

Prospects for a Socially Just Energy Transition in Viet Nam: 2021 and beyond

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in Viet Nam: 2021 and beyond**

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Contents

List of Figures.....	ii
List of Tables.....	ii
Units.....	ii
List of Acronyms.....	iii
Foreword.....	v
Executive Summary.....	vi
CHAPTER 1: INTRODUCTION.....	1
CHAPTER 2: CLIMATE & ENERGY: SITUATION ANALYSIS.....	3
2.1. Climate Crisis and Viet Nam’s GHG Emissions.....	3
2.2. Electricity Demand and Supply.....	6
2.2.1. Current Situation.....	6
2.2.2. Projections.....	8
2.3. Access to Energy for All.....	13
2.4. Employment.....	14
2.5. Energy Policy Framework.....	17
CHAPTER 3: POLITICAL ECONOMY OF ENERGY TRANSITION.....	22
3.1. Public Discourse on “Energy Transition”.....	22
3.2. Stakeholders in a Just Energy Transition.....	24
3.3. Stakeholder Views and Influence on a Just Energy Transition.....	26
CHAPTER 4: OVERCOMING BARRIERS TO A SOCIALLY JUST ENERGY TRANSITION.....	28
4.1. Renewable Power Development.....	28
4.2. Co-benefits of Dual Land-use of VRE.....	29
4.3. Increasing Access to Green and Decent Job.....	31
4.4. Emergence and Growth of Vietnamese Enterprises.....	31
CHAPTER 5: CONCLUSIONS AND RECOMMENDATIONS.....	33
5.1. Conclusions.....	33
5.1.1. Access to Energy for All.....	33
5.1.2. Climate Change.....	33
5.1.3. Energy-related Policy.....	33
5.1.4. Enabling VRE.....	34
5.1.5. Dual Land-use and Sea-use.....	34
5.1.6. Employment.....	34
5.1.7. Business Development.....	35
5.2. Recommendations.....	35
5.2.1. Ensuring a Socially Just Energy Transition.....	35
5.2.2. Accelerating VRE Deployment.....	36
5.2.3. Developing Strategic Partnerships.....	36
References.....	38
Annex 1: Coal power plants operating in Viet Nam by March 2021.....	43
Annex 2: Examples of Vietnamese companies involved in solar PV and wind power value chains.....	46
Annex 3: VRE-related tax regulations.....	48
Endnotes.....	49

List of Figures

Figure 1. Administrative map with provinces of Viet Nam.....	2
Figure 2. Updated NDC: BAU and GHG emission reduction targets.....	4
Figure 3. Electricity consumption in Viet Nam from 1971 to 2018.....	7
Figure 4. Electricity consumption by sector in 2010 and 2019.....	7
Figure 5. Electricity demand by region in 2010, 2015 and 2019.....	7
Figure 6. Installed capacity by market participation status by June 2020.....	7
Figure 7. Future power mix of Viet Nam to 2045 (draft PDP8).....	10
Figure 8. Roles of policymakers at different levels in wind power project development.....	19
Figure 9. Key policy processes related to the energy transition.....	20

List of Tables

Table 1. Sector shares in emission reduction targets.....	4
Table 2. Results of electricity demand projection to 2045 (base scenario).....	9
Table 3. Comparison of jobs created by different technologies (USA, 2010).....	16
Table 4. Estimated job creation from wind and solar by draft PDP8 base scenario.....	17
Table 5. Renewable energy support policies, including FITs.....	18
Table 6. Energy transition stakeholders' interests and relative influence (updated).....	25

Units

H₂	Hydrogen
Ha	Hectare
GW	Gigawatt = 10 ⁹ Watt
kWh	Kilowatt hour
MtCO₂e	Million tonnes of carbon dioxide equivalent
MW	Megawatt = 10 ⁶ Watt
tCO₂e	Tonnes of carbon dioxide equivalent
TOE	Tonnes of oil equivalent
TWh	Terawatt hour = 10 ⁹ Kilowatt hour
W	Watt

List of Acronyms

APV	Agriculture combined with Photovoltaic	EVN	EVN Ha Noi Power Corporation
BAU	Business As Usual	HANOI	
BESS	Battery Energy Storage System	EVN	EVN Ho Chi Minh City Corporation
BOT	Build-Operate-Transfer	HCMC	
CEC	Central Economic Committee	EVN NPC	EVN Northern Power Corporation
CHP	Combined Heat and Power	EVN SPC	EVN Southern Power Corporation
CIM	Construction, installation and manufacture	FDI	Foreign Direct Investment
COVID-19	Coronavirus disease 2019	FES	Friedrich Ebert Stiftung
CPI	Consumer Price Index	FIT	Feed-in Tariff
CPV	Communist Party of Viet Nam	FS	Feasibility Study
DOC	Department of Construction (provincial)	FS	Feasibility Study
DOIT	Department of Industry and Trade (provincial)	GCRI	Global Climate Risk Index
DONRE	Department of Natural Resource and Environment (provincial)	GDP	Gross Domestic Product
DOT	Department of Transport (provincial)	GHG	Greenhouse Gas
DPI	Department of Planning and Investment (provincial)	GIZ	German international development agency (Gesellschaft für Internationale Zusammenarbeit)
DPPA	Direct Power Purchase Agreement	HCM City	Ho Chi Minh City
EE	Energy efficiency	INDC	Intended Nationally Determined Contribution
EIA	Environmental Impact Assessment	IPCC	Intergovernmental Panel on Climate Change
EMS	Energy Management System	IPP	Independent Power Producer
EPC	Engineering, procurement, and construction	IRENA	International Renewable Energy Agency
EPTC	Electric Power Trading Company	I & O	Investment and Operation
ERAV	Electricity Regulatory Authority of Viet Nam	JSC	Joint Stock Company (in Viet Nam: a company with three or more shareholders)
EREA	Electricity and Renewable Energy Agency (MOIT)	LCOE	Levelized Costs Of Electricity
ESCO	Energy service companies	LNG	Liquefied Natural Gas
EU	European Union	LULUCF	Land use, land-use change and forestry
EuroCham	European Chamber of Commerce	MARD	Ministry of Agriculture and Rural Development
EV	Electric Vehicle	MOC	Ministry of Construction
EVN	Viet Nam Electricity Corporation	MOF	Ministry of Finance
EVN CPC	EVN Central Power Corporation	MOIT	Ministry of Industry and Trade
		MOLISA	Ministry of Labour, Invalids and Social Affairs
		MONRE	Ministry of Natural Resources and Environment
		MOT	Ministry of Transport
		MPI	Ministry of Planning and Investment

NAP	National Adaptation Plan	SoE	State-owned enterprise
NDC	Nationally Determined Contribution	SR Viet Nam	Socialist Republic of Viet Nam
NGO	Non-governmental organisation	STEM	Science, technology, engineering, and mathematics
NLDC	National Load Dispatch Centre	TAF	The Asia Foundation UNDP United Nations Development Programme
NPT	National Power Transmission Corporation	UNEP	United Nations Environment Programme
ODA	Official development assistance	UNDP	United Nations Framework Convention on Climate Change
O&M	Operation and maintenance	UNFCCC	United States of America
PC	Power corporation (power distributors)	USA	Unexploded ordnance
PDP7-revised	Revised version of Viet Nam's seventh Power Development Plan	UXO	Viet Nam Bank Social Policy
PDP8	Viet Nam's eighth Power Development Plan (draft of February 2021)	VBSP	Viet Nam Business Forum
PM	Prime Minister	VCCI	Viet Nam Chamber of Commerce and Industry
PPA	Power Purchase Agreement	VEA	Viet Nam Energy Association
PPC	Provincial People's Committee	VEPF	Viet Nam Environmental Protection Fund
PV	Photovoltaic	VEPG	Viet Nam Energy Partnership Group
PVN	PetroVietnam National Oil and Gas Group	VINACOMIN	Viet Nam Coal - Mineral Industries Holding Corporation
RE	Renewable energy	VND	Viet Nam Dong
REDS	Renewable Energy Development Strategy	VNEEP	Viet Nam Energy Efficiency Programme
RPS	Renewable Portfolio Standard	VRE	Variable Renewable Energy
SCADA	Supervisory control and data acquisition	VSEA	Viet Nam Sustainable Energy Alliance
SDG	Sustainable Development Goal	VUSTA	Viet Nam Union of Science and Technology Associations
SMEs	Small and medium enterprises	VWEM	Viet Nam Wholesale Electricity Market
SMO	System and Market Operator	WWF	World Wide Fund For Nature
SNV	Netherlands Development Organisation (Stichting Nederlandse Vrijwilligers)		

Foreword

When the country study [*Towards a Socially just Energy Transition in Viet Nam - Challenges and Opportunities*](#) was written in 2017, the state of renewable energy in country was very different from today. Back then, the share of renewable energies in the national energy mix was almost negligible and several barriers to the expansion of renewable energies could be identified. Over the past two years, this outset has changed, and Viet Nam experienced a “solar boom” that led to the installment of 9.3 GW in solar PV capacity. In a region that is still heavily dependent on coal-fired power generation while simultaneously being highly vulnerable to climate change, this can be reason for cautious hope and a positive signal to its neighboring countries. This impressive growth, the ongoing developments in this dynamic field and the accompanying changes in the policy framework gave the Regional Climate and Energy project of Friedrich-Ebert-Stiftung (FES) reason to revisit and update the study from 2017, which was part of a series of eight country studies in Asia.

Beyond the challenges that persist to advance the energy transition, such as the expansion of the grid, the integration of higher shares of variable renewable energies and vested interests, FES aims to shed light on the socio-economic impacts of this transition with the updated report. The energy transition is more than just the switch from one energy source to another: it is crucial to reduce greenhouse gas emissions from the energy sector, which are responsible for a significant share of Viet Nam’s total emissions and can thereby contribute to the implementation of the Paris Agreement by keeping global warming at 1.5°C. Viet Nam’s upcoming update of its Power Development Plan (PDP) will be decisive in this regard. Furthermore, the energy transition can yield many co-benefits for sustainable

development, like improving public health, reducing dependency on fossil fuel imports, the creation of new jobs and positive impacts for gender equality. Greater use of renewable energy may also lead to more socially and environmentally just energy structures. Understanding the barriers and which measures should be taken to unlock a socially just energy transition has been the main motivation for this report.

The study falls in line with previous FES’ work on a socially just energy transition in Viet Nam and in the region. FES and its partners will continue promoting a social-ecological transformation that includes the decarbonisation of the energy sector in a socially equitable manner.

We extend our sincere gratitude to Koos Neefjes and To Nhien Ngo, the authors of this paper on prospects for a socially just energy transition in Viet Nam, for their thorough research. We hope that it contributes to fruitful discussions and provides valuable insights for future initiatives.

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Executive Summary

This paper is an update of a 2017 publication written for the Friedrich Ebert Stiftung (FES) in Viet Nam on a *Socially Just Energy Transition in Viet Nam*. This energy transition must deliver a large part of Viet Nam's greenhouse gas (GHG) emissions mitigation, provide access to clean energy for all, and create opportunities for decent jobs and micro-businesses for the rural poor, women and ethnic minorities.

Climate crisis and electricity planning

Viet Nam is extremely vulnerable to climate change and has a major interest in preventing dangerous climate change. The updated Nationally Determined Contribution (NDC) (2020) has a 9 per cent GHG emission reduction target with domestic resources by 2030 compared to Business-As-Usual (BAU). It is 27 per cent with international support, or 6.2 tCO₂e/capita in 2030, which is high. The draft Power Development Plan No.8 (PDP8) shows that 2.2 tCO₂e/capita of this would be from electricity generation with coal and Liquefied Natural Gas (LNG). This would rise to 2.9 tCO₂e/capita in 2045. The European Union (EU) is aiming for carbon neutrality by 2050 and China by 2060. Viet Nam does not have such a target, and PDP8 would make carbon neutrality by 2060 unlikely.

Draft PDP8 would leave Viet Nam dependent on international markets, vulnerable to geopolitics, and remain an energy inefficient economy by international comparison. However, independent research has shown that more ambitious emissions reduction is likely to lead to higher economic growth and employment compared to the NDC targets, and carbon neutrality of the power sector is possible by 2050. This would also deliver lower electricity prices, possibly even in the short-term.

Recent solar PV deployment because of Feed-in-Tariffs (FiTs) showed this potential. It means that the draft PDP8 solar PV target of 2030, in fact, has already been met. The draft PDP8 is unambitious on grid development and power storage.

Access to energy for all and employment

Nearly 100 per cent of rural communities are connected to the national grid and tariffs are progressive, there is significant penetration of biogas and in 2019 and 2020 more than 100,000 solar rooftop systems were connected. The latter do not benefit small farmers much, but there are examples of Variable Renewable Energy (VRE) in support of micro-businesses. Large powerplants require conversion of agricultural land, reducing farm employment and increasing outmigration. The draft PDP8 will increase employment, but more green and decent jobs would be generated with more VRE, including higher employment rates for women. There is untapped potential to combine agriculture and aquaculture with solar PV (APV), which could increase income and employment.

Energy policy framework

- Energy policy since 2017 included successful solar PV and wind power FiTs. The lack of clarity on policy follow-ups is, however, causing risks for companies throughout the value chain and drives costs up.
- The Ministry of Industry and Trade (MOIT) is preparing PDP8, but the draft does not optimise long-term economic, environmental, and social co-benefits of VRE.
- Party Resolution 55 is particularly important. Its long-term GHG emissions reduction targets are weak, but it could enable ambitious energy security, affordability, renewable energy, and energy efficiency.

Public discourse and stakeholders in a just energy transition

Since 2017, the term “energy transition” has been increasingly used in Vietnamese. The media stress negative impacts of coal plants and support renewables and energy efficiency. Stakeholders that promote economic, social and environmental co-benefits from the energy transition have limited influence. For a successful transition, better communication about advantages and mitigation of the disadvantages of VRE is needed. Compared to the 2017 analysis of stakeholder influence and interests, a broader range of stakeholders feature in this update. They include Communist Party of Viet Nam (CPV) entities, MOIT and Viet Nam Electricity (EVN) units, independent researchers, and Unions. The latter have emerging energy transition interests, but little influence. The goals of Resolution 55 are widely supported, but “vested interests” determine action. Politicians are sensitive to high energy retail tariffs and the perception that VRE is expensive, despite evidence to the contrary.

Barriers to a socially just energy transition

- Some foreign investors are offering “clean coal”, but others are interested in green investment.
- Power market risks, with continued support of fossil fuel, a “stop-and-go policy” on VRE and a lack of a policy roadmap for VRE development affect operators throughout value chains.
- Large-scale solar PV and wind power claims on land and seabeds can be tackled by dual use, delivering co-benefits. However, there is no regulation to encourage dual use.
- Rooftop solar PV has cumulatively reached a significant scale, but APV on small- and medium-sized farms is limited despite its potential. Regulatory and access-to-finance barriers are being encountered.
- Many private companies are involved, but challenges include regulatory weaknesses, an immature financial market and low capacities of micro-enterprises.

- The expansion of green and decent jobs depends on growth of VRE deployment and businesses in VRE value chains. Barriers to workers, especially women, include skills and knowledge.

Recommendations on ensuring a socially just energy transition

- Low-income consumers must retain the benefits from progressive electricity tariffs.
- Employment generation requires supportive policies for domestic manufacturing, avoidance of “boom and bust” cycles, training of women and men, and STEM education of girls.
- Solar rooftop and APV must become accessible to low-income households through better distribution grids, access to capital, technological advice and information portals.
- Regulations are needed to force dual-use wind and solar PV parks and achieve co-benefits.
- “Distributed” VRE requires local micro-enterprises for operation and maintenance (O&M). Capacity building should target women.

Recommendations on accelerating VRE deployment

- The government should set a policy roadmap on a just energy transition, including goals on access to clean energy, maximising VRE co-benefits, development of VRE industry and decent jobs, maximising APV and support to (women-led) micro-enterprises to service distributed generation.
- Proponents of a just energy transition must communicate better on economic, social, environmental and political co-benefits and mitigation of disadvantages of VRE.
- Business organisations should encourage energy efficiency and deployment of solar rooftops.

Recommendations on developing strategic partnerships

- Proponents of a just energy transition can raise issues with MOIT through the Viet Nam Energy Partnership Group (VEPG).

- International agencies should enter into dialogues with CPV entities.
- Co-benefits, such as women's employment or APV, must be discussed – with Labour Unions, for example.
- The Viet Nam Cooperative Alliance can promote models of power generation.
- Support independent Vietnamese research to counter the narratives of “vested interests”.

Chapter 1: Introduction

This paper is an update of a 2017 publication written for the Friedrich Ebert Stiftung (FES) on a *Socially Just Energy Transition in Viet Nam*.¹ It updates data, analysis, conclusions and recommendations based on new written documentation and policy analysis. The long list of references is thus largely additional to that of the 2017 publication. This paper also complements the 2017 publication, for example by stressing and adding conclusions and recommendations, while not repeating some earlier ones despite their continued validity.

Viet Nam's energy policy has changed since 2017 and electricity policy is in a state of flux. The country experienced a spectacular surge in solar PV deployment in 2019 and 2020, whilst major deployment of wind power is expected to be completed in 2021. Viet Nam has updated its Nationally Determined Contribution (NDC) to the United Nations Framework Convention on Climate Change (UNFCCC), with increased ambition to reduce greenhouse gas (GHG) emissions by 2030 compared to its earlier Intended Nationally Determined Contribution (INDC). This matters, because the energy sector is the source of most of Viet Nam's GHG emissions, and within that the electricity sector is a very large emitter that is set to continue increasing emissions in the coming decades.

The public discourse on energy transition, the views expressed in public as well as social media have changed somewhat in recent years. The relative influence of some stakeholders as well as their interest in the energy transition has shifted somewhat since 2017, and insight into this has improved with additional observation and research. What it will take to ensure that the energy transition will be socially just has also become clearer with additional research and experience

gained by different organisations with regards to, for example, employment opportunities in the energy transition; dual land use of solar PV with agriculture that could benefit small farmers; and support to women entrepreneurs playing roles in energy value chains.

