# 5. Sustainability in the wind energy industry

Given the unparalleled stakes of the climate challenge, every stakeholder holds responsibility to adapt to a more sustainable path. Non-state actors, including wind energy companies of all sizes, must be accountable to the imperatives of decarbonisation, particularly as the industry calls for a massive scale-up of wind projects and related industrial activity.

There are increasingly strong business incentives to decarbonise, reflected in hardening retail and institutional investor sentiment on corporate sustainability. In 2020, the market for socially responsible impact investing funds, or ESG ETFs, reported a record influx of US$89 billion – almost nine times the level from 2018, according to Bloomberg Intelligence. Governments are also stepping forward to decarbonise industrial value chains, from enabling green power procurement to implementing zero-emissions building standards.

It no longer suffices to be a member of a sector focused on climate change mitigation; wind companies themselves must ensure growth does not come at unchecked cost. In short, the industry's own sustainability guarantees its "license to operate" in a carbon-neutral world.

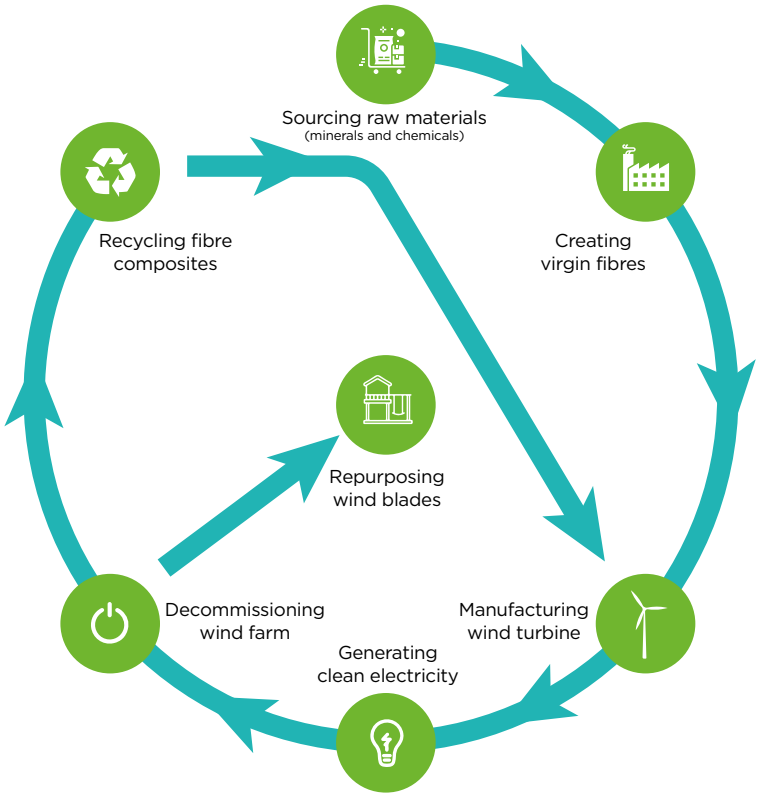
### Lifecycle environmental impacts of wind projects

As stewards of the fight against climate change, the wind industry must deploy optimal technology and processes, while minimising waste and decarbonising a supply chain which includes materials from "hard-to-abate" sectors like steel and cement. A full cradle-to-grave lifecycle assessment captures the emissions to air, water and land from a wind project, across manufacturing, transport, installation and decommissioning stages.

Lifecycle analysis shows that the carbon emissions payback period for wind is far shorter than for coal-based plants – about 5.4 months for a 2 MW onshore turbine and 7.8 months for a 6 MW offshore turbine, as of 2016 – and even outperforms hydro and solar generation. The manufacturing and installation stages account for over 90% of the total carbon emissions of an onshore wind farm and 70% of carbon emissions for an offshore wind farm (where shipping transport takes up a larger share).

More than 80% of total wind turbine mass is made up of recyclable materials, such as steel,

Circular economy theory of wind turbine blades




Source: GWEC Market Intelligence, March 2021

iron, copper and aluminum, according to NREL. But anywhere from 11-16% is composed of carbon fibre or fibreglass composites, plastics and resin, primarily for rotor blades which have a life expectancy of up to 25 years and are currently difficult to recycle commercially. These figures may be adjusted as turbine designs adapt, hub heights increase, blades become longer and lighter and components become more resilient or are replaced by more easily recyclable materials.

