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Back on the (climate) track

The quest for independence powers Germany’s energy transition

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EXECUTIVE SUMMARY

- The race to energy sovereignty sparked by Russia’s invasion of Ukraine could push Germany’s green transition well past the finish line. Despite the increased use of coal for electricity generation in the short term, the EU ETS will limit additional emissions, and coal is still on track to be phased out by 2030. In the medium term, Germany’s ambitious new targets should push the renewable energy share of its electricity mix even beyond what would be needed to meet the Paris climate goals by 2035.
- Achieving the target of a fourfold increase in renewable energy capacity requires a paradigm shift in core areas of the electricity system. Planning and approval procedures for renewable energy, electricity and hydrogen networks must be consistently simplified and accelerated. In addition, the infrastructure expansion for electricity, gas and hydrogen networks is in urgent need of coordination, which is unlikely to happen without an integrated system-development plan.
- The renewable expansion will provide a large economic stimulus: EUR40bn of value added per year until 2035 (1.1% in 2021 GDP) and 440,000 jobs in Germany alone.

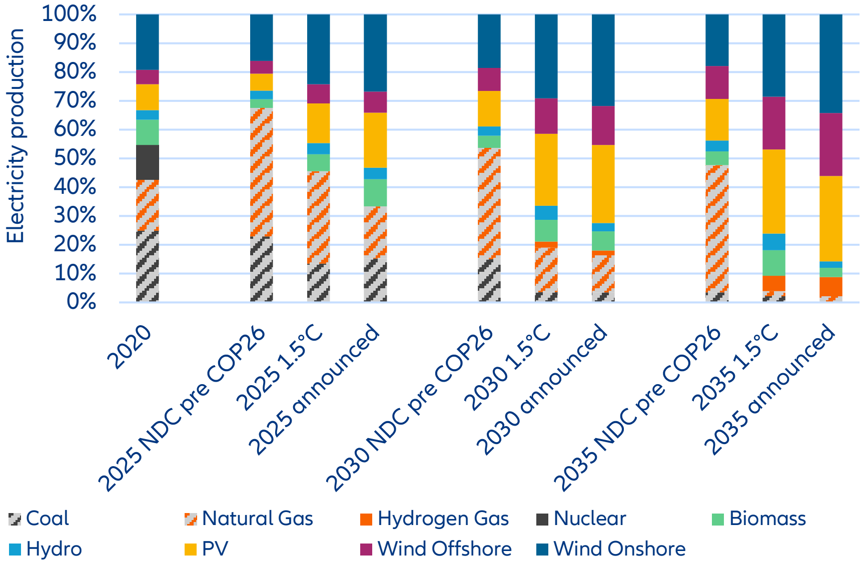
The race to energy sovereignty sparked by Russia's invasion of Ukraine could push Germany's green transition well past the finish line.

The looming threat of a suspension of gas imports from Russia has put Germany’s energy dependence in the spotlight. The short-term fix has been to rely more on coal for electricity generation, raising concerns about the country’s green transition going off track. However, this is unlikely for three reasons:

- More electricity generation by coal will not increase CO2 emissions in the EU as they are limited by the EU emission trading system (EU ETS). Additional coal usage will however increase CO2 prices in this system, leading to less CO2 emissions in other industries under the EU ETS.
- EU ETS prices will remain above levels that would allow coal to be competitive in the electricity market. Coal requires EU ETS prices below EUR60 while current prices fluctuate between EUR80-90 and are expected to rise further.
- The German government continues to be committed to phasing out coal by 2030, though this commitment is not legislated yet. Given the elevated EU ETS prices, it is very unlikely that coal will overstay its welcome as a substitute for Russian gas; it will be priced out of the market.

In the medium term, Germany's ambitious new targets aim for a more than fourfold increase in renewable capacities, which will accelerate the shift away from Russian gas. In Figure 1, the bars labeled as "announced" display how the electricity mix will evolve if the announced policy goals are achieved. In comparison, the bars labeled "NDC pre COP26" show the expected development of the electricity mix before the more ambitious transition targets that Germany submitted for the COP26 in Glasgow in the form of "Nationally Determined Contributions" (NDCs). Finally, the bars labelled "1.5°C" illustrate the development of the electricity mix for Germany that would be compatible with achieving the Paris climate goal of limiting climate change to 1.5°C. [1] The graph reveals a pleasant surprise: The silver lining of the energy crisis is that in its aftermath the 1.5°C goal might even be surpassed as the planned electricity mix for 2030 is very close (and even slightly more ambitious) compared to the necessary mix for 1.5°C. By 2035, Germany could have a substantially higher share of wind energy as well as hydrogen power plants than what would be necessary in the displayed 1.5°C scenario.

