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Article

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Mixed mid-term review for German traffic light coalition in the energy transition; significant effort needed to achieve targets

by Wolf-Peter Schill, Alexander Roth, Adeline Guéret, and Felix Schmidt

DIW focus

December 13, 2023 – The German traffic light coalition began its term two years ago with ambitious energy policy goals. Halfway through the legislative period, its track record is mixed. Good progress has been made in some areas, but in others a large gap between targets and the status quo remains. The *Ampel-Monitor Energiewende* by the German Institute for Economic Research (DIW Berlin) shows where we stand today in terms of key technologies for the transition to climate neutrality. This brief study first provides an overview of various indicators, followed by a detailed look at the dynamics of individual developments. While Germany is making good progress with photovoltaics, for example, the expansion of onshore wind power is currently well below the target path. Progress in electromobility is also clearly too slow. Overall, the pace of the energy transition must be significantly increased to meet Germany's climate protection commitments. However, if the government increases its efforts and acts consistently, the targets can still be achieved.

The swearing-in of Olaf Scholz as Federal Chancellor on December 8, 2021, marked the beginning of the current German government. In the coalition agreement, the so-called traffic light coalition (*Ampel* in German, referring to the three parties' colors of red, yellow, and green) promised to “bring new speed to the energy transition.”¹ In particular, they aimed to “make the expansion of renewable energies a central project of their government's work,” accelerate it “drastically,” and “remove all hurdles and obstacles.”

Shortly after the start of the legislative period, Russia's attack on Ukraine led to a natural gas and energy price crisis, resulting in a short-term shift of priorities in the German government's energy policy. In 2022, the focus was put on securing the supply of natural gas in particular² and easing the burden on consumers when it comes to electricity and gas prices.³

As the legislative period reaches its halfway point, we examine the state of the German energy transition. Following an **overview of the goals and the status quo** for a selection of relevant technologies,

¹ SPD, Grüne, FDP, *Mehr Fortschritt wagen. Bündnis für Freiheit, Gerechtigkeit und Nachhaltigkeit* (2021) (in German; [available online](#)). Accessed on November 11, 2023. This applies to all other online sources in this report unless stated otherwise.

² Franziska Holz et al., “Energieversorgung in Deutschland auch ohne Erdgas aus Russland gesichert,” *DIW Aktuell*, no. 83 (2022) (in German; [available online](#)).

³ Martin Kittel, Alexander Roth, and Wolf-Peter Schill, “Strommarkt erklärt: Preisbildung, Preiskrise und die ‘Strompreisbremse’: Ein Beitrag zur aktuellen Debatte über Eingriffe in den Strommarkt,” *DIW Politikberatung kompakt*, no. 184 (in German; [available online](#)); and resolutions of the coalition committee in September 2022 to relieve the burden on energy consumers (in German; [available online](#)).

we discuss the **dynamics of photovoltaics, onshore wind power, and electromobility** in greater detail. Further and continuously updated information can be found on the *Ampel-Monitor Energiewende* (Energy Transition Traffic Light Monitor) and the underlying *Open Energy Tracker*.⁴

