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Energy Transition Monitor #1 – what, when and how

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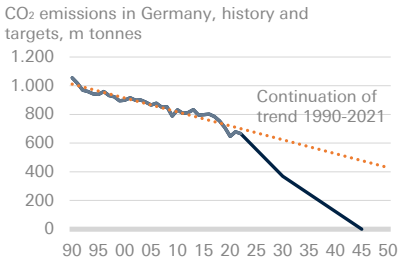
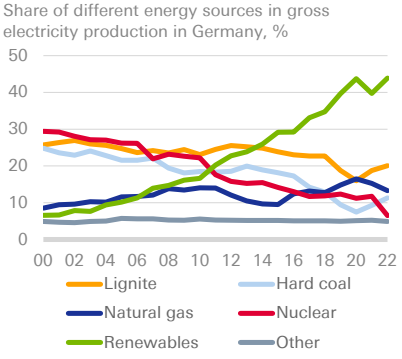
- Germany aims for climate neutrality by 2045. Key levers to reach this goal are a massive expansion of renewable energies and a stronger electrification of transport, industrial processes and of the heating sector. The German government has set itself concrete targets to be met by 2030.
- Installed capacity of onshore wind power is envisaged to rise to 115 GW by 2030. This equals an average additional growth of around 7 GW per year from 2023 to 2030, roughly 2 GW above the historic peak reached in 2017. For photovoltaics, the government targets an installed solar PV capacity of 215 GW by 2030. That translates into average gross capacity of 18.4 GW added per year from 2023 to 2030. The maximum of newly installed solar PV capacity reached in the past was 8.2 GW in 2012.
- The targets set for offshore wind power (30 GW by 2030 versus 8 GW today) electric heat pumps (6 m by 2030 compared to 1.5 m today), electric cars (15 m by 2030 vs. 1 m today), or charging points (1 m by 2030 vs. 80,000 in early 2023) are very ambitious, too. In our matrix we outline the bottlenecks currently hampering a speedy ramp-up for each sub-segment. These include lack of skilled labour, sufficient supply of raw materials and intermediate goods, dependency on imports, and financial constraints.
- Unless there is a significant acceleration in addressing all those bottlenecks, reaching the 2030 targets seems very challenging from today's point of view. Given the widening investment gap, investment spending (private and public) in all of these sub-segments will rise over the next few years (e.g. renewable energy generation, power grids and flexibility, district heating, energy efficiency and hydrogen infrastructure).
- Policymakers are well aware of the scope of the challenge and the "need for speed" in the transition. We currently see a raft of policy proposals being implemented or drafted (see accelerators in our matrix). While the impact of some policy measures is more immediate (e.g., fast-tracking permit procedures), the impact of others is likely to be felt more over the medium term (e.g., corporate off-take agreements leading to new wind farms being built or more production capacities for net zero technologies).
- Setting ambitious sub-sector targets provides a framework for future policy action. Germany is leading the way in the energy transition in various aspects: (i) involving all stakeholders in designing the future roadmap, (ii) roping in research institutes and the Agency for Disruptive Innovation to drive emerging green tech, (iii) open public debate about sharing the costs of the transition, and (iv) fostering cross-country interconnections (e.g., hydrogen pipelines) to raise import capabilities of green energies.

Figure 1: Germany aims for climate neutrality by 2045



Source: Federal Environment Agency, AG Energiebilanzen, Deutsche Bank Research

Figure 2: Renewables account for almost half of electricity production



Source: AG Energiebilanzen

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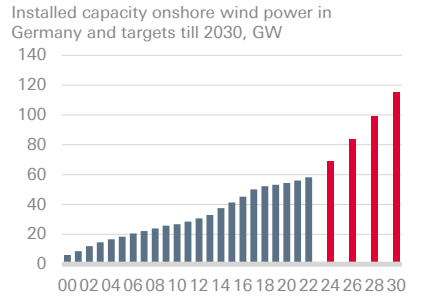
Germany aims to become climate neutral by 2045, five years earlier than the EU – the most ambitious climate target of any (large) country in the world. The key levers to achieve this goal are a massive expansion of renewable energies and a stronger electrification of transport, industrial processes and of the heating sector. Renewable energies (mainly wind power and solar PV) are set to account for 80% of gross electricity demand by 2030, compared to 46% in 2022. At the same time, power demand is expected to rise from around 555 TWh in 2022 to 680-750 TWh in 2030 because of the aim for a higher degree of electrification (an increase by at least more than one fifth). To achieve this goal, renewable power generation must increase massively with the German government having set concrete targets for installed capacity by 2030.

