

Green recovery
opportunities in
Southeast Asia,
Japan, South
Korea and
Taiwan



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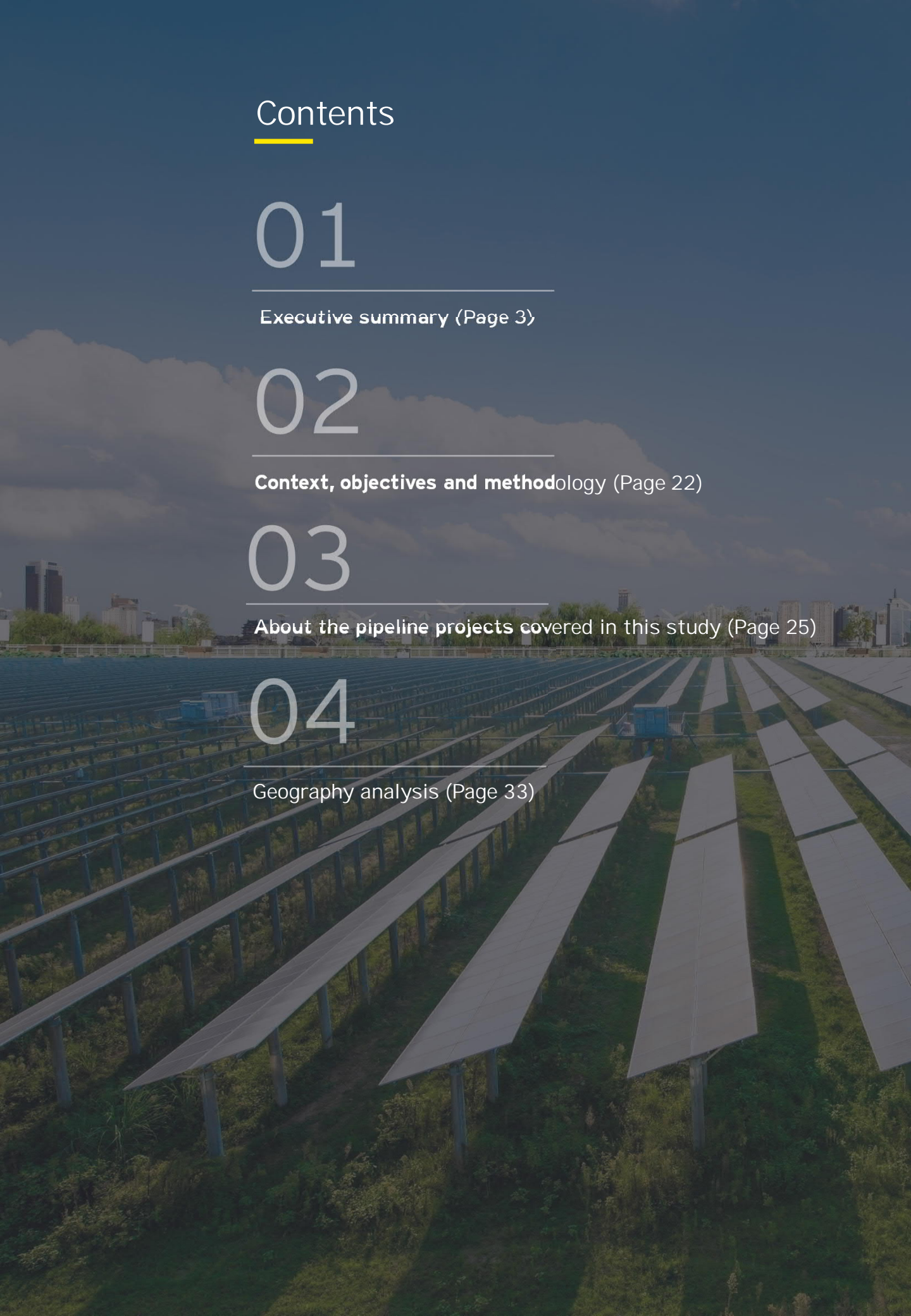
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Executive summary



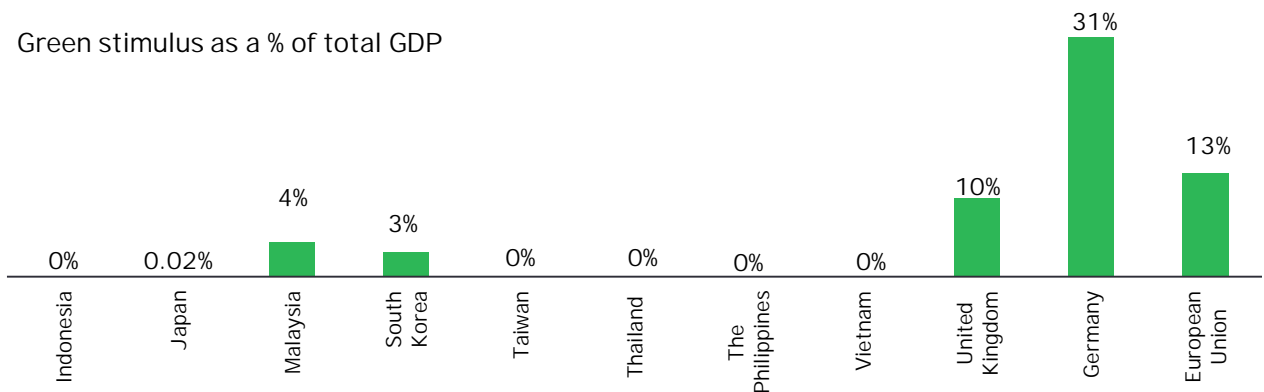
Executive summary

The COVID-19 pandemic has impacted lives and businesses significantly. To help businesses and individuals, governments in Asia have focused efforts on meeting the immediate needs of their economies.

The need for financial relief and emergency response services coupled with dwindling

tax revenues from reduced economic activity have resulted in geographies tapping into national coffers. Moving to a low-carbon economy can create jobs and contribute to help economies meet their Nationally Determined Commitments (NDCs) under the Paris Agreement. Many economies have started to do so.

Green stimulus as a % of total GDP



Data as per announcements until September 2020

The European Union has launched a “Next Generation EU” recovery fund that will provide US\$590b in grants and US\$295b in loans for member states, of which 25% will target climate action. In Asia, some economies have also announced green stimulus measures:

- South Korea has launched a new US\$141b Korean New Deal, of which about US\$65b will be invested to support investment in green technologies. The Korean New Deal will focus on three main areas: green transition of infrastructure; low carbon and decentralized energy supply; and innovation in the green industry.
- Malaysia has rolled out phase four of its large-scale solar action program (LSS4) 1GW tender and a MYR13b (US\$2.9b) expenditure for installation of LED streetlighting, rooftop solar panels and transmission lines as a part of its COVID-19 stimulus package.
- The Indonesian government is formulating the Surya Nusantara (or Solar Archipelago) plan to install thousands of rooftop solar panels with a combined capacity of 1GW a year for millions of the country’s poorest households over the next five years.

811

Projects identified

US\$316b

Investment potential

90GW

Renewable energy
capacity in the pipeline

229 MTCO₂e

Emission reduction
potential

870,000

Job creation
potential

EY undertook a study of the green investments in the energy sector in selected markets in Southeast Asia, Japan, South Korea and Taiwan.

And indeed, opportunities abound.

Just looking through public sources, we identified over 800 projects, which represent an aggregate investment of US\$316b. About US\$306b of these investments are from the renewable energy sector and 85% of them are expected to come from offshore wind and solar photovoltaics (PV).

These projects can support up to 870,000 jobs. With a higher job-intensity ratio than in most other traditional and fossil-based industries and a potential for participation from small and medium-sized enterprises, the low-carbon projects identified can have a significant contribution to a sustainable and green economic recovery in Asia.

Further, on an aggregate basis, the greenhouse gas emissions avoided are estimated at around 229 MTCO₂e per annum. The emission savings can help to support economies in meeting their respective NDCs under the Paris Agreement.

While other potential benefits such as improved air quality and energy independence were not assessed as part of this study, they form part of the value that the selected projects can deliver.

The COVID-19 pandemic presents a win-win opportunity to recover in an economically sustainable and environmentally responsible manner.

Objectives of this study

- Uncover a pipeline of shovel-ready projects, that are expected to reach financial close in the next two to three years.
- Identify the key barriers and challenges for a green recovery post COVID-19 pandemic.
- Support policy-makers across the focus geographies to formulate their economic recovery strategy and tap on the potential for green recovery.



Governments have a once-in-a-lifetime opportunity to reboot their economies and bring a wave of new employment opportunities while accelerating the shift to a more resilient and cleaner energy future.

Dr. Fatih Birol
IEA Executive Director¹

¹ Sustainable Recovery: World Energy Outlook Special Report, International Energy Agency, June 2020, accessed via <https://www.iea.org/reports/sustainable-recovery> on 18 January 2021

Key findings

Overview

From the study, renewable energy is the most active sector for investment where the pipeline is well-structured and significant market interest is present.

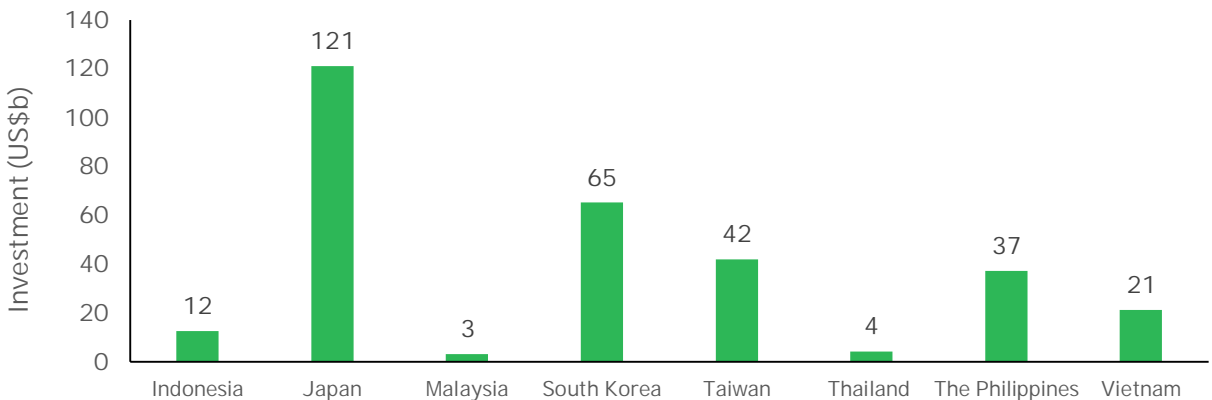
Despite the immense potential of energy efficiency in the markets covered in this study, the limited pipeline reveals a lack of momentum and low investor interest. Greater awareness is needed on the commercial value proposition of energy efficiency projects and efforts are required to encourage such projects.

The electric vehicle (EV) sector is still in its infancy in the region, with focus geographies only starting to feature EVs as part of their

mobility strategy. The pipeline is limited but could develop in coming years if EVs are integrated with the broader energy transition strategy.

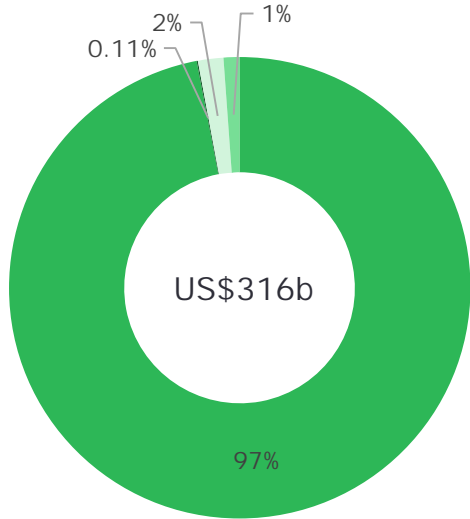
Although not directly green, grid infrastructure projects are seen as critical enabling infrastructure. Transmission and distribution (TD) infrastructure projects are largely developed by state utilities, under each specific market's framework. Hence, limited representation of such projects in the pipeline should not be interpreted as a lack of activity in the sector.

Investment in renewable energy (US\$b)



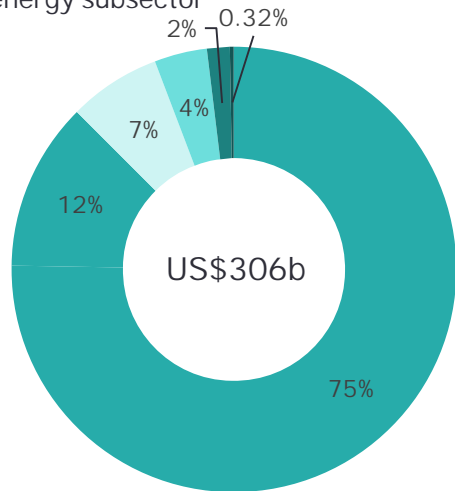
Investment share by sector

- Renewable energy (RE)
- Energy efficiency (EE)
- Electric vehicles and energy storage systems (EV and ESS)
- Transmission and distribution (TD)



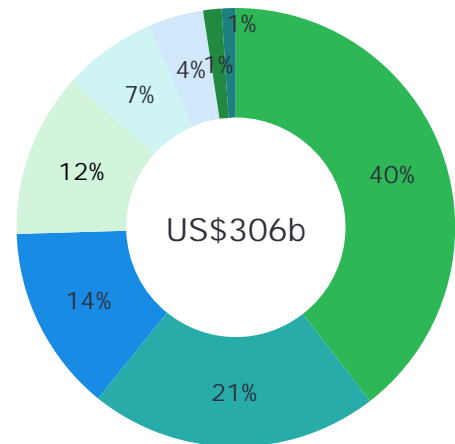
Investment share by renewable energy subsector

- Offshore wind
- Solar PV
- Onshore wind
- Geothermal
- Hydroelectric (<30MW)
- Others



Investment share in renewable energy by geography

- Japan
- South Korea
- Taiwan
- The Philippines
- Vietnam
- Indonesia
- Thailand
- Malaysia



Diverse pipeline

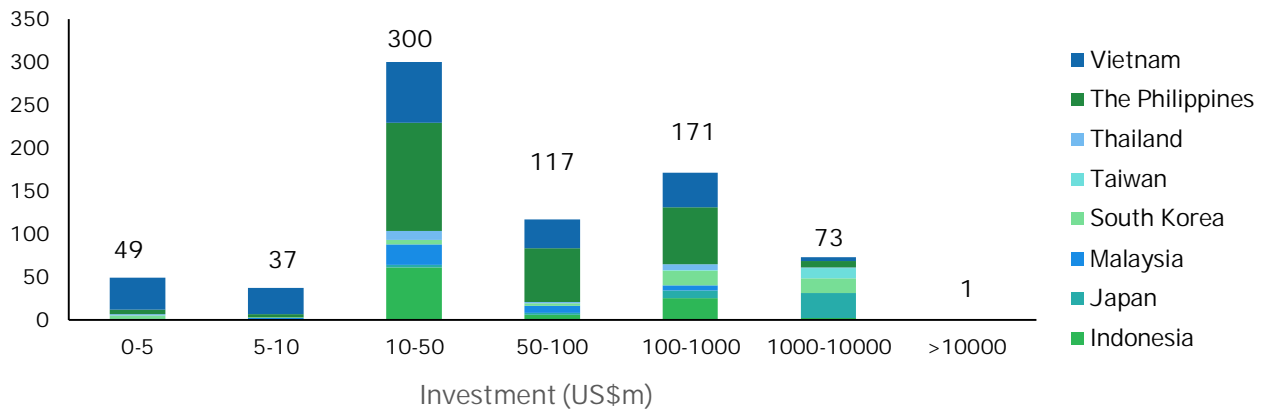
In terms of investment size, Japan and South Korea lead as the investment for offshore wind projects are considerably higher when compared to other renewable energy sub-sectors. Philippines and Vietnam lead in terms of the number of projects in the pipeline. In general, solar energy dominates the pipeline in Southeast Asia.

The study identifies that much of the capital needed for the projects are available and can be deployed quickly by the private sector, should some of the inherent challenges hindering the projects, particularly those for the smaller-scale projects, are addressed.

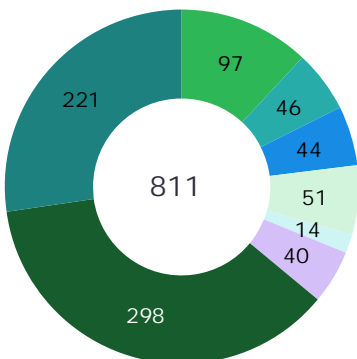
The pipeline shows diversity in terms of investment size. Approximate 48% of projects identified are small and require investments less than US\$50m.

The project sponsors consist of a mix of local developers, regional conglomerates and international developers and small and medium enterprises (SMEs). Supporting these projects can help spur economic activity across various investor groups, contributing to national objectives of economic activity revival.

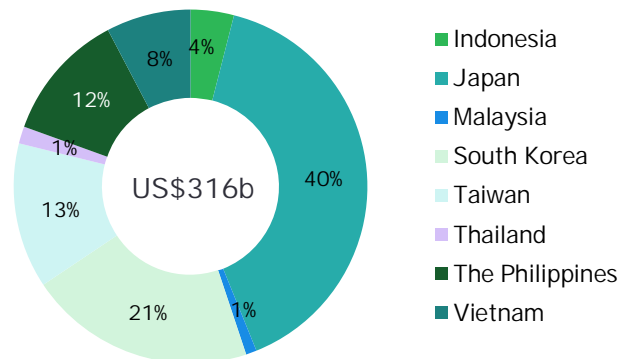
Breakdown of projects by investment range



Number of projects by geography



Investment by geography



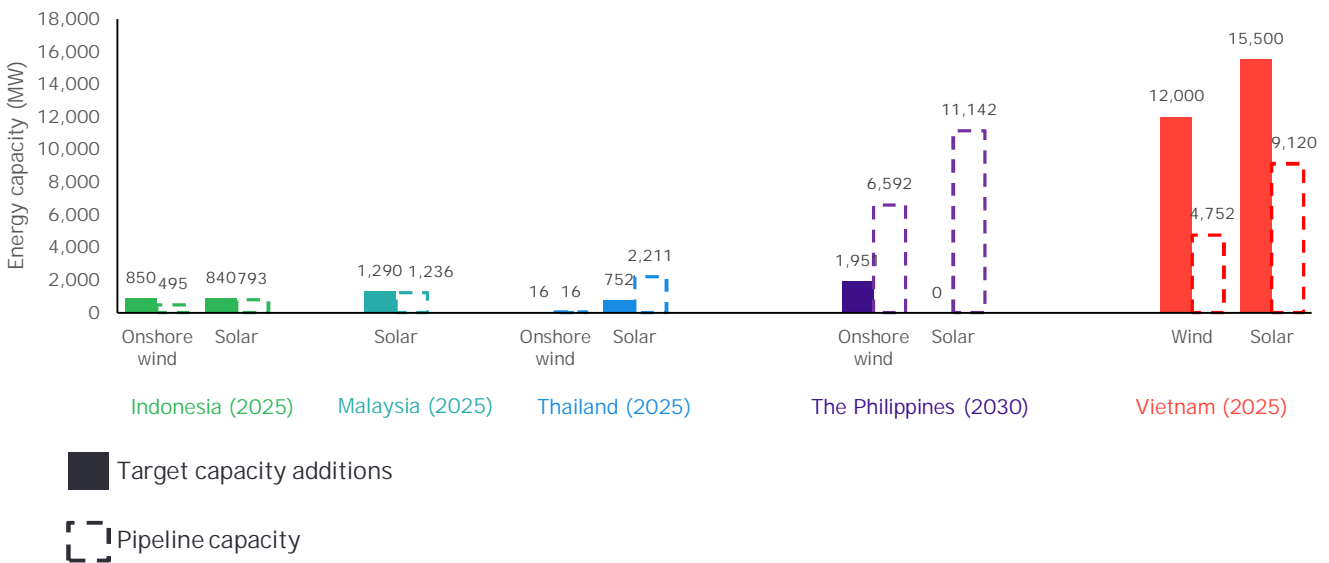
Solar dominates in Southeast Asia's pipelines

When pipeline projects are realized, geographies are better able to meet their renewable energy targets. In Southeast Asia, solar projects dominate the pipeline:

- In Indonesia, the solar pipeline can meet the 2025 targets of the Perusahaan Listrik Negara (PLN), a state-owned company tasked with supplying the electricity needs of the Indonesian people. However, the target remains modest compared to the potential, indicating a possibility to develop more ambitious targets.
- In Malaysia, the renewable energy pipeline is closely linked to the LSS program.
- For Thailand, the country's 2025 onshore wind target is modest. Thailand's pipeline has the capacity to exceed the country's planned solar capacity additions until 2025 by a significant margin due to the high level of interest in the solar sector.

An upward revision of targets, particularly for wind, could help catalyze sectors where there is considerable interest from private sector.

- For the Philippines, the current installed solar capacity in the country has already exceeded the 2030 national target while the pipeline capacity for onshore wind is thrice the amount required to meet the targets. The imminent National Renewable Energy Plan is expected to set more ambitious targets for solar and wind.
- For Vietnam, over the next two to three years, the pipeline has the potential to meet a significant portion of its revised forecasts for renewable energy. The pipeline identified is only a small fraction of the applications received by Vietnam's Ministry of Industry and Trade. The pipeline highlights growing activity and private sector interest.

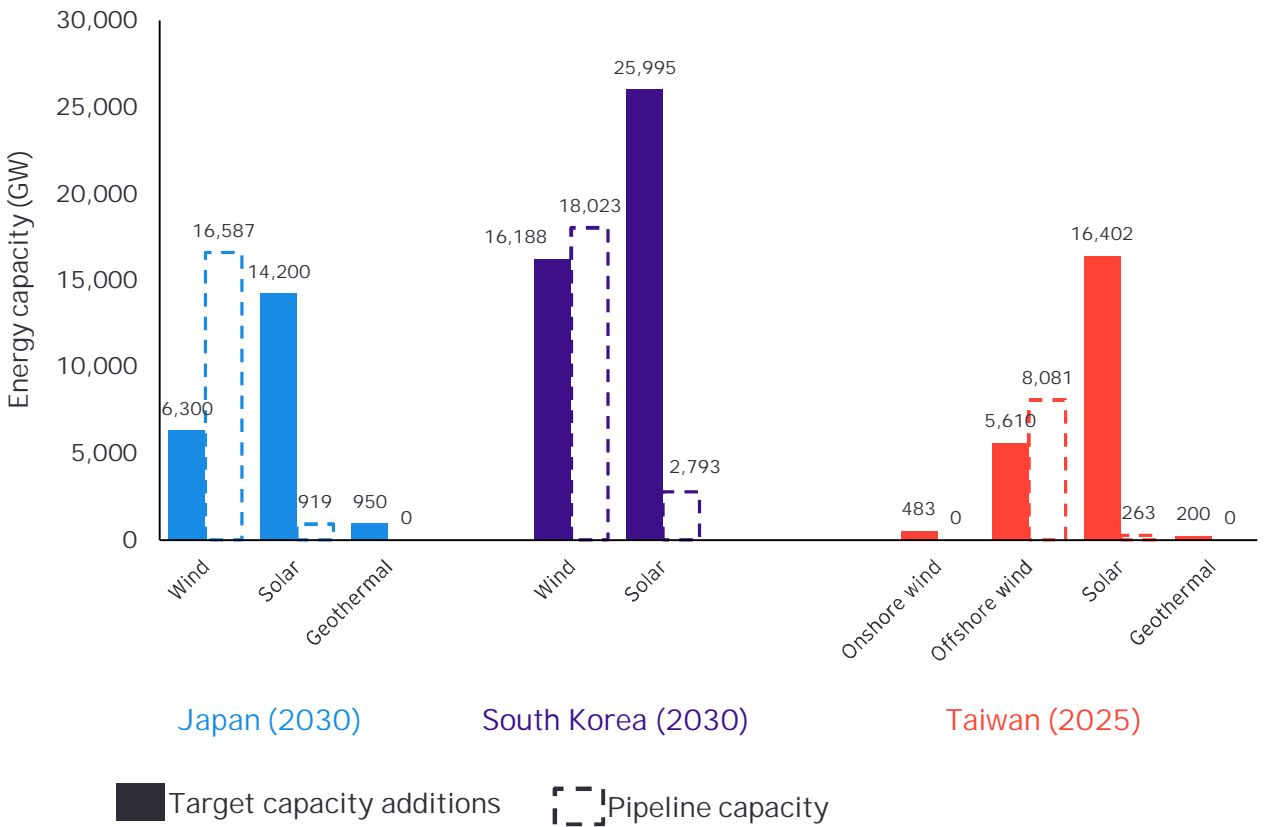


Offshore wind dominates the pipeline in North Asia

The pipeline of Japan, South Korea and Taiwan can significantly exceed the national offshore wind targets, indicating strong market interest in the offshore wind sector.

However, solar projects in the pipeline fall significantly short of meeting the national targets.

One reason for solar projects attracting less interest than offshore wind could be challenges around land availability, as articulated by developers and stakeholders.



Renewable energy and grid infrastructure

Realizing the pipeline is hinged on addressing several challenges. The availability of finance is generally not a challenge for grid-connected renewable energy generation projects. However, access to finance, particularly for smaller renewable energy projects (e.g., bioenergy, small hydro and rooftop solar) and energy efficiency projects, remains a challenge.

Close to half (48%) of the projects in the identified pipeline require an investment of less than US\$50m. Smaller-scale projects struggle to get access to local finance as institutions are cautious of the credit risks associated with small developers. Such developers also lack the ability to tap into the international financing pool. The specific financing challenges vary between sectors, developers and project types.

Financing is only one of the barriers identified. For most projects and geographies, the main challenges are non-financial and related to inherent regulatory, administrative and commercial issues.

For example, clarifications on policy such as Feed in Tariff (FiT) extensions, improving the quality and standardization of power purchase agreements (PPAs), insufficient grid capacity, delayed grid access and curtailments during operations are cited as challenges that impact the cost and availability of finance.

Incremental improvements may make access to financing easier and deployment of these projects faster.

The pipeline underlines the significant interest from the developers and investors in these markets. For policy-makers, it highlights the potential for setting more ambitious targets to leverage this enthusiasm.

Thus, an enabling framework for project roll-out through policy and regulatory measures and adequate transmission infrastructure investments will be required to deliver the potential environmental and social value.



