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AUSTRIA

Austria has set ambitious renewable energy and climate protection targets of reaching 100% renewable electricity by 2030. Nevertheless, the year 2020 marked a further decline in the expansion of wind power. Continuing political uncertainties and administrative barriers are slowing down the expansion significantly.

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In 2020, Austria installed seven turbines with a capacity of 25 MW, compared to 59 turbines in 2019. By the end of 2020, more than 3,120 MW

were installed. As a result comparing installed and decommissioned turbines in Austria gained a net reduction of existing wind power plants. [1]. The estimated feasible potential until 2030 is at 7,500 MW with 22.5 TWh p.a. [2].

TABLE 1. KEY NATIONAL STATISTICS 2020: AUSTRIA

Total (net) installed wind power capacity*	3.120 GW
Total offshore capacity	0 GW
New wind power capacity installed	25 MW
Decommissioned capacity (in 2020)	64 MW
Total electrical energy output from wind	7 TWh
Wind-generated electricity as percent of national electricity demand	11 %
Average national capacity factor***	25.5 %
Target	100% renewable electricity in 2030
National wind energy R&D budget	

*Installed wind power capacity: Use nameplate power ratings of the installed wind turbines

***Average national capacity calculation. Only include turbines in operation the whole year: (MWh production/8,760 hrs) / MW installed capacity
 MWh total electrical production from wind turbines operating January 1 through December 31 divided by 8,760 hrs divided by the total installed wind capacity (in MW) at the beginning of the year. [You can also use an estimate based on average installed capacity during the year: (installed 1 Jan + installed 31 Dec)/2. But in that case, state that this is how the estimate is calculated.]

