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Assessment of the draft updated National Energy and Climate Plan of Germany

Accompanying the document

COMMISSION RECOMMENDATION

on the draft updated integrated national energy and climate plan of Germany covering the period 2021-2030 and on the consistency of Germany's measures with the Union's climate-neutrality objective and with ensuring progress on adaptation

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1 SUMMARY

1.1 Overview of key objectives, targets and contributions in the draft updated NECP

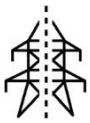
The European Green Deal, the fast-evolving geopolitical context and the energy crisis have led the EU and its Member States to accelerate the energy transition and set more ambitious energy and climate objectives, including objectives to diversify energy supplies. These developments are reflected in the legislative framework adopted under both the Fit for 55 package and the REPowerEU plan.

Germany's draft updated national energy and climate plan ('the draft updated NECP' or 'the plan'), submitted on 3 November 2023, partially takes into account this new geopolitical and legislative framework.

Table 1: Summary of key objectives, targets and contributions of Germany's draft updated NECP

		2020	Progress based on latest available data	2030 national targets and contributions	Assessment of 2030 ambition level
	Binding target for greenhouse gas emissions (GHG) compared to 2005 under the Effort Sharing Regulation (ESR) (%)		2021: -16.5% 2022: -19.4%[1]	-50%	NECP: -34.6%
	Binding target for net greenhouse gas removals under the Regulation on Land Use, Land Use Change and Forestry (LULUCF)		Reported net emissions of 4 Mt CO_2 eq. in 2021 and reported approximated net emissions of 1.8 Mt CO_2 eq. in 2022	Additional removal target -3.751 Mt CO_2 equivalent in 2030 of –30.84 Mt CO_2 eq.	Based on the latest revised inventory data Germany is projected to comply with the national 2030 target
	National target/contribution for renewable energy: Share of energy from renewable sources in gross final consumption of energy (%)	19.09%	2021: 19.17%	40%	Germany's contribution of 40% is slightly below 41%, as required pursuant the formula set out in Annex II of the Governance Regulation
	National contribution for energy efficiency:				
	Primary energy consumption	276.60 Mtoe	2021: 268.69 Mtoe	193,637 ktoe	Germany's primary energy consumption contribution is 193,637 ktoe. EED recast Annex I

[1] The ESR emissions for 2021 are based on final inventory data and for 2022 on approximated inventory data. However, the final ESR emissions for 2021 and 2022 will only be established in 2027 after a comprehensive review.

					formula results: 194,230 ktoe
	Final energy consumption	194.30 Mtoe	2021: 209.88 Mtoe	160,533 ktoe	Germany's final energy consumption contribution is 160,533 ktoe. EED recast Annex I formula results: 155,953 ktoe
	Level of electricity interconnectivity (%)	11.4%	11.2%	15%[2]	

Source: Eurostat; Germany's draft updated national energy and climate plan

1.2 Summary of the main observations[3]

Germany submitted its draft updated NECP more than three months after the deadline of 30 June 2023[4]. Therefore, the European Commission had limited time to draft its assessment in this Staff Working Document, in order to enable Germany to submit its final draft updated NECP by the legal deadline of 30 June 2024.

The draft updated plan refers to the revised energy and climate targets recently agreed under the **Fit for 55** package and the **REPowerEU Plan.** However, it does not sufficiently elaborate on how these targets will be effectively reached.

Regarding the **reduction of greenhouse gas emissions under the Effort Sharing Regulation**, the plan provides emission projections demonstrating that with existing policies and measures Germany is not on track to meet its national greenhouse gas target of -50% in 2030 compared to 2005 levels. According to Germany's projections, there is a gap of 15.4 percentage points, highlighting the need for more ambitious climate action. Germany did not provide ESR projections for the "with additional measures" (WAM) scenario in the plan but according to Germany's WAM projections submitted in March 2023, there is a gap of 9.9 percentage points.

On **LULUCF**, the draft updated plan indicates that Germany will not meet its 2030 target. However, when taking into account the latest revised inventory data, Germany appears to be on track, thus making a full assessment of the EU target complex. In addition, the draft does not provide a clear implementation timeframe, nor a quantification of the impacts of specific policies and measures. It also lacks information on the status and progress in

[2] Calculated by the European Commission based on the ETNSO-E data (Winter Outlook 2022-2023). The 2030 level represents the general interconnectivity target of 15%. The level of ambition cannot be assessed, because the actual 2030 interconnectivity levels will depend on the implementation of the planned interconnectors and changes in the generation capacity. The 2020 figure covers also interconnectors with the neighbouring countries outside the EU.

[3] In addition to the notified draft NECP, this assessment also considers informal bilateral exchanges, which are part of the iterative process established under the Governance Regulation.

[4] Article 14 (1) of Regulation (EU) 2018/1999 on the Governance of the Energy Union and Climate Action OJ L 328, 21.12.2018, p. 1–77.

ensuring higher tier levels and geographically explicit datasets needed to ensure the robustness of net removal estimates.

On **Carbon Capture Utilisation and Storage (CCUS),** the plan does not identify the amount of annual CO_2 emissions that can be captured. Since CO_2 storage is currently prohibited by law in Germany, no domestic geological CO_2 storage capacity has been identified. Germany is aiming at cross-border cooperation in view of storing captured CO_2 in the North Sea. The plan does not foresee the deployment of any dedicated CO_2 transport capacities.

The draft updated plan reflects limited progress towards **international commitments under the Paris Agreement**. Germany commits to phase out coal-fired electricity generation only in 2038, while lignite will be phased out by 2030. Moreover, the plan mentions the phasing out of fossil fuel subsidies without indicating a precise and credible timeline.

Regarding **adaptation to climate change**, the draft updated NECP does not contain adequate analysis of the relevant climate vulnerabilities and risks for the achievement of the national objectives, targets, and contributions, nor the policies and measures for the individual dimensions of the Energy Union. For instance, the NECP does not specify any climate risks for land carbon sinks, nor does it describe and quantify how the proposed nature-based solutions are expected to reduce such risks. The link to the specific Energy Union objectives and policies, which adaptation policies and measures should support, is not specified and quantified. Adaptation policies and measures, to support Germany´s achievement of national objectives, targets and contributions under the Energy Union, are not properly described in terms of their scope, timing and expected impacts. More specifically, there is no reference to the resilience of energy systems, to structural or seasonal water scarcity, or to innovative approaches such as insurance policies and fiscal measures addressing the climate protection gap.

For **renewable energy**, Germany's draft updated NECP presents a contribution to the overall EU target of 40% of renewables in national gross final energy consumption. This is slightly below the share of 41% resulting from the formula in Annex II of Regulation (EU) 2018/1999 on the Governance Regulation of the Energy Union and Climate Action ('Governance Regulation'). The draft updated plan does not include trajectories for renewables in the electricity, transport and heating and cooling sectors. In addition, no trajectory for renewable fuels of non-biological origin (RFNBO) including for advanced biofuels in transport is provided. However, Germany indicates that these trajectories will be included in the final updated plan as per Directive (EU) 2018/2001 on the promotion of energy from renewable sources as amended by Directive (EU) 2023/2413 ('revised REDII'). The draft updated NECP includes a list of measures that Germany has adopted or intends to adopt to support the deployment of renewable energy, but it provides little information on the expected impacts of these measures.

On **energy efficiency**, the German draft updated NECP is **comprehensive, ambitious, informative and detailed**. The increased ambition in Directive (EU) 2023/1791 on energy efficiency and amending Regulation (EU) 2023/955 ('EED recast') has been taken into account, in particular for the 2030 energy efficiency targets, as well as for the energy savings obligation. It includes national contributions to the EU's 2030 energy efficiency targets of 160.5 Mtoe for final energy consumption, and of 193.6 Mtoe for primary energy consumption with measures covering a wide range of demand sectors.

The '**energy efficiency first' principle** is mentioned as the basis for planning considerations in the draft updated NECP, but it still needs to be spelled out in terms of policies and measures. The draft updated NECP puts forward a set of comprehensive planned measures addressing all sectors, including buildings, transport and business sectors. However, a sufficient level of detail on expected savings such as the contribution to the energy saving obligations and the energy efficiency targets is not provided and the information on the public sector obligations is missing as well as information on financial needs and funding sources.

On **buildings**, the draft updated NECP does not set out more ambitious targets than those included in the German 2020 long term renovation strategy (LTRS), but briefly recalls some of its elements. Germany will present a revised strategy within its final updated NECP and plan prepare its Building Renovation Plan as foreseen by the upcoming revision of the Directive (EU) 2010/31 on the Energy Performance of Buildings ('EPBD'). The draft updated NECP includes some economic, fiscal and educational policies and measures, including the recent building energy law ('Gebäudeenergiegesetz') on heating and the support scheme for building renovations. Nevertheless, the individual saving impacts of each measure are not quantified.