Figure 1: Planned energy-mix vs. 1.5°C requirements and "old" NDC targets



Sources: Agora, NGFS, Allianz Research.

What will it take to achieve a fourfold increase in renewable energy capacity by 2035?

The foundation to ramp up renewable energy capacity was laid out in the Germany's "Easter package"[2], which envisages green energy accounting for 80% of gross electricity consumption by 2030 (up from 42% now and a previous target of 65%). In addition, domestic electricity generation is planned to be nearly greenhouse-gas neutral by 2035. Germany is thus following the recommendation of the International Energy Agency (IEA) for a climate-neutral power supply by 2035, which was also jointly announced by the G7 at its latest meeting in Elmau, Germany.

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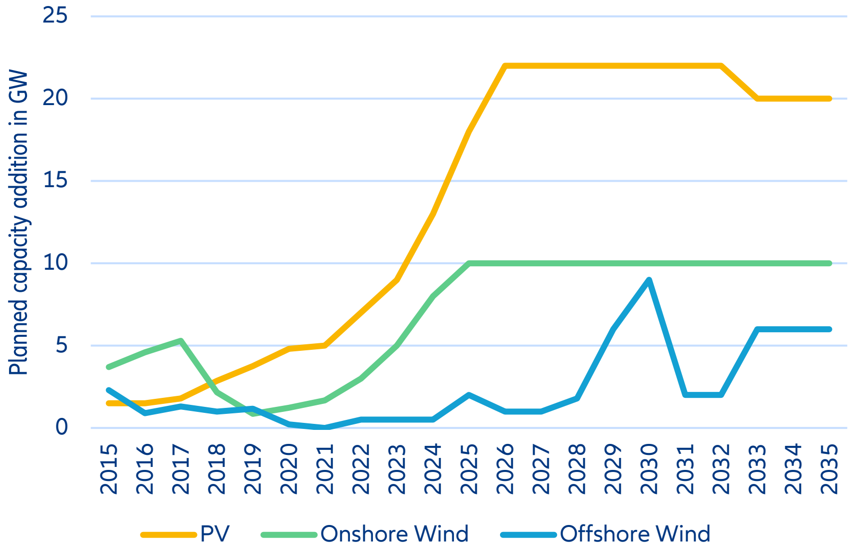
[1] *The development of the "announced" electricity production is derived from the results of "Agora Energiewende, Prognos, Consentec (2022): Klimaneutrales Stromsystem 2035. Wie der deutsche Stromsektor bis zum Jahr 2035 klimaneutral werden kann." The comparison pathways for "1.5°C" and "NDC" are derived from the NGFS pathways for Germany: www.ngfs.net.*

2 See our report Germany's Easter Package: Great green intentions.

Figure 2: Planned annual renewable energy capacity additions in Germany



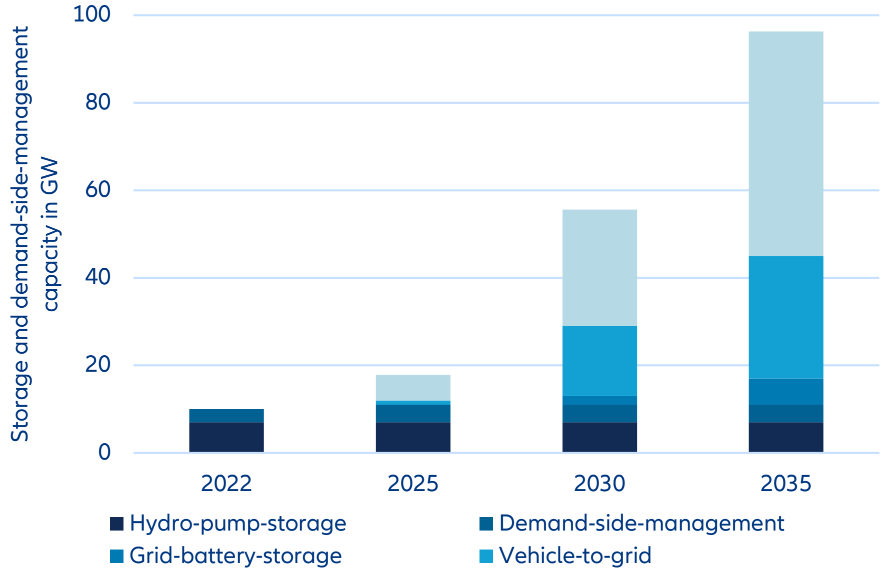
Source: Allianz Research.

