by 2030. A dramatic shift in capital spending reflects a series of policy decisions that have been taken since 2004 to reposition EVN away from being a traditional vertically integrated power company to being the systems operator with responsibility for grid operations and development. Future development of new generation capacity has been shifted to developers via IPPs and to the two state-owned entities (the PetroVietnam and Vinacomin). EVN's three generating companies, (Gencos 1,2 and 3) are eventually also expected to be unbundled from EVN.

PDP 8 (First draft of the Power Development Master Plan for 2021-2030 with a vision to 2045, released July 2020) includes the following objectives:

- Total installed capacity is set to more than double to 130GW in 2030 and reach 222GW in 2040. Expansion is to be driven primarily by new solar and wind energy projects and gas-fired power plants. These sources combined will make up 47% of the system in 2030, rising to 60% in 2040. The renewables share of the total market is expected to reach 15-20% by 2030 and 25-30% by 2045.
- New measures to encourage large-scale solar and rooftop solar in the North to address daytime peak demand.
- A move away from over-reliance on coal-burning IPPs with cancellation of 17GW of coal-fired capacity (nearly 50% of projects in the pipeline).
- Prominent role is to be given to combined cycle gas turbines (CCGT) to support peak load demand and complement intermittent nature of renewable energy. There is estimated to be a total potential of 108 GW of LNG-fired capacity for Vietnam, spread across the northern and southern regions. Given Vietnam's declining natural gas reserves, all new gas-fired capacity will be fuelled by imported LNG and newly discovered offshore reserves.
- Establishing new grid links and imports of electricity from Laos and China are expected to grow from current 2% of total output to 5% in 2030 (at 6.5 GW connected capacity) before declining to 3% by 2045 as renewable energy sources mature.
- Greater focus on system flexibility, with a move away from base-load orientated planning, to enable EVN to optimise a more diverse generation mix.
- Tariff support for storage, ancillary services, a transmission link from the Central South to the North.
- Encouraging the participation of all economic entities in electricity development, especially private economic enterprises.
- Encouraging the development of a modern, smart power grid in Vietnam.

National Energy Efficiency Plan (VNEEP)

According to the VNEEP, the Government aims to improve overall energy efficiency by 8-10% by 2030. Studies suggest that due to the subsidised low cost of electricity, industries have become inefficient in their use of electricity in production, choosing to spend on electricity rather than on capital investment in energy efficient equipment and processes.

Reform plans that have been implemented:

Generation: Plans to achieve a competitive power generation are being implemented successfully.

Transmission: In April 2020, Vietnam's first privately-funded and built transmission pilot project in the southeast province of Ninh Thuan started operating. In June 2020, the Law on Public-Private Partnerships legalising private financing of transmission infrastructure was adopted. Private sector participation in transmission development will initially be led by entities with direct interests in renewable power plants.

Distribution: (19 March 2020, Proposal 1968/TTr-BCT) The draft which will enable investors to propose solar projects and power prices, and bid for MOIT's list of substations and distribution lines, was submitted by MOIT to the Prime Minister and given in-principle approval.

Wholesale Market: After a pilot period, the competitive power wholesale market officially came into operation in January 2019, with five large power stations selling electricity directly. The World Bank has supported the development of the first-ever framework for competitive bidding for solar and is now providing transaction advisory support for the pilot phase (500 MW) solar auctions which are planned to be launched in 2021. (Vietnam Solar Transaction Accelerator (P172974) Project).

The preliminary MOIT draft for the competitive Solar Auction Mechanism entails:

- trying to secure lower-cost power through auctions,
- managing the risk of grid constraints through sub-station auctions and designated solar park auctions,
- securing rapid addition of capacity by offering guaranteed PPAs for the 1GW of projects actioned before June 2021.

Retail Market: Competitive retail market will be developed from 2021 until 2023. The pilot phase of the electricity retail market will start in 2022, with the aim to have it operating by 2023. Currently EVN is setting prices that are at least covering generating costs (average retail tariff stands at about US\$ 0.09/kWh).

4. Electricity Generation Mix

The main energy sources for power generation in the past have been Fossil fuels (coal) and Hydro. Initially growth was fuelled by hydropower resources, but in the last decade installed capacity of coal-fired power plants increased four-fold from 5GW in 2010 to 20GW in 2020. Natural gas has

also played a substantial role in electricity production. Hydro has very low operating cost and Fossil fuel extraction and consumption has been subsidised by the State.

