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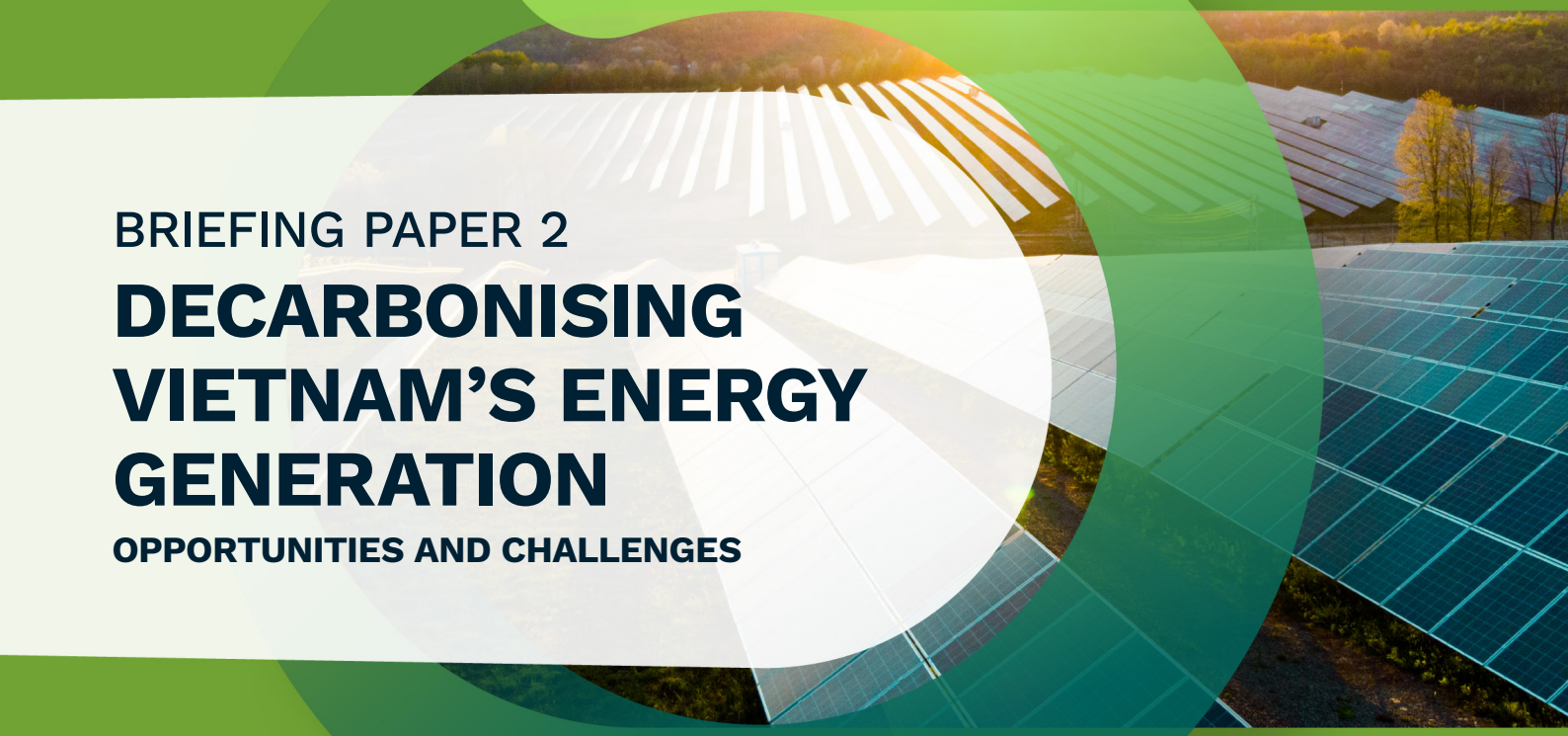


BRIEFING PAPER 2

DECARBONISING VIETNAM'S ENERGY GENERATION

OPPORTUNITIES AND CHALLENGES

This paper is part of the Australia-Vietnam Green Economy Program, an initiative by Asialink and Climateworks Centre

The Australia-Vietnam Green Economy Program, with its capstone summit, will drive new collaboration between Australian and Vietnamese businesses in the green economy, create trade and investment opportunities, and build connections among leading experts in the bilateral relationship. Pre-summit papers and training programs will enhance Australian businesses' knowledge, capacity and connections to seize opportunities in Vietnam's green economy.

Find out more about the program

Asialink

Asialink is Australia's national centre for Asia capability and engagement working to create a better future with Asia.