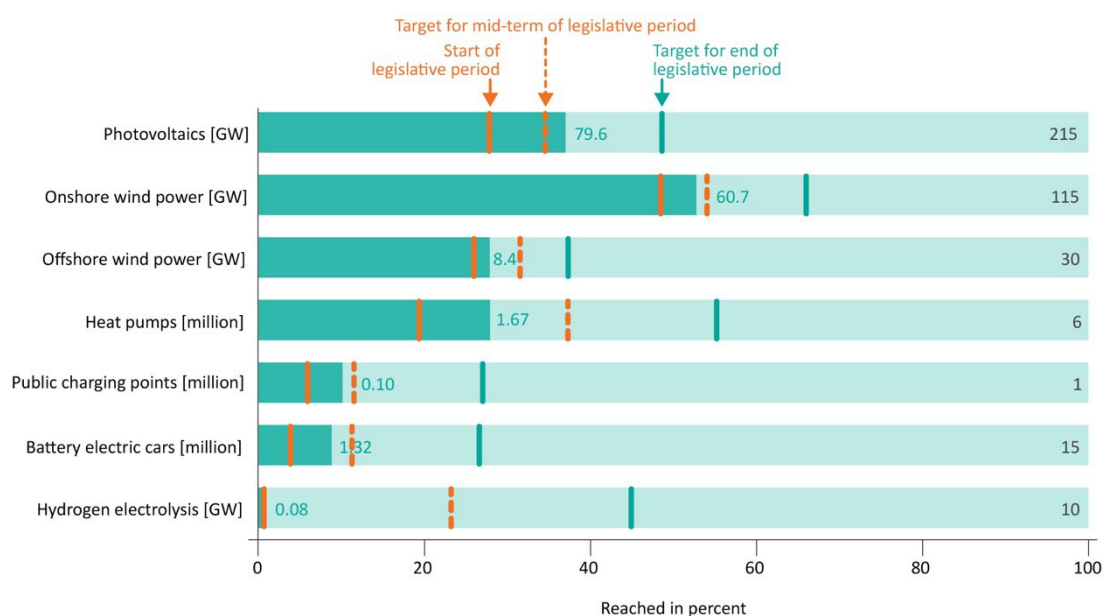
There is still a lot to do in all areas

The German government has set several quantitative targets for the energy transition focusing on renewable energy sources, energy efficiency, and greenhouse gas emissions. There are also qualitative targets for security of supply and affordable energy prices. This brief study discusses a few important indicators from the areas of renewable electricity and heat generation, electromobility, and green hydrogen. The respective targets are compared with the status quo (Figure 1).

Figure 1

Only photovoltaics has reached its target by mid-term; electromobility and hydrogen electrolysis have still a long way to go

Status relative to the targets for 2030 and the current legislative period for selected indicators of the energy transition



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To achieve the 2030 targets, considerable effort must be put into all indicators. Some indicators are still far from reaching their implied interim targets for the end of the legislative period. The development of electrolysis capacities to produce green hydrogen and the deployment of electric cars are particularly far behind. Naturally, the new government was not able to immediately go full throttle after years of relative stagnation as many projects require long planning and implementation times. For this reason, most targets include ramp-up periods.

Current **photovoltaic (PV)** capacity totals around 80 gigawatts (GW),⁵ which is 20 GW (or 33%) more than at the start of the coalition. By the end of the legislative period, the capacity is planned to be

⁴ See the [Ampel Monitor](#) and the [Open Energy Tracker](#). The development of these data tools and this publication were developed in the Kopernikus project Ariadne (Fkz 03SFK5N0-2).

⁵ The data for PV and wind power is from November 2023 and is based on data from AGEE-Stat and the Federal Network Agency; the data in the market master data register is, however, subject to uncertainties due to late registrations, among other things.

around 105 GW, which will then double again to 215 GW by 2030. The total capacity of **onshore wind power** plants is currently around 61 GW, which is only five GW (or nine percent) more than two years ago. By the end of the legislative period, the capacity is set to increase to just under 76 GW. Another 50% increase is planned to bring the capacity to 115 GW by 2030. Therefore, the current expansion in relative terms of onshore wind power is already closer to the target set for 2030 than the expansion of photovoltaics. The traffic light coalition's original expansion targets were somewhat lower⁶ and were only increased in the context of the natural gas and energy price crisis in 2022, from 200 to 215 GW (PV) and from 100 to 115 GW (wind power).

The expansion of **offshore wind power** has been very slow since 2020. Due to special conditions (land development, grid connections, offshore logistics), a particularly long lead time is required for new offshore wind farms. At the start of the coalition, the installed capacity was at 7.8 GW; since then, only just under 0.6 GW has been added. However, this expansion was already initiated many years prior. A significant expansion is planned to start from 2029.⁷ For this reason, over eight GW of new capacities were auctioned in 2023—roughly the same capacity that is currently installed in total. The winning bids not only did not ask for subsidies but actually paid large premiums to earn the right to develop their projects.⁸

In the heating sector, the government has set a target of six million **heat pumps** by 2030. Around 1.7 million heat pumps are currently installed, compared to just under 1.2 million at the beginning of the government's term. While the expansion has recently picked up significantly, the number of newly installed natural gas boilers surpassed the number of new heat pumps in the first three quarters of 2023.⁹ This is likely also a consequence of the long and controversial debate over the Buildings Energy Act (*Gebäudeenergiegesetz*, GEG).¹⁰ The coalition agreement originally provided that from January 2025 on, only heating systems powered by at least 65% renewable energy were allowed to be installed. In the wake of the energy price crisis, this start date was planned to be brought forward by one year. After lengthy discussions, the government agreed in the GEG to postpone this date until municipal heating plans would be available. Depending on the municipality, this means that the installation of purely gas or oil-fired heating systems is still permitted until June 2028 in some cases.

