


May 2021 | 57th edition  
Renewable Energy Country Attractiveness Index

# RECAI



Is finance the  
biggest hurdle  
in the race to  
net zero?



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working world

# Contents

# Introduction

As we move closer to the 2021 United Nations Climate Change Conference of the Parties (COP26), which is being held in the UK in November 2021, pressure is mounting for action on climate change.

It is widely considered the most important moment for the climate since the signing of the Paris Agreement six years ago, and all eyes are on governments to make good on their nationally determined contributions, raise their ambition and get the world on a trajectory to limit global temperature rise to 1.5°C above pre-industrial levels.

Not only is public pressure on governments to address the growing climate crisis, but calls for institutional investors to step up and deliver are also increasing. The devastating impact of the COVID-19 pandemic has only served to heighten the importance of institutional investors addressing environmental, social and corporate governance (ESG) and sustainability risks.

In this edition of the Renewable Energy Country Attractiveness Index (RECAI), we highlight how governments must deliver on spending promises for the energy transition. Net-zero commitments from China and the US in the past year represent a huge step forward for achieving the Paris Agreement goals – and, last month, the two superpowers announced that they are committed to working together, and with other countries and regions, to tackle climate change.

They agreed to discuss further specific actions to reduce emissions and help developing nations finance a switch to low-carbon energy – but how China and the US will finance this transition is still uncertain.

Leading developed nations must demonstrate that they will keep their word to increase research and development spending on clean energy to US\$10b per year as part of Mission Innovation. In addition, they must show they are genuine in their promise to deliver US\$100b per year in climate financing for developing nations.

Meanwhile, momentum for the low-carbon transition gained pace last month, with the US pledging at a climate summit hosted by President Biden to reduce carbon emissions by 50%-52% below 2005 levels by 2030.

RECAI 57 also looks at the role institutional investors can play in financing the energy transition to get us on a pathway to fulfilling the Paris Agreement. Last year, global renewable energy capacity investments grew 2%, to US\$303.5b. This marked the second-highest annual figure ever – an impressive achievement considering 2020 was such a difficult year.

A funding gap still exists, however, and EY professionals estimate future global renewable energy development to be a US\$5.2t investment challenge, based on the International Energy Agency's Current Policies Scenario. Around US\$7.7t is committed to renewables, while US\$12.9t is required under the Sustainable Development Scenario.

ESG has risen up the agenda as a result of the COVID-19 pandemic, and institutional investors' interest in renewables continues to grow. However, clearer commitments from governments on infrastructure spending – and details of pipelines of relevant investments that are likely to be supported – would help increase funding opportunities for institutional investors and insurers.

In this edition of RECAI, we also feature two green hydrogen case studies from different regions. The situation regarding green hydrogen embodies the larger issue facing the low-carbon transition: emerging technologies – not only hydrogen, but also electric vehicles and battery storage – offer enormous potential for achieving net zero, but require significant funding to bring them to scale and make them cost-competitive.

Finally, we take an in-depth look at power markets across East Asia, which has a strong outlook for renewable energy. Not only was China's net-zero commitment a big step forward, but there were also commitments from Japan and South Korea in the past year. As a result, the region is likely to benefit from an acceleration of renewables growth, building out the supply chain, driving down technology costs and attracting international investment interest.

In Southeast Asia, demand for energy is snowballing. With 45m people still to be connected to electricity, and the population expected to grow by 25%, renewable energy can play a key role in satisfying this growth demand. Addressing climate change and managing climate risks will be a priority in this region, as several of these markets are among the most vulnerable to climate change.

COP26 provides the world with a platform to accelerate the energy transition, but success during its build-up, at the conference itself and after it concludes will require a collaborative effort. Read on to discover how a variety of stakeholders can step up and put the world on a pathway to realizing the Paris Agreement, as we outline some of the key stories on renewable energy from around the globe.



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# recai

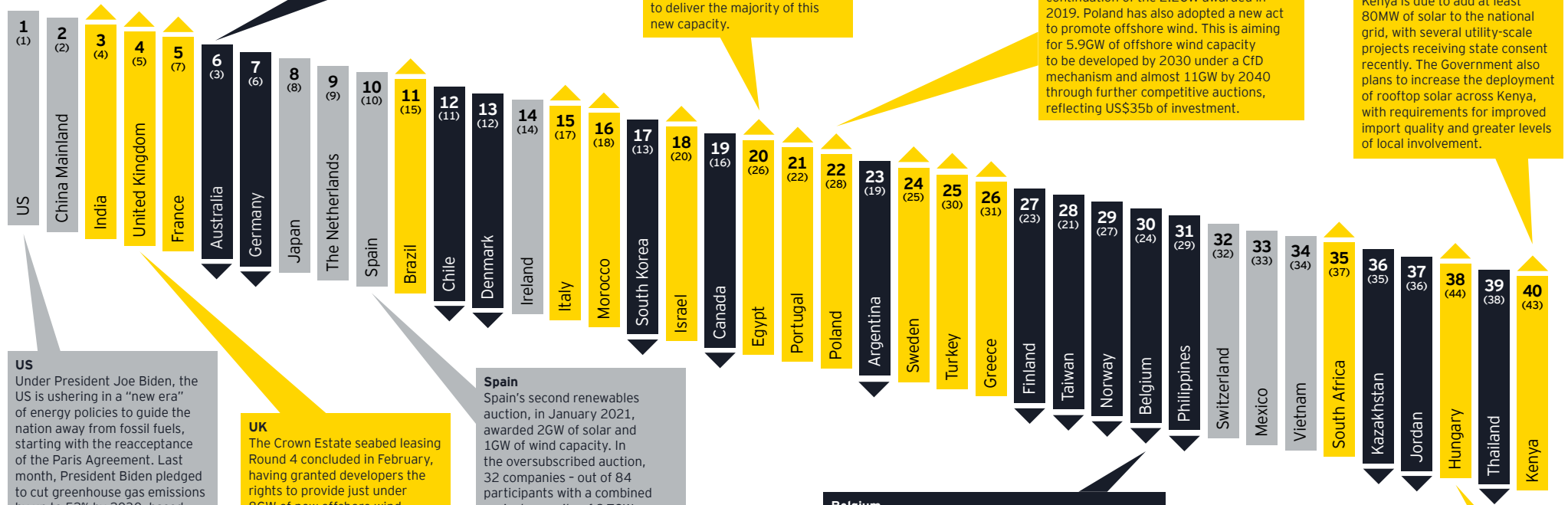
May 2021

### Methodology

The index was recalibrated in April 2021, with all underlying datasets fully refreshed. To see a description of our methodology, including how we are accounting for COVID-19, visit [ey.com/recai](http://ey.com/recai).

### LEGEND

- ▲ Increased attractiveness compared with previous index
  - ▼ Decreased attractiveness compared with previous index
  - No change in attractiveness since previous index
- Current ranking is in bold**  
(Previous ranking is shown in brackets)



**Australia**  
The Australian Minister for Energy and Emissions Reduction published a discussion paper outlining the Government's push for hybrid vehicles, while ruling out state support for an electric vehicle rollout. This is expected to negatively impact future demand for renewable electricity.

**Egypt**  
Egypt has announced it intends to increase the supply of energy generated from renewable sources to 42% by 2035, with solar PV providing approximately 25%, onshore wind 14% and hydro power 2%. Private developers are expected to deliver the majority of this new capacity.