The delivered-power mix has varied from year to year, with the exact ratios dependant on annual rainfall and the associated impact that has on hydropower capacity.

Coal has provided the primary baseload power in the North, while natural gas has provided the primary baseload power in the South.

According to EVN 2018 annual report the installed generation capacity was as follows:

Coal fired:	18 516 MW (38,12%)
Hydropower:	17 031 MW (35,06%)
Gas and oil fired:	8978 MW (18,48%)
Renewable energy:	3475 MW (7,16%)
Imports:	572 MW (1,18%)

4.1 Electricity from Fossil Fuels

Production in coal and local gas fields have been decreasing rapidly. There are limited coal resources and Vietnam has become increasingly dependent on imported coal. According to the 2018 Export and Import Handbook of the MOIT, coal imports (mainly bituminous coal and sub-bituminous coal for electricity production) increased by 61,4% from 2017 to 2018.

Gas fields currently supply the powerplants, but this gas will be insufficient with expansion in gas-fired plants and liquified natural gas (LNG) will have to be imported. There has, however, been a recent announcement of a new Vietnamese offshore gas discovery by ENI. (Offshore Energy. Eni confirms gas potential in discovery offshore Vietnam. July 2020). Currently 80% Vietnam's offshore gas output is used for power generation.

Vietnam's LNG sector is in the early stages of its development. According to preliminary PDP 8 data, it appears that as much as 12 800 MW of LNG-fired combined-cycle gas power has been approved but there is no comprehensive master plan nor a centralised management model for Vietnam's LNG industry, and hence, the full cost of integrating a large commitment to LNG into Vietnam's energy and power markets is not yet fully understood.

There are currently two LNG terminals under construction in the southern coastal province of Ba Ria-Vung Tau.

- Hai Linh LNG terminal, the first LNG import and regasification facility in the country (privately owned and operated), is expected to enter operation in 2021.
- The Thi Vai LNG terminal, owned by PVGas, (subsidiary of Petro Vietnam) is expected to come online in 2022.

4.2 Electricity from Hydro

Hydropower's share of the generation mix, is declining steadily. This is due to the absence of new large scale Hydro potential and capacity expansion in a market where there is rapid installed capacity expansion as other energy sources enter the generation mix.

4.3 Electricity from Nuclear

In November 2016, the plans to construct 2 nuclear power stations in the province of Ninh Thuan was suspended due to safety concerns and inadequate funding.

4.4 Electricity from Renewable Energy Sources

According to EVN 2018 annual report power generation from renewable sources were as follows:

Small Hydropower:	1648 MW
Wind:	189,2 MW
Biomass:	270 MW
Solar:	8 MW

Now (2020) the installed capacity is over 6GW. The renewable market is still very immature, but the Government is incentivising private investments in Renewable energy generation (solar, wind, biomass, mini-hydro) through a feed-in-tariff (FIT) policy and will be introducing competitive auctions for Solar. Government aims to improve to the bankability and risk allocation of the PPAs. The government aims to enable around 36W of additional renewable capacity by 2030.

4.4.1 *Solar*

The recent PDP 8 plans for rapid expansion in Solar generated power.

The southern provinces, particularly, have a geographical positioning very advantageous for solar power projects. Vietnam has an average DNI (Direct Normal Irradiation) of 2,67KWh/m² and more than 2,000 hours of sunshine annually.

Solar installed capacities have boomed. Nearly 4.5 GW of grid-connected solar photovoltaic (PV) based power plants, led by local private sector investments, were installed in the past two years, bringing total solar energy capacity in 2020 to 5,2GW. This was due to the

Renewed FiTs-based (feed-in-tariffs) support scheme for solar projects.

For solar, however, there is a move away from the FiT policy to solar auctions.

The wholesale price for solar (floating and ground-mounted solar projects), has been changed to a competitive bidding system while the price for Rooftop solar projects has been set at 9,35 US cents/kW.

There is an active programme promoting rooftop solar power development for the period 2019-2025. As of May 2020, Vietnam had 31 570 rooftop solar power projects with a total installed capacity of 658MWp. In total, rooftop solar power projects generated more than 311.8 million kWh on the national grid in the first five months of 2020.

4.4.2 ***Small Hydro***

There is some development in small scale hydro. EVN signed the contract (April 2021) for a private consortium to extend the Ialy Hydropower project by 360MW, with construction starting in 2021.