The energy transition in Viet Nam must be socially just. It must deliver a large part of Viet Nam's contributions to climate change mitigation consistent with the UNFCCC's Paris Agreement ambition to limit global warming to 2°C and preferably 1.5°C. It must also be fair and socially equitable, benefiting the rural poor, women and ethnic minorities and not only men, the urban population and large businesses. It must provide access to clean energy for all, as agreed in Sustainable Development Goal (SDG) number 7. And it must create opportunities for decent jobs and business opportunities for micro, small and medium enterprises. These "musts" are a frame for the analysis in this paper. In addition, there are many co-benefits that can be achieved by reducing GHG emissions in the energy sector. As will become clear throughout this paper, co-benefits can be economic, social and environmental, and also geo-political as in, for example, the case of dependency on fossil fuel marine exploration and imports. Recommendations are partly about maximising co-benefits.

In Chapter 2 we present a situation analysis of climate and the energy sector, in the context of a socially just energy transition. Chapter 3 provides an update of the political economy of energy transition, including the changed public discourse and stakeholder interests and influence. Chapter 4 analyses how the main barriers to a socially just energy transition could be overcome. Conclusions and recommendations are provided in the final chapter.

Figure 1. Administrative map with provinces of Viet Nam



Chapter 2: Climate & Energy: Situation Analysis

2.1. Climate Crisis and Viet Nam's GHG Emissions

Viet Nam and the Vietnamese are extremely vulnerable to climate change. As such, they have a major interest in adaptation as well as preventing dangerous climate change. The latter means that pursuing GHG emission reduction is critical in the short term, both at global and national levels. According to the Intergovernmental Panel on Climate Change (IPCC) report "Global Warming of 1.5°C", South and Southeast Asia have the highest risks from coastal flooding as a result of mean sea level rise, "assuming there is no upgrade to current protection levels, for all levels of climate warming".² Viet Nam is one of nine countries listed with at least 50 million people thus exposed to sea level rise.

According to the Global Climate Risk Index (GCRI) 2020, Viet Nam was the sixth most affected country in the world by climate variability and extreme weather events during 1999-2018.³ The GCRI is based on death rates and financial losses as a result of weather-related extreme events, which in this 20-year period included disasters in the Mekong Delta (river floods and droughts), the Central Highlands and Southeast (droughts), central region (typhoons with heavy rainfall and floods) and the Northern Mountains region (flash floods and landslides as a result of heavy rainfall). Weather-related extremes are predicted to become more severe nationwide as a result of climate change.⁴ Indeed, drought re-occurred in the Mekong Delta in the first half of 2020, even though there was no strong "el niño" (as in 1997-1998 and 2015-2016), and later that year the central region experienced consecutive typhoons and historical flooding. More extreme weather is predicted even if the world would limit average global

if the world would limit average global warming to at most 1.5°C above pre-industrial temperatures, which is the aspiration agreed in Paris in 2016, whereas the climate crisis will be significantly worse with 2°C or more warming.⁵ Climate-sensitive diseases are projected to increase as a result of higher temperatures, for example. The level of exposure to climate change-related health hazards is already "high" or "very high" and the rating of health vulnerability and adaptation was "very high risk" and "high risk" during 2013-2017.⁶ Viet Nam was among the first countries to submit its updated NDC to the UNFCCC in 2020.⁷ Compared to the INDC of 2016, the NDC base year was adjusted to 2014 and emissions from Industrial Production were added. Total GHG emissions in 2030 in the Business-As-Usual (BAU) scenario would be 928 MtCO₂e, a three-fold increase compared to 2014's emissions of 284 MtCO₂e (see Figure 2). Emissions from energy activities would be 684 MtCO₂ in 2030, accounting for 74 per cent of total BAU net-emissions. Energy is, thus, by far the largest contributor to GHG emissions. The targeted emission reduction by 2030 is 9 per cent compared to the BAU scenario with domestic resources (equivalent to 83.9 MtCO₂e) and up to 27 per cent with international support (equivalent to 250.8 MtCO₂e) (see Figure 2 and Table 1). These targets signify slightly increased overall mitigation ambitions compared to the INDC of 2016, in absolute terms.

The NDC anticipated the (draft) eighth Power Development Plan (PDP8), which is projecting 246 MtCO₂ emissions from electricity in 2030. These are emissions in the "conditional" scenario in 2030 of international and domestic actions, or about half of all energy sector emissions (Figure 2). According to the draft PDP8, this would be a 15 per cent reduction compared

to the BAU and in the updated NDC, the conditional scenario for the whole energy sector would be a 23 per cent reduction. Because the national conditional target is 27 per cent, the energy sector makes less

effort to reduce emissions compared to agriculture, Land Use, Land-Use Change and Forestry (LULUCF) and waste management, but it is the largest emitter by far; and electricity makes less effort than other energy sub-sectors (Table 1).

Figure 2. Updated NDC: BAU and GHG emission reduction targets

Source: Authors' graph with data from Viet Nam's Updated NDC

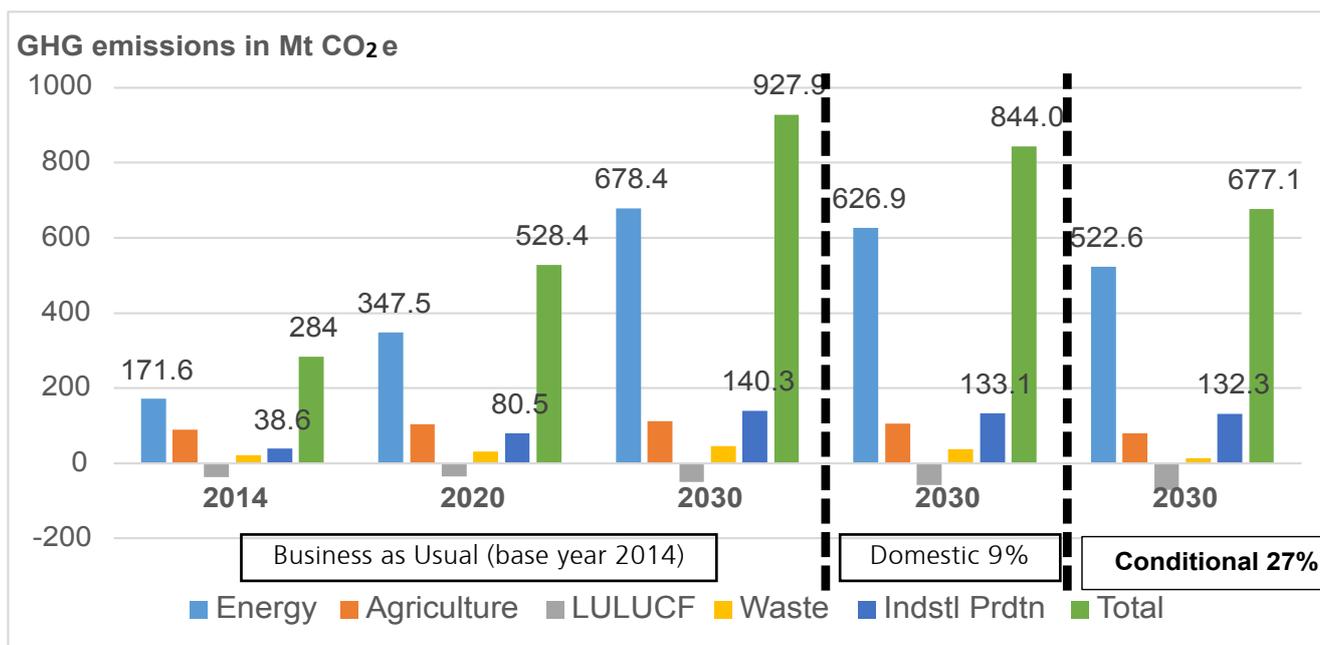


Table 1. Sector shares in emission reduction targets

Source: Authors' table with data from Viet Nam's Updated NDC

	Domestic		International support		Both	
	% total BAU	% sector BAU	% total BAU	% sector BAU	% total BAU	% sector BAU
Energy	5.55	7.59	11.2	15.37	16.8	22.97
Agriculture	0.73	6.07	2.8	23.02	3.5	29.08
LULUCF	1.00	-18.90	1.3	-24.19	2.3	-43.09
Waste	0.98	19.65	2.6	51.84	3.6	71.49
Industrial Production	0.78	5.13	0.1	0.57	0.9	5.70
Total	9.04		18.0		27.0	

Note: LULUCF = Land use, land use change and forestry; Indstl Prdtn = Industrial Production

According to the updated NDC, by achieving the 27 per cent target Viet Nam would emit 6.2 tCO₂e per capita in 2030, as the population would be 110 million. Energy (production, consumption) and Industrial Production are the main emitting sectors, whereas LULUCF absorbs more and more carbon (growth in negative emissions). The draft PDP8 power sector estimate comes to 2.2 tCO₂e/capita in 2030, or more than one-third of total net emissions. By comparison, the European Union (EU) will emit 5.4 tCO₂e/capita in 2030, according to its NDC of December 2020, down from 12 tCO₂e/capita in 1990.⁸ Viet Nam's emissions were low in 1990, about 1.5 tCO₂e/capita,⁹ but in 2030 Viet Nam's emissions would be high.

Because of such "historical emissions" by developed countries, there is some justification for developing nations to be slower in reducing to levels of emissions compatible with the Paris Agreement. The EU is aiming for carbon neutrality by 2050 and China by 2060, which are targets beyond the NDCs that are more or less consistent with maximum 2°C warming if all other countries follow similar paths. Viet Nam does not have a target date for carbon neutrality yet. But according to the draft PDP8, GHG emissions would be rising to 348 MtCO₂ in 2045, which with an estimated population of 120 million would be 2.9 tCO₂e/capita, just from electricity, because LNG and coal-thermal power will continue to expand, according to the draft PDP8. This will lock-in emissions for decades after and make it hard for Viet Nam to reach a point of peak emissions and subsequently reducing emissions to carbon neutrality by 2060 or 2070.

Several mitigation measures are proposed in the NDC for the energy sector to reach its targets for 2030, including energy efficiency in consumption (in residences, construction, industry, and transport), and energy production (renewable energy production, higher efficiency in fossil fuel-based power generation). As the

INDC was reviewed and the updated NDC was formulated, various co-benefits were researched, which had not featured in the INDC. The updated NDC says, for example, "in the energy sector, mitigation measures that can provide synergy with socio-economic development at high to very high levels include wind power, solar power, power-saving lighting, and efficient cooling", which is a recognition that not only financial costs matter in energy development. And more ambition is possible. In parallel to the updated NDC formulation it was shown that more ambitious emissions reductions in different sectors was likely to lead to higher economic growth rates and employment compared to NDC targets, because of technological innovation and efficiencies.¹⁰ These important co-benefits would be achieved with considerable expansion of renewable energy deployment and investment in energy efficiency as well further efforts in forestry and biodiversity, agriculture, waste management and industrial production, according to the economic model study. This conclusion was consistent with analysis by NGOs, the business community and other researchers.¹¹ That more ambition in renewable energy was justified is supported, in particular by international reports on the continued and very rapid annual reductions in investment costs of solar Photovoltaic (PV) and wind power as well as increases in employment (see section 3.3).¹²

Indeed, to most observers' surprise, in the first half of 2019 and the second half of 2020 major solar PV deployment occurred as deadlines expired of feed-in-tariffs (FiTs) that were guaranteed for 20-year periods. Similarly, a major spurt in wind power deployment is underway, with the FiTs expiring on 31 October 2021.¹³ As explained below, this has meant significant over achievement of Viet Nam's then prevailing electricity masterplan (known as PDP7-revised) in terms of renewable energy, not thought commercially possible during NDC

formulation. It turned Viet Nam from a laggard (in 2018) into one of the world's champions in solar PV deployment (by 31 December 2020). However, this is also causing some problems and a backlash against renewable energy. Curtailment of many new solar power plants had to be regulated on 4 January 2021 because of limited power transmission capacity during peak-production of solar power in the Southcentral coast region.¹⁴ Not much later, the Prime Minister insisted on strict regulation of solar PV deployment as well as synchronous development of the grid.¹⁵

The updated NDC also provides Viet Nam's "contributions" to adaptation, with three "strategic tasks" for climate change adaptation later reflected in the National Adaptation Plan (NAP) for 2021-2030 with a vision to 2050, issued in 2020.¹⁶ The NAP includes three groups of tasks: (1) improve climate change adaptation effectiveness through strengthening State management on climate change and integration of climate adaptation in the system of strategies and masterplans, (2) strengthening resilience and enhancing adaptive capacity of communities, economic entities, and ecosystems through investment in adaptation actions, science and technology, and awareness-raising, to be ready to adjust to climate change and (3) disaster risk reduction and damage reduction, preparedness to respond to disasters and climate extremes that are increasing due to climate change. The tasks in the NAP are assigned to different ministries and other governmental bodies. The bulk of tasks are for the Ministry of Natural Resources and Environment (MONRE) and the Ministry of Agriculture and Rural Development (MARD), with just three tasks for the Ministry of Industry and Trade (MOIT), of which one is energy-related: "Formulate and implement the plan for upgrading and improving electric power plants, electric transmission stations, electrical sub-stations, fuel pipeline systems, mines, coal yards, and other energy facilities in coastal areas".¹⁷ This implies that the NAP

is concerned with energy security and energy transition towards more renewables and energy efficiency is not part of its mandate.

2.2. Electricity Demand and Supply

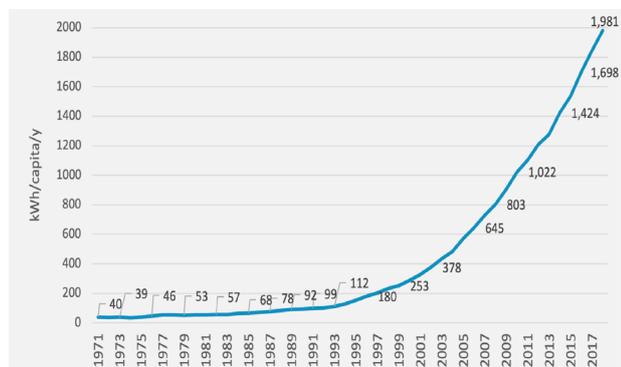
2.2.1. Current Situation

Viet Nam experienced a surge in solar PV due to a FiT of 9.35 UScent/kWh and a deadline to connect systems to the grid by 30 June 2019.¹⁸ This resulted in about 4.5 GWp of solar PV connected to the grid. A new solar PV FiT was issued with rates of 7.09, 7.69 and 8.38 UScent/kWh for solar plants, rooftop and floating systems, respectively and a deadline of 31 December 2020.¹⁹ According to EVN, by the end of 2020, the installed capacity of solar PV was 19.4 GWp, of which 9.3 GWp was the total of more than 100,000 rooftop solar PV systems, with the rest solar PV plants.²⁰ Current wind power FiTs are 8.5 and 9.8 UScent/kWh for onshore and offshore systems, respectively and a deadline of 31 October 2021.²¹ Each of those policies guarantee the FiTs for 20 years (see section 2.5). The FiTs were evidently commercially attractive, as demonstrated by spectacular solar PV deployment, whereas very considerable wind power deployment is ongoing at the time of writing.

The electricity mix of Viet Nam has thus changed substantially over the past two years, but thermal power also increased as well. As of early 2021, this means solar PV is making up more than a quarter of the total of nearly 70 GW in national power mix capacity. Wind power is lagging behind, with 533 MW currently installed, though several GWs of additional capacity is expected to be connected through 2021. The capacity factors of solar and wind power are usually lower than those of hydroelectricity, coal, diesel, gas and biomass-thermal power. Because solar irradiation and wind are intermittent, their shares of total power produced are lower than their shares of installed capacity. Reports on actual production of recent solar power will take some time. For example, while renewable power capacity jumped by 5.1 GW in 2019, 1.3 GW of coal power capacity was added as well.²²

Figure 3. Electricity consumption in Viet Nam from 1971 to 2018

Source: World Bank and General Statistic Office of Viet Nam



Viet Nam's electricity consumption per capita increased from 253 kWh/capita/yr in 1999 to 1,981 kWh/capita/yr in 2018, nearly an eight-fold jump in 20 years (Figure 3). The industry and construction (manufacturing) sector and the residential sector consumed the most, as shown in Figure 4. Electricity demand is not evenly distributed by region. The north and south (Ha Noi and HCMC, respectively) have a much higher load demand compared to the central region. Figure 5 shows the total commercial electricity supply by the five power corporations (PCs) that distribute electricity to customers in different regions of Viet Nam.

Figure 4. Electricity consumption by sector in 2010 and 2019

Source: Authors' plot with data from Institute of Energy (2021)

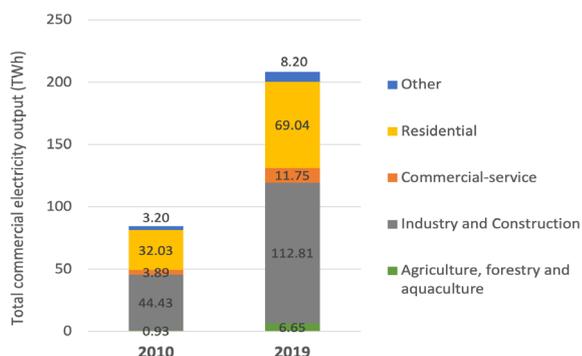


Figure 5. Electricity demand by region in 2010, 2015 and 2019

Source: Authors' plot with data from Institute of Energy (2021)

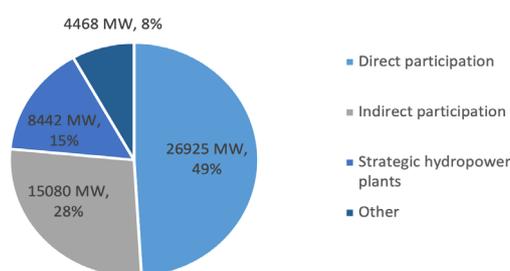


Notes:

EVNNPC: Northern Power Corporation;
 EVNSPC: Southern Power Corporation;
 EVNCPC: Central Power Corporation;
 EVNHANOI: Ha Noi Power Corporation
 EVNHCMC: Ho Chi Minh City Power Corporation

Figure 6. Installed capacity by market participation status by June 2020

Source: NLDC, 2020²³



Notes:

- For Build-Operate-Transfer (BOT) power plants, the MOIT signs a contract with the BOT investor for the construction of a thermal power plant. After construction is completed, the investor is entitled to operate the plant for a certain period of time. When this period expires, the investor transfers the plant to the MOIT.
- Independent Power Producer (IPP) is an independent power source project with capacity of 30 MW or more, invested by private investors.
- Renewable energy (RE) projects include solar, wind and biomass projects, as well as small hydro.
- Large hydropower projects have installed capacity of 30 MW or more.

