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Phasing out coal power in a developing country context: Insights from Vietnam

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Abstract

At the United Nations Framework Convention on Climate Change 26th Conference of the Parties (COP 26) in November 2021, Vietnam pledged to phase out unabated coal power by the 2040s or as soon as possible thereafter. Achieving this will require major efforts. This study investigates the drivers for Vietnam's coal power phase-out decision, barriers to Vietnam achieving a successful unabated thermal coal phase out, and potential strategies to achieve the pledge. To this end, a survey of 43 experts from government agencies, research institutions, civil society, and industry was carried out, supplemented by 23 follow-up interviews. The results indicate that ambition to attract international support for green growth initiatives in a context of limited financing options for new coal power projects appears to have been the primary driver for the decision. Key barriers include concerns about electricity shortages and incomplete regulatory frameworks for new clean power options. Recommended strategies include: 1) reforming regulations to facilitate investments in clean energy, electricity transmission, and energy storage; 2) continuing political prioritisation; and 3) building broad-based support from the community and enterprises. Vietnam's case is relevant to other developing countries and beyond.

Keywords:

clean energy, climate agreement, coal power, developing country, energy transition, Vietnam

JEL classifications:

P28, Q48, Q56

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Abbreviations¹

¹ ASEAN: Association of Southeast Asian Nations; COP 26: 26th Conference of the Parties of the United Nations Framework Convention on Climate Change; GDP: gross domestic product; EVN: Electricity of Vietnam; FIT: feed-in tariff; JETP: Just Energy Transition Partnership; GW: gigawatt; GWh: gigawatt hour; MW: megawatt; MWh: megawatt hour; tCO₂: tonnes carbon dioxide; PPP: purchasing power parity; TWh: terawatt hour.

1. Introduction

Phasing out unabated coal power to meet climate agreements poses enormous challenges to rapidly developing economies such as Vietnam. Indeed, Vietnam had the Association of Southeast Asian Nations (ASEAN)'s fastest growth in coal consumption over 2011–2021, at an average rate of 11% per annum (BP, 2022). Coal has been the largest contributor to Vietnam's electricity production since 2018, reaching about 115 terawatt hours (TWh) in 2020 before declining slightly to 114 TWh in 2021 (BP, 2022). Emissions from all coal use in Vietnam equalled 203 million tonnes carbon dioxide (tCO₂) in 2019. This was about 72% of Vietnam's total CO₂ emissions from fuel combustion (International Energy Agency, 2022).

As of July 2022, Vietnam had about 24,000 MW of coal power generation capacity in operation. About 90% of this had been opened this century (Global Energy Monitor, 2022). In addition, about 6,000 MW of coal power is currently under construction and 8,250 MW has been permitted or pre-permitted but remains pre-construction. Importantly, about 45,000 MW of pipeline projects was cancelled over 2010–2021 (Global Energy Monitor, 2022) for reasons including finance shortages and local community protests (Gao et al., 2021). Coal power is intended to contribute about 25–30% of total installed power generation capacity in 2030 under Vietnam's draft Power Development Plan 8 (MOIT, 2022).

In a largely unexpected development, in November 2021, Vietnam joined 44 other countries plus the European Union and 31 sub-nationals and organisations in supporting the Global Coal to Clean Power Transition Statement at COP 26 (UN Climate Change Conference UK 2021, 2021). Vietnam fully endorsed all four clauses of the statement, abbreviated versions of which are: 1) rapidly scaling up the deployment of clean power generation and energy efficiency measures, 2) rapidly ramping up technologies and policies this decade to achieve a full transition away from unabated coal power generation, 3) ceasing new unabated coal power projects, and 4) making a just and inclusive transition away from unabated coal power.

Of the 10 ASEAN countries, four others signed the Global Coal to Clean Power Transition Statement, although two of these are not major coal consumers (Singapore and Brunei Darussalam). Indonesia and the Philippines supported the statement, but did not endorse all four clauses. As a coal-dependent lower-middle-income country, Vietnam's full endorsement of the statement is relatively notable. Of the other countries to fully endorse the statement,

only six had a lower gross domestic product (GDP) per capita than Vietnam in purchasing power parity (PPP) terms in 2021 (World Bank 2022b). These countries are not major coal consumers, in aggregate consuming less than 3% of the coal used by Vietnam in 2021 (US EIA, 2023).²

Research on coal power phase-out in Vietnam has been relatively limited, especially in the post-COP 26 context. There has yet to be a study examining Vietnam's prospects for and approach to fulfilling its COP 26 coal power phase-out commitment. The underlying drivers for Vietnam's decision to adopt such an ambitious commitment and how the country will achieve the commitment remain relatively unexplored.

Among prior contributions, Dorband et al. (2020) and Steckel and Jakob (2021) provided insights into the political economy of coal in Vietnam, examining the context, actors, and objectives of the country's coal sector. Drivers of international investment in coal power in Vietnam were qualitatively analysed by Gallagher et al. (2021) and quantitatively assessed by Edianto et al. (2022). Reasons for coal plant cancellations in Vietnam were examined by Gao et al. (2021), including via expert interviews. Based on hypothetical scenarios in which coal power has greater reliability, Bakkensen and Schuler (2020) concluded that electricity consumers in Vietnam have higher willingness to pay for new coal power than for new renewables. Truong et al. (2022) proposed co-firing rice straw in coal power plants in Vietnam to improve local air quality and create jobs.

Our study is the first to provide detailed, context-specific information on strategies to phase out coal power in Vietnam. It seeks to answer the following questions:

1. Why has Vietnam decided to phase out unabated coal power?
2. What are the key barriers to unabated coal power phase-out in Vietnam?
3. How could these barriers be overcome?

To do so, we conducted a survey of 43 experts from government agencies, research institutions, civil society, and industry. Follow-up interviews with 23 survey respondents were then performed to provide additional insights. We examined institutional, economic, social,

² The six countries are Côte d'Ivoire, Mauritania, Nepal, Senegal, Zambia, and Somalia. Coal use is as aggregated in joules.

and technological aspects to identify drivers for and barriers to Vietnam's coal power phase out as well as suitable policy approaches (Do et al., 2020, 2022).

The study finds evidence of numerous barriers that need to be overcome for Vietnam to achieve the commitment, including incomplete regulatory frameworks for clean power options and concerns about power shortages. It also identifies key strategies to overcome the barriers, including: 1) reforming regulations to facilitate investments in clean energy, electricity transmission, and energy storage; 2) continuing political prioritisation; and 3) building broad-based support from the community and enterprises. The study provides timely and relevant inputs to policymaking in Vietnam. Lessons learned may be relevant for other coal-dependent developing countries such as Indonesia.

The paper is structured as follows. Section 2 provides an overview of Vietnam's coal power sector. Section 3 discusses our survey- and interview-based methods. Drivers of Vietnam's coal power phase-out decision are examined in section 4 and barriers to its achievement in section 5. Section 6 analyses strategies for implementing Vietnam's coal power phase out. Conclusions and policy implications are presented in section 7.