Renewable energy enablers

High perceived risk

- Supportive market framework
 - Most markets in Asia are single buyer markets.
 - Options should be developed to allow corporates to achieve their renewable energy ambitions through corporate power purchase agreements (PPA).
 - This will help attract foreign direct investments (FDIs) from companies that are increasingly seeking green electricity (e.g., through commitments under the RE100 initiative).
- Adaptive renewable energy policy
 - Investors need continuity in terms of policy. A streamlined process can help provide certainty to investors in cases such as annual tenders in Malaysia, which led to a 50% reduction in levelized cost of energy (LCOE) between LSS1 and LSS3.
 - Clarity of regulations around procurement and pricing of renewable energy is cited as an important driver for accelerating renewable energy development.

Medium perceived risk

- Robust transmission capacity
 - Investment in grid capacity must happen in tandem with increase in renewable energy capacity to boost investor confidence and combat curtailment.
- National ambition and targets
 - The pipeline capacity has the potential to exceed national targets in various sectors by a significant margin.
 - Price competitiveness of renewable energy is an opportunity for focus geographies to set renewed and more ambitious targets.
- Allocable land parcels
 - Lengthy and complex process for land acquisition is often cited as a constraint to project development.
- Thorough resource assessment
 - ▶ A lack of clarity of the offshore wind potential in the Philippines impedes the development of the sector.
 - ▶ Private developers echo the cost of assessing geothermal resource is capital-intensive and often makes projects unviable for investment.

Low perceived risk

- Financing and bankability
 - Availability of financing is generally not an issue with a few exceptions (e.g., non-recourse financing in Vietnam).
 - Policy-makers should focus on enabling financing solutions for SMEs and small-scale projects, which remain less bankable across the focus geographies.
- Favorable supply-demand
 - Growing energy demand across Asian economies due to increasing prosperity and economic development supports the development of renewable energy.

More to be done to create commercial opportunities for energy efficiency and EVs

Energy efficiency

The energy efficiency sector in Southeast Asia has untapped economic potential, especially energy conservation mechanisms such as government building retrofitting and public street lighting projects, which awaits a strong nudge for activation.

The relative lack of energy efficiency projects in the investable pipeline reveals the lagging momentum in the region's energy efficiency effort. Industry experts attribute this to various factors, including a lack of capacity at the host country level to mandate energy efficiency laws, shortcomings of public sector procurement and budgeting processes that do not allow the roll-out of large-scale energy efficiency projects in the public sector.

The business case for energy efficiency projects is also weaker in markets where retail electricity prices are subsidized. Stakeholder consultations reveal that energy efficiency projects are perceived to be "less attractive" to decision-makers when compared to renewable energy projects.

Recognizing the benefits and the enormous socioeconomic potential of energy efficiency projects, geographies like Malaysia and South Korea are considering energy efficiency projects as part of their green recovery packages. However, structural reforms are needed to support wider implementation.

Electric vehicles

The EV sector is still at the very early stages of development across the various focus geographies, with EVs contributing to a negligible share of new passenger vehicle sales.

There are a few pilot stage initiatives such as fleet replacement in Indonesia, promoting e-jeepony in the Philippines and incentives for EV manufacturing in Thailand. The market needs a combination of push and pull incentives to promote the sector.

Although the case for EV adoption remains weak in these markets due to the lack of a clear economic case, low consumer awareness and an absence of visionary targets, the future outlook remains bullish.

Need for systematic programs to induce commercial activity in the energy efficiency sector

High perceived risk

- Incentive and penalties
 - While some schemes such as the ESCO fund in Thailand are available for SMEs to support energy efficiency solutions, industry practitioners cite financing as a significant barrier for new projects. There are limited financial incentives for investing in energy efficiency projects in many geographies.
 - An absence of stringent penalties for non-compliance or non-performance is cited as a deterring factor.
- Consumer awareness
 - Limited awareness of the business model of energy services companies (ESCO) and the expected savings potential among SMEs, are often cited as significant barriers.
- Mechanism to capture value from energy savings
 - Lack of a mechanism to retain the savings earned through energy efficiency projects by government departments is a barrier promoting new projects by government agencies.
- Electricity tariff
 - Subsidized retail tariffs prevents the realization of the full potential of energy efficiency solutions.

Medium perceived risk

- Government targets and associated programs
 - National-level targets are present, but lack detailed implementation plans in most geographies. Ongoing efforts are focused on interventions like replacing lighting systems, minimum energy performance standard (MEPS) and labeling products like air conditioners.
 - More wide-scale energy efficiency projects like street lighting and government buildings' retrofits are needed.
- Technical knowledge
 - Limited availability of required skill set and service providers.
 - ESCO associations are present in each geography like Malaysia and Thailand to encourage skill development, but need greater support and awareness.

The EV sector is still in the early stages of development with focus geographies at early stages of adoption

Electric vehicles enablers

High perceived risk

- Incentives
 - Incentives are focused on manufacturing – several incentives are offered for manufacturing in Thailand, Indonesia and Malaysia.
 - Limited tax and import duty exemption are further slowing adoption.

Medium perceived risk

- Price competitiveness
 - Internal combustion engine (ICE) vehicles still retain their price competitiveness over EVs in most vehicle segments. Technological advancements, coupled with local manufacturing capability, are expected to bridge this gap in future.
 - The business case for private cars remains weak, which hinders investments into the sector.
 - However, there is a viable business case for bus fleets, which could emerge as a focal entry point for EV strategy in the region.
- Ecosystem for EV adoption
 - To encourage private sector participation in the EV sector, an ecosystem needs to be created through policies that support the development of charging infrastructure and associated business models.
 - There are a few players who are active across the region such as VinFast (Vietnam), Petronas Dagangan and TNB (Malaysia), Energy Absolute (Thailand). This demonstrates interest from the private sector. Market activity can be further strengthened by government incentives and policies.
- National targets and regulatory framework
 - All geographies have set some targets for EVs. However the focus in Southeast Asia remains on strengthening manufacturing capabilities.
 - In addition to national targets, definitive regulatory framework and strategies can help EV adoption.
 - EV adoption is increasingly seen in e-bikes across Vietnam and Indonesia.
 - Pilot-stage initiatives launched by focus geographies such as fleet replacement in Indonesia, promoting e-jeepney in the Philippines and incentivizing EVs in Thailand reflect an increasing market interest in the sector.

Interventions today can help achieve a green recovery and address some prevalent challenges

Regulatory clarity and certainty

- Regulatory clarity, clarification of applicable FiTs, offtake certainty and better coordination between all related stakeholders could support the greater deployment of renewables.
- Malaysia's LSS auction program is an example of how a well-structured process can support accelerated deployment of renewables.

Clear pipeline of projects

- There is a strong signal from the private sector for a clear procurement framework for new projects. Development of new projects has stagnated in Thailand due to a lack of clear procurement framework post the expiry of the FiT.
- Creating a pipeline and developing a procurement framework provides confidence in the investment community and creates a promising investment outlook.

Establish frameworks for development of energy efficiency projects

- The main challenge faced for developing energy efficiency projects is the lack of commercially attractive business opportunities for investors and lack of awareness of the benefits to customers.
- Incentives and penalties for promoting energy efficiency projects are needed for large-scale deployment of energy efficiency solutions.
- Greater awareness is needed for the ESCO savings model, particularly for commercial and industrial customers. Programs like retrofit of government buildings could kickstart the large energy efficiency transformation projects.

Support in creating an ecosystem for EVs

- EVs is still in the early stages of development. Most focus geographies are currently focusing on establishing a manufacturing base for EVs. Greater effort is necessary to incentivize and support adoption.
- While EVs are not yet price competitive with conventional vehicles, particularly in the individual user segment, there are immediate opportunities for fleet replacement of public transport such as buses where the economics are viable.

Snapshot of focus geographies shows immense potential that can be realized in the short term

Geography	Key observations	Estimated potential from a green recovery
Indonesia	<ul style="list-style-type: none"> Renewable energy is the most attractive sector for investment. Within the renewable energy sector, the geothermal sector has the largest number of projects. Market interest and availability of finance are strong for utility-scale projects. But high local content requirements could affect the levelized cost of renewable energy. There is limited interest in the development of energy efficiency projects despite the strong awareness of the benefits of energy management. Renewed national targets and a clear procurement process can accelerate implementation. Development of renewable energy projects is highly linked to the PLN's ability to offtake clean energy. Greater coordination between the national vision and the PLN's plan could provide clarity to the market. 	<p>97 projects identified</p> <p>US\$12b investment potential</p> <p>4GW renewable energy in the pipeline</p> <p>34k job creation potential</p> <p>19MTCO₂e emission reduction potential</p>
Japan	<ul style="list-style-type: none"> Renewable energy is the most attractive sector for investment. Within the renewable energy sector, offshore wind is the most prominent sector accounting for approximately 94% of the pipeline, followed by solar PV. Lack of appropriate land area and market saturation are key barriers for the development of solar and onshore wind projects. The recent offshore wind tender process is expected to provide the framework for future development. EIA and decommissioning requirements are highlighted as complex factors affecting the cost of developing projects. 	<p>46 projects identified</p> <p>US\$126b investment potential</p> <p>18GW renewable energy in the pipeline</p> <p>219k job creation potential</p> <p>27MTCO₂e emission reduction potential</p>

Snapshot of focus geographies shows immense potential that can be realized in the short term (continued)

Geography	Key observations	Estimated potential from a green recovery
Malaysia	<ul style="list-style-type: none"> Renewable energy is the most attractive sector for investment. The solar sector has the largest number of projects within the renewable energy sector, followed by small hydropower (<30MW). The market is primarily driven by the LSS auction process, which provides a clear and transparent framework for project development. Access to finance is not generally considered an issue for the development of large solar projects. However, the reliability of feedstock, access to the grid and the sponsor's creditworthiness are some of the concerns that impact the availability of finance for bioenergy projects. The energy efficiency sector shows promise. As part of Malaysia's recovery plan, MYR13b of infrastructure projects to upgrade LED street lighting, rooftop panels and transmission lines have been launched. 	<p>44 projects identified</p> <p>US\$3b investment potential</p> <p>1GW renewable energy in the pipeline</p> <p>6k job creation potential</p> <p>1MTCO₂e emission reduction potential</p>
South Korea	<ul style="list-style-type: none"> Renewable energy is the most attractive sector for investment. Within the renewable energy sector, offshore wind is the most prominent sector accounting for approximately 86% of the pipeline, followed by solar PV. Land availability, grid access and the uncertainty around the purchase price of renewable energy projects are some of the challenges echoed by the private sector. The Green New Deal has been announced to spearhead a sustainable recovery. The Green New Deal consists of eight projects base on three main themes: (1) green transition of infrastructures through energy efficiency measures; (2) low-carbon and decentralized energy through the development of smart grids and renewable energy; and (3) innovation in the green industry through the development of low-carbon and green industrial complexes. 	<p>51 projects identified</p> <p>US\$65b investment potential</p> <p>21GW renewable energy in the pipeline</p> <p>245k job creation potential</p> <p>66MTCO₂e emission reduction potential</p>

Snapshot of focus geographies shows immense potential that can be realized in the short term (continued)

Geography	Key observations	Estimated potential from a green recovery
Taiwan	<ul style="list-style-type: none"> Offshore wind dominates the pipeline with 12 out of the 14 identified projects. Change in law risk and the uncertainty around the applicable FiT are among the most pressing concerns for developers. Other barriers include stringent local content requirements specified by the Industrial Development Bureau. Land availability, public acceptance and environmental concerns impact the development of other sectors. Innovative solutions such as co-location of renewable energy plants with farmlands etc., could address some of these concerns. 	<p>14 projects identified</p> <p>US\$42b investment potential</p> <p>8GW renewable energy in the pipeline</p> <p>105k job creation potential</p> <p>28MTCO₂e emission reduction potential</p>
Thailand	<ul style="list-style-type: none"> Solar PV is the most prominent sector within the renewable energy sector. The pipeline appears to be well-diversified among the other focus sectors. Development of large-scale projects has slowed since the expiry of the FiT. The market awaits clarity on the procurement plan for renewable energy projects to achieve the 2037 target of more than 18GW. Thailand has announced plans to develop several floating solar projects over the next decade and has completed the first procurement in 2020. Procurement plan and framework for other sectors is awaited. Several pilot initiatives exist for the development of EVs and new energy solutions like smart grids. 	<p>40 projects identified</p> <p>US\$5b investment potential</p> <p>2GW renewable energy in the pipeline</p> <p>11k job creation potential</p> <p>2MTCO₂e emission reduction potential</p>

Snapshot of focus geographies shows immense potential that can be realized in the short term (continued)

Geography	Key observations	Estimated potential from a green recovery
The Philippines	<ul style="list-style-type: none"> The renewable energy sector is the most prominent sector with 265 projects and 21GW capacity in the pipeline. Majority of these projects are in the early stages of development. Clarity is needed on several policies and programs such as the National Renewable Energy Program (NREP 2020-2040), the Green Energy Option Program (GEOP) and the Renewable Portfolio Standards (RPS). Some challenges include complex permitting and land acquisition procedures, which contribute to lengthy project development cycles and higher costs. Despite the high potential, the energy efficiency sector remains relatively untapped. The economic case for energy efficiency projects is high due to cost-reflective retail tariffs. The lack of capacity, capacity and confidence deters investors. Developing a strong business case and pipeline of projects can catalyze the sector. 	<p>298 projects identified</p> <p>US\$37b investment potential</p> <p>21GW renewable energy in the pipeline</p> <p>151k job creation potential</p> <p>54MTCO₂e emission reduction potential</p>
Vietnam	<ul style="list-style-type: none"> Renewable energy, particularly solar, dominates the project pipeline. The market awaits revised targets to be adopted in the upcoming Power Development Plan VIII, together with supporting regulatory mechanisms. Teething curtailment issues have affected projects in the past. However, EVN has acted quickly in an attempt to address curtailment issues. Significant investments are planned to supplement grid capacity. Lack of awareness of the energy savings potential, the high minimum investment for energy efficiency projects and the absence of energy efficiency projects for streetlighting are additional factors preventing the sector from being explored. 	<p>221 projects identified</p> <p>US\$24b investment potential</p> <p>14GW renewable energy in the pipeline</p> <p>99k job creation potential</p> <p>32MTCO₂e emission reduction potential</p>

2

Context, approach and methodology





Overview of the study

The study aimed to identify an investable pipeline of shovel-ready opportunities, with a balance between short-term COVID-19 recovery liquidity stimuli and long-term orientations, to support the roll-out of competitive climate-neutral economy. It also solicits feedback from investors and developers active in the field. The investable pipeline would indicate the investable capital ready to be deployed if a conducive market environment is created.

The study focused on presenting a data-driven analysis of the potential for green recovery and aims to echo the views of market participants and policy-makers rather than provide an independent opinion.

The analysis focused on the following main sectors under energy transition:

- Renewable energy*
- Electric vehicles
- Energy storage systems
- Energy efficiency
- Grid infrastructure

* Excludes hydro (>30MW), nuclear energy projects and waste-to-energy sector

The analysis covered the following geographies:

- Indonesia
- Japan
- Malaysia
- South Korea
- Taiwan
- Thailand
- The Philippines
- Vietnam

The study was conducted in three phases:

Phase I: Scoping
Review of existing policies and targets

Phase II: Pipeline of opportunities
Collation of list of projects

Phase III: Insights and recommendations
Development of final report on challenges and recommendations

The study commenced on 11 August 2020 and was completed on 25 September 2020. Therefore, this study does not take into account events or circumstances arising after 25 September 2020.

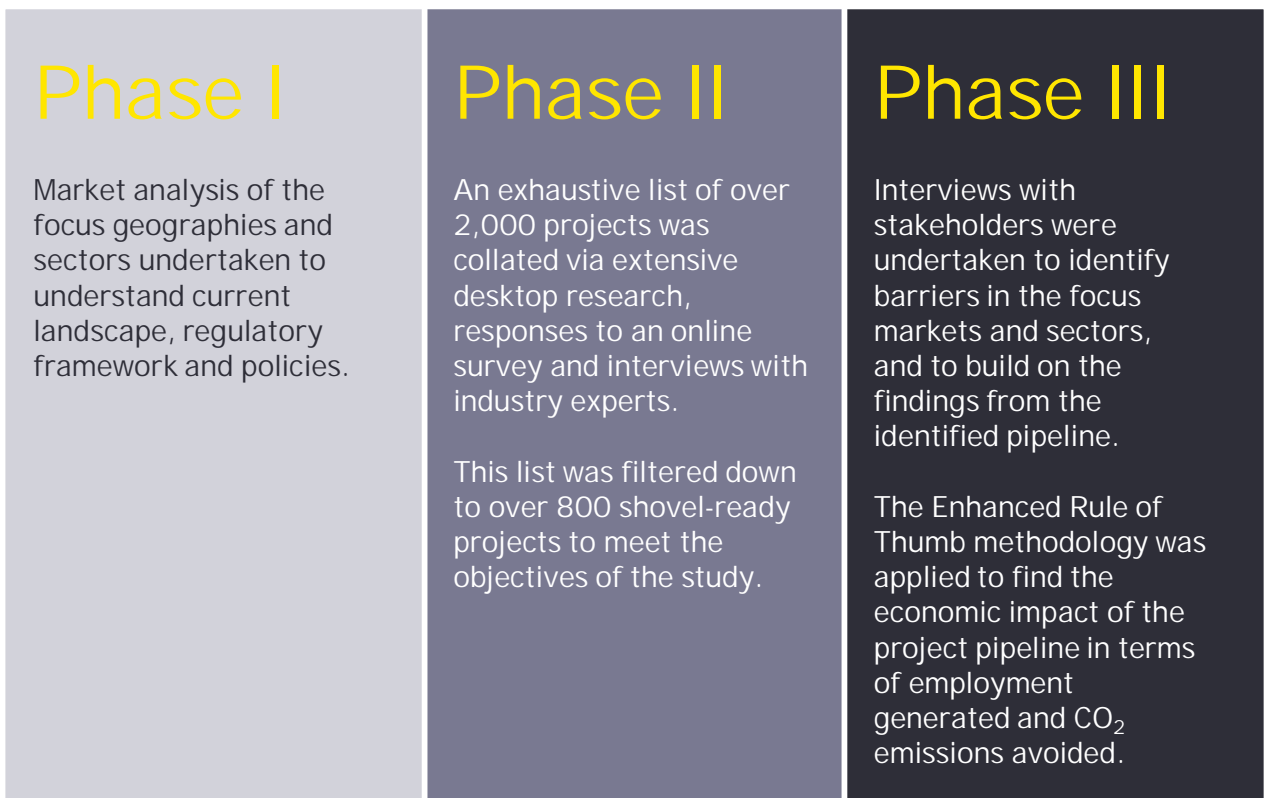
Detailed approach and methodology

The database of over 800 projects was collated via primary research using an online survey and extensive desktop research.

As the purpose of the study was to uncover a pipeline of shovel-ready projects, the team focused on projects that are expecting financial close in the short-term. Due to confidentiality concerns, exhaustive information about each project is not available in the public domain. This list of projects that the EY team has uncovered was put together in just over four weeks and illustrates the huge project pipeline that exists across the selected geographies to underpin a green and resilient recovery from the COVID-19 economic crisis.

The list of projects selected represents only a fraction of projects under development in the region due to a short research time frame of four weeks, as well as the limited availability of public information and reach of the study.

As Asia is not a homogenous region, the pipeline reflects the priorities of the local market in these focus markets. Consequently, the coverage of focus sectors is different. Realizing the pipeline will also require addressing the geography-specific challenges.

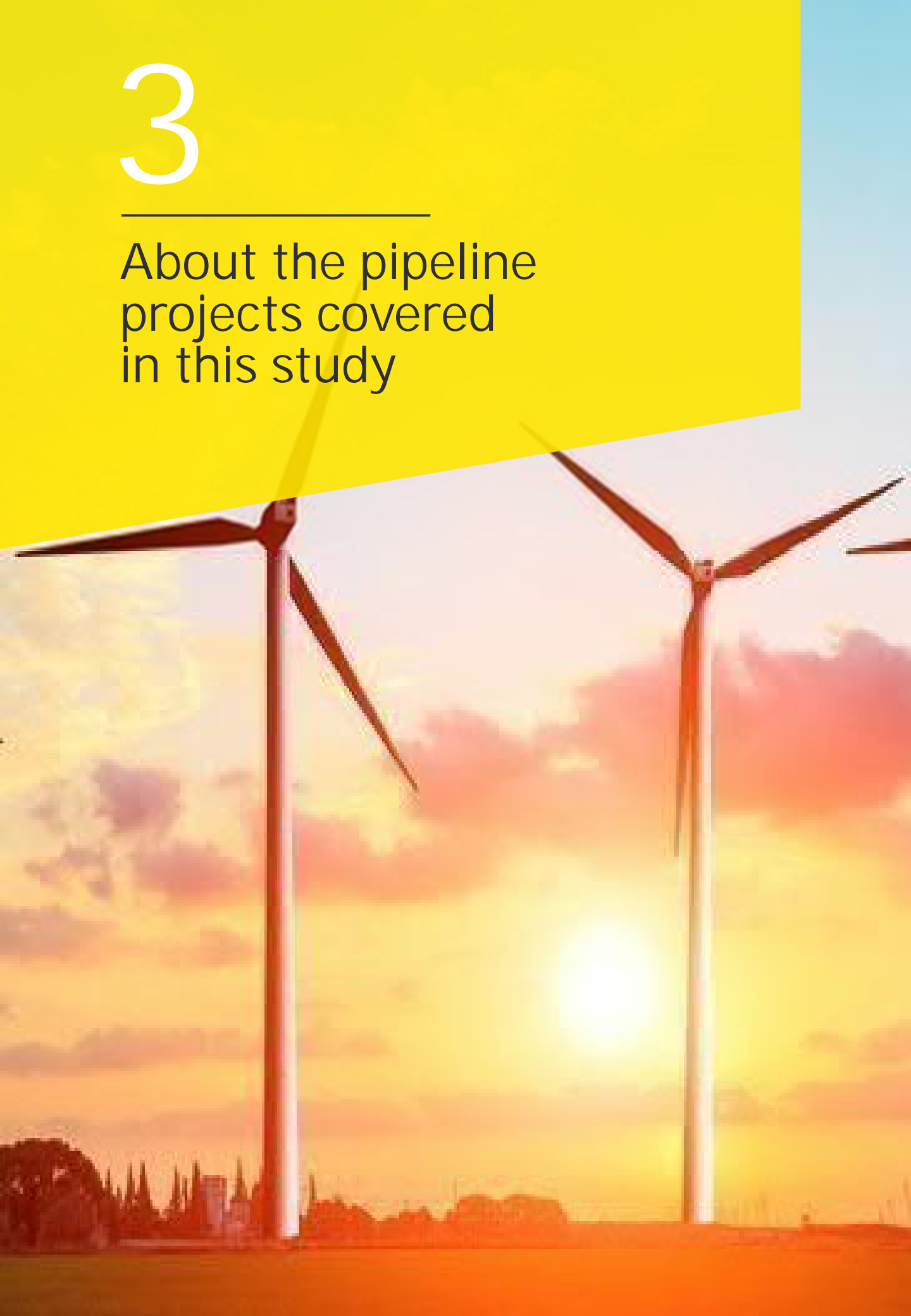


Research participants: **8** Industry experts

26 Developers and investors

3

About the pipeline projects covered in this study



Robust pipeline

The study revealed a robust pipeline of 811 projects with a total investment potential of US\$316b across eight geographies. The project team initially set out to identify a list of 500 shovel-ready projects using primary and secondary research.

As part of the research, an initial list of over 2000 projects were compiled. The broader list of projects was then filtered based on certain criteria set out for the study:

- Minimum capital investment of more than US\$10-15m
- Projects in development stage – projects that have not reached financial close
- Projects with a potential to reach financial close in the next couple of years

The study excludes projects with insufficient information, as well as those that are not part of the focus sectors, e.g., large hydropower, which may be considered renewable in certain geographies.

The list of projects is based on information available in the public domain, supplemented with research based on other secondary sources.

Independent verification of the projects identified and associated details were not a part of the scope of this study.

This report presents the study's findings informed by the data-driven analysis of the identified pipeline and the views of interviewed stakeholders.

It is noted that the focus markets are at different stages of development. The markets are also highly dynamic and see constantly evolving pipelines. Hence, there may be some divergence in the coverage and depth of information available.

811

Projects

Clean energy projects in the pipeline

229

Mt of CO₂ equivalent

Estimated potential of greenhouse gas emissions avoided per annum in the renewable energy sector

8 geographies

90

Gigawatts

Renewable energy supply in the pipeline. Offshore wind and solar PV correspond to 52% and 32% respectively

870,000

Jobs creation potential

*"The post-COVID recovery: An agenda for resilience, development and equality", International Renewable Energy Agency, 2020, accessed via https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2020/Jun/IRENA_Post-COVID_Recovery_2020.pdf on 20 November 2020

The Philippines and Vietnam account for 64% of the total number of projects in the database, of which the Philippines accounts for 37% of the total number of projects. This reflects great interest from investors ahead of the new FiTs or auctions.

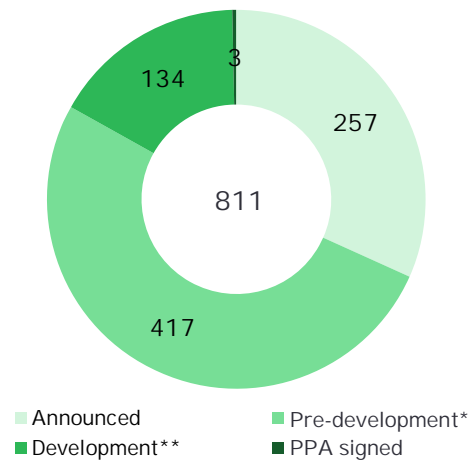
Although the North Asia markets account for only 111 projects out of the total 811 projects in the pipeline, it makes up for 74% of the estimated investment potential of the pipeline.

The study revealed that 51% of the projects are in the pre-development stage and hence, capital can be deployed quickly. Only 17% projects are at development stage.