Demand and supply of electricity is subject to the ongoing power sector reform process towards competitive electricity wholesale and retail markets (see also section 2.5). After years of preparation, the Viet Nam Wholesale Electricity Market (VWEM) started to operate in January 2019. In the first six months of 2020, there were 100 power plants directly participating in the VWEM with a total installed capacity of about 27 GW, or 49 per cent of total installed capacity (Figure 6). The Build-Operate-Transfer (BOT) thermal power plants and strategic hydropower plants indirectly participate in the wholesale market with total installed capacity of 23.5 GW, or 43 per cent of total capacity (in mid-2020). Renewable energy plants that receive FiTs for 20 years do not participate in the wholesale market.²⁴

Previously, the Electricity Power Trading Company (EPTC) was the “one-buyer” of electricity, but power is now purchased by the five PCs. These PCs are all EVN subsidiaries and are expected to compete in future, as the MOIT recently approved the design of a competitive retail market. In 2021, the National Load Dispatch Centre (NLDC) will be transformed into the System and Market Operator (SMO) company. It will pilot the Direct Power Purchase Agreement between renewable generation units and eligible customers.

During 2022-2024, (large) customers can buy electricity directly from the spot market (wholesale market). After 2024, all customers can select their power retailers. The five PCs will be (competing) retailers and at the same time, power distributors within the respective area they are in charge of.

2.2.2. Projection

Viet Nam is preparing the power development masterplan for 2021-2030 with outlook to 2045 (PDP8) based on electricity demand projections.²⁶ Projected electricity demand is the main determinant of the future scale of power generation and grid expansion. The Institute of Energy modelled demand growth, using assumptions for population, urbanisation, GDP growth, electricity consumption growth and elasticity of electricity, as shown in Table 2. It projects that electricity demand will be 491.3 TWh by 2030 and 877.1 TWh by 2045, more than two-fold and four-fold more than in 2020, respectively. Demand is expected to increase rapidly in the north and south with each region accounting for about 45 per cent of total national electricity demand in 2030, and a modest 10 per cent for the central region. However, most solar PV and wind power projects are in the central region, causing challenges in balancing the national power system and requiring investments in the power transmission grid.

Table 2. Results of electricity demand projection to 2045 (base scenario)

Source: Institute of Energy (2021)

Assumption	Unit	2016-20	2021-25	2026-30	2031-35	2036-40	2041-45
GDP 2010 price	Trillion VND	3,836	5,322	7,266	9,722	12,747	16,652
Industry-Construction	%	41.0	42.7	43.9	44.7	45.2	45.6
Agriculture-Forestry-Aquaculture	%	15.1	13.0	11.4	10.3	9.4	8.7
Commercial-Services	%	43.9	44.3	44.6	45.0	45.4	45.7
Population	Mil. People	96.7	101.8	107.1		118.2	
Urbanisation rate		36.8	40.0	43.1	46.3	49.4	52.6
Income per capita	US dollars/capita	3,490	5,580	8,177	11,758	16,582	23,323
Electricity intensity per GDP output	kWh/mil. VND	56.5	63.0	67.6	66.8	60.8	52.7
Electricity consumption per capita	kWh/person	2,243	3,294	4,588	5,770	6,554	7,076
5-year GDP growth rate	%/year	5.9	6.8	6.4	6	5.6	5.5
5-year electricity consumption growth rate	%/year	9.9	9.1	7.9	5.7	3.6	2.5
Electricity elasticity of 5-year GDP		1.67	1.35	1.24	0.96	0.64	0.46
Electricity demand/commercial electricity	TWh	216.8	335.3	491.3	649.4	774.6	877.1
Pmax	GW	38.7	59.3	86.5	113.9	135.6	153.2
Installed capacity	GW	69.9	102.2	137.7	190.4	233.8	276.6

Notes:

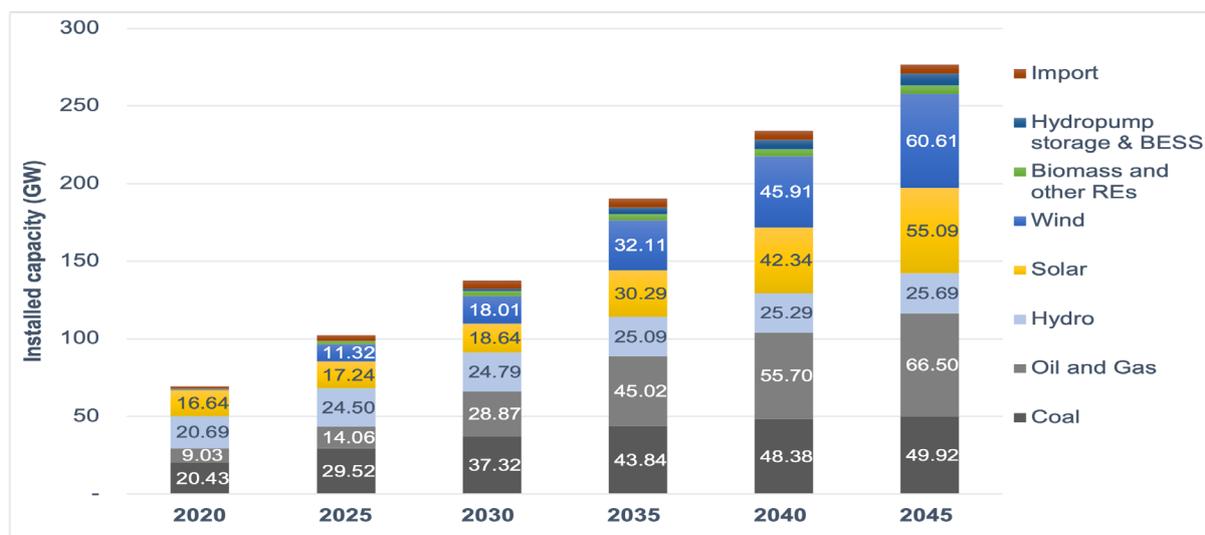
- Pmax is the maximum load capacity of the national power system.
- Electricity demand/commercial electricity is the annual average total commercial electricity demand in a five-year period.
- Installed capacity is the annual average total installed capacity of the power system in a five-year period.

The draft PDP8 projection for the power mix of Viet Nam to 2045 shows significant growth of (non-hydro) renewable energy, from 26 per cent of total installed capacity in 2020 to 29 per cent in 2030 and 44 per cent in 2045 (Figure 7). However, actual solar PV deployment in early 2021 was more than that modelled for 2020 and even for 2030. Expected deployment of wind power in 2021 may also mean the projected total for 2025 and 2030 can be achieved sooner. The draft PDP8 explains that maximum load capacity (Pmax – see Table 2) in PDP8 in 2030 is 4.1GW lower than in PDP7-revised.

However, the modelled projections of total installed capacity appear out of step with Party Resolution 55 of 2020 on energy sector orientation (see section 2.5), which proposes 120 GW installed capacity in 2030, down from 129.5 GW in PDP7-revised, whereas Figure 7 and Table 2 give 137.7 GW. This might be explained by the higher projected solar and wind power share, which have lower capacity factors and require “balancing” with other power sources when non-hydro renewables are insufficient. Indeed, electricity demand (commercial electricity) projections for 2030 have declined in successive policies, from 695 TWh in PDP7 (2011), to 572 TWh in PDP-revised (2016), 550 TWh in Resolution 55 (2020) and 491.3 TWh in draft PDP8 (Table 2).

Figure 7. Future power mix of Viet Nam to 2045 (draft PDP8)

Source: Authors' plot based on data from Institute of Energy (2021)



Demand projections are sensitive to assumed GDP growth. The PDP8 modelling exercise used the GDP growth projections of the government, which includes the impacts of COVID-19 for 2020, but not the following years. These GDP growth projections are lower than those used in PDP7-revised, but still appear optimistic. The demand projections are also sensitive to population growth projections and to the assumed relationship between GDP and energy consumption in an economy, which the draft PDP8 highlights for several other countries. But, in comparison to others, the draft PDP8 makes high projections of power demand and required installed capacity for 2030 and 2045. Germany, with a population of 84 million and GDP/capita of 46,000 US dollars in 2020, produced 516 TWh electricity in 2019 with 211 GW installed capacity. This is double the GDP/capita of Viet Nam's 2045 projection, yet it would require 877.1 TWh in 2045 when its population is projected at 118 million (40 per cent more than Germany today) and installed capacity would be 276.6 GW (Table 2). Although every country's situation is unique, it seems that Viet Nam is planning to become energy-inefficient in comparison to Germany.

The projected fossil fuel share in the total installed capacity would increase from

43 per cent in 2020 to 48 per cent in 2030, and then reduce to 42 per cent in 2045. The projected total installed capacity of (coal, gas, oil) thermal power in 2030 in the draft PDP8 is lower than in PDP7-revised (66.2 versus 74.3 GW in 2030 – see Figure 7). However, this projected reduction is small and according to PDP8 modelling, coal and gas thermal power will continue to grow in absolute total capacity to 116.4 GW in 2045, which implies construction of new thermal plants through to 2045, therefore locking-in emissions for subsequent decades (Figure 7). The draft PDP8 report estimates that coal demand for power generation is rising steadily from 37.4 million tonnes in 2020, to 86.4 million tonnes in 2030 and about 114 million tonnes in 2040 and 2045. Of the total coal-for-power demand, 12.4 tonnes was imported in 2020, about 45 million tonnes to be imported in 2030, and about 74 million tonnes in 2045.²⁷ This is less than the estimate made in 2012 on the assumption that PDP7 would be implemented and new plants would depend on imported coal, about 80 million tonnes in 2030.²⁸ However, fossil fuel use is still very substantial and growing steadily: although several coal power plants in PDP7-revised have been converted to LNG with less pollution, LNG is growing faster than in the older master plans and also leads to high GHG emissions. The continued increase of coal and LNG generation capacity implies long-term and strong

dependency of the power system on imported fuels, which is weakening national energy security, making Viet Nam more vulnerable for geopolitical disturbances and fuel market fluctuations.

As explained in section 2.2.1, the power sector would make up a large share of Viet Nam's total GHG emissions. Viet Nam issued its updated NDC with emissions reduction targets to 2030, but it has not decided on when peak emissions and carbon neutrality would be reached, as China, the EU, Japan and the Republic of Korea have done. The IPCC analysed how the world can achieve the Paris Agreement ambitions of maximum 2°C global warming and preferably no more than 1.5°C, showing different pathways in global emissions reductions, including a stage of negative emissions of certain gasses. It states that: "In pathways limiting global warming to 1.5°C [...] CO₂ emissions are reduced to net zero globally around 2050".²⁹ All scenarios presented show peaking of CO₂ emissions no later than 2030, and negative emissions from 2050, or later in the second half of the century if peaking occurs earlier than 2030. Negative CO₂ emissions are needed because other GHGs would reduce steadily, but stay above zero. Slightly less ambitious, but similar pathways would be needed for the maximum 2°C warming target, whereas the report shows that climate change impacts would be substantially more severe with 2°C warming, let alone "global heating" above 2°C. However, Viet Nam's long-term projection of power sector emissions is inconsistent with the notion of peaking GHG emissions by 2030 and reducing emissions towards carbon neutrality by, for example, 2060 as China has pledged. Continued growth in emissions from the power sector until 2045 and continued high emissions beyond that contradicts Viet Nam's implied responsibilities towards achieving the Paris Agreement's long-term ambitions. But, it does not have to be this way.

A study for the World Wide Fund for Nature (WWF) in Viet Nam and other Southeast Asia countries concluded that Viet Nam could phase-out fossil fuel power by 2050 with a combination of strongly improved energy efficiency and expanded renewable power generation, with some short-term costs – yet long-term economic benefits.³⁰ Very high ambition in energy efficiency and renewable power deployment was assumed in a study of Viet Nam's GHG emissions targets, concluding that GDP growth and employment would climb as a result, provided that additional FDI would flow into renewable energy and energy efficiency investments.³¹ These projections made more favourable assumptions about the reduction in costs of renewable energy compared to the updated NDC and draft PDP8 modelling, in line with recent developments in Viet Nam and globally. They also assumed higher energy efficiency of the Vietnamese economy, with increased power storage as the cost of batteries is reducing and there are international examples of large-scale commercial deployment. PDP8 modelling also includes storage whereas a large pumped-storage facility is under construction (Figure 7). However, the planned storage increase is insufficient for large-scale variable renewable energy (VRE) deployment.

Alternative studies on future power do not, however, provide details on the costs of "balancing" generation capacity, additional storage, strengthening the transmission network, or power demand and supply management needed to enable a high share of VRE in the power mix. Also missing in the PDP8 modelling as well as these alternatives studies is that by 2030, a significant share of cars and buses will be electric, which by 2045 will perhaps be close to 100 per cent.³² The spread of electric vehicles (EVs) is an unmistakable global trend, with all large car companies as well as Viet Nam's Vinfast developing electric cars, busses and trucks,

and announcing dates by which they will phase-out diesel and petrol car production, such as 2025 and 2030. And Viet Nam is hosting a joint venture shipbuilder that is already exporting electric tugboats.³³ The cost of batteries is critical in this regard and is expected to lead to competitive prices by 2021-2022 when the upfront cost of electric cars will be similar to petrol or diesel-driven ones, whereas fuel and maintenance costs of EVs are much lower. This has major implications for electricity demand and is also a power storage opportunity: parked vehicles can be connected to the grid, they might be automatically charged (when solar and/or wind power production is peaking) or release power into the grid (during high power demand or weak supply, crediting to the car owner). In the EU and China, the hardware and software for integration of EVs and the power grid is developing rapidly.

Power markets are a key factor in potential integration of VRE. Recent international analysis of the effects of power markets on the future of coal-thermal power suggests that Viet Nam's projection of continued growth in coal power deployment to 2045 is ill advised. There is a "surge in wind and solar investment [that] is pushing coal out of the electricity market" in Australia, challenging the supply by coal and gas thermal plants. Because wind and solar in the same markets have no fuel costs, they may bid lower prices – sometimes even zero, whereas coal and to a lesser extent gas-thermal plants take time and fuel cost to start-up and wind-down. A strongly reduced output by gas and coal generators in Australia is expected in the next five years and consumer prices will also be lower. Gas and coal generators will operate less of the time and particularly coal plant profitability is eroding significantly.³⁴ Similar reports have been coming out of Germany and other European countries. TERI did a model study of Variable Renewable Energy Integration Costs of the situation in India. It recognised that with an increasing

share of wind and solar the real-time balancing of supply and demand was challenging, but the low cost of VRE made it preferred for whatever demand it could serve, as in Australia and Europe. It concluded that in the short-term, the optimal VRE level was substantially higher than current levels, that the "opportunities for variable cost" in a regulated market could enable VRE shares of 40 per cent and that after 2030, VRE was expected to meet subsequent demand growth, because energy storage costs were falling to make battery storage systems more economical. To enable this, it proposed enhanced grid integration across different states of India, and increased use of battery storage and pumped hydro.³⁵

Viet Nam already has a partial wholesale market and the competitive retail market is being developed (see section 2.5). The current solar and wind power plants benefit from FiTs, but they will start expiring around 2038 and then enter the wholesale market. Solar and wind plants deployed in the coming years may receive fixed tariffs for periods shorter than 20 years or no fixed tariff at all (pending new regulations), and therefore also enter into the wholesale market. The effects observed in Australia and Europe and expected in India will then also affect coal power plants in Viet Nam. How this might develop is, however, complicated by the fact that many thermal power plants already in operation also receive long-term fixed prices for their power, necessitating that some "build-operate-transfer" (BOT) coal and gas thermal power plants "must-run" and thus providing the baseload. The impossibility of reducing the use of these dispatchable plants for years to come is a challenge for integration of VRE, unless coal and gas Power Purchase Agreements (PPAs) are renegotiated away from must-run status, which will affect their profitability. But doing so, is likely to reduce costs to consumers as is happening in Australia, and cannot be

ignored by policy-makers and EVN. Current coal power plants and some of their characteristics are outlined in Annex 1.

2.3. Access to Energy for All

SDG 7 is about access to affordable, reliable, sustainable and modern energy for all, with targets on renewable energy and energy efficiency.³⁶ As documented in 2017, rural electrification of Viet Nam is impressive, with nearly 100 per cent of rural communities and households connected to the national grid.³⁷ Electricity supply to rural, mountainous and island areas, including some off-grid community systems, is supported by a national programme running to the end of 2020 (aiming for 100 per cent access to electricity), financed by the EU and others, as well as some NGO projects. In the 2017 publication, it was acknowledged that many low-income rural households had benefited from bio-gas digesters and improved cooking stoves, in particular because of NGO programmes. Access to energy is also a topic of technical working groups of the Viet Nam Energy Partnership Group (VEPG), which also concerns itself with clean, efficient biogas and cookstove technologies.³⁸

It was also concluded that off-grid solar PV produced cheaper power compared to gasoline generators, and household rooftop PV systems with two-way metering (on-grid) had become economical and “would pay for themselves in 5-10 years”, whereas their economic lifetime is generally assumed to be 20 years.³⁹ Since then, regulation was issued and many rooftop solar PV systems were installed by businesses and private households. The 2017 paper analysed energy prices too, being comparatively low in Viet Nam and only rising with inflation (consumer price index (CPI)). Viet Nam continues to have a slightly progressive household electricity retail pricing system, with lower costs of the first units consumed per month that benefits low consumers and

therefore low-income households.⁴⁰ Whether the progressive electricity tariffs will remain with introduction of the competitive electricity retail market in 2024 is unclear (see section 2.5 on power sector reform). It, however, is an important tool to ensure access to electricity for low-income households. In addition, it must be appreciated that household tariffs, on the whole, are higher than those of businesses, although the tariff system distinguishes businesses and tariffs for different hours of the day and days of the week.