2. Overview of Vietnam's coal power sector

Coal is currently the principal power generation source in Vietnam, having overtaken hydroelectricity in 2018 (Figure 1). Vietnam's installed coal power capacity quadrupled in a decade, from about 5 GW in 2010 to about 20 GW in 2020 (World Bank, 2022a). Over 2011–2021, coal electricity generation increased at an average annual compound rate of 19% (BP, 2022). In 2021, coal accounted for about 30% of Vietnam's installed power capacity (DEA and EREA, 2022) and 47% of the electricity generation mix (BP, 2022). About 72% of Vietnam's coal consumption is for power generation (World Bank, 2022a).

Vietnam's thermal coal sector is of international significance. In 2022, Vietnam had the 12th-largest installed coal power capacity of 107 ranked countries, and was 2nd in ASEAN, behind only Indonesia (Global Energy Monitor, 2022). Vietnam's electricity generation from coal was the world's 13th-largest in 2021 (BP, 2022), with the potential to enter the world's top 10 given the expectation of rapid electricity demand growth over coming years.

Notably, Vietnam’s coal share in the electricity mix decreased by 2.2 percentage points in 2021 (BP, 2022) thanks to increases in the shares of solar and wind power (Figure 1). However, the country is still facing challenges in the integration of variable renewables, with output from some projects being curtailed. Liquefied natural gas became more expensive in 2022 and requires substantial infrastructure investment. For these and other reasons, it is premature to conclude that the coal share of power generation has peaked (Energy Institute, 2021).

Vietnam’s annual domestic coal production more than tripled within two decades, reaching 47.8 million tonnes in 2021 (BP, 2022). Most of this is in the north, particularly Quảng Ninh province and the Red River Delta basin (ILO, 2022). However, coal production has fallen far below coal consumption (BP, 2022), meaning that Vietnam now depends heavily on imports. Vietnam became a net coal importer in 2015 and imported about 55 million tonnes of coal in 2021 (World Bank, 2022a). It is expected that Vietnam will continue to rely on imports for much of its thermal coal needs under a business-as-usual scenario, with exposure to international coal price volatility being among the concerns (DEA and EREA, 2022).

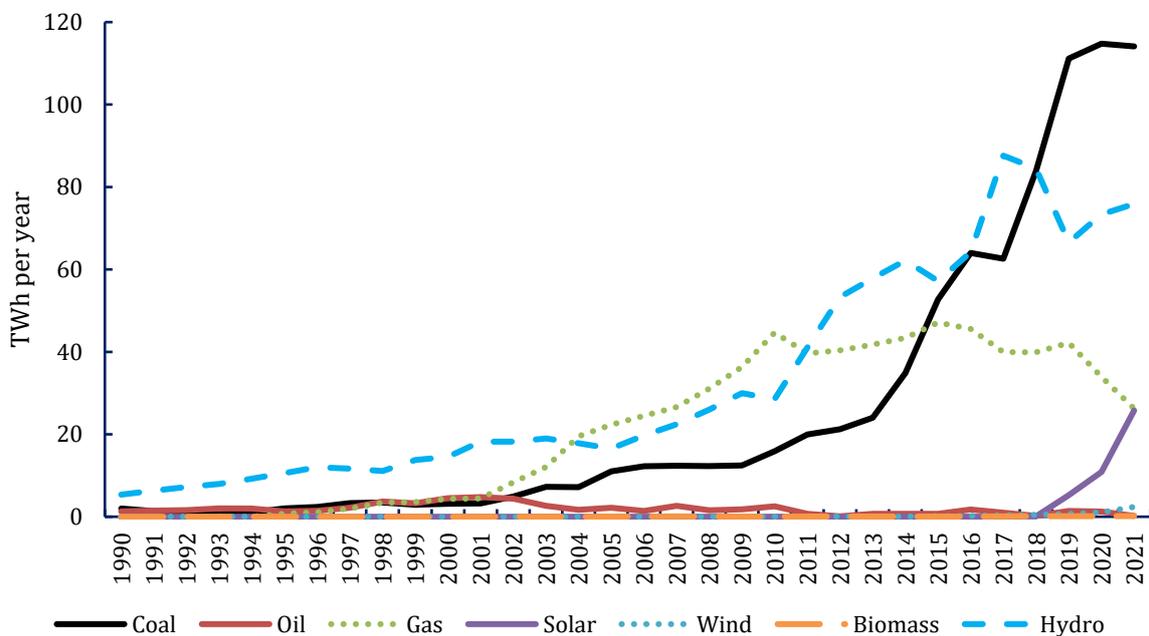


Figure 1. Vietnam’s electricity generation mix 1990–2021.
Source: BP (2022).

Most of Vietnam’s coal power plants are in the north of the country (near the coal deposits) and state-owned. As of July 2022, 71 coal-fired units in 39 plants were in operation and 12

units were under construction. Over half of the units are around 150 kilometres northeast of the capital city, Hà Nội (Figure 2). About two-thirds of the operating and under-construction coal power units are state-owned (Global Energy Monitor, 2022). Of the state-owned units, 62% fall under Electricity of Vietnam (EVN), 24% under the Vietnam Oil and Gas Group, 8% under the Vietnam National Coal and Mineral Industries Group (Vinacomin), and 6% are jointly managed by EVN and Vinacomin (Global Energy Monitor, 2022).



Figure 2. Coal power units in operation and under construction in Vietnam as of July 2022 (71 in operation and 12 under construction).

Source: Global Energy Monitor (2022).

Note: This map is without prejudice to the status of or sovereignty over any territory, to the delimitation of any international frontiers and boundaries, or to the name of any city, area, or territory.

Vietnam’s coal power fleet is relatively young, with the average ages of the country’s privately-owned and state-owned units being about 5 and 14 years in 2022, respectively (Global Energy Monitor, 2022). With a potential lifespan of over 40 years, these units could potentially run for several decades to come. Currently, no coal power plants are scheduled to retire before 2040, even old plants such as Ninh Bình (opened in 1974) and Uông Bí (opened in 1975) (Global Energy Monitor, 2022). Over half of the operating capacity relies on subcritical pulverised coal combustion technology, which has low efficiency (Global Energy Monitor, 2022).

Vietnam's coal power sector remains largely centrally planned. Developed by the Ministry of Industry and Trade and approved by the Prime Minister, Vietnam's power development plans provide guidance for the power sector over ten-year periods (Energy Institute, 2021). The plans include the installed capacities of the whole system as well as of each individual power source. Based on the plans, the state-owned utility EVN signs long-term (often 20-year) power purchase agreements with coal power plants. As the single buyer in the electricity wholesale market and single seller in the retail market, EVN decides the types and quantities of electricity to be distributed to end-users (Lee and Gerner, 2020).

Coal power has imposed negative environmental and social impacts. These include trace metal and other air pollution in Hà Nội and surrounding areas, which poses high carcinogenic and other risks (Hien et al., 2022). Indeed, nearly 35% of the PM_{2.5} pollution in Hà Nội has been estimated to come from nearby coal power plants and other industry (World Bank, 2022a). Air pollution from the energy sector, of which coal power plants are a key contributor, was estimated to cost about US\$4.6 billion in 2020 (DEA and EREA, 2022). The construction of new coal power plants in Vietnam's Mekong Delta is reported to have caused negative effects for local people's livelihoods, food production, and water resources (Dao, 2022).