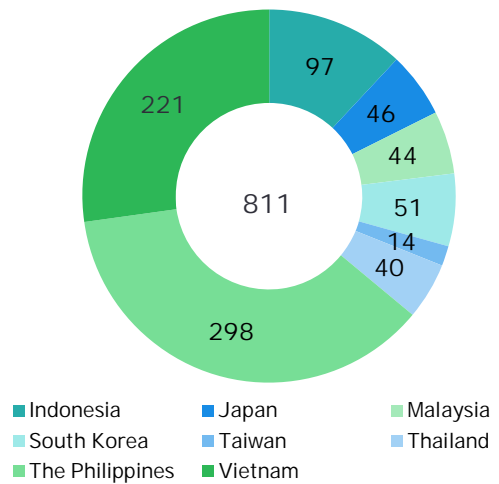
According to the study, 75% projects belong to the renewable energy sector, making it the most dominant of the focus sectors. This is followed by transmission and distribution sector, accounting for 19% of the projects.

The lack of representation of energy efficiency and EV projects in the pipeline, which account for 1.2% and 5.4% of the project database respectively, aligns with the limited momentum in these sectors. Projects in the energy efficiency sector include district cooling, demand response, smart streetlight and building retrofitting among others. Projects in the EV segment comprise fleet replacement and battery storage manufacturing projects.

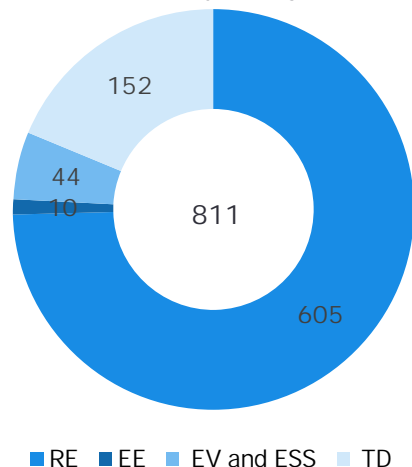
Number of projects by development stage



Number of projects by geography



Number of projects by sector

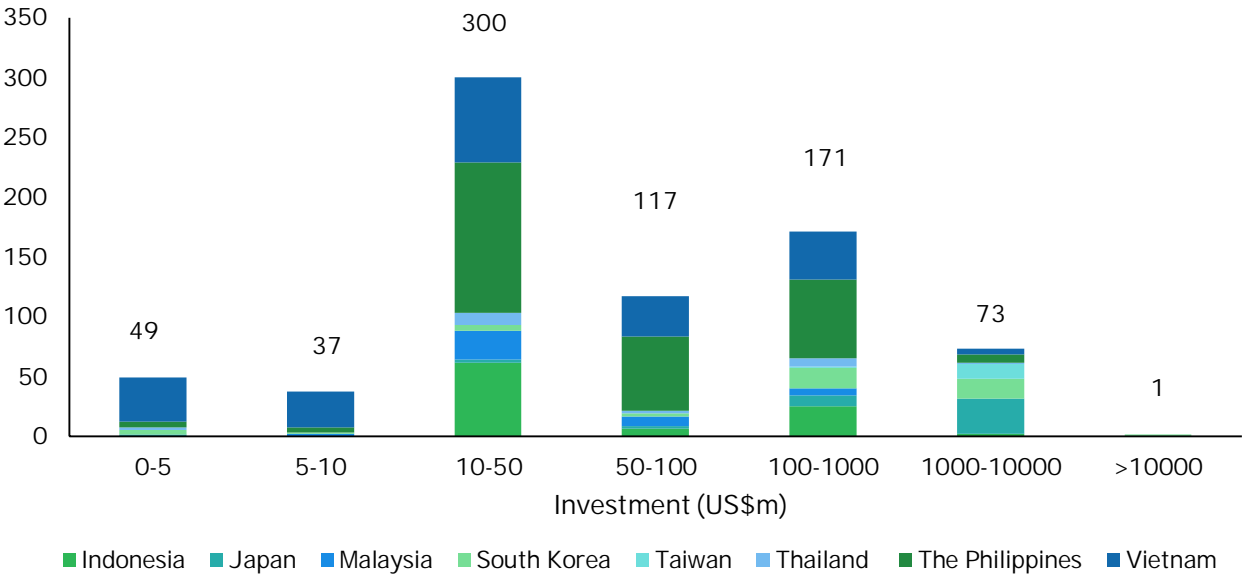


*The pre-development stage refers to projects in "launched feasibility", "pre-development", "approved" or "permitting" stage.
 **The development stage refers to projects "under procurement" or "development/financing" stage.

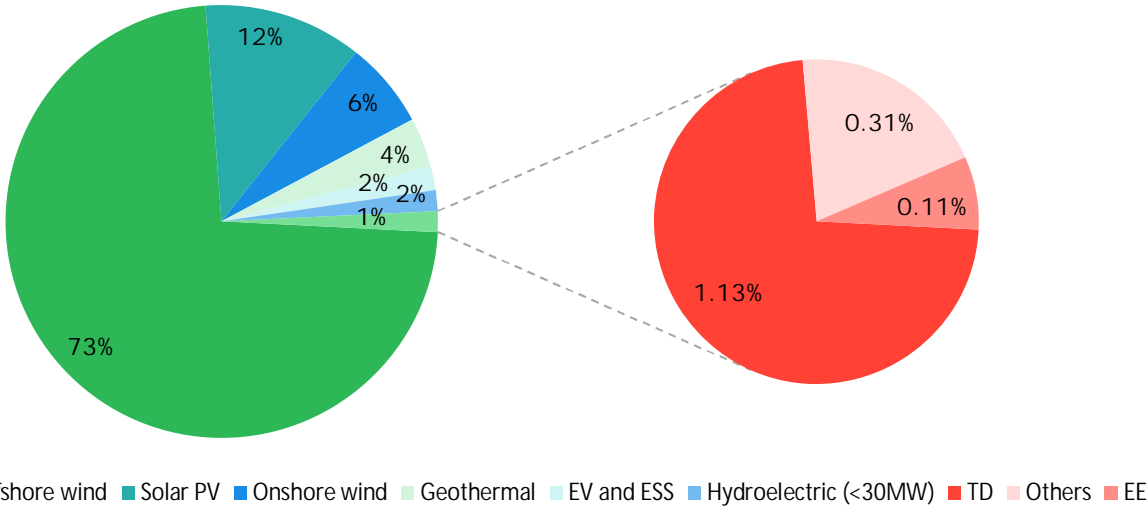
Forty-eight percent of the projects require an investment of less than US\$50m, highlighting the strength of small-scale projects in the pipeline. Majority of the projects in this category belong to the small hydroelectric (<30MW) (40%), solar (22%) and transmission and distribution sectors (30%).

The pipeline identifies only a few projects in some of the emerging renewable energy sectors such as tidal and energy storage. With market maturity, these sectors could yield a greater number of opportunities in coming years.

Breakdown of projects by investment range



Investment potential by sector



Renewable energy

The total renewable energy capacity in the pipeline is 90GW and is mainly located in South Korea, Japan and the Philippines.

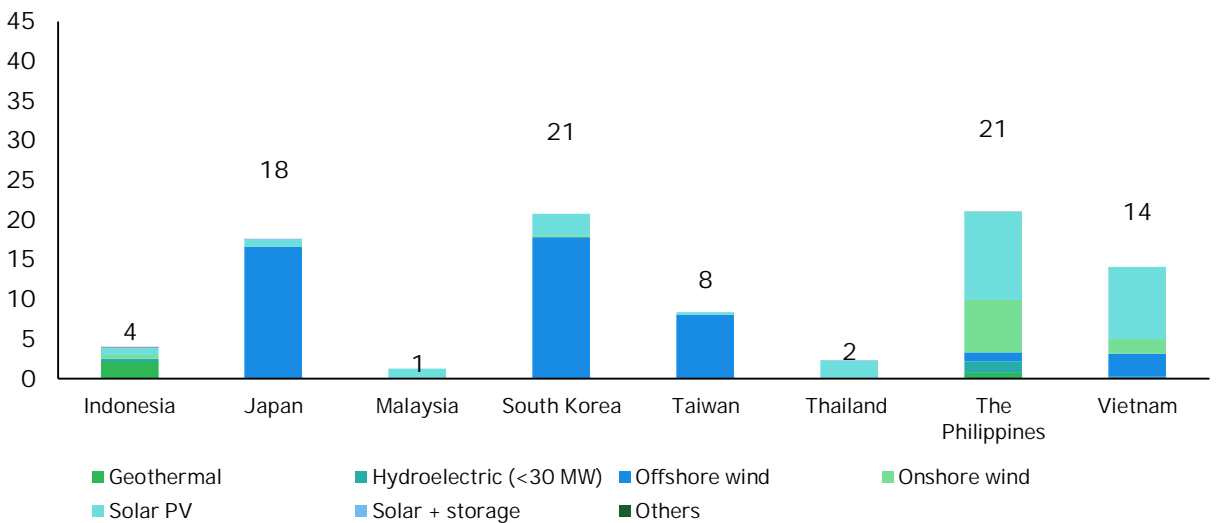
Offshore wind has the largest capacity in the pipeline with an estimated capacity of 46GW under development, followed by solar PV at 29GW and onshore wind at 9GW.

The pipeline emphasizes the emerging focus on offshore wind projects in the region, both in terms of capacity and investment.

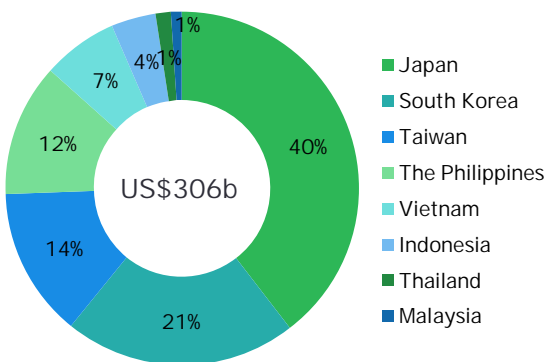
Offshore wind boasts of huge potential, constituting 73% of the total investments in the pipeline, followed by solar PV at 12% and onshore wind at 7%.

The majority, 13 out of 14, of the identified projects in Taiwan are in offshore wind. Due to the capital-intensive nature of the technology, Taiwan has the second highest investment potential in the pipeline.

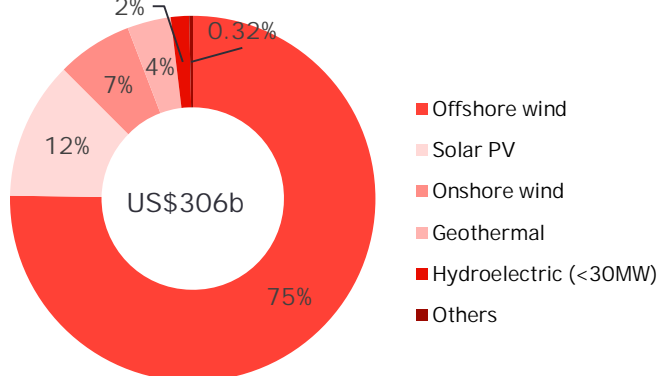
Renewable energy capacity: 90GW



Investment share in renewable energy by geography



Investment share by renewable energy subsector



Where investment value is not available, capital costs have been estimated using investment benchmarks

Estimated job creation potential

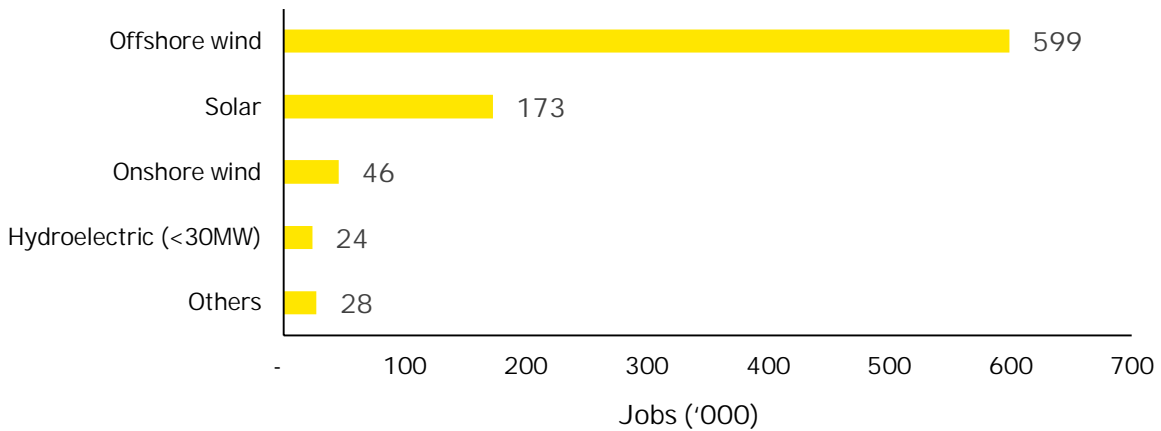
The collated pipeline has the potential to create up to 870,000 jobs across the focus geographies. Most of these jobs are likely to be created in the offshore wind sector, followed by the solar PV sector.

Japan and South Korea show the highest addition in jobs due to the dominance of offshore wind in their pipeline. The Philippines has a high job creation potential due to the high number of projects in the pipeline. However, actual job creation will

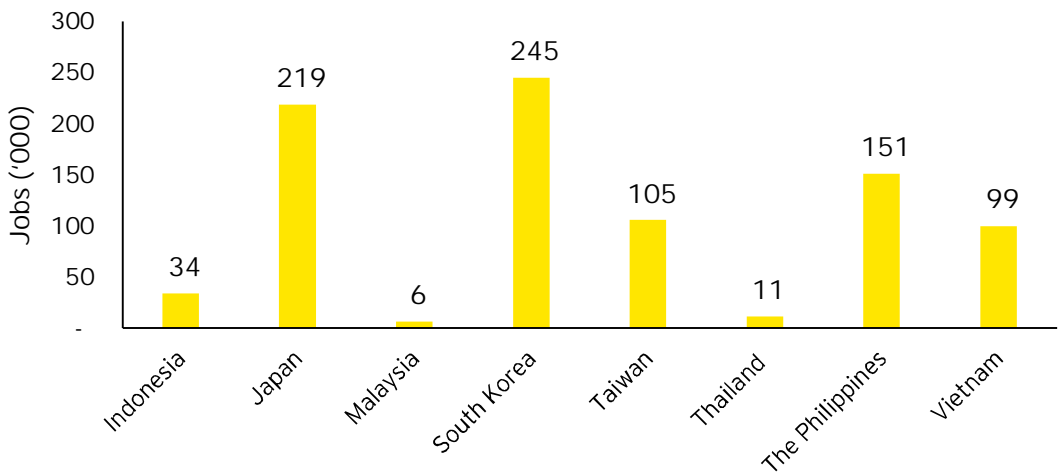
depend on the convertibility of the identified pipeline into actual investment.

Potential jobs from projects in the pipeline has only been calculated for the renewable energy sector. All subsectors from the RE sector have been analyzed to determine the job-creation potential of the project pipeline. The "others" category under RE includes geothermal and tidal.

Potential jobs by sector



Potential jobs additions



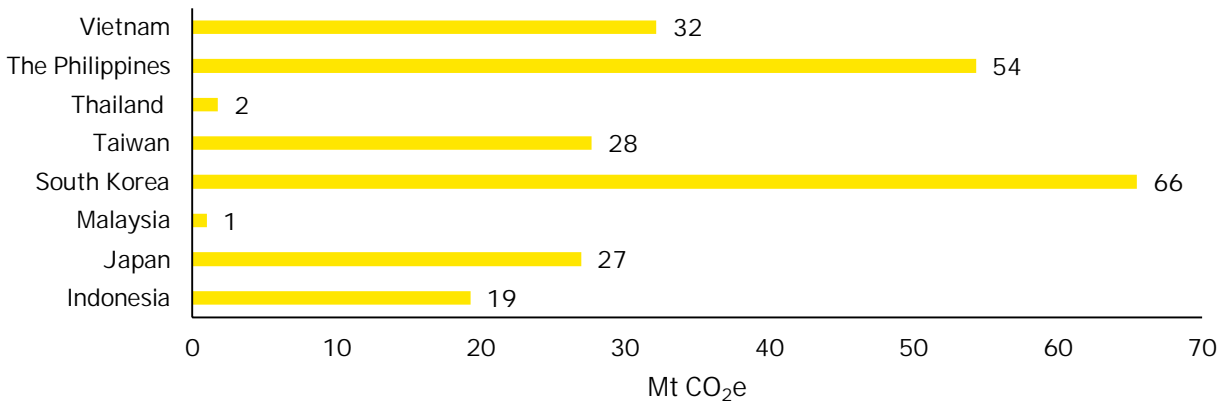
Carbon dioxide reduction potential

The pipeline estimates emission savings on the basis of displaced emissions due to the replacement of conventional sources with renewable energy sources.

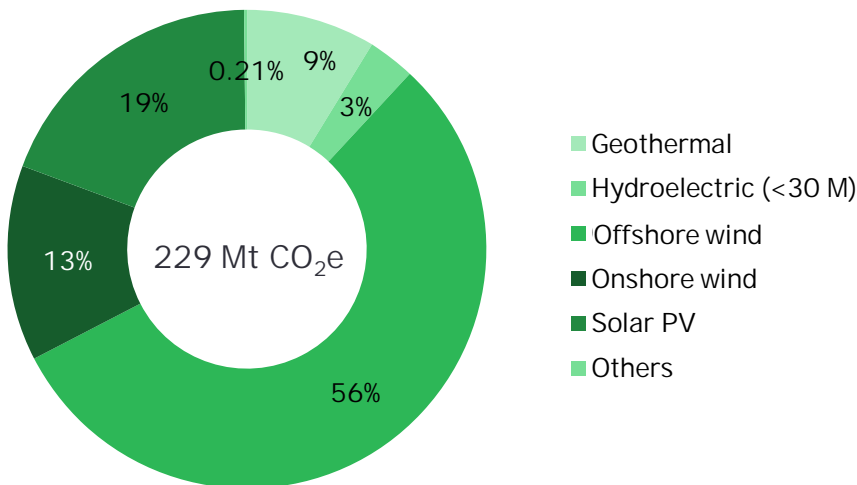
For renewable energy sector, the emission saving potential is estimated to exceed 229 Mt CO₂e, assuming the entire pipeline is realized.

The emission saving from other focus sectors has not been estimated at this stage due to the fragmented nature of the projects and initiatives being largely new-build pilot projects (rather than replacement).

CO₂ emissions avoided by geography



CO₂ emissions avoided by sector



Transformative projects in the region

Malaysia

A well-designed and transparent reverse auction mechanism helped the solar industry flourish, where LSS3 saw the lowest tariff offered at MYR 0.17/kWh, reducing tariffs with each round.

Japan

Vehicle-to-grid pilot program started by Chubu Electric Power, Toyota Tsusho and Nuvve, funded by METI and ANRE that enables EVs to be used as power generation assets for frequency regulation.

Taiwan

Second-largest offshore market in the region, due to a well-structured regulatory framework, attractive FiTs and conducive business environment. There are also plans to develop solar plants co-located with farms as a strategy to help small agricultural stakeholders to generate energy, along with other farm activity.

Thailand

The country's first peer-to-peer renewable energy trading project using blockchain technology at Sansiri's Town was developed by BCPG and Power Ledger. As well, leveraging a combination of floating photovoltaics and hydropower, the Sirindhorn Dam Hydro-Floating Solar Project in Sirindhorn District is expected to be the largest floating PV system in the world. Thailand is also planning several floating solar IPPs in the coming decade.

Vietnam

An attractive FiT and standard PPA led to the installation of 4.5GW solar capacity by 2019, exceeding the 4GW national target for 2025. The MoIT is now evaluating a direct power purchase agreement mechanism between renewable energy and private power consumers.

4

Geography analysis



Indonesia



A total of 97 projects with an estimated investment of US\$12b was identified. The renewable energy sector is the most prominent sector and remains most attractive, with 94 projects and 4GW capacity in the pipeline. Geothermal, solar and wind are the sectors of most interest; the geothermal sector has the largest number of projects, which is unique to Indonesia.

Although large hydro projects are not typically considered renewable and hence, not included in this study, these are considered as renewable energy in Indonesia's national plans.

The study only includes projects available in the public domain with an estimated investment of more than US\$10-15m per project. Hence, this study identifies only a small portion of the green projects under development.

97

Projects identified

US\$12b

Investment potential

4GW

Renewable energy capacity in the pipeline

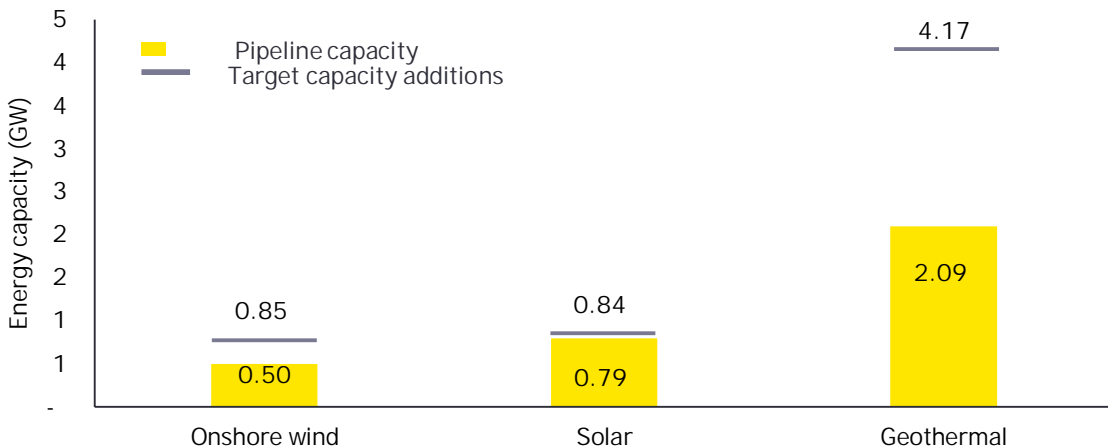
34k

Jobs creation potential

19 MTCO₂e

Emissions avoided

Comparison of pipeline capacity and target additions required



*Target capacity additions are as per the PLN's RUPTL 2019-2028

Renewable energy

There is continued interest from the private sector in renewable energy to contribute to Indonesia's energy transition. Renewed national targets and a clear procurement process can accelerate implementation.

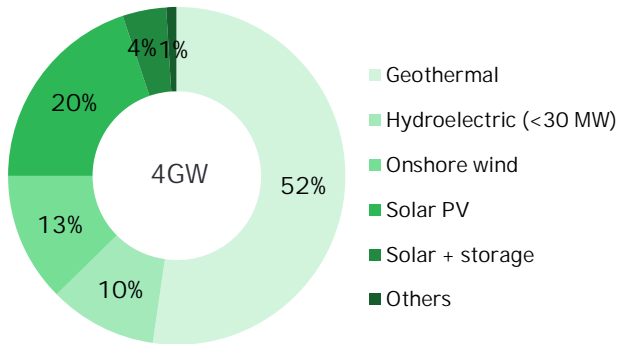
The pipeline shows modest additions of less than 1GW each for solar and wind projects. Interviews suggest that the absence of a clear plan for the procurement of renewable energy and the delay in RUPTL 2020-2030 hampers the development of a healthy pipeline.

The National Energy Policy (KEN) and National General Energy Plan (RUEN) have a target for the renewable energy share of the primary energy mix to reach 23% by 2025. The National General Electricity Plan (RUKN)

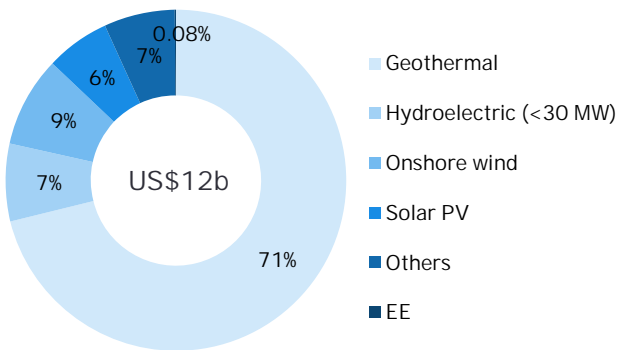
and National Electricity Business Plan (RUPTL) 2019-2028 have a target for the power sector's renewable energy share to reach 23% by 2025.

Per IESR estimates, to be on track with the energy transition scenario, installed capacity should be at least 23.7GW by 2025 and at least 408GW by 2050. Complementing RUEN's detailed breakdown of 23% target among different technologies by including these targets as part of the PLN's strategy can send strong policy signal to the market.

Renewable energy capacity



Investment potential by sector



Future renewable energy development in Indonesia will hinge on the PLN's strategy

Geothermal sector remains the most prominent sector in the pipeline (with planned capacity of more than 2GW). This appears to be consistent with the PLN's RUPTL 2019-2028, which targets almost 4GW of additions in geothermal power plants.

Recent announcements from the PLN indicate that the PLN's green transformation is focused on four levers:

- Co-firing
- Diesel plant replacement
- Floating solar PV plants
- Usage of existing dams for hydropower generation

There is no particular focus on solar and wind. The PLN plans to replace 2240 diesel power plants (lifetime >15 years) with 1.78GW renewables from 2021 to 2024.

As the sole offtaker of electricity, the PLN plays a central role in the development of renewable energy in Indonesia. Developers have cited that an increased interest by the PLN to consider applications for new renewable energy projects and shortening PPA negotiations could accelerate renewable energy development.

Limited financing is a constraint in the development of small-scale projects

A total of 61 out of 97 projects in the Indonesian pipeline require an investment of less than US\$50m. Of the 97 projects, only 20 projects are at or beyond the development stage.

The lack of non-recourse financing solutions typically hampers the development of small-scale projects. Higher lending rates in

the local market, limited availability of long-term debt finance and collateral requirements are barriers for small and independent developers. The financing challenge for small-scale projects is not specific to Indonesia and is often the case in many developing markets.

High local content requirements inhibit the development of projects at cost-competitive rates

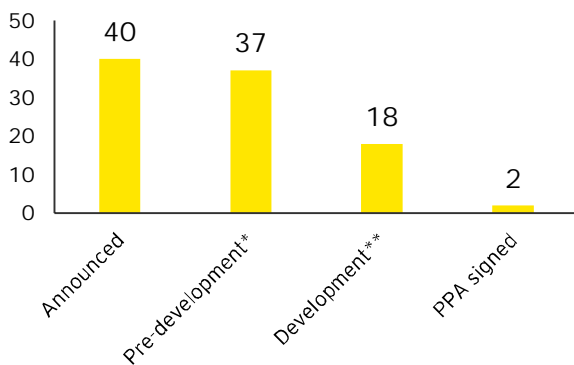
Local content requirements for renewable energy (solar, geothermal and hydropower) is challenging to achieve in the current context and increases the cost of renewable generation. Concerns over the quality of locally manufactured modules hamper the ability to finance projects with international lenders.