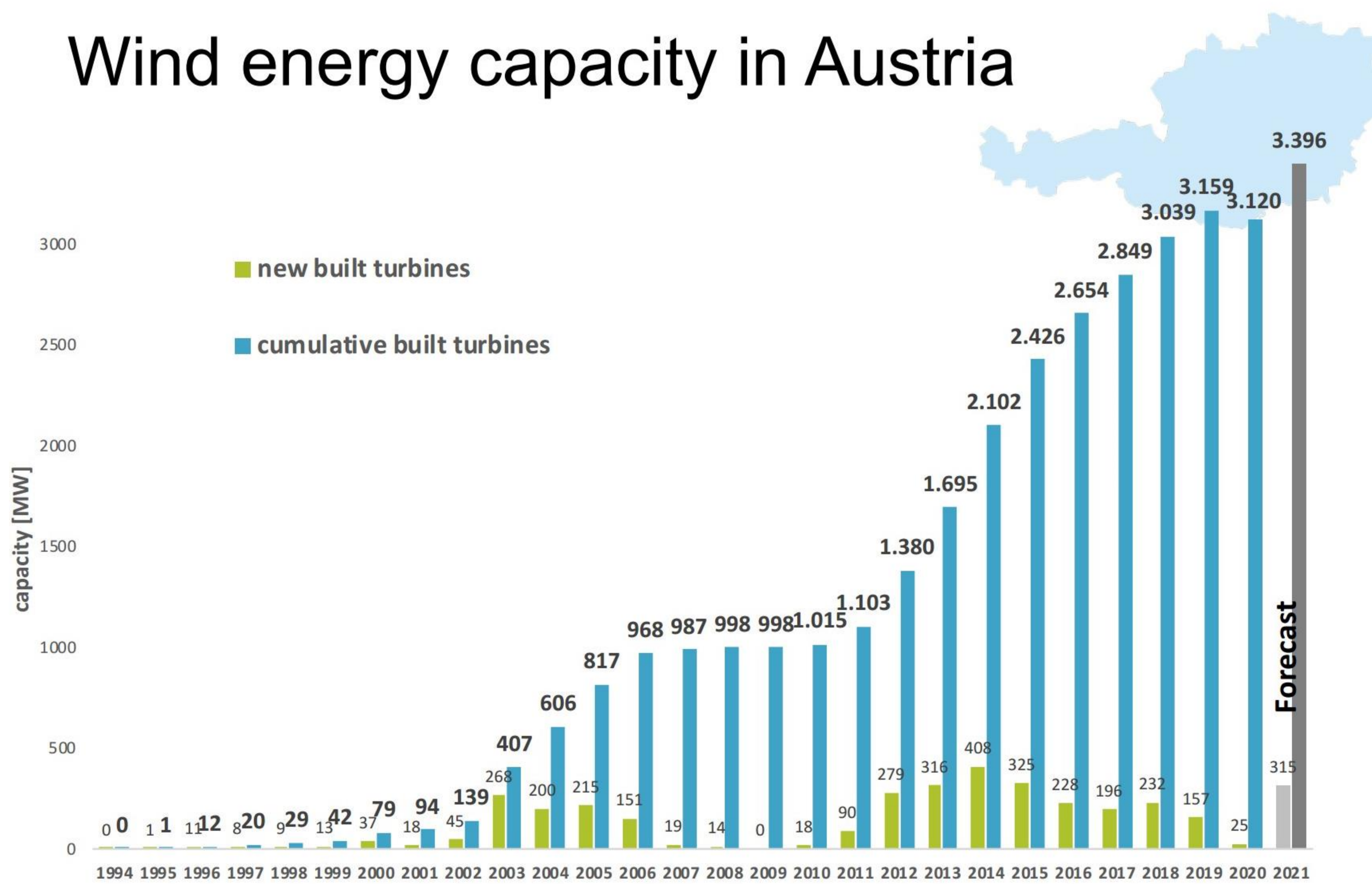
Market development

National targets and policies supporting development

The Austrian government set in their working programme the goal of 100% renewable electricity in 2030 from currently over 70%. Furthermore, the ambition is to make Austria climate-neutral by 2040. As

a step forward there are concrete targets implemented, such as additional 10 TWh of wind power, 11 TWh PV or 5 TWh hydro power by 2030. By contrast the year 2020 marked a further decline in the expansion of wind power. As a result, the last year can only be seen as a 'gap year', only seven wind turbines with a total capacity of 25 MW could be built, with a net reduction of existing wind power plants. One reason is that under

