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Assessment of the final national energy and climate plan of Germany

Table of contents

1. SUMMARY	2
2. FINALISATION OF THE PLAN AND CONSIDERATION OF COMMISSION RECOMMENDATIONS.....	4
Preparation and submission of the final plan	4
Consideration of Commission recommendations.....	4
3. ASSESSMENT OF THE AMBITION OF OBJECTIVES, TARGETS AND CONTRIBUTIONS AND OF THE IMPACT OF SUPPORTING POLICIES AND MEASURES	7
Decarbonisation.....	7
Greenhouse gas emissions and removals	7
Renewable energy	9
Energy efficiency	10
Energy security.....	11
Internal energy market	11
Research, innovation and competitiveness.....	12
4. COHERENCE, POLICY INTERACTIONS AND INVESTMENTS	13
5. GUIDANCE ON THE IMPLEMENTATION OF THE NATIONAL ENERGY AND CLIMATE PLAN AND THE LINK TO THE RECOVERY FROM THE COVID-19 CRISIS.....	15
Guidance on the implementation of the national energy and climate plan	15
Link to the recovery from the COVID-19 crisis	18
ANNEX I: POTENTIAL FUNDING FROM EU SOURCES TO GERMANY, 2021-2027	20
Table 1: EU funds available, 2021-2027: commitments, EUR billion.....	20
Table 2: EU funds available to all Member States, 2021-2027, EUR billion.....	20
ANNEX II – DETAILED ASSESSMENT OF HOW COMMISSION RECOMMENDATIONS HAVE BEEN ADDRESSED.....	22

1. SUMMARY

Germany's final integrated national energy and climate plan (NECP)¹ sets the target to reduce **greenhouse gas (GHG) emissions for sectors** not covered by the EU Emissions Trading System (non-ETS) by 38% by 2030 compared to 2005, as set in the Effort Sharing Regulation (ESR)². With the policies and measures set out, which are based on Germany's climate action plan and its Climate law, Germany projects to be able to almost close the gap to achieve the 2030 ESR target, from 14% based on existing measures, to 3%. Although Germany's national and sector-wide greenhouse gas emission reduction targets for 2030 are in line with its long-term strategy (national climate plan 2050), they are not always reflected in sector-specific national contributions. The final plan aspires to (almost) reaching the no-debit commitment for the **land use, land use change and forestry (LULUCF)** sector with additional measures, but it does not explain how.

Germany's contribution to the EU's **renewable energy** target for 2030 is 30% of gross final energy consumption in 2030. This is adequate as it is in line with the 30% share resulting from the formula in Annex II to the Governance Regulation³.

On **energy efficiency**, Germany's contribution to the EU target is sufficiently ambitious in terms of primary energy consumption, amounting to 216 million tonnes of oil equivalent (Mtoe). However, the corresponding projection of 185 Mtoe for final energy consumption is more modest in terms of level of ambition. The energy efficiency first principle is explored in great detail and reflected across all sectors and dimensions of the Energy Union. On buildings, Germany officially submitted its long-term renovation strategy on 3 July 2020. The final NECP also includes indications of actions and national goals related to the building sector.

Alongside affordability and environmental compatibility, Germany presents **energy security** as one of the three main objectives of Germany's energy transition. Underpinned by action on energy efficiency and renewables, Germany aims to achieve the energy security objective by ensuring that energy demand can be covered at all times and in all areas.

Regarding the **internal energy market**, the plan spells out general goals but includes neither policy objectives nor underpinning measures. There are no clear objectives, milestones nor timelines to deliver on the envisaged reforms and measures. The NECP does not address adequately the need to structurally solve congestion in the transmission network. While there is a commitment to the 15% interconnection target, this is not supported by complete set of data on the 2030 **electricity interconnection target level**.

The objectives on **research, innovation and competitiveness** mainly concern the strengthening of energy-related research and innovation by 2030. The federal government aims to spend EUR 1.3 billion per year from 2020 to 2022 under the 7th Energy Research Programme.