This is a particular challenge in mature onshore wind markets – Europe is home to nearly 12,000 wind turbines expected for decommissioning by 2024. While repowering should be pursued, the original blades, hubs, generators and gearboxes will need to be sustainably retired, reused or recycled. Industry-led initiatives like ZEBRA for zero-waste blade production and DecomBlades for recycling technologies are helping to close the loop.

As wind companies expand auditing to Scope 2 and 3 emissions across upstream and downstream activities, covering not just green electricity and transport but the emissions from manufacturing of components, pressure increases on the value chain for steel, cement and certain chemicals. These industries require enormous amounts of electricity at constant periods, providing a natural complement to affordable and large-scale wind power, particularly when paired with storage solutions. Greater coordination with upstream adjacent sectors is needed to jointly call for policy reforms that can unlock wind power at the scale of growth required for supply chain decarbonisation.

### A paradigm shift in business

If carbon neutrality by 2050 is the grand challenge, industry sustainability calls for a multitude of action plans at the company level. The Science-Based Targets initiative (SBTi) provides a transparent and standardised measurement for companies moving towards net zero goals in line with a 1.5°C pathway. Today, well over 1,200 companies spanning 60 countries are working with the SBTi to reduce their emissions, but this volume must rise exponentially to constitute a true shift in how we do business.

The wind industry is a leader in this respect: Ørsted transformed over the last decade from a fossil fuels company to the world's highest ranked sustainable corporation, according to Corporate Knights 2020 rankings, where Iberdrola, Vestas, Siemens, Acciona, ABB and other energy companies appear in the top 50. Notably, these companies are driving comprehensive sustainability strategies that cover not only environmental impacts but social goals as well. Workforce inclusivity and diversity of all dimensions (gender and ethnicity among others) will be critical for ensuring sustainability is reflected at all levels and geographies of the industry, and that this continues as the industry expands.

### A message from the UN's Race to Zero campaign: Building climate action momentum in the run-up to COP26

We encourage companies to join the UN-backed, global Race to Zero campaign. In doing so, companies will demonstrate the credibility of their sustainability commitments and highlight their taking immediate, meaningful action. This campaign, led by the High Level Champions for Climate Action, rallies leadership and support from businesses and others to achieve net zero emissions as soon as possible and by 2050 at the very latest. Building momentum ahead of COP26, already over 2,500 entities have joined the campaign – the largest collection of such commitments globally. Companies join through partner initiatives, including:

- Business Ambition for 1.5 – the main Race to Zero partner for businesses, requiring a science-based target
- SME Climate Hub – for small and medium-sized companies

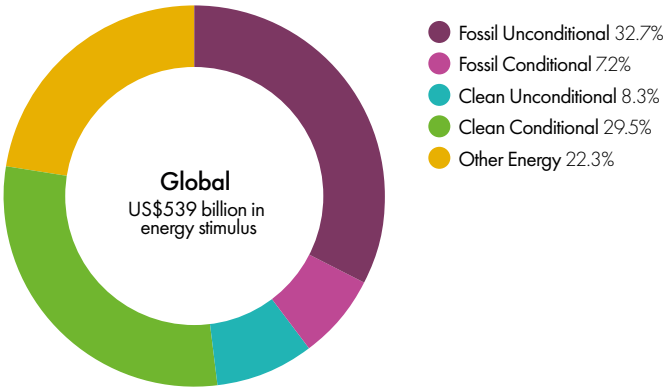
Wind sector companies already part of the Race to Zero include ACT Blade Ltd, EDP, Enel, Iberdrola, NKT Cables, Ørsted, SGRE and Vestas. More members from the wind industry would showcase the sector and support the scale up of government climate ambition. The Race to Zero has a 'breakthrough ambition' of 20% of major utilities joining the Race and a 'breakthrough outcome' goal by 2030 of 30% share of global electricity generation from wind and solar and 60% from all renewable sources.

# 6. Green recovery to catalyse a net zero course

The last year has seen unprecedented public recognition of climate change, high-level political gains, including net zero commitments from leading carbon-emitting countries. As of December 2020, 127 countries responsible for around 63% of global GHG emissions are either considering or have adopted net zero targets, according to the UNEP. The UNDP's "Peoples' Climate Vote" of 2020 determined that 64% of people covering 50 countries with more than half the world's population believe that climate change is the true global emergency, compared to the pandemic.