There is a history in Viet Nam of poor, ethnic minority and “social policy” households receiving cheap kerosene for lighting and cooking, before being replaced by small cash payments as the “lifeline electricity tariff” was abandoned some years ago.⁴¹ Access to electricity and biogas is particularly important for women and girls in poor rural communities, as it saves time on activities such as collection of fuelwood and cooking, and enables income-earning activities, homework and access to information (TV, radio, internet). Processes such as “local energy planning” applied in some communities in Viet Nam by the NGO GreenID have engaged women and men in learning and planning their energy options, including off-grid solar PV in some of the communities not yet connected to the national grid. There are also examples of VRE in support of women’s micro-businesses, such as solar-powered chicken incubation and ventilation equipment in chicken-rearing in Lao Cai province (see Figure 1), enabled by the NGO ChiaSe and the United Nations Environment Programme (UNEP) to help women entrepreneurs make business plans and select equipment.⁴²

However, these are the results of NGO projects in a limited number of communities, not replicated by national or provincial programmes. The above-mentioned energy-related cash transfers are not under the responsibility of MOIT, but that of the Ministry of Labour,

Invalids and Social Affairs (MOLISA), which directs poverty elimination, social protection and social security programmes. Power development masterplans and VRE support policies do not include social policies (although electricity tariffs are still progressive) and are essentially “gender-neutral” or “gender-blind”. International experience suggests that capacity building of women entrepreneurs in renewable energy can be empowering, and capacity building of policy-makers on women’s leadership in renewable energy can be effective too. All planning for renewable energy should include women in different roles, and women and rural communities should be able to access finance in the context of distributed VRE. But, aside from some NGO-supported cases, this is not happening in Viet Nam.

The solar rooftop expansion in 2019-2020 reached more than 100,000 systems, but included only a small number in rural areas on small- and medium-sized farms. The financial advantages of “net-metering” of nearly 10 MWp total installed capacity in those systems are thus primarily for investors, businesses in industrial zones, high-rise apartment buildings, hotels and office buildings, and higher-income households. Combining farming with solar PV (agri-PV or APV) is limited to some commercial rooftop systems with up to one hectare of shade-loving high value crops. At a small-scale it is at an experimental stage, such as a greenhouse on the farm of a Khmer household in An Giang province (see Figure 1), from where learning and expansion is planned. Initial results indicate that scaling-out and scaling-up is commercially possible and would provide farmers with additional income from power production and improved agriculture, depending on to-be-announced new regulations on solar PV and arrangements with lenders and/or external investors.⁴⁴ These small-scale systems will face regulatory and financing challenges. In the case of solar rooftops for on-site consumption of electricity or exporting power to the grid,

nearly all costs of a 20-year economic lifetime are invested upfront, whereas small- and medium-sized farmers have limited access to capital. A further challenge is the limited capacity of power distribution systems, especially in remote rural areas, and therefore only small rooftop systems may be interconnected or investments are needed in additional equipment, such as batteries or transformers to feed into higher voltage lines with more capacity. This means that for the same production and power revenue compared to urban and industrial areas, the investment cost is higher in remote areas (see sections 2.5 and 4.1). But where small- and medium-scale APV is feasible, greenhouses with solar panels can be a “vehicle” towards modern, clean and “high tech” agriculture, as promoted by the government. There is also a need for local service companies (design, procurement, construction, operation and maintenance) and there are opportunities to encourage women-entrepreneurs to step in, by providing capacity building and access to credit, for example.

2.4. Employment

Analysis of energy sector employment, the quality of those jobs as well as expected energy transition-driven changes were hampered by limited data in 2017. However, what was available indicated positive effects of the energy transition in terms of numbers of jobs, quality of jobs and share of jobs held by women.⁴⁵ There are now some additional data and model research on employment in the energy sector in Viet Nam, and international experiences are also relevant. Communities where livelihoods depend on agriculture have been negatively affected by power plant development, in particular coal-thermal power, as documented in 2017.⁴⁶ The need for land for coal-thermal power plants includes landfills, whereas solid waste is dumped in the sea in some cases with negative consequences

for biodiversity. Solid waste could be used as input into prefabricated concrete elements for example, but that is not happening at or near all current coal power plants despite it being a business opportunity that could generate employment.

Land conversion from agriculture or aquaculture is also a challenge in the case of solar PV plants, with a loss of farm-based livelihoods.⁴⁷ Consequent reductions in rural incomes and employment in agriculture has affected communities and added to out-migration, a phenomenon in many rural areas in Viet Nam where largely young people search for jobs. This is a further reason to promote the APV concept (see section 2.3), also regarding larger power plants. APV at scale would create similar income and employment opportunities from agriculture and additional (employment, income) opportunities because of power generation.

Workers in coal mining in Viet Nam would be hardly affected by the energy transition as guided by the draft PDP8, because domestic coal mining would grow to supply existing coal-thermal plants. Coal imports will rise to supply the newly-planned plants. Due to the expansion of coal and LNG imports for thermal power production, ports will be expanded to welcome larger vessels. This infrastructure and the new thermal plants imply substantial construction work opportunities. Coal-thermal plants will also require significant numbers of staff due to coal supply and solid waste management, including transport. Gas-thermal power plants, wind and solar parks will also generate construction jobs, with O&M generating relatively clean and skilled jobs.

The International Renewable Energy Agency (IRENA) estimated that the levelised costs of offshore wind power and solar PV generation reduced globally by 8.2 and 13.1 per cent in 2019 compared to 2018, respectively.⁴⁸

It also estimated that employment in renewable energy worldwide was 11.5 million in 2019, up from 11 million in 2018. Women held 32 per cent of these jobs and 33 per cent of the total was in solar PV. Many renewable energy jobs in Viet Nam may be in hydropower, and also biomass-based heat and electricity generation. But, the accuracy of IRENA data about Viet Nam, the types of jobs included, how green, clean and decent these jobs are and the number of women workers remains unclear. This suggests further research is needed. Nevertheless, the data are a positive sign. With 2019 covered, the data did not capture the solar PV “boom” of 2020, the ongoing expansion in wind power in which EPC company jobs and construction workers will have increased temporarily, as well as long-term O&M jobs. However, the 2021 “boom and bust” nature of VRE deployment as a result of policies (see sections 2.2 and 2.5) means some workers may be out of work already, notably in construction of solar PV systems. Jobs in VRE manufacturing may be less affected by “boom and bust” in Viet Nam, because that industry is focused on exports.

According to a co-benefit study on future skills and job creation in Viet Nam's energy transition, power development would create between 1.61-1.93 million job-years in different energy transition scenarios.⁵⁰ Job creation according to targets of the PDP7-revised scenario would increase renewable energy from 6 to 10.7 per cent and create about 315,000 job-years from solar, wind and biomass power generation to 2030. A shift to the most ambitious VRE scenario assessed would increase this to approximately 434,000 job-years. This study suggested that over the modelled period of 2015-2030, solar and wind would create 3.5 and 2.8 jobs respectively, per installed MW capacity, whereas coal created only 1.4 jobs per MW. Across all scenarios, around 80 per cent of jobs created in the power sector with all forms of generation would be in construction and installation. For wind and solar PV, about a

quarter of jobs would be for skilled workers, for which vocational and university training must be reinforced.

More green and decent jobs would be generated with increased VRE compared to the PDP7-revised or draft PDP8 scenario. A macro-economic study of GHG emission reductions with high targets and investment in VRE and energy efficiency in Viet Nam concluded that the likely outcome of such a scenario was increased GDP and total employment, including all value chains when compared to scenarios for NDC targets.⁵¹ According to data provided for some solar power projects in Viet Nam, a 50 MW solar farm would have about 20 people working during operation. This is equivalent to 0.4 jobs/MW, and with a total of 20GW installed for 20 years, this would mean 160,000 job-years just in operation (approximately how much solar PV was deployed in 2019-2020, including rooftop solar). In addition, many workers are required for the construction phase, but only for short periods as jobs are mostly low-skilled. A study in South Africa, based on employment data, compared two scenarios of electricity systems that were either completely dependent on coal (mining, transport, construction and operation of power plants) or renewables (construction, operation).⁵² It concluded there would be

30 per cent more jobs in the scenario of 100 per cent solar PV and wind plants compared to a fleet of 100 per cent coal-thermal plants producing the same power output over the lifetime of these systems. This is a significant difference in employment opportunities, but a smaller difference compared to the Viet Nam co-benefit study, which may be because the Viet Nam-focussed study looked at installed capacity and the South Africa one at power output – and VRE has lower capacity factors.⁵³ A USA-focussed study synthesised the number of jobs created by different types of power generation technologies, as given in Table 3.⁵⁴ These data showed that solar PV technology had the highest job creation rate, followed by biomass and wind technologies. This confirms that the energy transition would create more jobs compared to BAU with large shares of fossil fuel-based thermal power. Given the scale of VRE development as projected in the draft PDP8, by applying the (older) data from the USA to the draft PDP8, it is estimated that the total employment creation from solar power in 2030 could range between 5,500-28,324 jobs for construction, installation and manufacture (CIM) and between 2,279-19,138 per GW for O&M (Table 4). These numbers are lower for wind power, ranging between 1,777-7,819 jobs for CIM and between 2,488-7,108 per GW for O&M.

Table 3. Comparison of jobs created by different technologies (USA, 2010)

Source: Wei et al. (2010)

Technology	Total jobs/MWp		Total jobs/MWa		Total job-years/GWh			Average
	CIM	O&M	CIM	O&M	CIM	O&M	Total	
Biomass	0.11-0.21	1.21-1.53	0.13-0.25	1.42-1.80	0.01-0.03	0.16-0.21	0.19-0.22	0.21
Solar PV	0.29-1.48	0.12-1.00	1.43-7.04	0.60-5.00	0.16-0.84	0.07-0.57	0.23-1.42	0.87
Wind	0.10-0.44	0.14-0.40	0.29-1.25	0.41-1.14	0.03-0.14	0.05-0.13	0.10-0.26	0.17
Nuclear	0.38	0.70	0.42	0.78	0.05	0.09	0.14	0.14
Coal	0.21	0.59	0.27	0.74	0.03	0.08	0.11	0.11
Natural gas	0.03	0.77	0.03	0.91	0.00	0.10	0.11	0.11

Notes:

CIM: Construction, Installation and Manufacture; O&M: Operation and Maintenance

Table 4. Estimated job creation from wind and solar by draft PDP8 base scenario

Source: Authors' calculations based on Wei et al. (2010) and Institute of Energy (2021)

	Installed capacity (GW)	Total jobs 2,030				Installed capacity (GW)	Total jobs 2,045			
		CIM		O&M			CIM		O&M	
		low	high	low	high		low	high	low	high
Wind	18.01	1,801	7,924	2,521	7,204	60.61	6,061	26,668	8,458	24,244
Solar	18.64	5,406	27,587	2,237	18,640	55.09	15,976	81,533	6,611	55,090

Notes:

CIM: Construction, Installation and Manufacture; O&M: Operation and Maintenance

2.5. Energy Policy Framework

The landscape of energy policy has changed significantly since 2017 especially regarding renewable power generation, as explained in the above sections. Renewable energy support policies, including FiTs, are shown in Table 5. The most important non-hydro renewable energy in terms of scale as well as potential are solar PV and wind. In addition to FiTs, renewable power projects are also exempted from taxes on imported goods to create fixed assets. Corporate income tax is exempted or reduced according to regulations on taxes for projects on the list of special incentivised investment areas. Preferential land-use fees are also applicable for wind and solar projects. But as also explained above, the recent solar PV “boom” has caused some issues including grid overloads during peak hours

in the South-central coastal region (notably Ninh Thuan and Binh Thuan provinces). Grid enhancements there have lagged and solar power plants are being curtailed, in contrast to wind power plants under construction, which will add to the grid-load.

Development of these renewable energy projects was induced by policies listed in Table 5. The PDPs include lists of all major power generation plants and transmission infrastructure, but unlike large-scale thermal power projects, PDP7 and PDP7-revised include general references to (expected groups of) renewable power plants, but names and specific locations were not identified. Small-scale generation, transmission and distribution infrastructure of 110 kV and lower is not included in PDPs but in provincial plans, and generation units below 30 MW capacity require provincial permission only. Figure 8 shows the role of national and local authorities in wind power project development.

Table 5. Renewable energy support policies, including FiTs

Source: Compiled by the authors based on official documents

	Type	FiT1 (UScent /kWh)	Support Policy	FiT2 (UScent / kWh)	Support Policy
Solar	Ground-mounted	9.35	Prime Minister	7.09	Prime Minister
	Rooftop solar (<1MW)		Decision 11/2017/ QD-TTg 2017	7.69	Decision 13/2020/ QD-TTg 2020
	Floating solar			8.38	
Wind	Onshore	7.8	Prime Minister	8.5	Prime Minister
	Offshore		Decision 37/2011/ QD-TTg 2011		9.8
Biomass	Combined Heat and Power (CHP)	5.8	Prime Minister	7.03	Prime Minister
	Non-CHP		Decision 24/2014/ QD-TTg 2014		8.47
Waste	Incinerator	10	Prime Minister		
	Landfill gas recovery	7.28	Decision 31/2014/ QD-TTg 2014		

In addition to MOIT and other entities at national level, many decisions are needed at provincial level in different steps, including the provincial People’s Committee (PPC), Department of Industry and Trade (DOIT) and Department of Natural Resources and Environment (DONRE). Figure 8 also shows that, generally, the regulatory demands of project development are complex, which tends to drive-up costs and slows momentum.

Future power development planning and renewable energy support policies are guided by Party Resolution 55-NQ/TW on *Orientation for the development of Viet Nam’s national energy system to 2030, vision to 2045, issued in February 2020*.⁵⁵ The overall goal of the Resolution is to ensure energy security, supply adequate, reliable and affordable energy for socio-economic sustainable development as well as national security and environmental protection. Resolution 55 also says the following, among other things:

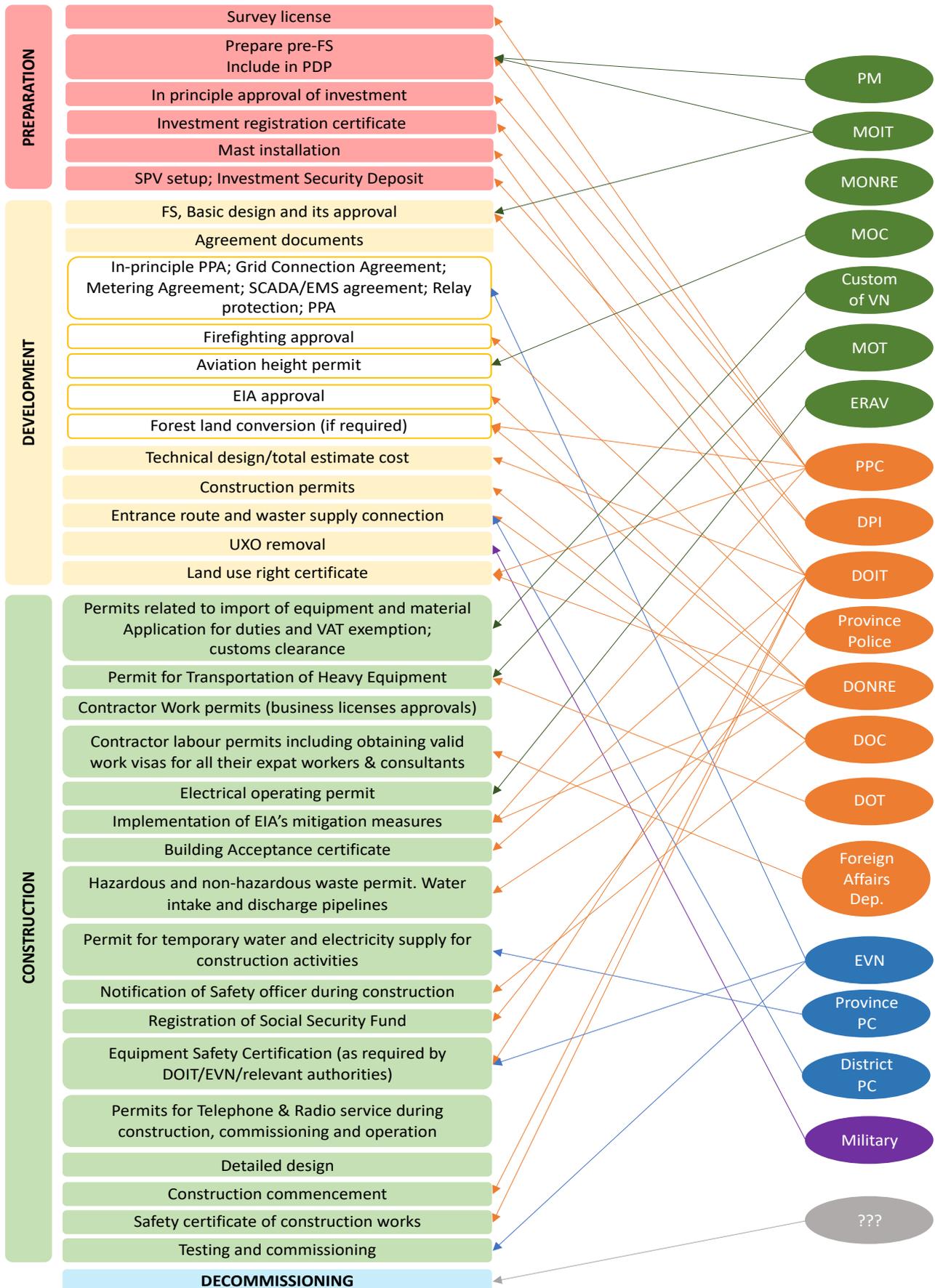
- The share of renewable energy in total primary energy supply should be 15-20 per cent in 2030.
- GHG emissions from energy activities against

the BAU scenario should reduce by 15 per cent by 2030 and 20 per cent by 2045 (compare section 2.1 on long-term emission reduction goals).