Onshore wind power

In 2022, onshore wind was the second-most important energy source in the German power market (behind lignite) and the most important renewable energy source. It had a share of 17.6% in gross electricity generation (lignite: 20.1%). According to the Federal Network Agency, onshore wind power reached 56.9 GW of installed capacity in mid-2022. This is equivalent to a share of 24.6% in total installed power generation capacity by this time.

The German government aims to expand the installed capacity of onshore wind power to 115 GW by 2030, with interim targets set for 2024, 2026 and 2028 (see figure). Assuming a linear increase and no retirement of existing wind power plants, that goal would equal an average additional growth of around 7 GW per year (2023-2030). That is roughly 2 GW above the historical peak reached in 2017 (4.9 GW additional capacity). The government does expect a non-linear expansion path, with a higher momentum in the second half of this decade. Moreover, some older wind power installations will reach the end of their lifetime before 2030. Thus, the gross addition of installed capacity needs to reach some 10 GW per year from the year 2025, double the historical peak. This translates into roughly 6 onshore wind power stations per day (assuming an average capacity of 4.5 MW per installation). For comparison: In 2022, some 1.6 new onshore wind power pants were installed per day. Thus, the speed to ramp up onshore wind power must be at least tripled compared to 2022 in order to reach the 2030 targets.

Figure 3: Onshore wind power: Installed capacity to rise to 115 GW by 2030



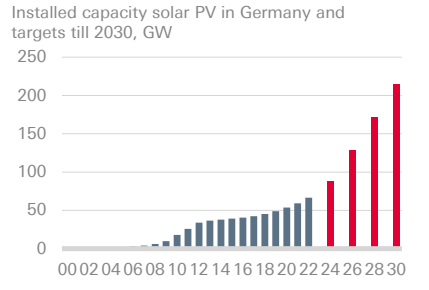
Source : BMWK, Federal Network Agency

Photovoltaics

Photovoltaics (PV) accounted for 10.4% of total German gross electricity generation in 2022, being the second-largest renewable energy source and the fifth overall. In terms of installed capacity, solar PV even had the largest share in the power market. All installations together reached roughly 63 GW by mid-2022, equalling 27% of total. Given the low full-load hours of solar PV, the discrepancy between the share in installed capacity and the share in actual power generation is usually very high. Solar PV had an average annual capacity utilisation of close to 11% last year (very low contribution to power supply during winter months). For comparison: Power plants based on lignite, which provide baseload power, had an average capacity utilisation of 71% in 2022. Their share in total installed capacity was 8% in 2022 but they accounted for 20.1% of total power generation.

The government aims to expand installed solar PV capacity to 215 GW by 2030. If we assume a linear expansion path and no dismantling of old installations, the average gross capacity addition would amount to 18.4 GW per year (2023-2030). Again, a higher momentum is targeted for the second half of the 2020s. A comparison shows how ambitious this target is: The historical record regarding the

Figure 4: Solar PV: More than tripling of capacity by 2030 intended



Source : BMWK, Federal Network Agency

growth of installed solar PV capacity was 8.2 GW in 2012. The average for the years 2020-2022 was 4.4 GW. The year 2022 was indeed a good year for solar PV with an increase of more than 7 GW. Still, this is less than half of the annual expansion necessary for the 2030 target.

Offshore wind power

Offshore wind power is quite a young energy source in Germany. It was not before the middle of the last decade that its contribution to power supply became measurable. The share of offshore wind energy in total German power generation stood at 4.4% in 2022. Installed capacity reached 7.8 GW by mid-2022. Due to higher and steadier wind level in coastal regions, offshore wind power registers a higher number of full-load hours compared to the other weather-dependent renewable energies. The average capacity utilisation of offshore wind farms reached 38% in 2022 (onshore wind power: 21%). This is an important advantage of offshore wind power since it reduces the problem of intermittency and seasonality of renewables.