Through our sustained engagement, impactful partnerships and signature offerings, we empower individuals, organisations, and governments with knowledge and capability to engage effectively in the region.

We have deep expertise across arts, business, education and diplomacy working towards one goal: to create a better future, one where Asia and Australia thrive together in our region.

Climateworks Centre

Climateworks Centre bridges the gap between research and climate action. We are climate transition specialists, working in Australia, Southeast Asia and the Pacific with decision-makers who have the power to reduce emissions at scale. Climateworks develops evidence-based solutions to accelerate emissions reduction in line with the global 1.5°C temperature goal and shared climate safety.

Co-founded by philanthropy and Monash University, Climateworks is an independent not-for-profit working within the Monash Sustainable Development Institute.

Executive Summary

Vietnam's surging demand for energy will require significant investment in coming years. The government has ambitious plans to develop renewable energy, particularly solar and wind power. Achieving these targets will require around AUD200 billion investment in power generation and transmission by 2030 based on the Vietnam Government's plans.

Australian investors and businesses are yet to establish a significant presence in Vietnam's energy transition, but they have the potential to make a substantial impact. To achieve this, they will need to navigate a complex business and regulatory landscape, which includes uncertainties surrounding energy pricing, such as Feed-in Tariffs.

Businesses that begin building their market knowledge, presence and connections now will have a strategic advantage in participating in Vietnam's energy transition.

This paper focuses on emissions reduction from energy generation, with another subsequent paper to examine energy consuming sectors.

What do we mean by "Green Economy"?

Asialink and Climateworks Centre define the concept of the "green economy" in this briefing series as:

"An economic policy framework that supports national energy needs based on renewable resources, net-zero greenhouse gas emissions, and maximum contribution to human well-being and social equity."

This framework must be designed to curb emissions, reduce environmental risks, safeguard ecosystems, increase resilience of energy systems through effective governance, harness low-carbon technologies and promote sustainable practices. As such, the policy briefing series developed within the Australian-Vietnam Green Economy Program will focus on areas that could create strong synergies and leverage economic competitive advantages between Australia and Vietnam, such as the regulatory challenge of the energy transition (including the needs of end-users), access to sustainable finance, skills formation, and technological innovation.

Vietnam's climate challenge

The green economy is increasingly important for Vietnam, which faces dual climate challenges. Vietnam is highly exposed to climate change: the frequency of natural disasters is intensifying, and projected sea level rises will have a significant impact. The risk of flooding in Ho Chi Minh City could triple by 2050, and it's estimated a once-in-100-year flood would affect 36 percent of the city. Without effective adaptation measures, a 1.5C temperature increase above pre-industrial levels could result in losses of 4.5 percent of GDP or AUD 6.7 billion (VND 104 trillion) over the next 10 years.

The potential impacts of climate change have prompted Vietnam to set ambitious reduction targets relative to its current emissions profile. As outlined in Briefing Paper 1 with Navigating the Australia-Vietnam Green Economy, Vietnam aims to reduce emissions by 15.8 percent below 2020 levels by 2030, with a 43.5 percent target conditional on international assistance. Vietnam has pledged to reach net zero by 2050. In the energy sector, Vietnam aims to achieve 47 percent of its power generated from renewable energy by 2030 as part of the Just Energy Transition Partnership (JETP). This multi-national partnership aims to raise at least AUD 24 billion over three to five years through a range of financial instruments.

Challenges facing energy generation

In recent years, Vietnam has dramatically expanded its renewable energy sources, focusing primarily on bolstering generation from solar and wind. These two sources alone have contributed 20.2 GW of capacity,

> *"As we celebrate 50 years of diplomatic relations, the green economy represents the next big opportunity in our economic partnership. The rapid expansion and transition of Vietnam's energy sector provides a real opportunity to evolve our trade and investment relationship into the future."*
>
> **- Andrew Goledzinowski, Australia's Ambassador Vietnam**

accounting for 26.4 percent of the total system power by the end of 2022. However, the transition to renewable energy is fraught with obstacles including infrastructure limitations and grid synchronisation issues, that require innovative solutions, strategic planning, and significant investment.