On the **energy security** dimension, the draft updated NECP sets out targets and policies to enhance the national security of gas, electricity and oil supply. Specifically in the **gas sector,** the plan mainly highlights the measures that have allowed Germany to compensate for the declining gas flows from Russia during the past year, and thereby significantly reduce its dependence on Russia. The draft updated NECP does not envisage any additional objectives to further diversify gas supply. According to the plan, a relatively high number of import routes is already available, bolstered by the recent additions of liquefied natural gas (LNG) infrastructure and the existence of cross-border infrastructure with all of Germany's neighbours. The plan lacks a clear description of the implemented gas demand reduction measures and how these measures are integrated in the medium-term planning towards 2030.

The draft updated NECP considers security of **electricity** supply in light of renewable generation expansion, increased demand from electrification and the phase-out of nuclear and coal power. The plan mainly emphasises the need to strengthen the European internal market, while security of supply is nevertheless reviewed continuously, with a 'roadmap for system stability' expected at the end of 2023 for instance. While the draft updated NECP acknowledges the increasing flexibility needs in the electricity system, it lacks a specific measurable target for energy storage. In the **oil sector**, the plan contains a specific forecast of oil consumption by 2030, 2040 and 2050 but fails to assess the adequacy of the oil infrastructure in the long run (refineries, oil stocks) with the expected oil demand decline.

The draft updated NECP notes a series of policy objectives and processes related to the **internal energy market**, especially related to addressing the current structural congestion within the German-Luxembourgish bidding zone against the background of an increasing share of renewable electricity production. The draft updated NECP sets out on-going and planned reinforcements of the **grid infrastructure** both internally and with neighbouring countries. While the draft updated plan integrated the crucial need to enhance flexibility and demand response, and mentions the importance of sector coupling, the plan remains general on this issue and does not provide clear targets or supporting policies and measures.

The plan details measures to ensure **consumer protection,** which encompasses transparency, right to energy, dispute settlements, and right to information. Information campaigns focus on structural measures that may help consumers decrease their bills, such as energy efficiency measures, or at making their behaviour more energy efficient. Germany also plans to significantly accelerate and update the smart meter rollout until 2030, also in the gas sector. However, the plan does not include comprehensive information on the decentralisation efforts in energy market, nor on the role of energy communities or energy sharing.

On **energy poverty**, the draft updated NECP provides a good overview of the social policy measures currently in place to support vulnerable consumers and energy poor households, including price and income support schemes, support for tenants and the housing benefits. Provision of household benefit, and namely the addition of the so-called climate and heating component, gives some insight into the number of vulnerable households affected by energy poverty. However, a specific target and timeline to address these groups is not included in the plan. The draft updated NECP does not explain how the structural energy efficiency measures envisaged under Germany's 2020 Long-Term Renovation Strategy could target vulnerable households in energy poverty.

As regards the **research, innovation, competitiveness and skills** dimension, the draft updated NECP presents in a general manner policies, support programmes on energy, as well as the funding sources linked to climate and energy. The plan does not provide operational details on the planned research and innovation (R&I) actions in the energy sector, such as priorities and objectives for R&I coupled with financial allocations or funding targets, and implementation milestones that could demonstrate quantitative pathways to reaching the 2030 and 2050 objectives for energy. The draft updated NECP includes some measures to support competitiveness of clean energy technologies and the manufacturing, scaling up and diversification of commercially available clean energy technologies, equipment and components. Nevertheless, the plan lacks information on concrete measures and investments to overcome the identified skills gaps.

Just transition is only partially addressed in the draft updated NECP. The plan provides limited information on social, employment and skills impacts, including distributional impacts, of the climate and energy transition. Moreover, it does not elaborate on the measures addressing access and preservation of employment and education and training in the context of the transition, neither in the coal regions nor more broadly. In addition, the draft updated NECP does not explain the resources specifically devoted to supporting a just transition beyond coal regions. Finally, the plan does not provide sufficient information for the preparation of the Social Climate Plan and how the consistency of the two plans will be ensured. On its **strategic alignment with other planning tools**, the draft updated NECP poorly covers the implementation of most of the investments and reforms included in the **RRP** and its revision (not yet endorsed by the Commission, at the time of writing).

However, the measures in the plan reflect the 2023 **European Semester Country Specific Recommendations**, in particular related to accelerating the deployment of renewable energy and electricity networks through several important reforms, energy efficiency efforts, and reducing the reliance on fossil fuels.

Finally, the plan does not provide an estimate of the investment needs and funding sources. Moreover, the methodologies behind the with existing measures ('WEM') scenario are not

explained. The with additional measures ('WAM') scenario is not included. The impact assessment of policies and measures is purely qualitative. Furthermore, there is no macro-economic assessment was provided.

2 PREPARATION AND SUBMISSION OF THE DRAFT UPDATED NECP

2.1 Process and structure

The draft updated NECP was notified to the European Commission on 3 November 2023, more than 4 months after the deadline.

The plan is not complete, but overall follows the structure provided by the Annex I template, covering all five dimensions, and including the main objectives and targets. However, policies and measures are described only summarily, and the analytical basis does not include an impact assessment.

The plan also provides evidence that, in line with the Whole of Government approach, the German Federal government reached out and worked together with the Länder and municipalities to update the plan. However, the draft updated NECP provides limited details of the discussions that were carried out.

The role of cities and local authorities is mentioned and referenced in terms of interventions related to climate mitigation and climate adaptation. Areas in which local authorities could play a role are presented, such as regards actions in the transport sector and in the energy services sector. The document presents a clear description of the regional consultation process but lacks references to local consultation processes.

2.2 Public consultation

The draft updated NECP does not outline a procedure to ensure early public participation before decisions were taken and throughout the decision-making process. The plan explains that consultations will take place in the course of 2023-2024 and that the Federal Ministry of Economic Affairs and Climate Protection provides information on the NECP process and opportunities for participation in the planned consultations on its website.

Germany has not established a multilevel energy and climate dialogue.

2.3 Regional consultations for preparing the draft updated NECP

There have been various consultations with neighbouring countries. These took place bilaterally with Demark, Austria, and Czechia as well as in established fora including the Pentalateral Forum involving Belgium, Luxembourg, the Netherlands, France, and Austria as well as the North Seas Energy Cooperation (NSEC) comprising Belgium, Denmark, France, Ireland, Luxembourg, the Netherlands, Norway, and Sweden. The main outcome has been summarised in the draft updated NECP, explaining its scope and procedural aspects.

The collaboration mainly focused on electricity markets, security of supply, flexibility, energy efficiency and decarbonisation, as reflected in the joint NECP chapter of the Pentalateral Forum, and the accelerated deployment of offshore renewables as reflected in the joint NECP chapter of NSEC covering joint/hybrid projects, permitting/maritime spatial planning, financing and long-term infrastructure planning.

3 ASSESSMENT OF THE AMBITION OF OBJECTIVES, TARGETS AND CONTRIBUTIONS AND ADEQUACY OF SUPPORTING POLICIES AND MEASURES

3.1 Decarbonisation dimension

3.1.1 Greenhouse gas emissions, removals and storage

The draft updated NECP refers to but only partially embeds the new and revised climate targets included in the ESR and LULUCF Regulation, as part of the Fit for 55 legislative package.

The plan confirms Germany's commitment to achieve climate neutrality by 2045, with reduction targets of at least 65% by 2030 and at least 88% by 2040, compared to 1990. However, **the plan does not include concrete pathways to 2030 and to 2050**, in line with the national long-term strategies and with the climate-neutrality objective set out in the European Climate Law. The draft updated plan includes emissions projections to 2050 under the WEM scenario, but not under the WAM scenario. The WEM projections are identical to those submitted in March 2023. Projections submitted in March 2023 under Article 18 of the Governance Regulation show net GHG emissions (including LULUCF and excluding international aviation) of 194 million tonnes of CO_2 equivalent (CO_2 eq.) by 2050 considering existing measures, and of 140 million tonnes of CO_2 equivalent with additional measures. This is equivalent to projected reductions by 2050, compared to 1990, of 85% and 89%, respectively.

Despite the commitment to achieve climate-neutrality by 2045, the information provided in the draft updated plan does not allow for a full assessment as to whether progress by Germany is consistent with the achievement of the EU climate-neutrality objective. However, based on all the available information, progress by Germany is likely to be consistent with the achievement of the EU climate-neutrality objective.

The draft updated NECP does not reflect the required ambition under the ESR, as the policies and measures included do not collectively suffice to reach the effort sharing sector obligations. The ESR sets Germany's 2030 ESR emissions reduction target to -50% by 2030, compared to 2005 levels. The plan projects emissions from the effort sharing sectors to be above this target in the scenario with existing measures, suggesting the need for more ambitious climate action. The plan does not include a WAM scenario. In the WEM scenario, Germany falls short of the target by 15.4 percentage points.

Member States have flexibilities under the ESR to comply with their targets. No specific use of ESR flexibilities is mentioned by Germany. To assess whether Member States comply, the use of saved AEAs from previous years is taken into account.