The government targets offshore wind power of 30 GW by 2030. That translates into capacity of some 2.7 GW to be added each year. The maximum capacity added in the past was 2.3 GW in 2015. The average of the years 2015-2022, however, was just 0.9 GW per year (2022: +0.4 GW). Thus, a tripling of the average speed of expansion is necessary to reach the 2030 target.

Electric heat pumps

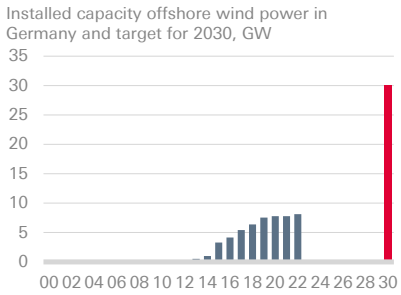
The German heating market is dominated by fossil fuels. In 2021, 49.5% of existing residential units were heated with gas, another 24.8% with oil. District heating, mainly based on fossil fuels as well, accounted for another 14.1%. Electric heat pumps reached a share of 2.8% for existing residential units in 2021. For new residential buildings, however, electric heat pumps have gained in importance during the last few years: They accounted for 43.6% in 2021 and more than 50% in 2022. Higher gas prices have contributed to the fast switch from gas heating systems to electric heat pumps in the new buildings segment. Given the long lifespan of buildings and heating systems, it (usually) takes decades for structural changes to materialize in the housing stock. The share of new homes in total stock of residential units was just 0.7% in 2022.

The German government aims to accelerate the ramp-up of electric heat pumps over the next couple of years. In 2022, the stock of installed head pumps stood at close to 1.5m. The target for 2030 is set at 6 m. This equals roughly 570,000 new installations of electric heat pumps per year until 2030. In 2022, a record number of 236,000 new heat pumps was installed, which means that more than a doubling of the speed of newly installed heat pumps would be required to meet the 2030 target.

Electric cars

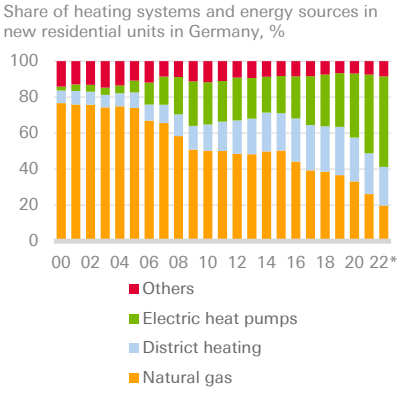
At the beginning of 2023, slightly more than 1 m battery electric vehicles (BEV) were registered in Germany (passenger cars only). This was an increase by 64% compared to early 2022. Still, BEVs account for just 2% in total existing passenger car fleet (30.6 m petrol-driven cars, 14.4 m diesel cars). The coalition treaty contains the goal to expand the number of fully electric passenger cars in Germany to at least

Figure 5: Offshore wind power: Speed of expansion must be increased



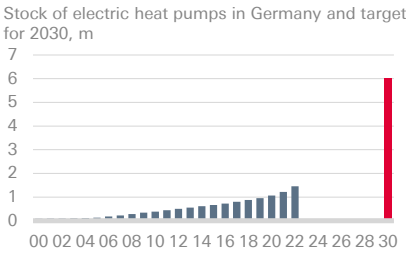
Source : BMWK, Federal Network Agency, German Wind Energy Association

Figure 6: Heat pumps taking the lead in heating market for new buildings



** January-May*
Source: BDEW

Figure 7: Nearly 600,000 electric heat pumps p.a. have to be installed



Source : Bundesverband Wärmepumpe

15 m by 2030. Leaving aside exports of used electric cars[1] or early retirements of BEV, this goal translates into 2 m newly registered BEV per year starting in 2023 (or even more new registrations later this decade if the number of new BEV remains below 2 m for some years to come). For comparison: In 2022, the number of total new passenger car registrations in Germany stood at 2.65 (thereof 471,000 BEV). Reduced subsidies for new electric cars from early 2023 on will – everything else being equal – dampen demand over the next few quarters.

Charging infrastructure

More public charging points are a prerequisite for the acceptance of electric cars. By early 2023, close to 81,000 public charging stations were installed in Germany (+21,000 or +35% yoy). The government aims to expand this number to 1 m by 2030. Thus, more than 131,000 new charging points would need to be installed on average each year to achieve this target – roughly six times the number of 2022.