Energy infrastructure is a key challenge in decarbonisation of energy systems. Rapid economic growth and urbanisation are causing energy demand to surge, with energy demand out to 2030 expected to grow by 10-12 percent per annum. Renewable energy sources are an attractive solution, but the existing grid, particularly in regions such as the Southern and Central Provinces, frequently lacks the technical capacity necessary for large-scale renewable power integration. The rapid proliferation of renewable projects, especially in solar-rich provinces like Binh Thuan and Ninh Thuan, has sometimes outpaced the development of infrastructure, resulting in grid congestion. High solar output during peak periods has overloaded provincial infrastructure and constrained the main north-south transmission line, compelling Vietnam Electricity (EVN) to curtail solar production.

The intermittent power output of renewable energy sources, particular solar and wind, exacerbates the situation. Investing in grid infrastructure is required to capture their generation potential. Vietnam's power infrastructure is unprepared for distributed solar at scale as the infrastructure was designed for utility-scale power infrastructure like large-scale hydropower and thermal plants.

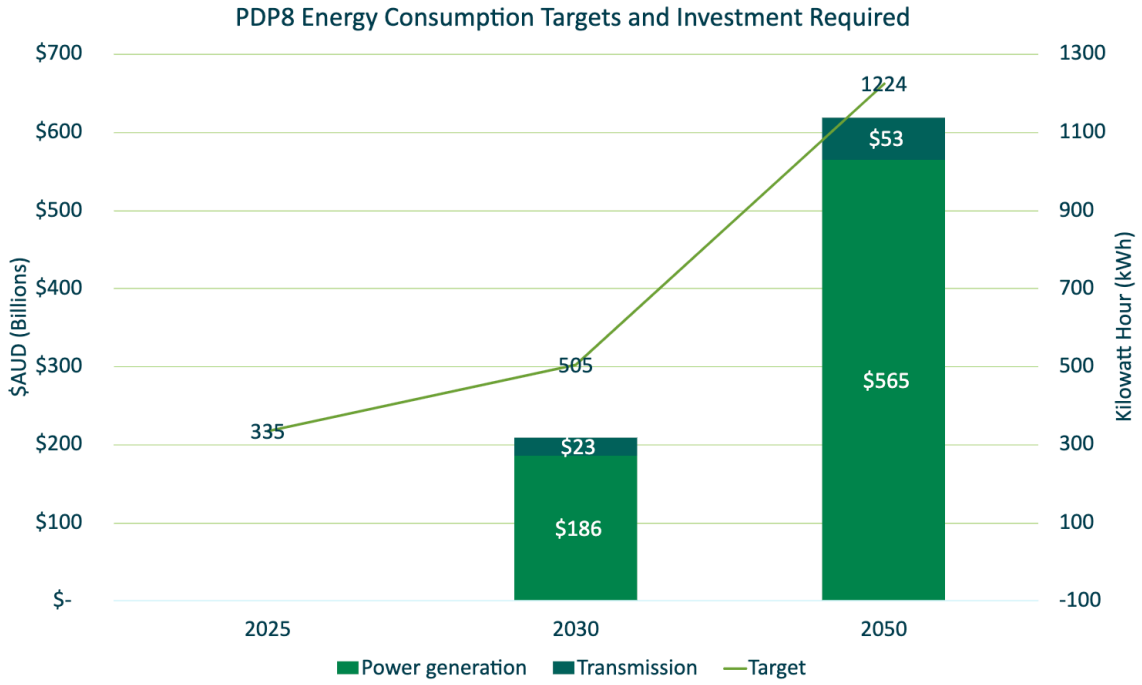
This variability also poses significant challenges for grid synchronisation. A grid functions optimally when it operates at a specific frequency, ensuring that the amount of energy generated is equivalent to the amount of energy consumed. The intermittent flow of energy from renewable sources can cause frequency and voltage fluctuations, compromising the stability of the power grid. Furthermore, the growing prominence of decentralised renewable systems, such as rooftop solar installations, introduces reverse power flows into the grid. This inversion, while indicative of the potential of decentralised energy, necessitates a paradigm shift in grid management.

Geographically, these infrastructure challenges are most severe in the Mekong Delta, Central Highlands, and South Central regions. These regions face both grid congestion and synchronisation issues due to their high renewable installations and substantial local energy demands. Like many countries with grids not designed for intermittent output, Vietnam's existing infrastructure is ill-equipped to handle such complexities and will require significant investment.