While costs are high, the tariff for purchase of renewables is capped at a ceiling price of 85% of BPP (Biaya Pokok Penyediaan

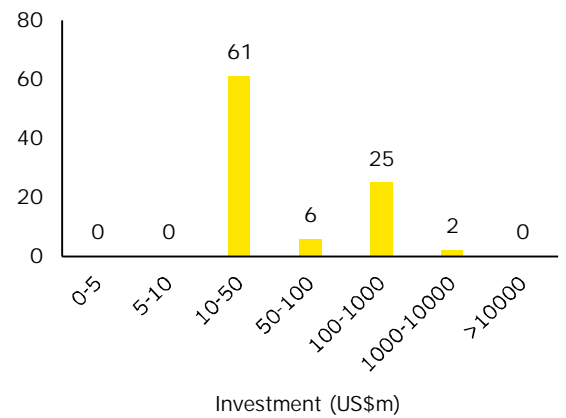
Pembangkit or system cost of generation). Investors say that tariff caps are not reflective of the cost of generation from renewables considering the local content requirements.

The development of a local manufacturing industry and the corresponding reduction in cost can be achieved if ambitious targets are set for each technology and supported by a clear regulatory framework and procurement process.

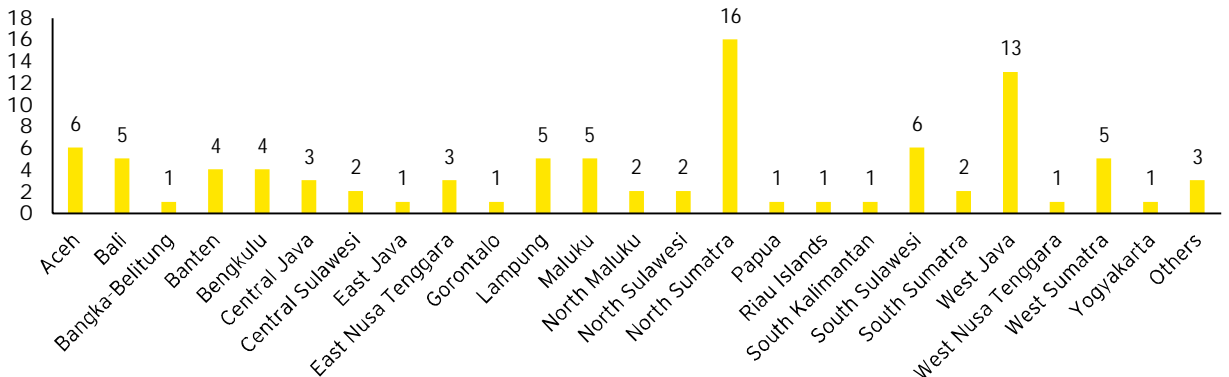
Number of projects by development stage



Number of projects by investment range



Number of projects by provinces



*The pre-development stage refers to projects in "launched feasibility", "pre-development", "approved" or "permitting" stage.

**The development stage refers to projects "under procurement" or "development or financing" stage.

The interviews reveal that Indonesia needs regulatory clarity to accelerate its energy transition

High perceived risk

- Supporting market framework
 - Allowing companies to source 100% green electricity is an area of opportunity that can be pursued by leveraging the PLN's recently announced service offering.
 - Generation for self-consumption permitted. Selling back to the grid is discounted at 65%.
- Adaptive renewables policy
 - MEMR regulations set out methods for the PLN to source renewable energy power and the relevant pricing regime. Most of the procurement is based on direct selection or appointment and at a mutually agreed tariff.
- National ambition and targets
 - The pipeline suggests a strong market interest, which is capable of meeting the national target addition for solar as the pipeline capacity is 94% of the additions required to meet the target suggesting that there is scope for the targets to be revised higher.
 - The PLN's plans do not indicate any additions in the solar and wind sector and the additions stated could also fall short of the national targets.
- Allocable land parcels
 - Land acquisition remains a challenge due to lack of clarity on ownership in certain locations and lengthy process.

Medium perceived risk

- Robust transmission capacity
 - Investment in strengthening grid capacity in tandem with the development of new renewable energy capacity can support long-term development of the renewable energy sector.
 - Support in the expansion of decentralized solutions such as micro-grids and smart grids can be pivotal in supporting renewable energy development, particularly in remote islands.
- Favorable supply-demand
 - Energy demand is growing by about 5-7% annually.
 - Balancing the development of new capacity with oversupply in certain places can be a potential focus area.
- Thorough resource assessment
 - Government assistance in resource assessment for geothermal sites can reduce the appraisal cost for developers and accelerate the pace of geothermal development.

Low perceived risk

- Financing and bankability
 - Although financing large-scale and grid connected projects is not a challenge, limited access to long-term finance impacts the development of small-scale projects and SMEs.

Energy efficiency

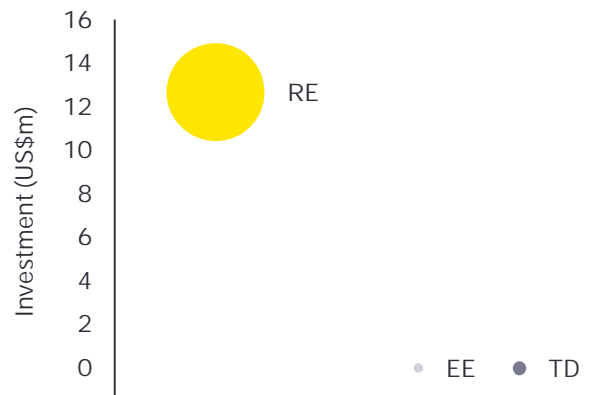
Despite the potential for socioeconomic benefit, the estimated investment in the energy efficiency sector is only 0.08% of Indonesia's total pipeline. The small pipeline is not due to lack of potential but from a lack of interest in the sector. Industry practitioners estimate the market size of street lighting projects to be upward of US\$1b with up to 30% energy saving potential. However, the sector has not yet picked up momentum due to limited stakeholder interest, lack of awareness of the energy and cost-saving potential.

Energy efficiency projects in Indonesia are usually initiated by project developers such as ESCOs. However, initiatives have been limited due to the inadequate financial capacity and constrained access to financing.

The government has introduced MEPS for certain products such as ACs and CFL lamps. In addition, there are requirements for large energy consumers to appoint an energy manager, perform energy audits and implement energy conservation programs. While guidelines are prescribed, there are no real incentives for compliance or penalties for companies who fail to submit their energy audit reports. Hence, the reporting and compliance rate remains low.

The adoption of green building codes also remains limited due to high investment costs, lack of funding scheme, little awareness of the cost-saving potential and a lack of understanding of the energy saving companies' cost-saving models. The green building code has to be enacted in the local (sub-national) regulation since building permit and license are the authority of sub-national government. Unclear regulatory framework and incentives from local government also slow down the adoption of green building standard.

Indonesia's pipeline snapshot by sector



Lack of stimulus, energy-intensive industries are indifferent to energy management self-reporting. Some of major barriers to the implementation of energy management reporting are no tangible benefits seen by the industries to reporting their programs and no real penalties or retributions imposed on entities that fail to submit their reports.

Indonesia Clean Energy Outlook: Tracking Progress and Review of Clean Energy Development in Indonesia, Jakarta: Institute for Essential Services Reform (IESR), 2019

Recommendations

The start of the energy transition in Indonesia will require alignment among the relevant ministries, authorities and the PLN to provide the market a clear direction of upcoming opportunities. The study highlights the PLN's pivotal role in providing an anchor for Indonesia's green energy transition, given its strategic role in the sector. The PLN can be tasked to implement specific market-based programs:

Coordinate market efforts between the government and the PLN: For Indonesia's clean energy transition, a strong commitment to supporting renewable energy technologies is essential. Greater alignment is required between the PLN's annual power development plans and national announcements made by the government. The market remains hopeful that RUPTL 2020-2030 will reflect the statements made by MEMR Minister in January 2020.

Initiate a clear pipeline of renewable energy projects with a transparent procurement process: A FiT-type approach for procurement may be adopted to address existing barriers while considering the local content requirements, the peculiarities of each grid location and the size of projects. As well, the introduction of a standard PPA

can shorten the contract negotiation process. The development of large-scale renewable energy procurement framework can create a systematic plan and pipeline for the market.

Introduce an "optimal" tariff to promote renewables: The tariff for renewable energy projects must reflect the costs of renewable energy generation given the local content requirements. Schemes like the Solar Archipelago (Surya Nusantara) plan, which is currently under development, could help to kick start the green recovery and is estimated to create local employment opportunities.

Incorporate support mechanisms: Measures such as credit guarantees, bridge financing and loans can be included as part of stimulus packages that can help finance small-scale projects.

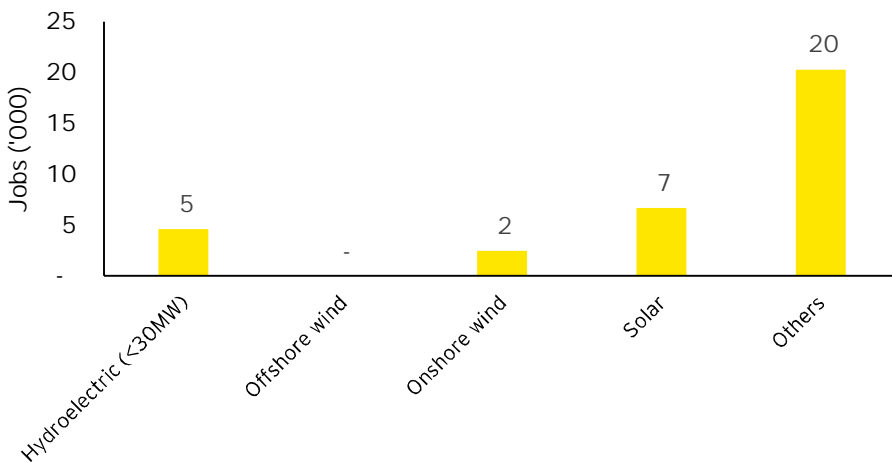
Encourage the roll-out of energy efficiency initiatives: Programs like government building retrofits, street lighting projects to encourage energy efficiency projects can be encouraged as part of the COVID-19 recovery packages.

Recommendations

Create a supporting ecosystem for EVs: This can help to encourage the penetration of electric motorbikes.

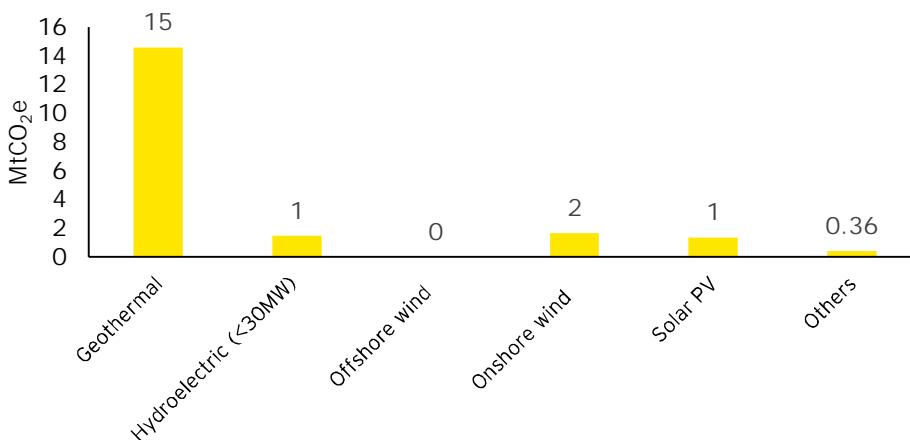
Implement the recommendations outlined by IESR in its report: These include reforming taxation schemes based on tailpipe CO₂ and pollutant emissions; providing non-fiscal incentives such as road toll exemptions, free parking, exemption from odd-even policy and allowance to use bus lanes; establishing a mandatory fuel economy standard to reduce transport emissions while EVs are not yet competitive; creating an initial market through public procurement of EVs such as for public buses and official vehicles for government officials; and increasing the fuel price through fuel quality standard improvement.

Number of jobs by sector



The pipeline has the estimated potential to create up to 34,000 jobs

CO₂ emissions avoided by sector



The pipeline has the estimated potential to avoid more than 19 MtCO₂e of CO₂ emissions per annum

Japan



The study identifies 46 projects with an estimated investment of US\$126b. While the renewable energy sector is the most prominent sector with 41 projects and 18GW capacity in the pipeline, the remaining projects belong to the EV and transmission and distribution sector.

Offshore wind is the most prominent subsector within the renewable energy sector, with 94% of the capacity in the pipeline, followed by solar PV, which accounts for 5% of the capacity.

The pipeline is the largest in terms of estimated investment required and the realization of these projects is contingent on addressing some of the inherent challenges.

The Japan chapter does not cover energy efficiency and EVs because of limited information on ongoing activities.

The study only includes projects available in the public domain that exceed a certain minimum threshold. Hence, this study identifies only a small portion of the green projects under development.

46

Projects identified

US\$126b

Investment potential

16GW

Renewable energy capacity in the pipeline

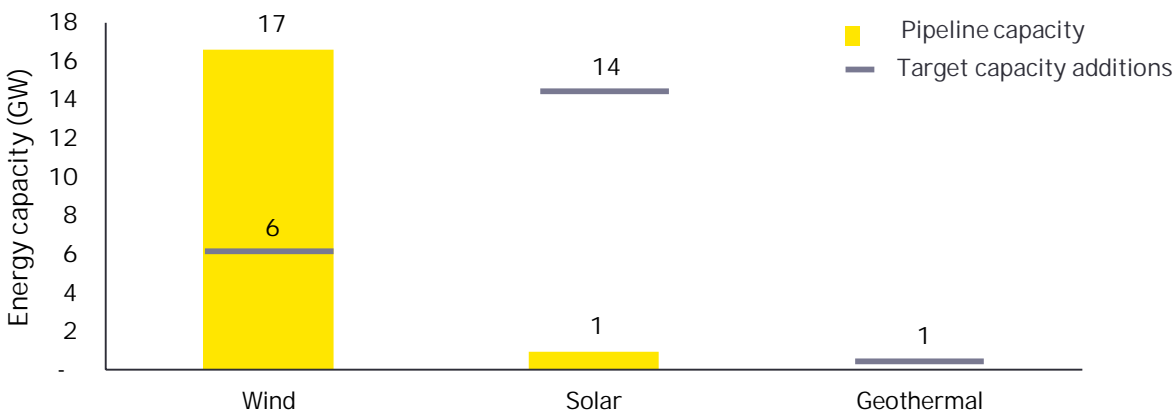
219k

Jobs creation potential

27 MTCO₂e

Emissions avoided

Comparison of pipeline capacity and target additions required



*Target capacity additions to achieve 2030 targets
Source: Agency of Natural Resources and Energy

Renewable energy

The lack of appropriate land area and market saturation are key barriers for the further development of onshore wind projects. Onshore wind only accounts for 0.15% of the total capacity in the pipeline. The land available for wind farms is becoming saturated, due to factors such as national forest, distance from the grid line, permission restrictions and restricted areas for rare animals and plants.

Experts believe that the onshore wind market is headed toward saturation due to the presence of many stakeholders as well as low availability of appropriate land. The expected introduction of an auction system, similar to the offshore auction process launched in June 2020, under a fixed price mechanism, could impact market attractiveness.

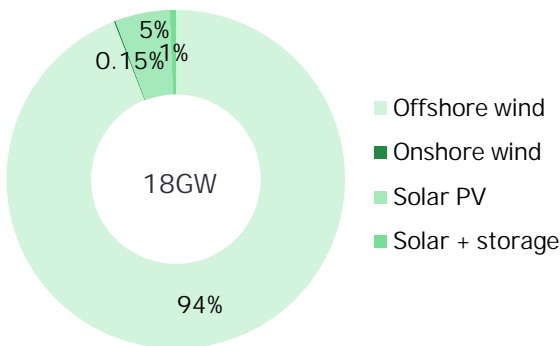
In the offshore wind sector, there are many opportunities available. However, uncertainty around promotion zones and increasing project costs pose challenges. Currently offshore wind dominates the

pipeline with 94% of the total capacity. For offshore wind, the government has slowly begun allocating geographical regions known as promotion zones, after consulting with local stakeholders, national ministries, local government bodies, fisheries groups and academic experts.

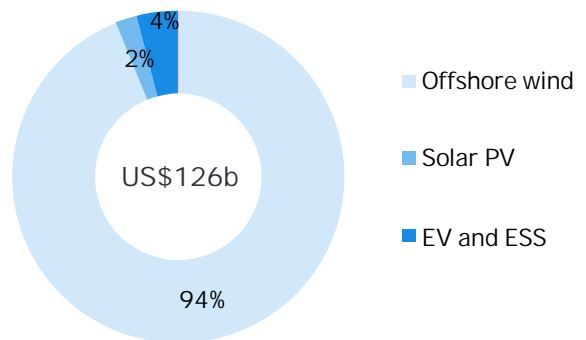
Uncertainties surrounding where the promotion zones are likely to be located is expected to slow the investment pace for new projects. Still, some developers have begun preliminary studies, such as feasibility studies and environmental impact assessments in anticipation.

The recently launched tender process and associated framework set out the process for offshore wind energy procurement in the coming years. Although project financing is prevalent, the extensive technical requirements, permit process, interfaces with other stakeholders such as fisheries or port authorities increase project costs considerably.

Renewable energy capacity



Investment potential by sector



EIA and decommissioning requirements are highlighted as two complex factors constraining the development cycle and LCOE. Currently, only 22% of the projects in the pipeline are at the development stage. Developers cite a lengthy environmental impact assessment and development cycle of projects, which could take between three to five years to receive approval, as a major barrier.

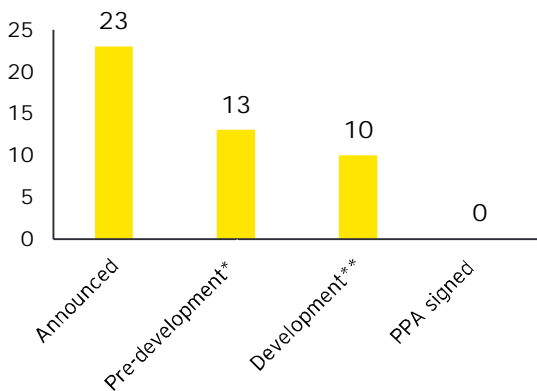
Developers need to submit decommissioning plans for a project, which are usually formulated later in the project lifecycle, to Japan's Ministry of Economy, Trade and Industry (METI) at the time of initial application for certification of business. This process is lengthy and complicated. Developers must also determine how to factor these decommissioning costs into the FiT to recover this cost.

As well, 90% of the projects require an investment of more than US\$100m and a reduction in LCOE can impact project economics.

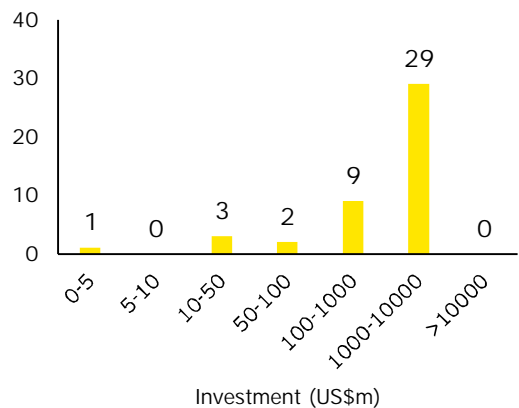
At the same time, integrating renewables in Japan island grid system is a challenge. Although transmission and distribution sector only showcases two projects out of the total 46 in the pipeline, developers say that Japan needs investments in grid strengthening.

The Japanese power system comprises two main AC synchronous areas: Western Japan (50 Hz) and Eastern Japan (60 Hz). Integrating renewables into the grid without impacting grid stability remains a major concern for transmission system operators. Grid access is granted on a first-come first-served basis, favoring existing generators, making grid connection relatively harder for renewable generators.

Number of projects by development stage



Number of projects by investment range



*The pre-development stage refers to projects in "launched feasibility", "pre-development", "approved" or "permitting" stage.

**The development stage refers to projects "under procurement" or "development or financing" stage.

A stronger focus on renewables needed to accelerate its energy transition

High perceived risk

- Allocable land parcels
 - There is a growing scarcity for land available for onshore wind and solar projects. Hence, the focus is shifting toward offshore wind.
- National ambition and targets
 - Strong market interest in the offshore wind sector with 17GW identified in the pipeline.
 - The pipeline capacity is more than 2.5 times the capacity additions of 6.3GW to required to meet the national target 10GW wind energy by 2030.

Medium perceived risk

- Adaptive renewables policy
 - ▶ The complex EIA and decommissioning process lengthen the development cycle for renewable energy projects.
- Favorable supply-demand
 - The government has committed to phase out 100 inefficient coal-powered plants in the country which create an opportunity for increased renewable energy share.
- Robust transmission capacity
 - More investment is required in the strengthening the grid sector.
 - Solar facilities over 50 kW could be subject to curtailment as electricity companies are reserving their transmission capacity for nuclear generators that are currently out of operations

Low perceived risk

- Supporting market framework
 - Companies have several options to source renewable energy including onsite generation, green electricity products and energy attribute certificates.
- Financing and bankability
 - Reduced FiT rates for solar are impacting the economic feasibility of projects. However the financing market remains robust.
- Thorough resource assessment

Recommendations

Some of the recommendations to help support green recovery in Japan include:

Create a vibrant pipeline, leveraging lessons learnt from the ongoing tender process to create a transparent process for future procurement in the offshore wind sector.

Encourage wider adoptions of programs like the “Net Zero Energy House” and the subsidy program launched in 2019 for household storage systems as part of their COVID-19 recovery packages.

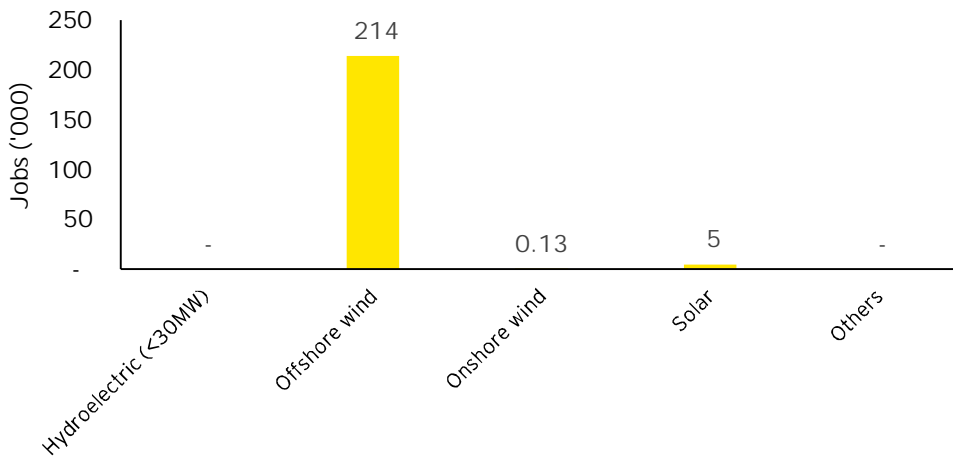
Implement subsidy programs to promote energy efficiency in the industrial and building sector can support energy efficiency initiatives for post-COVID-19 recovery.

Greater alignment with interfacing agencies is needed to streamline process. Creating policies in terms of regulation or system change should be discussed from a macro viewpoint in the governmental committees and working groups, instead of discussing with individual stakeholders, which often results in a patchwork institutional design. The potential of the offshore wind market can be better realized if there is regulatory flexibility provided in the approval process such as a simplified and short economic impact assessment and transparency in the announcement of promotion zones. As well, the government can conduct the required surveys prior to launch of tenders, as it is economically challenging for bidders to complete a submarine ground and other surveys while a project is in the auction stage. Government surveys can help bring down costs.

Recommendations (continued)

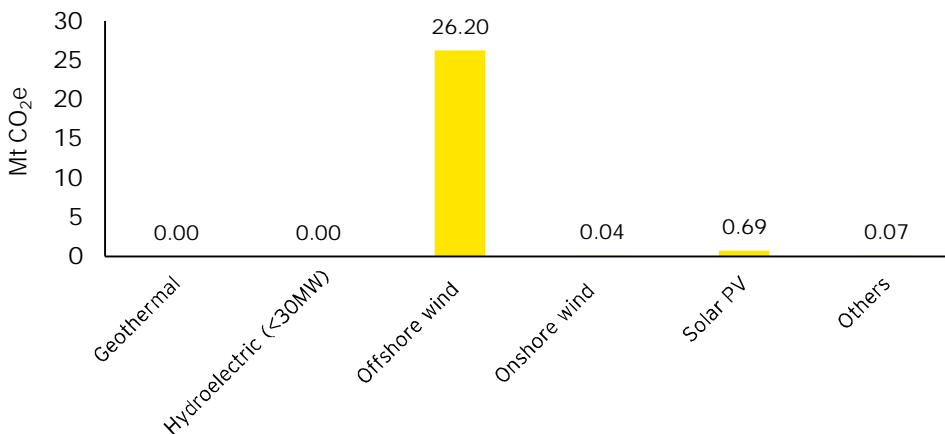
Encourage large Japanese utilities to explore new business solutions such as microgrids and virtual power plants (VPP). Permitting and actively supporting the emergence of new business models can help further accelerate the adoption of renewables. For instance, through the wide-scale adoption of green tariffs (e.g., Aqua Premium plan by TEPCO), private sector involvement in a digital application will help accelerate the transition.

Number of jobs by sector



The pipeline has the estimated potential to create up to 219,000 jobs

CO₂ emissions avoided by sector



The pipeline has the estimated potential to avoid up to 27 MtCO₂e of CO₂ emissions per annum

Malaysia



The study identifies 44 projects in the pipeline, with an estimated investment of US\$3b. The renewable energy sector is the most prominent sector with 40 projects and 1GW capacity in the pipeline. The remaining projects belong to the energy efficiency and transmission and distribution sector.

The solar sector has the largest number of projects within the renewable energy sector, followed by hydroelectric (<30MW). The TD and energy efficiency sectors make up 9% of the total number of projects.

The study only includes projects available in the public domain that exceed a certain minimum threshold. Hence, this study identifies only a small portion of the green projects under development.