The burning of coal for electricity generation resulted in 136 million tonnes of CO₂ emissions in Vietnam in 2019, accounting for about 88% of the country's CO₂ emissions from electricity generation. This exceeded the world average of 73% (International Energy Agency, 2022). Vietnam's electricity demand is expected to grow rapidly over coming years as the country continues to industrialise and modernise (DEA and EREA, 2022). A phase-out of thermal coal is central to efforts to decarbonise the power sector and achieve Vietnam's net zero emissions by 2050 target (Government of Vietnam, 2022a).

Since COP 26, the goal of a phase out of coal power has been high on the government agenda. Vietnam has established a National Steering Commission on Realising the COP 26 Commitments, chaired by the Prime Minister and coordinated by the Ministry of Natural Resources and Environment. In addition, Prime Minister Decision 888/QĐ-TTg dated 25 July 2022 on an action plan for COP 26 implementation identifies a coal-to-clean power transition as a priority (Government of Vietnam, 2022b). The Ministry of Industry and Trade has been

tasked to develop a roadmap for the transition from coal to clean power that is scheduled to be issued in 2023.

A major recent development occurred when Vietnam joined the Just Energy Transition Partnership (JETP) led by the Group of Seven (G7) industrialised nations in December 2022. Under the JETP, Vietnam will receive US\$15.5 billion to accelerate the decarbonisation of its electricity system, with the goal of peaking electricity sector emissions at no more than 170 million tCO₂ emissions by 2030. The planned coal power capacity peak will also reduce from 37 GW to about 30 GW (European Commission, 2022).

3. Methods

This study employs expert consultations to analyse the drivers, barriers, and strategies for Vietnam's coal power phase out, focusing on institutional, economic, social, and technical aspects (Borgner et al., 2018; Do et al., 2020). This type of approach has been applied in other recent studies of Vietnam's energy sector (Do et al., 2020, 2021, 2022; Dorban et al., 2020) and enables qualitative insights into energy decision-making processes. Such insights are of particular value given the limited modelling or other available analyses for the case of Vietnam (Do et al. 2020). We define a driver as "one of the main things that influence something or cause it to make progress" (Lea, 2010). Enabling strategies are evaluated with an emphasis on feasibility, defined as the extent to which the proposed policy can be implemented on institutional and political grounds (Do et al. 2022).

We developed a questionnaire based on a thorough review of literature on Vietnam's energy sector to identify context-relevant questions. Draft questionnaires were twice pre-tested during January–March 2022 with a focus group of four potential respondents from government agencies, academia, civil society, and industry. We then invited participants to complete a questionnaire (Appendix A) on the Qualtrics platform in May–June 2022. Multiple choice response options were shuffled to avoid potential biases from ordering. The respondents were given two weeks to complete the questionnaire.

Survey participants were recruited via a combination of stratified purposive sampling and snowball sampling (Do et al., 2022). The key characteristic of the sampling strategy was to select respondents who potentially possess rich information on the research questions

(Schreier, 2018). A triad-network approach was employed to identify respondents representing policy, societal, and industry networks (Nupueng et al., 2021).

We initially sent invitations to Vietnamese-based energy, climate, and environment practitioners who participated in recent Australian National University energy events or who have published on Vietnam’s energy sector since 2010. Of 71 approached experts, 43 agreed to take part in the survey, making a response rate of 61%. This number of survey respondents suits the minimum typical number of around 20–40 for a qualitative case study (Schreier, 2018). Twelve were from government agencies, 11 from academia, 6 from civil society, and 14 from industry (Table 1).

Table 1. Composition of survey respondents and follow-up interviewees (number and %).

	Survey respondents (n=43)	Follow-up interviewees (n=23)	Coding
Government agencies	12 (28%)	7 (30%)	G (2,3,8,9,10,11,12)
Academia	11 (26%)	5 (22%)	A (2,3,7,8,10)
Civil society	6 (14%)	4 (18%)	C (2,3,4,5)
Industry	14 (32%)	7 (30%)	I (1,3,5,9,10,11,13)

Source: Survey.

To gain further insights, we then conducted in-person and virtual follow-up interviews during July–August 2022 with 23 of the survey respondents: 7 from government agencies, 5 from academia, 4 from civil society, and 7 from industry. This number of interviews meets the typical threshold of 20 for qualitative studies, although there is no rigid rule for this (Schreier, 2018). We selected interviewees based on participant willingness and availability, with the aim of interviewing a balanced representation of stakeholders.

Vietnamese cultural and social norms were taken into account in conducting the survey and interviews (Do and Bennett, 2010). Face-to-face meetings were the principal mode for the interviews, with a Zoom format being offered as an alternative. We sent clarifying questions to interviewees in advance to allow them time to think. We also made it clear in advance that the personal and institutional details of the survey respondents and interviewees would remain confidential. Interviewees were asked additional open-ended follow-up questions such as “Why did you chose the option when completing the survey?” and “What other issues

you would like to discuss?”, which provided them a chance to elaborate on their responses. The interviews lasted about an hour each.

Responses were transcribed and coded in Excel for analysis, with interviewees coded G for government official, A for academic, C for civil society representative, and I for industry participant. Discussion points mentioned by more than 5% of the survey respondents, or by less than 5% but supported by secondary data, were brought forward for further analysis. Anonymised quotes from selected interviews are included in the paper.

In this paper, the expert perspectives are complemented by a desk-based review of peer-reviewed publications, government and non-government reports, and media stories including those in Vietnamese. We present the survey results, interviewee perspectives, and additional review-based analysis in an integrated manner.

4. Drivers for the coal power phase-out commitment

The survey results and interviews indicate that the coal phase-out decision was largely top-down in nature (C3, C5, G3, G9, I13). Political desire to attract international support for domestic green growth initiatives was identified as the most important driver for the decision by 30% of the survey respondents (Table 2). Specifically, the government was seen as keen to attract international financing for renewables and the energy transition (G2; G8; G11). Given that domestic financing is limited, attracting international support, both financially and technically, was believed to be crucial (A2; G2; IUCN, 2022). There is evidence that Vietnam’s climate policy in the early 2010s was similarly motivated (Zimmer et al., 2015).

Limited financing for new coal power projects was ranked as the 2nd-most important underlying driver for Vietnam’s decision to commit to a phase out of thermal coal use. Overseas financing has been the principal source of investment in Vietnam’s coal power sector over the last decade (Do et al. 2020; Gao et al., 2021). Announcements by major overseas coal power financiers such as China, Japan, and the Republic of Korea to cease financing new coal power projects have greatly diminished prospects for new coal power projects in Vietnam (A3, A8, G1, G3, I5).

Table 2. Ranking key drivers of Vietnam’s coal power phase-out decision.

Driver	Rank (% of survey responses)
Political desire to attract international support for green growth	1 st (30%)
Limited coal power financing	2 nd (26%)
Addressing climate change	3 rd (23%)
Local air pollution	4 th (7%)
Promoting renewable energy	5 th (5%)

Note: 1st is the most important. Survey respondents were asked to choose the most important driver among seven presented. They could also volunteer new ideas. Those selected by 5% or more of the respondents were reported as key drivers.

Source: Survey.