**Poland**  
The Government awarded 1.7GW of onshore wind and solar capacity to 96 developers through contract for difference (CfD) auctions in 2020, in a continuation of the 2.2GW awarded in 2019. Poland has also adopted a new act to promote offshore wind. This is aiming for 5.9GW of offshore wind capacity to be developed by 2030 under a CfD mechanism and almost 11GW by 2040 through further competitive auctions, reflecting US\$35b of investment.

**Kenya**  
Kenya is due to add at least 80MW of solar to the national grid, with several utility-scale projects receiving state consent recently. The Government also plans to increase the deployment of rooftop solar across Kenya, with requirements for improved import quality and greater levels of local involvement.

**US**  
Under President Joe Biden, the US is ushering in a "new era" of energy policies to guide the nation away from fossil fuels, starting with the reacceptance of the Paris Agreement. Last month, President Biden pledged to cut greenhouse gas emissions by up to 52% by 2030, based on 2005 levels. In 2020, the US installed 19GW of solar, a 43% annual increase, as well as energizing a record-setting 2.2GW of energy storage systems. The offshore wind sector continues to grow rapidly, with the state of Oregon, on the west coast, announcing a target 3GW of floating wind by 2030.

**UK**  
The Crown Estate seabed leasing Round 4 concluded in February, having granted developers the rights to provide just under 8GW of new offshore wind capacity across six projects. This process drew record prices and unprecedented interest from incumbents and newcomers alike. The UK Government has also given consent for the development of the largest battery-storage project, and pledged £92m in funding for innovative green technologies.

**Spain**  
Spain's second renewables auction, in January 2021, awarded 2GW of solar and 1GW of wind capacity. In the oversubscribed auction, 32 companies - out of 84 participants with a combined project capacity of 9.7GW - were successful. However, record-low prices could affect future project delivery. Average prices of €24.47 (US\$29.44)/MWh for PV and €25.31 (US\$30.45)/MWh for wind were 43% lower than current long-term price estimates, according to the Spanish Government.

**Belgium**  
Operational wind farms in the Flanders region of Belgium are facing reduced subsidy payments following the Government's decision to alter the support regime. Turbines of 2.5MW or greater will now fall into a lower payment band. The change is intended to reduce the burden on state financing in preparation for the planned 2024 phase-out of renewables subsidies.

**RECAI 57 incorporates a reduction to the COVID-19 scoring parameter:**  
▲ The COVID-19 scoring parameter's impact has been reduced to one-half on account of the impacts beginning to be reflected in other datasets. Furthermore, the COVID-19 scoring parameter now reflects the real-world impacts of the pandemic from both a health and economic perspective.

**Hungary**  
Hungary continues to grow as a market for solar PV, having met its targeted 14% of generation via renewables in 2020. The latest state-run solar PV auction was significantly oversubscribed, resulting in the contracting of 390GWh per year of generation.





## | Key developments

With COP26 on the horizon, governments and institutional investors must rise to the challenge of honoring the Paris Agreement.

## A record year for wind in China, but less ambitious emissions goals

China added an astounding **72.4GW** of new wind power in 2020, including 48GW in December alone, as developers rushed to beat an onshore wind subsidy cut-off – China will no longer approve subsidized onshore wind projects after 2020. It represents a three-fold increase from 2019 and is more than double the nation's previous record.

However, the figure reported by China's National Energy Administration could be skewed by **26.3GW**, as it includes grid connections that were installed, but not connected, by the end of 2019, according to Feng Zhao, Head of Strategy and Market Intelligence at the Global Wind Energy Council. Regardless, the net figure of 46.1GW in 2020 would still represent a tremendous achievement for China, and nearly equals the entire global capacity installed in 2018.

China also installed **3GW of offshore wind in 2020**, representing half of the new global capacity built last year. It is the third year in a row that China has led in new annual offshore wind capacity. In addition, it added **49.3GW** of solar capacity, up from 29.7GW in 2019.

Despite this increased growth in wind and solar installation, at a policy level, the emissions goals established in China's 14th Five-Year Plan for 2021-2025 are seen by some analysts as slow-moving and leaving the door open for emissions to grow for the next 10 years.

One of the main targets in the plan – a 20% non-fossil share in total energy consumption by 2025, an increase from 15.9% in 2020 – has been classified as a “modest acceleration” by **commentators**. It has led to calls for China to do more to reach its climate target of peak carbon emissions before 2030.

Last month, **China and the US announced** that they would work together, and with other countries and regions, to tackle climate change. The two superpowers agreed to discuss further specific actions to reduce emissions and to help developing nations finance a switch to low-carbon energy.

## A leap forward to regulate offshore wind sector in Brazil

Brazil is pushing ahead with plans to deploy offshore wind capacity. Currently, it does not have any turbines off its 8,000km Atlantic coast, but a new bill was proposed in Congress in February that, if passed, would open up the sector.

The nation has been locked in debate over how Brazilian waters should be subject to concessions or leases for offshore wind development. The **new bill** would ask developers to pay up to 5% of power production and other charges. An older offshore wind bill that proposes a “first come first served” system, without charging bonuses or leases, has been approved by the Senate and is being debated by the Lower House. It is expected that the two bills will be combined when the new bill reaches the Lower House.

Meanwhile, Brazil's federal environmental authority, IBAMA, released licensing guidelines for offshore wind power projects last year. Additionally, the federal energy planning authority, EPE, published a road map for the sector that called attention to infrastructure bottlenecks.

Brazil's potential offshore pipeline could see strong growth, thanks, in part, to a 50m-deep, 30km-wide continental shelf and wind speeds of 7m/s to 7.5m/s. Equinor and Iberdrola have already sought licenses for 4GW and 9GW respectively, while domestic firm BI Energia has submitted a request to build offshore wind farms. Total and Enauta have also expressed interest.

For the new industry to take off, however, costs will need to be reduced. Currently, planners in Brazil must follow regulations that enforce an order of contracting that combines lowest price with supply security. Given that Brazil's 18GW onshore wind power fleet is selling power at less than BRL90/MWh (US\$13/MWh), offshore wind – which has a global average price of approximately US\$50/MWh – is currently far too expensive to win power deals in a government tender.

## Poland passes offshore wind legislation

Poland has passed the [Offshore Act](#) regulating the development of offshore wind farms in the Baltic Sea. It aims for 5.9GW of capacity to be offered via contracts for difference by the end of June 2021. This is an increase from a [previous draft offshore wind bill](#), which would have allowed for 4.6GW. The first projects could become operational by 2025.

Investors are expected to be responsible for constructing and financing the connection of offshore wind farms to the national grid. Poland's state-owned transmission system operator, Polskie Sieci Elektroenergetyczne, will have the right of first refusal in case of a potential sale by an investor.

This marks Poland's first phase of development. Plans for the second phase include two auctions – the first in 2025 and the second in 2027 – both for 2.5GW of capacity. This would bring Poland's total offshore wind capacity that is operational or under development to 10.9GW by 2027. It also envisions a pipeline of up to 28GW. Poland is viewed as a potential springboard for non-Western European markets, and success here could result in developers turning their eyes toward the Black Sea.

## Turkey eyes offshore wind tender within next three years

A long-term [offshore wind roadmap](#) is being put together for Turkey by the World Bank, with the aim of holding a tender in the next two to three years. After a canceled 1.2GW offshore wind auction in mid-2018, the World Bank is now managing disbursement of EU funds to support feasibility and environmental studies ahead of a second attempt at an auction.