Wind energy capacity in Austria



Source: IG Windkraft, Jänner 2021

www.igwindkraft.at 1

FIGURE 1: OVERVIEW OF INSTALLED CAPACITY IN AUSTRIA WITH 2020 FORECAST

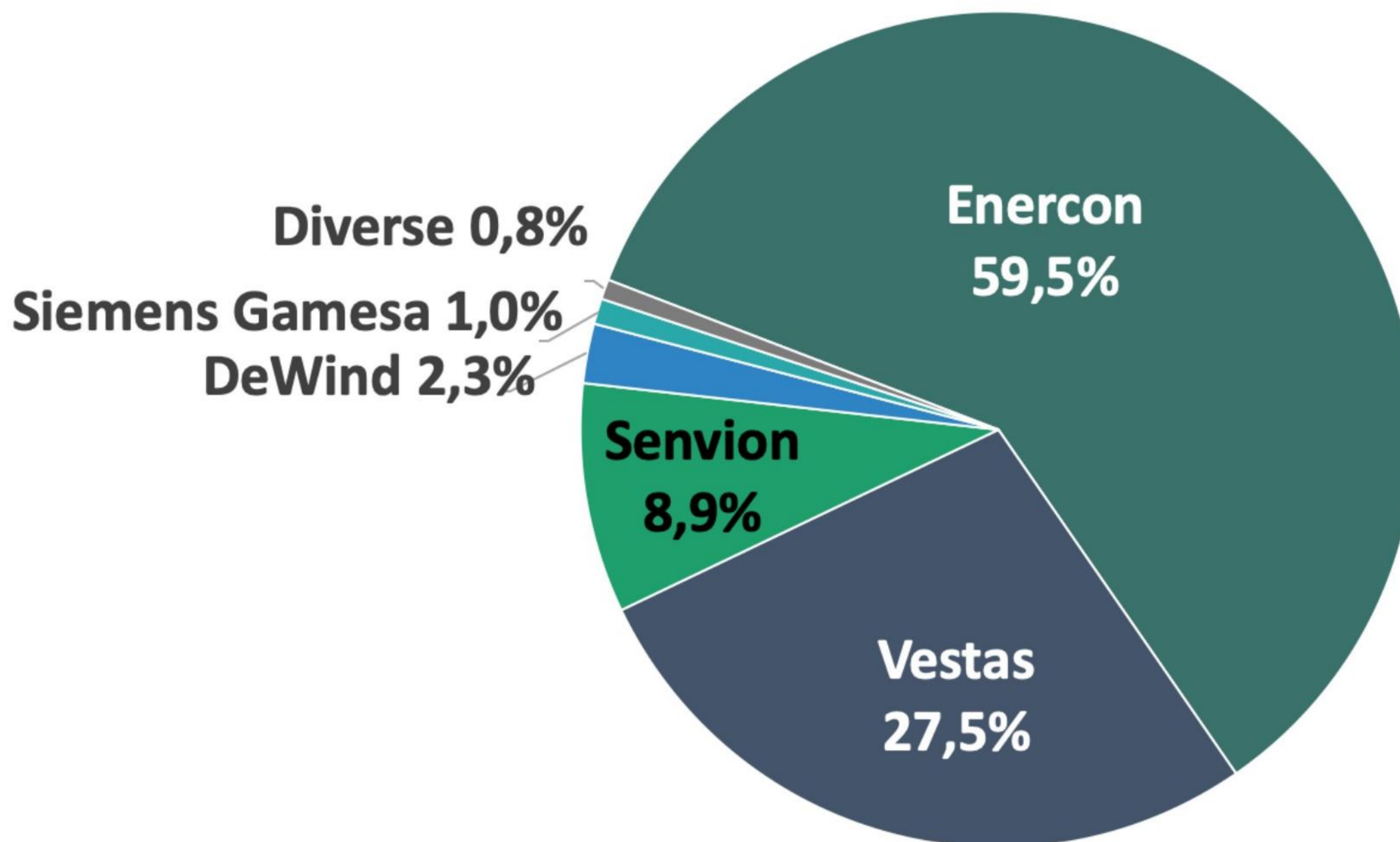


FIGURE 2: MARKET SHARE—WIND TURBINE MANUFACTURERS (2020) (SOURCE: IG WINDKRAFT)

the existing renewable energy law there are no funds left for new wind parks. The new renewable energy law is still under development and should be implemented in the second half of 2021. This is causing uncertain market conditions and a lack of funding for new wind power projects. The new renewable energy law is in the pipeline and should provide the framework and funding of projects for the next ten years. The European Green Deal and the need to adapt several European directives and policies connected with national laws supported the political awareness to speed up reaching Austria's targets.

Progress and operational details

While in 2018 a milestone was reached with total installed capacity of 3,000 MW, the general trend of decreasing wind power expansion continued in 2019 as well as in 2020. As a result, only 25 MW were established, marking an overall all-time low. In total Austria's wind power production was able to generate more than 7 billion kWh and 11% of the national electricity consumption. [1]

A forecast for 2021 assumes a significant increase of additionally installed wind power capacity. One of the reasons for this is the establishment of old projects that were already approved before 2019 and provided with a feed-in tariff due to a reform of the Austrian Renewable Energy act. These projects can now be set up, adding to Austria's wind energy capacity approximately 300 MW [3]. Another reason is the insolvency of the manufacturer Senvion, causing several project adaptations. The development of new projects with the timeframe of the next 3-4 years or more is still a

challenge due to a lack of funding through support scheme mechanisms caused by the unclear and not finalized framework of the new Renewable Electricity Law (EAG).

Regarding market development the Austrian market was dominated by Enercon, which was responsible for 100% of the added capacity in Austria. The overall market share is divided among mature players like Enercon with 59.5%, Vestas with 27.5% and the remaining stock of Senvion with 8.9%.