4.4.3 ***Wind***

Vietnam has optimal conditions to generate wind power, with 3,300 kilometres of coastlines and consistent winds in the range of 5.5 to 7.3 meters per second. An estimated 8.6 % of Vietnam's land mass could be used for wind power, potentially providing an estimated additional 25GW (World Bank).

The Vietnamese government has supported the shift to wind energy as part of its PDP 8 plan due to a substantial decrease in wind production costs, its low land usage (wind farms can be installed on agricultural land), and to alleviate reliance on imported coal.

Current (2020) FiT rates of 8.5 US cents/kilowatt for onshore wind installation and 9.8 US cents/kilowatt for offshore wind projects were valid for all projects entering operation before November 2021. The largest challenges remain in the bankability of EVN PPAs and the unreliable grid access.

The global Wind Energy Council expects that Vietnam will have over 1GW of wind energy installed by 2021. In 2020, Vietnam had 327 MW of onshore and offshore wind capacity installed. Vietnam is also the only nation in South East Asia to have an offshore wind farm.

4.4.4 ***W2E (Waste to Energy)***

In Vietnam, Waste to energy activities are potentially very attractive. There is an endless supply of waste fuel but the quality of the waste has a high moisture and organic material content which poses challenges. Large cities like HoChiMinh City produce up 8000 tons/day of municipal waste in addition to medical and hazardous waste. There are also landfills with several years of accumulated waste.

4.4.5 ***Biomass***

Although Vietnam has a large agricultural sector, installed capacity for Biomass is only 352 MW. This is mainly due to the previously low FiTs. As for availability of raw material, wood pellets are exported to Korea and Japan and Rice husk is mostly used as a domestic cooking fuel. There is potential to use rice straw that has, up until now, been left in the fields and burned.

Vietnam's electricity production from biomass is mostly used directly by factories and very little is sold to the grid as it is not economically viable.

4.5 Electricity imports and exports

4.5.1 Imports

Vietnam mainly imports electricity from China and Laos. According to EVN's 2018 annual report, power imported from Laos and China made up 1.47% of Vietnam's total power production and purchase as of 31 December 2018.

Although EVN will prioritize domestic capacity and cost optimization, PDP 8 outlines the benefits of increased importation of cost effective electricity from China and Laos to ensure stability of supply until energy from renewables mature.

In early 2018, Vietnam signed a memorandum which will facilitate the development of hydropower projects in Laos and connection of electrical systems and electricity trading between the 2 countries.

Also, the Laos wind project will be developed by Bangchak Corporation PLC (experienced Thai energy and renewables company). The price of wind power from Laos is capped at USD 0.069 per kWh, or almost 20% lower than the domestic rate.

4.5.2 Exports

Vietnam has mainly exported electricity to Cambodia, approximately one million kWh per year.

5. Transmission, Distribution and System Operation

Electricity Vietnam, a state-owned enterprise, has sole control over the national transmission grid.

According to EVN's 2018 Annual report, the grid infrastructure in Vietnam consists of about 450 000 kms of distribution lines, connecting almost 100% of the nation to reliable electric power, and about 25 000 km of transmission lines (7516km of 500kV lines and 17360km of 220kV lines) including interconnections with China and Laos (used primarily for imports) as well as Cambodia (used primarily for exports).

Recently, EVN co-operated with other international organisations on a study concerning the deployment of battery storage solutions to strengthen the grid. However, to date, no specific regulations have been issued to facilitate investment in this area.

The charges for the transmission of electricity are regulated by the Vietnamese Government. In 2018, the transmission price was VND110.88/kWh (about 0.48 US cents), excluding VAT of 10%. (See Chapter 3.2 on Reform and Reform objectives)

6. Electricity Market

6.1 Wholesale Market

The wholesale price of Electricity in Vietnam has been of the lowest in the world. Coal prices have been subsidised by the government and government has regulated Feed-in-tariffs. In the past, EVN was the sole buyer of electricity, but reforms are enabling private participation in the wholesale market and deregulated pricing of electricity through competitive auctions for solar. (See chapter 3.2 on Reforms and Reform Objectives).

A new initiative, the direct power purchase agreement (DPPA), which matches the supply from independent renewable energy producers with the demand from large buyers, is currently being explored.

6.2 Retail Market

The retail price of electricity in Vietnam is also low compared to other countries in the region. Prices to the consumer have been strictly regulated by the Vietnamese government. Electricity Vietnam (EVN), the wholesale buyer of electricity from IPPs, is allowed to adjust the price only within a 5% bracket when input parameters such as fuel price, foreign exchange rates and generation mix change significantly. MOIT has veto power for increases between 5 and 10% and the Prime Minister is responsible for approving increases of more than 10%.