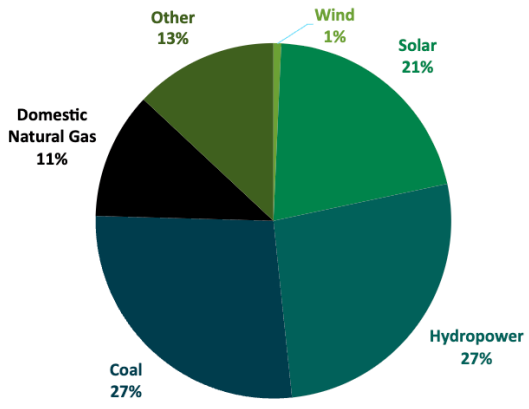
Government plans

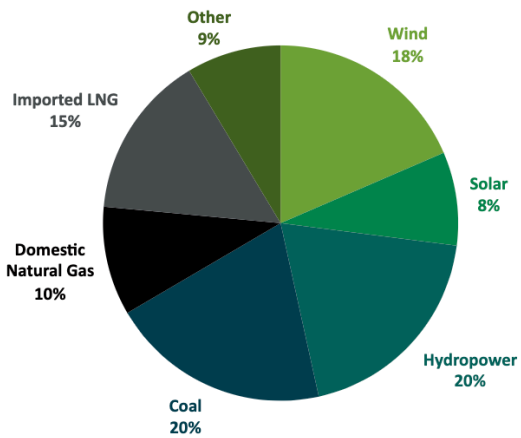
In response to these challenges, Vietnam's Ministry of Industry and Trade (MOIT) released the 2023 National Electricity Development Plan for 2021-2030 (PDP8). The forecast energy consumption underlines the substantial investment required to develop Vietnam's energy sector and presents opportunities for international energy companies. The table below outlines the targets and relevant investment required to 2050. The strategy anticipates solar and wind to do the heavy lifting for renewable energy, with solar projected to generate 34 percent of capacity after 2030 and wind projected to generate 27 percent of capacity by 2050.

Vietnam's energy generation and investment target



Vietnam's 2020 & 2030 energy mix according to PDP8





In addition to designating regions for renewable development, PDP8 also outlines strategies for grid improvement, ensuring that infrastructure keeps pace with renewable projects. The approach relies heavily on technological advancements, including sophisticated grid management systems with real-time monitoring capabilities. These systems can manage power flows autonomously, ensuring the synchronisation of multiple power sources. In addition, the infrastructure of the physical grid, including transmission lines, substations, and distribution networks, is undergoing modernisation. Modern substations can better manage power distribution, even in the face of variable renewable inputs, if transmission lines are upgraded to alleviate congestion.

Additionally, energy storage solutions, particularly battery storage, have garnered interest. These storage solutions can act as buffers, storing the surplus output during peak times and releasing it during periods of underproduction. Not only do they mitigate curtailment, but they also contribute to grid synchronisation, ensuring that the grid frequency remains stable despite the fluctuations of renewable generation.

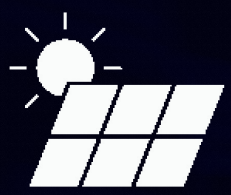
Key renewable opportunities based on PDP8

Wind Energy

Opportunity: Developing onshore wind power up to 21,880 MW and offshore wind power up to 6,000 MW by 2030. Long-term goal of reaching up to 91,500 MW of offshore wind by 2050.

Challenges: Meeting these ambitious targets will demand extensive land use, cutting-edge technologies, grid adjustments, and significant capital investments.

Key Locations: The Central Coastal region (Quang Binh and Quang Tri), Central Highlands (Kontum and Gia Lai Dak Lak), and the Southern Coastal regions (Ninh Thuan and Binh Thuan) have the greatest potential for onshore wind power. For offshore wind power, the Central Coast (particularly provinces in the south), southern provinces in the Mekong Delta region and northern provinces are identified as potential areas for development beyond 2030.



Solar Energy

Opportunity: Focus on increasing solar capacity by 4,100 MW and rooftop solar by 2,600 MW by 2030. The strategy emphasises the importance of rooftop solar for homes and businesses disconnected from the grid for on-site consumption. Long-term potential for 189,000 MW from various solar sources by 2050.

Challenges: Aligning this rapid development with existing grid capacities, ensuring consistent power distribution, and managing land acquisition and renewable generation close to demand centres.

Key Locations: Rooftop solar has widespread urban and rural potential. Central Highlands and South Central regions have potential for the development of solar energy facilities, in addition to Southern provinces for roof-top solar connected to large-scale industrial, commercial and residential facilities.

Biomass Energy

Opportunity: Aim to reach 2,270 MW capacity by 2030, increasing to 6,015 MW by 2050.

Challenges: Efficient supply chain management, technical expertise, infrastructure development and competing demand for land.