Addressing climate change was also assessed as being a significant driver for the decision. In particular, political interest in joining international efforts seem to have played a significant role (A1, A8, C2). Vietnam has actively participated in international climate treaties including the Paris Agreement (Do and Ta, 2022). Prior to COP 26, Vietnamese policymakers had frequent meetings with the COP 26 president and the ambassadors of the United Kingdom and the European Union, among others, to discuss climate issues in depth (G9, G10). Referring to international trends and practices is a norm in Vietnam’s climate policymaking (Do and Ta, 2022) and carried through to influence Vietnam’s decision regarding its COP 26 commitments (G3, G9).

According to the survey, local air pollution concerns were perhaps not a major motivator for the thermal coal phase-out decision, being selected by only 7% of survey respondents. The limits to Vietnam’s domestic coal reserves were also assessed as being only a minor driver and hence not shown in Table 2. Vietnam’s coal reserves were 3,360 million tonnes as of the end of 2020 and could continue to be exploited for about 69 years at the 2021 extraction rate (BP, 2022), although the easiest-to-access resources have already been extracted (A3, G8, I8).

The interviewees broadly assessed that the coal phase-out commitment was timely and sensible and helped send a necessary signal to energy stakeholders to plan for a low carbon society. One interviewee observed that “setting the ambitious coal power phase-out commitment indicated a long-term policy vision; waiting for all conditions to be met to set a goal would be too late” (A8). Another interviewee elaborated that “Vietnam has tended to set goals to aim for, rather than setting goals after all prerequisites have been met” (I13).

The top-down nature of Vietnam’s decision is a characteristic of its political system. Such an approach may be relatively suited to complex issues such as energy transition and decarbonisation, where national goals and targets are common. The top-down nature of the decision is also in line with central government negotiations regarding international support for coal phase out via mechanisms such as the JETP.

5. Barriers to a coal power phase out in Vietnam

The issuance of Power Development Plan 8 to 2030 has been postponed to incorporate the coal phase-out decision (G8, G11). Indeed, the draft of Power Development Plan 8 has been regularly updated since 2021 (MOIT, 2022). The Prime Minister has made it clear to “never say ‘impossible’” and that “commitments need to be realised”, and has requested the Commission to meet frequently to ensure close monitoring of progress and timely actions (G3; G11; Vietnam Communist Party, 2022). There are, however, many challenges to be faced, as discussed in this section.

Our survey asked respondents which of the clauses of the Glasgow Global Coal to Clean Power Transition Statement they consider to be the most difficult to implement. The 2nd clause, involving the rapid scale-up of technologies and policies in this decade to achieve a transition away from unabated coal power generation in the 2040s or as soon as possible after that, was seen by 53% of survey respondents as the most challenging. Some interviewees assessed that it is the required timeframes that make this clause particularly difficult to achieve (A7, C4, G10, G11). Clause 4 involving support to affected groups was ranked most challenging by 21% of the survey respondents, followed by clause 3 on ceasing new coal power projects (16%) and clause 1 on promoting renewable energy and energy efficiency (9%).

Table 3 shows key specific barriers to Vietnam’s coal power phase out, ranked in order of importance by the survey respondents. They can be grouped into institutional, economic, social, and technical barriers. Survey respondents tended to share similar assessments, although industry representatives emphasised incomplete regulations while government respondents were more concerned about power shortage risks (Table 4). Concerns about business resistance were viewed as least important from a list of eleven potential barriers.

Table 3. Ranking key barriers to coal power phase out in Vietnam

Barrier	Rank (% of survey responses)	Type of barrier
Incomplete regulations	1 st (81%)	Institutional
Concerns about power shortages, including impacts on the national economy	2 nd (52%)	Economic
Concerns about impacts of electricity price increases, including community resistance	3 rd (46%)	Social
Limited incentives to transition to clean power	4 th (32%)	Economic
Limited technical capacity	5 th (30%)	Technical
Concerns about unemployment and provincial economy impacts	6 th (21%)	Social

Note: 1st is the most important. Survey respondents were asked to choose the three most important barriers among 11. They could also volunteer new ideas but to a maximum of three barriers in total. Those selected by 5% or more of the respondents are reported as key barriers. The reported concerns are considered as barriers because they appear to impede the prospects for progress on coal power phase out.

Source: Survey.

Table 4. Key barriers identified by survey respondent group (%)

Barrier	Respondent group			
	Academic	Civil society	Government agency	Industry
Incomplete regulations	82%	83%	58%	100%
Concerns about power shortage impacts, including impacts national economy	73%	33%	92%	71%
Concerns about impacts of electricity price increases, including community resistance	45%	50%	50%	43%
Limited incentives to transition to clean power	28%	67%	33%	21%
Technical limits	28%	50%	25%	28%
Concerns about unemployment and provincial economy impacts	19%	17%	25%	21%

Source: Survey

5.1 Institutional barriers

Incomplete regulations for a transition from coal to clean power were highlighted as a key underlying barrier by 81% of the survey respondents (Table 3). Industry respondents

unanimously pointed to this barrier (Table 4). Specifically, no regulations currently exist regarding the decommissioning of coal power plants and associated issues such as compensation of privately-owned enterprises that have long-term power purchase agreements with EVN (A3, I1, I3). Other needed regulations include those for the handling of the assets and employees of state-owned coal power enterprises (A3, I13).

Regulations for transitioning to clean power sources remain underdeveloped. For example, there is a lack of regulations on marine spatial planning, environmental impact assessment, and leasing and licensing for offshore wind power development (Do et al., 2022). Insufficient regulatory infrastructure for public procurement and electricity pricing has delayed the issuance of new incentive mechanisms for renewables, including the adoption of reverse auctions and/or new FITs (A3, G8, I5, I9, I13).

Regulatory obstacles to the development of transmission grids were also seen by the interviewees to be a key barrier. Complex regulations on financial disbursements for official development assistance projects, grid project siting, and land issues have impeded progress in expanding transmission grids (A3; Energy Institute, 2021). Incoherent planning and approval processes involving multiple agencies have also prolonged transmission projects (G8; Energy Institute, 2021). Private firms have faced regulatory obstacles when tendering for publicly funded projects (I5; UNDP, 2022). One interviewee observed that “The issues seem not to come from limited funding, but ineffective administrative procedures” (A2). Limited cooperation among government agencies and imbalance between regulation development and enforcement have impeded policy implementation (Do and Ta, 2022). Regulatory barriers have also been observed in other developing countries such as China and Indonesia (Burke et al., 2019; Wang et al., 2021).

5.2 Economic barriers

Concerns about power shortages and their impacts on the national economy were identified as a key barrier by 52% of the survey respondents (Table 3). Ensuring a reliable electricity supply has been a government priority in the context of rapid electricity demand growth and high expectations from households and industry. Potential power outages are of high concern, and “make sure to keep the lights on” has been a constant government directive to EVN. EVN has often held the view that change from the *status quo* may compromise this

objective (A2, A3, G8). As many as 92% of government respondents highlighted concerns about power shortages as a barrier (Table 4).

The interviewees assessed that at an operational level the government is generally not yet highly ready for the energy transition. Public servants are often risk averse and reluctant to act in an incomplete regulatory environment (G10, G12). Having faced scrutiny with respect to problems arising under recent renewable FIT regimes, some officials now appear to heavily favour the *status quo* (A8, I13), with concerns about potential punishment if there are power outages or other problems (A2, C3). For some, the costs of engaging in the energy transition can be personal, tangible, and immediate (C1, C5). The benefits tend to be public, intangible, and remote.