Nonetheless, COVID-19 has crippled emerging economies with rising public debt and ongoing social/healthcare crises, deepening the affordability gap in the power sector and accentuating the financing risks for renewable energy. Additionally, GWEC's Green Recovery Hub with real-time data on stimulus packages worldwide estimates that the global response to COVID-19 has been more favourable to fossil fuels. At least US$274 billion in public support packages are seen as supporting fossil fuels on a conditional or unconditional basis, compared to $259 billion for clean energy. Among G20 countries, for every $1/capita going to clean energy, $1.05/capita is being spent on support for fossil fuels industries.

Announced COVID-19 Economic Stimulus Packages for Energy, as of February 2021




Source: Energy Policy Tracker; see GWEC's Green Recovery Hub for category definitions.

That extra $0.05 per person could instead be reinvested in the drive for net zero, across energy efficiency solutions or grid reinforcement to enable large-scale integration of green power. Green recovery investments present a limited window of opportunity for state actors to agitate existing dependencies and invest in system-wide transformation, such as:

- **Ratcheting up wind volumes:** National capacity targets for wind need to scale up to align with net zero commitments and respond to the alarming gap between our BAU trajectory and the actions needed to sustain an IPCC-compliant scenario. Repowering regulation offers an efficient solution for wind projects nearing the end of lifetime in Europe, while streamlined permitting will go a long way in enabling wind projects in Asia, Africa and Latin America to close financing and reach grid connection more efficiently.

> More than half the world's population believe that climate change is the true global emergency, compared to the pandemic.

- **Safeguarding existing wind capacity to sustain investment attractiveness:** Ramping up global installed onshore and offshore wind capacity from its current 743 GW to more than 2,000 GW by 2030 would create additional annual investment of US$207 billion or over US$2 trillion in total. To deliver these

volumes of wind energy investment, governments must secure transparent and predictable project pipelines with policy certainty and long-term visibility.

- **Reducing administrative and permitting barriers:** Allocating resource to institutions which can streamline the administrative and permitting processes for renewable energy can support wind projects in efficiently moving into the construction phase.

- **Fostering green jobs and an inclusive transition:** The wind sector offers an increasingly diverse range of low-skill to high-skill occupations, with tremendous direct employment effects of 10,000 full-time jobs over the 25-year project lifetime of a 500-MW offshore wind farm. For example, a recent study found that accelerated wind and renewable energy growth in China could yield multiplier effects, including expenditure shifting, job creation and higher economic efficiency, adding as much as 7.5% to national GDP and 5.9% to total jobs by 2030 compared to a BAU pathway. Fossil fuel-dependent states have the opportunity to allocate public funding to support workforce retraining and up-skilling from sunset industries (e.g. coal-fired generation, offshore oil and gas) to growing clean energy sectors like onshore and offshore wind. New training programmes to fast-track the transition of workers into a low-carbon economy are the need of the hour, following the example of Scotland's Transition Training Fund.

The compound benefits of green recovery measures have been widely recognised – the IMF estimates that measures put in place for a sustainable recovery could boost global GDP by 3.5% in 2023 above usual levels. Governments should heed the growing body of evidence at global and market level, as well as the irreversible shift of public opinion, by making green economic recovery a vital component of long-term plans for decarbonisation.

# MARKET STATUS

Photo Credit: Equinor

# Overview

2020 saw global new wind power installations surpass 90 GW, a 53% growth compared to 2019, bringing total installed capacity to 743 GW, a growth of 14% compared to last year.