- Coal mining and imports must meet the requirements of production, particularly electricity generation, coal-fired thermal power development should deploy “technologies such as ultra-supercritical (USC) and upwards”, whilst adhering to international environmental and safety standards and decommissioning plants that do not upgrade technology accordingly.
- Gas-fired power plants must be the priority thermal power stations, they must prioritise the use domestic gas, and there should be rapid development of LNG power plants.
- Renewable energy should be promoted towards maximum replacement of fossil fuel sources, with priority given to wind power (onshore and offshore) and solar PV (including solar PV plants as well as rooftop and floating solar PV) as well as promotion of power plants utilising urban waste, solid waste and biomass.
- Research and develop carbon tax policies for fossil fuel use and ensure inclusion of environmental and social costs in product prices and investment costs.

Figure 8. Roles of policy-makers at different levels in wind power project development

Source: Compiled by the authors based on exchanges with businesses and local government officials



To implement Resolution 55, MOIT issued an action plan and will draft a Renewable Energy Law and a revised Electricity Law.⁵⁶ The main policy instrument to determine future generation and transmission will however be PDP8, several aspects of which were discussed above. Arguably, the modest projected increase in renewable power generation and continued thermal power growth in draft PDP8, as well as the implied small reduction in GHG emissions compared with BAU could be seen as consistent with Resolution 55. But, it could also enable ambitious energy security, affordability, renewable energy, energy efficiency and a reduction in environmental pollution.

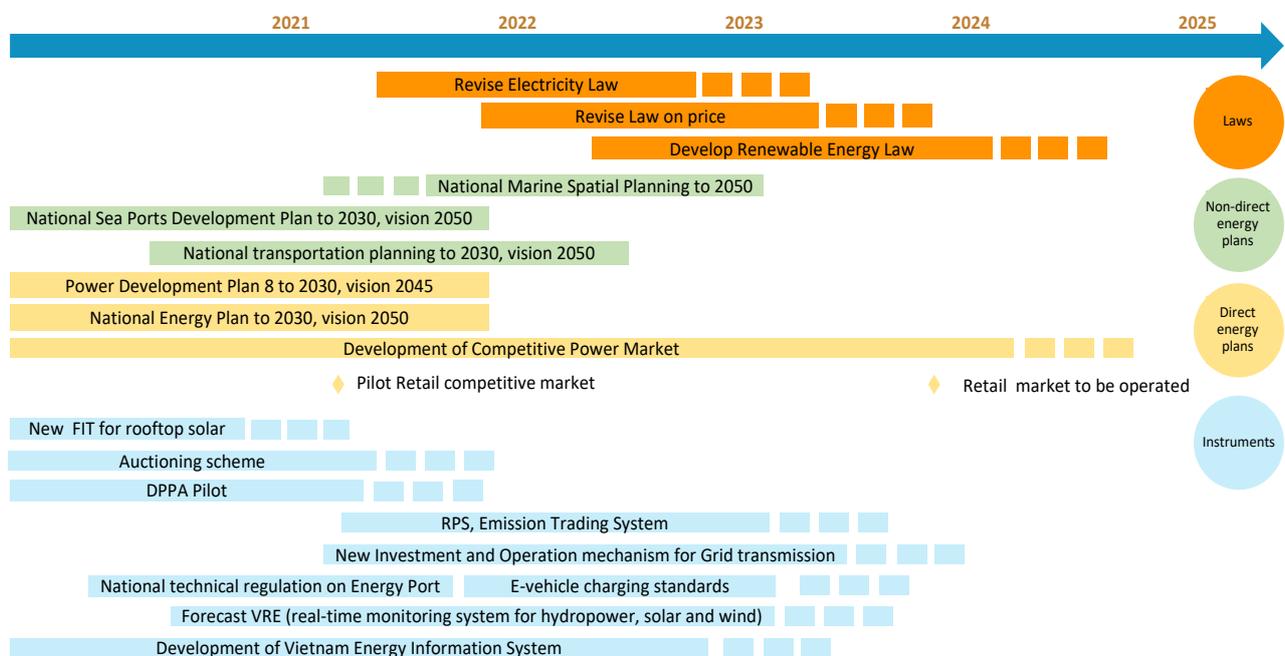
Other policy instruments being developed to enable the energy transition are presented in Figure 9. These include the Viet Nam Energy

Information System, an auctioning mechanism for solar power, the piloting of the Direct Power Purchase Agreement (DPPA) and a new FiT for wind power. Some policy options are being studied, such as private sector participation in grid investment and operation, Renewable Portfolio Standards for generation companies and an Emissions Trading System.

Relating to development of VRE manufacturing industry, Decision 39/2018/QD-TTg states that MOIT is responsible for development and submission to the Prime Minister of regulations on mechanisms to support local manufacturing of wind power equipment and increase the localization rate in wind power projects. MOIT also assigned ERAV to study and propose an auctioning mechanism for wind power, that might apply from 1 November 2021.⁵⁷

Figure 9. Key policy processes related to the energy transition

Source: Viet Nam Initiatives for Energy Transition 2020



Notes:
 DPPA = Direct Power Purchase Agreement; FIT = Feed-in Tariff,
 I&O = Investment and Operation,
 RPS = Renewable Portfolio Standard

As implied in section 2.3, forthcoming VRE policies (solar, wind) should also include guidance on achieving co-benefits. Solar PV at smaller and larger-scales can be combined with agriculture and aquaculture, industry, residential, tourism and administrative buildings and transport infrastructure – and not all is or must be “rooftop”. Onshore wind power could be combined with agriculture and aquaculture, transport (including harbours), and offshore wind power with coastal forest and fishing ground protection. Existing solar and wind policies do not promote all possible land-use combinations, and solar PV rooftop has limits in this regard (sections 2.3 and 4.1). However, new VRE policies could include conditions for design and approval of projects to optimise co-benefits, including various forms of dual land use.⁵⁸ Some models or approaches could be particularly helpful for low-income households, including very small-scale off-grid solar power systems that include batteries which could drive critical improvements, as it would enable schoolchildren to do homework with artificial light.

New VRE policies should also be explicit on development of human resources and employment opportunities across the country, as deployment will be “distributed” and will require engineers, construction workers as well as local service suppliers for O&M.

Finally, the policy-making processes in Viet Nam lack transparency, including how power generation projects are included in the (amended) annex of a power development plan (a pre-condition for getting a permit) or environmental impact assessments (which could include ways how biodiversity benefits instead of suffers from a wind power or solar PV plant, for example). Lack of transparency increases energy project development costs and reduces opportunities for local resident benefits. Transparency on energy-related data also needs to be improved with public access, to benefit investors and the public. Development of the Viet Nam Energy Information System is benefiting from dialogue under the VEPG’s technical working group on energy data and statistics and could be instrumental in enhancing transparency.⁵⁹

Chapter 3: Political Economy of Energy Transition

3.1. Public Discourse on “Energy Transition”

Viet Nam has achieved significant economic growth and poverty reduction since the *Doi Moi* reforms of 1986 gathered pace. This was accompanied by rapid growth in the supply of energy, with coal mining, petroleum exploration and domestic refineries, expansion of hydropower as well as thermal power generation, whereas Viet Nam achieved nearly universal access to the national electricity grid. It also set ambitious economic growth targets for the coming decades, which meant a major expansion of energy supply, whereas Viet Nam has become a net importer of energy in 2015. Energy plans, reflected in the INDC and the updated NDC, include a significant expansion of coal and gas thermal power generation as well as rapid expansion of traffic. With fossil fuel consumption prominent, PDP7-revised nor the draft PDP8 break this trend (see sections 2.2 and 2.5).

As described in the Friedrich Ebert Stiftung (FES) paper of 2017 on a Socially Just Energy Transition in Viet Nam, public objections had started to arise against air pollution in and around Ha Noi and other cities, as well as against thermal-coal power plants and related pollution.⁶⁰ Mismanagement of solid waste at the Vinh Tan coal-fired power plant in Binh Thuan province resulted in local protests in 2015. In Quang Ninh province, also in 2015, heavy rainfall caused flooding of coal mines and rupture of a mine waste facility, which destroyed homes and killed some people. Mismanagement at the Formosa steel plant with coal-thermal power generator in Ha Tinh province caused severe pollution and large-scale near-shore fish death and losses in fisheries and tourism in 2016. The aftermath was reported prominently in the public media for several months,

as a 500 million US dollars fine was imposed on the company concerned and compensation was allocated to groups of victims. With such incidents, the consequences for people’s lives and livelihoods were evident and criticism of pollution was voiced, signifying a shift in public sentiment.

The FES paper of 2017 showed that the “vested interests” in maintaining the strong expansion of fossil fuel use in power generation as well as transport were opposing renewable energy. Viet Nam updated its seventh Power Development Plan (PDP7) to PDP7-revised in 2016. This maintained a rapid increase of coal-thermal power generation to 2030, locking the country into a path to becoming a globally significant emitter of GHG and one of the countries with the largest coal-thermal pipelines, which was criticised.⁶¹ But, arguments against renewable energy were also publicly voiced, including the high costs of non-hydro renewable energy, lack of potential, intermittency and grid instability. However, these had been demonstrated to be myths as other countries have successfully addressed such challenges, whereas renewable energy has many advantages, including increased national energy security.⁶² And the possibility of “clean coal” power was promoted in its support, which is generated with higher efficiency and less air pollution, but it emits no less GHG (“clean coal” is also mentioned in the draft PDP8).⁶³

In the early 2010s, the phrase “Energiewende” became popular in Germany. It is being increasingly used in English as “energy transition” and since about 2017, the Vietnamese “*chuyển dịch năng lượng*” has been used by civil society organisations and in dialogues between the international community and national government agencies. It is

generally understood as a significant expansion of renewable energy in Viet Nam's energy mix, plus improvements in energy efficiencies in transport, industry, construction and buildings, as well as agriculture and aquaculture. It has been used regularly in the media, especially in 2019-2020, as demonstrated by internet searches of Vietnamese newspaper articles. "Hits" included articles in the outlets of the Communist Party of Viet Nam, MOIT, energy State-owned Enterprises (SoEs) such as EVN and PVN, outlets of professional associations, and mainstream daily newspapers and weekly magazines. In several cases, the focus was "renewable energy transition", with less stress on energy efficiency.⁶⁴ Solar PV took off in these same two years and currently much wind power construction is under way (sections 2.1 and 2.2), based on support policies for solar PV and wind issued in 2017, 2018 and 2019, as well as Party Resolution 55 (see section 2.5).

During 2016-2020 the international media highlighted Viet Nam's coal-dominated future and expected rapid rise in GHG emissions to 2030 as implied by PDP7-revised, as well as decades after as coal-thermal powerplants with a potential economic lifetime of at least 25 years would lock-in high emissions. NGOs and research organisations tracked the planning, construction and operation of coal-thermal powerplants. In 2018, Viet Nam came third out of 106 countries with 42,315 MW of new coal-thermal power in active development, after China and India; and it already operated 17,387 MW which was the 15th largest installed capacity of those 106 countries.⁶⁵ Modelling of energy development paths by international analysts showed that alternative scenarios would be financially feasible, and highly beneficial in terms of reduced GHG emissions and local environmental quality. The risk that coal power plants would turn into stranded assets was also analysed, for key countries in liberalised as well as regulated power markets including Viet Nam, using a global dataset and

model.⁶⁶ These studies concluded that the costs of power production with existing and planned coal power plants in Viet Nam is comparatively high, and electricity from new solar and wind would be cheaper by 2020. By 2030, 40 per cent of all coal power plants would have higher long-run operating cost than renewables. Investments in the new plants to 2030 would be a high commercial risk because capital recovery may be 15-20 years and power from new renewables would be cheaper than before that point is reached. These conclusions are consistent with international experiences and expectations of wholesale markets where cheap wind and solar power becomes a challenge for coal and gas thermal plants (section 2.2). Such reports were discussed in workshops in Viet Nam and featured in international and domestic media reports (see Annex 1 for a list of coal power plants). Climate Tracker research fellows from five Southeast Asian countries studied press articles and interviewed journalists in 2019-2020 with the question, "How do Southeast Asia's leading news outlets frame coal and renewable energy development, and why?"⁶⁷ As regards Viet Nam, key observations were: (a) the main national media framed renewables as the energy future, not coal-thermal power (still the official plan), (b) coal plants were reported to have negative environmental impacts from ash, but there were also "clean coal" references, (c) renewables were reported positively, (d) wind power was underreported as there is limited knowledge among journalists and there were few operating wind power plants in Viet Nam and (e) articles on solar PV mention challenges, such as grid capacity and pollution risks (panels, batteries), but did not discuss solutions for such issues such as recycling.

The draft PDP8 signals only small changes and not a break in the trend towards full energy transition and reduced future GHG emissions, despite a public discourse that supports more energy efficiency, VRE and less

coal-thermal power and pollution, as well as research that backs the energy transition. For successful deployment of VRE, more and better communication is needed on the advantages and mitigation of the disadvantages of VRE to move the public discourse further towards low carbon and clean electricity for all.⁶⁸ Stakeholders influential in this regard are listed in section 3.2, and section 3.3 discusses their influence on actual shifts away from thermal power towards VRE and a more rapid as well as more just energy transition.

3.2. Stakeholders in a Just Energy Transition

Compared to the 2017 analysis of interests and relative influence over decisions that affect the energy transition in Viet Nam, several changes and additions are proposed in Table 6.⁶⁹ Additional stakeholders are highlighted in the table. The changes in scores are based on analysis of media reports and workshop interactions between different stakeholders. They are subjective judgements of the authors based on recent experience and observations of changes in energy policy as well as approval and actual investment in renewable power generation capacity. The additional (and influential) stakeholders are as follows:

- The Politburo is the highest political body of the Communist Party of Viet Nam (CPV). It enacts policies approved by the Party Congress and Central Committee, oversees implementation of CPV resolutions and provides general orientations to the government. Resolution 55, of the Politburo, is a critical orientation for the development of Viet Nam's energy sector to 2045 (see section 2.5) and the main determinant of differences between PDP7-revised and the draft PDP8.
- The Central Economic Commission (CEC) is an advisory body of the Central

Committee of the CPV. It advises on development of resolutions directives and socio-economic orientations developed by the Central Committee, Politburo, and Secretariat. The CEC has driven the formulation of Resolution 55. It has also been an important interlocutor for external agents including (independent) think-tanks, NGOs and international agencies represented in Viet Nam.

- Recent developments have demonstrated that independent research and advice can make a difference in policy orientations, such as CPV Resolution 55.
- The Electricity and Renewable Energy Authority (EREA), under MoIT, leads State management and implementation of tasks in relation to electricity, new and renewable energy.
- The Energy Efficiency and Sustainable Development Department, under MOIT, has a key role in climate change policies in the industry, trade and energy sectors – and it leads the flagship national programme on energy efficiency (VNEEP3).⁷⁰
- The National Power Transmission Corporation (NPT) is a one-member liability company under EVN. The NPT aims to ensure secure, uninterrupted and stable power transmission for Viet Nam. It has an important role in technical support to renewable energy projects that feed electricity into the grid, support households and businesses to access the grid.
- Unions (industrial workers, farmers, also Youth Union and Women's Union) have engaged little with the energy transition so far. But, there have been expressions of interest in good jobs (FDI for solar panel assembly) and in solar PV on farms that can increase access to energy and farm income. There have also been expressions of concern over pollution (industrial and pollution with hot water by thermal power plants harming biodiversity, agriculture, and fishing). However, their influence appears limited.