¹ The Commission publishes this country-specific assessment alongside the 2020 Report on the State of the Energy Union (COM(2020)950) pursuant to Article 13 of Regulation (EU) 2018/1999 on Governance of the Energy Union and Climate Action.

² Regulation (EU) 2018/842 of the European Parliament and of the Council of 30 May 2018 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement and amending Regulation (EU) No 525/2013.

³ The Commission's recommendations with regard to the Member States' level of ambition on renewable energy are based on a formula set out in this Regulation. The formula is based on objective criteria.

The plan largely addresses and quantifies the energy-related **investment** needs stemming from additional measures, though it does not indicate the estimated overall amount of private and public funding up to 2030. It does mention the role of public finance. However, the information provided on funding is not quantitative and it does not indicate the share of each governance level in the overall funding. The *Energie- und Klimafonds (EKF)* is Germany’s main funding instrument for energy transition and climate change, largely financed by revenue from the EU Emissions Trading System. Germany plans to allocate a ‘three-digit’ billion euro sum to fund the climate and energy transition.



Germany’s plan includes a list of **fossil fuel subsidies** and related action taken. Germany also plans to phase out specific coal-related subsidies. The list of energy subsidies appears to be in line with the figures and categories identified as fossil fuels subsidies in recent Commission analyses on energy subsidies.

Germany’s plan also provides information on how the policies set out in the NECP interact with **air quality and air pollutant emissions policy**, and explores the links with the national air pollution control programme (NAPCP) in terms of policy priorities, methodology used and additional measures proposed.



The final plan covers **just and fair transition aspects** and provides information on the expected social, employment and skills impacts of making the transition to a climate neutral economy. According to projections, it includes creating 185 000 additional jobs by 2030. It lacks however a dedicated assessment of energy poverty, and does not contain targets, objectives or measures.

Germany’s final NECP contains several examples of **good practice**, in particular regarding the way it promotes energy efficiency across all sectors, develops multiple strands of regional cooperation, and also covers the environmental effects of bioenergy on land and water.

The following table presents an overview of **Germany’s objectives, targets and contributions**⁴:

	National targets and contributions	Latest available data	2020	2030	Assessment of 2030 ambition level
	Binding target for greenhouse gas emissions compared to 2005 under the Effort Sharing Regulation (ESR) (%)	-8%	-14%	-38%	As in ESR
	National target/contribution for renewable energy: Share of energy from renewable sources in gross final consumption of energy (%)	16.5 (2018)	18	30	Adequate (30% is the result of RES formula)

⁴ Regulation (EU) 2018/1999 of the European Parliament and of the Council of 11 December 2018 on the Governance of the Energy Union and Climate Action, amending Regulations (EC) No 663/2009 and (EC) No 715/2009 of the European Parliament and of the Council, Directives 94/22/EC, 98/70/EC, 2009/31/EC, 2009/73/EC, 2010/31/EU, 2012/27/EU and 2013/30/EU of the European Parliament and of the Council, Council Directives 2009/119/EC and (EU) 2015/652 and repealing Regulation (EU) No 525/2013 of the European Parliament and of the Council.

	National contribution for energy efficiency:				
	Primary energy consumption (Mtoe)	291.7	276.6	216	Sufficient
	Final energy consumption (Mtoe)	215.4	194.3	185	Modest
	Level of electricity interconnectivity (%)	11.4%	11.4%	Not provided	N.A.

Sources: European Commission, Energy statistics, Energy datasheets: EU countries; European Semester by country; Germany's final national energy and climate plan.

2. FINALISATION OF THE PLAN AND CONSIDERATION OF COMMISSION RECOMMENDATIONS

Preparation and submission of the final plan

Germany notified its final national energy and climate plan (NECP) to the European Commission on 11 June 2020.

A **public consultation** based on the draft NECP took place online between 14 June and 2 August 2019 on the basis of the draft NECP from late 2018 and a questionnaire covering the five dimensions of the Energy Union. Although Germany submitted, together with the final NECP, a detailed summary and analysis of the public's views on the draft plan for each of the dimensions of the plan, the plan does not always make it clear how those views were taken into account. There is no indication of a strategic environmental impact assessment (SEA) developed on the NECP under Directive 2001/42/EC.