These are without doubt ambitious targets. After all, assuming a gross electricity consumption of 750 terawatt hours (TWh) in 2030 – as electricity demand is set to surge due to the increasing electrification of industrial processes, heat and transport (sector coupling) – and in order to safely achieve the 80% expansion target, electricity generation from renewables will need to increase from just under 240 TWh at present to 600 TWh in 2030 and 875 TWh in 2035. This means that, in 2035, installed capacities will be close to 160GW for onshore wind (54GW in 2020), 60GW of offshore wind (8GW in 2020) and over 300GW for photovoltaics (PV, 54GW in 2020). Consequently, by 2035, the renewable share of electricity generation will be almost 90% while hydrogen will contribute another 7% of climate neutral electricity. At least on paper, one might be inclined to claim climate neutrality by then. Since Germany is expected to export more than 4% of electricity in 2035, the production of climate-neutral electricity will surpass domestic electricity consumption. Still, to integrate the increasing share of renewables, around 75GW of dispatchable capacity are required to fill the gap when renewables aren't generating. This includes biogas power plants and H2-ready natural gas power plants that will have to switch to using hydrogen as quick as the ramp-up of hydrogen production allows. In addition to the dispatchable power plants, close to 100GW of further flexibility services are needed, as outlined further below.

Figure 2 displays the German government's renewable expansion plan, which implies a massive frontloading of investments and accelerates the full transition of the electricity sector from the previous climate-motivated 2045 goal to a Ukraine-war-motivated 2035 goal.

However, achieving the target requires an essential paradigm shift in core areas of the electricity system. Planning and approval procedures for renewable energy, electricity and hydrogen networks must be consistently simplified and accelerated. With the emergency approvals and the already started construction of the still missing but necessary LNG infrastructure, the government has shown that this might be possible. In addition, the infrastructure expansion for electricity, gas and hydrogen networks is in urgent need of coordination, given the ambitious transition speed. This is unlikely to happen without an integrated system-development plan.

Figure 3: Flexibility capacity: Required storage and demand-side management



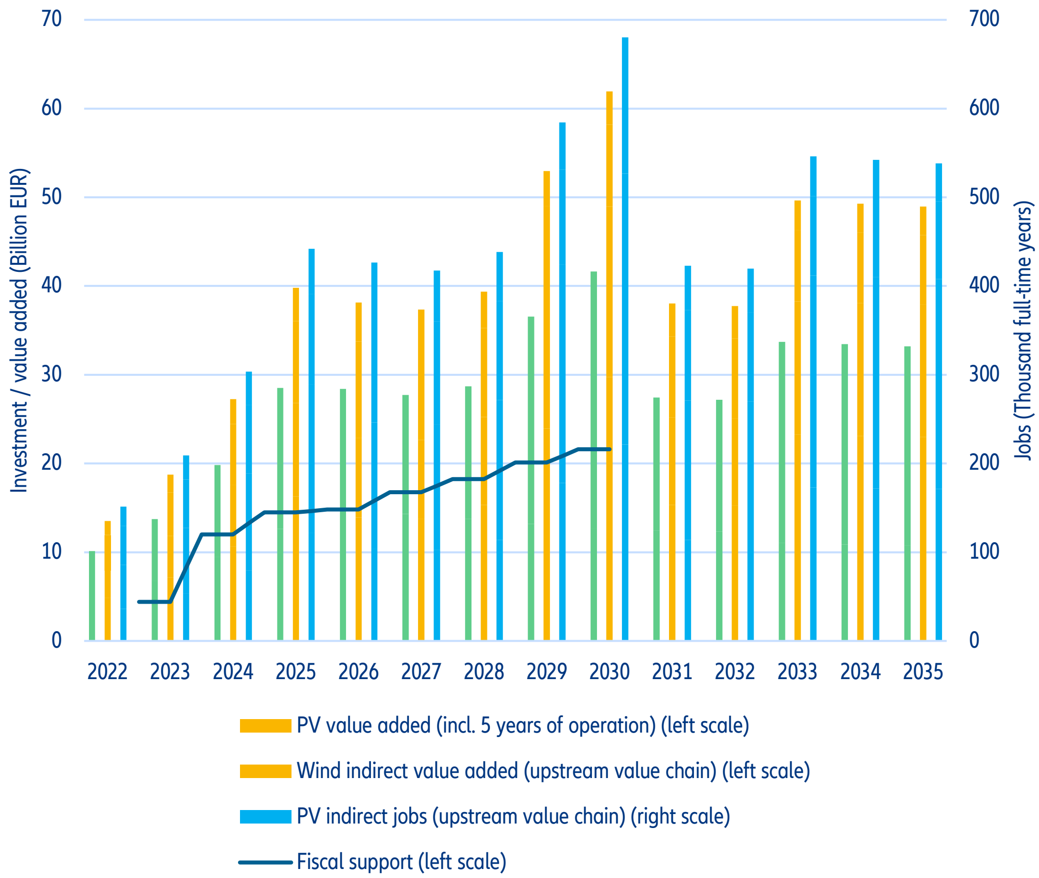
Sources: Agora, Prognos, Consentec, Allianz Research.