Electrolysers to produce green hydrogen

The German government aims to build electrolyser capacities to produce (green) hydrogen in the size of 10 GW by 2030. In 2022, the existing capacity in Germany was well below 0.2 GW since hydrogen production has so far mainly been used for industrial processes. A study conducted by acatech and DECHEMA in 2022 finds that there is a large gap (5.7 GW) between expected electrolysis power and the 10 GW political target set for 2030.

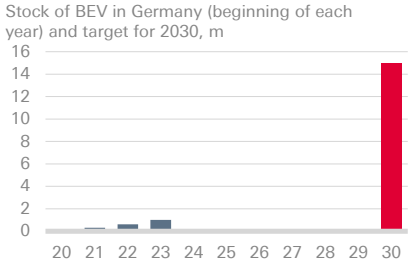
H2-ready gas-fired power plants

Germany aims to phase out coal-fired power plants (ideally by 2030). The last three nuclear power plants will go off the grid by mid-April. The Federal Government aims to build new H2-ready gas-fired power plants to fill the gap for times when the wind does not blow and/or the sun does not shine. Such power plants are also necessary to replace secured installed generation capacity based on coal and nuclear (which accounted for 40 GW in mid-2022, equalling roughly 50% of peak load). A sufficient number of new gas power plants is not being projected, though. The Federal Network Agency currently expects additional secured power generation capacity of 3.3 GW by 2025 only. At the same time, electricity demand is expected to rise by at least 20% by 2030 compared to 2022 (more electric heat pumps, e-mobility, electrification of industrial processes, digitization, etc.). If this gap cannot be closed within the next few years, some coal-fired power will most probably run longer than 2030 or remain in some kind of security reserve. The basic problem is that there is no cheap and large-scale power storage technology in sight (potential for pumped-storage power plants in Germany is exhausted). Thus, Germany will remain dependent on some traditional back-up power generation capacities even though their average capacity utilization will decline with additional renewable capacities entering the market.

2030 targets are difficult to reach, but energy transition will lead to massive investment spending

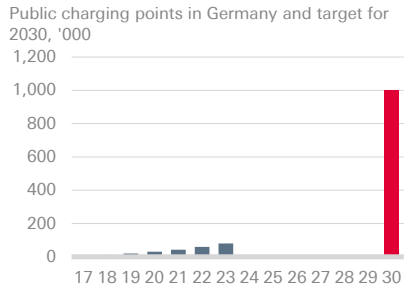
Looking at the charts in the previous section shows that the current speed of renewables' rollout, e-car uptake, heat-pump installations, and energy

Figure 8: Political goal: 15 m electric cars on German roads by 2030



Source : KBA

Figure 9: Aspiration for more charging points for e-mobility



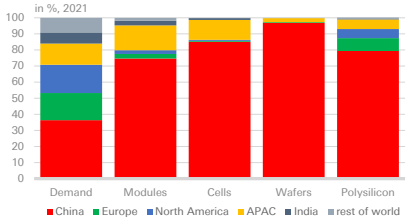
Source : Federal Network Agency

1 There has been a gap between cumulated new registrations of BEV since 2015 and the existing stock of BEV at the beginning of 2023 of more than 15%. This can be partly explained by the export of used electric vehicles after the minimum holding period of 6 months.

infrastructure build-up is by no means sufficient to reach the 2030 targets. In this section, we give an overview of the existing bottlenecks for reaching envisaged 2030 targets and then provide an update of current policy action aimed at mitigating those bottlenecks, both at the EU and national level. Unless there is significant acceleration in addressing all those bottlenecks, reaching the 2030 targets seems very challenging from today's point of view. As highlighted by the very recent report of the International Renewable Energy Agency, this is not only the case for Germany, but also holds true for the energy transition on a global scale. We summarize the scope of the challenge and drivers of acceleration in our policy matrix (see page 9):