Table 6. Energy transition stakeholders' interests and relative influence (updated)

Supporting ...	EE	EE Aid SME	Electric Transport	Gas-Power	Coal Power	V RE	VNse RE Investment	FDI RE Investment	VNse RE Manufacturers	Progressive Tariff	CC Mitigation	Agency / Influence
Stakeholder												
National Assembly	++	++	+	+++	++	++	++	++	+++	+++	++	+++
Politburo	+	++	++	++	++	++	+++	++	++	++	++	++++
Central Economic Commission	++	++	++	++	++	++	+++	++	++	++	++	+++
Office of the Government	+++	++	+	+++	++	++	++	++	+++	++	+	+++
MOIT policy-makers	++++	+++	+	+++	++++	++	+++	++	+++	+	+	++++
MOF policy-makers	+	+	+	++	++	+	++	+++	++	++	+	+++
MPI policy-makers	++	++	++	+++	++	+++	+++	+++	+++	++	++	+++
MOT policy-makers	++	+	++	+	+	+	+	+	+	+	+	++
MOC policy-makers	++	++	NA	+	+	++	+	+	+	+	++	++
MONRE policy-makers	++	++	++	++	+	+++	++	+++	+++	++	+++	++
MARD policy-makers	++	++	+	+	0	+++	++	++	++	++	++	++
Provincial/city authorities	++	++	++	+++	+	+++	+++	+++	+++	++	+	++
ERAV (MOIT)	++	++	++	+++	++	++	++	++	++	++	++	+++
EREA (MOIT)	+	+	++	+++	++	++++	+++	++	++	+++	++	++++
EESD (MOIT)	++++	++++	++	NA	NA	++	++	++	++	NA	+++	+++
Coal, petroleum SOEs	+	+	0	++++	++++	+	+	+	NA	NA	0	++++
EVN GENCOs	+	NA	+	++++	++++	+	+	+	+	NA	+	++++
EVN PCs (distributors)	++	++	+	+++	+++	+	+	+	+	+	+	++++
EVN NPT	+	NA	NA	++	++	++	+	+	+	NA	NA	++++
EVN other companies	++	++	+	+++	+++	++	++	++	++	+	+	++
VNse private industry	++	++	++	+	+	++	++++	++	++++	+	+	+
VNse financiers/ banks	+	+	0	++	++	+	+	+	+	NA	+	+
VN Development Bank & VEPF	+	++	0	+	0	++	++	+	++	+	+	+
VCCI, business associations	++	++	+	++	+	++	+++	++	++	+	+	++
Unions (industry, farmers)	++	++	+	++	++	++	++	++	++	NA	NA	+
FDI manufacturers	++	++	++	++++	++	++++	++	++++	++	+	++	++
FDI financiers	++	++	++	+++	+	++++	++	++++	++	+	++	++
ODA (loans & TA)	++++	++++	++	++	0	++++	+++	++	++	+++	++++	++
Institutes, researchers, Independent think-tanks	++	++	+++	++	+	+++	+++	++	++++	+++	+++	++
NGOs, VUSTA	+++	+++	+++	+	0	++++	++++	+++	++++	++++	++++	+
Energy experts, consultants	+++	++	++	++	+	+++	+++	+++	+++	++	++	+
Urban well-off	++	++	++	++	+	+++	+++	++	+++	++	++	++
Students, urban young people	+++	++	+++	++	0	++++	++++	++	++++	++	+++	+
Low-income households	++	NA	++	+	0	+	+	0	++	++++	+	+
Farmers, fishers	++	++	+	+	0	++	++	0	++	++++	+	+

Legend:

SUPPORTIVE OF<ISSUE>:

AGENCY/INFLUENCE:

0	+	++	+++	++++	NA
NO SUPPORT:	LIMITED SUPPORT:	REASONABLE SUPPORT:	STRONG SUPPORT:	VERY STRONG SUPPORT:	NOT APPLICABLE:
NO INFLUENCE	LITTLE INFLUENCE	REASONABLE INFLUENCE	INFLUENTIAL PLAYER	DOMINANT FORCE	NO OPINION

3.3. Stakeholder Views and Influence on a Just Energy Transition

A recent analysis of the political economy of climate and energy in Viet Nam concludes that the (continued) focus on coal-thermal power is more political than economic.⁷² Different stakeholders with different objectives influence energy policies, which strongly affects GHG emissions. The goals of the CPV, the political leadership – affordability, energy security, promoting domestic industry and environmental sustainability – are widely supported. But choices are determined by vested interests such as energy SoEs, which affects the pathways as well as relative achievement of each goal. The choices made also depend on assumptions by modelers of PDP8 scenarios about future costs of fuels and equipment. Many of the vested interests favour large-scale coal power over VRE because it would be cheaper, whereas the provincial level has environmental and health concerns, and such costs are not internalised by modelers. This appears to be confirmed by the draft PDP8, even though VRE has already demonstrated it can be deployed at competitive prices and deliver social and environmental co-benefits (see section 2.2.2).

Particularly relevant to the energy transition is the popular perception of high costs of energy, especially electricity. Politicians, such as National Assembly members, are sensitive to this factor. However, Viet Nam's electricity prices are low by international comparison, as the average retail price is set by the government, and retail tariff increases have closely followed the CPI (see section 2.3). In fact, there has been a gradual reduction in real costs in the 2000s and no increase in the past decade, whereas incomes have risen substantially above inflation for nearly everyone. Indirect support to SoEs also appears to continue, with public investment in fossil fuel transport infrastructure – essentially a subsidy use of fossil fuels for

power generation.⁷³ Nevertheless, when electricity price increases are announced, there is much buzz on social media and occasional complaints about high electricity bills in public media. The latter is likely because of a steady increase in electricity consumption per capita, and therefore higher bills.

The need for higher electricity tariffs has been used as an argument against non-hydro renewable energy deployment by representatives of the energy establishment. But, estimates have been made on the effects of energy transition and especially a large share of VRE on electricity prices in the short- and long-terms. Several independent model studies from 2012 onwards have suggested that the short-term price effects might indeed be upwards but small, whereas in the medium- and long-terms there will be lower electricity costs compared to BAU because of higher energy efficiency and renewable energy.⁷⁴ It was also shown how electricity tariffs could be modified to ensure that low-income groups would not be affected by short-term increases in the retail tariff (section 2.3).⁷⁵ Such study results have been shared with influential stakeholders, such as the CEC and EREA, but stakeholders promoting these findings have limited influence.

In addition, using a statistically representative survey in 2018 with more than 14,000 respondents, researchers concluded that Vietnamese residents' "willingness to pay" to ensure improved electricity reliability was quite high. Residents preferred renewables, as they were willing to pay 95 per cent more in monthly electricity costs if renewable power gave significant reliability improvements, and 62 per cent more if new coal plants were built for that.⁷⁶ So, short-term increases should not meet much resistance from most consumers. Furthermore, the most recent estimates suggest that overall electricity costs could reduce in the

short-term as a result of scale-up renewable generation, because the costs of solar PV and wind power are reducing faster than expected (section 2.2.) This was also demonstrated by the waves of solar PV deployment in 2019-2020, for FiTs around the average retail price: these FiTs were attractive, suggesting that any new FiT could be lower and still attract investment. Better yet might be the introduction of “reverse auctioning” of the right to build solar PV capacities, as is currently being explored (section 2.5). According to international experience, auctions could lead to very low electricity costs. It would mean that solar PV projects already under development might not be completed and investments by developers may be lost. These businesses might argue for profitable FiTs instead of auctioning, but their influence on policy is limited (Table 6). Auctioning of capacities leads to “bids” for prices which could be fixed in a PPA for less than 20 years, hence solar PV plants would also operate in the VWEM.

As mentioned in section 2.1, there was a backlash in early 2021 after the surprisingly large-scale deployment of solar PV. EVN’s NLDC issued an order for curtailment during peak production hours of 86 newly-connected solar PV plants in southeast coastal provinces and the Prime Minister called for strict regulation of further solar PV deployment. To integrate large-scale wind and solar power, the overall operation had to be adjusted and include demand-side management as well as short-term prediction of renewable energy production, while investment is needed in flexible generation capacity, grid infrastructure and storage, such as “pumped hydro” and batteries.⁷⁷ A World Bank study pointed out how possible VRE was without much short-term change and how

to deal with further increases of VRE. Battery storage costs are reducing steadily, such as in Australia where battery storage to respond to peak demand and for grid stabilisation is already 30 per cent cheaper compared to “gas-peakers”.⁷⁹ The draft PDP8 could have set a direction along such lines, yet on the back of widely held views it aims to rely on fossil fuel power for many more decades. Upgrading of transmission capacity was and is slow, with a lack of public investment capital. Private sector financing of transmission infrastructure, meanwhile, is not enabled by the Law on Electricity. But, there is a pilot case where private investment is being allowed and regulation may be built to ensure private and public investment in transmission infrastructure, which would enable larger VRE capacities on the grid.

Questions have been raised in local surveys, workshops and the media about the pollution risks of (decommissioned) solar panels and batteries. Fears of radiation have been expressed, no matter that radiation from solar panels is not occurring.⁸⁰ There have been reports of land-related complaints as solar PV developers have been buying agricultural land.⁸¹ Solutions for this include dual land-use solar PV and agriculture or aquaculture, which reduces land pressure and offers income opportunities for farmers (section 2.3).⁸² This requires policy-makers in the MARD and MOIT to cooperate and ensure adjustments in solar PV policy that enables APV, but cross-sector cooperation and complex regulation is resisted (section 4.2). Again, stakeholders with interests in economic, social, and environmental co-benefits from the energy transition have limited influence, as shown in Table 6.

Chapter 4: Overcoming Barriers to a Socially Just Energy Transition

4.1. Renewable Power Development

As discussed earlier in this paper, Viet Nam has experienced two “booms” in solar PV deployment, and currently a significant number of wind power plants are being constructed for connection before the expiry of the wind power FiT on 31 October 2021. This success does not, however, mean that barriers to further development of non-hydro renewable electricity have disappeared. Barriers include views and interests of certain stakeholder groups as discussed in Chapters 2 and 3. In this Chapter we discuss key aspects and are looking for ways to overcome the barriers.

As explained in section 3.1, the public discourse has shifted and the public media has welcomed increased deployment of VRE as it highlights disadvantages of coal-thermal power. Officials and others recognise disadvantages of the latter too, especially at provincial level. But, there is continued scepticism about the variable nature of solar PV and wind power and their challenge for power grid management. There are objections against land-use by solar PV plants and fears about pollution from panels and batteries. These perceptions appeared to have translated into conservative projections in the draft PDP8, which is a BAU scenario with increased coal and gas thermal power generation capacities in absolute totals, with additional VRE. Furthermore, it implies continued high rates of energy use per unit GDP and energy inefficiency of the Vietnamese economy.

Some international investors – from China, Japan and Republic of Korea – have responded to the BAU plans by making capital and technology available for thermal power in partnership with Viet Nam’s energy SoEs, while

offering “clean coal” technologies that would limit pollution, but not yet applied (see Annex 1). This includes State-affiliated financiers, according to media reports. However, there are also examples of international companies that perceive increased risks in the global context, as pressures on governments and industry to reduce emissions are increasing and some are “pulling out”.⁸³ Viet Nam’s supporters of coal and gas-thermal power expansion are dependent on international finance and technology that is increasingly in short supply. At the same time, an increasing number of international financiers are looking for clean and green investment opportunities. Access to international capital is thus one way of nudging the sceptics towards a greener power future.

Another barrier to a decisive shift away from thermal power to renewable energy is power market risks. These include the continued, indirect subsidies on fossil fuels that are causing (wholesale) market distortions as a result of continued electricity retail price controls by government and public support of fossil fuel transport infrastructure, for example.⁸⁴ There is also uncertainty about future electricity retail prices as competitive retail markets are expected by 2024, while the roadmap for renewable energy auction mechanisms and for inclusion of VRE in the wholesale market remains unclear. Delays in large projects due to the complex regulatory framework (LNG, grid infrastructure) are also evident. These market risks were analysed by, for example, the Viet Nam Business Forum (VBF) that promotes a shift away from coal, expansion of VRE as well as gas-thermal power generation, energy efficiency and battery storage.⁸⁵ One way to address market risk barriers is intensification of dialogues between authorities, businesses and international stakeholders on power market reforms, for which the VEPG has created a

technical working group.⁸⁶

Closely related are regulatory risks from the “stop-and-go policy” on VRE. The solar and wind FiTs have initiated VRE investment, but after the expiry dates of two solar PV support policies (see Table 5), no new policy has been put in place (see sections 2.5 and 3.3). Viet Nam is facing a rapid increase in energy demand even though PDP8 projections may be on the high side. It has achieved significant recent deployment of VRE that responded to the increase in demand and threat of power cuts, in particular in HCMC and surrounding areas, whereas there were delays in deployment of coal and gas-thermal power plants as reported by MOIT in 2019.⁸⁷ Efforts to increase energy efficiency are ongoing, for example as per “The national programme for thrifty and efficient use of energy in the period of 2019-2030 (VNEEP 3)”.⁸⁸ The CPV and government aim to ensure energy security, and to meet rising demand at lowest costs, as per the draft Energy Master Plan as well as draft PDP8.⁸⁹ However, VRE lacks a clear policy roadmap. Lack of clarity also applies to rooftop solar PV systems, with deployment also on hold as policy is unclear. This affects operators throughout the value chain, including the manufacture and trade of equipment, developers, EPC companies and financiers. As insecurity persists, capacities built up in the value chain will erode, future deployment efficiencies will reduce and costs climb.

Many steps are required to address these barriers. As suggested, the draft PDP8 does not provide targets and investment proposals to take Viet Nam’s power sector towards (net) zero emissions and achieve additional economic, environmental, and social co-benefits, but perhaps the final version will do better in this regard. It does discuss matters critical for successful VRE inclusion at a large scale, with transmission infrastructure a core part of the masterplan. It also explores storage options, including the recent option to produce

hydrogen (H₂) in association with VRE. Hydrogen can be stored and used for power generation or other purposes, and is rapidly becoming popular in the EU as part of the European Green Deal, for example. However, the draft PDP8 sees this as expensive and difficult to transport, and only as an option in the long-term future.

PDPs, by historical precedent, are not concerned with laying out policy roadmaps. But whether in PDP8 or in other policies, the government should reduce uncertainty and regulatory risk in VRE, through: (i) enabling public and private investment in the power grid and storage capacity to prevent curtailment, (ii) roadmaps on auctioning of VRE capacities, introduction of RPSs and inclusion of VRE in the wholesale market, accompanied by re-negotiation of some PPAs of coal and gas thermal plants (see section 2.2), (iii) improved grid management, including forecasting of renewable energy production, demand management and using backup capacity and balancing techniques, (iv) the phase-out of (indirect) public support to fossil fuel production, transport and consumption and (v) a support mechanism to develop local manufacturing capacity and increase localization rates for VRE projects.

4.2. Co-benefits of Dual Land-Use of VRE

There is a need for policy adjustments to ensure local communities and stakeholders can benefit more from VRE, in particular APV, as discussed in Chapters 2 and 3. One of the challenges in solar power development is land-use changes. The limitations of the land/water surface ratio for solar power at 1.2 ha/MWp, as stipulated in a MOIT circular on solar power project development, ensures systems tend to have high density land cover.⁹⁰ Land used for solar projects in operation is particularly significant in Ninh Thuan, Binh Thuan, Ba Ria-Vung Tau, and Tay Ninh provinces (Figure 1). For some solar power projects, the official land-use purpose was changed from agricultural land to solar farm use. For example,

the Sao Mai solar project in An Giang province converted 272 ha of agricultural land (mostly from rice cultivation) for a solar farm. In other cases, the official land use of protection forest or special-use forest was first converted to agricultural and then to industrial land-use for solar farms.

Some years ago, rooftop solar PV was dismissed as being small-scale and unsuitable as a solution to the rapid increase in demand. That is no longer obvious, as more than 100,000 rooftop systems have been installed with nearly 10 MWp total capacity, and EVN is actively enabling rooftop solar (section 2.2).⁹¹ There is currently a policy vacuum, but solar PV rooftop is expected to be regulated again soon, as a draft FiT of 5.5 UScent/kWh is rumoured (well below the average retail price of electricity). Importantly, only a small fraction of solar rooftop systems are on homes and workshop buildings of farmers, let alone above crops (greenhouses) and ponds. Instead, some rural communities have been affected by large solar plants that caused a reduction in agriculture-based livelihoods (section 2.3 and Chapter 3). However, dual land-use combinations of solar PV with crops, livestock or aquaculture (APV) could potentially benefit large numbers of farming families across Viet Nam, with savings on electricity expenditure, income from selling power and increased income from agriculture in greenhouses.⁹²

APV faces regulatory, financial and technical barriers that must be overcome. For example, current solar support policy requires “a construction” with a roof, which means that a solar PV system above a gar of agriculture (notably rice) and industry (power production). This means, for example, that solar PV “trees” cannot be erected along the boundaries of rice fields where the effects on rice growth might be minimal, even if the roof-requirement of solar policy would not apply. A further challenge is the relatively weak power distribution

infrastructure in rural areas, allowing only a few small systems. Regarding access to finance for small- and medium-sized farming households, the Viet Nam Bank Social Policy (VBSP) has shown interest in providing loans to farmers for investment into APV, if the regulatory environment allows for it and provincial authorities support it. Similarly, major commercial banks are present in all districts and some commune centres, in particular Agribank (Viet Nam Bank for Agriculture and Rural Development) that has farmers as clients and might be drawn into the financing of greenhouses with solar panels.

Combinations of wind power with other land-use and sea-use is also possible and not yet explored or regulated. As in other countries, wind turbines could be erected along dykes, expressways and in harbours, depending on wind resources. These tend to be locations that are easy to access and land rent may be low and hence cheaper to build compared to systems on mountain ridges, in the inter-tidal zone (near-shore) or offshore. There is interest, for example, in Mekong Delta coastal provinces to combine wind power with coastal protection work and nature conservation, as Viet Nam’s first wind park was built in the inter-tidal zone of Bac Lieu province and is now marketed as an eco-tourism site. There are reports that fishers and shellfish gatherers (in Bac Lieu) have been challenged not to use the zone in the wind park, even though they might not affect the actual turbines at all, and their yields could be good as well as sustainable, depending on management. Internationally, there are reports that offshore wind parks can help protect and regenerate biodiversity with positive impacts on fish populations and benefits for fishers. Seeking co-benefits in planning onshore or offshore wind parks to ensure a just transition is not yet a requirement in the permission and approval processes at local and national levels. This could be an element in “reverse auctions” of wind power capacities in pre-determined locations.

4.3. Increasing Access to Green and Decent Jobs

Some data have been presented in sections 2.3 and 2.4 regarding employment in fossil fuel thermal power and in VRE value chains, including some international data. The expansion of green, clean and decent jobs in the energy transition are primarily in growth of VRE deployment (sections 4.1 and 4.2) and increasing domestic business throughout VRE value chains, including manufacture of VRE equipment (section 4.4).

Skills and knowledge are important barriers to industry expansion and accessibility of green and decent jobs. To ensure workers have appropriate skills – in particular women and women entrepreneurs – to participate in VRE value chains, there is a need for targeted education and capacity building in technical aspects at different levels, including vocational training and university-level education of girls and young women.

4.4. Emergence and Growth of Vietnamese Enterprises

Private sector involvement in the energy transition is critical, but there are challenges: such as uncertainties and weaknesses in the regulatory environment, dominance of (monopolistic) SoEs and slow power sector reforms toward competitive markets, slow development of transmission and distribution infrastructure and an immature financial market.⁹³ This affects the emergence and growth of Vietnamese micro-enterprises, SMEs and large enterprises, which need to strengthen throughout VRE value chains, energy storage and also energy efficiency for a rapid and just energy transition. Nevertheless, there are numerous private companies involved, including some with histories as units of SoEs. The FES paper of 2017 highlighted some wholly Vietnamese as well as foreign-invested firms in manufacturing

of components for wind power and solar PV. Some of these enterprises have grown and Vietnamese and global demand has been strong in the past few years. For example, Solar BK has ambitions to grow exports as well as be a dominant player in the Vietnamese equipment market (see also Annex 2). This is despite certain equipment for solar PV and wind power having low import tax rates, and in the absence of substantial support to the domestic manufacturing industry (MOIT policy to support wind power equipment manufacturing was only issued in 2020) (see section 2.5).

