

## **Part 2:**

### **The Expansion of Renewable Energy Sources (RES)**

Renewable energy is supposed to provide 65% of total power produced by 2030 and at least 80% by 2050. Starting with approx. 5% of mainly hydropower in 2000, RES reached 19.2% by 2010, 33.3% by 2015, 38.2% by 2017 and 40.6% by 2018. 2019 saw a huge jump to 46,1% of net electricity generation: 24.6% wind (with approx. 5% offshore), 9% solar, 8.6% biomass and 3.8% hydropower.

By the end of 2019, RES already constituted 60% (125.24 GW) of Germany's total installed electricity generation capacity (209.9 GW). Despite improvements over the past years, the energy sector still emits 35% of all CO<sub>2</sub>. The energy sector so far has managed to cut carbon emissions by 35% since 1990.

The German target provides for a maximum of 183 MTCO<sub>2</sub> (Mega tons of CO<sub>2</sub>)

According to scientific calculations, the amount of renewable power capacity connected to the grid needs to reach 200 GW by 2030. During the past years, under good weather conditions, more and more often situations occur, when wind and PV together can cover more than 75% of German electricity demand at some hours of the day.

#### **Led by onshore wind:**

With almost 30.000 installed onshore and approximately 1.500 offshore wind turbines, and a total installed capacity of 53.1 GW, wind energy generated around 24% of Germany's electricity in 2019. The government's plan calls for a total of 67-71 GW of onshore wind installed capacity by 2030. Onshore wind power will continue to play a key role in meeting Germany's energy transition goals, but onshore expansion has run into obstacles, mainly due to regulatory conflicts with aviation authorities and lawsuits against new projects by citizens. Preferential treatment during tendering for citizen energy cooperatives to boost citizen participation proved to be detrimental as many projects could not be realized. Regulations will be adjusted. With almost 30.000 onshore turbines, mainly located in the open plain areas in Northern Germany, Germany is running out of easily available space with good wind conditions. In 2019, the net addition of new turbines fell to the lowest level in two decades. Only 0.65 GW was added to the net. Exploring wind parks in forest areas or hilly areas draws objection from environmentalists.

However, greater power yields and more operation hours per turbine have made previously unattractive locations economically viable. Production costs are predicted to fall from up to 9 Euro cents in 2014 to below 5 Euro cents in 2020, potentially giving wind power a long-term competitive edge over coal-fired power production.

Germany's Ministry of Economic Affairs and Energy has presented a plan to break the deadlock in wind power expansion:

New turbines and new models replacing older ones (so-called "repowering") must maintain a minimum distance of 1,000 meters from the nearest residential area (defined as at least 5 housing units). However, many consider a 1,000 m distance as too long and argue that this might be a further serious barrier for wind energy in Germany. The Bavarian government, though, already announced that the existing minimum distance in Bavaria, which is ten times the turbine's height (the "10H rule"), "will remain unchanged."

In addition, all municipalities will now receive part of the profits generated by turbines built on their land. A "regional bonus" in guaranteed remuneration is meant to ensure that turbines are distributed more evenly across the country and not primarily in the more windy part of Northern Germany .

As experience shows, citizens' acceptance does not rise with greater distance to the turbines, but rises with financial profit from the nearby wind park project!

### **Strong increase in offshore wind:**

On the other hand, offshore wind is not facing these problems. The Government proposes increasing the target from 15 to 20 GW of installed capacity by 2030.

At the end of 2019, almost 1,500 offshore wind turbines with a total output of 7.6 GW fed into the grid, approximately 5% of Germany's energy mix. By the end of 2019, a further 1.2 GW were added to the grid. The legally permitted expansion of 7.7 GW by 2020 should be achieved as planned.