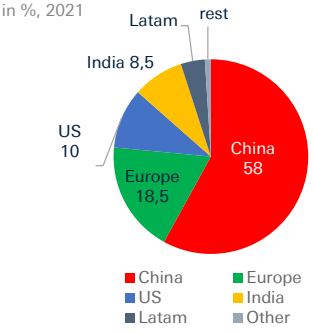
- **Lack of skilled labour:** This holds true for craftsmen (e.g., installation of heat pumps or solar power systems), industry workers (e.g., production of wind turbines, charging points, electric cars), engineers (R&D, planning), or employees in public authorities (planning and approval procedures). In 2022, several industry and craft associations estimated a lack of 190,000 skilled workers for the energetic refurbishment of buildings alone. Image campaigns (and wage increases) for craft trades, retraining and continuing education as well as the targeted recruitment of skilled foreign workers could alleviate the problem. This will take time, however.
- **Lack of sufficient supply of raw materials and production capacities for intermediate and finished goods:** Global demand for copper, nickel, lithium, cobalt and other "clean energy metals" will most probably rise faster than demand. Thus, prices are likely to trend upwards for the years to come. Germany and the EU aim to strengthen and expand partnerships with countries with large raw material endowments (see Critical Raw Materials Act below). Existing production facilities in the automotive industry must be retrofitted to produce electric cars. This process has already started. New sites are needed to produce charging points, batteries, equipment for solar PV or wind power. This requires an acceleration of planning and approval procedures.
- **Dependency on imports (not least from China) especially regarding solar PV:** This obstacle is related to the aforementioned. Germany is currently highly dependent on imports of processed clean energy metals and some green technologies. According to International Energy Agency (IEA), China is the largest producer of processed clean energy metals such as lithium, cobalt, or graphite with shares in world market of (far) more than 50%. It is also the largest producer of battery cell components and battery cells (global market share roughly 75% each). What is more, China's share in all manufacturing stages of solar panels exceeds 80%. While Germany has some production sites for photovoltaic modules or inverters, the country imports solar PV equipment mainly from China. According to the German Federal Statistical Office, China accounted for 87% of all German imports of solar power systems. Germany will not be able to expand solar PV capacity at home without imports from China in the short to medium term. Trade tensions between the EU and China would dampen the expansion speed of solar PV. Germany and Europe aim to expand the production of solar PV technologies in Europe (see Green Deal Industrial Plan below). If they succeed, they still will remain dependent on imports of raw materials to a certain extent. For wind power, dependency on imports is less pronounced since Europe/Germany have a fair share of production capacities. Still, China is the dominant player here as well, accounting for 58% of global wind turbine manufacturing capacity in 2020 (Europe: 18.5%).
- **Time constraints – bureaucratic hurdles:** Planning and approval procedures for new wind farms or factories are still very long even though

Figure 10: China dominates the global solar PV manufacturing capacity



Source: iea, Deutsche Bank

Figure 11: China dominates the wind turbine manufacturing capacity



Source: GWEC, Deutsche Bank

recent regulation aims to fast-track them (e.g., for wind farms). Local resistance against new projects (recent survey finds that NIMBY – not in my backyard – is an argument used by roughly one third of the survey participants) and delays during the construction phase cannot be ruled out.

- **Insufficient end-consumer demand – switch to electric cars and heat pumps:** It remains to be seen to what extent private households are willing and able to switch to electric cars or alternative heating systems. Ultimately, the final customer must be convinced of the advantages of new technologies and must be able to afford it. Even if the switch to new technologies is mandatory by regulation, private households might still decide to use their existing technology as long as possible (e.g., continued remedial maintenance of a gas or oil heating system instead of switching to an electric heat pump). Having said that, technological progress and economies of scale will most likely increase the acceptance of new technologies and bring down costs.
- **Uncertainty regarding the legal framework – especially with respect to H2-ready gas fired power plants:** The necessary construction of new H2-ready gas-fired power plants will depend on the regulation of the power market. With a further expansion of renewables, their market share in power generation will continue to increase. As the marginal costs of wind power and solar PV are close to zero, these weather-dependent renewables will always be fed into the grid first. Therefore, the average annual capacity utilization of the back-up power plants (natural gas) will continue to decline. Insufficient capacity utilization, however, will make it difficult for investors to create a business case for new gas-fired power plants when revenues can only be generated by electricity sales. Thus, the government could support the necessary investment by creating a capacity market where operators of power plants are rewarded for the provision of secured capacity.
- **Capacity of power (distribution/transmission) networks – high investment needs:** With a further electrification of the heating and mobility markets, the requirements concerning the capability of local power distribution networks will increase. An enlargement will become necessary in many regions or residential quarters, including (costly) civil engineering measures. In 2021, the Federal Network Agency estimated the investment needs in the power distribution network at EUR 47 bn by 2030. What is more, higher investment spending in power transmission networks is also necessary to connect new onshore and offshore capacities. A first draft strategy of the transmission grid operators published a few days ago shows that investment needs for the transmission network could amount to EUR 198 bn by 2037.