In the area of electromobility, the coalition has set itself a fleet target of 15 million **fully electric cars** by 2030. Currently, there are more than 1.3 million fully electric cars registered in Germany, which is around twice as many as at the start of the coalition (just under 0.6 million). Assuming a realistic (logistic, i.e., S-shaped) fleet growth, there should be around four million electric cars by the scheduled end of the legislative period. The traffic light coalition also wants to achieve one million **public charging points** by 2030. There are currently over 100,000 compared to just under 60,000 two years ago. The public charging infrastructure is currently growing at roughly the same rate as the fleet of electric cars.¹¹ However, the coalition agreement stipulated that the expansion of the charging infrastructure should “precede” demand.¹²

To produce green hydrogen, the traffic light coalition has set the target of achieving an **electrolysis capacity** of ten GW by 2030. At present, it is still below 0.1 GW, i.e., around one percent of this target. Furthermore, the capacity has barely increased over the past two years.¹³ However, the National

⁶ Cf. BMWK, *Eröffnungsbilanz Klimaschutz* (2022) (in German; [available online](#)).

⁷ Cf. Bundesamt für Seeschifffahrt und Hydrographie, *Flächenentwicklungsplan 2023* (2023) (in German; [available online](#)). For further details on the expansion path of offshore wind power and monthly additions, see the figure in the *Ampel-Monitor Energiewende* (in German; [available online](#)).

⁸ Bundesnetzagentur, *Ergebnisse der Offshore-Ausschreibungen aus dem dynamischen Gebotsverfahren* (2023) (in German; [available online](#)).

⁹ Cf. data from the *Bundesverband der Deutschen Heizungsindustrie* (Federal Association of the German Heating Industry) (in German; [available online](#)).

¹⁰ See episodes 7 to 9 of the *Ampel-Monitor Energiewende's* “fossilfrei” podcast (in German; [available online](#)).

¹¹ Much more information on electromobility is constantly updated on the Open Energy Tracker (in German; [available online](#)).

¹² Various measures to expand the charging infrastructure were taken by the coalition committee in March 2023 (in German; [available online](#)).

¹³ A new chlor-alkali electrolyzer, in which hydrogen is only a by-product, was not included. No increasing expansion path was defined for electrolysis expansion, so a uniform expansion from the end of 2021 to 2030 is assumed for the figure.

Hydrogen Strategy, published in mid-2023, created a new framework for the simultaneous ramp-up of hydrogen supply, demand, and infrastructure, which includes tenders for electrolyzers.¹⁴ Various new measures were also enacted, such as the construction of a hydrogen core network and the ramp-up of hydrogen imports.