44

Projects identified

US\$4b

Investment potential

1 GW

Renewable energy capacity in the pipeline

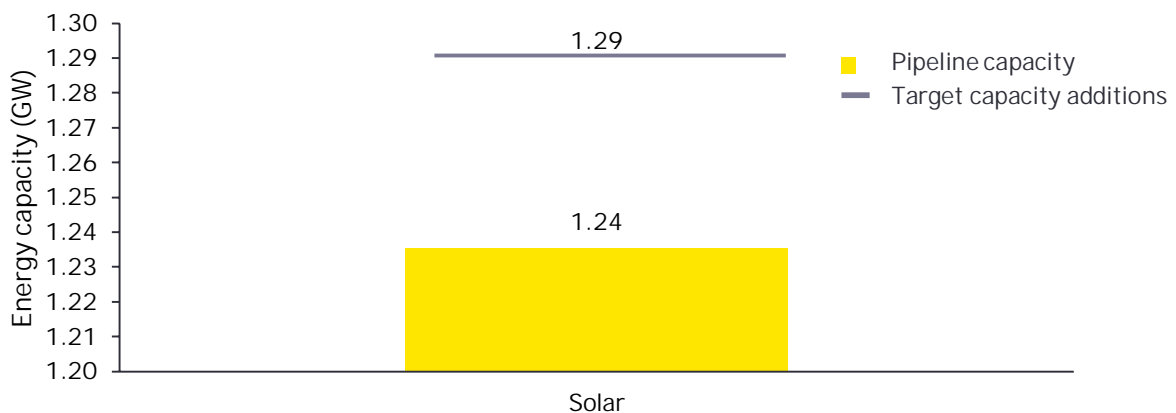
6,300

Jobs creation potential

1 MTCO₂e

Emissions avoided

Comparison of pipeline capacity and target additions required



*Target capacity additions to achieve 2025 targets
Source: IRENA; Suruhanjaya Tenaga Generation Development Plan 2019

Renewable energy

The pipeline for renewable energy projects reflects the resources that Malaysia is endowed with. The identified pipeline is dominated by solar PV projects, which make up 95% of the total capacity, followed by hydroelectric (<30MW) accounting for 5%. The dominance of solar PV can be attributed to the LSS auction process that has been successfully implemented in Malaysia.

For the purpose of this study, waste-to-energy projects have not been considered. However, it must be noted that the sector shows promise in Malaysia and has garnered active market interest. Sustainable Energy Development Authority (SEDA) reports approved biomass applications of ~400MW, which will come online by the end of 2021.

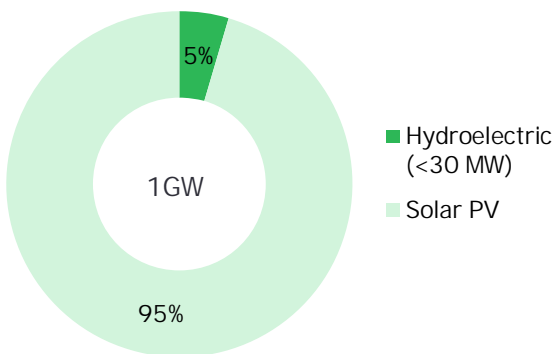
While there are opportunities in the biomass sector, the private sector has cited some

barriers for development linked to location and supply chain. For example, biogas generation uses wastewater for palm oil mills. Developers cite that the interconnection cost would be prohibitive for remote locations situated far away from the national grid.

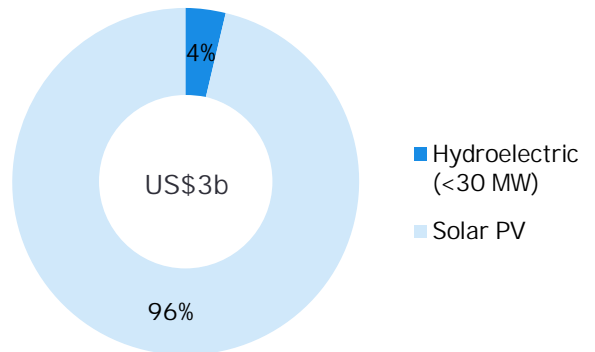
As well, the high costs of interconnection limit the number of viable sites to only about a-third of the country's mills. There are a finite number of palm oil mills in the country, which will eventually all be connected to the grid.

Developers estimate that for projects located more than 7km from the grid, grid connection needs to be set up by the developer, the additional costs of which can make the project economically unfeasible.

Renewable energy capacity



Investment potential by sector



Due to the bespoke nature of projects in sectors like energy efficiency and electric vehicles, comparable investment benchmarks are not available. Therefore it may be inferred that the investable pipeline may be far greater than estimates made under this study.

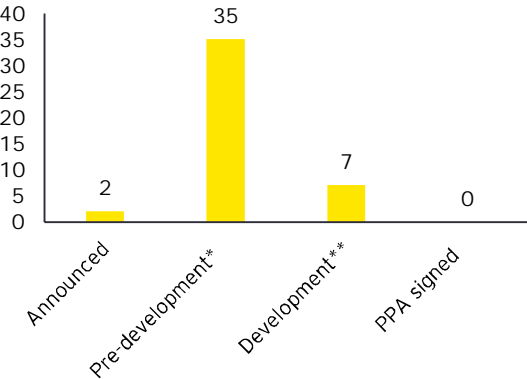
Small-scale projects need to be financed on a corporate finance basis due to difficulty in accessing project financing. A total of 7 projects out of the total 47 projects in the pipeline reached the development stage, highlighting the difficulty in accessing funding for projects.

Banks are wary of the sponsor or contracting party's credit strength for SMEs and small-scale projects, other than solar procured under the LSS program. Appetite for financing projects where the offtaker is not Tenaga Nasional Bhd (TNB) is less. For such projects, corporate loans are preferred instead of project loans.

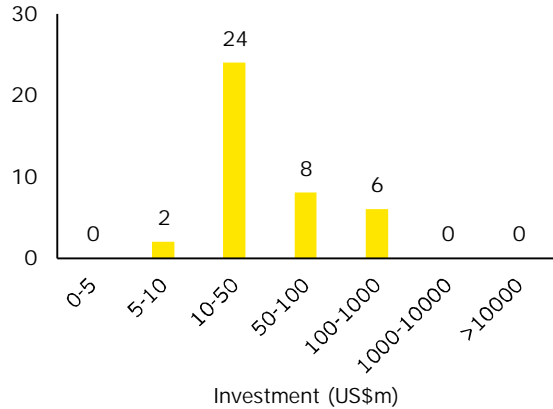
Small-scale projects make up a significant portion of the pipeline, with 59% projects requiring an investment of less than US\$50m. Facilitating access to finance for such projects can help to accelerate the development of the renewable energy sector and increase the number of projects that can progress to the more advanced stages.

Some of the concerns around financing small-scale projects include grid access, availability of feedstock for biogas projects and counterparty strength.

Number of projects by development stage



Number of projects by investment range



*The pre-development stage refers to projects in "launched feasibility", "pre-development", "approved" or "permitting" stage.
 **The development stage refers to projects "under procurement" or "development or financing" stage.

Opportunity for Malaysia to revise national targets given strong market interest; streamlining land conversion process can accelerate its energy transition

Medium perceived risk

- National ambition and targets
 - There is an opportunity for Malaysia to revise national renewable energy targets as the private sector has shown strong interest. The latest tender demonstrates competitiveness of solar versus gas.

Low perceived risk

- Financing and bankability
 - Access to finance not an issue for utility-scale projects.
 - Difficulty in accessing financing for small-scale projects and projects where TNB is not the offtaker (i.e., East Malaysia).
- Adaptive renewables policy
 - ▶ The Large Scale Solar scheme has invigorated the sector by creating a centralized procurement mechanism.
 - ▶ The LCOE decreased by 50% from LSS1 to LSS3.
- Robust transmission capacity
- Supporting market framework
- Allocable land parcels
- Thorough resource assessment
- Favorable supply-demand
 - ▶ Robust energy demand growing at over 5% p.a. since 2010.

Energy efficiency

The energy efficiency sector shows insofar untapped potential and this constitutes 4.5% Malaysia's project pipeline. Low retail electricity tariffs (at ~US\$4-6 c/kWh) and low input gas price are cited as some of the primary barriers for adopting energy efficiency measures.

The government has introduced several incentives for promoting energy efficiency, such as the Government Green Procurement (GGP) initiative, Green Investment Tax Allowance (GITA) and Green Income Tax Exemption (GITE), which have been extended until 2023. While these programs have seen some success, expansion of the program with more ambitious targets can further strengthen the energy efficiency sector.

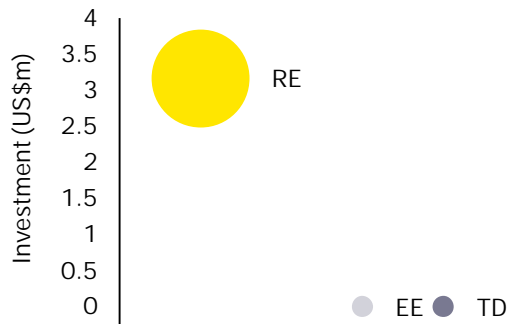
Although efforts such as the Malaysia Debt Ventures Energy Efficiency Fund exist and provide credit financing for energy efficiency and energy savings-based projects, there is a general lack of awareness on the potential of energy efficiency projects.

Customers view the viability of energy efficiency solutions through ESCO cost-saving modes with skepticism and are unconvinced of the potential to earn profits from the cost savings.

Most energy efficiency projects focus on replacing aging equipment. The approval process for energy efficiency projects is complex, lengthy and lacks clarity. There are no specific guidelines regarding which ministry to approach for such projects. While there are subsidies for energy savings, experts believe that the absence of an energy efficiency law and the commercial environment has withheld the sector from developing.

The first tender for government building retrofitting was released in early 2020, but the project has been stalled due to the COVID-19 outbreak.

Malaysia's pipeline snapshot by sector



Bubble size represents number of projects

Electric vehicles



Better safety standards, charging flexibility and convenience, lower operating costs of EVs are the key motivating factor for EV purchase in Malaysia.

The future of EVs in South East Asia

The EV sector is in nascent stage and holds promise in the long-term. Malaysia has introduced a strategic direction for EVs and other energy-efficient vehicles (EEVs) in its national policy. However, more incentives are needed to drive adoption.

The National Automobile Policy (NAP) 2020 aims to accelerate the implementation of low carbon mobility solutions. NAP 2020 focuses mainly on the automobile manufacturing aspects and aspires to improve Malaysia's competitiveness as a hub for EV-related manufacturing (including components). However, there are limited incentives to drive consumer adoption through demand-side interventions.

Further, there are limited EV models available in Malaysia and the price of EVs are significantly higher than conventional ICE vehicles. According to The future of electric vehicles in South East Asia position paper⁷, only 37% of respondents in Malaysia are open to buying EVs as their next purchase, indicating limited attractiveness of EVs compared to ICE vehicles.

In terms of EV charging infrastructure, Petronas Dagangan Bhd (PetDag) entered into a three-way partnership with GreenTech Malaysia and TNB Energy Services Sdn Bhd (TNBES), a wholly owned subsidiary of TNB, to install ChargeEV charging stations across Malaysia. As of 2020, there are 223 public EV charging stations with 329 chargers across Malaysia. There are a few other players also in the market such as Schneider Electric. Sustained deployment to increase coverage of charging infrastructure will help deployment.

In October 2019, the government unveiled in its 2020 Budget, outlining plans to invest US\$108m to acquire up to 500 electric buses of various sizes. However, the plans await implementation in a post-COVID-19 environment and the market is waiting for the 2021 budget to understand if any initiatives are planned in the coming years. Although activity remains limited in the short-term, the sector has the potential to generate economic benefits in the long-term.

⁷ "The future of electric vehicles in South East Asia", Frost & Sullivan, January 2018, accessed via [Nissan_whitepaper \(frost-apac.com\)](#) on 20 January 2021

Recommendations

Some of the recommendations to help support green recovery in Malaysia include:

Encourage new energy solutions such as microgrids and smart grids to enable the market to explore alternate contracting models and technologies for renewable energy, particularly in rural areas. The local governments can expand programs like the Sarawak Alternative Rural Electrification Scheme (SARES), which has seen some success in Sarawak, to other remote areas. Increasing awareness around initiatives such as major banks' funds targeted at SMEs and small-scale developers can help unlock other sectors such as bioenergy and energy efficiency.

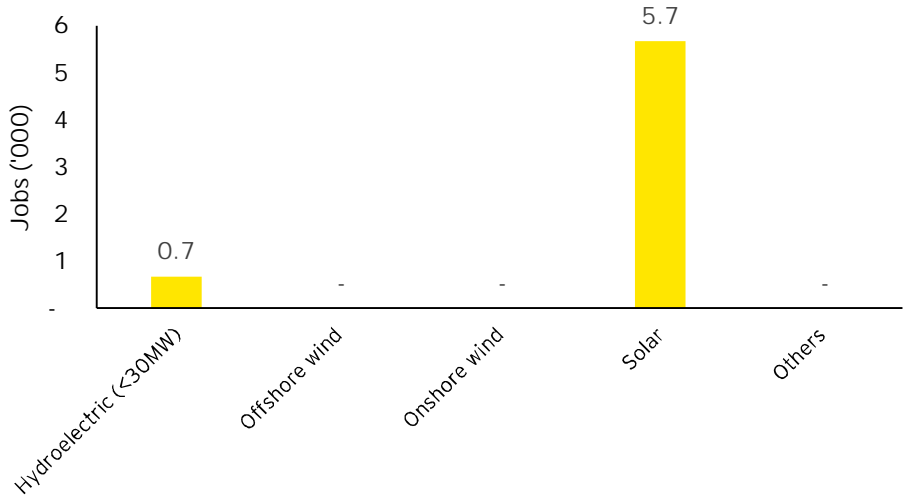
Further, introducing dedicated end-to-end technical assistance program for energy efficiency projects will be key to strengthening the pipeline of bankable project by creating opportunities to replicate and scale energy efficiency best practice. The technical assistance can help with preparation of a bankable Investment Grade Audit to help investors evaluate the benefits and risks of investing in a proposed energy efficiency projects.

Encourage more business to take advantage of schemes such as the Green Technology Financing Scheme 2.0, which will offer financial support (subject to only to the green technology or component cost finance) for a producer, user and ESCOs. The government can also drive further awareness regarding opportunities arising from the planned spending of MYR13b (US\$2.9b) for the energy efficiency sector outlined as part of the COVID-19 recovery package. The focus must remain on creating a robust ecosystem for EVs through improved manufacturing and greater adoption.

Consumers need to have greater awareness of the value proposition offered by EVs. Private companies can be encouraged to deploy EV charging infrastructure through the development of clear policies to enable V2G services and other ancillary services to promote scale. There are several government programs in place to build a conducive EV ecosystem. The industry will benefit greatly through incentives such as tax exemption, purchase subsidy, tax incentive or special program execution fund or grants that will help combat the higher cost of ownership for private purchase. Apart from private adoption, programs such as fleet replacement for public buses can support the public EV sector.

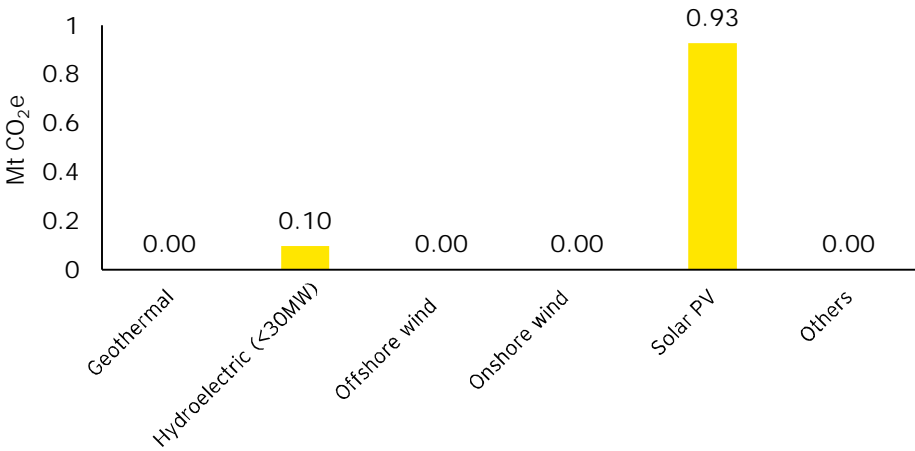
Recommendations

Number of jobs by sector



The pipeline has the estimated potential to create up to 6,300 jobs

CO₂ emissions avoided by sector



The pipeline has the estimated potential to avoid more than 1 MtCO₂e of CO₂ emissions per annum

South Korea



The study identifies 51 projects in the pipeline, with an estimated investment of US\$65b. While the renewable energy sector is the most prominent sector with 45 projects and 21GW capacity in the pipeline, the remaining projects belong to the EV and TD sectors. Offshore wind is the most prominent subsector within the renewable energy sector, with 86% of the capacity in the pipeline, followed by solar PV, which accounts for 13% of the capacity.

The pipeline is the second largest unveiled in the study, in terms of estimated investment required and the realization of these projects is contingent on addressing some of the inherent challenges.

The study on South Korea does not cover energy efficiency and EV because of limited information on ongoing activities.

The study only includes projects available in the public domain that exceed a certain minimum threshold. Hence, this study identifies only a small portion of the green projects under development. The identified pipeline exceeds the national targets and could signal a need to further rationalize the regulations around offshore wind.

51

Projects identified

US\$65b

Investment potential

21GW

Renewable energy capacity in the pipeline

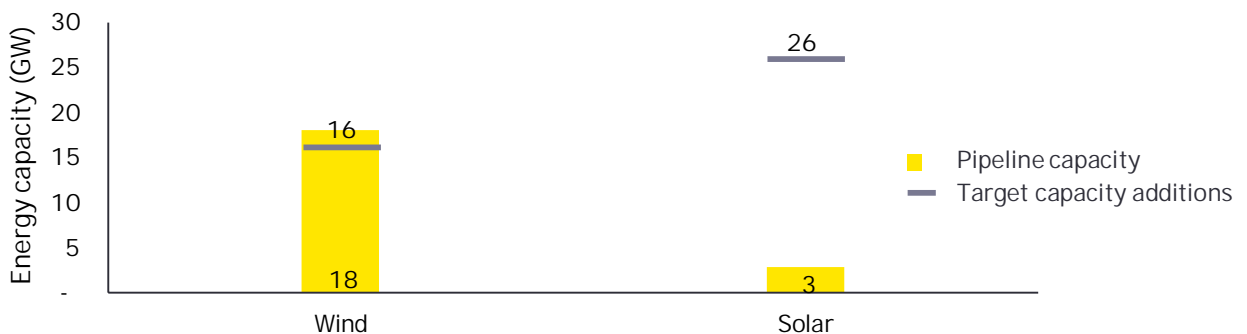
245k

Jobs creation potential

66 MTCO₂e

Emissions avoided

Comparison of pipeline capacity and target additions required



*Target capacity additions to achieve 2030 targets
Source: Renewable Energy Plan 3020

Green New Deal

The renewable energy sector dominated the pipeline, of which offshore wind was the most prominent sector with 86% share of the total capacity. The Renewable Energy 3020 Plan assumes that wind power would contribute to only 34% of new capacity additions while solar PV would contribute to 63% of new capacity additions by 2030. This indicates keener market interest in the wind sector, compared to the solar sector.

To spearhead green recovery, South Korea has announced a Green New Deal, which is part of the Korean New Deal. Under the Korean New Deal, there are plans to invest US\$141b (US\$101b worth of fiscal investment) to create 1,901,000 jobs by 2025 based on two main policies – the Digital New Deal and Green New Deal.

The Green New Deal consists of eight projects based on three main themes: green transition of infrastructures through energy efficiency measures; low-carbon and decentralized energy through the development of smart grids and renewable energy; and innovation in green industry through the development of low-carbon and green industrial complexes.

Although the Korean government has announced a green COVID-19 recovery, experts remain skeptical due to a lack of consistency in policies and a lack of concrete measures to promote the national roadmap, such as the Green New Deal or the Renewable Energy 3020 Plan.



The Green New Deal is about responding preemptively to the climate crisis, a desperate reality already confronting us. The COVID-19 pandemic has reaffirmed the urgency of responding to climate change.

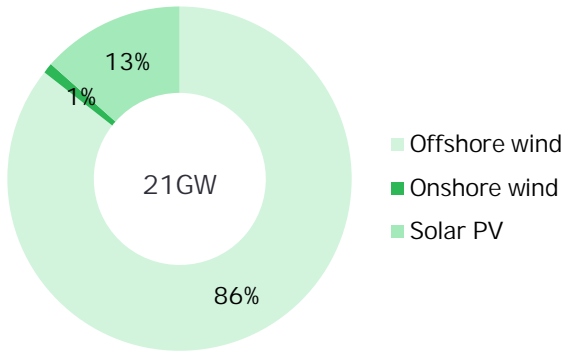
Moon Jae-In
President, South Korea

Renewable energy challenges

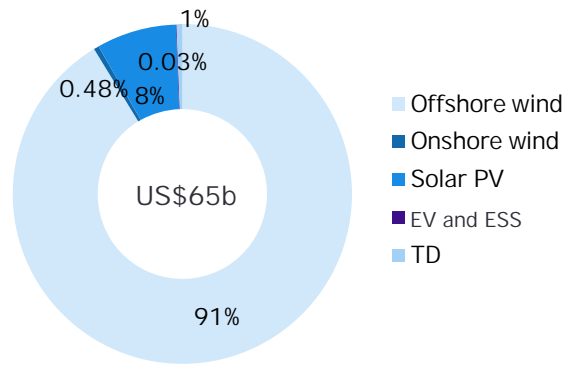
Developers cite that government-issued energy plans are issued every two to five years. The planning period, goals and issuing agencies are different for each plan, resulting in inconsistencies. The project development cycle is longer and the changes in renewable energy-related laws, regulations, incentives, requirements and restrictions impact the project development at the later stage of the cycle.

Although the Green New Deal does not provide the allocation between the solar and wind power capacity additions of 42.7GW, it is expected that capacity additions will follow similar proportions as per the Renewable Energy 3020 Plan, with solar PV being the majority driver.

Renewable energy capacity



Investment potential by sector



Renewable energy

Developers in South Korea find it challenging to obtain public acceptance and grid access. In the country, project developers are responsible for obtaining public acceptance. In many cases, there is a large gap in expectations between developers and residents, making it difficult to carry out projects. In addition, the government requires developers to agree with locals to apply for permits and environmental impact assessment approvals.

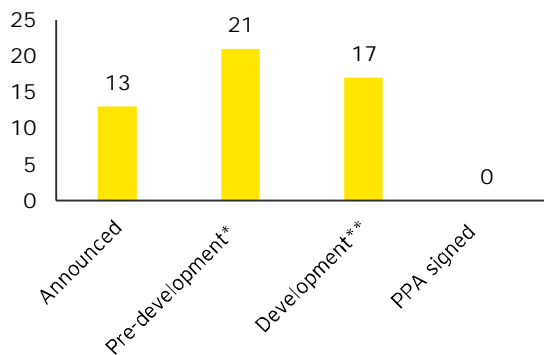
Further, some local governments are establishing ordinances restricting sites available for renewable energy project developments. Hence, securing grid access in a timely manner remains a challenge and affects the project economics as it is expensive. Some 66% of the projects in the pipeline are before or at the pre-development stage. On average, only about 25% of the applications are approved. It can take at least two years until the construction of a substation is completed, significantly impacting project development costs.

Experts suggest grid balancing and frequency management solutions would need to be introduced in the transmission network and distribution network to allow flexible renewable energy sources.

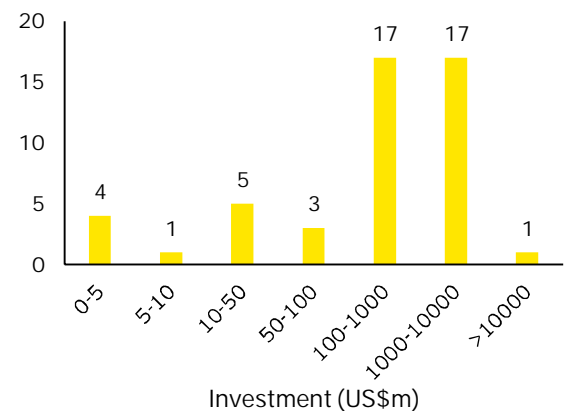
Further, the uncertainty of the purchase price for renewable projects adds risk around the economic feasibility of the projects. Currently, 69% projects in the pipeline require an estimated investment of more than US\$100m and only 33% of the projects are at the development stage.

The revenue for a renewable energy project is determined through a combination of variable system marginal price (SMP) and renewable energy certificates (REC) prices – post the phase-out of FiTs. The variability in prices has added significant uncertainty on the purchase price of renewable energy projects impacting its bankability, particularly in view of the long development cycle needed to achieve public acceptance and grid access.

Number of projects by development stage



Number of projects by investment range



*The pre-development stage refers to projects in "launched feasibility", "pre-development", "approved" or "permitting" stage.
 **The development stage refers to projects "under procurement" or "development or financing" stage.

South Korea needs regulations to help developers access land for renewable energy development, along with a supporting market framework to accelerate its energy transition

High perceived risk

- Supporting market framework
 - Consistent enforcement to implement RPS needed. For instance, the compliance requirement was lowered from 3.5% to 3% in 2015 and from 4% to 3.5% in 2016.
 - High volatility of RECs price results in difficulty to secure financing and increase financing cost.
- Allocable land parcels
 - 70% of land area are high mountains and many of them are categorized as strictly protected areas, leaving little land area for renewable project development.
- Adaptive renewables policy
 - The complex approval process was cited as a barrier in project development. The process of obtaining government permits can take a long time and involves five detailed steps.

Medium perceived risk

- Robust transmission capacity
 - Securing grid access in a timely manner remains a challenge for most developers and impacts project economics.
- National ambition and targets
 - There is strong market interest in the wind sector with 18GW in the pipeline, indicating strong potential to revise the targets upward for the wind sector.