As offshore turbines are getting bigger, costs are declining. Today, an offshore wind park does not cost more than a coal or a gas power plant and is definitely much cheaper than a nuclear power plant. The production cost for energy from offshore wind depends on the

location: very good locations between 7.79 and 9.95 EuroCt/kWh, near shore locations cost up to 13.79 EuroCt/kWh. Germany started offshore with relatively high Feed-in-Tariffs (FIT) in 2010 to ensure developers' interest and allow for the industry and supply chain to establish. Germany never insisted on local content requirements, but relied on market competition. In 2017, Germany switched from FIT to auctions. During the transition phase in 2017, fewer projects were realised. In total, all new projects since allocated per auction and to be connected to the grid between 2021 and 2025 will add up to 10.8 GW by 2025.

### **PV will get a further boost:**

PV has been enjoying significant growth in installation during the past years. In 2019, 3.34 GW of PV were added to Germany's power mix to reach a total of 48.57 GW. Currently over 1.7 million PV systems are installed in Germany. The support cap for photovoltaic solar power, currently set at 52 GW, is planned to be removed in 2020. The government aims for solar PV installed capacity to reach 98 GW by 2030.

However, to reach 65% of RES by 2030, Germany would need to install 4-5 GW of PV annually. Although PV systems can deliver electricity over several decades, systems owners may increasingly consider to replace older systems with newer and more efficient ones in the coming years. This process termed Repowering might eventually reach capacities of 6-7 GW annually. Already more than 10% of all houses are fitted with PV on the rooftop - especially in the sunny south - which gives consumers the possibility to become producers as well and use self-generated electricity. More and more houses are supplied with small-scale batteries to store energy for use at night time and eventually, for charging electric cars. On sunny working days, photovoltaics can already temporarily cover 45% of the current electricity consumption; on Sundays and public holidays - even 60% - by PV alone!

### **Biomass and hydro to play a minor role:**

The installed capacity of biomass is projected to reach 8.4 GW by 2030, while hydro power should reach 6 GW of installed capacity.

### **RES in Global Comparison: Germany ranks very High**

The latest Renewable 2019 Global Status Report shows Germany in 3rd place in RES capacity in the world, behind China and the US. Germany tops the rankings in terms of per capita RES:

in Germany, each person can use 1.4 kW of RES - by far the highest figure in the world (global average 0.2 kW). The report also shows that today, more than a quarter (26%) of global electricity is produced by RES. For the fourth year in a row, more RES generation capacity was installed in the electricity sector than fossil and nuclear combined. 2018 alone saw an addition of 100 GW solar capacity. In 2018, at least 9 countries in the world produced more than 20% of their electricity from wind and solar, incl. Denmark 52%, Uruguay 36%, Ireland 29%, Germany 28.8% and Portugal 24%.

RES are also powering cities: in more than 100 cities around the world, at least 70% of the electricity consumed is generated by RES including Nairobi (Kenya) and Dar-es-Salaam (Tanzania), Stockholm (Sweden), Auckland (New Zealand) and Seattle (USA). Ambitious climate targets have also been adopted by German cities, such as Frankfurt and Osnabrück, which are participating in the 100% RE Cities and Regions Network.

Further reading:

Net installed energy generation capacity in Germany: Energy charts (Fraunhofer-ISE), 2019, January 2020, [https://www.energy-charts.de/power\\_inst.htm](https://www.energy-charts.de/power_inst.htm)

Which type of power is the cheapest? Welche Art von Strom ist am günstigsten? 25 March, 2019 (available only in German), <https://www.quarks.de/technik/energie/welche-art-von-strom-ist-am-guenstigsten/>

Renewables in a global comparison: Germany ranks very high (BMW i, Energiewende Direkt), 5 September 2019 <https://www.bmwi-energiewende.de/EWD/Redaktion/EN/Newsletter/2019/07/Meldung/direkt-answers-infographic.html>

Renewables in Cities Global Status Report (REN 21) 2019, <https://www.ren21.net/reports/cities-global-status-report/>, September 2019.

Disclaimer: this information has been compiled by the German Institute Taipei based on information provided by trustworthy governmental, scientific and other sources. While we have taken great care to cross-check information, we cannot guarantee accuracy. Note, that some data might be provisional and is subject to adjustments (01/2020)