Key Locations: The Mekong Delta, abundant in agricultural residues, is pivotal for biomass-based energy projects.

Hydropower

Opportunity: The long-standing cornerstone of Vietnam's energy matrix, hydropower, is set to reach 29,346 MW by 2030 and potentially 36,016 MW by 2050.

Challenges: Addressing requirement for freshwater ecosystem sustainability, managing resettlement of displaced households, and ensuring consistent power supply during dry seasons.

Key Locations: On the Red River system in the north, Hoa Binh and Lai Chau provinces remain as the key sites for construction of hydropower plants. Provinces such as Gia Lai in the central/central highland areas have also been identified as potential locations for future hydropower expansion.

Stored energy or battery solutions

Opportunity: focus on developing pumped hydropower and battery storage by 2030, totalling 2,700 MW.

Challenges: capital-intensive projects, and grid integration.

Key Locations: Under PDP8, the Ninh Thuan province in the southeast will be the primary location for pumped hydropower plants.

Private investment

Private investors have contributed substantially to the expansion of Vietnam's energy generation capacity since 2018. At least 45 percent of this growth is attributable to private investments (both foreign and domestic), while 35 percent came from FDI, either alone or in partnership with local companies and governments. In 2022, foreign investment in renewable energy reached a record AUD 10.6 billion, up from USD 8.2 billion in 2021. This investment reflects the interest of other countries, including Europe, Japan, Korea, China, and the US, in seizing opportunities in Vietnam.

Uncertainty around government policy has created perceptions of risk that could deter some investors. While Vietnam has made recent progress in providing an enabling regulatory environment to support renewables, other risks remain. For instance, land acquisition is complex and challenging. Concerns regarding land rights, compensation, and relocation must be addressed and weighed against the available renewable energy resources. Local communities need to be brought on this journey.

Regulation around feed-in tariffs (FiTs) has also been challenging. FiTs are a pricing mechanisms that guarantee producers of renewable energy a fixed price for the energy they input into the national grid. FiTs are intended to incentivize renewable energy investments by providing predictable revenue streams and ensuring the financial viability of projects. The 2017 solar FiT was a turning point for solar generation, promising 9.35 cents per kilowatt-hour for twenty years.

Within two years, solar installations had grown massively. This boom created grid congestion as production outpaced regional capacity. A new regulation in 2020 revised the FiT regime and the government has been working through how to handle incomplete solar projects started under the previous regulation, which has contributed to a slow down in renewable energy development.

Phasing out coal power

Vietnam is attempting to slowly phase out coal, which continues to dominate energy generation, comprising more than fifty percent of the capacity added since 2018. Under PDP8, Vietnam has committed to phasing out coal by 2050 however it will still complete six coal-fired power plants under construction by 2030. It plans to convert plants older than 20 years to alternate fuels (including gas and co-firing with biomass and green ammonia) once it is cost effective and feasible. Plants older than 40 years that cannot be converted will be decommissioned. However, technology and planning may not be sufficient on their own. The human element is paramount to the transition. The coal industry is a major employer. A 'just transition' as coal is phased out will require the workforce to be retrained and integrated into the emerging renewable energy sector (reference to section in paper).

Businesses will also need to navigate the commercial implications of phasing out coal. Many of these assets may become "stranded" if coal is phased out, resulting to significant financial losses. And coal power plants often have long-term import agreements and power purchasing agreements. It can be complicated to renegotiate contract terms or face potential penalties.

Preparing for the renewable energy market

Investors and businesses considering the renewable energy sector in Vietnam should take a number of preliminary steps. Australian investors in infrastructure projects in emerging markets should be prepared for a different risk profile. This results in a higher weighted cost of capital, which necessitates a higher internal rate of return in order to achieve profitable results. To accomplish the desired returns, the commissioning process must be expedited. Adopting best practices for the delivery of capital projects, such as developing an integrated construction and commissioning plan early on, can be advantageous.

Australian investors new to doing business in Vietnam should actively seek out and establish trustworthy partnerships with domestic entities that possess the necessary expertise. These local associates offer invaluable insights, spanning knowledge of the Vietnamese energy sector, capital initiatives, and the prevailing regulatory framework. Local energy enterprises, such as Trung Nam, TTC, Gelex, T&T, Bitexco, and PC1 Group have practical knowledge of the nuances of the Vietnamese energy market.