Sites are under assessment in the Sea of Marmara and the Black Sea. Wind speeds in the Turkish part of the Black Sea are estimated at 7m/s to 7.5m/s, in mostly deep waters. Currently, no sites are under assessment in the Aegean or Mediterranean seas, although three sites were being examined for the canceled tender attempt in 2018. The possibility of sites in the Aegean Sea could be limited by the closeness of several Greek islands to Turkish shores.

According to the World Bank, Turkey has the technical potential for 75GW of offshore wind within 200km of its coasts, comprising 63GW of floating wind and 12GW with bottom-fixed foundations.

Turkey ranks in [Europe's top 10](#) for installed wind capacity and is among Europe's top 5 wind turbine equipment makers, producing both onshore and offshore equipment.



## Renewables auctions in Greece could total 2.1GW by 2025

Greece's Regulatory Authority for Energy (RAE) has [announced](#) it will hold a joint wind and solar tender on 24 May. It will be the nation's third joint renewables tender, offering 350MW of capacity to bidders. The process will be open to solar projects with a capacity of up to 20MW and wind projects of up to 50MW.

The RAE says a ceiling price of €53.86/MWh (US\$64.04/MWh) will be put in place for prospective bidders. Greece's first joint auction for wind and solar projects was in April 2019, when it awarded 437MW of capacity. Last year's auction awarded 503MW of capacity, including a [record-breaking tariff](#) of €49.11 per MWh (US\$58/MWh) for a 200MW solar project in Ptolemaida by state-owned utility Public Power Corporation.

The upcoming auction will be the first of six that Greece plans to hold before the end of 2024, with a target of awarding 2.1GW of renewables capacity. Its tender regime has brought a steady reduction in tariffs and created a competitive environment for domestic companies.

Greece has also introduced a [new digitized licensing process](#), helping to expedite procedures for developers to participate in national renewable energy auctions.

## Wind subsidies reduced in Flanders region in Belgium

Belgium's Flanders region has reduced subsidy payments for future wind projects. Wind farms of 2.5MW or larger will now fall into a lower payment band, compared with a previous cut-off of 3MW.

A reduction in the internal rate-of-return parameters for wind farms entering the support scheme has also been introduced in Flanders, as has a mandate that wind projects will only receive the appropriate payment for their nameplate capacity. The measures come as developers prepare for the phase-out of subsidies by 2024.

The changes also prevent developers from taking advantage of a perceived loophole that would allow them to de-rate installed wind farms to qualify for larger subsidy payments. Approximately 30 permitted wind projects in Flanders will be affected by the new regulations.

## Sun shines on Hungary's solar sector

Hungary's [second renewables auction](#), held in October, was significantly oversubscribed. Of the 257 projects submitted (of which 256 were solar projects and the other a 0.5MW geothermal plant), only 36 projects were successful.

For small photovoltaic (PV) power plants between 300kW and 1MW, the lowest bid was HUF21000/MWh (US\$71/MWh). For projects ranging from 1MW to 49.9MW, the lowest bid was HUF16180/MWh (US\$54.9/MWh).

In total, the Hungarian Energy and Public Utility Regulatory Authority (HEA) expects to contract 390GWh. At Hungary's first renewable energy auction, held in March 2020, it contracted 199GWh. For the second tender, there was a rise in the capacity limit – from 20MW to 50MW – for large-scale projects, which was popular among foreign investors. HEA will grant 15-year FIT payments to the 36 successful projects, to top up wholesale electricity prices.

Despite the strong growth of Hungary's solar PV market, its renewable energy market is still hampered by a tax that supports small district heat producers. Hungary has put solar at the heart of its renewable energy policy, setting a [target of 6GW](#) of solar PV capacity by 2030, with existing capacity at just above 1GW.

## Eyeing a solar breakthrough in Kenya

Kenya is expected to add **80MW of solar power** to the national grid this year – a huge increase for a nation that currently generates about 200MW of solar power. Two solar plants, both 40MW, have received approval and will be built by private investors. They are due to be operational before the end of the year.

With abundant sunshine throughout the year in most of its regions, Kenya is an ideal location for solar power, from both utility-scale and rooftop installations.

Meanwhile, the nation is planning to review its solar legal framework to improve uptake among the industrial sector. To boost uptake of household rooftop installations, Kenya is seeking to introduce regulations for standards of imported solar equipment, to safeguard consumers from substandard products. Currently, the nation imports more than **90% of its solar equipment**.

Kenya is hindered by a lack of local production technology and capacity, and the Energy and Petroleum Regulatory Authority is currently considering a new regulatory framework to promote technology transfer.

## 1GW fourth-round Normandy offshore tender launched in France


France **opened bidding** in January for a tender for the construction, operation and maintenance of an offshore wind park in the English Channel off the coast of Normandy. It will have a capacity of between 900MW and 1,050MW, spread across a zone covering 500km.

The tender will have three stages: the selected developer, responsible for the project financing and management, will be **announced in 2022**; environmental studies will be conducted in the project area, in consultation with relevant stakeholders; and the wind farm will then be built at least 30km from the Normandy coast, to minimize the impact on fishing activities, maritime traffic and the marine environment.

Upon completion, it is expected to generate enough electricity to power **800,000 homes**, and will be France's eighth offshore wind farm. Last year, the Government announced plans to hold tenders for 2.4GW of offshore wind to be commissioned by 2023.







# Seven signs of success for the Paris Agreement and COP26

Six years on, we highlight the key requirements needed to address climate change at COP26 if the Paris goals are to be realized.

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The 2021 United Nations Climate Change Conference of the Parties (COP26) in November - the first COP to be held since the Paris Agreement's measures took effect - offers a monumental opportunity to address climate change, strengthen ambition and embark on the pathway to limiting the global temperature rise to 1.5°C above pre-industrial levels.

2020 was one of the three hottest years ever recorded, with an average temperature 1.2°C above pre-industrial levels. Momentum is building that could result in COP26, which will be held in Glasgow, UK, from 1 to 12 November 2021, being a turning point in the climate crisis.

In the past year, major steps forward have been taken, with the world's two biggest economies - China and the US - announcing net-zero carbon emission commitments. The European Green Deal, aiming to make Europe climate neutral by 2050, is now being deployed, with a 55% CO2 reduction **target by 2030** embedded in the European Climate Law.

Significant commitments must still be made, however, in the run up to COP26, during the conference, and through progressive coalitions and alliances once the conference comes to a close.

This is highlighted by the fact that the **latest science** shows emissions need to drop by half by 2030, and reach net zero by mid-century, to limit the temperature rise caused by global warming to well below 2°C - and, ideally, 1.5°C - as part of the Paris Agreement. Current policies in place are projected to put the world on course for a **2.9°C temperature rise** by 2100.

Based on the findings of the 57th edition of the Renewable Energy Country Attractiveness Index (RECAI), here is our view of what the Glasgow conference must try to achieve, with seven markers of success.

## Seven markers of success

### 1 A commitment from countries and regions to greater accountability and transparency

This could include unveiling road maps, with precise figures, on how participants will achieve their nationally determined contributions (NDCs), as well as higher ambition in their NDCs, and details on the policy measures that will be used to spur investment in renewables. Reducing emissions to keep temperature rise well below 2°C on a pathway to clean electricity and green hydrogen would require up to US\$130t of new investment between now and 2050, according to **BloombergNEF**.