The interviewees held that incentives for enterprises to transition from coal to clean power are yet to be effectively put into place. Established enterprise models based on existing price signals and technologies, plus distortions that keep the price of domestic thermal coal below the international market price, mean that key incumbents are not highly motivated to change (I5, I13). Long-term fixed contracts for the output of coal power plants have also reduced the ability for solar and wind power to directly compete (Steckel and Jakob, 2021). Solar PV and wind power purchase agreements face bankability problems due to reasons including that take-or-pay obligations currently do not exist for EVN (Do et al., 2020, 2021, 2022). EVN and other state-owned enterprises have also been cautious about investing in renewables. State-owned enterprises accounted for only 4% and 1% of solar and wind power installed capacities respectively in Vietnam as of 2021 (Do, 2022).

Overseas financing sources have yet to be fully activated, although the recent JETP announcement is a major step. In 2021, international investors accounted for only about 10% and 4% of the total investment in solar and wind power in Vietnam, respectively (Do, 2022). Impediments include complex administrative procedures and policy uncertainty (Do et al., 2020, 2021, 2022). Funding for solar and onshore wind power projects has come mainly from local banks, which have limited financing capacity (A2; IUCN, 2022). One interviewee observed that “foreign investment could be substantial; the issue is how to attract it” (I13).

5.3 Social barriers

Concerns about the potential for social unrest if electricity prices rise were identified as an important barrier by 46% of the survey respondents. Retail electricity tariffs are regulated at a relatively low level in Vietnam (Lee and Gerner, 2020); the average residential retail tariff was only about US\$0.08/kwh in 2021 – well below the global average (Global Petrol Prices, 2022). Proposals to increase electricity prices often face community resistance, and the government has been highly cautious about this issue (G8, I13). There are concerns that phasing out coal power would add to pressure to increase retail electricity prices given the capital investments required. Concerns about increases in electricity prices due to a coal phase-out often dominate policy debates (Postges et al., 2022). This issue is also relevant in other countries such as India and Indonesia (Jakob et al, 2020).

Another barrier, mentioned by 21% of the survey respondents, emanates from concerns about unemployment and impacts on the provincial economies of coal dependent regions. About 200,000 jobs in the mining sector, power generation, and related services may be affected by a full coal phase-out in Vietnam (ILO, 2022). There is a concern that closing coal power plants would affect not only the workers but also their family members (C5, G9, I10), as the location of new jobs and investment does not always coincide with the location of existing jobs and energy production. Coal-dependent provinces such as Quảng Ninh are the most vulnerable (Quảng Ninh Provincial People’s Committee, 2022). The percentages of survey respondents pointing to social barriers are quite similar among the four types of survey participant (Table 4).

5.4 Technical barriers

Some interviewees evaluated that determining suitable cleaner alternatives for power generation remains a major technical challenge, particularly in the near term (A3, A8, C2, C3, G8, I13). Large-scale hydro power is already mature in Vietnam. Nuclear power is costly, would take a long time to develop, and would involve safety risks and serious concerns from the public (C2, C3). Natural gas use involves greenhouse gas emissions, and so is difficult to reconcile with the goal of moving to net zero emissions. Vietnam’s domestic natural gas supply is also limited given current exploration capacities (Energy Institute, 2021). Relying on imported liquefied natural gas would require substantial and lengthy investments in infrastructure and be expensive (A8, I13).

Solar and wind technologies are highly promising and becoming much cheaper over time. They are seen to face land availability issues in this population-dense country, among other concerns (DEA and EREA, 2022). Vietnam has huge potential in offshore wind power, although it will require significant upfront capital costs and take time to develop (Do et al., 2022). Solar and wind are likely to become much more important contributors to the electricity mix over time, but substantial investment and careful management are needed. These technologies will be further discussed in section 6.

Limited capacity to manage the electricity grid during the transition from coal to clean power is seen as presenting a particular hurdle (A2, A3, G8, C1). An addition of about 12 GW of interregional transmission capacity (about 40% above the current capacity) is seen to be needed by 2030 alone (DEA and EREA, 2022). Significant energy storage capacity will also need to be built over the medium to long term, from a base of almost zero now. There will likely be a need for other dispatchable power supply and other investment to modernise the power system (DEA and EREA, 2022). To date, EVN generally has not performed well in integrating solar and wind power into the grid, with some projects needing to curtail their output (A3, C5). Technical barriers are of particular concern to the survey respondents from civil society, as highlighted by 50% of the respondents within this group (Table 4).

In short, numerous challenges to implementing Vietnam's coal power phase out commitment remain, with incomplete regulations, concerns about power shortages, and concerns about impacts of electricity price increases having emerged as key barriers. While the various barriers will all likely need to be addressed over time, incomplete regulations are identified as the most important barrier and may thus need to be a top policy priority. Potential strategies to overcome the barriers are discussed in the next section.

6. Strategies for coal power phase out

6.1 Supply and demand management

6.1.1 Setting coal power reduction targets

Setting coal power reduction targets was evaluated to be highly important for coal power exit planning (A2, A3, C5, G6, I9). More than three-fifths of the survey respondents assessed that a target of about a 25–30% coal share in the installed power generation capacity by 2030 as currently proposed in the draft Power Development Plan 8 seems about right (Figure 3).

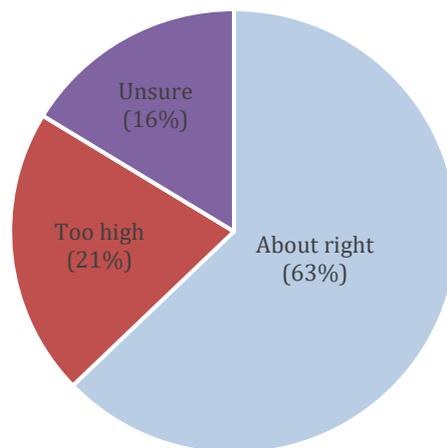


Figure 3. Survey perspectives on the proposed coal share of about 25–30% in Vietnam’s installed power generation capacity in 2030.

The number of respondents selecting the options in the absolute and % terms, n=43.
Source: Survey.

About 60% of the survey respondents predicted that a complete coal power phase out before 2050 will be unlikely in Vietnam. Decommissioning coal power plants too quickly is seen to pose risks of power shortages and system instability (C5, G3, I3). Some interviewees revealed specific doubts about the feasibility of the idea in the draft Power Development Plan 8 of having all coal power plants being run on ammonia and biomass by 2050 (A1, C2). Looking to 2050, most respondents (52%) assessed that maintaining a coal share in power generation capacity of above 0% but not exceeding 10% may suit the Vietnamese context. This assessment was quite similar across the survey groups. There thus remains some scepticism about Vietnam’s ability to achieve its COP 26 thermal coal phase-out commitment, unless carbon capture and storage is used.

