



Vietnam

Vietnam's wind market is at an inflection point. The opportunity ahead is to accelerate into a phase of rapid growth to meet the country's increasing electricity demand, ensure energy security and deliver socio-economic benefits in pursuit of a renewables-led pathway.

Over the past five years, giant turbines churning in windy sites have become more common, mainly spurred by a staggering increase in electricity demand at an average of about 10% annually and the dramatic 30% decline in the capital cost of wind turbines, according to McKinsey. Today wind makes up roughly 1% of electricity production, or just 597 MW, which falls short of the 800 MW wind target set by PDP 7 (revised) back in 2018, largely due to permitting postponements caused by the impact of COVID-19 and its recent 2021 national assembly election.

GWEC welcomed the approval of an additional 7 GW of wind projects by the Prime Minister in June 2020, in Document No. 75. Soon after, the Ministry of Industry and Trade (MOIT) proposed to add 6.4 GW of

new wind projects to the power plan in Document No. 7201/BCT-DL, bringing the total existing and approved wind power capacity to the current power plan to 18,200 MW.

These timely announcements, along with the issuance of Resolution 55 early last year to open up opportunities for the private sector to participate in energy development, demonstrated Vietnam's clear commitment to be a leading market for wind energy development in Asia.

Policy stability needed to sustain wind growth

A shift towards renewables was confirmed by the recent draft release of the Power Development Plan VIII (PDP8), which awaits commentary and finalisation at the time of writing. In February 2021, the MOIT issued Document No. 828/BCT-DLL detailing the implementation of the law on the national sector planning, including the long-term wind energy targets and interconnection development strategies:

While the target is significantly

higher than the revised PDP7 of 2016, the realisation of this ambition is challenged by the nearing expiry of the wind Feed-in Tariff (FiT) at the end of October 2021 and the pandemic-related delays of 2020.

Towards late 2020, the MOIT issued Document No. 8159/BCT-DL for comments and revealed a proposed extension of the onshore wind FiT at a slash of 17% – one of the most dramatic reductions seen in any wind power market globally to date, for projects commissioned from late 2021 to the end of 2023. Such a drastic reduction in an early-stage market risks slowing down growth and investment in Vietnam's promising wind power sector. The industry is awaiting a decision on FiT expiry/extension in the coming months, ahead of the current FiT's expiry in November 2021.

The global trend is widespread transitions from FiTs to competitive bidding schemes, and the wind industry is positive about declining LCOE through increased competition and price transparency. But this transition

needs to be carefully studied and adapted to the local context to ensure a smooth transition.

The grid playing catch-up with renewables

Critical to the steady progression of the wind market will be the ability to successfully integrate renewables into the heavily burdened and overloaded transmission network. Interconnection availability has become the primary concern for wind developments in Vietnam, particularly following the influx of 11 GW of solar supply to the grid in 2020, compared to the 850 MW expected in the revised PDP7, due to an installation rush ahead of a FIT expiry.

The solar boom in 2019 and 2020 has clearly highlighted outdated and poor grid infrastructure, and the heavy investment needed to avoid power shortages and excessive curtailment in coming years. The question remains whether Vietnam can provide the policy and

regulatory clarity needed to spur sufficient capital investment to upgrade its grid infrastructure.

A new law on public-private partnerships (PPP) in Vietnam took effect in January 2021, opening opportunities for greater private and foreign investment into transmission grid projects. Investing in upgrading Vietnam's transmission grid, including additional domestic and international interconnections, will increase overall system flexibility and the integration of strategic and cost-competitive renewables.

The tailwinds for offshore wind

Among other technologically mature renewable energy technologies, offshore wind offers Vietnam a scalable, indigenous, clean, and affordable electricity source. For its tremendous natural endowment of 3,000 kilometres of coastline translating into 475 GW of offshore wind technical resource potential, there is enormous opportunity for

scaling up the burgeoning nearshore projects into a thriving offshore wind sector in the coming years.