Consideration of Commission recommendations

In June 2019, the Commission issued 11 recommendations to Germany, based on its draft NECP⁵. Annex II to this staff working document gives a detailed account of how the different aspects of the Commission's recommendations were taken on board in the final NECP. Overall, the final NECP **largely addresses** the Commission's recommendations. The main changes made to the final plan are summarised below.

On **greenhouse gas emissions in non-ETS sectors**, Germany **fully addressed** the recommendation to specify cost-efficient additional policies and measures, notably in the building, transport and agriculture sectors, to address the significant projected target gap for non-ETS sectors. In particular, the final plan provides a comprehensive list of additional policies and measures, with a scenario including additional measures (WAM) that almost achieves the 2030 target for effort sharing. Moreover, further measures are being announced.

On **renewables**, Germany **largely addressed** the recommendation to provide detailed and quantified policies and measures to enable the country to achieve its target contribution, and to put forward trajectories and specific measures to meet the transport target. Specifically, Germany put forward trajectories under Article 25 of Directive (EU) 2018/2001 and additional details on

⁵ Commission Recommendation of 18 June 2019 on the draft integrated national energy and climate plan of Germany covering the period 2021-2030, C/2019/4405.

the frameworks for renewable energy self-consumption and renewable energy communities. However, the plan sometimes still lacks detail on the expected impacts of the different measures, especially in the heating and cooling sector. Moreover, the high target in the power sector of 65% depends on accelerating the extension of the grid and bringing in faster permitting procedures for wind turbines.

On **energy efficiency**, Germany **largely addressed** the recommendation to set a sufficiently ambitious national contribution, which was lacking in the draft plan. Specifically, Germany put forward primary energy consumption levels of 216 Mtoe by 2030 (240 Mtoe with non-energy consumption), which translates into a reduction in final energy consumption of 185 Mtoe. Germany envisages reducing energy consumption continuously over the period covered by the NECP. On buildings, the NECP includes a wide range of policies to foster energy efficiency.

On **energy security**, Germany **partially addressed** the recommendation to specify the measures supporting the objectives to diversify and reduce energy dependency, including measures ensuring flexibility, as well as information on phasing out nuclear energy. In particular, Germany sets out ongoing investment plans by market participants, such as for LNG terminals, though the statements made and plans on energy dependency remain vague.

Related to the **internal energy market**, Germany **partially addressed** the recommendation to set forward-looking objectives and targets on market integration, notably measures to reinforce market signals including locational signals and to improve the effective impact of market components in the electricity price. Specifically, the plan provides an overview of all measures and details measures to improve flexibility. It also provides a good overview with clear timelines on ongoing infrastructure investment. However the plan does not provide clear information on core market indicators (such as market concentration, liquidity or the share of market-based investment). Contrary to the recommendation, the plan argues against bringing in locational price signals.

On **research, innovation and competitiveness**, Germany **partially addressed** the recommendation to clarify the national objectives and funding targets in research, innovation and competitiveness to be achieved between 2022 and 2030. It provides a rather complete, descriptive list of policies and measures. However, there appear to be only few dedicated policies and measures specifically designed to achieve the long-term objectives mentioned.

Germany received a recommendation to reinforce **regional cooperation** and has **fully addressed** this recommendation. Specifically, before finalising the plan, Germany engaged in a number of regional cooperation fora, which are listed and briefly described in the final plan. This includes, in addition to multilateral cooperation, bilateral cooperation with France on energy and climate policy, declarations of intent with Belgium and the Netherlands, and energy and climate policy under the strategic dialogue process with Czechia.

On **investment**, Germany **partially addressed** the recommendation. It extended its analysis of investment needs provided for electricity transmission infrastructure to include an overview of the investment needed. In particular, Germany's plan provides an estimate of the additional energy-related investment needs (compared to a reference scenario) over the 2021-2030 period for a total amount of EUR 279.2 billion to implement the 2030 climate protection programme adopted in 2019 by the German government, including a breakdown by sector. An indication on investment needs by region (Bundesland) could have served as a basis to discuss regional specificities. Information on funding is generic and not quantified.