Table 2: ESR target and projections in Germany's draft updated NECP

ESR target and projections[5]					
	2030 target*	**2021 performance (inventory data)**	**2022 performance (approximated data) ***	**2030 WEM projection***	**2030 WAM projection***
Germany	-50%	-16.5%	-19.4%	-34.6%	Not reported
EU	-40%	-14.5%	-16.9%	-27%	-32%

*Compared with the 2005 emissions as set out in Annex I of Commission Implementing Decision (EU) 2020/2126.

The draft updated NECP reflects the increased ambition of the new LULUCF Regulation and the 2030 national target requiring Germany to deliver additional -3 751 kt CO_2 eq. net removals in 2030. According to the projections submitted in the draft updated plan (WEM only), Germany will achieve -18 000 kt CO_2 eq. in 2030. However, the plan does not contain information on compliance in the first commitment period 2021-2025 ('no-debit rule').

The plan states that the target for 2030 (i.e., improving the sink by 3.8 Mt CO_2 equivalent) and the budget target 2026-2029 are in line with the target of the Federal Climate Change Act ('Bundes-Klimaschutzgesetz') for the LULUCF sector (improve the sink to 25 Mt CO_2 equivalent on average between 2027 and 2030). However, the 2030 target of the Federal Climate Change Act cannot be easily compared to the EU-LULUCF target, as they differ in the calculation method and data sources.

The plan shows a significant gap in emissions and removals in the LULUCF sector for the years 2021 and 2023. In 2021, net emissions in the LULUCF sector amount to 4 Mt CO_2 equivalents. For the years 2022 and 2023, this negative trend is reversed, projecting net removals in the LULUCF sector of – 12 Mt CO_2 equivalent and – 14 Mt CO_2 equivalent, respectively. However, the plan is not clear on how the additional removals of – 16 Mt CO_2 equivalent between 2021 and 2023 will be achieved.

The draft updated NECP only briefly describes the policies and measures to support the LULUCF sector, including the action programme for natural climate action. It is unclear how the described measures contribute to the reaching the target.

The draft updated plan does not provide information on the status and the progress to be made in ensuring improved GHG monitoring and reporting. A draft regulation will be presented at the end of 2024. It is unclear if the improved monitoring is aimed at ensuring higher tier levels and geographically explicit datasets, in line with the provisions under Regulation (EU) 2018/1999 for monitoring, reporting and verification (MRV).

Overall, Germany does set out a pathway to increase the contribution of land sector to the overall EU's enhanced climate target, but does not clearly describe or quantify the mitigation potential of the planned or additional measures.

[5] The comparison between the ESR target and emission projections does not consider the flexibilities available for Member States under the ESR to comply with their 2030 targets. The ESR emissions will be comprehensively reviewed in 2027 (for the years 2021-2025) and 2032 (for the years 2026-2030).

The plan does not include a separate target for agricultural emissions. It does contain reference to measures to reduce emissions from agriculture, but it is unclear from the information provided how these measures will contribute to the reduction. Projections included in the plan show only a small reduction in agriculture emissions towards 2040 and 2050. The plan includes policies, plans measures and budgetary allocations for improved access to zero- and low-emission **mobility, transport and vehicles**, as well as measure to promote cycling.

The plan is broadly aligned with the provisions of the new Alternative Fuels Infrastructure Regulation (a new national plan to comply with it will be needed) across transport modes, and has additional measures to promote zero-emission rail transport. The plan includes roadmaps and measures for the production and deployment of sustainable aviation fuels (SAF) and sustainable inland waterway fuels.

The plan encompasses a strong vision, underpinned by two national plans until 2030 for freight and passengers, for the modal shift towards low-carbon modes (including fiscal measures, deployment of infrastructure, public transport vehicles and services, and an array of support schemes for users both for freight and passengers, notably commuters). The co-benefits of these measures for air quality are also referred to, and so are CO_2 standards for cars[6] , with ambitious targets for zero-emission vehicles diffusion.

A drawback of the plan is the reliance on natural gas, which is not a low-GHG fuel, whose demand shall not be incentivised, notably under the current geopolitical and energy framework. Biogas too would be more efficiently used in high-efficiency cogeneration or hard-to-abate sectors where electrification is not possible, rather than for transport.

The draft updated plan discusses the importance of **carbon capture, storage and use of CO_2** and the will to step up research and development activities in the field, in order to give domestic companies and research institutions a competitive advantage and export opportunities. Carbon Capture Utilisation and Storage (CCUS) is already widely supported in Germany, including through research and development projects (e.g., 'CO_2-Plus', 'CO_2-WIN', ERA-Net Cofund ACT, the PHOENIX initiative). The capture of CO_2 from the atmosphere is also increasingly supported. However, the plan does not estimate the annual CO_2 emissions that could be captured, neither from ETS nor non-ETS sources. The plan does not foresee the deployment of any dedicated CO_2 transport capacities; however, it mentions that Germany is looking at regional cooperation in view of the development of a CO_2 network. In terms of storage, the plan mentions that there is no storage of CO_2 for research purposes in Germany. The plan mentions that Germany is aiming at cross-border cooperation in view of storing captured CO_2 in the North Sea.

The plan pays attention to mitigating **non-CO_2 emissions** in different sectors. In agriculture, the plan covers methane emissions from enteric fermentation and manure management, as well as N_2O from agricultural soils. In waste management, the plan addresses methane emissions from landfill sites. In addition, on F-gases, the plan includes a public procurement measure. Finally, the plan mentions the use of bio-methane in transport.

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[6] An EU-level reduction per OEM of 55% for cars and 50% for vans of CO_2 emission per km by 2030; 100% reduction (only Zero-Emission Vehicles - ZEV) at 2035. Measures such as corporate cars incentives and any fiscal incentive for ZEV shall be reported.

However, the plan does not provide quantified projections, which makes it difficult to assess the impact of the policies. Hence, it remains unclear whether the policies are sufficient, for instance, to address the stagnation of methane emissions and N_2O in agriculture, which together have represented 13% of the 2021 value defined in Regulation (EU) 2018/842.

The **assessment of the impact of policies and measures** on the achievement of the GHG mitigation targets contained in the plan is based only on qualitative arguments. The plan only includes a baseline scenario (WEM), which does not include policies and measures adopted or entered into force after 31 august 2022. Based on the WEM scenario, the policies and measures proposed in the plan will not allow Germany to reach the targets set in EU and national legislation as well as international commitments. The policies and measures are not described in sufficient detail in terms of their scope, timing and likely impact.

The draft updated plan reflects limited progress towards **international commitments under the Paris Agreement**. The draft updated plan includes a commitment to phase out coal-fired electricity generation only in 2038, when the last coal-fired power plant in Germany will be shut down. However, lignite will be phased out in North Rhine-Westphalia by 2030. Germany mentions the phasing out of fossil fuel subsidies by referring to G20 and G7 commitments to eliminate inefficient fossil subsidies by 2025. Furthermore, the draft updated plan states that Germany will carry out more intensive and regular assessments of such subsidies. However, it does not discuss steps and provide a precise and credible timeline to phase them out.

On 2 January 2020, Germany submitted to the Commission its national long-term strategy. The long-term strategy did not include a clear goal of achieving climate neutrality by 2050. In March 2023, Germany reported on the status of implementation of its initial NECP, where the 2045 climate-neutrality objective was defined. The goal is enshrined into law. This climate-neutrality goal is reiterated in the draft updated plan.

3.1.2 Adaptation

The draft updated NECP does not explicitly identify the relevant climate vulnerabilities and risks that may threaten the achievement of national objectives, targets and contributions in any of the five dimensions of the Energy Union.

Germany did not identify adaptation goals in its NECP of 2019. Compared to that, the 2023 draft updated NECP does not show progress on the inclusion of official adaptation goals. There is also no reference to Germany's national adaptation strategy, or to the national climate adaptation law adopted in 2023.

When outlining the new national action plan on nature-based solutions for climate and biodiversity, the draft updated NECP mentions measures to make forests and land ecosystems more climate resilient. It also refers to the need to finance 'new tasks like nature conservation and climate adaptation' in agriculture and coastal protection. Furthermore, the relevant sections of the plan do consider the need to minimise environmental impacts and enhance biodiversity.

However, the draft NECP does not further specify any climate risks for land carbon sinks, nor does it describe and quantify how the proposed nature-based solutions are expected to reduce such risks.

Furthermore, there is no reference to the resilience of energy systems to structural or seasonal water scarcity. Innovative approaches such as insurance policies and fiscal measures addressing the climate protection gap are not considered, either.