### 3 More market incentives

Achieving long-term decarbonization targets will require the activation of more market mechanisms and incentives, such as phasing out subsidies for fossil fuels, implementing carbon prices or taxes, or tying recovery support to environmental performance. Of US\$12t earmarked by the G20 to address the economic disruption caused by the COVID-19 pandemic, just **one-quarter** of the donors are dedicating funds to efforts to reduce carbon emissions.

### 2 More nations are making a commitment to achieve net zero by 2050

Currently, there are 29, plus the EU, with net zero by 2050 as a policy position. Success would include more countries and regions showing greater urgency by aiming to reach **net-zero targets to before 2050** - as Finland (2035) and Austria (2040) have done. It could also mean going a step further and making their commitments law, not just a policy position - as Denmark, the UK, France and Sweden have done.

### 4 A faster flow of climate finance

This might include putting in place legislation mandating regulation on sustainable finance for banking, capital markets and non-bank financial institutions, and following France's lead of legislating for **mandatory climate reporting** by asset owners and managers.



## Seven markers of success

### 5 Developed countries and regions delivering on the \$100b finance commitment

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This commitment for climate action in developing regions could become the foundation of what is mobilized each year. Hopefully, the commitment from multilateral banks, such as the World Bank, to end fossil-fuel financing will be followed by all other major loan providers.

### 7 Plans for resilience and loss

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Nations would promise to build resilience and respond to loss and damage caused by climate change. This must include vows to empower locally led actions by the people and communities most affected by climate impacts. Also, where possible, it would leverage the power of nature-based solutions, such as protecting rainforests, mangroves and peatlands that can serve as carbon sinks.

### 6 Follow-through on R&D

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Leading developed nations would make good on their vow to increase research and development spending on clean energy to US\$10b per year as part of Mission Innovation. So far, the effort has raised spending to just **US\$4.9b** per year.

## An opportunity for action

While ambitions are raised in the run-up to the conference, and in the coalitions that develop afterward, success for the Paris Agreement at COP26 will require nations to take a holistic approach to solving the climate conundrum.

Beyond raising mitigation goals, participants will need to incorporate adaptation to the impacts of climate change and build resilience by increasing transparency and accountability, while also empowering communities to take local-led action.

Many pieces of the puzzle will need to come together, but COP26 can provide the stage to accelerate meaningful action on achieving the aims of the Paris Agreement.



# How climate risk is driving institutional investment in renewables

As institutional investors address climate risk, new tools are unlocking additional value in the renewable energy sector.

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Growing public pressure means institutional investors can no longer ignore climate risk concerns. Now, more than ever, there is growing awareness among investors of all sizes of the need to consider the climate crisis and the energy transition when deploying capital.

As a result, there has been a significant uptick in investor interest in renewable energy development. Increasing numbers of institutional investors have pledged to incorporate climate risk concerns into their investment decision-making processes. But what impact is this having on renewable energy sector investment strategies?

In 2020, global renewable energy capacity investments grew 2% to US\$303.5b, according to [BloombergNEF](#). This is the second-highest annual figure ever, and it was the seventh year in which investments exceeded US\$250b.

The 57th edition of our Renewable Energy Country Attractiveness Index (RECAI) reveals a scope and a clear need to encourage more investment in renewables. Institutional investors in particular have the capability and the appetite to provide the large, long-term capital injections needed to support the rapidly developing global renewable energy sector.

The International Renewable Energy Agency (IRENA) has estimated that institutional investments in renewable projects – directly and through renewable-focused funds – currently total approximately US\$12b annually. This is based on [a study](#) of a global sample of more than 5,800 pension funds, insurers, sovereign wealth funds, and endowments and foundations, with about US\$87t in assets under management.

However, EY teams estimate future global renewable energy development as a US\$5.2t investment challenge. Based on the International Energy Agency's Current Policies Scenario, around US\$7.7t is committed to renewables, but US\$12.9t is required under the [Sustainable Development Scenario](#). Clearly, there is a significant gap to be filled.

## Incentivizing private investors to do more in renewable energy

There is growing interest in renewables investment from the private sector, particularly in the COVID-19 pandemic era. Large private investors, such as pension funds and insurers, are increasingly expected – by shareholders, governments and financial regulators – to operate with an eye on environmental, social and corporate governance (ESG) credentials.

Although many institutional investors have pledged to invest along low-carbon or environmental lines, research shows they could do more. According to the IRENA research, approximately 20% have invested indirectly through funds in renewables over the past two decades, while only 1% have invested directly in projects.

These direct and indirect investments totaled US\$6b each in 2018, out of a possible US\$87t managed by the group of investors IRENA analyzed. It pointed out that: "Such renewable investments represent a miniscule share of the capital held by the world's institutional investors."

A growing number of investors are now integrating ESG considerations into every investment case. This typically involves scoring a potential investment, using a best-in-class approach and based on ESG considerations relative to other companies in the same sector.

A perhaps more direct approach involves using positive screening solutions to actively invest in projects with a specific ESG objective, such as a renewable energy project. While such strategies are growing, allocations are not always as significant for the sector at present. For example, Amundi, Europe's largest listed asset manager, has expanded its assets under management for environmental solutions from €10b (\$US12b) in 2018 to €22b (US\$26.4b) using this kind of approach, but had allocated €356b (US\$428b) at the end of December 2020 under the first type of strategy.



Another way in which capital is increasingly flowing from institutional investors to renewables is via engagement with energy companies that are pivoting from fossil fuels to lower-carbon strategies ahead of the energy transition. Growing numbers of financial firms are divesting from heavy-hitting emissions sectors, such as tar sands and thermal coal, but there is also a growing movement to engage with organizations to encourage the phase-out of fossil fuels in line with net-zero emissions targets.

In 2014, Norway's US\$1t Government Pension Fund Global decided to engage, rather than divest, to combat climate change. The largest pension fund in the world – Japan's US\$1.36t Government Pension Investment Fund – has also emphasized strongly to its asset managers the benefits of stewardship when discussing climate risk issues in recent years. This movement has reverberated throughout the market, with similar action from major asset managers, including [BlackRock](#) and [L&G Investment Management](#).

For many institutional investors, engagement is preferable to divestment for all but the most polluting industries, such as thermal coal. It enables large investors to retain some power of influence, guiding capital to encourage a low-carbon transformation of the organizations in which they invest.

## Taking the strain out of finding and accessing projects

Even as capital allocations from institutional investors to the sustainability sector grow, challenges remain for this type of investor to participate in renewables financing in particular.

"There is a surplus of demand to invest versus opportunities," says Gareth Mee, Partner, Sustainable Finance Consulting, at Ernst & Young LLP. European investors often encounter difficulties relating to long-term planning, he adds, because there is insufficient information available about pipelines of relevant investments that are likely to be supported by governments.

"For example, if you look at the UK infrastructure development plan for all of the projects the UK Government is planning to finance over the next 10 years, there is often insufficient information about start dates, debt versus equity structures, likely terms and so on. So it's very hard for an insurer to plan to invest in a specific project at a future date," Mee explains.

Similarly, when considering individual investment targets, current reporting and disclosure requirements and capabilities leave a lot to be desired, creating a level of regulatory overhead for those involved in these markets. "In Europe, for example, insurance companies can benefit significantly from demonstrating that their investments meet certain regulatory criteria," Mee says. "But the level of disclosures required to help insurers understand whether they meet those regulations are quite onerous. It's become standard for the funds that raise money to understand those conditions so they can help the borrowers – that is, the projects – to provide that information."