To complement the renewable expansion, and in addition to dispatchable power plants, flexibility providers need to increase their capacities to cope with the increasing volatility of electricity production caused by the intermittency of wind and PV. Flexibility services can react to low electricity supply by reducing their electricity demand or even reversing their flow and supplying electricity to the net. Flexibility capacity will need to increase tenfold from 10GW today to almost 100GW in 2035 (Figure 3). Attractive areas for system-friendly demand-side management include the charging of electric vehicles, generation of heat (operation of the 9mn heat pumps in 2035) and hydrogen production by electrolysers. Battery storage and pumped storage power plants already contribute to flexibility today, with batteries providing a huge potential for further expansion. The lion's share of battery capacity is not expected to come from large-grid battery storage, but rather from highly decentralized home-battery storage systems (coupled with rooftop PV) and electric vehicle batteries that are "sector-coupled" through bidirectional charging back to the electricity provision via vehicle-to-grid. Combined, batteries could provide about 90% of the needed flexibility capacity in 2035.

440,000 jobs: Germany's climate-neutral electricity system comes with an economic stimulus.

Germany's climate neutral electricity system comes with significant growth and employment benefits. As shown in Figure 4, until 2035, the expansion of the renewable electricity capacity alone requires average investments of EUR28bn per year (direct and indirect – the latter concerns upstream supply chains of the renewable energy investments). This will induce additional value added of EUR40bn per year, which is 1.4 times the investment or 2.7 times the fiscal support by the government. Meanwhile, the renewable expansion will employ an average of 440,000 workers in total from 2022-2035 (the figure shows the contribution of the respective year to the total in "full-time equivalent years"). However, this could be a blessing or a curse. If the economy remains weak, this will be a more than welcome economic stimulus. But if the economy moves back into bullish territory or the recovery of global supply chains doesn't keep up with the expansion, this could induce further price pressure on scarce resources, provoking inflation or even facilitating a wage-price spiral.

Figure 4: Economic stimulus of the renewable expansion



Source: Allianz Research.

Our analysis includes the near-term economic benefits for the first five years of operation of the installations. Their contribution to value-added varies between 37% for free field PV and 52% for offshore wind. The investment volume will surpass 1% of current GDP at the end of the decade and over the whole period, gross value added will contribute on average with more than 1% to economic growth[3]. A decomposition of the contributing factors into investment and operation as well as direct and indirect separated by wind and PV is included in the Annex. In Figure 4, the effects are shown in the year in which the expansion is currently planned in the legislation and in which the capacities are likely to be auctioned. In practice, these effects will be smoothed out over time.[4] The 440,000 jobs are calculated rather "conservative" and do only count the impact of the renewable expansion.[5] The actual contribution to GDP growth will likely be much larger than 1% per year.