6.1.2 Alternative power sources

Up to 70% of the survey respondents indicated that offshore wind power should be the main replacement for unabated coal power in Vietnam by 2050 (Figure 4). Vietnam has about 475 GW of offshore wind power potential – about six times the country’s total installed power capacity as of 2021 (Do et al., 2022). Offshore wind has a relatively high capacity factor and involves less land interference, and so is an attractive option. Other seemingly viable options include solar and onshore wind power, as highlighted by 49% and 42% of the survey

respondents respectively (as they could tick more than one option). In addition, Vietnam has many potential sites for pumped hydro energy storage (Blakers et al., 2019). It has been assessed that the country has the potential to achieve a penetration of solar and wind power exceeding 90%, coupled with off-river pumped hydro energy storage, in its electricity mix at a competitive cost of US\$63–85/MWh (Lu et al., 2021).

Nuclear power, domestic natural gas, liquefied natural gas, and coal power with carbon capture and storage were assessed by some interviewees to have potential to contribute to the power mix, but it was thought that these are unlikely to be dominant due to high costs and other reasons (A2, I13). Waste-to-energy was also considered worth exploring as a contributor based on experience with the 75 MW Sóc Sơn project in Hà Nội (A8; VnExpress, 2022). Electricity imports from Laos and China may also be useful complements to domestic generation (A7; Energy Institute, 2021). Exploiting the remaining potential of about 11 GW for small hydro could also be a cost-effective approach (DEA and EREA, 2022; G8).

In short, the survey respondents generally shared the view that, over time, wind and solar power are the most likely replacements for coal power in Vietnam. This was similar across respondent type and is in keeping with the global rise in the use of these technologies (Burke and Do, 2021).

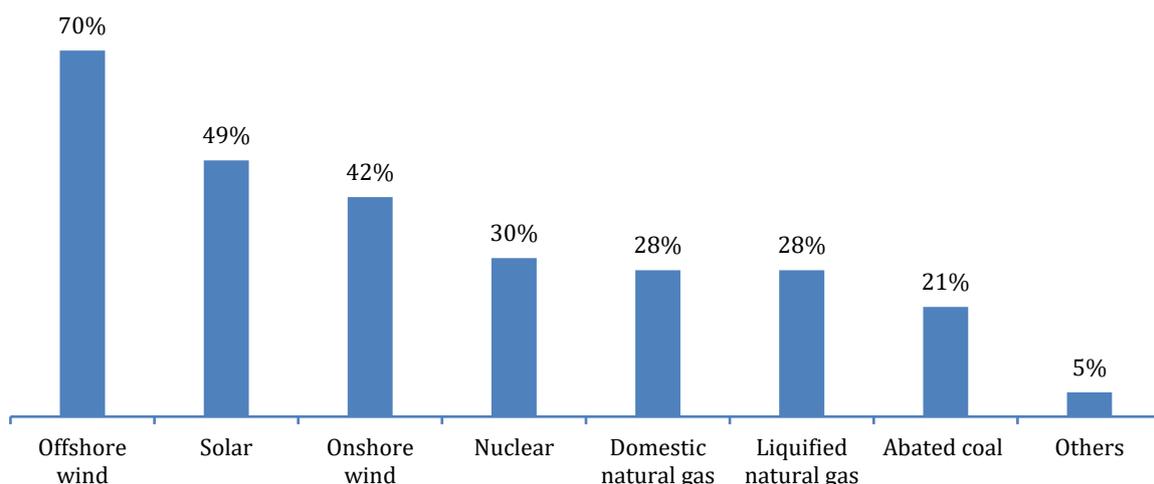


Figure 4. Key potential replacements of coal power in Vietnam (% of respondents).

Respondents were given various options from which to select. They could select more than one, as well as volunteer new ideas. Those selected by 5% or more of the respondents are reported.

Source: Survey.

6.1.3 Electricity saving and demand flexibility

There are opportunities for Vietnam to improve end-use efficiency to reduce the emphasis on supply expansion. Indeed, Vietnam's economy is more electricity-intensive than those of some other ASEAN countries, although this reflects a range of underlying reasons.³ Energy efficiency improvements could be achieved via approaches such as updating building codes and introducing comprehensive technical specifications for lighting and cooling devices, consumer appliances, and industrial and transport equipment (World Bank, 2022a). Enhancing public awareness and reforming electricity pricing could also contribute to electricity savings (C4, I9).

Besides, improved demand flexibility would help to facilitate efficient integration of variable renewables. This could be achieved via mechanisms such as time-varying prices to encourage consumption when solar and wind power are abundant (I3; Burke and Do, 2021). Flexible charging of electric vehicles could significantly reduce requirements for other forms of energy storage (I1; DEA and EREA, 2022). If built, a south-north domestic high-voltage-direct-current subsea cable could substantially assist in grid management and ensuring that the lowest-cost electricity generation and storage opportunities are utilised. Enhancing cross-border interconnectivity of electricity grids is also useful for boosting system flexibility (Do and Burke, 2022).

6.2 Regulatory reforms

About half of the interviewees highlighted that comprehensive regulatory reform is needed to enable a coal-to-clean power transition (A2, A3, A10, C2, C3, G8, G11, I3, I5, I10, I13). Amendments to relevant laws such as the Public Investment Law, Bidding Law, Investment Law, Pricing Law, and Electricity Law would help to improve accountability, reduce investment risks, and incentivise both state and non-state actors (A10, C2, I10). A new renewable energy law could help to address existing key barriers (C3, C5, I9). Enactment of a climate change law would also have the potential to provide an umbrella regulatory framework (G9, I13).

The use of direct regulations such as a government decree to achieve a coal power phase out was evaluated as the most suitable approach in Vietnam's case (A2, C3, G3, G11, G12). Some

³ The country's ratio of electricity consumption (GWh) and GDP (PPP, current international million \$) in 2021 was 0.21, while those of Indonesia and Thailand were 0.07 and 0.18 respectively (BP, 2022; World Bank, 2022b).

interviewees assessed that such a direct approach would be more effective than emissions-based regulations (A4, G12). Direct interventions to ensure coal power station exits have been seen in some other countries such as China (Diluiso et al., 2021).

In addition, detailed and clear regulations for renewable energy are needed. A decree on offshore wind power to specify rules for site preparation, leasing, and permitting would speed the adoption of this sizable alternative power source (G10; Do et al., 2022). Bottlenecks in site identification and preparation for transmission grid upgrading projects could also potentially be addressed via a Prime Ministerial decision clarifying the responsibilities of relevant agencies (A3, G8). Classifying site clearance as a separate project from a grid upgrading project, with simplified administrative procedures, may help to address delays (A8, Ha, 2022).

Regulatory reforms could focus on facilitating financing. Detailed guidance on the participation of foreign investors in offshore wind power projects following Decree 31/2021/ND-CP would help (Do et al., 2022). Increased investment could be promoted via amendments to Circular No. 22/2019/TT-NHNN to allow more bank capital to be invested in long-term renewable energy projects (A7, G2). Sovereign debt guarantees for flagship renewable energy projects could also be considered (A8, G2). Proper attention to regulation enforcement and improving cooperation among government agencies would be needed as well.

6.3 Central planning approaches

About 44% of the interviewees observed that central planning will play a principal role in coal phase out in Vietnam (A3, A8, C2, C5, G8, G9, I1, I3, I9, I13) for reasons including that the market economy is yet to fully function in Vietnam's energy sector and that power transmission infrastructure has network and natural monopoly characteristics and is managed by EVN. Given that most coal power plants are state-owned, a central planning approach could be used to carry out detailed scheduling of coal power plant exits (A7; Tan et al., 2021). Government initiatives will likely play a more dominant role than market forces in Vietnam as well as in other developing countries (Steckel and Jakob, 2021).