For a developer attempting to enter into a bilateral agreement with an insurance company, however, it could be quite a formidable undertaking to provide this information at the outset of a deal.

Amundi's Chief Responsible Investment Officer Elodie Laugel highlights the same challenges around evaluating a renewable energy company or project for investors who want to invest directly: "The financial markets offer a lot of listed companies and issuances, but – in the renewables segment – part of the job for us is also developing the ability to source projects; we raise a lot of environmental finance, but the market is not equipped to channel this into projects."

To address this issue, Amundi has established partnerships with organizations including the World Bank's International Finance Corporation, the European Investment Bank, and the Asian Infrastructure Investment Bank – public entities that help to source projects. This has been particularly useful for less developed or more illiquid renewables markets in which finding the necessary information about projects to establish robust financial contracts can be even more difficult. "They can source the project and ignite the offer, so that we can bring the capital of our investors," Laugel explains.



## Nuanced solutions for greater private sector involvement

Institutional investor needs tend to tally with the benefits of renewable energy infrastructure investments, including asset diversification, and strong and stable long-term cash flows. However, they also require risk mitigation tools and structured finance mechanisms that are tailored specifically to the renewables sector. Flexible options that work across many different types of market and market maturity will give larger investors access to bigger, or more aggregated, investment opportunities.

New tools are certainly needed to support more investment by institutional investors in the global renewable energy sector as the market looks toward the energy transition. These approaches must be increasingly nuanced, however, to provide the returns needed to satisfy growing institutional investor interest in renewables.

Vimal Vallabh, Global Head of Energy at infrastructure investment management firm Morrison & Co, says that, although institutional investors are increasingly interested in renewables, the sector has struggled to meet their return expectations.

“There seemed to be more capital than there were high-quality projects in supply in recent years, and that, effectively, is what made us go into development,” Vallabh says of Morrison & Co, which operates several international renewable energy development platforms. “The institutions wanted to invest in renewable generation given the energy transition, but they did not feel the returns were good, relative to the rest of the infrastructure spectrum.”

When they could not get the required returns from contracted renewables, many institutional investors wanted to move up the risk curve into development, Vallabh explains. To aid this trend, Morrison & Co developed a bottom-up approach to comparative risk analysis, to better assess renewables investments relative to other assets.

“Investors talk about renewables on a relative basis across asset classes, but it’s difficult to compare returns when the risks can be inherently different,” Vallabh continues. “For example, how can you compare volume risk on a renewables offtake contract with that of a data center? There are key stages to the development cycle of a renewables project and, if you put them side by side with a data center, they are not comparable.”

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**Investors talk about renewables on a relative basis across asset classes, but it’s difficult to compare returns when the risks can be inherently different.**

**Vimal Vallabh, Global Head of Energy, Morrison & Co**

Morrison & Co’s approach is focused, instead, on assessing risk versus return within the same asset class but across geographies, rather than comparing investments across asset classes. “So, I understand the risks of an Australasian wind farm development and operations, but how does that compare with a different market with the same asset – Texas versus New South Wales or Andalusia, for example?” Vallabh explains. “It’s a bottom-up, purist approach to comparative risk analysis.”

Starting in 2016, Morrison & Co applied this model to the North American market through a platform called Longroad Energy, and has since established similar platforms in the European and Australasian renewables markets, with entry into Asia on the horizon.

Others in the market have also identified the need to tailor renewable energy investment offerings to suit specific institutional needs, particularly as renewables markets around the world mature.

Previous conduits, such as yieldcos and infrastructure funds, have provided a point of access for investors without necessarily requiring an in-depth understanding of the specifics of the sector. With the energy sector at a tipping point in relation to the swing toward low-carbon production, investors now require “deeper domain expertise” than before, according to Bob Psaradellis, Chief Executive Officer of Renewable Power Capital (RPC), a UK-based platform launched in December 2020 to invest in the European solar, wind and battery storage markets. It is majority owned by the Canada Pension Plan Investment Board (CPP Investments).

“Previously, the barriers to entry were very low for investors ... but everyone in our industry now has one thing in common: the need to sell electrons,” Psaradellis says. “And we haven’t had to think very hard about how we sell those electrons until now.”

As the main shareholder in RPC, CPP Investments expects to deploy a “meaningful” amount of capital at good, risk-adjusted returns through the platform, according to Psaradellis. RPC sits within the newly established Sustainable Energy Group at CPP Investments, which combines the organization’s expertise in renewables, conventional energy, and new technology and service solutions, and has approximately CA\$18b (US\$14b) in assets. In January 2021, it committed up to €245m (US\$290m) to RPC in support of the latter’s first European renewables investment – a 171MW capacity portfolio of wind projects in Finland.

RPC plans to invest right across the value chain for wind and solar, from development to construction and operations. It will handle power purchase agreements (PPAs) and project financing rather than relying on developers.

“We have built an analytical framework to help guide our decisions about when we contract, for how much, and for how long – and we can look at the whole range of options, from short-term hedges to long-term corporate PPAs, to being fully merchant,” Psaradellis explains. “We will make those decisions based on signals we receive at the time.”

RPC Chairman Shaun Kingsbury says the platform will help CPP Investments access pockets of value in the market by using flexible capital, which is the key differentiating factor in RPC’s approach. “We can create value by being able to play in all parts of the market without debt or a PPA attached,” Kingsbury adds. “Others need to have more pieces of the puzzle in place before they can invest. They have to raise capital with a certain flavor, and cluster their results around a certain number – the number they promised their investors. We’re quite happy making higher returns and taking more risk, or lower returns with a little less risk, as long as we are doing something that makes the right risk-adjusted return for investors.”

Satisfying stakeholders’ appetite for risk-adjusted returns has become increasingly difficult as the renewable energy market has started to mature in many parts of the world. However, as the market emerges from the worst of the COVID-19 pandemic, it will be mutually beneficial to expand the participation of large private investors in the renewables sector.

If the sector is to continue to attract more finance, particularly from large institutional investors, market participants need to support the development of a more nuanced approach to renewable energy investment. New models are starting to help investors locate opportunities that satisfy their risk and return expectations by tackling issues such as long-term merchant risk. This will enable institutional investors to satisfy stakeholders’ growing climate risk concerns by providing the kind of “patient capital” required to support future renewable energy development and operations.

A large white spherical hydrogen storage tank is the central focus of the image. It is supported by a white metal structure and has a red staircase leading to the top. The tank is situated in an industrial area with other similar tanks visible in the background. The sky is clear blue, and the foreground shows a road with a metal guardrail.

# Why hydrogen is starting to get the green light in global renewables

We examine initiatives in different regions to find out how low-carbon hydrogen might be used in pursuit of net zero.

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Green hydrogen is currently attracting enormous levels of interest from investors, developers and politicians as an enabler to meet net-zero targets. As part of efforts to support economic recovery from the COVID-19 pandemic, policy-makers are giving a bigger role to the energy transition.

Hydrogen already has a large customer base among some of the most polluting industries for carbon dioxide emissions that need to find technological solutions to reduce their footprint and improve their investors' perception of their environmental, social and governance (ESG) credentials. Hydrogen is also seen as increasingly important for countries or regions wanting more energy independence, as the economics of hydrogen favor local production.

The potential of green hydrogen to decarbonize transport, heating and heavy industry, while also offering greater scope for long-term storage than utility battery storage, could make it a game changer for the low-carbon transition, and projects are already happening now. The 57th edition of the Renewable Energy Country Attractiveness Index (RECAI) revealed that the hydrogen industry experienced rapid growth last year, despite all the challenges of 2020. 50GW of green hydrogen electrolysis projects were announced out of a current global total of 80GW, as more countries and regions reveal ambitious clean hydrogen strategies to help them decarbonize. With many of the projects at gigawatt-scale, there is hope that their immense size will quickly bring down the cost of green hydrogen through economies of scale. [BloombergNEF](#) predicts that, with an investment of US\$11t, this renewable energy source could supply up to one-quarter of the world's energy needs by 2050 and eliminate up to one-third of global emissions.

Green hydrogen still faces a number of challenges, such as cost, scaling up renewables and electrolyzer capacity, securing offtake agreements, and a need for adaptive, regulatory frameworks. In [RECAI 56](#), we examined these challenges in depth. This article looks at case studies from Europe and Asia that highlight how projects and initiatives are overcoming the economic and technical barriers to convert interest into reality.

## Case study: a blended approach to decarbonizing heating in Europe

The [European Green Deal](#) has set a target of net-zero greenhouse gas emissions by 2050. With heating and cooling in the built environment accounting for nearly **40%** of the EU's energy demand, pressure is mounting on the bloc to take significant steps forward.

Renewable fuels, such as hydrogen-blended methane, could offer a low-carbon solution that delivers heat and power at the same time. But hydrogen is costly. Innovation and technology evolution are needed for production efficiency to be improved.

One company at the cutting edge of blending hydrogen is Italian energy infrastructure company Snam. In April 2019, it became the first gas transmission system operator (TSO) in Europe to introduce a mix of **5%** hydrogen by volume and natural gas into its transmission network. In December 2019, it doubled the percentage of hydrogen by volume to **10%** at a trial with its natural gas transmission network in Salerno.

A blend of 10% hydrogen mixed into Snam's total gas transported annually would result in seven billion cubic meters of H2NG (hydrogen and natural gas mixture) being introduced into the network each year. That is enough to heat three million households and would reduce carbon dioxide emissions by five million tons.

Currently, Europe is nowhere near producing enough clean hydrogen to reach such a share of overall energy consumption. However, the [European Commission's hydrogen strategy](#), launched last July with a target of 10 million tons of hydrogen by 2030, provides a road map for potential regulations that could increase the use of renewable hydrogen as a fuel transported by existing natural gas grid networks.

In the UK, where heating is the largest source of carbon emissions, pioneering hydrogen heating trials are in their early stages. Following the Government's announcement, last December, of a [Ten Point Plan](#) for a green industrial revolution, all five owners of the UK's gas



distribution network operators – Cadent, National Grid, Northern Gas Networks, SGN and Wales & West Utilities – have outlined [plans](#) for how they will transition away from natural gas to delivering hydrogen instead.

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Feasibility studies will be needed, because [green hydrogen and methane] are completely different, and hydrogen is much more demanding in terms of the quality of the pipeline and compressors.

**Giacomo Chiavari, EY-Parthenon Italy Strategy Leader, EY Advisory S.p.A**

To turn aspirations into real usage, more than 650 households and commercial buildings in the village of Winlaton, in Gateshead, Tyne and Wear, will trial a natural gas blend of up to 20% hydrogen over a 10-month period this year. The UK Government plans to invest up to [£500m](#) (US\$695m) to create a hydrogen neighborhood in 2023, a hydrogen village in 2025 and, before 2030, a town running entirely on hydrogen.

“It is important to remember, though, that the blending of green hydrogen into methane is not going to be linear,” warns Giacomo Chiavari, EY-Parthenon Italy Strategy Leader, EY Advisory S.p.A’. “Feasibility studies will be needed, because the two gases have extremely different features; and hydrogen is much more demanding in terms of the standards the pipeline and compressors need to meet. Additionally, every time the mix is changed, the consumption points would need to adapt and evolve in parallel. A massive transition of the network from methane to hydrogen will need to address many technological obstacles.

“Pragmatically, localised generation of hydrogen, close to the largest consumption point, could be a solution to simplify the distribution.”

Green hydrogen offers enormous potential as an enabler for the decarbonization of energy consumption in Europe. However, given the enormous challenge – and that the technology is still in its early stages – green hydrogen is unlikely to be a short-term silver bullet. Unless incentive schemes fill the profitability gap of the technology.

## Case study: how China could power a green hydrogen revolution

As green hydrogen seeks a breakthrough – needing demand and supply-side support to be scaled up and for production costs to fall – all eyes have turned to China. The nation’s vast domestic market, large state-owned companies, distinguished research institutions and abundant renewable resources give the nation the building blocks to be a green hydrogen superpower.

China is already the world’s largest hydrogen producer, although much of this production comes from fossil fuels. With the nation [vowing](#) to reach net zero by 2060, however, green hydrogen is expected to play an integral role in the transition, with the [China Hydrogen Alliance](#) projecting that it will account for 20% of the nation’s energy mix.

If China is to reach its lofty renewable hydrogen goals, a coordinated approach will be crucial for the nation to capitalize on its economies of scale and foster the industry collaboration that is paramount for an emerging technology. Established in 2018 by the National Energy Group, the China Hydrogen Alliance serves as a link between the key players in this nascent industry, catalyzing action to solve technological gaps in the value chain.

With more than 100 members, the Alliance has established a “hydrogen community” and is playing a multifaceted role in renewable hydrogen’s development by spurring innovation, enabling production and collaboration, and charting a path for the sector’s progress.

It has established think tanks, promoted research collaboration between industry and universities, started building a big-data platform, initiated manufacturing and transportation of equipment and basic materials to large-scale enterprises, prepared a technical road map for a hydrogen energy strategy, and defined the standard for green hydrogen in China. Furthermore, it is exploring the establishment of a green hydrogen innovation center.

With the China Hydrogen Alliance pushing forward collaboration at the industry level, the sector has also had policy support, particularly across the value chain for hydrogen fuel cell vehicles. A handful of cities and city clusters has been selected as fuel cell vehicle demonstration cities, with each city cluster eligible for up to ¥2b (US\$308m) under an incentive framework. This depends on how successful they are at meeting targets, such as minimum range and putting at least 1,000 vehicles into the city cluster, and technical parameters on the power and power density of fuel cells.

Additionally, ¥200m (US\$30m) is available to each city cluster for achieving refueling infrastructure targets – such as the provision of at least 5,000 metric tons per year of hydrogen – and reducing the cost of hydrogen at the pump to below ¥35/kg (US\$5.3/kg). In total, the estimated financial support for the program is close to ¥10b (US\$1.5b).

While China drives ahead with production of renewable hydrogen, it is also playing a key role in the expansion of hydrogen internationally. The China Hydrogen Alliance has cultivated international cooperation in the sector, hosting workshops with Japan, the US and Europe. Looking ahead, China – with its vast renewable resources, economies of scale and competitive labor market – has all the ingredients to become a major exporter of green hydrogen. Expansion of production in the coming years will lead to a greater division of labor, promote the specialization of production, and improve labor proficiency and production efficiency. The last piece of the puzzle, though, would be a breakthrough in large-scale, ultra-long-distance hydrogen storage and transportation technology.

Technological innovations are still needed to make green hydrogen cost competitive, but China is on the right path. It is already the world's biggest producer of solar and wind energy, and if it can hold its lead in green hydrogen production, the nation will be set to dominate the global renewable energy supply chains and technologies.







# How East Asia's diverse markets are fueling renewables development

Policy and capital market activity are aligning as East Asian markets attempt to address power demand growth and climate concerns.

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Power markets across East Asia – in Japan, South Korea and Taiwan in the Northeast, and Singapore, Vietnam, Thailand, Malaysia and the Philippines in the Southeast – are incredibly diverse. However, they currently all have one thing in common: a strong outlook for power demand. And for many of these markets, renewable energy will play an increasingly important role in fulfilling this.

Over the last year, three major economies in the northern part of the region have declared net-zero carbon-emissions targets: China (by 2060), and Japan and South Korea (both by 2050). This is likely to have a significant impact on the area in terms of accelerating renewables growth, building out the supply chain, driving down technology costs and attracting international investment interest.

Across Southeast Asian markets such as Singapore, Vietnam, Thailand and Malaysia, conditions are also varied. However, many of these markets are set to follow a similar path to their Northeast Asian neighbors because of a strong demand outlook.

The region's energy consumption is expected to more than double by 2040, according to [Southeast Asia market analysis](#) by the International Renewable Energy Agency (IRENA). It says this will be driven by regional economic expansion of more than 4% per year (with variation between markets) as a result of a broader structural transformation with these economies moving “in different ways and at varying speeds” from agriculture to extractive, manufacturing and service industries.

Southeast Asia is home to nearly 1 in 10 of the world's population and some of the fastest-growing economies. [Millions of people have gained access to electricity over the past 20 years](#), according to the International Energy Agency, with 45m still to be connected. According to IRENA, the region's population is expected to grow by another 25% by 2050, accelerating demand for affordable and reliable energy. Much of this future growth could be satisfied by renewable energy.

## Asian markets get serious about renewables

Governments in East Asia are considering the use of renewables to fuel projected demand growth to varying degrees. Japan has set a renewables target of 22%-24% by 2030, while Taiwan is aiming for 20% by 2025. Collectively, the Association of Southeast Asian Nations (ASEAN) set a target last year of securing 23% of its primary energy from renewables by 2025.

While fossil fuels still retain a grip on some markets, upcoming retirements will leave a gap that could be filled by renewables across much of the region. Japan, Taiwan and South Korea, for example, face projected thermal and nuclear capacity retirements totaling 89GW between 2020 and 2030, according to Wood Mackenzie. Addressing climate change and managing risks arising from the climate crisis are also priorities for these markets, many of which are among the most vulnerable to climate change, according to the [Global Climate Risk Index 2020](#). All have signaled an awareness of the need to tackle climate change, most via national or regional commitments in line with Paris Agreement goals.

The recent net-zero announcements by China, Japan and South Korea, as well as bans on the use or financing of coal by countries or regions including the Philippines, have marked a new direction for this part of the world. “The past 12 months have seen a period of profound change in Asia in terms of climate,” says Assaad Razzouk, Chief Executive Officer and co-founder of Singapore-headquartered Sindicatum Renewable Energy.

“Then there was a tremendous explosion of activity in Vietnam during this period, which shows what happens when a nation gets serious about renewables. We can't ignore that these are the drivers that are going to increasingly play out [in this region] going forward,” Razzouk adds, referring to government actions in relation to low-carbon targets and strategies.



Northeast markets such as Japan, South Korea and Taiwan have already established a firm hold on renewable energy development. For most markets in Southeast Asia, however, the shift from a coal-based primary energy approach to renewables is less about climate change and more about economics. Certainly, renewable energy is becoming more competitive with non-renewable resources in markets around the world, points out Patrice Clause, Chief Operating Officer of AC Energy International, the energy platform of Philippines-based conglomerate Ayala Corporation.

“I also mean competitive in a slightly broader sense,” Clause adds. “Obviously, price per kilowatt hour matters, but there is also the ability to get finance and speed to construction and generation.”

The region certainly has a very robust pipeline of clean energy projects. [EY research](#) commissioned by the European Climate Foundation (ECF) last year identified more than 800 shovel-ready clean energy projects across Indonesia, Japan, Malaysia, the Philippines, South Korea, Taiwan, Thailand and Vietnam, with a total investment potential of US\$316b.

Aside from this growing demand for low-carbon power, however, these markets are starkly different. From currency, to geography, to the domestic banking landscape and government attitudes toward power market policy and climate risk, each market is governed by very specific fundamentals.

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**There has been a tremendous explosion of activity in Vietnam during this period, which shows what happens when a nation gets serious about renewables.**

**Assaad Razzouk, Chief Executive Officer, Sindicatum Renewable Energy**

In addition to the high-level emissions-reduction goals set by governments in recent years, more specific support for renewable energy development typically comes from market design changes or policy developments. Indeed, policy has already made a difference to renewables development in many markets in East Asia.

Vietnam is a prime example of how government support can boost renewable energy development in this region. It implemented a system of subsidies, starting with a feed-in tariff (FiT) Phase 1 in 2016, and introduced other support mechanisms, such as a standard power purchase agreement (PPA). Vietnam has since become the largest solar market in Southeast Asia, with solar capacity of 16.5GW as of 2020, according to [IRENA](#). Although offshore wind remains in its infancy in Vietnam, there is strong potential based on a target of 2GW-3GW by 2030 in the Government’s recent Draft Power Development Plan VIII (PDP 8).

“The aim of creating a fairly generous FiT was to put themselves on the map and build up local experience and knowledge before reverting to normal market forces,” Clause says. “As an approach, this seems to have worked.”

This sort of visibility is important for developers eyeing new markets, says Benjamin Dumas, Senior Manager, International Business Development at solar developer Lightsource BP. “We do not want to go into markets without medium-term policy clarity. That doesn’t help to promote continuity, which enables the market to gradually consolidate, learn through experience, and eventually reduce kilowatt-hour costs for the end buyer.”

“Taiwan, for example, has set clear goals and established a route to market with its FiT. This allows developers to create a pipeline of projects and know there is a way to sell the electricity produced in the future by these projects,” Dumas continues.

“This strong visibility, the depth of the market and the correct risk allocation on contractual arrangements also enable projects to attract non-recourse project financing at competitive terms. It is worth tackling market-specific challenges - such as high development costs and technical issues relating to geography and weather - if the market in question has this depth, visibility and clarity,” he adds.

Not all governments have followed this example, however. “In all of these [markets], regulatory changes play a role in clearing the path to getting projects permitted,” says David Ludwig, Director Asia-Pacific at German solar developer ib vogt. But he adds: “Getting access to the grid and the market remains difficult in many parts of Asia. There isn’t yet a proven route to market in many regions for non-government tenders.”

Ludwig points to the Philippines as a market offering greater clarity in this respect. Other markets at later stages – even those basking in recent success – could still encounter issues going forward. “The Vietnamese market is fully government-run, so outside the government procurement program, even if there was huge demand from corporates, it can’t be served,” he adds.

## Market-driven solar solutions emerge as subsidies disappear

At the other end of the renewable energy development spectrum, the more advanced markets in the region are now following Europe into subsidy-free territory. “Nations like Japan already have vast amounts of solar but represent what we’ve already seen in Europe – the second wave of solar where subsidies have gone, and we are now seeing the emergence of market-driven solar solutions. This is even more exciting than the first wave,” says Ludwig.

While solar certainly continues to be an attractive option in this part of the world, this type of capacity must be balanced with other technologies to reduce grid constraints or issues. Wind could provide this balance. [Research from the Global Wind Energy Council \(GWEC\)](#) shows that nearly 56GW of new wind power capacity was installed in Asia-Pacific last year, a 78% year-on-year increase that has brought total capacity to nearly 347GW. While mainland China accounted for more than 90% of last year’s growth, Taiwan (0.13%), Vietnam (0.22%), South Korea (0.29%) and Japan (0.81%) had individual increases of between 449MW (Japan) and 74MW (Taiwan), according to the GWEC.

For the various land-limited markets [in this region](#), floating offshore wind also has great potential. The governments of Japan, South Korea and Taiwan have already communicated bold ambitions in this area, piquing industry interest. According to the ECF report: “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.”

While the [Japanese Government](#) plans to quadruple offshore wind generation capacity to 45GW by 2040, South Korea [announced](#) details of the world’s largest offshore wind power project in February 2021. Its current offshore capacity is 125MW, and this project would make up 8.2GW of its 2030 offshore wind target of 12GW.

An estimated 15GW of capacity will make Taiwan the second-largest offshore wind market in Asia-Pacific after China by 2035, according to [GlobalData analysts](#). Market stability, including a robust PPA market, has led to the development of several major projects, including the 128MW [Formosa 1](#) and 376MW [Formosa 2](#), as well as Taiwan Power Company's 109MW Changhua Phase 1 project.

As the region's offshore wind sector has developed in recent years, bottom-fixed turbines have been used for shallow water projects of less than 50m. However, Rasmus Wandrup, Chief Technology Officer at Swancor Renewable Energy, says floating wind technology could help these markets add even more wind capacity in the future.

"Floating wind technology has advanced rapidly in the past decade and is now considered a viable solution for offshore wind development for water depths greater than 60m," Wandrup says. "Although it is still undergoing final commercial viability, the industry has recognized significant benefits."

He says this includes more environmentally friendly foundations, local fabrication and installation opportunities, and the ability to support larger turbines compared with traditional fixed-bottom turbines.

Market participants believe the right fundamentals to drive the future growth of resources in other parts of East Asia are also present in several newer renewables markets in the region. In addition to more established markets such as South Korea, Vietnam and the Philippines, Ludwig says Malaysia will be a key area of focus for solar developer [ib vogt](#) over the next few years.

"In Malaysia, the fundamentals are very strong," he explains. "There is high irradiation, land is available, the political system is stable, and it has a very good regional rating. Even though it is not US dollar-based revenue, the currency is very financeable, and the Government has been consistent in issuing large-scale solar tenders on an annual basis."

Although the specifics of the market are different, the Philippines shares many of the same fundamental drivers as Malaysia, alongside high electricity costs and an integrated grid with a liberalized market. Like the more developed markets of Singapore and Japan, the Philippines has a spot market for electricity.

Referencing solar specifically, Ludwig says: "Last year, we saw the first true bilateral business-to-business PPAs in this market. We see a similar combination of fundamentals to other growth markets. Also, local financing is available, which is always important."

By establishing infrastructure to enable market participation in state-run procurement processes, governments in these markets are taking the initial steps toward the development of robust domestic renewables sectors. As happened in the past with more advanced markets in the region, this will encourage companies, investors and lenders to develop knowledge and experience ahead of the point when market participants are able to access the grid outside of government-run auctions.

Sindicatum's Razzouk adds that there is even potential to improve on models that have been successful for neighboring markets. "Vietnam had a tremendous explosion of activity by introducing FiTs that were high and proving itself a serious offtaker," he says. "It was all driven by energy demand growth of 9%-10% per year ... Similar factors apply to markets like Indonesia and Cambodia, which have not yet taken advantage of those dynamics. They could create even more robust regulatory frameworks and PPAs that are more bankable to attract even more capital, without having to offer FiTs and going directly to reverse auctions."



## Cooperation is key if the region's potential is to be realized

Supportive government policies encourage the capital market activity needed to drive renewable energy capacity growth. For example, pricing PPA contracts in the local currency as opposed to US dollars can have a significant impact on market development. "This is an important decision that will affect which capital pools a market can attract and the cost of capital, as well as the level of experience the debt providers bring to the table," says Clausee.

Such decisions are affected by the stability of the exchange rate and strength of the local finance or banking sector. "A market like the Philippines has plenty of local liquidity, so can definitely write local currency power contracts and PPAs," says Clausee. "In Vietnam, where the local liquidity pool is smaller, this is more challenging, but not impossible. However, for a place like Myanmar, it would probably be impossible to get long-term financing on a local currency PPA."

To strike the right balance when deciding on contract terms, governments and markets across the region have taken a range of approaches that will attract different capital pools. Similarly, the rating or perception of the governments running these markets will affect investment appetite.

"Ideally, a renewables transaction will combine equity and non-recourse debt, with lenders considering project cash flows and the project as security," explains Razzouk. "To do that, the banks look at the regulatory framework and, in particular, the offtake agreements, and ask: who is promising to pay for the power, and what are the terms and conditions?"

Projects in Vietnam, for example, have been affected by concerns about the Government's ability to terminate PPAs, as well as curtailment risk. A lack of coordination in planning and grid access has led to curtailments of up to 30% in 60% of all solar projects in the Vietnamese market, according to the ECF report.

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The Philippines has plenty of local liquidity, so can definitely write local currency power contracts and PPAs. In Vietnam, where the local liquidity pool is smaller, this is more challenging.

**Patrice Clausee, Chief Operating Officer,  
AC Energy International**

The [report](#) also found that financing is only one of several barriers to development in this region. It states: "For most projects and geographies, the main challenges are non-financial and relate to inherent regulatory, administrative and commercial issues." In addition to a need for policy clarity and standardization of PPAs, "insufficient grid capacity, delayed grid access and curtailments during operations" all impact the cost and availability of finance. Across the region, investment in grid capacity must happen alongside any further growth in renewables capacity to bolster investor confidence.

Establishing grid links across borders would not only help to ease the integration of large volumes of renewables but also support small, or land-limited, markets – such as Singapore and South Korea – in accessing renewable energy. Slow progress on this front risks impeding the growth of these renewables markets, leaving assets stranded or grids unable to cope with supply.

For some, this kind of regional cooperation should be more of a priority. Although the Australia-ASEAN Power Link is set to supply up to 20% of Singapore's power needs from 2027, with solar shipped from Australia, Razzouk says it's "pretty crazy" that geographically closer markets, such as Thailand and Malaysia, are not providing this power instead.

Change is happening – Malaysia and Singapore [signed an agreement](#) in October 2020 to cooperate more on energy issues – but it's not fast enough, according to Razzouk. "There is a lot of work happening on regional cooperation, but it needs to go from desktop paperwork to real life," he says.

There is a clear and growing demand for renewable energy in East Asia, and private sector interest is demonstrated by the robust pipeline of more than 800 projects. While the markets in this area are incredibly diverse, continued support by governments – both domestically and across borders – could help to realize the true growth potential of the region.





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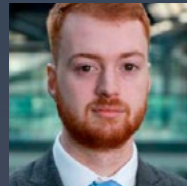
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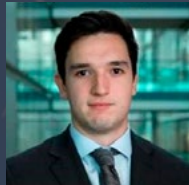
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