Germany **largely addressed** the recommendation to list the action taken and plans to **phase out energy subsidies**, in particular fossil fuel subsidies. The plan includes a comprehensive and quantitative catalogue of mainly fossil fuel subsidies, although not all energy-related subsidies are mentioned. The plan mentions the expiry dates for a number of subsidy schemes, although it only specifies actions and plans relating to coal subsidies.

Germany **fully addressed** the recommendation to supplement the plan with an **analysis on air quality**. The NECP analyses the implications of decarbonisation measures on air pollution. Projections of air pollutant emissions are factored into the reference scenario of the climate change programme for 2030 and there is consistency with GHG projections.

Lastly, Germany **partially addressed** the recommendation to better **integrate just and fair transition aspects**. The final plan notably projects an increase in employment of 185 000 jobs as compared to the baseline. In addition to the increase in the number of jobs, higher growth is also reflected in more productive employment and higher wages. The document highlights that Germany has seen a noticeable shift in employment from traditional, mostly conventional energy to renewables since 2000. However, the plan does not sufficiently consider the use of relevant EU funds to address the socio-economic impacts of the phasing out of coal and lignite. The final plan does not address the recommendation on **energy poverty**. Although additional information is provided in the corresponding chapter, the final plan lacks a dedicated assessment of energy poverty and related targets, objectives or measures.

Links with the European Semester

In the context of the European Semester framework for the coordination of economic policies across the EU and of the country report 2019⁶, Germany received one country-specific recommendation⁷ on climate and energy, calling on it to focus on sustainable transport as well as energy networks and affordable housing, taking into account regional disparities. In the 2020 country report⁸ adopted on 20 February 2020, the Commission found that Germany had achieved limited progress on this recommendation.

Due to the COVID-19 crisis, the European Semester country-specific recommendations⁹ for 2020 addressed Member States' responses to the pandemic and made recommendations to foster economic recovery. In particular, they focused on the need to start mature public investment projects as soon as possible and promote private investment, including through relevant reforms, notably in the digital and green sectors. In this context, Germany received a country-specific recommendation stressing the importance of focusing investment on “the green and digital transition, in particular on sustainable transport, clean, efficient and integrated energy systems, digital infrastructure and skills, housing, education and research and innovation”.

The Governance Regulation requires Member States to ensure that their national energy and climate plans take into consideration the latest country-specific recommendations issued in the context of the European Semester. Germany's national energy and climate plan can support implementation of the European Semester recommendations, as it identifies the necessary investment needs and the financial resources to meet them.

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

Decarbonisation

Greenhouse gas emissions and removals

Germany's binding 2030 **non-ETS greenhouse gas (GHG) emission target** is to achieve a 38% reduction compared to 2005. Germany aims to achieve this target domestically. The gap ‘with existing measures’ to the target for effort sharing sectors is estimated to be 14 percentage points by 2030. The scenario ‘with additional measures’ includes the impact of the comprehensive climate action programme adopted at the end of 2019. Under that scenario, emissions in the effort sharing sectors are projected to fall by 35%, i.e. it is almost sufficient to meet the non-ETS target. Germany has a separate national target to achieve a 55% total GHG emission reduction in 2030

⁶ The Annex D to the 2019 Country report also sets out priority investments for the 2021-2027 cohesion policy, substantially contributing to the clean energy transition.

⁷ Recommendation for a Council Recommendation on the 2019 National Reform Programme of Germany and delivering a Council opinion on the 2019 Stability Programme of Germany, COM(2019) 505 final.

⁸ Commission staff working document, Country Report Germany 2020, SWD/2020/504 final.

⁹ Recommendation for a Council Recommendation on the 2020 National Reform Programme of Germany and delivering a Council opinion on the 2020 Stability Programme of Germany, COM(2020) 505 final.

compared to 1990. This is consistent with Germany's national 2050 objective of climate neutrality.