The time is now for Vietnam to recognise that offshore wind can play a significant role in its future energy system and its economy, delivering clean energy jobs, sustainable growth and a cost-competitive supply chain that can serve the wider region in Asia.

How Vietnam will take advantage of this potential via clear policy ambitions in the finalised PDP8, regulatory certainty and grid upgrades remains to be seen. But capitalising on the wind market growth potential in the next few years will have far-reaching consequences for GDP growth, trade balance, environmental performance and energy security in the long term.

| Vietnam's wind energy targets, based on draft PDP8 (at time of writing) | | | | | | |
|---|------|--------|--------|--------|--------|--------|
| | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 |
| Onshore wind and near shore wind (MW) | | | | | | |
| High scenario | 630 | 12,280 | 16,080 | 25,880 | 34,680 | 40,080 |
| Base scenario | 630 | 11,320 | 16,010 | 23,110 | 30,910 | 39,610 |
| Offshore wind (MW) (in the sea area with the depth of more than 20m) | | | | | | |
| High scenario | 0 | 0 | 3,000 | 11,000 | 23,000 | 36,000 |
| Base scenario | 0 | 0 | 2,000 | 9,000 | 15,000 | 21,000 |





Colombia

Currently, more than two-thirds of Colombia's energy demand is met by hydropower, around 1% by non-hydro renewable energy and the rest by fossil fuel sources. While electricity supply in Colombia is dependent on hydropower, the country is prone to El Niño conditions and long periods of low rainfall. For firm and sustainable power supply, hydropower needs to be complemented with a higher share of wind or other suitable renewable energy.

As of 2020, Colombia has 19.5 MW of wind installed capacity in the Jepirachi Wind Project. Wind project installation is expected to take off from 2022, as the country awarded 2.27 GW of wind capacity across two auctions in 2019. After a reliability charge auction, 1.07 GW of wind capacity was awarded in the country's first large-scale renewable energy auction in October 2019.

In early 2020, Colombia's national energy planning unit UPME approved grid connection for 2.53 GW of wind projects. As of December 2020, UPME has 322

active projects of 16.02 GW, including 3.16 GW of wind capacity in the pipeline.

The COVID-19 crisis significantly lowered energy demand in the country, and as a result Colombia did not issue any tenders in 2020. The Ministry of Mines and Energy (MME) has revised its short-term energy forecast, and in a best-case scenario demand is averaging 72.10 TWh in 2021 and 79.74 TWh in 2026. However, long-term energy demand is still expected to grow by more than 60% to 2050, at an annual rate of around 1.5%.

A net zero pledge with support for renewable energy

Colombia is driving the RELAC initiative (Renewable Energy for Latin America and the Caribbean) and has committed to the regional goal of increasing renewable energy share to 70% by 2030. Domestically, it intends to achieve a goal of at least 4 GW by 2030 from non-conventional renewable energies. By the end of 2020, the government had announced that it plans to reduce 51% GHG emissions by 2030 as part of its long-term strategy to reach net

zero by 2050. Under this forward-looking plan, the country's enormous and untapped wind potential needs to be realised for resilient energy system transformation and socio-economic benefits.

A series of regulatory proposals has been made to grow non-conventional energy sources:

- First, the MME published a draft resolution setting minimum favourable requirements for sale of renewable power by wholesale market participants. To increase renewable power purchase swiftly, it also stipulates that at least 10% of annual energy sales to end-users should come from non-conventional sources, both in the regulated and free markets. Its annual obligation will come into force from 1 January 2022.
- Second, new rules and procedures for transmission capacity assignment on the national grid published by power sector regulator CREG would relax connection bottlenecks by re-allocating rights for the use of

idle capacity to new power plants. Further, grid capacity utilisation of other provinces in the country can push feasible development of wind projects to these potential regions.

While these policies would foster the renewable power purchase, Colombia needs to address short to medium-term challenges which hinder wind project development and grid connection timelines. Considering the market challenges, GWEC Market Intelligence forecasts that 2.2 GW of new wind capacity could be installed from 2022 to 2025.