As of 20 March 2019, the average retail price was VND1,864.44/kWh, exclusive of VAT. (*Decision No. 648/QĐ-BCT dated 20 March 2019*)

In August 2020, the MOIT proposed a plan which provides for price increases. The electricity retail price will differ for living and non-living purposes. Customers could choose to pay a fixed price instead of on a sliding scale based on the amount they consumed. The fixed price would be 145% or 155% of the average retail electricity price and equivalent to VND2,703/kWh or VND2,889/kWh (excluding VAT).

Reforms in the Retail market are expected to commence 2021. (See Chapter 3.2: Reforms and Reform Objectives)

7. Conclusion

In Vietnam, the incorporation of renewables can be realised at a lower cost than in many other markets due to extensive hydro-generation capacity and the potential to add flexible LNG generation, backed by local and offshore gas reserves, to the mix. Studies have shown that renewables, even though they benefit from shorter development time, will still increase the average cost of generation until enough grid capacity is in place to realise system efficiencies.

The key challenges confronting the sector include managing capacity expansion and the transition to a renewable based power system. Grid modernisation and an increase in grid transfer capacity will be needed as well as ability of the grid operators to balance the intermittent nature of the

renewables supply. It is hoped that the introduction of competitive energy auctions (anticipated to start in 2021) will drive down the cost of renewable energy.

The transition to renewables is not likely to have an adverse impact on Vietnam's domestic coal industry but would instead limit the amount of coal imports required to meet demand. Thermal-asset utilisation would remain high (at an estimated 65%) for existing facilities due to the anticipated electricity demand growth.

It is not very clear in the PDP 8 how much of the proposed growth will be funded directly by EVN and its ratepayers and how much will be financed by IPPs and other funding partners. EVN's gross margin will depend on its ability to integrate IPPs with fixed capacity payments and new renewables that will require significant ongoing grid investment. Setting realistic funding expectations and realistic tariffs for electricity will be crucial to the success of this transition.

EVN is a well-managed, modestly profitable corporation. Reliability of the power system has been steadily improving with technical losses nearing global benchmarks (about 6% in 2020), and billing and collection rates consistently near 100%. EVN, however, faces lower capex obligations and higher fixed payment obligations. Rather than raising debt to finance its own asset base, it now faces the risk that if tariff increases are not sufficient, new debt will be needed to help meet the company's growing IPP payment obligations. EVN's effort to raise capital by divesting stakes in its generation companies (Genco's) has stalled.

EVN's lack of direct access to adequate international funding poses a challenge. Vietnam can no longer access concessionary funding for low-income countries from multi-lateral development banks due to its strong growth track record. Also, EVN is currently rated BB stable by Fitch—a sub-investment grade notch in line with Fitch's rating for Vietnam. In addition, Vietnam has limited foreign currency hedging capacity which leaves EVN exposed to foreign exchange risks.

With onset of COVID-19 the priority of Prime Minister Phuc's government has been to protect jobs, keep factories open and to stand with the public. This resulted in a net loss for EVN. Total sales in the first six months rose only 2.3% year-on-year versus the usual double-digit growth rate. (EVN. Operational Report for the First Six Months of 2020. 11 July 2020.) In addition, the Prime Minister's decision was to have no rates increase through 2020, and EVN had to offer a 10% rebate to customers from April to July. By late June, these rebates amounted to VND 6,800 billion (USD 291 million), or 1.7% of the previous year's revenue.

There are numerous challenges, but MOIT has demonstrated considerable insight in working with the market on the development of the first-round solar and wind FiT programmes outlined in the PDP 7, and similar pragmatism will be needed for PDP 8 visions to progress.