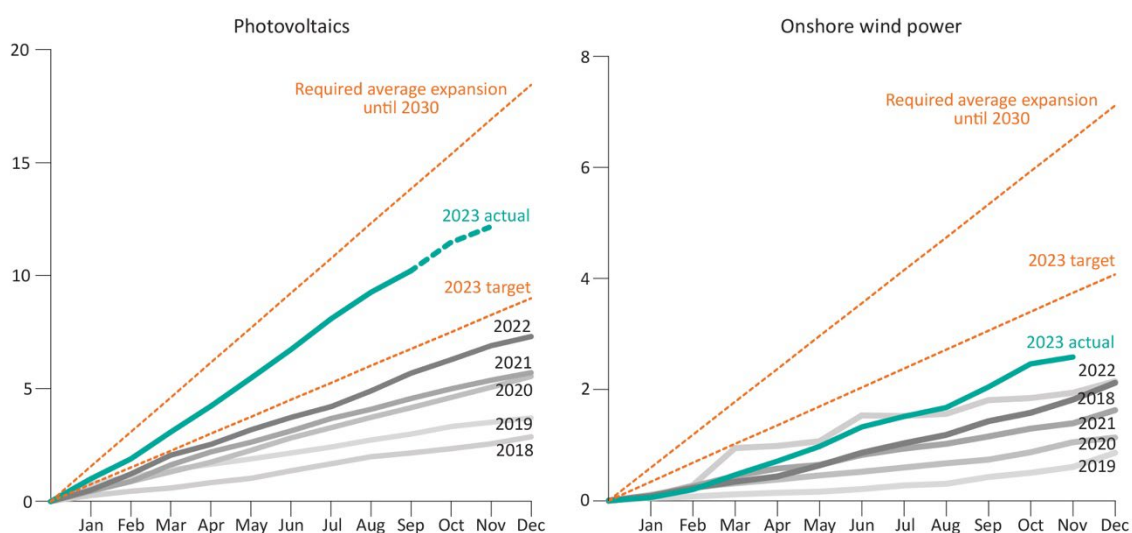
Positive development in photovoltaics, weak momentum in onshore wind power

The pace of expansion in photovoltaics is currently particularly high and well above plan (Figure 2, left).¹⁵ The expansion target for 2023 was already reached in August and this year's expansion dwarfs the additions of previous years. However, importantly, this pace is still well below the average that is required to achieve the 2030 target (around 18 GW per year), as the government's expansion targets increase from year to year. In terms of land use, the government is aiming for the further expansion of PV to be supported in equal parts by larger ground-mounted systems and smaller systems on buildings.¹⁶ However, the expansion is currently being driven primarily by relatively small rooftop systems, which are subsidized by feed-in tariffs and self-consumption benefits.¹⁷

Figure 2

Photovoltaics already reached its target for 2023 in August, while onshore wind power will miss it

Monthly net additions 2018–2023 and average additions required to achieve the targets by 2030



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Onshore wind power is showing significantly weaker momentum. The expansion is currently well below the target path and just slightly above the level of the previous year (Figure 2, right). A significant increase is required to achieve the targets, particularly considering the required average net expansion of around seven GW per year to reach the 2030 target. Considering long planning and approval periods for new wind farms, achieving that target appears uncertain. Whether the target will be reached also depends on how quickly the various measures to designate new areas and to speed up

¹⁴ Cf. Martin Kittel et al., "National Hydrogen Strategy: Clear Focus and Consistent Implementation Necessary," *DIW Weekly Report*, no. 40-42 (2023): 269-278 ([available online](#)).

¹⁵ The net expansion in PV at the current margin (October and November 2023) is subject to uncertainty due to late and incorrect reports in the market master data register.

¹⁶ Cf. BMWK, *Photovoltaik-Strategie* (2023) (in German; [available online](#)).

¹⁷ Cf. further illustrations of PV expansion by size class and type of subsidy (in German; [available online](#)).

the approval processes, some of which the coalition initiated together with the federal states, take effect. Nevertheless, there is currently a positive trend in new approvals.¹⁸

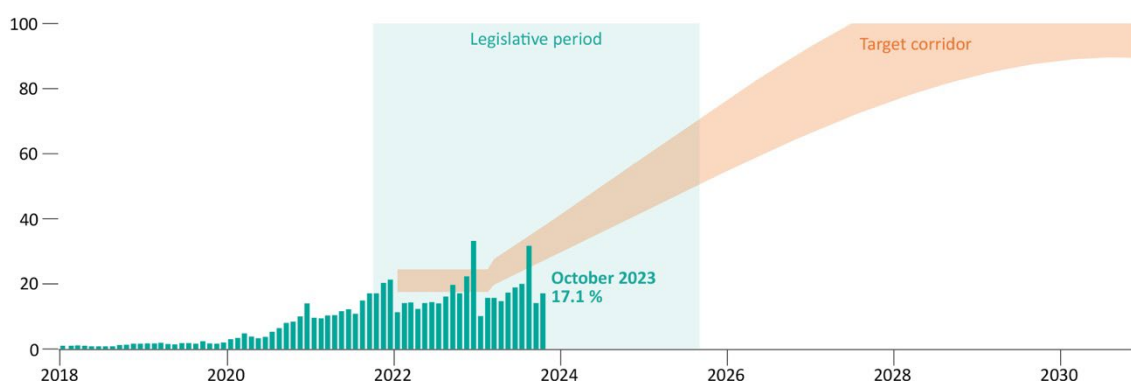
Growth in electric cars picks up slightly, but is still too slow

The share of battery electric cars in new registrations has risen significantly in recent years. However, there have also been strong monthly fluctuations due to changes in fleet limits or subsidy measures (Figure 3).