In addition, significant real estate developers who are proficient in land-use and managing capital projects in Vietnam can impart specialised knowledge pertinent to each province. Understanding and working with Vietnam's renewable energy incentives is essential. Expert advice to Navigate Vietnam's complex incentives, feed-in tariffs, taxation rules, and capital subsidies will be essential. Participation in public-private partnerships could facilitate the acquisition of necessary resources and approvals. Keeping abreast of evolving policies, incentive structures, and technological innovations will provide a competitive edge for investors and developers.

Finally, it is essential to collaborate with provincial agencies, the Investment Promotion Agency and relevant government ministries. Obtaining land-use rights for renewable initiatives can be challenging. For instance, in some provincial land-use plans the majority of land is reserved for agricultural activities. Provincial plans designate land parcels for particular industries and goals, including power generation. Therefore, developers are tasked with presenting their projects' significance and justifying their inclusion in these plans. While provinces enjoy considerable autonomy in their land use planning, it is essential that their local strategies align with Vietnam's national objectives.

Key areas of opportunity for Australian businesses

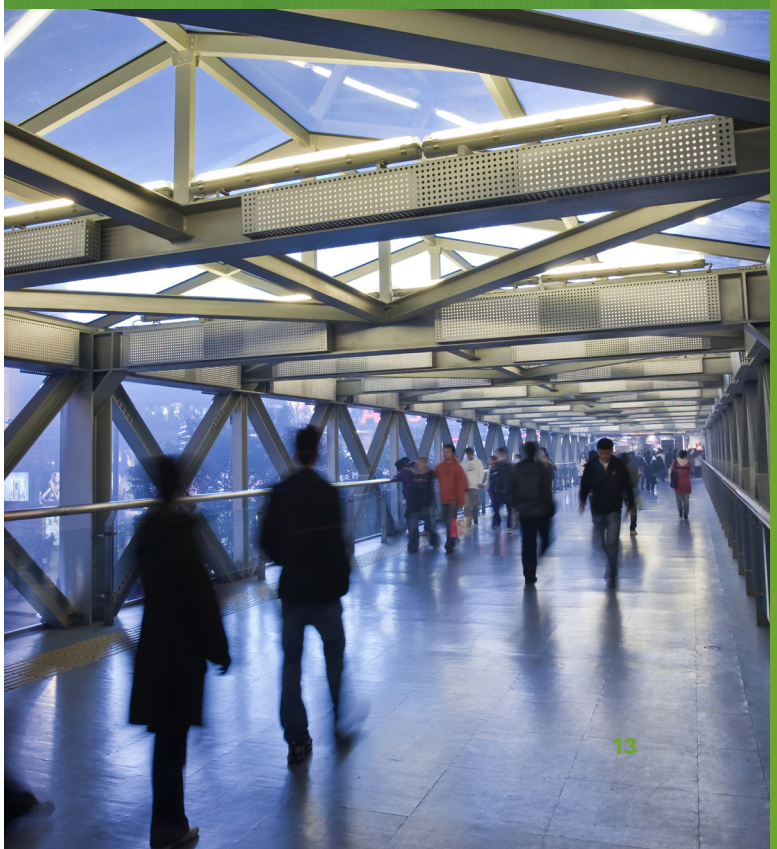
Wind and solar energy are more likely to be medium-term opportunities for Australian businesses and investors due to recent regulatory uncertainties. However, companies can't simply expect to enter the market at a future point and immediately do business. They should begin building their market knowledge and presence now through commissioning expert advice, regular visits, establishing representative offices, and exploring partnerships.

Off-grid solar is an opportunity given Australia's expertise in this area and its protection from the impact of FiTs, although great regulatory is needed first. Residential and commercial developments by major Vietnamese conglomerates present opportunities for export of Australian equipment, technology and services. Other areas of opportunity that play to Australia's strengths include pumped hydro, energy storage and alternate fuels to fire coal-fired powerplants, such as green ammonia. In addition to businesses taking advantage of Austrade and the Department of Foreign Affairs and Trade (DFAT) services in Vietnam, the Australian Government is setting up an Investment Deal Team that will support investors.

Forthcoming papers will identify opportunities further along the value chain for Australian businesses.

Future of Electricity – Vietnam

The Future of Electricity – Vietnam (FE-V) initiative was launched in July 2023 by the Australian Government with the support of the Central Economic Committee (CEC). The initiative aims to strengthen ties between the energy and climate institutions of both countries. This new partnership will focus on sharing knowledge on electricity generation, fuels, infrastructure, markets, and consumption in order to increase green energy production and secure energy supplies. FE-V complements the Australian Government's recent announcement of a AUD 105 million package to support Vietnam's economic development.



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