3.1.3 Renewable energy

The renewable energy contribution proposed in Germany's draft updated NECP is a share of 40% of the national gross final consumption of energy in 2030. This proposal is based on a WEM scenario, with policies and measures adopted by August 2022, presuming that the imported hydrogen consumed would be exclusively from renewable energy sources. In an alternative scenario, with the assumption of all imported hydrogen being non-renewable, the overall renewable energy contribution would be at only 38.5%[7]. Absolute values are not included. This contribution is slightly below the share of 41% resulting from the formula in Annex II of the Governance Regulation. The scenarios set out in the draft updated NECP are provide overall renewable energy contribution trajectories and technologies up to 2030, and values, in five-year intervals, including 2040 and until 2050. However, Germany states in its draft updated NECP that the trajectories for sectors and technologies would only be provided in the final updated NECP. The indicative trajectory to reach the 40% contribution in 2030 is provided, including specific reference points for 2022 (a renewables share of 20.4%), 2025 (a renewables share of 24.1%) and 2027 (a renewables share of 29.4%). The submitted reference point for 2022 is in line with the trajectory (20.2%) calculated in line with the German contribution of 30% to the EU 2030 renewable energy target of 32%, which was in force at that time. The reference points for 2025 and 2027 are below the trajectory following the formula of Annex II (28% and 33% respectively) calculated in line with the increased EU 2030 renewable energy target of 42.5%[5], indicating that especially high efforts will be required in the last years before 2030.

For renewable electricity generation, the plan includes a target of 80% by 2030 compared to the 44% in 2020. The projections in the scenarios are even higher with 84.9% (all imported hydrogen being renewable) and 84.8% (all imported hydrogen not being renewable) in 2030, but the plan, only refers to a share of at least 80%. This is even more ambitious in the light of a strong increase in overall electricity demand due to the partial electrification of heating and transport. Wind power will be the main source of renewable electricity (32.3% onshore and 12% offshore), with installed capacities of 115 GW onshore and 30 GW offshore. For both, further strong capacity increases are planned in the future, with 160 GW onshore for 2040 and 40 GW in 2035 and 70 GW in 2045 for offshore wind. It is expected that 30% of power production will come from solar power in 2030, with an installed capacity of 215 GW and a further very strong increase to 400 GW in total in 2040. Bioenergy is expected to lose some of its overall share in 2030 (7.3%, down from 9.1% in 2022) and hydropower will remain approximately stable (3.1% compared to 3.2%), while overall, electricity use is expected to grow significantly. The draft updated plan does not include information on the **innovative target for renewable energy technologies deployment.**

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[7] For simplification, in the following, reference will only be made to the first scenario assuming that all hydrogen imports are from renewable sources, except from areas where this assumption leads to strong differences in results.

The use of renewable energy in the heating and cooling sector is projected to reach a share of 29.2% by 2030 (up from 14.5% in 2020) in the scenario with imported hydrogen being fully renewable and 27.6% with it being fully non-renewable. In both scenarios, the average increase would be higher than the binding target set for the periods 2021-2025 and 2026-2030 in line with revised REDII, assuming that these values do not include the use of waste heat. For renewable energy in district heating and cooling, Germany sets a 2030 target of 50%, including waste heat, up from 23% in 2020. This is higher than the indicative annual average increase of 2.2 percentage points over the period 2021-2030. However, the role of waste heat and cold and the accounting of renewable electricity in the trajectory and impacts on the target setting and achievement remains unclear. Bioenergy, including the renewable part of waste, will remain dominant with 16.5% in 2030, up from 13% in 2020. Other technologies, at only 2.2% in 2020, are expected to grow quickly to 10.5% in 2030. No breakdown by individual other technologies is provided, with the exception of hydrogen. Depending on the scenario, the contribution would be between 2.2% and 0.7%. The plan also mentions the target of installing 500,000 **heat pumps** yearly from 2024. The **renewable energy share in buildings** is expected to reach 49% by 2030, while no values were provided for the use of **renewable energy in industry.**

In the transport sector, the share of renewable energy is projected to reach 30% in 2030, and Germany indicates an increase of the existing quota for the reduction of the emission intensity of transport fuels. The scenario for 2030 is with 34.6% (32.2% in the scenario with imports of only non-renewable hydrogen) even higher. The plan includes a trajectory for the share of RFNBOs (2.8% in 2030 if only renewable hydrogen is imported, 0.4% if it is non-renewable) in transport but no figures on advanced biofuels. Multipliers are included in the calculation of the trajectory of the 2030 target. The plan sets out that the share of conventional biofuels will not increase until 2030. The draft updated NECP sets a target of 15 million electric cars by 2030. The plan states that the deployment of **electric vehicles** based on renewable electricity and the use of zero- and zero-carbon fuels will be the main pillars for low-emission mobility to meet the climate targets in transport. The draft updated NECP includes a comprehensive set of measures targeting both the uptake of electric vehicles via incentives for consumers and supporting the deployment of recharging infrastructure (including measures related to integrating the recharging points into electricity grid). In addition, Germany has adopted in autumn 2023 a measure to support recharging from solar energy as part of self-consumption. The draft updated NECP provides information on the capacity of electrolysers of at least 10 GW in 2030 and sets out measures for RFNBO use in demand sectors mostly in transport and industry, however with no RFNBO target set for the industry sector. At the same time, when it comes to **international partnerships** to facilitate **imports of renewable hydrogen,** Germany is currently working on an import strategy. It has reached an agreement with Norway to allow for a long-term import of renewable hydrogen.

For only a few of the **policies** and **measures** to support the achievement of the proposed objectives and contributions for renewable energy a good level of detail is provided. Overall, the draft updated NECP does not clearly describe the expected impacts of specific policies and measures, nor the budget required. In the **electricity sector** the objective is to accelerate the production of electricity from renewable energy partially through the use of reverse auctions, but it is not clear which share of the envisaged capacity increase is expected to be covered by auctions. The promotion of long-term power purchase

agreements receives little attention. On guarantees of origin, Germany does not specify any measures aimed at enhancing the current system to improve consumers' information. Germany envisages the implementation of a **joint project with Denmark** to develop the energy island Bornholm.

The plan contributes to the objectives of the EU's **solar energy** strategy by setting out very ambitious targets for the rollout of solar PV but does not elaborate on how these should be achieved. A subsidy scheme providing support to the combined installation of rooftop solar PV, a charging station and a battery is mentioned. The draft updated NECP does not, however, elaborate on what measures Germany envisages to simplify and shorten permitting for solar PV. **Individual and collective self-consumption** receives little attention in the plan despite recent legal changes in this area to make it more attractive. There is a clear legislative framework in place to support **renewable energy communities** which benefit from specific rules such as exemptions from the obligation to participate in auctions up to certain thresholds (18 MW for wind, 6 MW for solar). Quantitative targets for self-consumption and for energy communities are not included in the plan. The draft updated NECP does not present sufficient and well-described measures for promoting individual and collective self-consumption.

Germany has not indicated in its draft updated NECP whether it has put in place a strategy on **energy system integration**, but it refers to sector coupling as a key element of the plan, especially as a combination of a projected high share of renewables in the power sector and an electrification of heating and cooling and the transport sector. It also mentions the need for increased flexibility via demand-response and electricity storage in batteries, where Germany plans to make significant investments. Furthermore, the development of smart metering systems is intended to be accelerated significantly thanks to legislative changes. As regards digitalisation of the energy system, German passed a new law on digitalisation, which is the basis for further measures in this area such as the further development of technical standards and the regulatory framework for a better grid integration of renewable energy and flexible demand.

Measures for **renewable heating and cooling** include the pricing of CO_2, a heat pump initiative, the obligation for municipalities of a certain size to make a municipal heat plan by a certain date, support for the installation of renewable energy solutions, with financial support provided for the municipal heat planning. It also includes an obligation to use 65% of renewable energy in newly installed heating systems, which is however limited at first to (most) new buildings, with longer lead-in times for existing buildings, depending on the existence of a municipal heat plan. Moreover, it also allows under certain conditions the installation of new gas boilers, depending on whether they can theoretically be used with renewable hydrogen. However, it is expected that very little renewable hydrogen will be used in the heating of buildings in the future due to its high price, the existence of cheaper and more efficient alternatives and the need to reserve hydrogen mainly for hard-to-decarbonise sectors. Concrete measures related to industry have not been included except from the possibility of financial support. The draft updated NECP provides information on several measures to be implemented in line with Article 23(4) and on different measures and policies to enable sector integration between energy networks. Taken together, it is highly questionable that, with the current measures, the required rapid changes to meet the heating and cooling targets will be possible, especially since the obligation to use 65% renewable energy is limited in scope and allows for exceptions and longer timeframes for application.

As regards the **industry sector,** the plan does not include measures to promote renewable-based electrification of industrial processes, nor does it set targets for the use of renewable hydrogen in industry. Several measures for renewable hydrogen use are however envisioned under the national hydrogen strategy, and industry is considered to be one of the main end users.

Measures to promote **bioenergy** sustainability are not exhaustively included in the draft updated NECP, but it announces the adoption of a national biomass strategy which is being prepared. The draft updated NECP includes some estimations for biomass demand by 2030 but does not include projections on bioenergy demand until 2030 (or up until 2040) for the electricity, heating and cooling and transport sectors, nor projections on biomass supply by feedstocks and origin. The cascading principle has not been discussed exhaustively, but the draft updated highlights that priority should be given to material use of biomass over energy use, without providing further details. The draft updated NECP does not assess the impact that bioenergy trajectories may have on LULUCF sinks, biodiversity and air quality. The draft updated NECP does not include an assessment of domestic supply of **forest biomass** for energy purposes in 2021-2030 in accordance with the strengthened sustainability criteria of the revised REDII. The plan also does not assess the compatibility of the projected use of forest biomass for energy production with Germany's obligations under the revised LULUCF Regulation, particularly for 2026-2030. On biomethane, the draft updated NECP does not provide an action plan but presents a production target of 0.4% as share of the total renewable energy production in 2030 (in comparison with 0.2% in 2021), and allocates the use of biomethane to the transport sector.