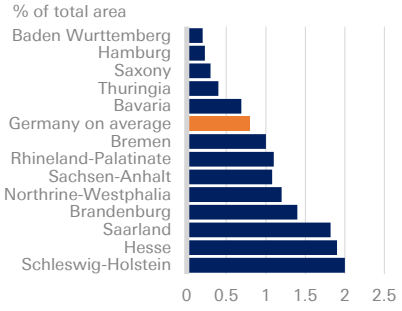
Strong policy momentum to speed up the energy transition – both at the EU and the national level

Policy makers are aware of the scope of the challenge and the "need for speed" with respect to the energy transition. Thus, we are currently seeing a raft of policy proposals being implemented or drafted (see our recent Germany Blog from March 16). While 2022 was all about security of supply, accelerating the availability of affordable green energy (while still safeguarding security of supply) has become a key policy goal in 2023. We aim to provide a short overview of what we regard to be the most relevant ongoing or upcoming legislative changes with respect to the energy transition. While the impact of some policy measures is more immediate (e.g., fast-tracking permit procedures), the impact of others is likely to be felt more over the medium term (e.g., corporate off-take agreements leading to new offshore wind farms being built).

Fast-tracking of permit procedures for renewable installations - implemented. At the EU level, on December 22 the EC adopted a regulation on accelerating the deployment of renewable energies, which have been declared as being of overriding public interest. Permit-granting periods will be limited to a maximum of either one, three or six months (e.g., for solar installations, electric heat pumps). The regulation will be valid for 18 months and is likely to (at least slightly) accelerate the roll-out of renewables. Germany already approved the national law implementing this fast-tracking in on March 3.[2] Currently, it takes four to five years from planning to licensing of a wind farm (see wind energy association).

German onshore wind strategy on April 19th – current PV and wind tenders draw little investor interest. On February 1, the "onshore wind energy law" came into force, which aims to expand onshore wind by a massive 10 GW a year from 2025. It details rules for using a minimum of 2% of the country's surface area for wind turbines. Given mandatory targets (and sanctions) for the states it is likely to accelerate reaching the 2% goal (see Figure 12).[3] But onshore wind investment had a slow start in 2023 (3210 MW on offer in February, undersubscribed with only 1502 MW bidded[4]). Last Wednesday EconMin Habeck presented a first draft of a detailed onshore wind strategy with the final strategy to follow on April 19th after consultations with stakeholders have been held. The main areas of discussion are (i) how can faster permit procedures be really implemented at the state / municipal level, (ii) discussion about bringing forward the 2% target of the country's surface area for wind turbines (currently set for 2032), (iii) easier financing conditions for PPAs, (iv) easier re-powering of old wind farms (potentially more than § 16b BImSchG currently allows), and (vi) solving issues with respect to the transport of wind turbines.

Figure 12: Lack of dedicated areas for wind power as major bottleneck

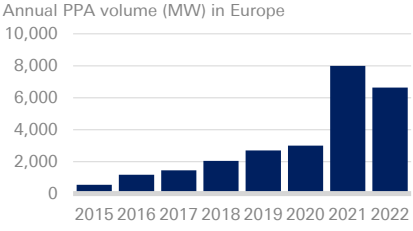


Source : BDEW/ EY Fortschrittsmonitor

German solar PV strategy – Solarpaket I and II presented to parliament before Pentecost. EconMin Habeck unveiled a draft PV strategy on March 20, aiming at both expanding ground-mounted and roof-mounted solar PV installations. Facilitating land use is the biggest accelerator for ground-mounted solar PV,[5] while increasing tenants' possibilities to install panels on the buildings they live in is the biggest lever for roof-mounted solar power.[6] The strategy is currently debated with stakeholders and set to be transformed into law and presented to parliament before Pentecost.