Maintaining government regulation of final electricity tariffs was seen by some interviewees to be beneficial to shield consumers from the risk of tariff increases that may occur during the

transition (A8, C5). Some argued that the current block tariff mechanisms could continue to be used to ensure affordability for low-income electricity users (A3, I3). These mean that relatively low tariffs apply for the first units of consumption and higher tariffs for later units. This is important to gain public support, particularly in the developing country context.

Planning will be needed to mitigate negative impacts on coal power enterprises and coal-dependent regions. Retraining workers for new employment opportunities is important (A3, G9). Planning for restructuring the local economies of coal dependent provinces will also be necessary (A8, G9). For example, Quảng Ninh's economy could potentially be guided to make a switch from coal to tourism, manufacturing, and clean energy generation (Quảng Ninh Provincial People's Committee, 2022).

Government policies to promote solar and wind power are seen as being critical for the energy transition (A2 A10, C5, I3, I5). These could be implemented via planning approaches such as renewable energy targets in power development plans (A2; Burke and Do, 2021). With this approach, the government could have more control over the renewable electricity generation quantity, which would help in informing transmission investment and grid management plans.

Major government-led investments in modernising transmission grids will also be needed. About a quarter of the interviewees evaluated that additional government prioritisation of grid upgrading is necessary (A3, A10, C5, G3, G8, I10). While some private sector involvement in connectivity between solar and wind farms to the grid has been allowed under the revised Electricity Law 2022, most grid upgrading work is seen as being needed to be done by EVN (G8, I9).

6.4 Market-based approaches

Several interviewees identified carbon pricing as a relevant policy instrument to assist the phasing out of thermal coal power in Vietnam (A3, A8, I5). This approach would help to ensure coal power is more expensive than renewable alternatives such as solar and wind power and hence speed up the transition, although its effectiveness may be reduced when it comes to state-owned enterprises (Benoit et al., 2022). Some interviewees assessed that while a regulation on coal power phase out would ideally be the primary mechanism, a carbon price

would be useful to incentivise coal power enterprises to adapt their business strategies and plan for an exit (A2, A3).

A carbon tax appears to be the more promising form of carbon pricing in Vietnam. A tax would have the advantage of being relatively simple to administer via an increase in and expansion of the current environmental tax on fuels (Do and Burke, 2021). Given the political momentum supporting net zero emissions targets, some interviewees felt there could be an opportunity to introduce a small carbon tax in the near future, as in Singapore and South Africa (A2, A8). Revenues would be generated that could then be used to help fund the clean energy transition.

Some interviewees assessed that continuing to reform the wholesale electricity market would contribute to accelerating the energy transition (A10, C3, I9). In a competitive wholesale market, solar and wind power would receive dispatch priority on the basis of their low marginal cost (Do and Burke, 2021). There would also be more accurate price signals on a highly time-granular basis so as to incentivise both supply and demand responses (Burke and Do, 2021). Electricity market reforms could facilitate greater use of direct power purchase agreements whereby solar and wind power generators could sell electricity to end users including large international companies, via EVN-managed transmission lines (with charges paid to EVN) or their own power lines (Do et al., 2021).

Incentivising investment in energy storage is important for a renewable power system. Substantial energy storage may only be needed from 2030 (DEA and EREA, 2022). However, it will take time to develop long-term storage capacity for reasons including a lengthy process involved in regulatory preparation. Some interviewees assessed that it is a suitable time to prepare for mechanisms such as reverse auctions for private investment in energy storage (A7, I11).

Government would play a crucial role under both the central planning and market approaches (Zhang and Andrews-Speed, 2020). There is a perception among some Vietnamese policy practitioners that markets such as wholesale electricity markets and carbon credit markets can function without much government facilitation and regulation (A3, C5). Instead,

successful markets rely on rule-setting and regulation by the government (Shidore and Busby, 2019; Zhang and Andrews-Speed, 2020).

6.5 Stakeholder involvement

Continued political commitment was predicted by 35% of the interviewees as the primary factor for success in achieving a thermal coal phase out in Vietnam (A3, A5, A8, C2, G8, G11, I5, I13). This differs from developed countries such as Germany where non-governmental coalitions tend to play an important role in maintaining policy advocacy for coal power phase out (Markard et al., 2021). A resolution or directive by Vietnam's Communist Party on achieving net zero emissions including the coal power transition would help to strengthen and sustain the process and lay a strong foundation for subsequent government policy and regulations (I13; Do and Ta, 2022). For example, the earlier Party Resolution 55/NQ-TU in 2020 on "Strategic Orientation for National Energy Development to 2030, vision to 2045" (Vietnam Communist Party, 2020) has been effective in steering energy policy (A8, G8, I13). One interviewee noted that "If the Party provides leadership in all aspects, the energy transition would benefit" (I13).

Another major enabler is thought to be international financing in the form of both official development assistance and foreign direct and other investment (A3, C5, G9, I5). Indeed, an assumption behind Vietnam's coal phase-out decision was the international transfer of technologies including for carbon capture and storage and green hydrogen (G3, G8, G10). One interviewee predicted that "Developing countries like Vietnam are unlikely to achieve climate and energy transition targets without international technical and financial support" (A8). International financing has previously been cited as highly important for the coal power phase out in developing countries (Ohlendorf et al., 2022). The newly announced JETP is likely to be highly important in financing the transition.

Support from enterprises and the community will also be crucial. Resistance from the coal industry could be mitigated via policies for retraining workers (A2, A3, A8, C5, G9, I1, I9), including those in privately-owned enterprises (A3; Wang and Lo, 2022). The livelihoods of the affected communities also require attention. Investments in infrastructure such as roads, schools, and hospitals may increase local community support for the energy transition (C2, G9, G10). Early and regular stakeholder involvement and communication are important for

any reforms (Jakob et al., 2020; Yu et al., 2022). While political commitments can create enabling policy environment, building broad-based support from the community and enterprises will be needed to implement the coal power phase out decision.

7. Conclusion and policy implications

This study has presented results from an expert survey and follow-up interviews on the factors that motivated Vietnam's 2021 commitment to phase out unabated thermal coal and barriers to its implementation. Enabling strategies for the coal power phase have been examined across institutional, economic, technical, and social aspects, with a focus on the local context. Vietnam's coal power phase out will be crucial as part of efforts for the country to achieve its net zero greenhouse gas emissions by 2050 target.

The analysis has found that ambition to attract international support for green growth options amid limited financing for new coal power projects was the leading perceived motivator of Vietnam's coal power phase-out decision. The December 2022 announcement that Vietnam will enter the JETP is evidence that this strategy is paying dividends. Other developing countries could consider adopting similar decarbonisation initiatives to leverage international support.

While the largely top-down decision was assessed to be timely and sensible by our experts, its implementation faces numerous challenges. Key obstacles include underdeveloped regulations and concerns about potential power shortages, particularly as the electrification of transport and industrial processes potentially ramps up towards the net zero emissions target. Other barriers include a lack of incentives for the transition, limited technical and financial capacity, and concerns about social disruptions due to electricity price increases and/or electricity supply disruptions.