The draft updated NECP does not include a **mapping of the areas** that will be critical for Germany to focus on for it to achieve its national contribution to the Energy Union's renewable energy target. However, it makes references to recently adopted regulations for the **designation of renewables acceleration areas** and dedicated infrastructure areas. For the streamlining of administrative procedures and time limits for granting **permits**, the plan includes a reference to a contact point for project promoters for offshore wind. Further measures taken to streamline administrative procedures include the introduction of the presumption of overriding public interest of renewable energies, the bundling and streamlining of offshore assessments, the law on spatial planning for onshore wind energy, including provisions implementing Council Regulation (EU) 2022/2577, and standardisation in the area of species protection through a revision of the federal nature protection law. The plan makes a reference to the way offshore renewable development is addressed in the maritime spatial plan. Information related to streamlining of administrative procedures for other technologies is also provided (onshore wind, electrolysers, repowering projects). Further measures are planned to ease permitting in designated wind areas, to further standardise species protection law and to streamline judicial procedures. The draft updated NECP refers to the ongoing revision of the federal emission control act which would strengthen the role of project managers in the permitting process but does not elaborate further on the additional human resources dedicated to permitting.

3.2 Energy efficiency (including buildings) dimension

Energy savings are presented as a pillar of the draft updated NECP, with Germany targeting a reduction in energy consumption of 5 Mtoe/year until 2030. This corresponds to a corrected **national contribution** of 193.6 Mtoe for primary energy consumption and

160.5 Mtoe for final energy consumption. The target for final energy consumption deviates from the results of the formula in Annex I of the EED recast by 2.9%[8]. The contribution for primary energy is set at a level which is slightly more ambitious than the results of the formula in the Annex I of the EED recast. The target for 2030 is also set at a lower level as compared to the German 2020 energy efficiency targets (-30.0% and -17.4% for primary and final energy consumption respectively).

The target for reducing the total final energy consumption of all public bodies is not described in the draft updated NECP. Three measures are described addressing central government buildings: (1) example-setting role of federal buildings, (2) federal level state dialogue contracting and (3) exemplary role in the public building stock. However, the contribution of these measures to reach the final energy consumption target of public bodies under Article 5 of the EED recast and the public buildings renovation target under Article 6 EED recast is not quantified.

The total cumulative end-use saving requirement for 2021-2030 according to Article 8 of the EED recast is 137,51 Mtoe. The target has been calculated following the new provisions and the increased ambition of the EED recast. The draft updated NECP provides comprehensive information on the alternative policy measures that will be used to deliver the required savings. However, the estimation of cumulative energy savings is missing. Germany is not applying an energy efficiency obligation scheme to comply with the obligation. More details are needed to understand how the reported measures contribute to the achievement of the 2030 energy efficiency contributions.

The draft updated NECP presents a wide range of measures covering all sectors. Apart from the Energy Efficiency Law and complementary alternative measures (covering all categories of instruments), the focus is on buildings and notably building renovation. In addition, transport is covered by measures addressing transport decarbonisation, optimisation and electrification. The industry sector is also covered, notably as regards compulsory energy audits in line with the EED requirements.

The draft updated NECP presents new measures adopted after 2020 and planned measures to achieve the 2030 energy efficiency goals, but their expected savings are not reported. Germany mentions that the reported measures are preliminary and might be adapted. In addition, further measures might be added.

For the public sector, measures targeting energy efficiency, public procurement and renovation support for the local level are also included. Measures to encourage public bodies to use energy performance contracting are included through the provision of model contracts and targeted information.

Germany reports on existing schemes of energy audits for non-SMEs, in line with the EED recast. The draft updated NECP states that changing the strategy to reward the introduction of energy management systems by tax reductions to an obligation in line with the EED recast is under consideration. Further to energy audits, technical support is provided via voluntary energy efficiency networks and bundling initiatives for SMEs.

The draft updated NECP highlights that the **'energy efficiency first' principle** is the basis for planning considerations in the plan. However, this still needs to be spelled out in terms

[8] According to Article 4(4) EED recast, a Member State shall ensure that its contribution in Mtoe is not more than 2.5% above what it would have been had it resulted from the EED recast Annex I formula.

of policies and measures. As regards financing, the draft updated NECP does not quantify the financial needs of the listed energy efficiency measures. The plan does not raise the ambition of Germany's 2020 long term renovation strategy but recalls its key elements. In particular, the plan recalls a 2030 milestone related to primary non-renewable energy usage in buildings, but not the milestones for 2040 and 2050. Further, it projects a reduction of final energy consumption in the residential sector of 15%, 30% and 37% respectively by 2030, 2040 and 2050 against the base year 2020. The draft updated NECP reports that Germany will present a revised LTRS in the end of June 2024 with its final updated NECP or prepare its building renovation plan as foreseen by the upcoming EPBD recast.

The German draft updated NECP reports 24 measures specifically targeting the **building sector** including notably updates of the building energy law related to heating and the support scheme for building renovations. The measures include a comprehensive set of economic, regulatory, information, fiscal and education actions. They also include specific assistance to vulnerable households by means of overall social policy (targeted subsidies and transfers), rather than through energy efficiency measures (including energy advice and energy audits). However, the individual energy saving impacts of each measure is not quantified.

3.3 Energy security dimension

Fossil fuels play a prominent role in the German energy system, accounting for 79% of the national energy mix in 2021, substantially above the EU27 average[9]. It is positively noted, however, that the draft updated NECP foresees a steep decrease in the share of fossil fuels over the coming decades, with an expected decline to 64% by 2030 and to 45% by 2040. The high reliance on fossil fuels translates into a high **import dependency on third countries** of around 58% in 2021, which has increased from around 50% in 2013[10]. The plan does not provide a forecast for the evolution of this indicator. It does, however, project a gradual decrease of general energy import dependency[11], from 69.7% in 2023 to 65.2% in 2030, and to 55% in 2050.

Germany aims to: 1) satisfy national energy demand at all times; 2) maintain resilience to supply crises and further reduce the likelihood of such crises; 3) provide for precautionary measures and reserves in the event of a deterioration of supply conditions. The plan notably stresses the importance of an integrated EU energy market for German security of supply.

Natural gas plays a key role in the German energy system. It represents the second largest energy source in the country, covering 26% of the energy mix and 18% of the electricity mix in 2021[12]. Germany relies on imports for most of its gas consumption (around 83% in 2021). During the period between 2015 and 2021, its main supplier has always been Russia; in 2021 it was still dependent on Russia for 41% of its gas imports[13]. After Russia's invasion of Ukraine, Germany has compensated for declining gas flows from Russia by notably increasing imports from Norway, the Netherlands and Belgium, as well as by

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9 Eurostat data.
10 Eurostat data.
11 Contrary to import dependency on third countries, energy import dependency also includes energy imports from other EU Member States
12 Eurostat data.
13 https://economy-finance.ec.europa.eu/system/files/2023-05/DE_SWD_2023_605_en.pdf

commissioning its first LNG infrastructure in the North of the country. Germany can also count on the largest gas storage capacity of the EU, with 23 bcm commercially operated storage capacity spread across sites. This storage capacity represents slightly less than one third of Germany's usual annual gas consumption (79.3 bcm in 2022, 93.6 bcm in 2021)[14]. This has altogether allowed Germany to reduce its significant dependence on Russian gas.

The draft updated NECP does not foresee any additional objectives to further diversify gas supply. According to the plan, a relatively high number of import routes are already available, bolstered by the recent additions of LNG infrastructure and the existence of cross-border infrastructure with all of Germany's neighbours. Import dependency for gas is, however, expected to remain high in coming years, with a dependence of 91.4% in 2030 and 93.7% in 2050 according to the projections in the plan. The plan foresees a decline of the consumption of gases from 2 895 PJ in 2023 to 2 511 PJ in 2029 and 1 222 PJ in 2050, with limited information on which gases are covered. Apart from the aforementioned acceleration of LNG infrastructure commissioning, Germany introduced other measures to safeguard security of supply following the Russian invasion of Ukraine. This includes the abolishment of the requirement to deodorise gas from France, measures to fill storages to the required 90% pursuant to Regulation (EU) 2022/1032 and the establishment of the Gas Security Platform, which also allows solidarity requests to be transmitted. Overall, the draft updated plan lacks details about the envisaged actions to further reinforce German gas security of supply towards 2030.