The scientific study 'Stromzukunft Österreich 2030' quantifies the total investment costs as 1,350 to 1,570 EUR/kW (1,516 to 1,763 USD/kW) and the O&M costs as 36 to 40 EUR/kW (40 to 45 USD/kW) per year. [4]

Matters affecting growth and work to remove barriers

The Austrian parliament adopted a new legislation for electricity from renewable energy sources in 2011: the Green Electricity Act 2012, which offered the existing FiT system, a stable legal framework through 2020. However, the lack of sufficient support scheme budget of renewable energy projects, especially for wind power, created a backlog of permitted projects with a capacity of over 800 MW, waiting for a FiT since 2016. Thanks to the amendment to the Green Electricity Act of September 2019, the backlog could be reduced, resulting in around 320 fully approved wind power turbines with a capacity of 1.185 MW to be installed within the next four years. However, for the upcoming next ten years a well performing new Renewable Energy Law is needed to provide necessary funding for new projects. A first draft was presented in the end

of 2020, but it is still under development and will be finished in 2021. In addition to adding 10 TWh of new wind power until 2030, a few main key elements of the current draft are that wind power will be excluded from auctions until 2024, market premiums will displace the FiT system, and the introduction of an adapted support scheme framework for the development of projects with poorer wind conditions to exploit the full wind power potential in Austria.

Although many elements of the draft of the new renewable energy law sound promising, the success will not be possible without strong ambitions at federal government level. Many crucial elements of a fast expansion of renewable energy projects and especially wind power are located under the jurisdiction of the federal governments. What is more, important regulations and processes differ from one federal state to another, causing an increased complexity for wind energy project developers. In addition, the current climate and renewable energy plans of the several federal governments are partly outdated or lack the necessary ambition to make Austria climate-neutral by 2040.

These are significantly larger barriers in the development of new wind power projects. For example, direct international competition with other states of net grid costs for renewable energy is causing discrimination for domestic renewable electricity producers exceeding the capacity of 5 MW. The reason is the so called 'G-component' of around € 1.3 per MWh, which has to be paid by the operators of renewable energy plants with a capacity > 5 MW for grid connection. Furthermore 'G-components' differ from one federal state to another, causing discriminatory market conditions. Additionally, the current average time between the start of planning and the construction of a wind turbine in Austria is between 3 and 8 years, although longer periods may also occur. Complex and long environmental impact assessment (EIA) procedures slow down the infrastructure expansion and prevent investments. Another crucial element was the increasing lack of necessary eligible spaces for wind power in the federal states. As a consequence, nearly all Austrian federal states need to determine additional areas for wind power to lift existing potentials.

However, movements like 'Fridays for Future' and other civil engagements confirm the high public acceptance rate of wind power. Latest surveys show that over 80% of the Austrian population support a further wind power expansion—a continuing trend since 2011 [5].

R,D&D activities

National R,D&D priorities and budget

Based on the topographic and climatic conditions, the following two R,D&D topics are currently given priority in Austria: In 2020 research projects regarding wind energy in cold climate and projects regarding the utilisation of Wind Lidars at challenging locations were pursued. Those projects not only addressed site-specific technical challenges but also the requirements during approval procedure.

National research initiatives and results

In 2020, a new research project related to the topics 'Cold climate' and 'Digitalization' was initiated. This project aims at improving the control mechanisms of wind turbines operating under icing conditions. Icing forecast algorithms is to be combined with machine learning to optimize the triggering of a rotor blade heating system and shutdown in case of ice accretion.

Test facilities and demonstration projects

2020 was an important year for a new research project related to wind energy utilization in cold climates. This project, called N.Ice, uses an ultra-short pulse laser to generate nanostructures in the sub-µm range on technical surfaces (like rotor blades) in order to avoid or prevent the adhesion of ice or at least reduce the lifespan of ice shells. Individual samples will be used in field tests on a small wind turbine and will be exposed together with reference samples. The laser-processed samples will be monitored continuously together with unprocessed reference samples, and the ice formation on the sample surface will be registered quantitatively. This should enable statements to be made about the degree of ice formation and the duration of icing.