The solar PV “booms” of 2019-2020 and ongoing wind power construction have involved medium to large Vietnamese companies, foreign enterprises, foreign and domestic financiers as well as numerous Vietnamese SMEs (Annex 2 includes SMEs). Large projects have involved (former) EVN power engineering companies for feasibility studies and designs. Many engineering, procurement, and construction (EPC) companies have emerged on these waves, growing their businesses perhaps from a local basis in providing electrical services to construction projects. The solar PV “bust”, however, caused a sudden reduction of business opportunities and job losses.

In remote areas, some NGOs have supported various micro-enterprises, such as through training and loans in several sectors and sometimes focused on women entrepreneurs. If deployment of small rural solar PV rooftop and APV takes off (section 4.2), there will be a need for local services, with employment in construction and O&M (sections 2.3, 2.4 and 4.3). Support towards the emergence and growth of (women-led) micro-enterprises is rare, but opportunities for local business and green and decent jobs could emerge, also for women entrepreneurs and workers. But, emergence and sustained growth of such micro-enterprises also requires stable and growing markets and a clear policy roadmap,

instead of policies that generate “boom-bust” cycles.

As previously mentioned, the VBF analysed the energy sector and proposed to move away from coal-thermal power towards gas-thermal power and renewable energy, as well as improved energy efficiencies. It also proposed a regulatory environment to attract private sector investment in VRE, including “behind the meter” and off-grid investment, direct PPAs (through which enterprises can sell power to others using the EVN transmission and distribution grid), and elimination of barriers to the emergence and growth of energy service companies (ESCOs) that will help improve energy efficiencies.

Surveys reported in 2017 showed that businesses’ main concern was not price, but power supply stability. Back-up generators may be available to large businesses, but most SMEs must suspend production during blackouts. Cheap solar rooftop that is grid-connected and includes small- to medium-sized battery sets may be a solution, as battery storage is becoming cheaper. A recent survey on climate change risks and natural disaster effects on business performance and continuity of more than 10,000 (Vietnamese and foreign-invested) enterprises nationwide by the

Viet Nam Chamber of Commerce and Industry (VCCI) and The Asia Foundation (TAF), showed a general willingness to improve environmental performance. Response actions reported by enterprises included “upgrading production technology” that often included clean and energy efficient technology and enterprises ensuring their production was more resilient and sustainable. To promote renewable energy development, the government issued some tax incentives according to technology and project size. Investors and import-export companies need to comply with import, export and corporate income taxes, including those listed in Annex 3.

The various tax regulations reflect the government’s encouragement of enterprises to invest and establish domestic manufacturing in VRE. However, VRE development targets under PDP7-revised or draft PDP8 have not kept up with VRE industry development as the scale of production cannot be shaped and there is no clear plan to develop the local supply chain and product localisation. The trend of importing complete units and (therewith) installing a series of solar farms has, in fact, meant lost opportunities to increase the number of manufacturing jobs and enhanced the level of technology and industrial production in solar PV in recent years.

Chapter 5: Conclusions and Recommendations

5.1. Conclusions

Conclusions are summarised and drawn from Chapters 1-4, as follows:

5.1.1. Access to Energy for All

- Viet Nam has achieved near-universal access to electricity, bar a small number of communities and households. Efforts are being made to connect those to the grid or enable off-grid energy solutions.
- The poorer rural areas and small- and medium-sized farms have hardly benefited at all from the solar PV rooftop regulation, largely due to weak distribution network capacities in (remote) rural areas and lack of access to capital.
- Many Vietnamese households and businesses are willing to pay more for electricity to avoid blackouts, especially if achieved with clean energy. The current progressive electricity tariffs enable cheap access for low-consuming households, but whether that remains with the introduction of the competitive electricity retail market is unclear.

5.1.2. Climate Change

- Viet Nam is at high risk from climate change effects, so the country could be expected to strongly support global and national efforts to reduce GHG emissions.
- Viet Nam's updated NDC has slightly increased emissions mitigation targets compared to the INDC of 2016. Within that, the ambition of energy emissions reduction has increased. However, the rate of energy emissions reduction in the NDC is below the national target, whereas energy emissions make up the largest part of overall emissions (section 2.1).
- The NDC's internationally-supported target will make Viet Nam a high GHG emitter per capita in 2030 compared to other countries.

- However, independent modelling shows that more deployment of VRE and improved energy efficiency is possible and would result in higher GDP growth, employment generation, and environmental and social co-benefits.

5.1.3. Energy-related Policy

Support policies for solar PV deployment were highly successful in 2019-2020, and wind power is developing rapidly through 2021. However, these policies need to be followed-up as the FiTs have expiry dates. A clear policy-roadmap for the future is lacking, as the FiTs have expiry dates. A clear policy-roadmap for the future is lacking.

- However, power sector reform is ongoing. The Viet Nam Wholesale Electricity Market (VWEM) has been created for part of the generation capacity and by 2024, the competitive retail market should start functioning. If VRE starts to operate in wholesale markets, international experience and modelling suggest that low solar and wind power prices could cause reduced profitability and even force closure of thermal plants. But, whether and how VRE will enter into wholesale markets is unclear.
- Party Resolution 55 is particularly important and offers opportunities for energy transition, but it leaves details to government policies such as PDP8. It was driven by the Central Economic Commission of the CPV.
- Compared to PDP7-revised, the draft PDP8 shows less coal-thermal power, more gas-thermal power and increased VRE, whilst demand projections have been scaled-down. The draft PDP8 also signals steadily continued growth of coal and gas thermal power until 2045, and likely a lock-in of high emissions in the period after mid-century, which is inconsistent with Paris Agreement ambitions.
- The draft PDP8 does not provide targets and investment proposals to take Viet Nam's power sector towards (net) zero emissions and achieve

additional economic, environmental and social advantages, but studies show that this is possible.

5.1.4. *Enabling VRE*

- There is continued scepticism among influential stakeholders about VRE potential because of the variable nature of solar and wind power causing difficulties in power grid management and the need for back-up capacity. Solutions for these challenges would not be affordable.
- There are also objections against land use by solar PV plants and fears about pollution by solar panels and batteries.
- Some international investors are making capital and “clean coal” technology available for thermal power, responding to the dominant view of influential stakeholders. However, some international investors perceive increased risks in the global climate change context and are pulling out of projects in Viet Nam. There is a growing trend to divest from fossil fuels and instead international financiers are looking for clean and green investment opportunities.
- There is still limited investment or policy-enabling of private investors in the power transmission grid and energy storage capacity to enable high shares of VRE.
- A number of regulatory barriers and market risks for VRE investment remain, including continued indirect subsidies on fossil fuels, uncertainty about future electricity prices, VRE auction mechanisms and inclusion of VRE in wholesale markets.
- Efforts to increase energy efficiency are ongoing (VNEEP3) and important given rapid electricity demand growth. The draft PDP8 appears to assume energy inefficiency per unit GDP in the long run, and by implication of businesses and household consumers.

5.1.5. *Dual Land-use and Sea-use*

- With deployment of VRE, Viet Nam has started a transformation from highly centralised large power generation units (large hydro- and coal-power) towards distributed power generation. This requires adjusted management of demand and supply within and between regions and in grid planning. It also offers

opportunities for households and businesses

- Land-use conversion from agriculture to solar or thermal power plants affects agriculture and aquaculture-based livelihoods and can be limited through different forms of dual land-use.
- Solar rooftop PV has yet to be rolled out on farms and in (remote) rural areas, where most potential is.
- Agriculture, livestock and aquaculture production can be combined with solar PV at small and larger scales, but solar and land use regulations are not enabling this, and weak grid capacity is also a barrier.
- There is scope for APV for small- and medium-sized farms especially if regulation explicitly supports this, access to financial capital can be improved and the capacity of the electricity transmission and distribution grid in the remoter areas improves.
- Wind power is being developed (onshore, near-shore and offshore plants), but there is no requirement in permission and approval processes at local and national levels to seek co-benefits, such as combinations of wind power with coastal protection, nature conservation, local (aquaculture) livelihoods or fishing ground regeneration. Wind parks could be erected along dykes, roads and in harbours, but has yet to occur.

5.1.6. *Employment*

- International data and research in Viet Nam suggest that employment increases with a larger proportion of VRE, perhaps by 30 per cent with the same power output by VRE that substitutes fossil fuel-based power generation. Employment in the VRE value chain is comparatively clean, requires higher skill levels and offers more opportunities for women to participate.
- Total employment generation by VRE expansion compared to a BAU scenario with much coal and gas thermal power is significant.
- The largest number of jobs in all power development scenarios are in construction and include relatively many low-skilled jobs.
- The share in highly-skilled jobs in VRE is larger than in thermal power, looking at the full value

chains and economic lifetimes of different power sources including mining, fuel transport and waste management.

- There are opportunities for increasing the share of women workers and women-led enterprises in VRE value chains, including in deployment and O&M of distributed solar PV plants and rooftop systems.

5.1.7. Business Development

- The “boom and bust” nature of policy, such as solar PV regulation, caused uncertainties for EPCs and other companies in the value chain, as well as their workers. This reduces efficiencies and increases costs throughout VRE value chains.
- There is scope for emergence of and support to (women-led) micro-enterprises in the context of solar PV rooftop and APV in remote (rural) areas.
- There is significant private sector participation in solar and wind power value chains, supported by certain tax exemptions for manufacturers and importers. However, there is no clear roadmap to support domestic manufacturing and there have been lost opportunities for employment generation in relation to the recent solar PV boom.

5.2. Recommendations

Based on Chapters 1-4 and the above conclusions, the following recommendations are presented:

5.2.1. Ensuring a Socially Just Energy Transition

- A socially just energy transition in Viet Nam requires even better access to energy for all, including electricity and energy for heating, cooking and transport, among other needs. Therefore, low-income consumers must get the benefit from progressive electricity tariffs despite introduction of competitive electricity retail markets.⁹⁸ Support may also be given to low-income households for procurement of solar water heaters or biogas digesters.
- Employment generation, including more

clean and decent jobs for women and men, can be the result of increased VRE deployment. This is possible throughout the value chain. This requires support policies for domestic manufacturing and assembly, and avoidance of “boom and bust” cycles through clear policy roadmaps. It also requires training of women and men in appropriate skills, education of girls in (energy) science and technology, and proactive policies of enterprises to recruit women as well as men workers.

- Grid-connected and off-grid rooftop solar (rooftop) PV systems must become accessible to low-income households especially in (remote) rural areas, including ethnic minority groups, requiring improved local distribution grids, access to capital and information portals targeting low-income and ethnic minority households.

- Small- and medium-sized farming households throughout Viet Nam should be given the opportunity to apply APV. This requires changes in solar PV and land use policy, to widen the APV options and limit the costs, agricultural and technological advice, improved local distribution grids and access to capital, including loans from the Viet Nam Bank for Social Policy (VBSP) or commercial banks as well as information portals for farmers on solar power generation and appropriate agriculture, aquaculture and livestock production.

- Capture fishery and coastal aquaculture, often low-income occupations, should not be disadvantaged by wind power development. Instead, those livelihoods should benefit where possible, through regulations that give access to near-shore wind parks for shellfish harvesting, investments by wind parks that enable fish breeding and biodiversity regeneration and investments by near-shore wind parks that improve coastal protection.

- “Distribution” of wind power generation to coastal zones and solar PV to all rural areas of Viet Nam could support the emergence and growth of micro, small- and medium-sized enterprises to provide O&M and finance management services to small and larger

generation units in various locations. Based on examples in Viet Nam and internationally, women-led enterprises should be actively supported to provide such services through capacity building.

5.2.2. Accelerating VRE Deployment

- The government should formulate a clear policy roadmap for a just energy transition in Viet Nam, as part of existing policy instruments, such as laws, the national energy strategy, the power development master plan, and possibly a new policy instrument.⁹⁹ This should include goals on: (a) access to clean energy for all, (b) GHG emissions mitigation including peak emissions and net zero emissions from the electricity sector over the coming decades, (c) maximising environmental and social co-benefits of VRE, while minimising negative impacts such as agricultural land conversion and stimulating dual land-use, (d) development of Viet Nam's VRE manufacturing capacity and increase the localization rate for VRE projects, (e) employment generation throughout the VRE value chain, including women-led micro-enterprises providing O&M services to distributed generation units, (f) human resource development, information, communication and education (ICE) strategies to enable women and men to participate in the energy transition, (g) maximising the participation in VRE deployment of small-scale power producers (SMEs, cooperatives, farmers) as well as households ("prosumers") with grid-connected solar PV rooftop systems, (h) de-risking VRE deployment, (i) increased power storage, improved power transmission and distribution grid capacity as well as demand and supply management, to enable VRE deployment and (j) phase-out of (indirect) public support to fossil fuel production, transport and consumption.
- Specifically, policy must reduce uncertainty and regulatory risks to investors in VRE to speed-up the energy transition with co-benefits such as increased employment opportunities, through: (a) enabling public and private

investment in the power grid and storage capacity (pumped storage, batteries stand alone and along with solar and wind power plants and rooftop solar, and hydrogen research and piloting in connection with wind and solar PV), (b) regulations on auctioning of VRE capacities, introduction of RPSs, and inclusion of VRE in the wholesale market, accompanied by re-negotiation of some PPAs of "must run" coal and gas thermal plants, (c) improved grid management including forecasting of renewable energy production, demand management and using backup capacity and balancing techniques and (d) regulatory adjustments, such as current regulations on minimum required density of solar PV plants per hectare, to enable dual land-use, water-surface and/or seabed-use with solar PV and wind power plants as well as solar PV rooftop systems.

- In addition, approval of design and environmental impact assessment (EIA) of VRE projects must be made conditional on: (a) optimising biodiversity and dual land-use or seabed-use by solar PV and wind power plants and (b) meaningful consultations with local residents on minimising negative impacts and maximising co-benefits of such plants.
- Proponents of a rapid and just energy transition must communicate better with strategic partners/stakeholders, regarding co-benefits, which include: (1) economic benefits (GDP growth, lower energy costs, household or enterprise income), (2) social benefits (increased employment and good jobs also for women, access to clean energy, benefits also to remote rural communities with ethnic minorities), (3) environmental benefits (cleaner air resulting in better public health, less or no land and water pollution, strongly reduced GHG emissions) and (4) political benefits (national energy security and low dependency on imports, popular support because of less pollution, international support because of low GHG emissions).
- Proponents of a rapid and just energy transition must communicate well on how

to deal with the disadvantages of VRE, such as the need for investment in and better management of the transmission and distribution grid as well as the need for storage capacity (batteries rapidly reducing in price, pumped storage potential is large, potential pollution from decommissioned solar panels and batteries (set protocols for decommissioning in licenses, recycling) and undesirable land-use conversion (dual land-use and seabed-use).

- The government and business organisations, such as VCCI, should encourage energy efficiency measures (e.g., with VNEEP3) and deployment of solar rooftops for small and large businesses, through voluntary commitments as well as clear and supportive regulation, as well as clear and supportive regulation, including policy roadmaps.

5.2.3. Developing Strategic Partnerships

- Through and with networks of NGOs and development partners it is strategic to enter into dialogue with the Central Economic Commission, for example, on implementation of Resolution 55.

- Active participation by civil society organisations, NGOs and businesses in (technical working groups of) the VEPG can enable proponents of a rapid and just energy transition to raise issues with policy makers on all the important issues.

- Co-benefits of the energy transition, such as more decent jobs and women's participation in the energy-related workforce, or the possibility of APV for small- and medium-sized farming households, could be addressed in dialogues and with labour unions, Farmers' Union, Women's Union and Youth Union. This could lead to a positive influence on energy transition policy as well as practical applications, such as lending by the VBSP to APV.

- Link with the Viet Nam Cooperative Alliance and related authorities and develop models of power generation by existing cooperatives such as rooftop solar combined with cooperative constructions, and setting up energy cooperatives following examples from other countries, that develop, own and operate small- to medium-sized solar or wind power plants.¹⁰⁰

- Conduct sound Vietnamese research to counter the narratives of "vested interests". Independent Vietnamese researchers or research organisations, perhaps working with one or more mass organisation, could support arguments in favour of the energy transition on specific topics, for example related to VRE equipment manufacturing and assembly industries (solar panels, wind towers), or concerning employment growth opportunities as well as job quality.