**2020 saw global new wind power installations surpass 90 GW, a 53% growth compared to 2019**

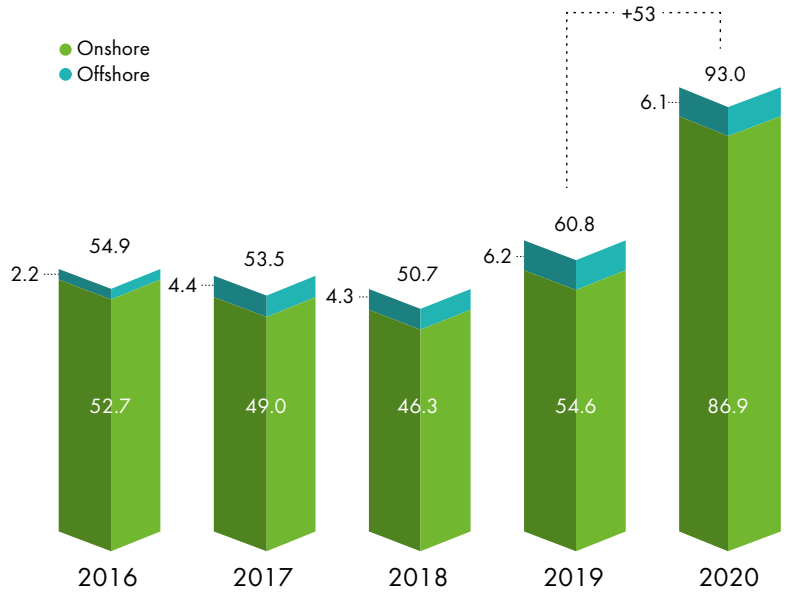
New installations in the onshore wind market reached 86.9 GW, while the offshore wind market reached 6.1 GW, making 2020 the highest and the second highest year in history for new wind installations for both onshore and offshore.

Thanks to the explosive growth of installations in China, Asia Pacific continues to take the lead in global wind power development with its share of the global market increasing by 8.5% last year. Driven by a record year of installations in the US, North America (18.4%) replaced Europe (15.9%) as the second largest regional market for new installations. Latin America remains the fourth largest regional market (5.0%) in 2020, followed by Africa & Middle East (0.9%).

The world's top five markets in 2020 for new installations were China, the US, Brazil, Netherlands and Germany. These five markets combined made up 80.6% of global installations last year, collectively more than 10% greater than 2019.

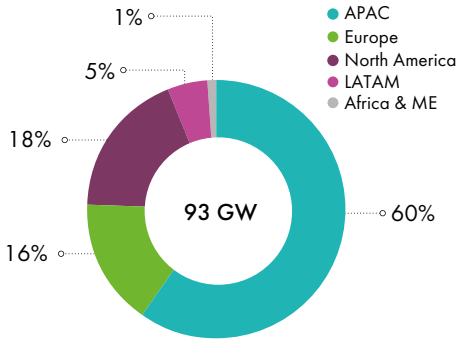
In terms of cumulative installations, the top five markets as of the end of 2020 remained unchanged. Those markets are: China, the US, Germany, India and Spain, which together accounted for 73% of the world's total wind power installations.

New installations



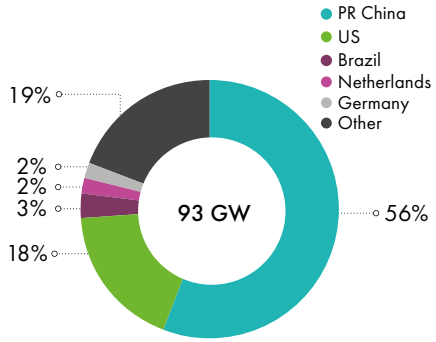

New wind power capacity in 2020 by region

Per cent




New wind power capacity in 2020 and share of top five markets

Per cent



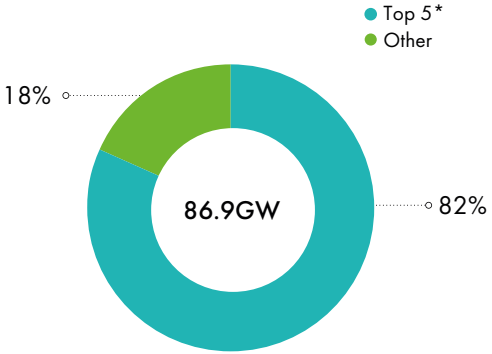
# Onshore Wind market – Status 2020

86.9 GW of onshore wind capacity was added globally in 2020, representing 59% YoY growth and taking cumulative onshore wind capacity beyond the 700 GW milestone. This outstanding increase in 2020 was driven primarily by explosive growth in the world's two largest wind power markets, China and the United States.