Figure 3

New electric vehicle registrations are on the rise but are behind target corridor

Share of battery-electric passenger cars as a percentage of new registrations and target corridor for 15 million vehicles in 2030



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Since the beginning of the coalition, battery-electric vehicles have had an average share of new registrations of just over 17%, which is slightly below a realistic, necessary target corridor.¹⁹ By the end of the legislative period, this share must roughly triple to achieve the fleet target of 15 million electric cars by 2030. This already considers electric car disposals. Recently, a significant number²⁰ of relatively new electric cars have been exported to other countries, presumably partly as a windfall effect of the relatively high purchase premiums in Germany. Reasons for the limited growth of the electric car fleet include the still restricted range of models; various incentives for purchasing cars with combustion engines or hybrids in the important commercial new car segment; and, in some cases, less attractive new car prices in some segments. In addition, some leading politicians are not communicating on the topic clearly, raising expectations in parts of the population about possible future use of hydrogen or e-fuels in the passenger car sector. However, these expectations appear extremely implausible from both a market and an energy system perspective.²¹

Mixed conclusion: a lot has been initiated, but steady implementation is crucial

Overall, a mixed picture emerges after two years of the new traffic light coalition. On a positive note, many of the goals of the coalition are significantly more ambitious than those of previous federal governments, in particular the expansion paths for photovoltaics and wind power formulated in the

¹⁸ Cf. Fachagentur Windenergie an Land, *Monatliche Genehmigungen* (2023) (in German; [available online](#)).

¹⁹ The corridor in Figure 3 represents the uncertainty about annual new registrations, which are assumed to lie between 2.5 million (upper bound of the corridor) and 3.5 million (lower bound).

²⁰ In the last two years, an average of around 20 percent of new monthly registrations of electric cars were deregistered. These vehicles can only have been a few years old at most.

²¹ While e-fuels and hydrogen are likely to remain scarce and therefore expensive for a long time to come, practically all relevant car manufacturers have now largely abandoned the fuel cell. There are currently only around 2,000 fuel cell cars in Germany and there are virtually no opportunities to purchase new vehicles.

Renewable Energy Act. While some targets were raised once more during the natural gas and energy price crisis, other energy policy priorities shifted to the short term.

In view of the long planning and implementation times for many technologies, major expansion successes cannot yet be expected in all areas after just two years. Current developments in photovoltaics are encouragingly dynamic. As the expansion of PV is currently being driven primarily by smaller, self-consumption-oriented rooftop systems, their efficient integration into the electricity system should be given higher priority in future energy policy. In the case of onshore and offshore wind power, it is important to consistently implement the various measures that have been initiated to increase the amount of available land and to speed up planning and approval procedures as well as to remove any remaining hurdles. For space heating, the aim must be to avoid further transition delays through fact-oriented and clear communication maintaining high installation rates for heat pumps and ending the installation of fossil-based heating systems as soon as possible. The same applies to the area of electromobility, where the share of new registrations of vehicles with combustion engines must fall more quickly. Although there are currently hardly any concrete plants for green hydrogen, the pace of infrastructure planning and development is comparatively high. Here, too, it is now a matter of consistent implementation, focusing on the use of hydrogen in areas of application that are otherwise difficult to electrify.

Overall, the motto is “keep at it.” If everything that has been initiated in the first half of the legislative period is consistently pursued in the second half, it should be possible to achieve the targets that have been set. Unfortunately, the current financing difficulties of the Climate and Transformation Fund are hampering these efforts. An efficient and needs-based use of funds is therefore more important than ever. Only consistent government action and convincing, objective communication can put the energy transition on a path to achieving the overarching goal of climate neutrality by 2045.

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