Collaborative research

Based on the above-mentioned focus areas, Austria is participating in IEA Task 19, Task 32 and Task 41. In Task 19, the Austrian partner is leading a subtask that deals with the risk of ice fall and ice throw, in Task 32 the Austrian focus is on the utilization of Lidar devices in complex terrain. Because of the international cooperation and the produced deliverables in the Task, the impact of the national research projects could be improved and gain value for the national authorities

Impact of wind energy

Environmental impact

Wind power is supposed to play a dominant role in Austria's current and future climate and energy strategy. Therefore, around 3 million tons of CO₂ could be saved in 2020. Strict rules on the natural impact during the

permitting procedures fulfil the European requirements of environmental protection. During the last year, a significant number of studies on birds and wildlife around wind power plants are published and show the functioning of their coexistence. As a result of those strict rules as well as the increasing knowledge, most populations of big birds of prey have been growing within the last years. However, a lot of excessive and redundant legal prerequisites prevent efficient expansion of renewable energy sources and its positive effects. Especially discussions on landscape impacts by wind power through different administrative processes delay the permission of wind power projects significantly and hinder the forthcoming of renewable energy. Therefore, it is highly important to take positive impacts of wind power into consideration and balance them with possible negative ones. Furthermore, permission processes have to speed up significantly as the average process last up to ten years and therefore constitutes a high barrier for wind power.

Economic benefits and industry development

The Austrian wind power industry consists of many companies with over 3,700 employees, including wind turbine operators, planning offices, and component suppliers for international wind turbine manufacturers. The supply chain alone includes more than 180 companies. In 2020, the annual turnover of existing wind park operators was over 510 million EUR (623 million USD) [6]. Cooperatives and private companies own 60% of Austria's existing wind turbines, while the other 40% are owned by utilities. One wind turbine (5 MW) produced 3.2 million EUR (3.9 million USD) of domestic added value. Furthermore, through its 20-year lifetime it generates more than 5.2 million EUR (6.3 million USD) added value as well as 2 permanent jobs.

Local Austrian companies are successful in both onshore and offshore sectors, and Austrian crane companies, planning offices, and software designers work abroad to a high degree. Austrian wind energy companies of the supply chain are industry leaders, e.g. in the fields of electricity conduction, wind power generators, wind turbine generator design, and high-tech materials. Several wind power operators have successfully implemented projects and are operating on an international level. Austrian operators are very active with neighbouring countries in Central and Eastern Europe, and some independent companies have also started businesses outside Europe. There are no major wind turbine manufacturers in Austria, though there are manufacturers of small- and micro-sized wind turbines. According to a study conducted by the Austrian Wind Energy Association, the Austrian wind energy supply chain industry

generates estimated export value exceeding 400 million EUR (489 million USD).

Austrian component suppliers serve as hidden champion in several fields in the international wind turbine market too. Bachmann Electronic GmbH is a leading manufacturer of turbine control systems. Hexcel Composites GmbH develops and produces materials for blades. Elin EBG Motoren GmbH supplies generators for the global market. There are also several global players with competence centres in Austria, e.g. SKF GmbH.

In the field of innovation, start-ups form a sustainable part of the wind energy industry. For example, start-ups like Eologix implemented an innovative ice detection system on rotor blades and Aero Enterprise offers drone inspection services of wind turbines. Promising developments were also made by the recently founded start-up Speedpox which conducts research in new processes for the production of fibre composites for wind turbine blades.

Next term

In 2021, the new Renewable Electricity Law (EAG) will be finished, providing funding and a framework for the upcoming next ten years. Several additional policies need to be revised such as Austria's climate protection law, the revision of the NECP or measures on federal state level like spatial planning to achieve Austria's ambitious climate laws and the EU's 'Fit for 55%' program.

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