Low perceived risk

- Favorable supply-demand
 - Stable electricity demand growth of more than 2% p.a. over the coming decade.
- Financing and bankability
 - Low access to long-term finance impact the development of small-scale projects and SMEs.
- Thorough resource assessment

Recommendations

Some of the recommendations to help support green recovery in South Korea include:

Provide clarity around the plans and measures around the deployment of the stimulus in the Green New Deal worth US\$65b and initiate tangible actions. The Green New Deal has understandably generated significant interest from investors that were already active in the renewable energy sector in the country. Two key areas of focus in the deal are smart grids, which will enhance the digital communication between utilities and consumers; and microgrids, which will promote renewable energy and energy storage systems in remote areas of the country. The authorities will be tested on their ability to roll out concrete plans to achieve the following objectives set in the stimulus package: create approximately 659,000 jobs over the 2020-2025 period; expand the solar and wind capacity to 42.7GW by 2025 and install

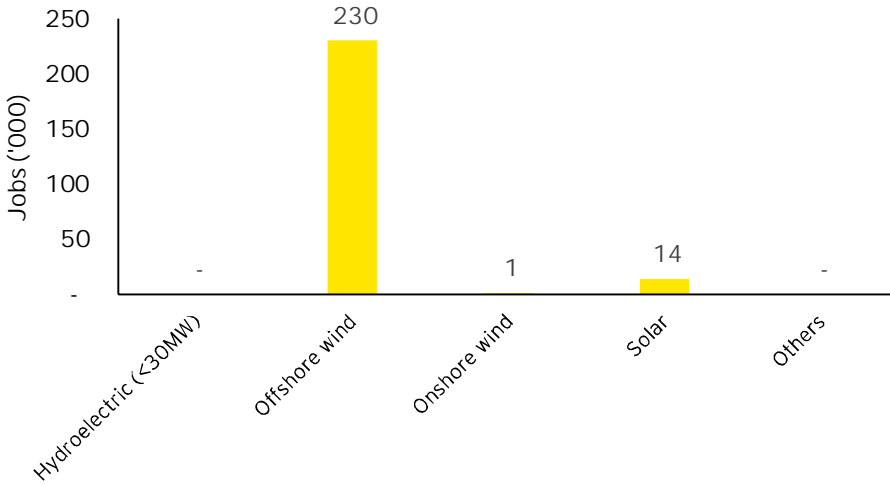
solar panels on 225,000 public buildings; and achieve domestic adoption of more than 1.13 million EVs by 2025.

Explore connecting renewable energy power plants to the existing grid by changing the operating system. This can be achieved by changing frequency balancing from the current one-day or hourly basis to real-time basis at the transmission network stage and by introducing frequency balancing in the distribution network.

The pipeline indicates strong interest in the wind sector, which has the potential to exceed the national targets set for 2030. Regulatory support can accelerate the achievement of targets, especially for offshore wind where high market interest exists. There is further scope to rationalize the regulations around offshore wind. Focused effort would be needed to strengthen market activity in the solar PV sector.

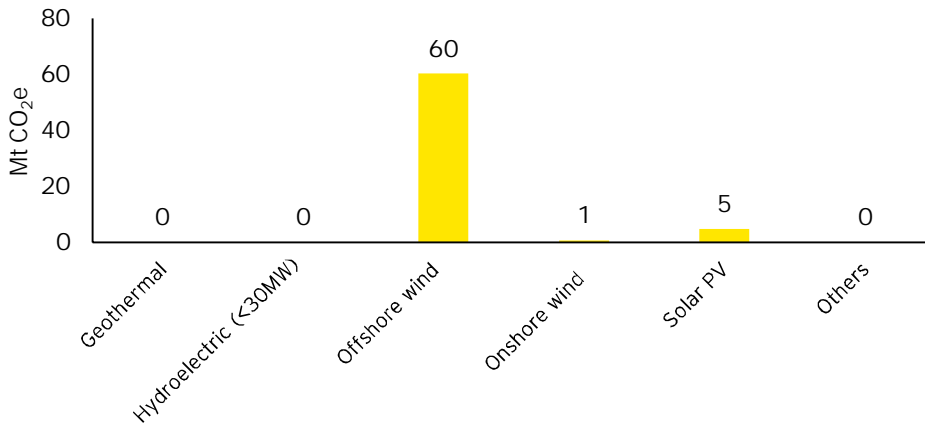
Recommendations

Number of jobs by sector



The pipeline has the estimated potential to create up to 245,000 jobs

CO₂ emissions avoided by sector



The pipeline has the estimated potential to avoid up to 66 MtCO₂e of CO₂ emissions per annum

Taiwan



The study identifies 14 projects in the pipeline, with an estimated investment of US\$42b. The renewable energy sector is the most prominent sector with 13 projects and 8GW capacity in the pipeline. Offshore wind dominates the pipeline with a large margin with 12 out of the 14 projects, with the other two projects being from solar PV and transmission and distribution sector.

The pipeline is relatively large in terms of estimated investment required with the third-highest investment potential among the focus markets covered in this study, given Taiwan has the least number of projects. This can be attributed to the higher investment required by offshore wind projects compared to other technologies.

The realization of the US\$42b investment potential is contingent on addressing some of the inherent challenges.

The study on Taiwan does not cover energy efficiency and EV because of limited information on ongoing activities. The study includes projects available in the public domain that exceed a certain minimum threshold. Hence, this study only identifies only a small portion of the green projects under development.

14

Projects identified

US\$42b

Investment potential

8GW

Renewable energy capacity in the pipeline

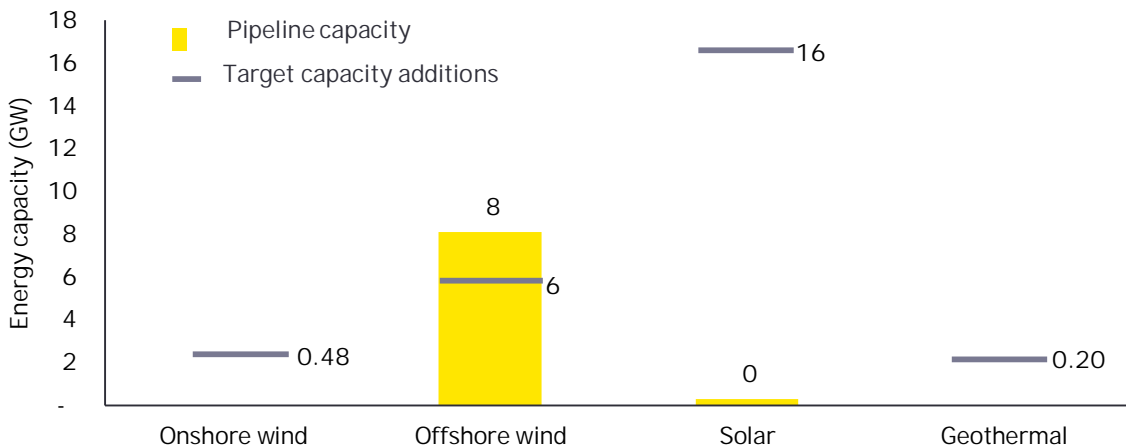
105k

Jobs creation potential

28 MTCO₂e

Emissions avoided

Comparison of pipeline capacity and target additions required



*Target capacity additions to achieve 2025 targets
Source: Bureau of Energy

Renewable energy

Risk of change in law and uncertainty around applicable offshore wind FiT impact project development. In Taiwan, offshore wind has major potential, accounting for 97% of the pipeline. Realization of this capacity will require certainty about the legal framework and FiT mechanism for developers to foresee and better plan the project economics.

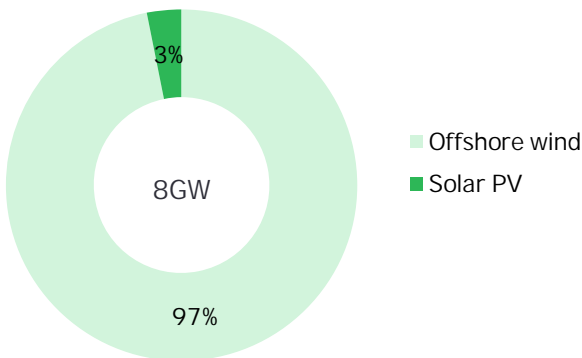
In 2020, several newly introduced legislations were imposed, which created an additional compliance burden on existing projects. Such requirements could potentially delay project implementation.

Regulations for Utilization and Management in Specific Zones of Non-First-Grade Coastal Conservation Zones (Coastal Management Permit) impacts a large proportion of utility-scale projects that had been planned in Changhua, Yunlin, Chiayi, Tainan, Kaohsiung and Pingtung and will be expected to add approximately six months to the development of the affected projects.

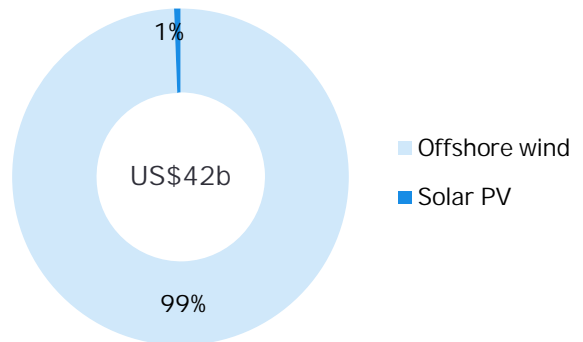
The additional requirements also require site investigations, reporting and implementation costs, which had not been factored into the cost formula used to set this year's FiT levels, impacting project economics. For Taiwan, land availability, public acceptance and environmental concerns could potentially hinder future projects. Solar constitutes a mere 3% of the capacity in the pipeline. Between 2016 and 2018, the government announced 38 zones that enjoyed a fast-tracked approval process to obtain the relevant permits and approvals. Experts cited that by 2019, most of the usable land in these zones have been exhausted – either due to private landowners not willing to lease their lands for renewable energy use or insufficient grid access.

Per the latest regulations, land conversions below 2 hectares are prohibited while land ranging from 2 to 30 hectares requires approval from both local authorities and the Council of Agriculture (COA).

Renewable energy capacity



Investment potential by sector



Further, solar plant developments have been hindered by a few controversial projects such as the Miaoli foothill project, which has been opposed by environmental groups. Lands that have been the habitat of umbrella species have now been converted to solar plant sites.

Foreign renewable energy developers tend to offer a one-time monetary compensation to affected parties; however, the government is concerned that this may not be the most appropriate solution. The government has urged developers to consider deepening its local connections in addition to promoting long-term industry developments.

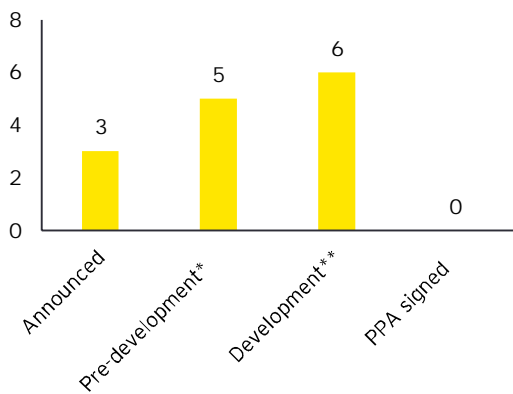
At the same time, local content requirements of the supply chain can potentially impact the availability of competitively priced financing. Currently, 6 out of the 14 projects are in the

development stage. Increased local content requirements could make it challenging to secure ECA-backed financing, which has been previously deployed for offshore wind projects.

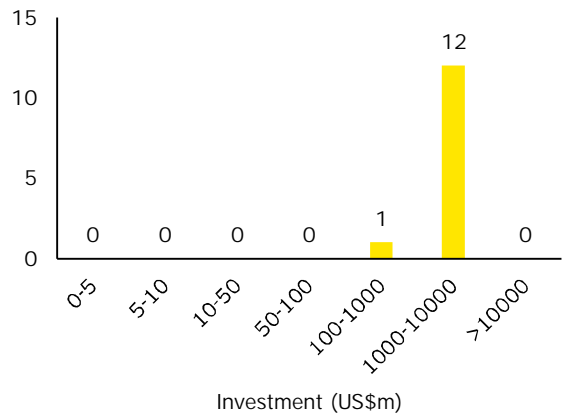
The localization requirements specified by the Industrial Development Bureau also specify requirements on tier 2 of the supply chain such as wind turbine blades, wind turbine towers and spinner covers.

Further, disruptions due to the COVID-19 pandemic are expected to cause significant delays and add costs in the development cycle. The COVID-19 pandemic has already posed challenges to the development of offshore wind projects, where crew members are of international, non-Taiwanese origin. If the pandemic continues and travel disruptions persist, experts predict that development costs may increase by 20-30%.

Number of projects by development stage



Number of projects by investment range



*The pre-development stage refers to projects in "launched feasibility", "pre-development", "approved" or "permitting" stage.

**The development stage refers to projects "under procurement" or "development or financing" stage.

The interviews reveal that Taiwan needs more ambitious renewable energy targets and clarity around land ownership to accelerate its energy transition

High perceived risk

- Supporting market framework
 - Market structure is liberalized with the amendment of the Taiwan Electricity Act in 2017, allowing the sale of renewable energy directly to end users. The corporate PPA market has seen tremendous growth with strong commitment seen from company under the RE100 initiative. Recent deals include the CPPA (920MW) between Orsted and Taiwan Semiconductor Manufacturing Company.
- Allocable land parcels
 - Clarity around land ownership is required particularly for the development of solar projects.
 - Framework for co-locating renewables with farmlands can address stakeholder opposition on renewables development.

Medium perceived risk

- Robust transmission capacity
 - Inadequate distribution networks has hindered the progression of solar power systems, particularly making it challenging for remote areas.

Low perceived risk

- National ambition and targets
 - ▶ Offshore wind market is the most promising with a strong pipeline and ambitious targets.
- Thorough resource assessment
 - ▶ Current offshore wind capacity is only 5% of the estimated feasible potential.
- Adaptive renewables policy
 - Taiwan has reduced FiT for offshore wind, but retains high local content requirements. Developers say that such requirements could impact new projects.
- Favorable supply-demand
- Financing and bankability



Recommendations

Some of the recommendations to help support green recovery in Taiwan include:

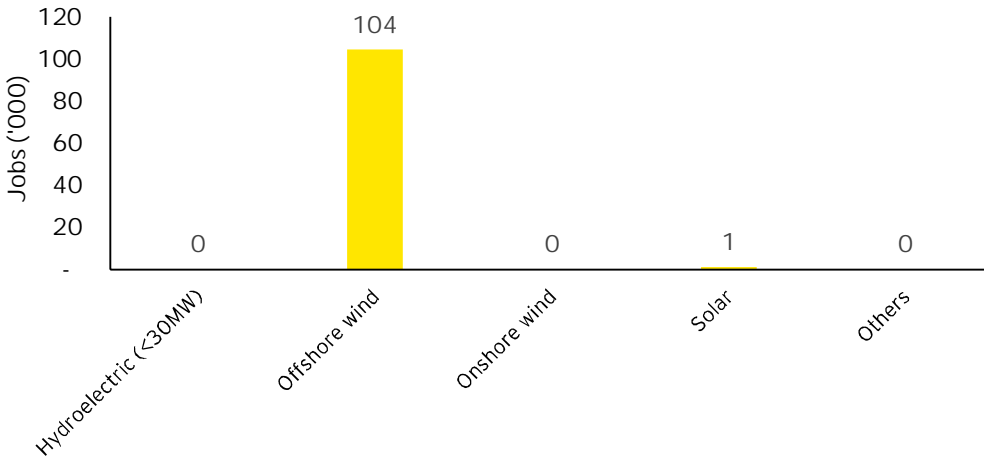
Provide clarity on policy direction after the COVID-19 pandemic to help developers plan their investments. For example, for the 2020 FiT Extension, the newly introduced Outflow Control and Coastal Management regulations will provide six-month relief for FiT qualification. Further relief considering supply chain difficulties can help affected projects. As well, the government has permitted dual-use fishery PV projects to meet its renewables targets, given the ability for these plants to be co-located with existing aquaculture facilities. Such projects have the potential to increase the productivity of the lands. However, there is a need to have appropriately priced FiTs for such projects given the higher construction costs. The current tariff scheme does not offer a separate FiT for dual-use projects.

Prioritize the challenges related to land acquisition for the development of new projects. The central government has been assisting local authorities in planning renewable energy zones in several cities or counties. A streamlined process could help to accelerate development.

Actively support the development of innovative renewable energy solutions together with local stakeholders through tangible interventions that can contribute to an active pipeline of projects. Some targets have been announced, but need a pipeline to kickstart activity. The COA has promised to develop 8GW ground-mounted solar plants by 2025, contributing to the government's total target of 14GW. To this, the COA announced plans to promote aqua voltaic solar farms and listed approximately 7,000 hectares of potential sites.

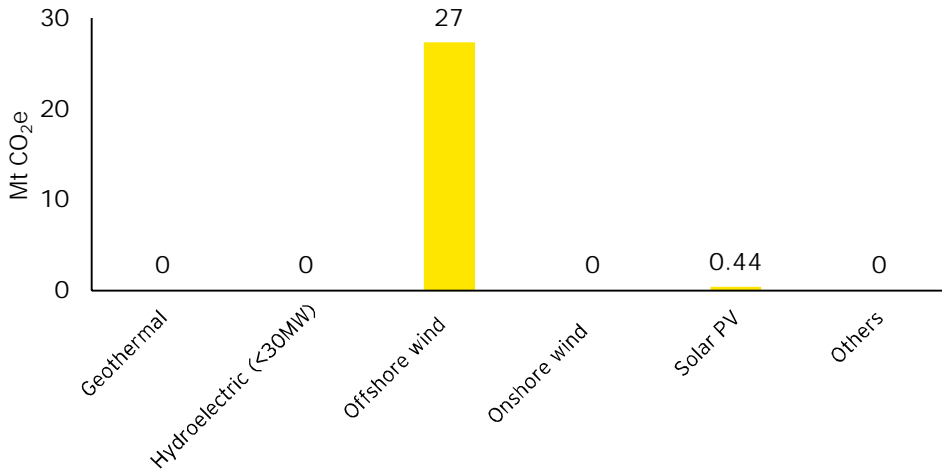
Recommendations

Number of jobs by sector



The pipeline has the estimated potential to create up to 105,000 jobs

CO₂ emissions avoided by sector



The pipeline has the estimated potential to avoid up to 28 MtCO₂e of CO₂ emissions per annum

Thailand



The study identifies 40 projects in the pipeline, with an estimated investment of US\$5b. The renewable energy sector is the most prominent sector with 20 projects and 2GW capacity in the pipeline. Solar PV technology is the most prominent subsector within the renewable energy sector.

The pipeline appears to be well-diversified among the other focus sectors as well, with five projects from the energy efficiency sector, nine projects from the EVs and energy storage sector and the remaining from the transmission and distribution sector. The pipeline is relatively small in terms of estimated investment required and the realization of these projects is contingent on addressing some of the inherent challenges.

The study only includes projects available in the public domain that exceed a certain minimum threshold. Hence, this study identifies only a small portion of the green projects under development.

40

Projects identified

US\$5b

Investment potential

2GW

Renewable energy capacity in the pipeline

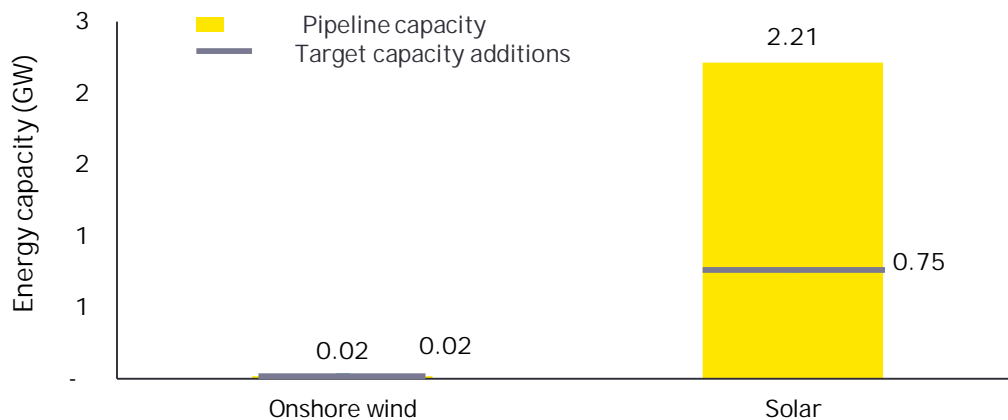
11k

Jobs creation potential

2 MTCO₂e

Emissions avoided

Comparison of pipeline capacity and target additions required



*Target capacity additions to achieve 2025 targets
Source: IRENA; Suruhanjaya Tenaga Generation Development Plan 2019

Renewable energy

The renewable energy pipeline indicates modest additions in capacity. The study identifies only around 2GW of planned capacity additions over the next three years. This seems modest, compared to the approximate 18GW of renewable energy capacity additions planned in the Power Development Plan (PDP) 2018-2037 over the next two decades.

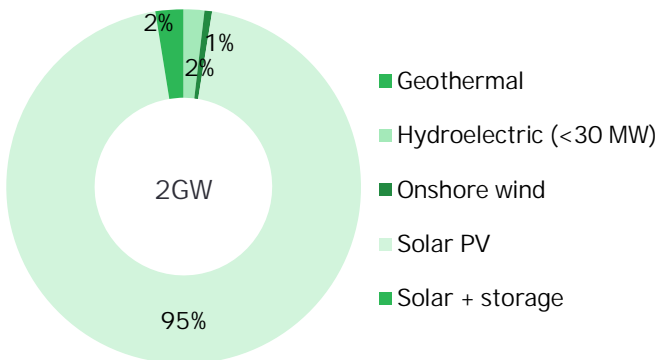
The limited pipeline is validated by stakeholder discussions, which revealed that there have been very limited additions in utility-scale renewable energy projects over the last few years. Experts cite a need for a dedicated ministry to govern the renewable energy sector. Currently, four different government bodies are responsible for developing and overseeing renewable energy policy in Thailand: the Department of Alternative Energy Development and Efficiency (the Ministry of Energy), the Energy Policy and Planning Office, the Energy Regulatory Commission and the Electricity Generating Authority of Thailand.

The current pipeline is relatively small compared to the other focus markets in terms of capacity. Increased coordination is required to adopt new targets for renewable energy and propel the stagnant industry forward.

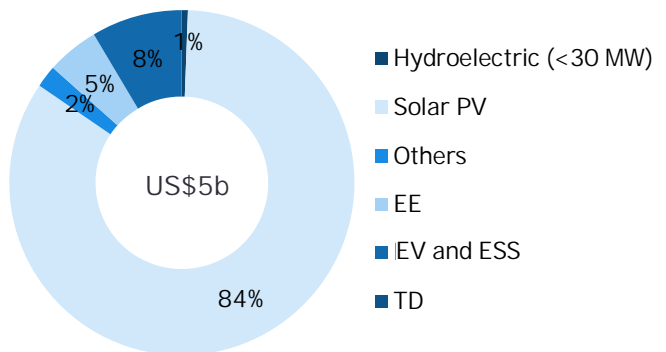
Onshore wind projects constitute only 1% of the total renewable energy capacity in the pipeline due to a lack of an official capacity target for the wind sector. This impacts the pipeline as developers and investors await targets for wind power projects in the PDP (2019-2038).

Associations such as Global Wind Energy Council and the Thai Wind Energy Association have been advocating for a wind target to be included in the PDP. It is understood that there is a new draft PDP developed by the previous cabinet and the market anticipates an ambitious wind target to invigorate the sector. With a reshuffling of the cabinet, it remains unclear whether the existing draft will be adopted, or a new one will be put in place instead.

Renewable energy capacity



Investment potential by sector



Due to the bespoke nature of projects in sectors like energy efficiency and electric vehicles, comparable investment benchmarks are not available. Therefore it may be inferred that the investable pipeline may be far greater than estimates made under this study.

Although solar PV constitutes of 95% of the total capacity in the pipeline, the pace of development is slower than required to meet the ambitious PDP (2018-2037) target of 10GW. Currently, 48% of the projects are in early stages of development.

The pace of progress has been slow, despite ambitious targets in the PDP 2018-2037. In 2019, some large Thai developers had a very modest pipeline: e.g., 2019 BGRIMM: 58MW; Blue Solar: 50MW; Super Energy: 21MW.

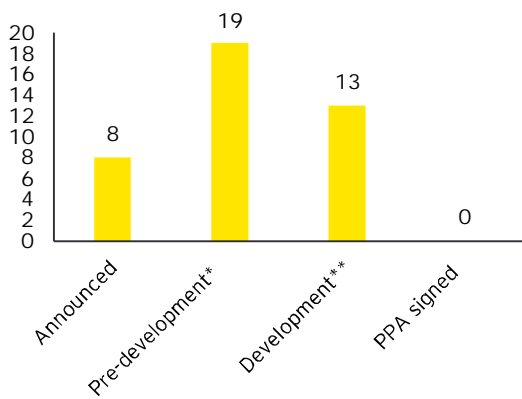
Although the target of 10GW solar addition has been set, there is no clarity on the procurement plan for it. There has been some activity in the solar and storage sector, though the scale remains small and the sector accounts for only 2% of the total capacity in the pipeline and the projects are in the permitting, development or financing stages.

As well, the scale of projects is small, with 30% projects requiring an investment of less than US\$50m. The market is well-structured and has the highest share of 33% of projects at the development stage among the focus geographies, despite the limited pipeline.

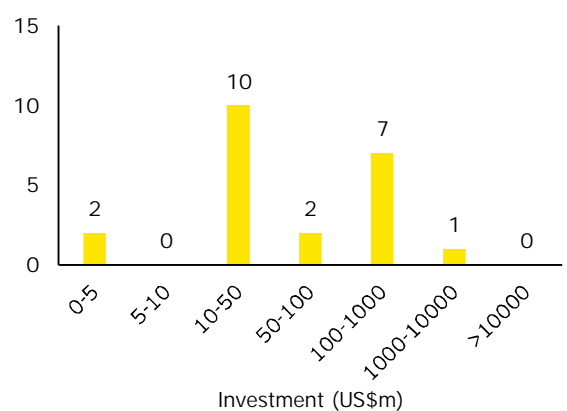
Investors say that the main challenge is the lack of a procurement plan for the development of the PDP 2018-2037 targets. The ERC launched the SPP Hybrid program in 2017 and enabled 300MW of solar PV procurement through a competitive bidding process. Since then, there have been no utility-scale solar procurement projects in Thailand.

In addition, the expiry of the FiT for wind power has brought the sector to a standstill and has prevented the development of new utility-scale projects. The market is waiting for the Energy for All scheme, currently in the drafting stage, which aims to roll out projects totaling 700MW.

Number of projects by development stage



Number of projects by investment range



*The pre-development stage refers to projects in "launched feasibility", "pre-development", "approved" or "permitting" stage.