Colombia has several areas with high wind power potential. Its La Guajira area stands out as one of the most favourable sites in Latin America, with Class 7 annual average wind speeds that near 10 m/s. As per World Bank data, this area has up to 18 GW for power generation potential - enough to cover national demand twice.

Current and near-term challenges to the pace of wind growth

But for existing wind projects, developers and investors are facing logistical issues due to the unavailability of suitable land-

based infrastructure to transport longer and larger wind turbine components via roads, such as blades and towers. Additionally, wind turbine components are imported via shipping to nearest ports. Since most of these port facilities and vessels are privately owned or operated, robust agreements to regulate the use of ports is required. This will not only help to safeguard wind components but will address project execution timelines and expenditures.

Aside from logistical challenges, there is continued delay in the construction of the 470 km 500 kV Colectora transmission line, as the construction company must advance social impact assessments and EIAs as part of the licensing procedure.

This line will dispatch the energy generated by six wind farms of more than 1,000 MW, awarded in the La Guajira area. Although some communities have already signed agreements, certificates have to be issued as the next step for licensing. Moreover, the physical meetings of this process have been delayed due to the pandemic. These wind projects have execution commissioning

guarantees up to 31 December 2023 and the situation will be critical if the Colectora transmission line fails to be operational by this deadline.

Colombia's president has announced that a second large-scale renewable energy auction with long-term PPAs will be conducted during the first semester of 2021. The rules for the

insufficient infrastructure for power evacuation and unsuitable transportation networks should be resolved through solutions such as single window clearance, virtual public hearings and strategic long-term infrastructure planning. Preparation of a long-term auction pipeline can further provide visibility to investors and developers in the market.

La Guajira area stands out as one of the most favourable sites in Latin America, with Class 7 annual average wind speeds that near 10 m/s

tender are currently in the public hearing process. The MME also intends to cover power retail companies serving households, commercials and small industrial businesses in this auction.

Notably, eligible projects will need to be operational before December 2022, in an effort to consolidate the country's position in the diverse and non-conventional energy space. In this case, challenges related to environmental licensing,

Reportedly, the Vientos Alisios consortium is planning to conduct pre-feasibility studies for Colombia's first 200 MW offshore wind farm, 15 km off the coast at the Port of Cartagena. Developers intend the project to enter construction in 2024 and come online by December 2025.



Mozambique

Mozambique is well-endowed with natural resources and has the largest power generation potential in Southern Africa. Its population of 30 million is spread over a large area with a dispersed rural population and limited grid infrastructure. Until recently, the country's primary energy resource potential has been hydropower, which represents roughly 80% of installed power generation capacity, as well as proposed development of its substantial offshore natural gas reserves through floating LNG infrastructure.

However, over the last decade, the Mozambican government has started to adopt non-hydro renewable energy sources to diversify its electricity mix. The country has areas with excellent wind resource potential, and wind is being incorporated into centralised electricity planning in the Integrated Master Plan of Energy Infrastructures (PDIE).

Expanding electricity access while diversifying the power mix

Due to its dependence on hydropower, Mozambique is vulnerable to drought, but produces

sufficient electricity to provide bulk exports to South Africa via existing interconnections through the regional South Africa Power Pool (SAPP). While Mozambique's power generation potential is generally estimated to be more than 185 GW, its installed capacity is currently less than 3 GW.

Access to the power grid has tripled in Mozambique over the last decade and is forecast to continue growing at an annual rate of 7-8%. This is driven by the government's National Electrification Strategy (ENE) to achieve universal access by 2030 for the more than 4 million households without electricity, a large increase from the current access rate of about 40%. The National Energy Regulatory Authority (ARENE) and state-owned utility Electricidade de Mocambique (EDM) are also developing a sustainable energy strategy to significantly reduce GHG emissions while supporting the growth of electricity demand.

According to the latest wind resource measurements from 2020 developed by consultants to the

IFC, Mozambique has technical potential to achieve up to 681 GW installed capacity and 1,570 TWh/year of net wind energy generation. Beyond its excellent wind resource, there are other favourable conditions for wind development, including complementarity with the country's well-developed hydropower capacity and its peak energy demand in the evening.

Mozambique's government and EDM also have a track record, albeit limited, of working with renewable energy IPPs. In 2016, Scatec Solar and Norfund signed a PPA for the country's first large-scale renewable energy IPP project – the Mocuba solar PV plant, built in the north-central province of Zambezia, which secured a 25-year PPA with EDM and involves IFC-led financing. As has been the case in many emerging markets in Africa and globally, Mozambique's first wind projects parallel its solar development.

Increasing momentum towards competitive procurement

The Namaacha region in the south of the country hosts Mozambique's

two most advanced wind projects, each with 60 MW capacity. One is being developed by EleQtra and the other by Globeleq in partnership with local developer SourceCapital. Both projects received approval in 2018 following an agreement signed between each developer and the Mozambique Energy Fund. The United States Trade and Development Agency has awarded several grants for wind project feasibility studies, including to EleQtra's project and to a Globeleq subsidiary's wind/storage project in the Manhiça district.

While the Namaacha and Manhiça projects were developed on a bilateral basis, there is a clear trend in Mozambique to move towards a competitive procurement framework – driven by the PROLER (Project for Promotion of Auctions for Renewable Energies) programme. Supported by the Agence Française de Développement (AFD) and EU, PROLER assists EDM in setting up calls for tenders and conducting preliminary environmental and social studies. In addition, the AFD has proposed a guarantee mechanism to mitigate offtaker risk around the buyer, EDM. To date,

three solar projects are planned in the north, while a fourth wind/storage project is being planned in Inhambane, on the coast just north of the capital Maputo.

Mozambique can become a leader in the next wave of wind energy markets in Sub-Saharan Africa

Medium-term potential for wind in Mozambique

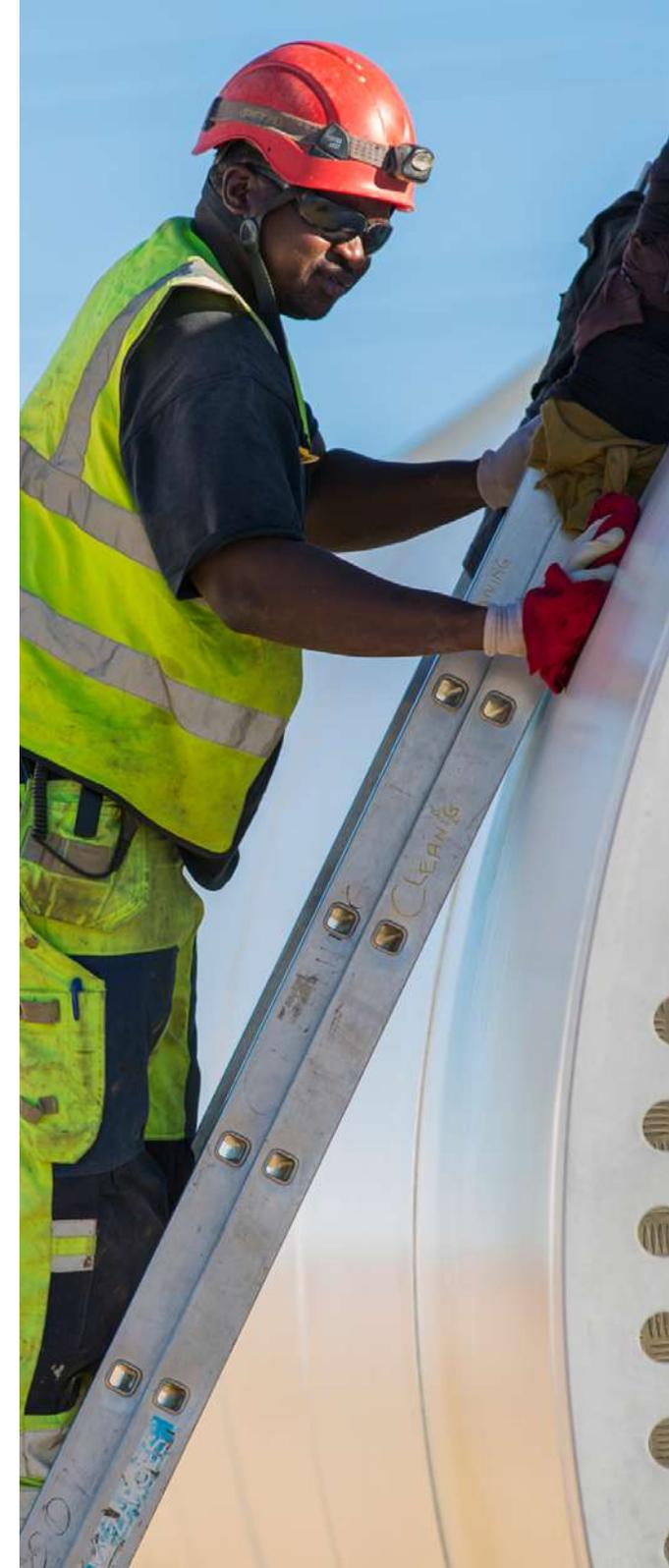
The Mozambican energy system has the potential to implement up to 200 MW of wind projects in the medium term, depending on government energy planning decisions, construction of adequate complementary infrastructure and execution of PPAs at suitable long-term tariff rates. More wind energy capacity could also be developed based on opportunities to export power to neighbouring South Africa and Zimbabwe via the SAPP.

The growth of the Mozambican wind energy market is closely tied

to the success of the projects currently in the pipeline, and the demonstration effect they will have on industry and government stakeholders. Early signals from EDM are positive, but the technology still has much to prove before it can be more heavily relied upon in Mozambique's energy mix.

Competition from gas-fired thermal power plants, based on supplies from the massive LNG projects under development, still poses a threat to renewable energy's growth. However, unfavourable market conditions stemming from the pandemic, coupled with the evolving armed conflict in the north, are casting uncertainty over the first proposed LNG project.

Despite a variety of market challenges, Mozambique can become a leader in the next wave of wind energy markets in Sub-Saharan Africa. With the necessary elements to spur wind energy development into a significant element of the generation mix, Mozambique is an important wind market to track on the continent.



Exploring new markets

From the perspective of GWEC Market Intelligence, it is important to highlight the development for wind in emerging markets. The four selected markets, Thailand, Philippines, Ethiopia and Uzbekistan, are representative of markets with high wind potential but varying political support and targets to date. Still, in all four markets there is an increasing awareness that wind can provide a scalable, cost-competitive and efficient solution for renewable energy.

GWEC Market Intelligence is monitoring activities in 46 markets on a regular basis to document the opportunities and progress of taking wind global.

Thailand

Development stage
 Limited wind capacity in the pipeline. There may be new opportunities in 2021 if the proposed revision for PDP 2018 is adopted, calling for at least 90 MW of new wind capacity annually between 2022 to 2024.

Political support
 The proposed revision of its PDP 2018 can accelerate some of the developments allowing for 90 MW of new wind capacity per year between 2022-24. Although limited in size, it's the first wind-specific target, and new tenders could be issued within the next year.

Challenge
 Thailand currently faces overcapacity with a reserve margin of 47% (including imports) in 2019. The commissioning of the new hydropower plants in Laos last year, for which Thailand has a long-term purchase commitment, further exacerbated the overcapacity challenge.

Next milestone
 Steps towards policy certainty and implementation of the PDP revision need to happen in 2021. The transformation of Thailand into a power trading hub presents a future prospect for wind developers.

Philippines

Development stage
 Despite the wind industry being stagnant for the last four years, the Philippines has a large pipeline of proposed almost 5 GW of wind projects.

We can expect some momentum brought in by a 132 MW wind plant in 2021 and by the beginnings of discussions around offshore wind development in the country.

Political support
 The draft Philippines Energy Plan for the period 2018-40, published in 2020, falls short on its 2030 renewables target. However, the launch of a green energy auction in 2021, moratorium on greenfield coal plants and development of the Green Energy Option Program for large power consumers will promote growth of renewables.

Challenge
 Lack of incentivisation under the current FIT, long permitting process, legal obstacles along with limitations on transmission capacity have made it difficult for wind development thus far.

Next milestone
 GWEC expects that improving economics of wind development and green energy auctions could help materialise some of these pipeline projects. However, the future of wind is still dependent on the type of supply requirement called for through the annual auctions.

Ethiopia

Development stage
 Since the 320 MW installations of wind by 2015, there have not been further developments. However, momentum is growing with its 120 MW Aysha-II and 100 MW Asella-I wind farms in development, 300 MW wind project under negotiation phase and 2x 125 MW projects under feasibility study along with wind speed measurement across 18 sites clearly depicts a strong wind pipeline in years ahead.

Political support
 As per draft Ethiopian Electric Power System Development Plan for the period 2021 – 2030, published in January 2021, aims for the commissioning of 24 wind farms that will increase wind capacity in the generation mix from current 7% (324 MW wind / 4,505 MW total) to 15% by 2030 (2570 MW wind / 17,056 MW total).

Challenge
 Financing in general is a big challenge in Ethiopia. The rapid devaluation of the Ethiopian birr has led to currency convertibility risk, as IPPs are paid in birr, as well as uncertainty around the credibility of Ethiopia Electric Power as an offtaker. Furthermore, there is a general lack of a domestic and foreign commercial banking presence.

Additionally, the process of competitive bidding for wind IPP projects is long and time intensive which needs improvement to grow the country's wind market.

Next milestone
 Adopting the currently being considered auction system (similar to South Africa) together with the strengthened institutional framework and provision of risk mitigation measures for currency convertibility, transferability and availability would significantly help the country in achieving its ambitious plan for wind development.

Uzbekistan

Development stage
 Soon after the raised renewables target, in June 2020, Uzbekistan sealed the deal for its first wind farm of a 500 MW capacity, shoring up its wind power ambitions..

At the start of this year, another 2 PPAs were signed with ACWA Power for two separate wind farms that aim to connect 1 GW of wind, powered by approximately 200 wind turbines, to supply 2.7 million households in the country.

Political support
 In May 2020, the Uzbekistan Ministry of Energy announced a goal to source 25% of its power from renewables by 2030, which would require an estimated 5GW of solar and 3GW of wind.

The country has also devised a low-carbon energy strategy to aid renewables transition.

Challenge
 The lack of utility-scale renewables projects to date makes it hard for companies to gauge development barriers ahead, with challenges working with a utility integrating wind power into the country's grid for the first time. In addition, materials used for large-scale renewables are not specifically exempted from import duties, which raises uncertainty among developers as they consider developing a project in Uzbekistan.

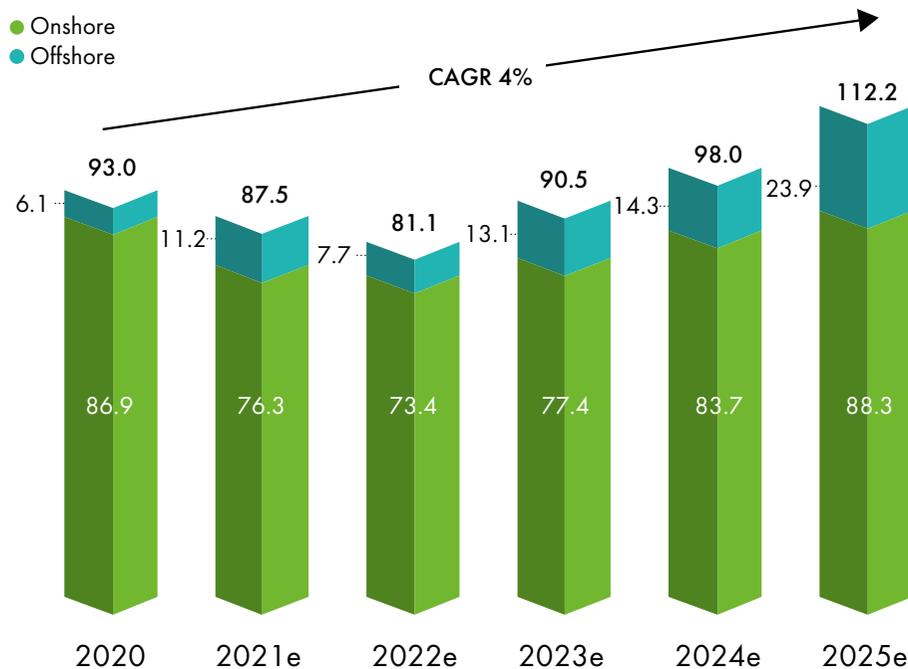
Next milestone
 For a country with wind capacity potential estimated at more than 520 GW, proper plans for the tender of the first projects, possibly beginning with a demonstration scale project will be crucial to kickstart the industry.

A photograph of a wind farm on a hillside at sunset. The sky is a mix of orange, yellow, and blue. Several white wind turbines are visible, some in the foreground and others on the ridge. The terrain is hilly and appears to be a mix of dirt and sparse vegetation. A thin blue horizontal line is positioned above the text.

MARKET OUTLOOK 2021 – 2025

Global wind energy market expected to grow on average by 4 per cent each year

New wind power installations outlook 2020-2025 (GW)



GWEC's Market Outlook represents the industry perspective for expected installations of new capacity for the next five years. The outlook is based on input from regional wind associations, government targets, available project information and input from industry experts and GWEC members. An update will be released in Q3 2021. A detailed data sheet is available in the member only area of the GWEC Intelligence website.

Global outlook

- The market outlook for the global wind industry remains positive. The CAGR for the next five years is 4.0%, even though the installed capacity for 2020 marked a new high.
- GWEC Market Intelligence expects that over 469 GW of new capacity will be added in the next five years. That is nearly 94

GW of new installations each year until 2025.

- Growth at the beginning of the next five-years will continue to be driven by government policy, including FiT, PTC, ITC, Green Certificates and renewable or technology-neutral auctions and tenders. New installations are expected to drop slightly in 2021, but it is still possible to make it the second-best year in history, taking into account the ongoing installation rush in the world's two largest markets, China (offshore) and the US (onshore), driven by the cut-off of FiT and the deadline to qualify the full PTC value respectively.
- From 2022 onward, although the PTC will remain as the main driver for installations in the US (where the one extra year PTC extension passed the senate last December can prevent the US onshore market from a cliff drop

in 2025), the rest of world is expected to operate based on wind-only, hybrid, and technology-neutral auctions or on the grid-parity scheme (mainly China). To ensure stable growth in Europe, Latin America, Africa & Middle East and South East Asia, lessons shall be learnt from the previous auction market design failures in countries like Germany and India.

Global onshore outlook

- The CAGR for onshore wind in the next five year is 0.3%. The average annual installation is 79.8 GW. In total, 399 GW is likely to be built in 2021-2025. In China, from 2021, onshore wind has entered a new era: subsidy-free. Although the expected drop in the Chinese onshore market in the near-term will slow down global onshore growth, the net zero targets declared by the Chinese government and the implementation plans of provincial governments and corporates are likely to accelerate the new installations from 2022(for details, see the China net zero case study).

Global offshore outlook

- The CAGR for offshore wind in the next five year is 31.5%. New

installations are likely to quadruple by 2025 from 6.1 GW in 2020. In total, more than 70 GW offshore is expected to be added worldwide in 2021-2025. This positive global offshore wind market outlook is supported by: 1) the sharp drop of offshore wind LCOE, 2) increased offshore wind targets in Europe, the United States and key markets in Asia such as Japan and South Korea, 3) the expected commercialisation and industrialisation of floating wind, and 4) offshore wind's unique role in facilitating cross industry cooperation and accelerating the global energy transition from fossil fuel to renewables.