In China, the National Energy Administration (NEA) reported 68.6 GW of grid-connected onshore wind installations last year, boosting its total onshore installations to more than 272 GW. Out of the 68.6 GW of grid-connected onshore wind, however, about 26 GW was installed by the end 2019, but didn't actually achieve grid connection until 2020. Excluding this latent volume, grid connected new installations in China in 2020 were 42.3 GW. Not including grid connection, new installations were 48.9 GW. The rush to complete onshore wind farms in 2020 was driven by new policy released by the National Development and Reform Commission (NDRC) that presented a clear roadmap towards "subsidy-free" onshore wind. This regulation means that projects already approved until 2018 will continue to receive the Feed-in-Tariff (FiT) if they are grid-connected before the end of 2020. Starting from 1 January 2021, all newly approved onshore wind projects must reach the grid parity

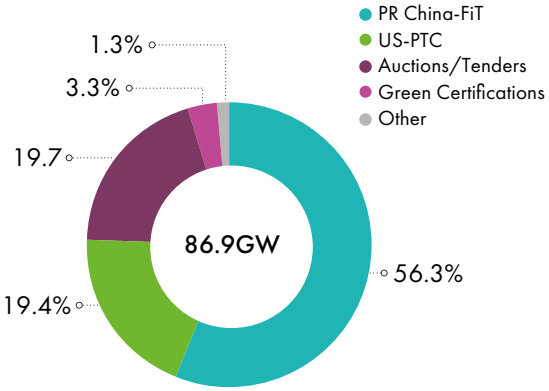
This outstanding increase in 2020 was driven primarily by explosive growth in the world's two largest wind power markets, China and the United States.

New wind power capacity in 2020 and share of top five onshore markets
Per cent, onshore




*(PR China, the US, Brazil, Norway,Germany)

New wind power capacity in 2020 by market support mechanism
Per cent, onshore




(currently based on the regulated price for coal power in each province).

The US onshore wind sector reported its highest-ever year of new installations in 2020, nearly 17 GW was commissioned, bringing its total above the 120 GW threshold. The US onshore wind installation rush was primarily driven by the planned Production Tax Credit (PTC) phase-out as project developers had to chase the 2020 deadline to qualify for the full PTC value. Although the Internal Revenues Service (IRS) extended the commissioning deadline for projects that started construction in 2016 and 2017 from four to five years, recognising the disruption of COVID-19 on supply chain and project construction execution, to ease the pressure on developers, a record of installation was still achieved. This has shown the resilience of onshore wind in a market where the COVID-19 pandemic had a strong negative impact on many industries. Last December, the Senate extended the PTC for a further year with 60% of the full PTC rate. Thus, PTC qualification will remain as the main driver for new onshore installations in the US throughout the forecast period (2021-2025).

In addition to China and the US, the top five onshore wind markets were Brazil (2.30 GW), Norway (1.53 GW) and Germany (1.43 GW).

Looking at the market support mechanisms behind the new onshore wind capacity added in 2020, the situation remains the same as the previous year. Excluding the two largest markets China and US, where the FiT and PTC were the key support schemes, mechanisms such as auctions, tenders and Green Certificates were the main drivers. Last year, 23% of new installations originated from these market mechanisms, 16% lower than in 2019, primarily due to the increased level of onshore installations in China and the US.

While the first half of 2020 saw auctions being postponed or cancelled due COVID-19 restrictions, the sector bounced back strongly in the second half of the year as key mature and emerging wind markets began overcoming the impacts of COVID-19. Overall, 33.7 GW of new onshore wind power capacity was auctioned globally in 2020, of which China accounted for 67% of the global onshore wind power capacity awarded in 2020. Since the majority (96%) of the awarded onshore capacity in China last year was based on grid parity scheme, grid parity onshore wind can be expected to be a key element of new installations in next year's Global Wind Report.