[3] *See Annex for details.*

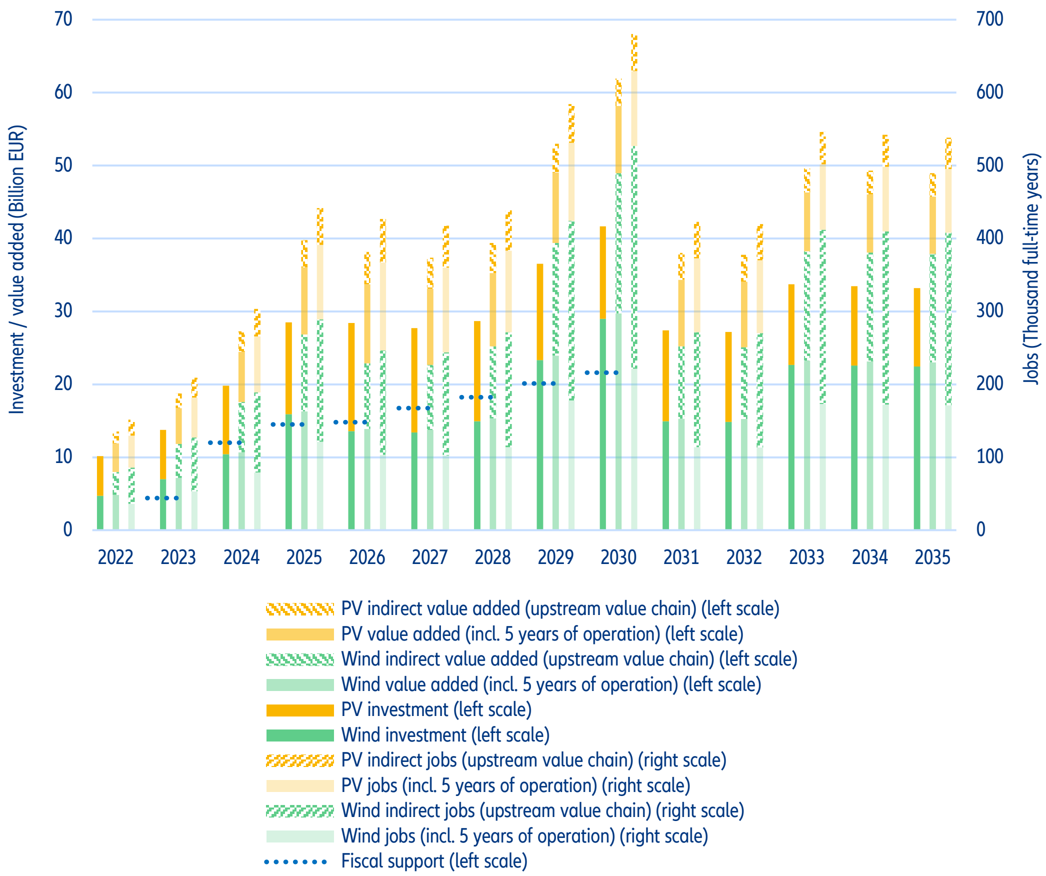
[4] *Several reasons support a smoothing in praxis. Firstly, projects are not necessarily realized right away in the year of the auctioning. Secondly, operation effects are by our definition spread out over five years.*

[5] *See Annex for details.*

ANNEX

The analysis in Figure 4 focuses purely on the core renewable technologies wind and PV; it does not include the further effects through the expansion of transmission networks and the electric vehicle fleet, charging infrastructure, heat pump installation, hydrogen production or the many other innovations that will help achieve the transition to a sustainable and sovereign energy system; Figure 5 illustrates the decomposition of the economic effects shown in Figure 4.

Figure 5: Decomposition of the economic stimulus of the renewable expansion



Source: Allianz Research.

The methodological approach for quantifying the economic effects is very similar in most studies and our approach is similar to e.g. BDEW (2020) "Konjunkturimpulse der Energiewirtschaft - Methodik und Ergebnisse einer Input-Output-Analyse einschließlich regionaler Effekte". Methodologies typically vary in the inclusion of the economic benefits for the operation of the installations as well as the inclusion of so-called induced effects on top of indirect effects. Unlike us, the BDEW study excludes operation benefits but includes induced effects and thus arrives at smaller effects than our study. Our methodological approach is therefore closer to Hirschl et al. (2010) "Kommunale Wertschöpfung durch Erneuerbare Energien" and Hirschl et al. (2015) "Wertschöpfung durch Erneuerbare Energien - Ermittlung der Effekte auf Länder- und Bundesebene", which include operating effects for 20 years and thus arrive at larger effects than our study. Arguably including just five years of operational benefits implies a rather conservative lower bound evaluation and including up to 20 years of operation benefits could be justified. In addition, our analysis does not include the benefits for the international suppliers which would further increase the value-added effects from a global perspective.

These assessments are, as always, subject to the disclaimer provided below.

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