The evidence suggests that continued political prioritisation will be vital to ensure a successful thermal coal phase out. A Party directive, followed by a government direct regulation on coal power phase out, would provide sustained and powerful guidance. Regulatory reforms are also essential to incentivise both state and non-state actors. Areas of need include reforms to encourage transmission expansions and improvements, offshore wind power, and energy storage investments. Adopting elements of a central planning approach appears suited to the

local context, with market-based instruments such as carbon pricing and competitive wholesale electricity markets providing potential supportive roles. Government policies can play an important role in energy transition, in both developing and developed country contexts.

The energy transition will take time and involve uncertainty, with the potential for occasional setbacks such as cost spikes along the way (Blazquez et al., 2020). To accomplish this challenging journey will require strong support from stakeholders. Careful policy design to ensure that affected enterprises and communities can adapt, combined with improving awareness on the net social benefits of coal power phase out, will be needed to cultivate their support. Maintaining and improving electricity availability and affordability during the transition will be crucial. Attracting international financial and technological support would enable the process. The JETP is a major step.

There is little doubt that the technological opportunities available in 2050 will far surpass those available today. In particular, improvement in solar photovoltaic efficiency and reductions in costs may well facilitate solar power uptake in particular on a much larger scale than currently planned. Technologies under piloting may be commercialised sooner than expected. Coal power plants could potentially be retrofitted for thermal energy storage (MIT, 2022). Offshore wind power in the south and in northern provinces such as Quảng Ninh and Hải Phòng may be able to make a larger contribution than is currently planned. Nevertheless, energy transition is a gradual process and the insights from experts in Vietnam presented in this paper reveal there are multiple barriers to be overcome.

The present study provides a static qualitative analysis. There are many potentials for future research in what is a dynamic and important setting. Detailed research on financing mechanisms and the economic and social impacts of the energy transition would be highly useful. It would also be useful to closely track Vietnam's progress toward meeting its unabated thermal coal phase-out commitment. Specific lessons learned along the way may be useful for other developing countries.

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Appendix A. Survey questionnaire
(English version; the original is in Vietnamese)
Your Opinion about Coal Phase Out in Vietnam

This is part of a study conducted by the Australian National University.

Responses will be used only for research purposes. The names and institutional affiliations of respondents will remain confidential. Results will be reported in aggregated form only and identification of individual responses will not be possible.

Participation is voluntary. You can withdraw at any time. Should you decide to withdraw, we will not use your responses.

Background

In November 2021 at the United Nations Framework on Climate Change' Conference of Parties, Vietnam joined 46 countries and 31 sub-nationals and organisations in supporting the Global Coal to Clean Power Transition Statement (herein after referred to as coal power phase out).

The commitments' clauses are:

1. To rapidly scale up the deployment of clean power generation and energy efficiency measures.
2. To rapidly scale up technologies and policies in this decade to achieve a transition away from unabated (those without carbon capture, utilisation, and storage) coal power generation in the 2040s (or as soon as possible thereafter).
3. To cease issuance of new permits for new unabated coal-fired power generation projects that have not yet reached financial close, cease new construction of unabated coal-fired power generation projects.
4. To provide financial, technical, and social support to affected workers, sectors, and communities.

We would like to hear your opinion on this topic.

1. What sector do you work in?

- Government agency.
- University/research institution.
- Industry/consultancy.
- International organisation.
- Local non-governmental organisation.
- Other (please specify).

2. How much do you know about Vietnam's coal power issues?

- Nothing.
- Not much.

- Quite a lot.
 - A lot.
3. In your view, what is the most difficult clause to implement among the four clauses in the statement that Vietnam has joined? (tick one only)
- Clause 1 about increasing clean power and energy efficiency.
 - Clause 2 about coal power phase out by the 2040s (or as soon as possible thereafter).
 - Clause 3 about ceasing new coal power projects.
 - Clause 4 about a just and inclusive transition.
4. In your opinion, what was the most likely key reason for the government to join the statement on coal power phase out? (tick one only)
- Addressing climate change.
 - Attracting international support for green growth
 - Limited coal power financing.
 - Local air pollution.
 - Vietnam is running out of coal resources.
 - New opportunities in renewable energy.
 - Other (please specify).
5. In your opinion, what are the **three most important barriers** to coal phase out? (tick three only)
- Concerns about national economic losses.
 - Concerns about provincial economic losses.
 - Concerns about unemployment.
 - Concerns about higher electricity prices.
 - Concerns about insufficient electricity supply.
 - Business resistance.
 - Community resistance.
 - Legal and administrative difficulties.
 - Technical limits.
 - Limited incentives to transition to clean power.
 - Others (please specify).
6. In your view, what is the most suitable policy instrument for coal power phase out? (tick one only)
- Regulations on closing coal power plants.
 - Strict environmental regulations on coal power emissions.
 - Government payments for closing coal power plants.
 - Remaining coal power plants pay out early retiring plants.
 - Removing subsidies for coal power.

- Imposing a carbon price.
 - Enhancing enabling policies for renewable energy.
 - Other (please specify).
7. The draft Power Development Plan 8 proposes having about a 25%–30% coal share in Vietnam’s installed power generation capacity by 2030, which is similar to the level of 2021. Do you think this is: (tick one only)
- About right.
 - Too much.
 - Too little.
 - Unsure.
8. In your opinion, future Power Development Plans should include a coal share of installed power generation capacity for 2050 of: (tick one only)
- 0%.
 - <0% to 10%.
 - >10% to 20%.
 - >20% to 30%.
 - > 30%.
 - Other (please specify)
 - Unsure.
9. In your view, who will be most affected by a coal phase out? (tick one only)
- Coal power enterprises.
 - Electricity consumers.
 - Coal power plant workers.
 - Coal mining workers.
 - Coal trading workers.
 - Local communities in coal power plants/mines.
 - Other (please specify)
10. In your view, what is the most important compensation scheme? (tick one only)
- No compensation needed.
 - Retraining for those who will become unemployed.
 - Providing one-off cash assistance to those who will become unemployed.
 - Building infrastructure such as roads, hospitals, and schools for affected local areas.
 - Preventing electricity prices from rising too high.
 - Reducing taxes for businesses.
 - Other (please specify)
11. When do you think coal power phase out will be achieved in Vietnam? (tick one only)

- Before 2040.
- During 2040–2050.
- After 2050.
- Unsure.

12. In your view, what should be the main replacement for unabated coal power in Vietnam?
(can tick more than one)

- Solar.
- Onshore wind.
- Offshore wind.
- Domestic natural gas.
- Imported liquefied natural gas.
- Nuclear.
- Coal power with carbon capture, utilisation, and storage.
- Other (please specify)

13. In your view, what is likely to be the most important factor for future success in coal power phase out? (tick one only)

- Vietnam Communist Party's strong determination via measures such as a directive on a coal power phase out.
- Government policies and regulations.
- Community support.
- Industry support.
- International support.
- Technology advancement.
- Other (please specify)

14. What are other coal phase out issues that you would like to discuss?

15. Do you agree to participate in a follow-up interview on this issue?

- Yes
- No

About yourself (please complete if you agree to participate in the follow-up interview)

Name:

Email: