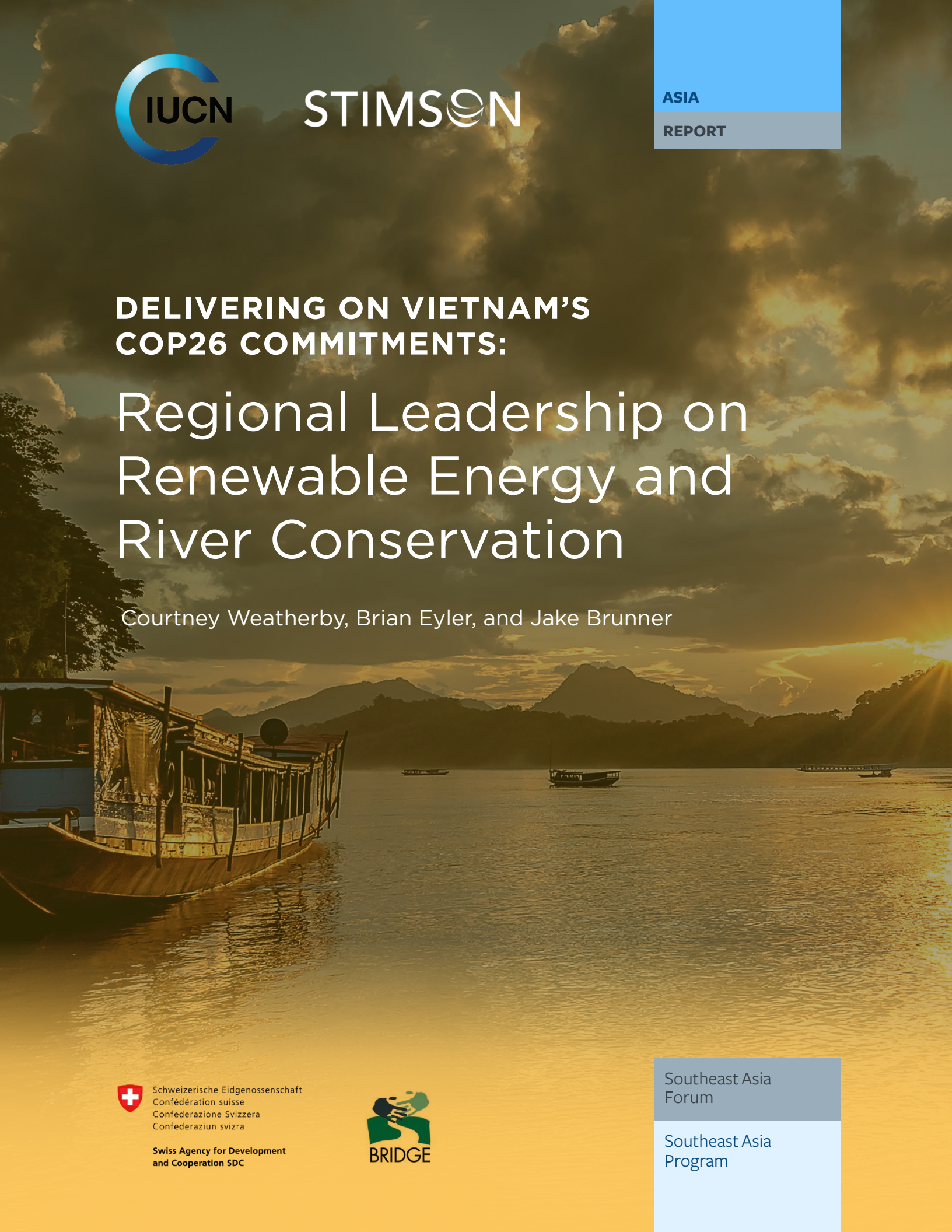

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REPORT

DELIVERING ON VIETNAM'S COP26 COMMITMENTS:

Regional Leadership on Renewable Energy and River Conservation

Courtney Weatherby, Brian Eyler, and Jake Brunner

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The BRIDGE (Building River Dialogue and Governance) Project aims to build water governance capacities through learning, demonstration, leadership, and consensus building, in particular in transboundary river basins. Collaborative governance is central to the sustainable and efficient use of the water resources of the trans-boundary 3S rivers. IUCN, under the umbrella of the BRIDGE project funded by the Swiss Agency for Development and Cooperation, supports Cambodia, Lao PDR and Viet Nam in establishing frameworks to implement a long-term water resources management strategy for the basin.

For more information see: https://www.iucn.org/our-work/region/asia/our-work/water-and-wetlands/bridge-sekong-sesan-and-sre-pok-river-basins-bridge-3s.

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EXECUTIVE SUMMARY

Vietnam's COP26 commitments delivered in November 2021 offer an ambitious agenda to de-carbonize its economy by avoiding new coal plants and transitioning towards clean energy. This is a significant departure from existing energy plans and an indication that Vietnam is politically motivated to move to a more diverse and less carbon-intensive energy mix. As Vietnam re-prioritizes domestic energy investment and rethinks power imports, it can also reduce threats to the Mekong Delta by importing power from Laos that excludes high risk dams and prioritizes imports from solar, wind, and low-impact hydropower plants.

Vietnam's previous power development plans anticipated more than 40,000 MW of new coal plants to be built in coming decades, and Vietnam's commitment to build no new coal plants will require a major change to the power mix. One aspect of this will be to robustly expand renewable solar and wind power. Vietnam has a good track record of rapidly scaling up variable solar and wind, moving from almost none of either in 2017 to approximately 20,000 MW of both by early 2022. This is a major success, but the Mekong Infrastructure Tracker shows that to date Vietnam's rapid deployment of solar has been largely driven by domestic investment. Domestic funds are limited, and so as Vietnam moves to expand renewable power, it will need to grapple with regulatory and grid integration issues in order to attract international finance.

Vietnam plans to meet future power demand by importing more electricity from Laos. This can be done in ways that either promote or threaten the integrity of the Mekong River, which underpins the region's extraordinary agricultural and fisheries productivity as well as the climate resilience of Vietnam's own Mekong Delta. Vietnam's choices about which projects to support can be used to maintain long stretches of free-flowing rivers by avoiding sourcing power from badly placed hydropower projects. A Lao hydropower project with potentially huge environmental impacts is the Sekong A dam, which is being built by the Vietnamese company Song Da 6. This dam would disconnect the Sekong River, the last free-flowing major tributary of the Mekong, and negatively impact fish and sediment for only 86 MW of power. By strategically selecting lower-impact hydropower projects or solar and wind farms in southern Laos, Vietnam can increase power imports while avoiding unnecessary impacts on agriculture and fisheries.

Opportunities to increase non-hydro electricity imports are growing. Vietnam and Laos have negotiated the first cross-border trade deal for wind energy in ASEAN, setting a precedent for regional trade in solar and wind as the ASEAN Power Grid starts to take shape. Cambodia, Laos, and Vietnam have an opportunity to coordinate energy planning and investment in ways that help all three countries achieve energy security while minimizing social and environmental costs. A study by IUCN and Stimson Center on energy options in the Sekong-Sesan-Srepok (3S) River Basins shows that international cooperation on energy planning is vital to maximizing mutual benefits.[1]

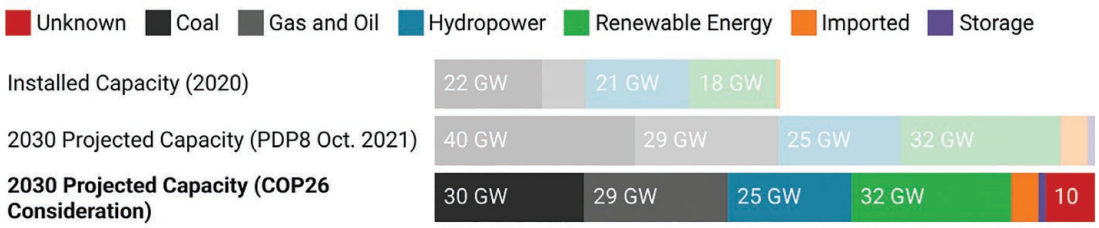
This report explores how Vietnam can implement its COP26 energy commitments in the power sector through supporting the renewable energy transition at home, sharing lessons learned with decisionmakers in Laos, and coordinating on electricity trade to minimize environmental impacts.

VIETNAM'S COP26 COMMITMENTS

At COP26, Prime Minister Pham Minh Chinh emphasized the need to put climate change and environmental management at the center of economic development. He also signed onto a UK-led commitment to accelerate the clean energy transition and move away from new coal. These commitments build on the recent boom in solar and wind power and the need to ensure Vietnam's competitiveness in a world where low-carbon energy and environmental sustainability are key for attracting international investment. The Communist Party of Vietnam has passed a series of resolutions to help drive progress in this space, most notably Resolution 55 in 2020 on the *Orientation of Viet Nam's National Development Strategy to 2030 and Outlook to 2045,* which provides a legal basis for Vietnam's transition to renewable energy.

Vietnam's COP26 commitment to building no new coal projects beyond those already under development will require far reaching changes. Coal currently makes up about one-third of total energy capacity and many projects are already under construction.[2] A late 2021 draft of Power Development Plan 8 (PDP8) proposed an additional 41,000 MW of coal capacity by 2030.[3] Just over 30,000 MW is accounted for by projects that already exist or are under construction. Vietnam therefore needs to find at least 10,000 MW of alternative power sources to replace the previously planned coal. Filling this gap requires a much greater investment in natural gas, renewables, and power imports.

IMPACT OF COP26 COMMITMENTS ON VIETNAM'S POWER MIX



Installed Capacity in 2020 is drawn from the Stimson Mekong Infrastructure Tracker. Data on 2030 Projected Capacity PDP8 is drawn from the October 2021 draft of Vietnam's Power Development Plan. Data on the 2030 Projected Capacity with COP26 consideration reviews the 2030 projected capacity, removing 10 GW of planned coal projects which have not yet begun construction as of January 2022 according to the Mekong Infrastructure Tracker.

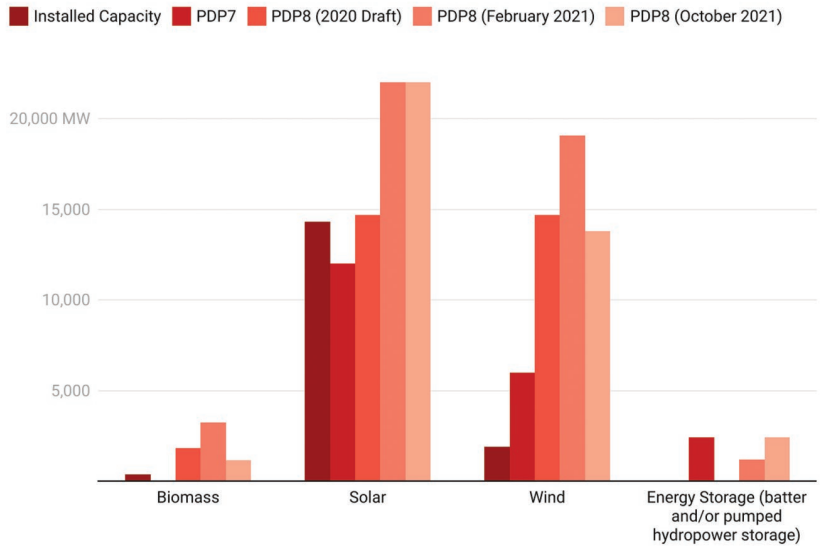
A dramatic expansion of renewable energy is possible over the next decade: Vietnam increased its installed solar capacity from almost zero in 2017 to over 16,000 MW by the end of 2021. Technical challenges remain relating to energy storage, transmission, and grid reliability. However, the biggest challenge to further investment is regulatory. To date, Vietnam's success in expanding solar and wind has been driven by domestic and regional financing but doubling that capacity will require Vietnam to tap into international financing.

UNLOCKING RENEWABLE ENERGY IN VIETNAM

To meet its goal of net-zero emissions by 2050, Vietnam needs to massively increase its renewable energy capacity, particularly solar and wind. This will require substantial investment: the most recent iteration of Vietnam's PDP8 estimates an annual financing need of over $11 billion, much of which will be allocated for renewables.[4] To date, almost all investment in Vietnam's renewable generation has come from domestic and regional sources in Asia. Maintaining the rapid expansion of renewables, however, depends on Vietnam's ability to unlock international investment.

Vietnam has done an impressive job tapping into local private investment to rapidly scale up solar, far exceeding government targets. While it's not yet clear exactly how much solar and wind will be included in the final and official PDP8, they are clearly set to rise.

EVOLVING RENEWABLE ENERGY TARGETS IN VIETNAM



Power Development Plan 7 (PDP7) doesn't note specific power generation capacity targets for biomass. The earliest PDP8 did not have specific capacity targets for energy storage, but these were added in more recent iterations of PDP8.[5]

The question is how to pay for the large new amounts of renewable energy needed to achieve net-zero emissions by 2050. Most renewable energy projects in Vietnam have been developed by domestic companies. Data from the Mekong Infrastructure Tracker shows that 58% of renewable energy projects in Vietnam were developed entirely by Vietnamese companies. Another 27% were developed by a Vietnamese company with an international partner. Only 12% (or 13 projects) were developed without a Vietnamese project partner.

Mekong Infrastructure Tracker data also suggests that most of the foreign companies sponsoring renewable energy projects in Vietnam come from other countries in Asia, notably Thailand, Japan, and the Philippines. China is largely absent as a project developer or financier in Vietnam, although its companies are heavily involved in neighboring Cambodia and Laos and have more recently begun to acquire stakes in Vietnamese projects.[6]

CHALLENGES IN FINANCING RENEWABLE ENERGY

The problem is that Vietnamese banks and developers alone don't have the financial capacity to meet all future investment needs. Although domestic institutions play a very active role in this space, their resources are finite and must support development across all sectors. Achieving net-zero can only be possible if Vietnam also mobilizes international funding. This requires reforms in investment policy. To unlock international support Vietnam needs to address the following regulatory obstacles:

- **Unbankable Power Purchase Agreement (PPA) terms for utility-scale power plants.** Since 2017, Vietnam has offered a competitive Feed-in Tariff (FIT) for solar energy projects but Electricity Vietnam (EVN)'s standard PPA for solar projects allocates too much risk to project developers. EVN can curtail purchases at any moment for an indefinite period of time. The lack of a purchase guarantee is out of line with global best practice and makes the risk profile unpalatable to many international investors. Vietnamese companies have been able to reduce the risk by engaging key political stakeholders in ways that international companies cannot.
- **Uncertainty over prices.** Vietnam's 2017 FIT provided a guaranteed price for projects that came online within a specific time frame. But there were two issues: the FIT was adjusted numerous times, often giving developers too little time to qualify for the new FIT, and there were sometimes long gaps without an official FIT. While periodic FIT revisions are understandable given how rapidly Vietnam's solar market developed, uncertainty over which FIT would apply when a project comes online is a major risk.
- **Cumbersome permitting procedures.** Registering a new project involves numerous departments from initial project approval to integration into the provincial level plans to land permitting, and so on. The process can be difficult to navigate for international investors without local connections.
- **Direct PPAs between private sellers and buyers have been slow to materialize.** In 2020, government clarified rooftop solar policies, allowing companies to invest in solar to cut costs and help meet corporate emissions targets.[7] This was an important first step but rooftop solar alone is insufficient to meet long-term carbon reduction targets, and many companies want to purchase renewable energy directly from outside producers. Despite MOIT announcing plans for a pilot direct PPA scheme in 2019, movement has been slow.

Vietnam has taken steps to address these issues: in January 2022 the National Assembly approved Law No. 3 which gives private companies the right to invest in and operate electricity transmission lines.[8] This should alleviate some of the uncertainty and risk involved in connecting utility-scale renewable energy to the transmission network. The Ministry of Industry and Trade has announced a 2-year pilot direct PPA scheme that will start in 2022.[9]

BANKABILITY CONCERNS FOR PPAS

Issue	Details
No "take or pay" obligation	Electricity Vietnam (EVN) is currently the only offtaker for electricity generated by power producers in Vietnam. The PPA terms currently do not require EVN to purchase electricity, and so if for any reason EVN is unable to take power--for instance, if they curtail production due to grid overload or are unable to take electricity due to grid maintenance--then the project developer has no alternative market available. A "take or pay" clause is common practice elsewhere and ensures that the offtaker or purchaser of electricity will pay something, even if they are not making use of the electricity--but the solar PPA does not include a "take or pay" clause. This places risk on the project developer.
No sovereign guarantee for EVN	EVN has historically run into cost-recovery and cash flow issues, due to the necessity of providing affordable electricity to consumers while also managing grid maintenance and investing in new power generation and transmission projects to meet rapidly rising demand. While EVN has since 2021 has achieved a positive credit rating, EVN has in previous years incurred significant financial losses and its creditworthiness has been an issue. The PPA does not provide a government guarantee for EVN's obligations to purchase electricity, meaning that if EVN defaults for any reason, the government of Vietnam does not guarantee that a project developer will get paid for their electricity. This places risk on the project developer.
Limited repayment in the event PPAs are terminated	In the event that EVN terminates the Power Purchase Agreement, the law has previously limited EVN's compensation obligations to the value of electricity generated during the previous year which is a relatively limited amount when compared against the potential debt that developers took on. This could be problematic if a PPA is terminated only a few years after the project becomes operational. A 2019 update does provide some restitution and expectancy damages, but the burden of proof of losses is on the project developer. The law specifically notes that in the instance of force majeure--a legal term for a situation where unforeseeable circumstances prevent one side from fulfilling a contract--that either side does have some relief, but it notes that acts of government are not expressly included as force majeure. This means that if EVN is unable to pay due to any force majeure event, there is limited recourse for project developers.
Developer responsibility for transmission costs	The PPA required developers to be responsible for the cost of connecting a new renewable energy project to the national grid. This involves not only additional investment in transmission infrastructure but also the necessary permitting and grid connection agreements. This incurs costs to the developer.
Inflation or exchange risks	The PPA did not index pricing of the feed-in-tariff to anything like the Consumer Price Index, which potentially leaves inflation risks. A 2019 update to the PPA terms did include adjustments for the VND/USD exchange rate on the date of invoice.
Government-led dispute resolution process	In the event of any disputes over the PPA, the Renewable Energy Department under the Ministry of Industry and Trade will handle dispute resolution. if the dispute is not solved, then the resolution would be shifted to the Electricity Regulatory Authority of Vietnam and then Vietnamese courts. This government-managed dispute resolution could be perceived as partial given that EVN is also a government body. Some solar PPAs have included alternative options, and so this

Table contents are summarized from discussions with private sector stakeholders and also draw on commentary by legal experts at Norton Rose Fulbright, Akin Gump, Duane Morris Vietnam, and Jones Day.

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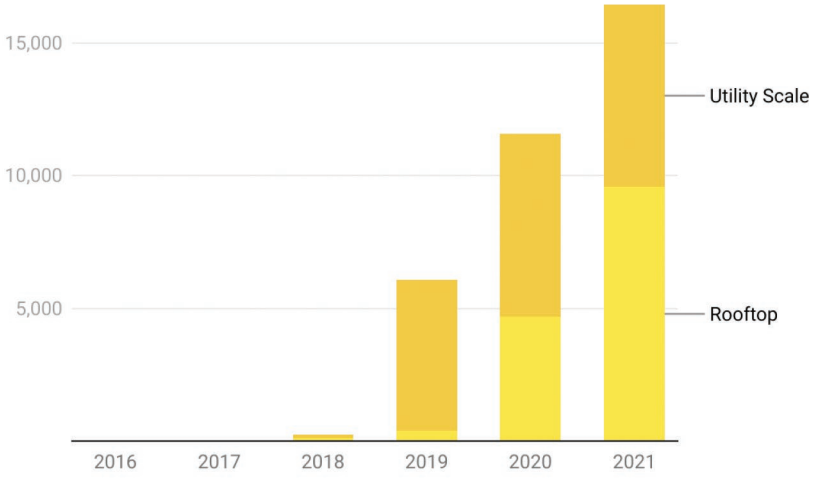
FUTURE OF SOLAR AND WIND IN VIETNAM

Nowhere has the importance of regulatory reforms been clearer than in the solar and wind sectors. Vietnam set global records after adoption of an attractive Feed-in-Tariff (FiT) in 2017 triggered an investment boom. In 2017 Vietnam had almost no solar power; by 2021, it had more than 16,000 MW of solar power.[11] This was directly linked to the adoption of new FiTs, including the April 2020 adoption of a rooftop solar FiT which brought online 9,500 MW by December 2021.[12] This skyrocketed past Vietnam's solar target through 2030 and rapidly surpassed Thailand's installed solar capacity of about 3,000 MW, pushing it to be the third largest global solar market in 2020 and the leader in ASEAN for solar deployment.

VIETNAM INSTALLED SOLAR CAPACITY, 2017–2021

This chart shows the total installed solar capacity in Vietnam by year and type of installation.



Source: Data on installed capacity for each type of solar power drawn from IRENA Renewable Energy Statistics in 2019 and 2020, EVN Solar website, PV-Tech, and Vietnam Energy Partnerships Group. • Created with Datawrapper

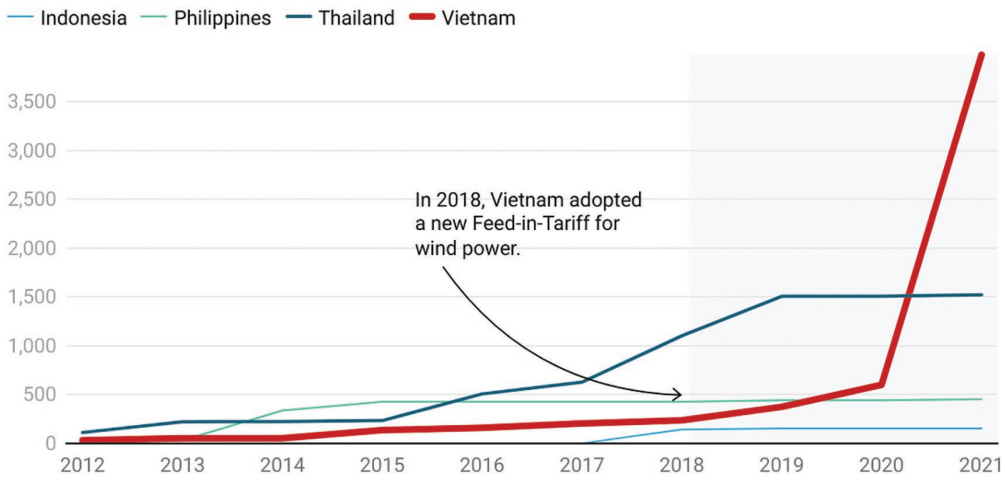
However, it is expected that wind and not solar will drive the next phase of Vietnam's renewable energy transition. The final version of PDP8 raised the target for solar and wind to 50% of Vietnam's power supply by 2045. As wind and solar are intermittent, 18 GW of wind is needed by 2030 and an estimated 42.7 GW of onshore wind and 54 GW of offshore wind are needed by 2045.[13] This rapid expansion is technically feasible: Vietnam has at least 24 GW of high-quality onshore wind potential with average wind speeds of over 6 m/s, and an additional 404 GW of potential at lower wind speeds of 5-6 m/s.[14] Due to its long coastline and the strong winds of the north-east monsoon, the World Bank estimates Vietnam's offshore wind potential is more than 500 GW and could eventually replace coal as base load power.[15] Wind also generally has a higher capacity factor than solar. But taking advantage of this potential will require massive investment as Vietnam's current wind power comes to just under 4 GW.

Although solar has driven Vietnam's recent surge in renewable energy, government interest in wind power actually pre-dates solar. Vietnam's PDP7 published in 2010 aimed for 1,000 MW by 2020 and 6,200 MW by 2030.[16] In June 2011, the Prime Minister's Decision 37 introduced a guaranteed FiT for wind of $0.078/kWh for a

20-year contract.[17] However, investment in wind power projects has been slow to materialize. Only 135 MW of wind power was online by 2015, well under half the PDP7 target for 2020.[18] In response, Vietnam's revised PDP7 in 2016 reduced the wind target to 800 MW by 2020.[19] This contrasted with solar, where capacity expanded exponentially after an attractive FIT was announced in 2017.

In the early 2010s, Vietnam was setting similar wind targets as Thailand and the Philippines but installed capacity lagged both. A key difference was the lower FIT: the Philippines' FIT was $0.16/kWh and Thailand's FIT was $0.15/kWh.[20] These higher FITs were successful in stimulating investment, but Vietnam's FIT was simply too low, especially given high interest rates for renewable energy projects.[21] But in 2018, Decision 39 raised the wind FIT to $0.085/kWh for onshore and $0.098 for offshore wind for projects that came online by November 1, 2021.[22] This attracted investment: Vietnam's wind capacity rose 10-fold from less than 300 MW in 2018 to 3,980 MW by November 2022.[23]

WIND POWER IN ASEAN, 2012–2021



This chart shows installed wind capacity in four ASEAN countries from 2012 to 2021. Until 2019, Vietnam's wind capacity was significantly less than capacity in the Philippines and Thailand.

Source: IRENA Renewables Statistics 2021; Electricity Vietnam; and nd press releases for small-scale wind projects in Thailand and the Philippines in 2021. • Created with Datawrapper

Another 37 projects with 2,500 MW of capacity missed the late October 2021 deadline.[24] In many cases this was attributed to supply chain and labor disruptions as well as commissioning delays due to the COVID pandemic. Although close to completion, these projects are stuck in limbo, as the developers cannot move forward until they know the pricing structure.

As of mid-2022 there is still significant uncertainty about the future pricing structure for both onshore and offshore wind. Decision 39 indicated that the FIT might be replaced by a reverse auction system after the FIT expired in 2021, which would push investors to compete on price. A letter from the Ministry of Industry and Trade proposed FITs that would decline over time through 2023, but no decision has been made.[25] This lack of clarity about the price and PPA terms will likely inhibit further near-term investment.

GRID INTEGRATION CHALLENGES

Vietnam has made impressive progress on its renewable energy transition in recent years, but the rapid expansion of solar and wind is straining the country's electricity grid. In 2020 and 2021, more than 100,000 rooftop solar projects, at least 15 utility-scale solar plants, and around 75 wind plants were connected to the grid. Most of these projects are concentrated in a few southern provinces, outpacing the ability of the grid to integrate them. This is emerging as a major hindrance to further expansion of renewable energy: in 2022 Vietnam's National Load Dispatch Centre announced a pause on new solar and wind projects.[26] To ensure continued progress toward Vietnam's renewable energy target of 50% solar and wind by 2045, Electricity Vietnam (EVN) must improve grid planning and investment.

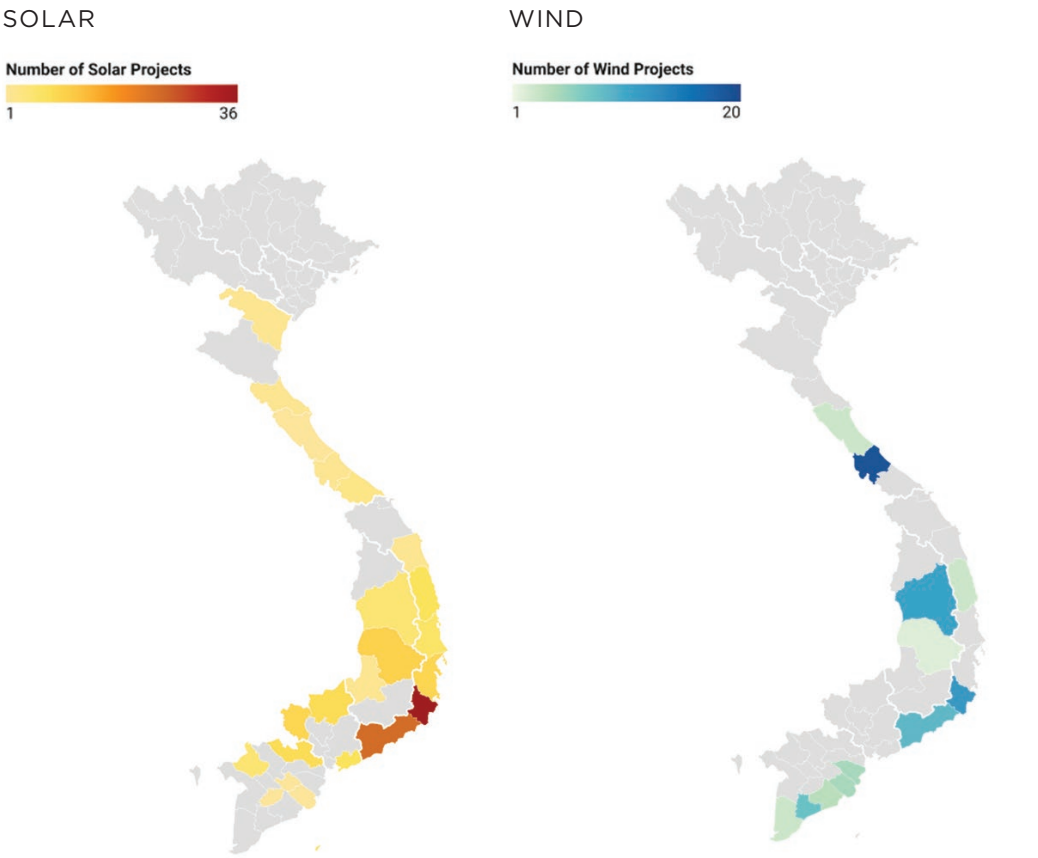
Variable solar and wind power differs from traditional power sources like coal, natural gas, and hydropower in important ways. The latter can produce power on demand, but solar and wind power are variable. When only a few power plants produce variable energy and their contribution to overall power supply is low, grid operators can manage variability in the grid without much difficulty. Experts generally divide renewable energy penetration into phases, and as the grid's share of renewable energy rises, grid operators need to make increasing adjustments to ensure that the grid operates smoothly.

PHASES OF VARIABLE RENEWABLE ENERGY INTEGRATION

Phase	Characteristics	Actions	% of VRE	Examples
Phase 1	VRE projects are connected to the gird, but impacts are localized at the point of grid connection. There is no noticeable impact on the broader energy system.	Not necessary	Usually 5% or less.	3.1% 2.6% 1.6% 0.2%
Phase 2	Enough VRE power plants are connected to the grid that there are noticeable differences between planned electricity load and actual electricity produced from VRE. VRE has some impacts on grid and energy system management and operation.	Make operational changes to better utilize VRE and utilize existing resources to effectively integrate VRE.	Often between 5-10%.	7.5% 7.8% 8.2% 8.4% 9.1%
Phase 3	The amount of VRE in the energy system causes systematic disruptions to the supply and demand balance, impacting stability. VRE determines the way that the broader energy system operates.	Invest in additional power system flexiblity. Curtail VRE production to maintain stability.	Often between 10-25%.	California 13.6% Texas 13.9% 13.9% 23.9% 28.3%
Phase 4 and Up	During some periods of time, VRE produces almost all of the electricity.	Make significant regulatory and operational changes to ensure system stability. Require VRE to provide ancillary services such as battery storage, backup power, etc.	May begin above 20% of installed capacity for less flexible grids; often above 30% for more developed grids	31.4% S Australia 46.6% 58.5%

This table shows the four general phases of variable renewable energy integration, describing effects on the grid and potential responses. The ability of a grid to integrate variable renewable energy (VRE) will depend on its technical specifications, regulatory practices, operational and institutional practices, and other market factors--so there is no specific percentage of renewable energy for each phase. However, this chart shows example countries at each phase and their percentage of VRE generation. No country has yet reached Phase 5 or 6, but in coming years some countries may reach points at which VRE begins to provide temporary surplus or deficit, requiring storage on a larger scale.[27]

Vietnam's deployment of renewable energy has been both rapid and geographically concentrated with the vast majority of solar installed in the south. Solar energy accounts for about 25% of Vietnam's total installed capacity, but up to 42% of installed capacity in some southern provinces.[28] Wind is also concentrated: half of all of Vietnam's wind projects are located in Gia Lai, Ninh Thuan, and Quang Tri Provinces. Renewable electricity generation is only approximately 16%, however, due to curtailment.[29]



This map shows the number of operational solar power projects (left) and wind projects (right) in each province in Vietnam as of May 2022. There solar map includes a total of 151 operational solar projects with installed capacity of more than 12,000 MW, not including rooftop solar projects. The wind map (right) This map shows the number of wind projects which had reached partial or full commercial operation with Electricity Vietnam in each province as of November 1, 2021. [30]

Vietnam has moved rapidly from Phase 1 of variable renewable energy integration on the chart above—where renewables represent a small percentage points of total energy supply and have limited impact on the grid—to at least Phase 2 at the national level and in some places to Phase 3, where there is enough renewable energy to impact grid operations and additional investments in grid infrastructure are required.

Like many other countries in developing Asia, Vietnam has historically underinvested in transmission. Instead, planners have prioritized funding for power generation to meet rapidly rising demand. Vietnam's planned transmission expenditures in 2021 were about a quarter of what was envisioned in the Power Development Plan, which outlines Vietnam's future vision for the power system through 2045.[31]

Existing north-south transmission lines are close to capacity: a World Bank study showed that existing transmission could integrate up to 3.3 GW of variable renewable energy in southern Vietnam, but that additional power would require upgrades to transmission lines and transformers.[32] The recent expansion of solar and wind is closer to 20 GW, significantly outpacing the grid's ability to absorb the new power.

New rules are helping the integration of renewable energy, including requiring grid operators to prioritize the dispatch of solar and wind power. However, several technical and regulatory constraints are holding back progress:

- **No clear plan to address grid congestion.** It takes longer to build transmission lines than to build power stations. Yet a 2020 survey by USAID was unable to identify a clear grid investment plan to integrate variable energy.[33] EVN is therefore stuck reacting to the recent solar and wind boom rather than planning for it. This must be addressed urgently to support the rollout of the 100 GW of new solar and wind power that Vietnam needs to meet its zero net emission target.
- **Limited forecasting of variable energy**. Vietnam cannot yet reliably forecast variable renewable energy production, inhibiting its ability to march supply and demand. Better forecasting based on weather and historical power plant operations would ease grid management.
- **Outdated national grid code**. Vietnam has made some updates to grid regulations, but these don't yet provide the flexibility to accommodate frequent changes in variable energy and lack specific technical requirements for variable energy.[34]
- **No incentive for other energy sources to complement variable energy.** As renewable energy's share of the electricity supply rises, the grid will benefit from the deployment of ancillary services. These include battery storage and using traditional power sources more flexibly, especially LNG plants that can be quickly ramped up and down to complement solar and wind output. Traditional power purchase agreements (PPAs) do not allow for flexible operation. Adjusting PPA terms and instituting a preferential tariff could incentive battery storage and optimize the use of traditional power sources.
- **Limited connections with its neighbors.** Vietnam trades electricity with neighbors China, Laos, and Cambodia, but trade is still very limited. Improved interconnectivity and increased power trade could allow for spot purchases of electricity from Laos or Cambodia when solar and wind underproduce in Vietnam, thereby optimizing power supply at the regional level.

LINKING THE RENEWABLE ENERGY TRANSITION TO RIVER CONSERVATION

While efforts to promote renewable solar and wind and remove coal from the future power plan are progressing domestically, Vietnam also plans to increase power imports from neighbors to meet national energy demand. Vietnam's April 2022 draft PDP8 anticipates that electricity imports will rise from only 572 MW in 2020 to around 4,000 MW by 2025.[35] This will take advantage of a regional focus on building an ASEAN Power Grid and improving regional electricity trade. Vietnam's future power imports will largely come from Laos and possibly from Cambodia.

ASEAN countries have discussed the merits of electricity trade for more than three decades, and a more interconnected grid has clear benefits on a regional scale. The ADB estimated in 2012 that improvements in electricity trade could save up to $200 billion in energy investments across the region.[36] The IEA did a study on multilateral power trade in ASEAN and revealed that increased connections would allow ASEAN to better integrate and use both hydropower and variable renewable energy sources because it allows for better planning around weather and seasonally dependent resources.[37] These benefits are evident in other power systems in the United States, Central America, and Africa. Improving grid connections can help build greater resilience and absorb excess variable renewable electricity. For example, more and better grid connections would enable provinces in southern Vietnam to sell excess solar power to Laos or Cambodia rather than curtail it and when weather forecasts indicate cloudy weather is coming, southern Vietnam could more flexibly import hydro or solar from unaffected areas in Laos or Cambodia.

However, the way in which Vietnam engages in electricity trade with its neighbors will directly influence the development of power generation projects in those countries. Much of the power Vietnam imports from Laos could come from dams that deliver significant environmental impacts to Vietnam's Mekong Delta downstream. Yet as a power purchaser, Vietnam can alter the course of power development in Laos and Cambodia to keep the Mekong free of the most impactful dams.

Coordinating on electricity trade will be vital to protect the Mekong Delta, which is home to 90% of Vietnam's rice exports and most of its fruit and aquaculture production. The Delta plays a major role in national and regional food markets, but its agriculture and fisheries are threatened by a mix of sea level rise, groundwater exploitation, and the impacts of upstream projects that have diminished the flow of sediment and nutrients from the Mekong River. Without transboundary cooperation on energy planning and investment, there is a risk that Vietnam successfully transitions into renewable energy domestically but still purchases electricity from hydropower projects built upstream in Laos that directly threaten the delta.

Vietnam has already acted to reduce domestic threats to the Mekong Delta. In November 2017, the government issued Resolution 120, which provides a legal basis for de-intensifying rice production for multiple social, economic, and climate change adaptation benefits.[38] Resolution 55 was approved in February 2020 and sets out a vision for large-scale integration of renewable energy.[39] While Resolution 55 and Resolution 120 address separate issues, they are connected because the choices that Vietnam makes in terms of its energy mix can either strengthen or undermine Resolution 120.

THE HISTORY OF ELECTRICITY TRADE IN VIETNAM

- Vietnam has been importing electricity from neighbors for nearly 20 years to help address power deficits at home, with imports from China starting in 2004 and power imports from Laos starting in 2013. For reasons of energy security, the government has largely kept imports to a relatively small amount of Vietnam's overall power system. Although the amount of imported electricity has grown over time, the importance of electricity imports peaked in 2010 at 5.6% of the overall power supply.[40] And projected power imports have often not fully materialized: Vietnam's Power Development Plan 7 (PDP7) initially anticipated imported power to make up 3.1% of the power system by 2020, but Electricity Vietnam only imported 1.3% of Vietnam's electricity that year.[41] The revised PDP7 in 2016 anticipated that only about 1,554 MW would be imported by 2030, or only 1.2%.[42]
- While the majority of Vietnam's electricity imports have come from China in recent years, future additional electricity imports will come largely from Laos. Geopolitical concerns about dependence on China surely play a role in this preference, but so too does the Lao government's national development target of becoming the "Battery of Southeast Asia" through exporting hydroelectricity to its neighbors. Laos has signed MOUs with Thailand, Cambodia, and Vietnam to export a total of more than 18,000 MW of electricity through 2030. At least 5,000 MW of Lao power is intended for Vietnamese markets.

Overview of Electricity Trade in CLV Countries

	Electricity Imports 2016-2020	Planned Power Imports in 2030	Existing Power Trade Commitments
Cambodia	19.00% → 30.80%		Cambodia has an MOU to purchase 2,900 MW of electricity from Laos by 2027. Cambodia has previously signed an MOU with Thailand to support power trade with no specified amount. Cambodia has long-term PPAs with Vietnam and a long history of purchasing electricity.
Laos	29.80% → 2.80%	N/A	Laos has existing MOUs to export 10,200 MW to Thailand, up to 5,000 MW to Vietnam by 2030, and 2,900 MW to Cambodia by 2027. There have been some discussions of electricity exports of up to 300 MW to Myanmar by 2025, although the coup and civil war in Myanmar may disrupt this plan.
Vietnam	1.50% → 1.30%	Revised PDP7 in 2016 planned for imports to make up 1.2% of the total electricity mix, or about 1,554 MW. PDP8 increases the role of electricity imports to over 4,000 MW by 2025.	In 2016, Vietnam signed an MOU with Laos to import 1,000 M W of power by 2020, 3,000 MW by 2025, and 5,000 MW by 2030. Vietnam has already signed PPAs for 2,180 MW of power plants. An additional 2,086 MW of PPAs are currently under negotiation and approval processes. Vietnam is considering increasing imported electricity from China and importing from some projects in Cambodia, but no new MOU has been signed.

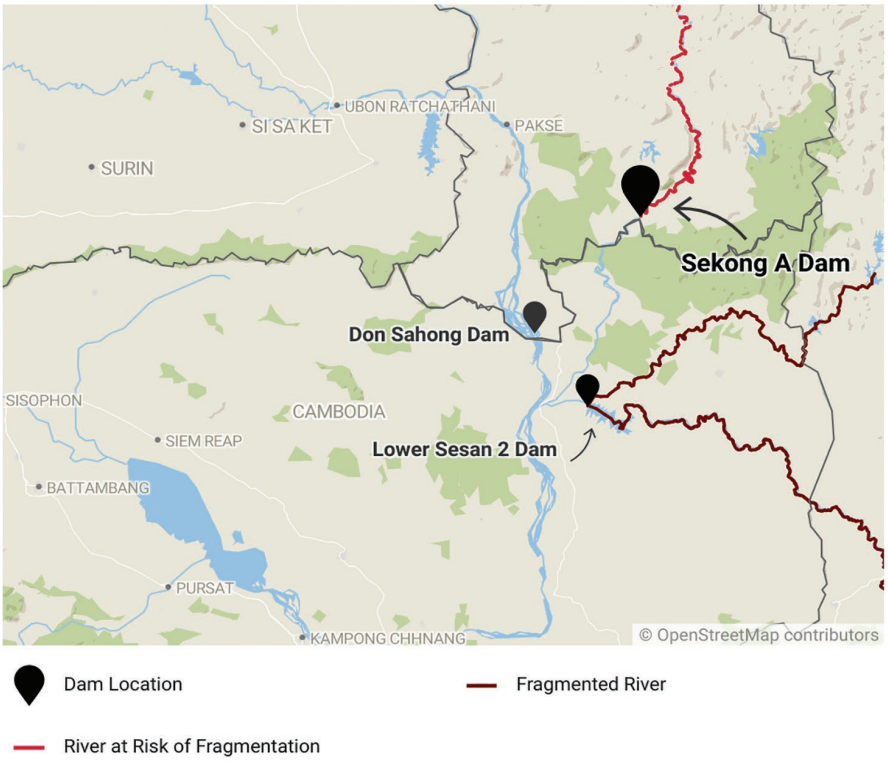
Data taken from EVN Annual reports, EDC Annual Reports, and EDL Statistical Reports for relevant years. Data on power trade commitments draws on press releases and national power development plans.

Over 150 dams have been built in the Mekong River basin, including 13 on the mainstream: 11 in China and two in Laos.[43] Most of Laos' hydropower is intended for export to neighboring countries, including Vietnam. As Vietnam moves to reduce coal in its energy mix and increase power imports from Laos, Vietnam's decisions about *which* power projects in Laos to invest in and buy from will impact sediment flow to the delta and fish migration.

While approval of individual projects is a sovereign decision, Laos has limited financial resources to develop power infrastructure. Interest and investment from outside actors are key drivers determining which projects in Laos are ultimately developed. Decisions are made on largely a project-by-project basis as outside investors from Thailand, Vietnam, and Cambodia sign power purchase agreements or invest in individual projects. While Thailand and Cambodia have already identified a range of specific projects from which to import electricity in the near future, the sources for Vietnam's future power imports are still largely undetermined.

Laos's current portfolio of projects includes more than 7,600 MW of power projects under consideration in the Sekong river basin in southern Laos, along the borders with Cambodia and Vietnam.[44] Cambodia has committed to purchasing power from specific coal and hydropower projects. Vietnam's power purchase plans are less clear: the draft of Vietnam's Power Development Plan 8 includes an appendix list of potential projects in Laos which are under consideration, which references potential purchases from 1,667 MW from both tributary and mainstream Sekong dams in the 3S Basin.[45]

SEKONG A DAM AND CONNECTIVITY

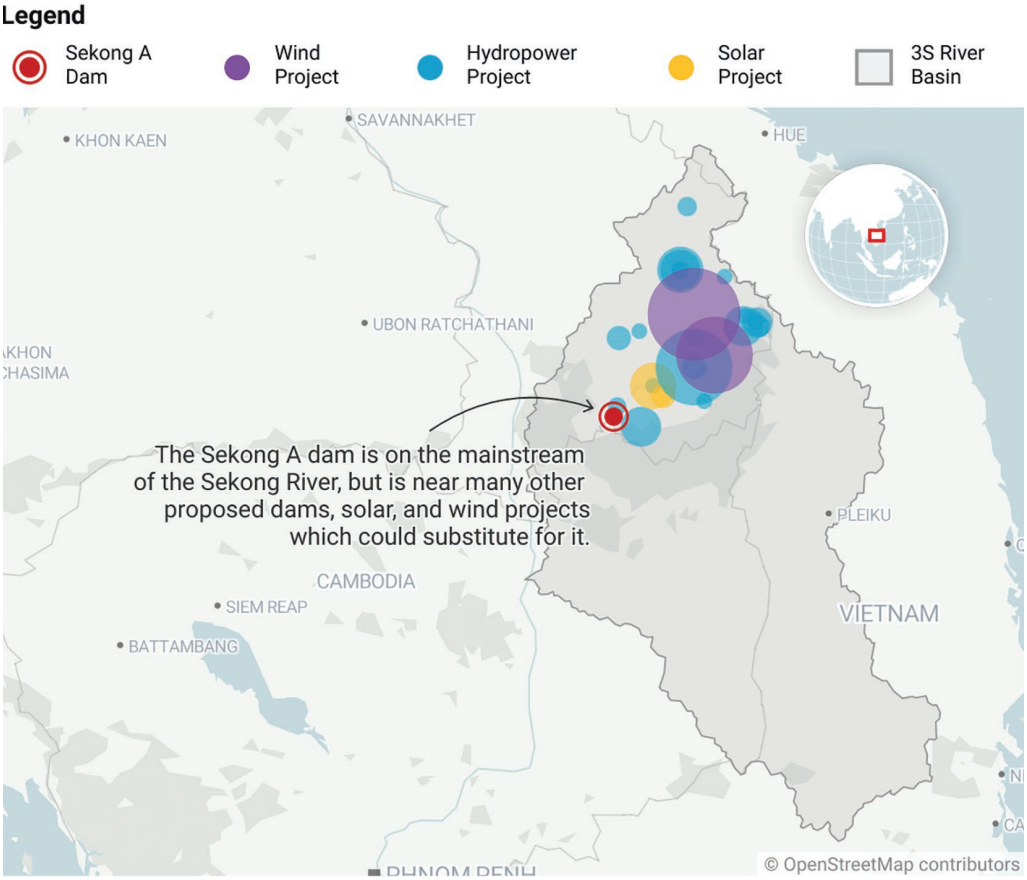


Data on dam locations is taken from the Mekong Infrastructure Tracker.

Damming the Sekong mainstream and portions of tributaries would be extremely damaging to Vietnam's Mekong Delta and the productivity of the entire Mekong fishery, and the Sekong A dam specifically will have serious impacts because of its location on the Sekong mainstream close to the confluence of the Sesan and the Srepok rivers. These two rivers were cut off from the Mekong when Cambodia built the Lower Sesan 2 dam in 2018, leaving the Sekong River as the Mekong's largest free-flowing tributary and a vital channel for fish migration, spawning, and stock recovery. Recent research shows that following the completion of the Lower Sesan 2, more fish and a larger number of species are migrating up and down the Sekong.[46] Since half the fish caught in the Mekong are long-range migrants, maintaining the Sekong as free-flowing is vital to regional fisheries and food security.

If built, the Sekong A dam would produce just 86 MW, a tiny fraction of electricity relative to regional power supply. Yet it would disconnect all but 126 km of the Sekong's 1,917 km from the Mekong, further restricting sediment delivery to the delta thereby threatening the success of Resolution 120. It would also gravely weaken Vietnam's widely admired leadership on sustainability regionally and globally.

ALTERNATIVES TO THE SEKONG A DAM



There are numerous alternative power projects that Laos and Vietnam could develop. The very small amount of power produced by the Sekong A dam could easily be substituted by investing in solar and wind, which would be quicker to build and have zero impact on river connectivity and consequently on sediment delivery and fisheries migration.

Vietnam, Cambodia, and Thailand's decisions about investment and power purchases from individual projects in southern Laos will directly influence whether the river system is fragmented or maintains the current level of connectivity and the natural migration of fish and transportation of sediment flow that it provides. If policymakers prefer to invest in low-risk hydropower, there are many options: about 25 projects with a total capacity of up to 2,000 MW have been identified on tributaries of the Sekong.[47] These dams are located off the mainstream, higher up the river system, and upstream of existing dams and would thus have much lower downstream impacts.