New EU electricity market design – good for predictability for investments in renewables. The recently unveiled proposal for the new design of the EU electricity markets is keeping what works by sticking to price signals in the short-term electricity market and not making wholesale power price caps permanent. In addition, it proposes to strengthen the role of long-term contracting to foster investments in renewable assets, either via corporate sector power purchase agreements or as a last resort, via two-way contracts for difference to be mandatorily used for investments in renewables and nuclear that need public support. However, given the current annual volumes of EU PPAs it seems unlikely that they will be able to deliver the necessary scale of investments (see Figure 13). After EU leaders endorsed the legal proposal at their summit on March 23/24, the

Figure 13: Are PPAs capable of delivering the necessary scale of investment?



Source : WindEurope

2 BDEW, EU Notfallverordnung vereinfacht Erneuerbaren Ausbau, March 2023
3 Wirtschaftsdienst, Flächenziele für die Windenergie, September 2022
4 Bundesnetzagentur - Presse - Ergebnisse der Ausschreibungen für Wind an Land und Solar auf Gebäuden und Lärmschutzwänden
5 Baunutzungsverordnung für PV-Anlagen in Gewerbe- und Industriegebieten
6 Solarbeschleunigungsgesetz and Entbürokratisierungsgesetz

legislative process (agreement between Council and parliament) could potentially be concluded by the end of the year.

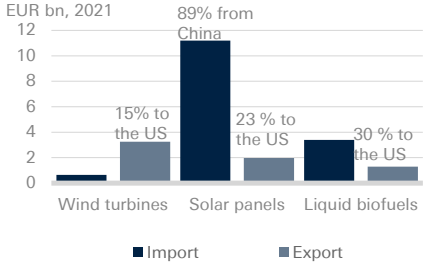
Heating sector – or how to bring down fossil fuel consumption quickly without sparking public unrest. The threefold legislative push of the "Building Energy Act", the "District Heating Act" and the "Energy Efficiency Law" is causing heated public debates with no full consensus reached after the end-March multi-day coalition meeting. According to a draft of the **"Building Energy Act"**, as of 2024, new heating systems must be operated by at least 65% with renewable energy – de facto banning new oil and gas-fired heating systems. Low- and middle-income households are to be supported with public funds with the volume of public support program yet to be decided (likely in the form of a mix of grants from the climate and transformation fund and tax credits). The final legislative proposal is set to be presented in the course of April. The **District Heating Act** aims to promote the expansion of district heating with a law currently being drafted. Thirdly, the draft of the **Energy Efficiency Law**, includes energy saving targets for public sector and obligations for industry to invest in certain energy efficiency measures and for data centres to connect to district heating networks.

New labour strategy to fill the estimated gap of 200,000 skilled workers. A recent study by KOFA estimates that for the ramp-up of solar and wind energy around 216,000 skilled workers (IT specialists, skilled electricians) are needed. After approving a new labour strategy in October the government presented a draft to amend its immigration law in February with business associations calling for easier immigration procedures for skilled workers. The solar industry association has signed an agreement to integrate Indian skilled workers at the end of February.

Fostering local production of net-zero technologies (solar, wind, batteries, etc.) to alleviate supply-side bottlenecks in the medium-term. The push for more local production of net-zero technologies might alleviate supply-side bottlenecks in the medium term, but creates the risk of retaliatory action by key trading partners (e.g. China) in the short-run. The USD 379 bn US IRA acted as a catalyst for more active green industrial policy in the EU and Germany with **several legislative proposals** revealed recently:

- In February, the EU Commission presented its overarching Green Deal Industrial Plan. The plan aims to provide a more supportive environment for scaling up the EU's manufacturing capacity for net-zero technologies and products.
- On March 9, the EU Commission **implemented the first part of the plan** by announcing the temporary and targeted relaxation of the EU's state aid rules. This allows member states to subsidize part of the investment cost in production capacities for sustainable technologies (batteries, solar panels, heat pumps, wind turbines, electrolysers, and carbon capture technologies, recycling capacities for critical raw materials). The maximum amount of aid is set at EUR 150 m per company in more prosperous and up to EUR 350 m per company in poorer EU regions.
- In addition, the **EU's** proposed **Net Zero Industry Act** set targets for green industrial capacities – 40% for own net-zero manufacturing capacity by 2030. Moreover, it **streamlines processes for green tech manufacturing projects** (one stop shops in each member state). It also includes regulatory sandboxes, proposals for European standards for low-carbon technologies and regarding public procurement and support. Overall, its focus lies on setting ambitious targets and not so much on tools to reach those targets.