As a consequence of the Russian invasion of Ukraine, Germany reduced its gas demand by 17% between August 2022 and August 2023, more than the -15% voluntary objective and slightly less than the EU27 average (-18%)[5]. The plan only briefly describes the implemented gas demand reduction measures, however, referring solely to the public energy saving campaign "*80 million together for energy transitions*". The plan also does not explain how these demand reduction measures are integrated in the medium-term planning towards 2030.

The draft updated NECP considers security of **electricity** supply in the light of renewable generation expansion, increased demand from electrification and the phase-out of nuclear and coal power. Security of supply is ensured in all scenarios assessed by BNetzA, the national regulatory authority (NRA), between 2025 and 2031 even accounting for the phase out of nuclear and coal power, the latter by 2030. These scenarios take into account the planned expansion in renewable electricity generation, grid adequacy and the transformation of power plants necessary for decarbonisation. The scenarios assume various market and network developments, such as increased demand side flexibility and extensive use of cross-border re-dispatching.

Germany has introduced electricity reserves outside of the market to address low probability events for which markets alone are considered insufficient, particularly during the phase out of coal and nuclear power but also in the long term for a decarbonised electricity system. The reserves are made up of two elements. The first one is a Network Reserve of 4,6 GW during winter 2022-2023 to manage network congestion, maintain voltage and ensure the re-establishment of electricity supply. The second reserve is a Capacity Reserve procured every 2 years (max. 2 GW) that can be activated by the TSO to ensure security of supply only after market and network measures have been exhausted.

[14] https://economy-finance.ec.europa.eu/system/files/2023-05/DE_SWD_2023_605_en.pdf

A 'roadmap for system stability' is expected at the end of 2023 providing a roadmap for a safe and robust operation of the electricity grid based on 100% renewables.

The draft updated NECP acknowledges the increasing flexibility needs in the electricity system, and that these can be covered by for instance grid development, flexible power plants, demand response, storage and electricity exchanges with neighbours. According to a study on storage commissioned by the European Commission, the current operational German power storage capacity is around 16 431 MW (notably including pumped hydro, mechanical flywheel and electro-chemical storage) and one of the main barriers identified was related to network tariff exemption for storage facilities[15]. The plan does not, however, set a specific target for energy storage. A 'Platform for Climate-Neutral Electricity System' has been set up to, *inter alia*, discuss barriers and potential flexibility options with stakeholders. The plan also refers to increasing network use and a more efficient management of re-dispatching.

Germany is the largest **oil** consumer in the EU. Oil is also the largest single energy source in Germany, representing 34% of the energy mix[16] in 2021. Oil is primarily used in transport (76%) followed by the industry sector (32%). Domestic oil production is marginal, and Russia was the main oil supplier in 2021, accounting for 34% of imports, mostly imported through the Druzba pipeline. After the EU ban on Russian oil, USA, Norway, and Kazakhstan became Germany's main oil suppliers. Germany's crude oil supply primarily runs through three cross-border pipelines: the Transalpine Pipeline (TAL) from Trieste/Italy, the Rotterdam Rhine Pipeline from Rotterdam, and Mineralölverbundleitung (MVL), an extension of the Druzhba pipeline from Poland. The TAL pipeline transported 37.3 Mt in 2022, 7 million more than in 2017 due mostly to the reduction of Russian oil import via the Druzba pipeline which still supplies Kazakh oil to Germany. The German crude oil supply system relies on three North Sea ports – Wilhelmshaven, Brunsbüttel and Hamburg – as well as the ports of Rostock and Gdansk/Poland on the Baltic Sea. Germany has 16 refineries located throughout the country (capacity 2 mb per day). The only import pipeline for refined products runs from Rotterdam to the Ruhr and Rhine District (capacity of 250 000 b/d).

The plan does contain a specific forecast related to the expected percentage decline in oil consumption by 2030, 2040 and 2050.Despite the importance of the German petrochemical industry, the plan does not assess the adequacy of the oil infrastructure in the long run (refineries, oil stocks) with the expected oil demand decline.

The draft updated NECP does not address **critical infrastructure** protection, including **cybersecurity**, nor the **resilience of the supply chains** in terms of access to critical raw materials needed for the green transition. The plan also does not assess **the implications for energy security of climate change**, for instance in terms of hydropower output.

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[15] This figure is derived from the database which accompanied the ENTEC study on Storage funded by the European Commission and published in November 2022, by taking into account only the "operational" facilities: https://op.europa.eu/en/publication-detail/-/publication/dfcaa78b-c217-11ed-8912-01aa75ed71a1/language-en?WT_mc_id=Searchresult&WT_ria_c=37085&WT_ria_f=3608&WT_ria_ev=search&WT_URL=https%3A//energy.ec.europa.eu/.

[16] Eurostat. Share of oil in the gross available energy.

The draft updated NECP adequately describes measures in the **event of security of supply crisis** for electricity and for gas. It notably refers to the definition of protected customers, which includes households, basic social services and district heating installations that cannot switch fuel, standard load profile customers and those providing basic social services. Germany submitted its National Risk Assessment, Emergency Plan, as well as the Common Risk Assessments for Ukraine, Belarus, Baltic Sea (which it coordinated), Norway, Denmark, and United Kingdom regional risk groups. At the time of writing, these are all being assessed by the European Commission.

Germany has not submitted its preventive action plan which was due by 1 March 2023 (even if the draft updated NECP asserts that the preventive action plan was last updated in 2023), nor have the common risk assessment for the L-gas (for which only a draft version was received) and the North Eastern regional risk groups been submitted (the former of which still has no coordinator Member State) while they were due by 1 November 2022.

3.4 Internal energy market dimension

The draft updated plan supports additional **interconnection projects** in view of the EU interconnection target for 2030 but underlines the importance of the additional indicators, as set out in the Governance Regulation, to assess interconnection levels taking account of the rapid increase of renewable energy capacity in the German electricity mix. The plan specifies that around 8,500 km of grid expansion should be implemented by 2030 requiring investments of EUR 55 billion. These investments include several interconnection projects as well projects of common interest (PCIs) with a significant cross-border impact. Several measures were adopted to accelerate the construction of power lines. The plan does not further elaborate on the expected benefits of the key electricity infrastructure projects for the current identified congestion.

In terms of energy **infrastructure development**, the draft updated NECP underlines the importance of rapidly increasing grid infrastructure in Germany to integrate the increase of renewable energy share. The plan focuses on the expansion of the grid in order to mitigate structural congestion within the German-Luxembourgish bidding zone.

On the internal energy market, the plan also acknowledges the need to incentivize demand response, though, without providing a clear overview and quantification of the flexibility needs. Moreover, the plan does not indicate specific targets and objectives to accelerate the deployment of demand response and to provide adequate locational signals to facilitate the penetration of flexibility services where they are needed. The plan mentions the importance of sector coupling to increase the flexibility of the energy system and enable the market to accompany the energy transition. However, the plan is missing appropriate and concrete policies and measures to support it, and overall, enable a non-discriminatory participation of new flexibility services.

On the retail market, the plan recalls existing measures on consumer empowerment and consumer protection, including transparency requirements for billing information or right to energy, standards for electricity portals to be comparable or consumer awareness of the electricity supply contracts with dynamic tariffs. The Federation of German Consumer Organisations and the consumer associations ensure market monitoring a cost-effective and fair energy transition. The draft updated plan also envisages massive acceleration of the smart meter rollout, simplification of the procedures to deploy smart meters and completion of the process by 2030, based on the Act on the Relaunch of the Digitalisation

of the Energy Transition adopted in 2023. Currently, all electricity suppliers are obliged to offer dynamic tariffs to their customers using smart metering systems from 2025 onward, while the cost of smart metering is capped at EUR 20 per year. Energy efficiency measures are promoted through advice, information and promotion measures and campaigns (such as the "80 million together for energy transition" campaign). Advisory and assistance services are accessible on energy-saving behaviour in the field of heat, water and electricity through consumer associations. These services are provided free of charge to low-income households. Campaigns and information sharing are accompanied by financial measures, price and incentive mechanisms.

Regarding **energy poverty**, the description and identification of vulnerable households in energy poverty was not elaborated in light of the latest legislative developments. In addition, the plan only partially defines and identifies the number of households currently affected by energy poverty, since the support to household energy needs is covered by Germany's general social policy. Targeted relief from higher housing and heating costs for lower income households is encompassed by the climate and heating component added to the housing benefits. As a result, the housing benefits with the climate and heating component are currently accessible to a total of 2 million vulnerable households (compared to 600,000 before the introduction of the climate and heating component). The draft updated NECP does not indicate whether this number is considered significant, nor does it establish a national objective to reduce energy poverty.

On the other hand, the plan details some of the affordability policies and measures addressing energy poverty. On top of the above-mentioned household benefits, Germany allows for energy debts to be taken over by a loan; jobseekers receive support which also covers standard needs (including costs of general household electricity); and there are regionally diversified benefits. During the energy crisis, Germany introduced electricity and gas price brakes, including caps on price of district heating, which helped to absorb the sharply increased costs of energy. However, information on the phase out of the crisis measures is missing.