**The development stage refers to projects "under procurement" or "development or financing" stage.

Thailand needs clarity around renewable energy targets and procurement mechanism to accelerate its energy transition

High perceived risk

- National ambition and targets
 - The Thailand Integrated Energy Blueprint (TIEB) was created to support the development of all energy-related sectors. The blueprint brings together different plans such as the Power Development Plan (PDP), Energy Efficiency Plan (EEP) and Alternative Energy Development Plan (AEDP) to streamline efforts across all energy-related sectors.
 - There is strong market interest in the solar sector as the pipeline capacity is thrice the planned capacity additions (until 2025), indicating that there is scope for an upward revision of targets.
 - There is currently a 3GW government target for the wind sector for 2037, 50% of which has already been achieved by February 2020. The market is calling for more ambitious target, which are being awaited in the next PDP (2019-2038).
- Adaptive renewables policy
 - A detailed and clear procurement process can help achieve the 10GW target for solar.
 - The expiry of the wind FiT has brought the sector to a standstill.

Medium perceived risk

- | | | |
|--|---|--|
| <ul style="list-style-type: none"> • Robust transmission capacity <ul style="list-style-type: none"> ▶ Integrating renewables into the national grid is a challenge as sufficient capacity is required to absorb additional renewable capacity and ensure a reliable electricity supply. ▶ Several opportunities for grid expansion and improvement are identified in PDP 2018-2037. | <ul style="list-style-type: none"> • Supporting market framework <ul style="list-style-type: none"> ▶ Thailand's electricity market is largely dominated by state-owned entities EGAT, PEA and MEA. Regulations for new energy tends to balance the need for innovation and avoiding disruption. ▶ EGAT is the single buyer of electricity from the private sector. It is involved in generation and solely manages the transmission. | <ul style="list-style-type: none"> • Allocable land parcels <ul style="list-style-type: none"> ▶ Although 100% foreign ownership is permitted, there are restrictions around land ownership under the Land Code. Developers seek to avail incentives under the investment promotion law which permits 100% ownership. |
|--|---|--|

Low perceived risk

- Financing and bankability
 - ▶ The commercial loan market is well-established, especially for solar and biogas projects and non-recourse financing is available.
 - ▶ There is also a vibrant green bond market in Thailand, with two major green bond issuances in the past two years. Thai Bond Market Association has also rolled out an incentive scheme for green, social and sustainability bond issuance.
 - ▶ Various support schemes are available to support SMEs such as the Energy Service Company (ESCO) fund.
- Favorable supply-demand
- Thorough resource assessment

Energy efficiency and electric vehicles

Even though the current pipeline identifies only 5 projects in 40, there may be some projects being developed by the private sector using the mechanisms such as energy service company fund. The projects may not be in the public domain and hence, are not captured in this study.

Although Thailand has the strongest pipeline for EVs among the focus markets, domestic adoption lags in the absence of any economic case. Currently, 23% of the projects in the pipeline and 8.5% of the investment share belongs to the EV sector. There are incentives for manufacturing that have worked well and attracted international players to set up EV manufacturing in Thailand but the landscape for domestic adoption remains weak.

Thailand’s Board of Investment (BOI) launched the EV scheme in March 2017 to encourage investment proposals and supporting applications from car makers. The privileges include tax holidays of 3 to 10 years and import duty exemptions for cars and machinery, which attracted several international automobile manufacturers. A total of 13 companies were granted incentives for hybrid EVs by BOI to build plug-in hybrid EVs.

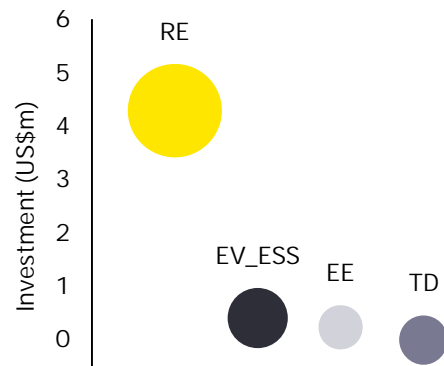
However, the market lacks incentives for promoting EV adoption. EV cars are still significantly more expensive to ICE vehicles. Range anxiety and availability of charging infrastructure appear to be significant concerns for EV adoption in Thailand.

While some pilot initiatives exist to test new energy solutions, a regulatory framework is needed for wide-scale deployment. Thailand is relatively advanced compared to other Southeast Asian countries in testing new energy solutions and its pipeline has 12% of projects from the energy efficiency sector, higher than any of the eight focus markets covered in this study.

The ERC has set up the ERC Sandbox as a platform to promote and pilot new technologies, test new business models and inform on energy regulation in Thailand. The Sandbox program allows applicants to obtain some exemptions from existing regulations, where needed, for the implementation of new technologies.

The first round of the Sandbox program allowed a wide range of projects such as microgrids, battery storage and peer-to-peer trading to be implemented. While there have been rumors of a second phase, no official announcements have been made. The market awaits the regulatory framework for large-scale deployment of such solutions.

Thailand’s pipeline snapshot by sector



Bubble size represents number of projects

Recommendations

Thailand is well-positioned with a clear institutional framework and market structure. Recognizing the falling cost of renewables, the time is right for Thailand to move away from the FiT-based scheme to an auction-based process for renewable energy procurement. A clear pipeline of capacity to be procured over the coming years will provide the investor community with investment opportunities.

Some of the recommendations to help support green recovery in Thailand include:

Create guidelines for new energy solutions to further build on the success of ERC Sandbox program, which piloted new energy solution projects. Regulations around net metering, wheeling charges etc. are needed to create a commercial market for large-scale deployment of microgrid solutions, particularly in industrial estates and remote islands.

Develop clear regulations for increased consumer adoption of EVs to catalyze fast adoption. Clarity of regulation around charging infrastructure can also support roll-out. The government can set medium-term targets around mandatory fleet replacements to create a pipeline of opportunity and incentivize private sector investments.

Encourage the use of available schemes and facilitate SMEs to utilize the financial and technical support offered under the Energy Efficiency Revolving Fund (EERF) fund and the ESCO Fund by the government. Thailand's Energy Efficiency Plan (2015-2036) includes various measures: voluntary (e.g., energy-saving measures in the transport sector, promoting low-interest loans for LED replacement) and compulsory (e.g., the Building Energy Code, Enforcement of ENCON Act 1992, energy labeling on equipment and appliances). There is scope for SMEs to tap into the support available.



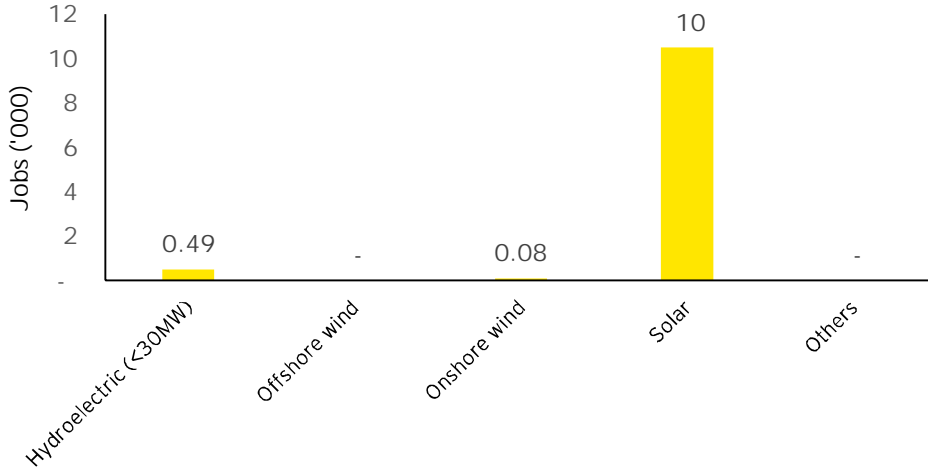
Thailand has high long-term goals but no short-term steps to achieve renewable-energy goals.

Chariya Senpong
Head of the Greenpeace Thailand
Energy Transition Campaign*

*"Thai energy policy comes in come criticism by Green Peace", The National Thailand, 24 September 2020, accessed via <https://www.nationthailand.com/news/30395057> on 20 January 2021

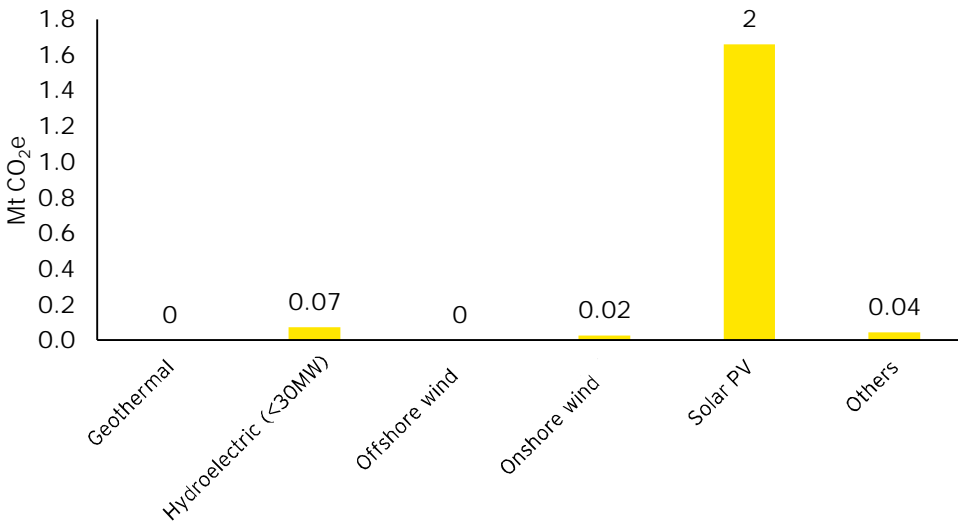
Recommendations (continued)

Number of jobs by sector



The pipeline has the estimated potential to create up to 11,000 jobs

CO₂ emissions avoided by sector



The pipeline has the estimated potential to avoid up to 2 MtCO₂e of CO₂ emissions per annum

The Philippines



The study identifies 298 projects in the pipeline, with an estimated investment of US\$37b. The Philippines has the highest number of projects and the highest renewable energy capacity among the focus markets. The renewable energy sector is the most prominent sector, with 265 projects and 21GW capacity in the pipeline. Onshore wind and solar PV are the sectors of most interest. The pipeline has identified 11GW of solar PV projects, making it the most prominent renewable energy sector.

The study only includes projects available in the public domain that exceed a certain minimum threshold. Hence, this study identifies only a small portion of the green projects under development.

298

Projects identified

US\$37b

Investment potential

21GW

Renewable energy capacity in the pipeline

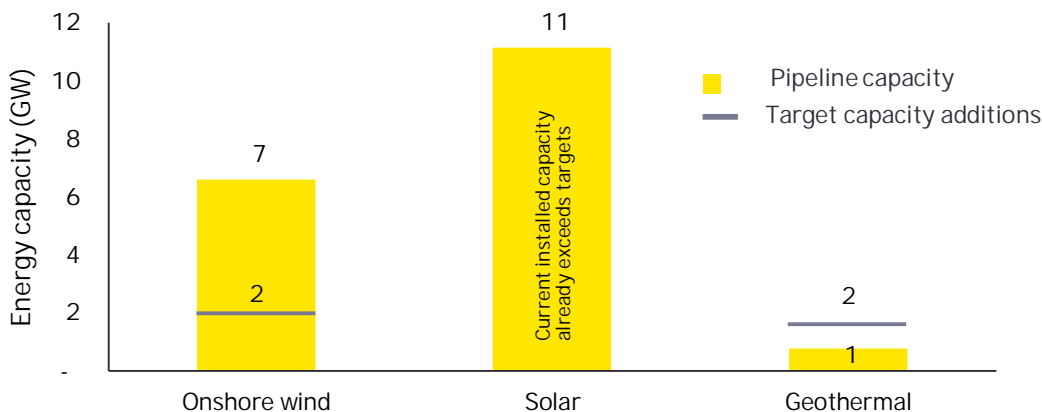
151k

Jobs creation potential

54 MTCO₂e

Emissions avoided

Comparison of pipeline capacity and target additions required



*Target capacity additions to achieve 2030 targets

Source: NREP 2011-2030 as issued by Department of Energy

** The current installed capacity has already exceeded the target set in NREP 2011-2030

Renewable energy

The Philippines has a strong pipeline under development. The realization of this pipeline depends on regulatory clarity. The majority of the renewable energy sector projects have been taken from the latest database of projects published by the Department of Energy (DOE). Some of these projects have been a part of the DOE database for an extended period. There is little clarity on the current status of these projects.

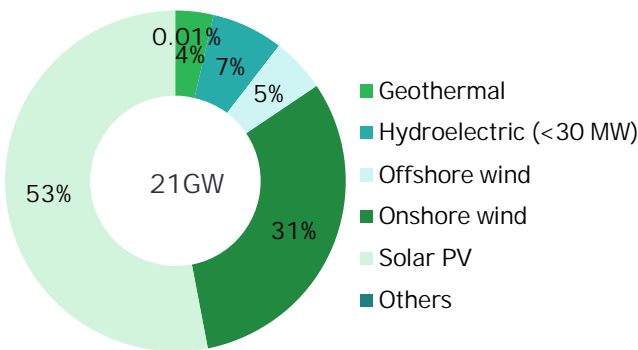
From being an early adopter of renewable energy, the sector's momentum has slowed down in recent years due to a delay in implementing new regulations following the full allocation of the FiT quota. The regulatory standstill impacts project implementation over the last few years, as seen by the falling share of renewables in the country (34% in 2015 to 29% in 2019). The delay in the launch of the Green Energy Option Program (GEOP) and Renewable

Portfolio Standards (RPS) following the expiry of FiT is slowing the energy transition.

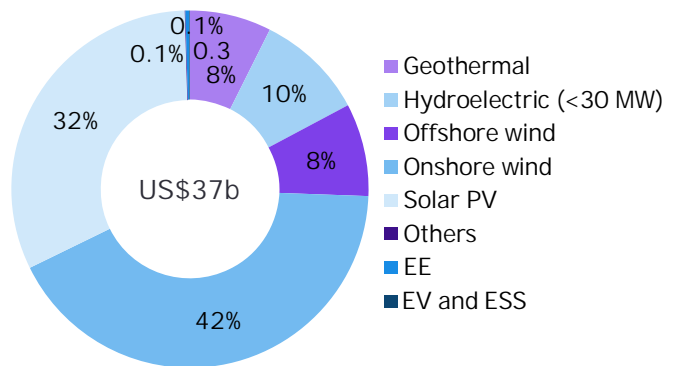
Although the RPS was included in 2008 in the Renewable Energy Act, the final RPS rules were only released in 2017. RPS targets are generally considered to be modest and can be achieved without additional renewable energy capacity coming online. Stakeholders suggest that RPS targets can be revised upwards to leverage the pipeline of investments and accelerate the energy transition.

The latest draft of the Philippines Energy Plan (PEP), which will articulate the plan until 2040, suggests an increased reliance on coal-fired power plants. The PEP estimates the share of renewables in the installed capacity to be 32% lower than the previously mentioned 35% goal.

Renewable energy capacity



Investment potential by sector



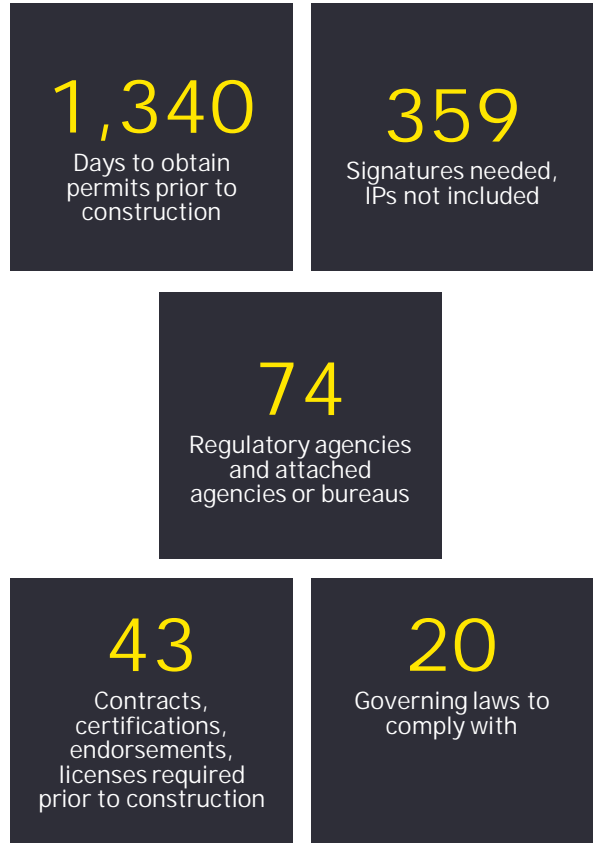
Due to the bespoke nature of projects in sectors like energy efficiency and electric vehicles, comparable investment benchmarks are not available. Therefore it may be inferred that the investable pipeline may be far greater than estimates made under this study.

There is a vast pipeline of projects in the country, especially in the pre-development stage, which makes up 79% of the pipeline. The process for project approval is extremely lengthy, requiring many signatories and involving numerous agencies.

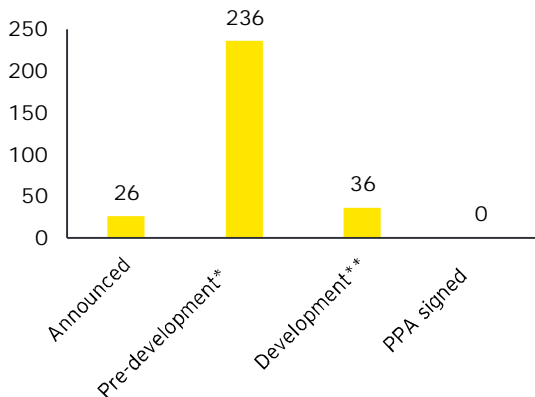
There is also a need to create a level playing field for independent developers and SMEs as projects that require less than US\$50m in investment make up 45% of the pipeline. Investors cite that getting approvals and raising finance is quite complicated in the Philippines, making it very difficult for small developers and SMEs to participate in the renewable energy and energy efficiency sectors. The Philippines government is working on improving the process.

The market is dominated by large players who have integrated generation and retail capabilities, leaving little room for independent developers to participate. There is a need to create market regulations coupled with a pipeline of opportunities for independent developers and SMEs to participate.

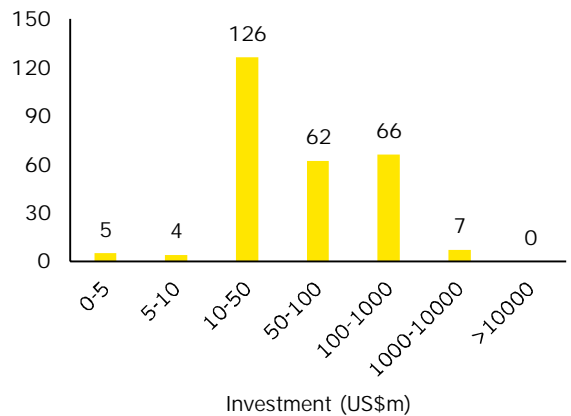
Current challenges in getting a permit in the Philippines¹



Number of projects by development stage



Number of projects by investment range



*The pre-development stage refers to projects in "launched feasibility", "pre-development", "approved" or "permitting" stage.

**The development stage refers to projects "under procurement" or "development or financing" stage.

Source: DOE-Energy Investment Forum 2018 <https://www.doe.gov.ph/eipo/energy-investment-forum-2018>

¹ "Challenges in Permitting: 2018 Energy Investment Forum", Department of Energy, Republic of the Philippines, 2018, accessed via https://www.doe.gov.ph/sites/default/files/pdf/e_ipo/06_eif_2018_manila_aboitiz_power_corporation.pdf on 20 January 2021

The interviews reveal that the Philippines needs regulatory clarity to accelerate its energy transition

High perceived risk

- Supporting market framework
 - The process to obtain a permit is extremely lengthy and complex.
- Allocable land parcels
 - Gaps in areas such as property rights recognition, public provision of land information, land use planning and management result in significant land acquisition challenges.
 - Landowners generally have a tendency to band together and inflate the price of land when it is anticipated to be used for power projects, raising project costs artificially.
- National ambition and targets
 - The pipeline showcases 7GW of onshore wind projects, indicating strong market interest and an opportunity for revised national targets.
 - The release of National Renewable Energy Plan is expected to catalyze the market.
 - The combined capacity for coal-fired power plants rose 87% in 2016 from 2005 levels.
- Adaptive renewables policy
 - The latest draft of the Philippine Energy Plan (PEP 2018-2040) anticipates the adoption of “highly efficient” coal and natural gas in its clean energy scenario, indicating a continued focus on conventional power.
 - The market is awaiting clear laws and regulations after the expiry of the FiT mechanism.

Medium perceived risk

- Robust transmission capacity
 - ▶ The DOE has recently launched the Grid Planning and Competitive Renewable Energy Zones (CREZ) process to help achieve the country’s goals of scaling up renewable energy generation on the power system and to ensure sustainable, secure, reliable, accessible and affordable energy.
- Thorough resource assessment
 - The Philippines may benefit from assessing its offshore wind resource potential.

Low perceived risk

- Favorable supply-demand
 - ▶ The electricity demand is expected to grow at a rate of 5.5% p.a. between 2020-2025.
- Financing and bankability
 - If the pending tax reform bill is passed, the renewable energy sector will lose the incentives it enjoys under the Renewable Energy Act.

Energy efficiency and electric vehicles

Despite the high potential of the energy efficiency sector, the lack of projects in the pipeline is indicative of the insofar untapped potential of the sector. Most experts suggest that energy consumption is not closely metered, monitored or reported by companies, especially among SMEs. Moreover, energy management systems are not widely adopted. The lack of effort for compliance with standards like ISO50001 indicates a huge untapped opportunity.

Further, the COVID-19 pandemic has impacted the pace of development of the Smart Solar Project (Energy Efficiency) in the outlying islands as access to the site is a challenge. The economic case for energy efficiency is more robust in the Philippines than other regional markets as the electricity retail tariffs reflect the real costs and are free of any subsidies. The electricity tariffs are higher than neighboring countries (at US\$c21/kWh). The primary barriers are a lack of capacity, capability and confidence and very few bankable projects, which deters investors.

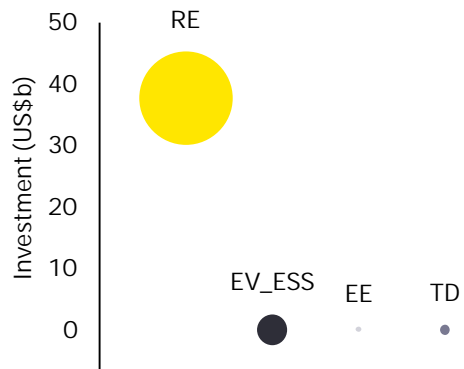
Industry practitioners estimate that street lighting projects have an investment opportunity of more than US\$885m. However, the inability to retain savings by the implementing agency disincentivizes stakeholders from implementing energy efficiency projects.

The potential of EVs is well-recognized and the sector has 29 projects in the pipeline, which is higher than any other focus markets covered in this study. However, it is yet to be integrated into the mainstream energy strategy at the national levels.

There are some initiatives to promote e-jeepney in the country, but the efforts remain sporadic. There is also limited incentive or official policy direction to retrofit fleets.

Systematic efforts to develop charging infrastructure, including the regulations around tariffs and potential V2G applications in the context of the Philippines new Smart Grid Roadmap need to be explored.

The Philippines' pipeline snapshot by sector



Bubble size represents number of projects

Source: Energy Efficiency Market Gap Analysis; Product Standards and Energy Efficiency Business Environment for the UK Foreign & Commonwealth Office
 Due to the bespoke nature of projects in sectors like energy efficiency and electric vehicles, comparable investment benchmarks are not available. Therefore it may be inferred that the investable pipeline may be far greater than estimates made under this study.

Recommendations

Some of the recommendations to help support green recovery in the Philippines include:

Streamline the strategy and policy-making for renewable energy. Currently, the governance scope falls under four bodies – the Renewable Energy Management Bureau, the Energy Regulatory Commission, the National Electrification Administration and the National Renewable Energy Board. Renewables are no more marginal and have the potential to provide cost-competitive alternatives. This study indicates that there is a robust pipeline and interest from the market to participate in the renewable energy sector. The government has the potential to capitalize on this interest by creating a clear framework for renewable energy development in terms of procurement, pricing and financing. As well, the new auction system will be a catalyst for renewable energy development. The implementation of regulations such as green tariff (auction program) and laws such as the energy transition law are windows of opportunity.

The COVID-19 pandemic has highlighted the inflexibility of the power system – conventional plants have faced forced outages. It is understood that certain utilities are invoking force majeure clauses and consumers have faced increased power bills. Experts suggest that the COVID-19 pandemic could be an inflection point for greater focus on flexible renewable energy solutions and the role of utilities in the energy transition. The focus should be on implementation of modular renewable energy or distributed energy systems and grid updates over the development of new baseload (inflexible) power.

Introduce support mechanisms such as credit guarantees, bridge financing and loans as part of stimulus packages to help finance small-scale projects.

A combination of policy and capital can also accelerate the growth in the energy efficiency sector. The Department of Energy should consider initiatives such as issuing department circulars and certifications and creating a mechanism that incentivizes cost savings due to energy efficiency efforts. Individual departments should be able to retain any savings realized due to energy efficiency projects. Moreover, the procurement system should be flexible to enable departments to procure projects and solutions that can be implemented on a savings model rather than a base-cost basis.

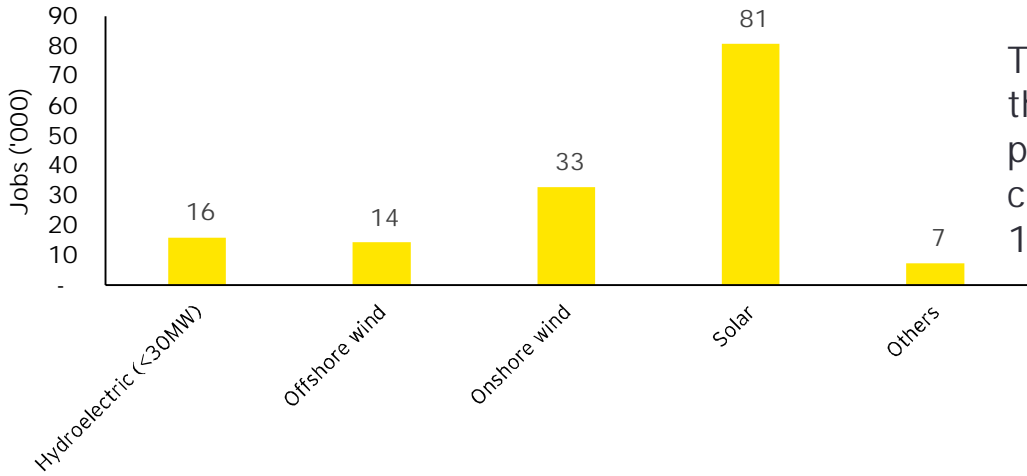
Including projects like government building retrofits and public street lighting projects in the COVID-19 recovery packages can increase momentum in the energy efficiency sector. Creating a pipeline will automatically catalyze the sector as financing is not a roadblock because projects do not require upfront cost and can be financed via the savings model.