7. Bibliography

- Asiabriefing.com. 2021. *An Introduction to Doing Business in Vietnam 2021 | Asia Briefing*. [online] Available at: <<https://www.asiabriefing.com/store/book/introduction-doing-business-vietnam-2021.html>> [Accessed 10 May 2021].
- Bao, N. (2016), 'Republic of Korea Country Report' in Kimura, S. and P. Han (eds.) in *Energy Outlook and Energy Saving Potential in East Asia 2016*. ERIA Research Project Report 2015-5, Jakarta: ERIA, pp.337-354.
- Eria.org. 2021. [online] Available at: <https://www.eria.org/RPR_FY2015_No.5_Chapter_17.pdf> [Accessed 10 May 2021].
2021. [online] Available at: <<https://www.mckinsey.com/featured-insights/asia-pacific/exploring-an-alternative-pathway-for-vietnams-energy-future#>> [Accessed 10 May 2021].
- Documents1.worldbank.org. 2021. [online] Available at: <<https://documents1.worldbank.org/curated/en/380361609834947041/pdf/Concept-Project-Information-Documents-PID-Vietnam-Renewable-Energy-Accelerating-Change-REACH-P174460.pdf>> [Accessed 10 May 2021].
- Documents1.worldbank.org. 2021. [online] Available at: <<http://documents1.worldbank.org/curated/en/598851561961183317/pdf/Vietnam-National-Energy-Efficiency-Program-2019-2030.pdf>> [Accessed 10 May 2021].
- Esmap.org. 2021. [online] Available at: <<https://www.esmap.org/sites/esmap.org/files/Vietnam's%20Power%20Sector%20.pdf>> [Accessed 10 May 2021].
- Breu, M., Dobbs, R., Remes, J., Skilling, D. and Kim, J., 2021. [online] Available at: <<https://www.mckinsey.com/featured-insights/asia-pacific/sustaining-growth-in-vietnam>> [Accessed 10 May 2021].
- Briefing, V., 2021. *Renewables in Vietnam: Current Opportunities and Future Outlook*. [online] Vietnam Briefing News. Available at: <<https://www.vietnam-briefing.com/news/vietnams-push-for-renewable-energy.html/>> [Accessed 10 May 2021].
- International Trade Administration | Trade.gov. 2021. *Vietnam - Power Generation*. [online] Available at: <<https://www.trade.gov/knowledge-product/vietnam-power-generation>> [Accessed 1 June 2021].
- Brown, M., 2021. [online] Ieefa.org. Available at: <https://ieefa.org/wp-content/uploads/2020/09/Vietnams-EVN-Faces-the-Future_September-2020.pdf> [Accessed 1 June 2021].
- Nguyen, V. and Trinh, T., 2021. [online] Uk.practicallaw.thomsonreuters.com. Available at: <[https://uk.practicallaw.thomsonreuters.com/4-628-5349?transitionType=Default&contextData=\(sc.Default\)&firstPage=true](https://uk.practicallaw.thomsonreuters.com/4-628-5349?transitionType=Default&contextData=(sc.Default)&firstPage=true)> [Accessed 13 June 2021].
- TỔNG CÔNG TY PHÁT ĐIỆN 3. 2021. *Press release - Seminar on introduction of investment opportunities in Power Generation 3*. [online] Available at: <<https://www.genco3.com/en-US/notice/evn-press-release/press-release-seminar-on-introduction-of-investment-opportunities-in-power-generation-3>> [Accessed 1 June 2021].

- IEA. 2021. *Vietnam - Countries & Regions - IEA*. [online] Available at: <<https://www.iea.org/countries/viet-nam>> [Accessed 10 May 2021].
- IEA. 2021. *Southeast Asia can reach clean energy targets by investing in transmission – Analysis - IEA*. [online] Available at: <<https://www.iea.org/commentaries/southeast-asia-can-reach-clean-energy-targets-by-investing-in-transmission>> [Accessed 10 May 2021].
- Enerdata.net. 2021. *Vietnam Energy Information | Enerdata*. [online] Available at: <<https://www.enerdata.net/estore/energy-market/vietnam/>> [Accessed 10 May 2021].
- Le, P.V. Energy demand and factor substitution in Vietnam: evidence from two recent enterprise surveys. *Economic Structures* 8, 35 (2019). <https://doi.org/10.1186/s40008-019-0168-9>
- Asian Insiders. 2021. *Vietnam 2020 Renewable Energy Outlook*. [online] Available at: <<https://asianinsiders.com/vietnam-bold-ambitions-for-a-greener-future-in-energy-production/>> [Accessed 1 June 2021].
- VIR, V., 2021. *Investors give EVN Genco 2 cold shoulder at IPO*. [online] Vietnam Investment Review - VIR. Available at: <<https://www.vir.com.vn/investors-give-evn-genco-2-cold-shoulder-at-ipo-82519.html>> [Accessed 1 June 2021].

Reports for sale

<https://www.enerdata.net/estore/country-profiles/vietnam.html>