CLV countries have an opportunity to move beyond bilateral power trade agreements and instead consider coordination of energy production and power trade in southern Laos. The renewable energy transition—which is playing out with solar and wind in Vietnam—provides an opportunity to review and adjust the regional power mix to be more forward-looking, sustainable, and resilient in the face of climate change and drought.

Expanding the geographic scope of renewable power would also have significant benefits for Vietnam: currently Vietnam's grid suffers from overconcentration of solar and wind in a few specific provinces, which experience large swings in power production when the sun shines or the wind blows. This has caused the grid integration and curtailment challenges discussed previously. Investing farther afield in similar projects in Laos helps to build in flexibility in the face of weather swings and could also balance the seasonal profile of hydroelectricity in Laos, which often dips during the dry season.

Solar and wind are booming in Laos. Vietnam has recently negotiated a power purchase agreement from the first phase of the 600 MW Monsoon wind project in southern Laos. A Thai, Chinese, and Singaporean consortium is considering a 1,000 MW expansion of that wind project for export to the ASEAN market.[48] More than 50 solar projects are undergoing feasibility study in Laos with a total capacity of almost 8,000 MW.[49] Many are floating solar on dam reservoirs, which take advantage of existing transmission lines and benefit from the water's cooling effect, which increases efficiency. There are four dam reservoirs in Sekong tributaries that could host floating solar, which peaks in the dry season when hydropower declines sharply. For Laos, this would have the added advantage of reducing expensive dry season power imports from Thailand.[50]

Vietnam has multiple opportunities to import additional power from Laos in ways that boost government revenue and minimize impacts on sediment and fisheries. A more diverse and less hydropower-dependent power mix would also reduce vulnerability to the more frequent prolonged droughts and saltwater intrusion that have become the new normal in the Mekong Delta.

RECOMMENDATIONS

- **Vietnam should terminate support for the Sekong A dam and replicate its highly successful domestic expansion of solar and wind power in Laos in order to meet sustainability goals under Resolutions 120 and 55.** As preparatory and early construction work on the Sekong A dam continues, the window of opportunity to avoid the Sekong A dam's impacts and risks to the Mekong Delta and Tonle Sap is shrinking. There are numerous other projects that could replace the Sekong A dam, and Cambodia, Laos, and Vietnam could use this limited window of time to collaboratively and strategically review these projects in the Sekong basin to identify a sustainable path forward. If Vietnam refuses to purchase the power, there is not an alternative power market immediately available. Vietnamese construction and investment firms have substantial experience with solar and wind projects domestically, and the government has already set up terms for a power purchase from wind projects in Laos. Vietnam can provide both strategic support in identifying priority alternatives and also bring investment to the table to help implement an alternative plan. Doing so would help Laos meet its export and revenue goals, ensure that markets in Cambodia and Vietnam can meet their energy needs through electricity imports, and also keep the Sekong mainstream free-flowing.

- **Vietnam's National Mekong Committee (NMC) should request that Laos pause forward movement on the Sekong A dam until it has gone through Mekong River Commission (MRC) notification and review processes.** There is a time-sensitive opportunity to request a halt and a full review of the project under the MRC's prior notification process for dams with transboundary impacts. While the MRC's best known Procedures for Notification, Prior Consultation, and Approval are only fully applicable for dams on the Mekong mainstream of the Mekong River, the MRC does have a notification process for tributary dams with significant transboundary impacts which should apply to the Sekong A. Vietnam and Cambodia's NMCs have a vested interest in ensuring that the project goes through review in order to ascertain more details on the impacts and potentially provide space to discuss alternative projects.

- **Vietnam must address grid integration to ensure continued progress toward its COP26 commitments**. Even as it pauses new wind and solar investments, the government needs to invest heavily in improved transmission and storage when it becomes economically viable to ensure smooth integration of future renewable energy. The first and easiest opportunity is to prioritize funding for grid improvements. Historically, EVN, the state-owned utility, has invested heavily in power while also maintaining a monopoly over transmission. As a result, EVN has limited funding to alleviate the grid bottlenecks that are now limiting solar and wind expansion. Vietnam can rely on private sector for power generation, but short-term grid investments will have to be made by EVN given the current legal framework and length of time to bring transmission projects to fruition. Nevertheless, there may be opportunities to open specific grid infrastructure projects to private investment to remove key bottlenecks as the government opens up transmission to private investment.

- **EVN can work with international funders such as the Development Finance Corporation, Japan Bank for International Cooperation, and Export Finance Australia to build out Vietnam's transmission system to manage higher amounts of variable energy**. Grid constraints brought solar and wind development in Vietnam to a standstill in 2022. Vietnam can take advantage of major new funding sources through COVID recovery plans and green funds to alleviate this bottleneck, maintain its widely admired renewable energy transition, and avoid similar future challenges as it races towards net zero carbon emissions. The Biden Administration's Indo-Pacific Strategy prioritizes clean energy, but the U.S. Development Finance Corporation has yet to identify a flagship renewable energy project in Southeast Asia. Post-COP26, the Japan Bank for International Cooperation announced a decarbonization initiative for emerging economies in Southeast Asia as it works toward a net-zero emissions portfolio. Even China, historically a big funder of coal plants, issued guidelines in March 2022 on greening the Belt and Road Initiative by supporting low-carbon projects including renewables and energy storage.[51] If it gets regulations right, Vietnam can unlock substantial new funding to power its renewable energy transition and perhaps identify one or more flagship clean energy opportunities through these initiatives.

- **In parallel to addressing grid integration issues, the government should issue a clear and longer-term revised PPA that is attractive to international investments**. The temporary pause on new solar and wind projects and the ongoing issues with curtailment and grid integration will dissuade further investment in the short-term but identifying a clear long-term policy will help pull in pipeline investment in both solar and wind. Future permitting and pricing policies must be transparent, clear, and include longer time horizons to avoid uncertainty and attract international investors. As electricity demand continues to rise, direct PPAs could play a key role in decarbonizing Vietnam's industrial sector. The industrial sector is a major emitter of greenhouse gases, and many international companies want to green their supply chains and meet their carbon emissions targets, which are often more ambitious than Vietnam's official targets. Direct PPAs will incentivize these companies to invest in their own renewable energy generation and at the same time reduce demand on the national grid. The government should identify a path to scale up the ongoing DPPA approach.

- **The international community can provide capacity building and financial support to assist Vietnam remove or alleviate these barriers.** The US can share lessons from its experience integrating massive amounts of wind: Texas has more than 30 GW, and wind provides more than 20% of electricity in at least 10 states. Australia can share its experiences with managing rooftop solar and large-scale battery storage. There may also be space for pilot projects to test grid-connected energy storage. USAID has previously invested in many of these approaches through previous programs like USAID Clean Power Asia. It would be valuable for the U.S. to utilize recently announced programs like USAID Southeast Asia's Smart Power Program to target support towards countries like Vietnam which are not only facing current barriers but also serve as case studies for neighboring ASEAN countries who have been relatively slower to act on climate issues.

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