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Annex 1

Coal power plants operating in Viet Nam by March 2021

No	Plant name	Installed capacity (MW)	Owner	Form of investment (by state-owned holdings, BOT, IPP)	Market participation	Fuel source	Technology	
							Boiler Technology	Steam pressure
1	Alumi Nhân Cơ	30	VINACOMIN	State-owned	Not participate			
2	An Khánh 1	120	An Khanh Electricity JSC	IPP	Direct	Domestic	CFB	Subcritical
3	Cẩm Phả #1	330	VINACOMIN	State-owned	Direct	Domestic	CFB	Subcritical
4	Cẩm Phả #2	340	VINACOMIN	State-owned	Direct	Domestic	CFB	Subcritical
5	Cao Ngạn	115	VINACOMIN	State-owned	Direct	Domestic	CFB	Subcritical
6	Duyên Hải 1	1245	EVN GENCO 1	State-owned	Direct	Imported	PC	Subcritical
7	Duyên Hải 3	1245	EVN GENCO 1	State-owned	Direct	Imported	PC	Subcritical
8	Duyên Hải 3 MR	688	EVN GENCO 1	State-owned	Direct	Imported	PC	Supercritical
9	Formosa Đồng Nai #1, 2	300	Hung Nghiep Formosa	IPP	Indirect	Imported	PC	Subcritical
10	Formosa Đồng Nai #3	150	Hung Nghiep Formosa	IPP	Indirect	Imported	PC	Subcritical
11	Formosa Hà Tĩnh	676	Hung Nghiep Formosa	IPP	Indirect	Imported	PC	Subcritical
12	Hải Dương #1	600	JAKS Resources, China Power Engineering Consulting Group	BOT	Indirect	Imported	PC	Supercritical
13	Hải Phòng 1	600	EVN GENCO 2	State-owned	Direct	Domestic	PC	Subcritical
14	Hải Phòng 2 #3	300	EVN GENCO 2	State-owned	Direct	Domestic	PC	Subcritical
15	Hải Phòng 2 #4	300	EVN GENCO 2	State-owned	Direct	Domestic	PC	Subcritical
16	Lee & Man	125	Lee & Man Viet Nam Paper Limited Company	IPP	Not participate	Imported	PC	
17	Mạo Khê	440	VINACOMIN	State-owned	Direct	Domestic	CFB	Subcritical
18	Mông Dương 1	1080	EVN GENCO 3	State-owned	Direct	Domestic	CFB	Subcritical

No	Plant name	Installed capacity (MW)	Owner	Form of investment (by state-owned holdings, BOT, IPP)	Market participation	Fuel source	Technology	
							Boiler Technology	Steam pressure
19	Mông Dương 2	1200	AES-VCM	BOT	Indirect	Domestic	PC	Subcritical
20	Na Dương 1	111.2	VINACOMIN	State-owned	Direct	Domestic	CFB	Subcritical
21	Nghi Sơn 1 #1	300	EVN GENCO 1	State-owned	Direct	Domestic	PC	Subcritical
22	Nghi Sơn 1 #2	300	EVN GENCO 1	State-owned	Direct	Domestic	PC	Subcritical
23	Ninh Bình	100	EVN GENCO 3	State-owned	Not participate	Domestic	PC	Subcritical
24	Nông Sơn	30	VINACOMIN	State-owned	Not participate	Domestic	CFB	Subcritical
25	Phả Lại 1	440	EVN GENCO 2	State-owned	Direct	Domestic	PC	Subcritical
26	Phả Lại 2	600	EVN GENCO 2	State-owned	Direct	Domestic	PC	Subcritical
27	Quảng Ninh 1 #1	300	EVN GENCO 1	State-owned	Direct	Domestic	PC	Subcritical
28	Quảng Ninh 1 #2	300	EVN GENCO 1	State-owned	Direct	Domestic	PC	Subcritical
29	Quảng Ninh 2 #1	300	EVN GENCO 1	State-owned	Direct		PC	Subcritical
30	Quảng Ninh 2 #2	300	EVN GENCO 1	State-owned	Direct		PC	Subcritical
31	Sơn Động	220	VINACOMIN	State-owned	Not participate	Domestic	CFB	Subcritical
32	Thái Bình 1	600	EVN GENCO 3	State-owned	Direct	Domestic	PC	Subcritical
33	Thăng Long #1	310	Thang Long Thermal Power JSC (Geleximco)	IPP	Direct	Domestic	CFB	Subcritical
34	Thăng Long #2	310	Thang Long Thermal Power JSC (Geleximco)	IPP	Direct	Domestic	CFB	Subcritical
35	Uông Bí 1 #1	50	EVN GENCO 1	State-owned	Not participate	Domestic	PC	Subcritical
36	Uông Bí 1 #2	55	EVN GENCO 1	State-owned	Not participate	Domestic	PC	Subcritical
37	Uông Bí MR #1	300	EVN GENCO 1	State-owned	Direct	Domestic	PC	Subcritical
38	Uông Bí MR #2	330	EVN GENCO 1	State-owned	Direct	Domestic	PC	Subcritical

No	Plant name	Installed capacity (MW)	Owner	Form of investment (by state-owned holdings, BOT, IPP)	Market participation	Fuel source	Technology Boiler Technology	Steam pressure
39	Vedan Việt Nam	72	Vedan Vietnam JSC	IPP	Not participate	Imported	PC	Subcritical
40	Vĩnh Tân 1 #1	600	VINACOMIN, CTY Lưới điện Phương Nam, CTY Điện lực Quốc tế Trung Quốc	BOT	Indirect	Imported	PC	Supercritical
41	Vĩnh Tân 1 #2	600	VINACOMIN, CTY Lưới điện Phương Nam, CTY Điện lực Quốc tế Trung Quốc	BOT	Indirect	Imported	PC	Supercritical
42	Vĩnh Tân 2	1245.6	EVN GENCO 3	State-owned	Direct	Domestic	PC	Subcritical
44	Vĩnh Tân 4 #2	600	EVN GENCO 3	State-owned	Direct	Imported	PC	Supercritical
45	Vĩnh Tân 4 MR	600	EVN GENCO 3	State-owned	Direct	Imported	PC	Supercritical
46	Vũng Áng 1 #1	600	PVN	State-owned	Direct	Domestic	PC	Subcritical
47	Vũng Áng 1 #2	600	PVN	State-owned	Direct	Domestic	PC	Subcritical

Annex 2

Examples of Vietnamese companies involved in solar PV and wind power value chains

Company name	Website	Developer	EPC	O&M	Investment	Manufacture
Control & Automation Solutions Co.,Ltd (CAS)	https://cas-energy.com/		+			
Sao Nam Intergated Technology Joint Stock Company	https://www.sntek.vn/		+			
Viet Control Solutions Joint Stock Company	https://solar.vietcontrol.vn/		+			
Powertech Technology Trading Company Limited	http://www.powertech.vn/		+			
Dien Xanh investment joint stock company	https://dienxanh365.com/san-pham/		+	+		
Sametel Corporation	https://sametel.com.vn/		+			
SunTech Technology Engineering Joint Stock Company	https://dienmattroisuntech.vn/		+	+		
VES Joint Stock Company	https://ves-vn.com/			+		
Red Sun Energy Joint Stock Company	https://redsunsun.com.vn/		+			+
Sunemit Joint Stock Company	https://sunemit.com/			+		
Alena Energy Technology Company Limited	https://alena-energy.com/gioi-thieu/		+			
Solar Top Joint Stock Company	http://solartop.vn/		+	+		
Green Energy On Energy Joint Stock Company	https://onenergy.com.vn/		+	+		
Dat Engineering Company Limited (DAT)	https://datsolar.com/		+			
Techpal Online Technology Investment Joint Stock Company	https://solar.techpal.vn/			+		
Phu Hung Smarthome Solar Power Solution Co.,Ltd	https://phuhungsolar.com/		+			
Mat Troi Viet Import Export Trading Production Company Limited	https://sunpower.net.vn/		+			
Think Vuong Electric Construction Design Joint Stock Company	https://solarthinkvuong.vn/		+	+		
Sharp NSN Energy Solution JSC	https://global.sharp/solar/en/	+	+	+		
Megasun Manufacture Company Limited	https://www.megasun.com.vn/v2/		+	+		+
Sao Viet consultant design construction company limited	http://saovietenergy.com		+			

Company name	Website	Developer	EPC	O&M	Investment	Manufacture
Duc Hoa Trading and Production Company Limited	http://duchoasolar.vn/		+			
Hoang Gia Automation Technology Company Limited	https://hgsolar.vn/		+			
Lien Thanh Viet Nam Mechanical Electrical Joint Stock Company	https://lithaco.vn/		+	+		
Vu Phong Energy Group Joint Stock Company	https://vuphong.vn/	+	+	+		+
Solar Mien Trung High Technology Company Limited			+			
Southern Power Corporation Contact Center		+	+	+		
Green Energy Engineering Trading Company Limited	http://gee.com.vn/		+	+		
Phoenix Clean Power Joint Stock Company	https://www.phoenixcleanpower.com	+	+	+		
VS Group Corporation	http://vs-group.vn			+		
Seco – Solar Technical Services And Trading Co., Ltd	http://secosolar.com.vn/		+	+		
Ho Chi Minh City Energy Solutions Joint Stock Company	https://ecchcmc.com/			+		
Power Engineering Consulting Joint Stock Company 3	https://www.pecc3.com.vn/		+	+		
Vu Son Mechatronics & Energy Co.,Ltd	https://vusonsolar.vn/			+		
Solar BK	https://solarbk.vn/		+	+	+	

Annex 3

VRE-related tax regulations

- Decree No. 118/2015/ND-CP of 12 November 2015, Point 3, Section III, Part A, Appendix I gives the list of business lines eligible for investment incentives, i.e., it defines which investment in power plant development belongs to industries and sectors that are eligible for investment incentives.

- According to Clause 11, Article 16 of the Law on Import and Export Tax No. 107/2016/QH13, Article 14 of Government Decree 134/2016/ND-CP of 1 September 2016, "Exemption of duties on imported fixed assets of entities eligible for investment incentives" is defined, including:

- Machinery and equipment; components, details, detachable parts, spare parts for synchronous assembly or synchronous use with machinery or equipment; raw materials and supplies used to manufacture machinery or equipment or to manufacture components, details, detachable parts, spare parts of machinery or equipment;
- Specialised means of transport in the technological line directly used for production activities of the project;
- Construction materials that cannot be domestically produced.

The tax exemption for imported goods specified in this Clause applies to both new investment projects and expansion of existing investment projects.

- Domestic factories are eligible for import tax exemption for 5 years from the date of commencement of production for raw materials, supplies, and components that cannot be domestically produced as prescribed in Clause 13 Article 16 of the Law on Import Tax and Export Tax No. 107/2016/QH13.

- Based on the opinion of the Ministry of Planning and Investment in Official Dispatch No. 2119/BKHDT-KTCN dated April 3, 2019, the item "Photovoltaic panels" and "Photoelectric panel support frame" are on the list of products domestically produced goods according to Circular No. 01/2018/TT-BKHDT; as per the Official Letter No. 4456/BKHDT-KTCN dated July 1, 2019, the item "Photovoltaic panel support frame" is a construction material that can be domestically produced.

- Corporate income tax (CIT) is exempted for 4 years, reduction of 50 per cent of tax payable for the next 9 years for enterprise income from new investment projects specified in Clause 1, Article 15 of Decree 2018/2013/ND-TTg; or the income from new investment projects prescribed in Clause 3, Article 15, and income of the business from new investment projects in industrial parks (except for industrial parks located in socially and economically advantaged areas) shall be eligible for tax exemption for two years and 50 per cent tax reduction for the next 4 years.

Endnotes

- ¹ Neefjes and Hoai 2017. <http://library.fes.de/pdf-files/bueros/vietnam/13684.pdf>
- ² IPCC 2018, section 3.4.5.
- ³ Eckstein et al. 2019.
- ⁴ Trần Thực et al. 2015.
- ⁵ IPCC 2018.
- ⁶ Tran Thi Tuyet Hanh et al. 2018.
- ⁷ SR Viet Nam 2020d; see <https://climateactiontracker.org/climate-target-update-tracker/> for data on submission of updated NDCs.
- ⁸ See: EU 2020.
- ⁹ According to Viet Nam's Initial communication to the UNFCCC (SR Viet Nam 2003) emissions in 1994 were a about 104 MtCO₂ considering all sectors (Table 2.28, p.46). Assuming a rise since 1990, so about 95 MtCO₂ in 1990 and a 1990 population of 68 million would give 1.4 ton/capita in 1990.
- ¹⁰ UNDP-Viet Nam 2018
- ¹¹ Viet Nam Business Forum 2019; VEPG 2018.
- ¹² IRENA 2019.
- ¹³ A recent analysis of rapidly changing deployment of solar PV and windpower is in e.g. VIET 2020
- ¹⁴ NLDC 2021
- ¹⁵ Prime Minister quoted in VnExpress 18/02/2021.
- ¹⁶ SR Viet Nam 2020f
- ¹⁷ SR Viet Nam 2020f, Annex F.III.2
- ¹⁸ SR Viet Nam 2017b
- ¹⁹ SR Viet Nam 2020c
- ²⁰ EVN 2021 (press release of 6 January 2021). See also EVNSolar 2020 <https://solar.evn.com.vn>
- ²¹ SR Viet Nam 2018.
- ²² EVN 2020.
- ²³ NLDC 2020.
- ²⁴ MOIT Circular No. 23/2015/TT-BCT dated 13 July 2015
- ²⁵ MOIT Decision no.2093/QD-BCT of 7 August 2020
- ²⁶ Institute of Energy 2021, chapter 6.
- ²⁷ Institute of Energy 2021, chapters 7 and 9.
- ²⁸ UNDP-Viet Nam 2012, pp.13
- ²⁹ IPCC 2018, p.13
- ³⁰ IES & MKE 2016; VEPG 2018.
- ³¹ UNDP-Viet Nam 2018.
- ³² The draft PDP8 does use a low-level projection of transport electrifications from the Ministry of Transport
- ³³ Damen-Song Cam, Hai Phong.
- ³⁴ Edis and Bowyer 2021.
- ³⁵ Spencer et al. 2021
- ³⁶ <https://sdgs.un.org/goals/goal7> and UNDP-Viet Nam 2018.
- ³⁷ Neefjes and Hoai 2017.
- ³⁸ <https://vepg.vn/technical-working-groups/%E2%80%8Btechnical-working-group-energy-access/>
- ³⁹ Neefjes and Hoai 2017, section II.1.
- ⁴⁰ UNDP-Viet Nam 2017

⁴¹ UNDP-Viet Nam 2014, 2017.

⁴² <https://www.unep.org/news-and-stories/story/solar-power-charges-pandemic-recovery-indigenous-farmers-viet-nam> and <https://www.empowerforclimate.org/en>

⁴³ This is by GreenID and Climate Sense Ltd in association with researchers on crop production and social economics, and one of the authors is leading this; analysis and documentation of the pilot is in progress but not yet publicly available. See also GreenID 2019.

⁴⁴ The draft new FiT for rooftop solar PV may be US Cents 5.5 /kWh which is low for small scale projects but likely sufficient for certain APV systems to be profitable if all power would be exported to the grid, and more profitable if it substitutes a portion of on-site (day-time) electricity consumption which is off-set against retail prices that are higher than this FiT.

⁴⁵ Neefjes and Hoai 2017, section II.1.

⁴⁶ Neefjes and Hoai 2017.

⁴⁷ See e.g. SNV 2019 regarding solar plants for which land was bought from farmers

⁴⁸ IRENA 2019, page 21.

⁴⁹ IRENA 2020.

⁵⁰ Sauerborn et al. 2019.

⁵¹ UNDP-Viet Nam 2018.

⁵² Bischof-Niemz 2019.

⁵³ Compare with Sauerborn et al. 2019.

⁵⁴ Wei M, et al. 2010

⁵⁵ CPV 2020.

⁵⁶ MOIT 2020.

⁵⁷ MOIT Document no. 07/VBHN-BCT (6/3/2020) assigns this task to the Department of Industry of MOIT

⁵⁸ See e.g. Steins et al. (2021) on off-shore wind power with benefits for nature conservation and seafood

⁵⁹ <https://vepg.vn/technical-working-groups/%e2%80%8btechnical-working-group-energy-data-statistics/>

⁶⁰ Neefjes and Hoai 2017.

⁶¹ SR Viet Nam 2016a; UNDP-Viet Nam 2016.

⁶² GreenID 2016; RLS 2016.

⁶³ Institute of Energy 2021, chapter 7

⁶⁴ The authors created a collection of such "hit" articles in Vietnamese.

⁶⁵ Shearer et al. 2019.

⁶⁶ Carbon Tracker 2018; Carbon Tracker 2019.

⁶⁷ Climate Tracker 2020.

⁶⁸ Myths were dispelled in e.g. GreenID 2016 and RLS 2016, but not in detail and not all objections were tackled.

⁶⁹ Compare Neefjes and Hoai 2017, Table 6.

⁷⁰ SR Viet Nam 2019.

⁷¹ Compare Neefjes and Hoai 2017, Table 6.

⁷² Dorband et al. 2020, who use e.g. Neefjes and Hoai 2017, among other sources

⁷³ UNDP-Viet Nam 2012, 2014, 2016, 2017

⁷⁴ See e.g. UNDP-Viet Nam 2012; VEPG 2018

⁷⁵ UNDP-Viet Nam 2017.

⁷⁶ Bakkensen and Schuler 2020.

⁷⁷ See e.g. Climate Tracker 2018.

⁷⁸ IES 2018.

⁷⁹ Clean Energy Council 2021.

⁸⁰ Nguyen Ngoc Hung et al. 2020.

⁸¹ SNV 2019.

⁸² GreenID 2019.

⁸³ A recent example of financing by JICA that was challenged by NGOs is <https://www.hrw.org/news/2021/01/25/japan-withdraw-coal-power-plant-project-vietnam> ; and even more recently a Japanese company, Mitsubishi, pulled out of coal power projects in Viet Nam: <https://e.vnexpress.net/news/business/companies/mitsubishi-pulls-out-of-central-vietnam-coal-plant-4240625.html>

⁸⁴ UNDP-Viet Nam 2012, 2014, 2016, 2017.

⁸⁵ VBF 2019.

⁸⁶ <https://vepg.vn/technical-working-groups/%E2%80%8Btechnical-working-group-energy-sector-reform/>

⁸⁷ MOIT 2019.

⁸⁸ SR Viet Nam 2019.

⁸⁹ Institute of Energy 2020b; Institute of Energy 2021.

⁹⁰ MOIT 2020a.

⁹¹ See <https://solar.evn.com.vn>

⁹² GreenID 2019; SNV 2019.

⁹³ Dang, Le Ngoc and Farhad Taghizadeh-Hesary 2019.

⁹⁴ Neefjes and Hoai 2017.

⁹⁵ VBF 2019.

⁹⁶ Neefjes and Hoai 2017, section II.2, p19

⁹⁷ VCCI & TAF 2020.

⁹⁸ See e.g. UNDP-Viet Nam 2017.

⁹⁹ This recommendation has some similarities with UNDP-Viet Nam 2014.

¹⁰⁰ DGRV 2020

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