As regards structural measures to decrease energy bills of households in energy poverty, no national objectives or timelines are set. The measures in the Long-Term Renovation Strategy focusing on energy efficiency and improving energy savings only partially target low-income households or households in energy poverty. A good example of a structural energy efficiency measure targeting landlords and tenants is the apportioning of the carbon dioxide costs between the landlord and the tenant on the basis of the energy quality of the building, which applies from the beginning of 2023. It incentivises landlords to invest into energy efficient measures and systems in their buildings and in heating while helping tenants to behave in an energy-saving manner. In case of tenants, these costs are also taken into account when the housing benefit is calculated. On the other hand, tax support for energy renovation of buildings need not be sufficiently adequate for vulnerable households in energy poverty since these measures usually require initial financial investments inaccessible to these population groups. The plan does not sufficiently inform about the link between energy efficiency measures envisaged in the LTRS and the vulnerable groups addressed by social policies and affordability measures.

3.5 Research, innovation, competitiveness and skills dimension

3.5.1 Research and innovation

Germany's draft updated NECP includes **national objectives** for research and innovation (R&I) in specific clean energy technologies in qualitative terms only. The plan provides a comprehensive overview of Germany's *7th Energy Research Programme – Innovations for the energy transition*, which is a strategic instrument of energy policy with the aim of stepping up energy research funding between 2020 and 2030 and supporting application-oriented research in view of reaching the country's 2050 climate and energy targets. From 2014 to 2022, total funding from different public sources grew steadily from around EUR 800 million in 2014 to EUR 1.49 billion in 2022. However, the plan does not set a concrete ambition for public and private expenditure in energy R&I for 2030 and 2050.

The *Energy Research Programme* covers a wide range of measures addressing the innovation needs along the entire value chain: (i) energy transition (buildings and districts, industry, businesses and trade, mobility and transport services, emphasising 'energy efficiency first'); (ii) energy generation (wind, solar, thermic generation); (iii) system integration (grids, storage, sector coupling and hydrogen); (iv) cross-cutting research (energy system analysis, digitalisation, CO_2 technologies); (v) nuclear safety, both as part of and supporting the exit from nuclear energy. The *Programme* has a special focus on technology transfer, to bring research results to the market and to deepen the cooperation of German researchers at European level (Strategic Energy Technologies Plan (SET Plan), the Clean Energy Transition Partnership Horizon Europe), bilateral initiatives and at an international level, through the IEA-TCPs or Mission Innovation. However, the draft updated NECP does not provide information on the potential extension of these measures beyond the end of the 7th Energy Research Programme and until 2030.

The German draft updated NECP also presents a relevant overview of complementary research initiatives, i.e., on process emissions, financial markets, bio economy, and innovation in buildings. These programmes are financed by different federal ministries. Other initiatives present Germany's engagement in European projects, such as the ERA-Net on CCU or the European Research Infrastructure Consortium ACTRIS (Aerosol, Clouds and Trace gas Research Infrastructure).

There is already good **regional cooperation** taking place between Germany, neighbouring countries and several other EU Member States in R&I. For instance, the plan mentions clustering research on electro-chemical processes between the Netherlands and Germany to accelerate the market introduction of green hydrogen. However, no details are provided on the allocated funding for this project and other support. The plan clearly covers cooperation with the SET Plan, the results of which were used in the preparation of the *7th Energy Research Programme.* Germany is active in 14 SET plan implementation working groups, including concentrated solar power, wind, geothermal, ocean energy, energy systems, batteries and CCS-CCUS. However, the German draft updated NECP lacks detail on the funding allocated to the listed priorities and does not further develop the potential future objectives for regional cooperation in R&I.

Overall, the German draft updated NECP covers a broad range of relevant R&I activities but is not sufficiently quantified through for instance clear timeframes and funding targets or budget allocations to achieve the country's R&I objectives. The information provided is not sufficiently complemented with clear and measurable objectives and funding details,

to assess the broad priorities of the *7th Energy Research Programme* with first project results. In addition, the plan does not elaborate on the alignment of R&I priorities to ensure an effective implementation across the ministries.

3.5.2 Competitiveness

The draft updated NECP reports that Germany is one of Europe's leading manufacturers and exporter of clean technologies. Germany's share of global GDP is only 3%, but companies in climate technology and resource efficiency make up 14% of the global market. The German draft updated NECP provides information on several measures addressing the competitiveness of clean energy technologies in general and the market development of individual technologies.

Germany has put in place measures to support manufacturing and scaling-up of commercially available clean energy technologies, equipment and components. Measures address the internal and the global market. For example, Germany aims to develop and produce innovative batteries on an industrial scale, with a focus on digitalisation and circular economy. The draft updated NECP lists relevant measures and initiatives but does not clearly indicate how these translate into concrete climate and energy-related competitiveness objectives. Furthermore, the implications of the measures and initiatives for the resilience of supply chains is not elaborated on in detail.

Germany provides information related to the Digitalisation of the Energy System EU Action Plan, through measures that enable digital transformation of the energy system such as the 'Gesetz zur Digitalisierung Energiewende (GDEW)'. In addition, the 7th Energy Research Programme includes digitalisation as a cross-cutting priority. Other R&I initiatives address different aspects of digitalisation and sector coupling. One encouraging example boosting innovation in clean technologies is the SINTEG-programme, which focuses on the digitalization of the energy sector and bringing new technologies to market. Five "model-regions" have been established through the framework, where over 300 participating companies are able to demonstrate their technologies and contribute to knowledge-building towards future changes to the regulatory framework.

On CCU/CCS, Germany provides no detailed figures on funding programs or the volume of deployment of this technology. The draft updated NECP indicates that CCS projects for research purposes currently do not exist in Germany. It refers to two federal funding programs and EU-level programmes such as the SET plan and the Innovation Fund that boost what it views as an essential technology for reaching net zero, especially for processing raw materials.

The German draft updated NECP covers a broad area of activities with the potential to enhance the competitiveness of specific clean energy technologies or different parts of the German economy. The plan does not, however, clearly explain how the measures support general climate and energy objectives, nor how much public funding is dedicated to each priority. The draft updated NECP also does not set a concrete ambition in this regard for 2030 and 2050. The information provided is not complemented with sufficiently clear and measurable objectives, timeframes and funding details.

3.5.3 Skills

The draft updated NECP provides general information on the skills required for the transformation of the German economy towards a digital, green economy. The overview provided covers a broad area of relevant R&I activities to enhance competitiveness in clean technologies and provides insights for instance into the qualification needs linked to the coal phase-out. The draft updated NECP includes plans to allow migration of skilled labour into the relevant job markets and makes reference to the German 'Skilled Immigration Act', which contributes to tackling skills shortages.

However, the draft updated NECP does not identify skills shortages for the development of strategic sectors (e.g., for energy efficiency improvements of buildings and accelerating permitting processes), nor does it include information on concrete measures to overcome them. Additionally, the plan lacks sufficiently detailed information on dedicated investment needs for green skills and upskilling or on potential measures to boost European competitiveness in clean energy technologies, equipment and components.

4 JUST TRANSITION

The draft updated NECP only partially addresses just transition aspects. The plan does not include an adequate assessment of the social, employment and skills impacts of the energy and climate transition on different actors and groups. Also, the draft updated plan does not provide sufficient information for the preparation of the Social Climate Plans, as assessed in chapter 7.

Overall, although the impact assessment of policies and measures considers the most relevant issues, it is rather short and only qualitative, providing no quantification of the effects of the transition. The plan refers to measures to alleviate the impact of the national ETS for heating and transport (e.g., the elimination of surcharges, the housing allowance plus act and measures for the allocation of CO_2 costs between tenants and landlords). The plan also pays attention to urban and spatial planning in the climate and energy transition and refers to mandatory consideration of climate change mitigation and adaptation measures where public funding is provided to urban development (as described in chapter 6). However, the information provided is insufficient for a proper Commission assessment.

The plan generally does not contain detailed information on policies and measures or targets to **address access to and preservation of employment** in the context of the energy and climate transition. While the plan refers to measures to alleviate the issue of skilled labour shortages, such as the strategy on skilled workers in the energy and climate-related sectors, and a new law on the immigration of skilled workers, few details are provided.

Overall, just transition is tackled mainly through the lens of coal phase-out in certain regions rather than more broadly as a nationwide objective. As per the structural development act for coal-mining regions, the last coal-fired power plants will be shut down by 2038 at the latest. The lignite phase-out in North Rhine-Westphalia is planned for 2030. The act also includes a shutdown schedule for individual lignite power plants and envisages the creation of 5,000 new jobs in the transition regions before the end of 2028. However, the plan does not include information on **re-skilling and training measures** both in the context of coal regions and more broadly.

The plan mentions that EUR 40 billion is provided from national funds in support to federal states affected by the coal phase-out. Additional aid is provided to support areas with coal-fired power plants and the former lignite mining area in Helmstedt and Altenburger. In addition to these, the federal states are eligible for financial support under the Just Transition Fund (JTF). However, the plan does not explain information on resources dedicated to supporting the just transition beyond the coal regions.