Figure 14: The EU is a net importer of solar panels, but a net exporter of wind turbines

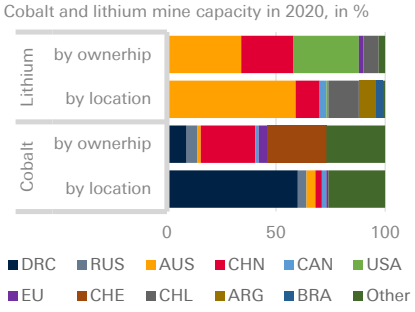


Source : Eurostat, Deutsche Bank

The legislative process (so-called trilogue between Council, Commission and European Parliament) could be concluded until the end of the year at the earliest. [7]

- EU Critical Raw Materials Act – **voluntary or mandatory joint purchasing?** The just proposed legislation sets voluntary targets for the EU's annual capacities along the strategic raw materials value chain – 10% for extraction, 40% for processing and 15% for recycling. Moreover, it proposes to speed up permitting for new mines (maximum of 2 years) and processing plants (maximum of 1 year), to set up a central buying agency for critical raw materials and to establish a critical raw materials club (see Figure 15). The legislation is envisaged to be approved by both, Council and European Parliament, before the next EP elections in May 2024.

Figure 15: EU's critical raw material supply depends on partnership with key mining countries



Source : EU JRC, Deutsche Bank

Figure 16: Germany's energy transition at a glance: scope of the challenge and drivers for acceleration

	Target for 2030	Status quo	Expansion last three years	Expansion needed to reach 2030 target	Has this speed ever been reached before?	Main bottlenecks	Regulatory action that might accelerate ramp-up
Onshore wind	115 GW	58 GW	1.7 GW p.a.	7 GW p.a.	No. Historic peak: 4.9 GW in 2017	Lengthy permit procedures, lack of dedicated areas	1.4% of land area to be dedicated to wind energy by 2026; faster permit procedures for the next 18 months
Photovoltaics	215 GW	67 GW	5.9 GW p.a.	> 18 GW p.a.	No. Historic peak: 8.2 GW in 2012	Skilled labour, supply of components, dependency on imports from China	Solarpaket I & II: Removing legislative barriers for ground-mounted and roof-mounted solar PV installations
Offshore wind	30 GW	8 GW	0.2 GW p.a.	2.7 GW p.a.	No, but close. Historic peak: 2.3 GW in 2015	Grid infrastucture, planning procedures	"Offshore Wind Energy Act" (early 2023) aims to accelerate planning and approval procedures
Electric heat pumps (stock)	6 m	1.5 m	166,000 units p.a.	570,000 units p.a.	No. Historic peak: 236,000 in 2022	Funding, especially financial constraints of private households, technical issues in older houses, skilled labour	"Building Energy Act", as of 2024, new heating systems must be operated by at least 65% with renewable energy
Electric cars	15 m	1 m	292,000 units p.a.	2 m units p.a.	No	Consumer demand (price, range, charging infrastructure)	Subsidies for electric cars have been reduced
Charging infrastructure	1 m	0,08 m	17,000 units p.a.	132,000 units p.a.	No	Lengthy approval procedures, uncertain business case, funding, capability of local distribution network	"Roadmap charging infrastructure II" (2022) aims to address bottlenecks
Electrolysers	10 GW	< 0.2 GW	< 0.05 GW p.a.	> 1.2 GW p.a.	No	Funding and questions regarding business case, complex large-scale projects	Different public support schemes as part of the "National Hydrogen Strategy", EU Innovation Hydrogen Bank

Source : Deutsche Bank Research

7 Bruegel, The Net-Zero Industry Act puts EU credibility at risk, March 17, 2023

Closing remarks

Germany is often criticized for having done too little for climate protection during the past decades. This is, of course, all a question of perspective. Germany managed to reduce CO_2 emissions by 37% between 1990 and 2022. During the same period, German GDP grew by almost 50% and its population increased by more than 5 m (+6.6%). This is quite impressive, not least in international comparison. It's fair enough to urge for more ambition. However, political actors always have to find a balance between different fields of action and take into consideration economic and social aspects. This is important to ensure overall societal acceptance of climate-policy measures – a truly difficult endeavor. We are optimistic that the current legislative actions will set the course for an acceleration of the green transition even though they might not be sufficient to reach the 2030 targets.

Appendix 1

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