Directing investments into public fleet replacement to introduce more EVs in the public transport sector can increase EV adoption in the country. Initiatives such as the Green Green Green Program, which was launched in 2018 to provide assistance to 145 cities to make them more livable and sustainable, can create a strong business case for energy efficiency projects.

Source: Philippines Power Sector Can Reach Resilience by 2021 by IEEFA (June 2020)

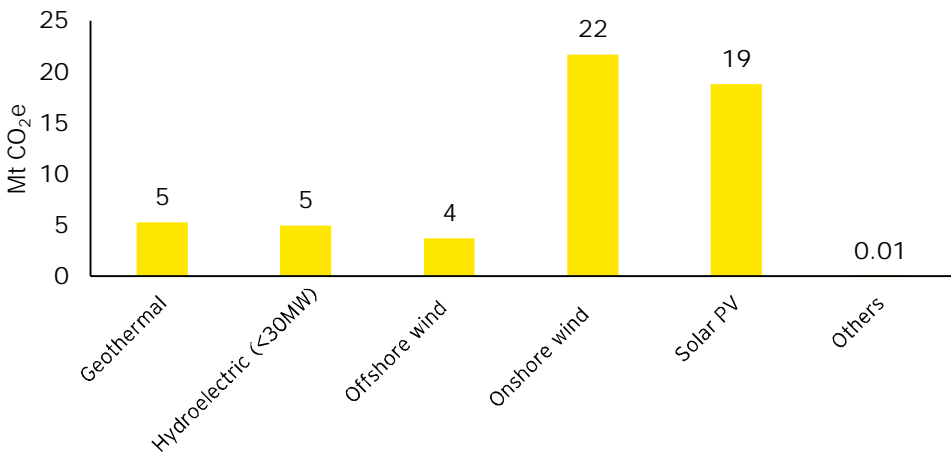
Recommendations (continued)

Number of jobs by sector



The pipeline has the estimated potential to create up to 151,000 jobs

CO₂ emissions avoided by sector



The pipeline has the estimated potential to avoid more than 54 MtCO₂e of CO₂ emissions per annum

Vietnam



The study identifies 221 projects in the pipeline, with an estimated investment potential of US\$24b. Renewable energy remains the most attractive sector for investment in Vietnam. The renewable energy sector showcases 87 projects and 14GW capacity in the pipeline. Within the renewable energy sector, solar and wind sectors dominate with 97% of the potential capacity. The TD sector has 132 projects.

While Vietnam has the second-highest number of projects among the focus markets covered in this study, converting the investable pipeline into actual investments is contingent on addressing some of the inherent challenges.

The study only includes projects available in the public domain that exceed a certain minimum threshold. Hence, this study identifies only a small portion of the green projects under development.

221

Projects identified

US\$24b

Investment potential

14GW

Renewable energy capacity in the pipeline

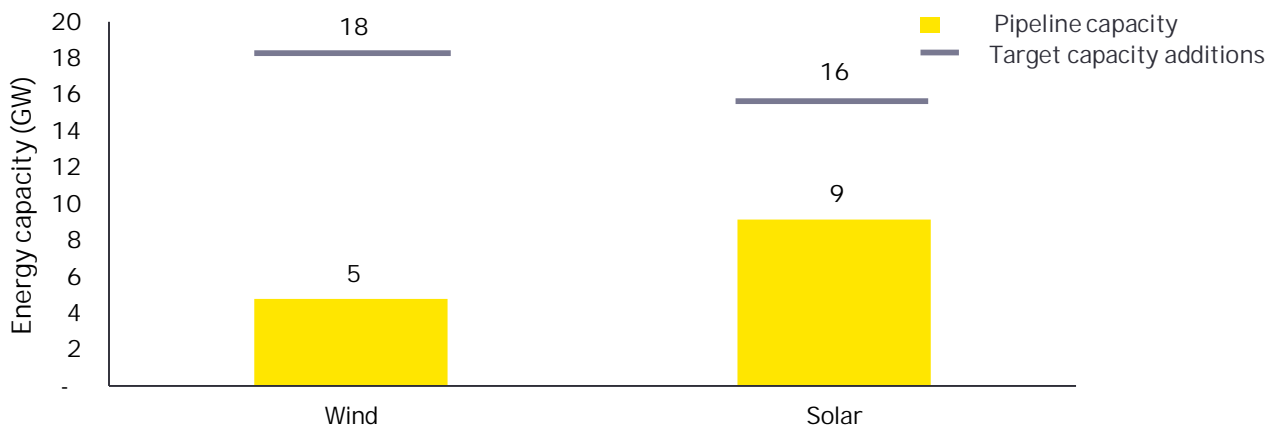
99k

Jobs creation potential

32 MTCO₂e

Emissions avoided

Comparison of pipeline capacity and target additions required



*Target capacity additions to achieve 2030 targets
Source: Draft Power Development Plan VIII

Renewable energy

The development of new renewable energy projects is slowing down until revised targets are adopted in the upcoming Power Development Plan (PDP) VIII, together with supporting regulatory mechanisms. As solar and wind projects dominate Vietnam’s renewable energy pipeline, with 98% of the capacity belonging to these sectors, PDP VIII is eagerly awaited by the developer and investor community for clarity on new installation targets.

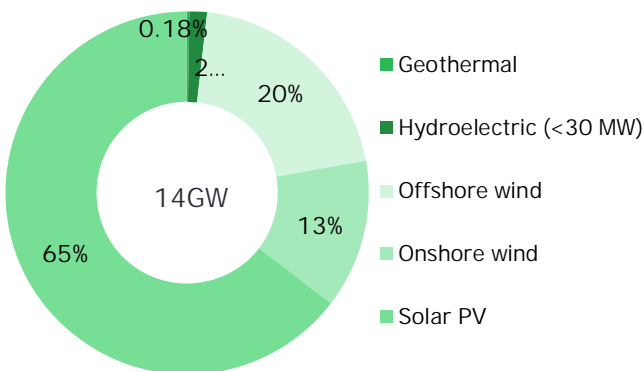
Financial close for wind projects is delayed due to ambiguity of FiT eligibility as the current FiT for wind projects is expiring in November 2021. Clarity is required on the government’s stand on FiT extension - if the government will extend the FiT system or opt for an auction-based mechanism - and whether there will be an ambitious target set for offshore wind capacity in the country. Speculation on energy sector policies may continue until the election results for the National Assembly and People’s Councils are out in May 2021.

Teething curtailment issues have added to investors and lenders’ anxiety. There is a lot of speculation around the curtailment risk, which has impacted lenders’ confidence.

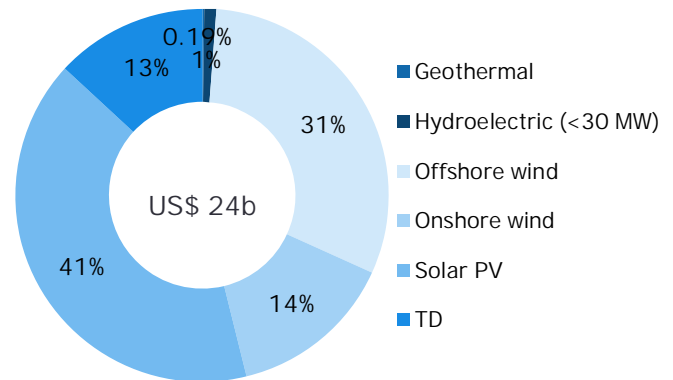
There has been significant commissioning of new power plants in Vietnam recently. Corresponding investment in network infrastructure by the country’s largest power company, Vietnam Electricity (EVN), has been lagging, which led to grid congestion and curtailment in some areas. As well, the launch of the first Solar FIT attracted many projects in concentrated areas. However, a lack of coordination in planning and grid access has led to a curtailment of up to 30% in 60% of all solar projects. Generally, there is a risk of congestion to the Vietnam assets due to new projects coming online without any corresponding increase in network capacity.

Teething issues are not unusual and EVN has acted quickly in attempts to address curtailment. The draft PDP VIII indicates EVN’s new focus on investment into the transmission network with 12% of the country’s potential investment belonging to the transmission and distribution sector. The pipeline captures 132 projects in the transmission and distribution sector, highlighting EVN’s proactiveness in resolving curtailment issues relatively quickly.

Renewable energy capacity



Investment potential by sector



For some sectors, due to the bespoke nature of projects, comparable investment benchmarks are not available. Therefore it may be inferred that the investable pipeline, particularly for sectors like energy efficiency and electric vehicles, is far greater than this study’s estimation

Only 13% of the projects in the pipeline are at or beyond the development stage, suggesting that only a small fraction of projects in the pipeline have had success in securing financing.

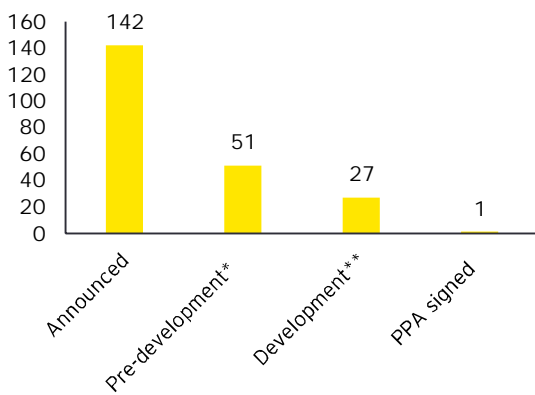
Other factors that limit projects for advancing in the development cycle include lengthy processes at different stages of development and inclusion in provincial plan or masterplan. Investors tend to choose smaller projects (< 49MW), which only require provincial approvals as large projects need to go through a masterplan approval process.

Risk allocation in the PPA has prevented developers from raising international non-recourse financing, with very few

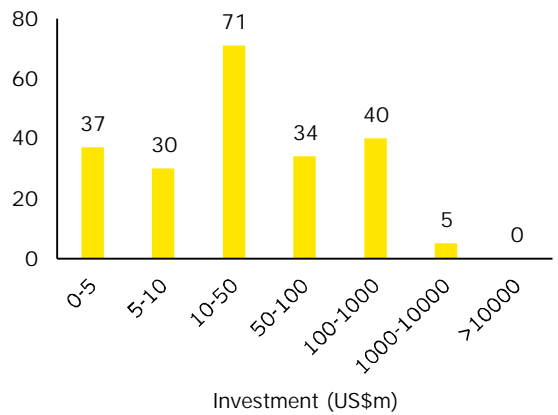
exceptions. Domestic funding is available but requires collateral. Hence, only strong sponsors with necessary credit strength are able to raise necessary finance. Most projects, particularly those small in scale, are financed on corporate finance basis.

Small-scale projects make a significant portion of the pipeline – 62% of the projects require an investment of less than US\$50m. These projects mostly comprise solar PV or hydroelectric (<30MW), bioenergy and transmission and distribution projects. The development of small-scale projects has slowed due to barriers in accessing finance.

Number of projects by development stage



Number of projects by investment range



*The pre-development stage refers to projects in "launched feasibility", "pre-development", "approved" or "permitting" stage.

**The development stage refers to projects "under procurement" or "development or financing" stage.

The interviews reveal that Vietnam needs clarity around renewable energy targets to accelerate its energy transition

High perceived risk

- Supporting market framework
 - Vietnam is a single buyer market with EVN acting as the sole offtaker for renewable energy.
 - The direct power purchase agreement (DPPA) mechanisms between renewable energy developers or power generation companies and private power buyers or consumers is expected to be approved soon, which will create a vibrant pipeline of projects in coming years.

Medium perceived risk

- Robust transmission capacity
 - ▶ Significant curtailment issues have been faced in the initial boom of installed solar capacity, which is being addressed by EVN.
- Financing and bankability
 - ▶ Domestic banks have limited capacity to appraise credits for non-recourse project financing and favor corporate finance solutions.
 - ▶ International funding also requires support from the developers to mitigate gaps in the template PPA.
- National ambition and targets
 - The pipeline showcases 14GW of solar projects.
 - Vietnam added 4.5GW in solar PV capacity by June 2019 and the current capacity exceeds its 1GW target for 2020 by a large extent.
 - The official release of PDP VIII is awaited to give a clear direction to the industry.
- Adaptive renewables policy
 - The solar and wind industry are at a standstill as the FiT is set to expire in December 2020 and November 2021 respectively. Clarity around whether the FiT mechanism will be extended can give a clear direction to the industry in the near future.

Low perceived risk

- Allocable land parcels
 - ▶ Vietnam is one of the few geographies where investors did not mention land acquisition as a barrier.
- Favorable supply-demand
 - A market balance exists between a growing energy demand and a vibrant renewable energy pipeline.
- Thorough resource assessment
 - Vietnam is finalizing the assessment of its offshore wind potential.

Energy efficiency

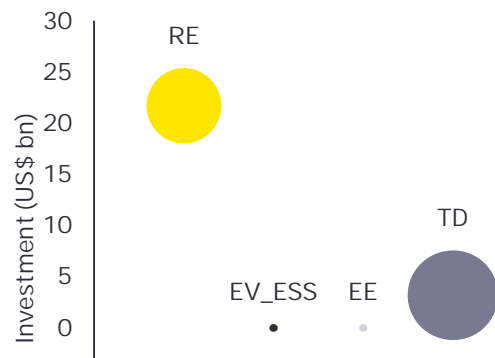
Although Vietnam has the will for energy efficiency, there is limited knowledge and interest, much like the rest of the region. As Vietnam is experiencing high growth in electricity demand requiring significant investments in the generation, transmission and distribution assets, energy efficiency measures can significantly benefit the country energy sector. However, the country still lacks the motivation to explore and adopt energy efficiency practices. The pipeline is representative of this as it reflects only one project from the energy efficiency sector.

Industry practitioners indicate that the primary motivation for industrial companies to invest in technology upgrades or modern energy-efficient equipment is to replace old or faulty equipment. The lack of awareness of the energy savings potential, the high minimum investment for energy efficiency projects and the absence of energy efficiency projects for streetlighting are additional factors preventing the sector from being explored.

Further, the electricity tariff subsidies and ambiguous tariff structures limit the incentives for industrial consumers to invest in energy efficiency solutions. Decision No. 34/2017/QĐ-TTg on the average retail electricity pricing methodology for the period of 2016 - 2020 and the pricing framework published in December 2017 suggest that electricity prices will continue to benefit from subsidies.

Vietnam has introduced the Vietnam Energy Efficiency for Industrial Enterprises (VEEIE) with funding support from the World Bank. The program aims to improve energy efficiency in the industrial sector through energy efficiency investment or lending and project implementation support. Even though a pilot framework has been developed, the utilization of the funds remains lower than the budget available. For instance, of the available funding of US\$20m in FY19/20, only about US\$2.8m was spent. Of the FY20/21 budget of US\$35m, only about US\$21.6m was spent.

Vietnam’s pipeline snapshot by sector



Bubble size represents number of projects

Due to the bespoke nature of projects in sectors like energy efficiency and electric vehicles, comparable investment benchmarks are not available. Therefore it may be inferred that the investable pipeline may be far greater than estimates made under this study.



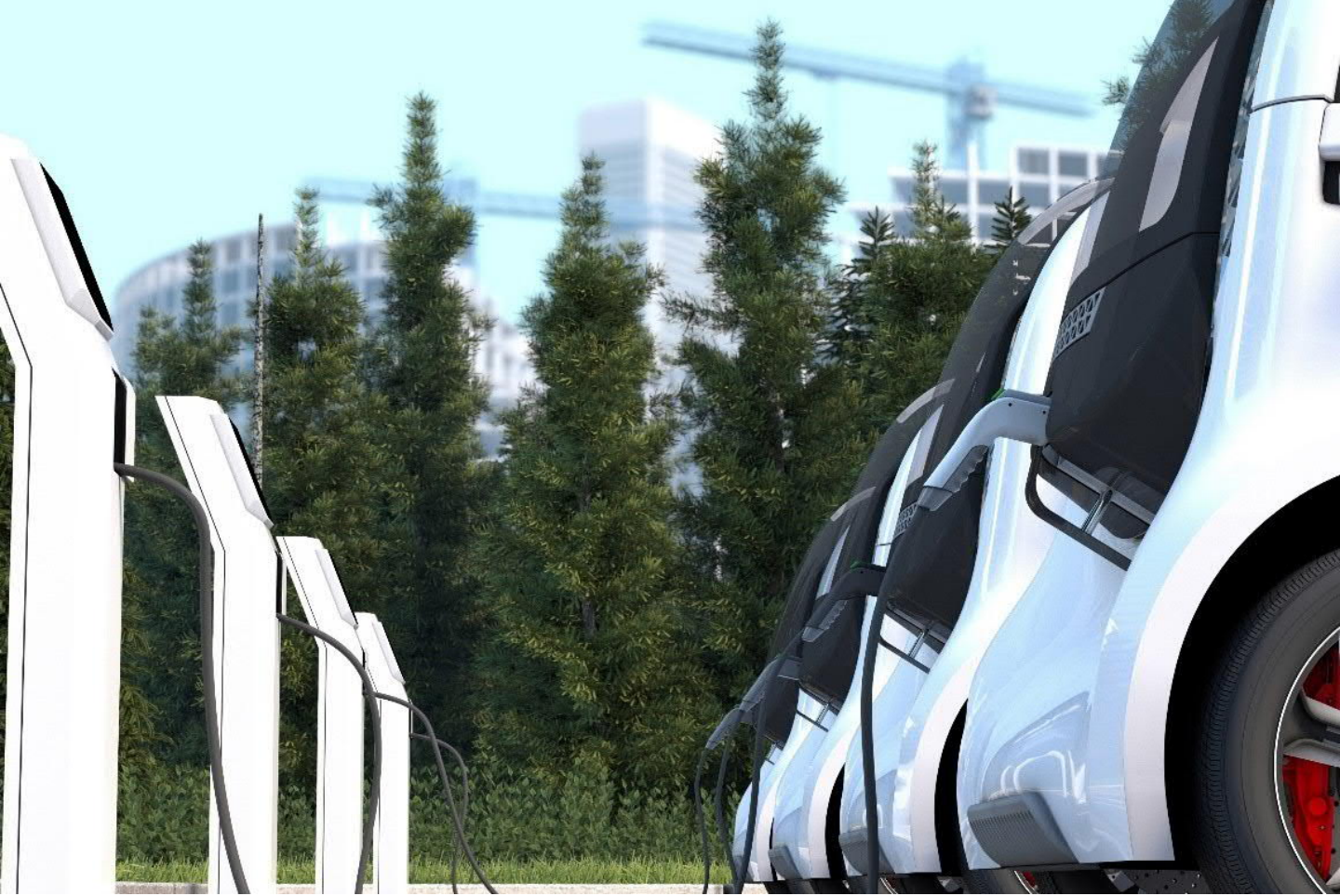
Success of Vietnam's renewable energy sector

Direct PPAs in Vietnam

The Ministry of Industry and Trade of Vietnam (MOIT) had submitted Proposal No. 544 to the Prime Minister in the first half of 2020 along with a new draft decision for approval of the pilot program on direct power purchase mechanisms between renewable energy developers and power generation companies and private power buyers and consumers. The formal approval, expected to come soon, could create a vibrant pipeline of projects in coming years.

Solar in Vietnam

Vietnam has achieved a cumulative installed solar capacity of over 4.5GW as of 2019, far exceeding its 2020 target, on the back of an attractive FIT regulation and a standard PPA.



Electric vehicles

The pipeline includes only one project from the EV sector, which indicates a significant lack of momentum to explore the sector. While private companies are exploring the potential for EVs, a public vision is also required to accelerate EV adoption in the country.

Electric bikes are now ubiquitous in Vietnam but the economic potential of EVs is still untested. Vietnamese company VinFast is focusing on developing EVs both through domestic manufacturing and through the creation of a supporting ecosystem. Based on press releases, VinFast has partnered PVOil to develop charging stations across Vietnam. Similarly, Mitsubishi also has plans to invest in R&D of EVs in Vietnam. The lack of market participants indicates the relatively untapped potential for the sector.

Further, EVs are yet to feature in public policy. Incentives aimed to stimulate manufacturing and use of EVs are scattered across numerous legal documents such as the National Automobile Development Strategy and tax decrees. Despite special tax rates announced in 2016, it is reported that hybrid EVs have not yet been granted tax reliefs.

Recommendations

Some of the recommendations to help support green recovery in Vietnam include:

Having an updated policy direction will provide stakeholders the required clarity to deploy the renewable energy pipeline and help in keeping the significant momentum achieved in the past three years. The official targets in PDP VIII and supporting mechanisms for solar (new FiT or introduction of auction) and wind (FiT eligibility) as well as policy direction on offshore wind has the potential to spur the market. Investors are also hoping to leverage greater synergy between provincial and national level plans to ensure the sector development is coordinated for the approval process, inclusion in masterplans and better certainty of grid connection.

The inclusion of Resolution 55 in PDP VIII can bring about constructive change, incentivizing stakeholders to move forward with the projects in the pipeline. Resolution 55 aims at encouraging private investment in renewable energy, diversifying the energy system and advocating for renewable energy laws.

Reforming the procurement process and implementation of the auction mechanism and allowing for direct PPAs can open the market and make the procurement process convenient for a range of stakeholders.

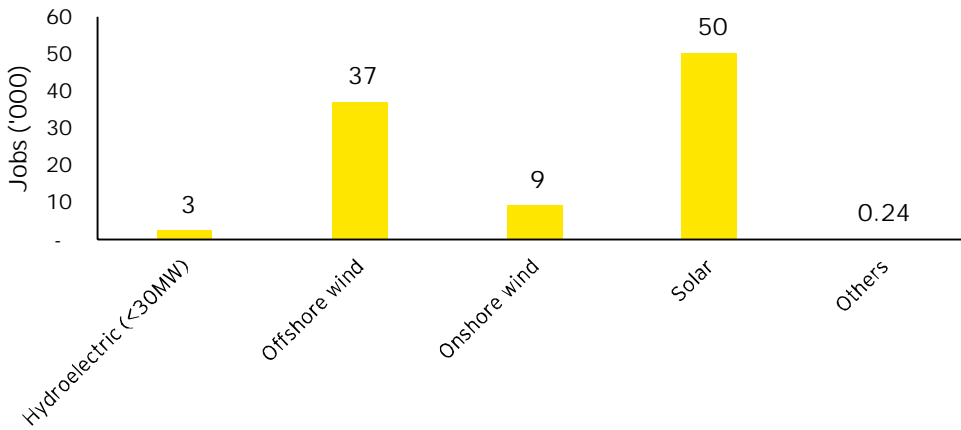
Build on the current success by developing stronger incentives to promote energy efficiency projects through mandatory compliance requirements, incentives for energy efficiency projects and credit support for SMEs.

Build awareness and provide technical support for implementing energy efficiency projects to create a bankable pipeline of projects. The current stimulus has focused on tax reductions and waivers to ensure that businesses stay afloat and more measures can help to ensure an increased participation of local manufacturers in the global supply chain. As part of the COVID-19 recovery packages, the government can include obligations for incorporating energy conservation and green technologies such as rooftop solar.

Introduce a comprehensive integrated energy transition strategy that incorporates renewable energy, energy efficiency and EV sectors and recognizes the synergies in application. This can help to catalyze the investment potential and further build on Vietnam's renewable energy success.

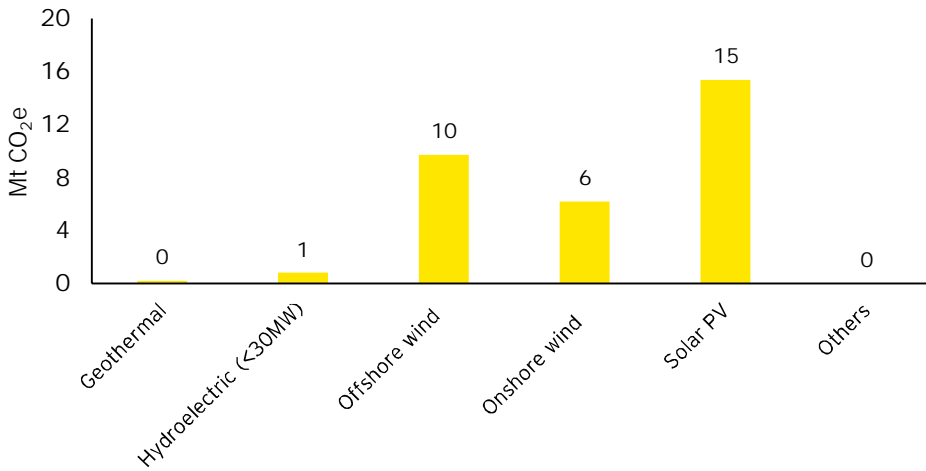
Recommendations (continued)

Number of jobs by sector



The pipeline has the estimated potential to create up to 99,000 jobs

CO₂ emissions avoided by sector



The pipeline has the estimated potential to avoid more than 32 MtCO₂e of CO₂ emissions per annum

Conclusion

The environmental and economic benefits of green energy development can no longer be ignored. Governments around the world have acknowledged the role the green energy sector can play in economic recovery post the COVID-19 pandemic. The study finds that there is tremendous investor interest and surplus private capital ready to be deployed in the clean energy sector. However, the clean energy transition can be accelerated and amplified only when certain challenges are addressed by the authorities, which will make the sector attractive for private investment.

Recovery in a post-COVID-19 environment requires coordinated action from various stakeholders. With greater collaboration between the public and private sector, economies can tap into the immense potential that clean energy projects can offer to drive better economic, environmental and social outcomes. The choices today will shape the economies of tomorrow.



The pandemic offers Asian governments a unique opportunity to place the clean energy transition at the center of policymaking to drive the economic recovery and future growth.

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