5 REGIONAL COOPERATION

The plan envisages a strategic role for regional cooperation. This is reflected in bilateral exchanges and Germany's participation in established regional fora, in particular the Pentalateral Forum (Penta), the North Seas Energy Cooperation (NSEC) and Baltic Energy Market Interconnection Plan (BEMIP). NSEC and BEMIP are fora for regional cooperation to advance offshore renewable projects and related grid infrastructure projects as well as market integration respectively. The draft updated NECP describes well how Germany cooperates with other Member States, within Penta and NSEC, on issues such as security of supply and solidarity (resource adequacy and risk preparedness), market integration and flexibility needs, energy efficiency, decarbonisation, hydrogen and offshore electricity. NSEC's role in facilitating the conclusion of a non-binding agreement on offshore renewable energy goals in the North Sea basin is well addressed, and so are the relevant cooperation initiatives (on hybrid projects, maritime spatial planning, and financing).

Germany has already signed two solidarity agreements on the security of gas supply with Austria and Italy, out of the nine needed (the remaining ones being with Poland, Czechia, Italy, France, Luxembourg, Belgium and the Netherlands).

In the area of renewables, the plan highlights the prominent role of cooperation in the margins of the high-level groups, notably BEMIP and NSEC. Furthermore, Germany is developing together with Denmark the joint project of the energy island of Bornholm.

6 INTERNAL COHERENCE AND POLICY INTERACTIONS

The draft updated NECP reflects the importance of key synergies within and between the five dimensions of the Energy Union, in particular the role of energy efficiency across all sectors and as a key building block for the Federal government's climate policy including the role of the new ETS 2 planned as of 2027. The draft updated NECP also pays attention to the role of urban and spatial planning in the climate and energy transition. Germany favours energy-efficient urban development with integrated neighbourhood concepts, systemic interaction between buildings, neighbourhoods and energy infrastructure and requires mandatory consideration of climate change mitigation and adaptation measures where public funding is provided to urban development. The results of this approach are particularly relevant for low-income and vulnerable groups.

However, the draft updated NECP acknowledges that coherence and policy interactions will be improved for the final updated NECP as the draft updated plan does not provide an analysis of the consistency of policies and measures in each dimension, nor a quantitative analysis of interactions of certain objectives.

7 STRATEGIC ALIGNMENT WITH OTHER PLANNING INSTRUMENTS

Germany formally submitted a modified RRP on 15 September 2023, including some of the energy-related measures in the draft updated NECP, such as a programme subsidising the installation of charging infrastructure and a new measure to provide funding support for green district heating networks. Under this investment, district heating systems will integrate renewable energy and waste heat. The draft updated NECP excludes the additional funding under the RRP to scale up a scheme to support private purchases of electric vehicles (zero-emission and hybrid vehicles). The draft updated NECP mentions the amended RRP on some occasions, though the consistency between the draft updated NECP and the RRP is only vaguely described.

The draft updated NECP poorly covers the main reforms and investments included in the **RRP** connected to the objectives, targets and contributions. It includes or refers to 14 out of the 23 climate relevant measures in the RRP (i.e., those with 40% - 5 measures – or 100% - 18 measures (17 investments and 1 reform) – climate tracking). This is the case, for example, for investments dedicated to the decarbonisation of industry (hydrogen projects within the framework of IPCEIs – part 1, 2 and 3; funding programme for decarbonisation in industry and carbon contracts for difference) or climate-friendly mobility measures.

Overall, 4 measures out of those that are 100% climate tagged are poorly or not reflected in the NECP. In addition, some of the measures that are reflected, lack the necessary granularity and detail to allow a full comparison with those in the RRP. This is the case for the investment in hydrogen projects within the framework of IPCEIs (Component 1.1, investment 1), where the R&I dimension is not covered. Several investments are explained but do not reflect in concrete terms the ambition of the RRP, such as: support for the replacement of the private vehicle fleet (component 1.2, investment 3), support for the purchase of buses with alternative propulsion (component 1.2, investment 5), support to promote alternative rail propulsion (component 1.2, investment 6) and federal funding for energy-efficient buildings (component 1.3, investment 3). Some measures are mentioned but not explained, such as the investment on municipal living labs for the energy transition (component 1.3, investment 2).

The draft updated NECP is partially consistent with the adopted **Territorial Just Transition Plans (TJTPs)**. The plan states that Germany plans to phase out coal by 2038 at the latest, and to phase out lignite by 2030. However, the plan foresees coal and lignite to cover respectively 5.8 percent and 0.3 percent of primary energy consumption by 2030 and to still be used in 2050. Moreover, the draft updated NECP lacks detail regarding the national support foreseen to accompany the coal phase-out in the regions also covered by the TJTPs, and their complementarity with JTF measures.

The plan provides an inadequate analytical basis for the preparation of the **Social Climate Plan (SCP)** that will address the impacts of the new emissions trading system for fuel combustion in buildings, road transport and additional sectors (ETS2) on vulnerable households, transport users and micro enterprises. The plan contains some measures and initiatives that would be relevant for the Social Climate Fund (SCF), such as energy efficiency schemes specifically targeted to vulnerable households. However, it fails in linking them to the SCF. The plan does not outline reforms and policy framework for the

future SCP. Thus, it does not explain how the SCP will build on the NECP update nor how the consistency between the two plans will be ensured.

In the draft updated plan, Germany does not provide the quantification of the climate impacts of measures currently included in the **CAP Strategic Plan (CSP),** thus the plan does not explain whether the CSP is in line with the new LULUCF and ESR targets and whether additional measures are necessary.

Compared to the **National Adaptation Strategy**, the draft updated NECP is less detailed and less ambitious on the respective actions.

In the draft updated NECP, Germany addresses the 2022 and 2023 **country-specific recommendations** (CSRs) to contribute boosting investment in and accelerating the deployment of renewable energy and electricity networks through several important reforms, such as a new regulatory framework to accelerate the roll-out of renewable energies, and its electricity grids, declaring the use of renewable energy to be an overriding public interest. Similarly, Germany's updated national hydrogen strategy intends to accelerate its market uptake. Investments in green district heating networks, integrating renewable energy and waste heat, or federal funding for building renovation in energy-efficient buildings, contribute to stepping up energy efficiency measures in buildings, another country specific recommendation. Reducing reliance on fossil fuels by taking specific actions such as the reinforced support for the charging infrastructure; the promotion of industries involved in hydrogen and fuel cell applications in transport; or reforms such as the extension of the ten-year tax exemption for purely electric vehicles, address another country specific recommendation in the draft updated NECP.

8 FINANCING THE ENERGY AND CLIMATE TRANSITIONS

8.1 Investment needs

The draft updated NECP does not include information on the expected additional investment and the total investment needs to implement the planned policies and measures for the five dimensions of the Energy Union. Overall, the cumulative additional investments needed for the energy transition from 2023 to 2030 are not estimated. The plan only provides estimates on past overall investments in the energy sector (EUR 30 billion in 2021) and in energy renovation of buildings (EUR 46.5 billion in 2020) as well as an overview of the energy relevant subsidies extracted from the federal government subsidy report. These are the most concrete figures in the plan and no split in public and private investments needs is provided.

8.2 Funding sources

The plan outlines occasionally the main sources of financing used to implement the planned key policies and measures. However, this is not done in a consistent way for all measures. There is also no consolidated overview at plan level. As this holds also true for the estimation of investment needs (see section 8.1), it is therefore not possible to identify potential gaps in terms of funding. The plan does not provide information on the quantity and the sources of financing of each policy and measure, the split between public and private expenditure, the lifetime of the measure, and the share coming from the EU budget or NextGenerationEU. An overview table gathering all the budgetary information of the

different policies and measures is also missing. In addition, as a consequence of the annulment of the budget transfer in favour of the Climate Transition Fund (KTF) by the Federal Constitutional Court on 15 November 2023, a large share of the funding of the Germany's draft updated NECP is uncertain and should be reassessed.

9 ROBUSTNESS OF THE ANALYTICAL BASIS OF THE DRAFT UPDATED NECP

The plan is partially based on quantitative analysis. The methodologies used for the WEM projection are not explained, and the plan only refers to publications of the German Environmental Agency (UBA). The plan does not include WAM projections, nor does it include an impact assessment of the policies and measures.

For the WEM scenario, the plan provides projections for the relevant sectors of the economy, including industry and transport, covering the period until 2050. The analysis is based on a methodology described in a report by the German Environmental Agency (UBA), and on parameters deviating from the values recommended by the Commission, described in detail in the referenced report. The data sources used are well documented. The transition from the national ETS to the new ETS for buildings, road transport and additional sectors (ETS 2) has been considered in the plan but not in scenario projections.

The plan does not include a quantitative analysis of the expected impacts of targets and policies. There is no macro-economic assessment of the updated draft NECP, which under the Energy Union Regulation is a mandatory requirement. The plan states that a detailed assessment will be provided with the final NECP update.