# Offshore Wind Market – Status 2020

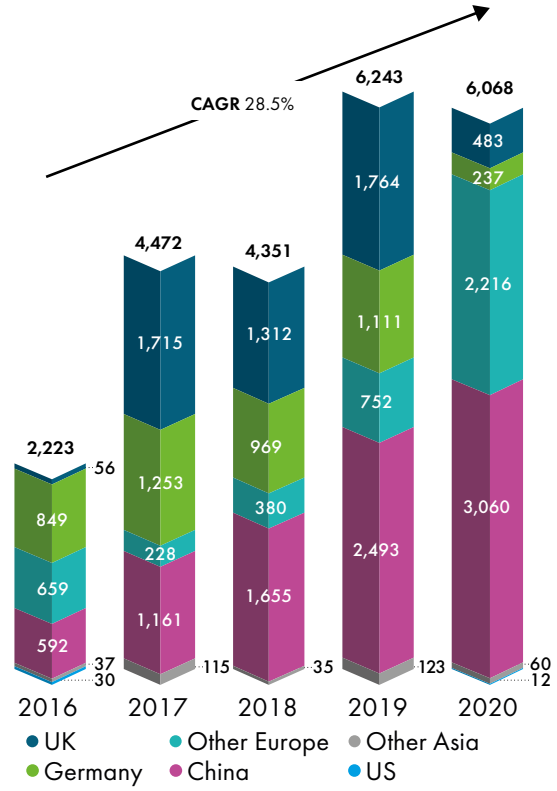
Despite the impact of COVID-19, the global offshore wind industry had its second-best year ever in 2020 installing over 6 GW of new capacity, keeping growth on track.

- China led the world in new annual offshore wind installations for the third year in a row with over 3 GW of new offshore wind capacity in 2020.
- Steady growth in Europe accounted for the majority of remaining new capacity, led by the Netherlands which installed nearly 1.5 GW of new offshore wind in 2020, making it the second-largest market in 2020, followed by Belgium (706 MW).
- The UK and Germany installed 483 MW and 237 MW respectively, making them the No.4 and No.5 markets in new installations in 2020. The slowdown of growth in the UK is due to the gap between the execution of projects in the Contracts for Difference (CfD) 1 and CfD 2 rounds. In Germany, the slowdown is primarily caused by unfavourable conditions and a lower level of short-term offshore wind project pipeline.
- Outside of China and Europe, two other countries recorded new offshore wind installations in 2020: South Korea (60 MW) and the US (12 MW).
- 2020 also saw Portugal commission two new floating offshore wind turbines, totalling 16.8 MW.
- The UK remains in the top spot globally in terms of cumulative offshore wind capacity, while China has now overtaken Germany to become the world's second largest offshore wind market.
- Last year, only 1,005 MW offshore wind capacity was awarded worldwide through auctioning, of which 759 MW is from the Netherlands and the remainder from China. A consortium of Shell and Eneco won the right to build the 759 MW Hollandse Kust North project in the Netherlands. The project is the third so called "zero-priced" bid, meaning that the project will only receive the wholesale price of electricity and no further support/payment.
- Although awarded offshore wind capacity was relatively low compared to 2019, more than 7 GW of offshore wind auction/tenders were launched in 2020, of which 5.5 GW is through state-issued solicitations in New Jersey, New York and Rhode Island in the US. The rest of the capacity is from Denmark (800-1000 MW) and Japan - representing its first auction for both floating and bottom-fixed offshore wind.
- Last year GWEC continued to provide guidance on offshore wind potential and technical development around the world and organise targeted advocacy and capacity building activities. Aside from the launch of a joint Japan Offshore Wind Taskforce with JWPA and the Floating Offshore Wind Taskforce, the Japan Cost Reduction Study conducted in 2020 informed the key findings and objectives of the Japanese government's "Offshore Wind Industry Vision" targeting 10 GW and 30-45 GW of offshore wind by 2020 and 2040 respectively.

The offshore wind market has grown from 2.2 GW in 2016 to 6.1 GW 2020, bringing its market share in global new installations from 4% to 7%, which is 3% lower than 2019 due to the strong growth spurt of onshore in 2020. GWEC Market Intelligence expects the global offshore wind market to continue to grow at an accelerated pace (for details, see Market Outlook).

New offshore installation

MW



# All regions increased new installations, except Europe and Africa & Middle East

2020 saw the annual wind market grow (with onshore and offshore combined) in all the regions except Europe and Africa & Middle East. All of the 32.2 GW YoY increase comes from onshore wind markets: China 24.6 GW, the US 7.8 GW, Latin America 1.0 GW, Europe 72 MW. However, 2020 was a challenging year for India's onshore wind market. Aside from the existing challenges of land acquisition, grid connection and permitting, the COVID-19 pandemic hit the market hard and caused delays in project construction execution. New installations in Africa & Middle East dropped by 7 MW compared to the previous year, primarily due to relatively low installations in North Africa, namely Egypt and Morocco. New offshore wind installations decreased slightly compared to 2019, which was mainly due to weak activity in the two largest European offshore markets: the UK and Germany.

Changes in new installations 2019 to 2020

GW, onshore and offshore