Germany does not indicate whether it intends to generate credits from the land use, land use change and forestry (LULUCF) sector that can be used for compliance with the effort sharing target (potentially up to 22.3 Mt over 10 years). It also projects that the LULUCF sector, which was a net carbon sink until 2018, will become a net source of emissions over the whole decade.

As an important new **cross-cutting measure** to achieve the non-ETS target, Germany has adopted a national law introducing carbon pricing for CO₂ emissions from fossil fuel combustion outside the ETS, with industrial and building heating and transport the key emitting sectors covered. The system starts with a fixed price in 2021, increasing up to 2025 (from EUR 25 to EUR 55/t CO₂, respectively). The emission cap from 2026 reflects the ESR emission reduction trajectory. From that year on allowances will be tradable.

Germany has a trajectory for emission reductions in the **transport** sector (125 Mt CO₂eq by 2030 compared to 161 Mt CO₂eq by 2021), responsible for more than a third of the effort sharing emissions. The final plan identifies a broad range of measures in this sector, e.g. regulatory, fiscal and financial support measures, to stimulate demand for alternative fuel vehicles and infrastructure in road transport, transport efficiency and digitalisation, massive investment in the rail network and measures such as aviation taxation. However, not much detail is provided on a modal shift. Road transport continues to generate the majority (96%) of external costs due to transport, including accidents, environmental costs (through air pollution, greenhouse gas emissions, noise, habitat damage) and congestion. **Electromobility** and the underpinning charging infrastructure is supported by the higher CO₂ price and various regulatory, fiscal and financial support measures, with the ambitious aim to have 7-10 million electric vehicles on the road and up to 1 million publicly accessible recharging points by 2030. A third of road freight would be powered by electricity or other zero- or carbon-neutral fuels.

Germany has also set a quantitative target for further emission reductions in the **building** sector (from 118 Mt CO₂eq in 2020 to 70 Mt CO₂eq in 2030). The plan lists a number of measures beyond the new carbon pricing for this sector. They range from energy efficiency measures, including renovation of existing building stock and standards for new buildings, to renewable energy, including district heating.

The plan also includes contributions and potential measures in the product use and **fluorinated gas** sector (EU-level policies) and in the **waste** sector. Specifically, the German climate law stipulates that emissions from the waste sector must almost halve from 2020 to 2030. The plan does not explore the links between energy and waste management.

The plan covers **LULUCF and agriculture** in Germany, including a detailed list of measures focusing on enhancing the natural carbon sink in organic soil and forests, reducing nitrogen emission sources and surpluses in soils, strengthening the production of biogas, developing organic farming, and reducing emissions from livestock sectors. It tackles energy consumption with specific legislative initiatives and measures, including consumption and demand-side measures. Certification of soil organic matter and awareness raising are among the actions put forward. Both GHG and ammonia emissions from the agriculture sector are expected to fall. The plan makes reference to **forest** conservation and sustainable management and the sustainable use of wood, support to create swathes of wooded land, improve forest resilience and restore forests.

Although Germany has a national adaptation strategy, the final energy and climate plan does not specify any **climate adaptation** goals.

Germany notified its long-term strategy to the Commission on 2 January 2020. Germany now refers to climate-neutrality in its Climate Law. However, the long-term strategy lacks many elements required under Article 15 of the Governance Regulation.

Renewable energy

The national contribution to the EU's 2030 renewable energy target is set at a **renewables share** of 30% in gross final consumption of energy in 2030. This is considered adequate as it corresponds to the share resulting from the formula in Annex II to the Governance Regulation. The indicative trajectory goes even slightly beyond all reference points¹⁰. However, the policies and measures that Germany puts forward appear, at this stage, not enough to ensure the country reaches its targets on renewables, especially on electricity and heating and cooling.

In the **electricity** sector, Germany aims to cover a 65% share of its electricity consumption from renewable energy sources by 2030, which will require having an installed renewable energy capacity of approximately 200 GW. To achieve this target, it is essential to speed up the expansion of the grid and to accelerate planning and approval procedures for onshore wind energy. The increased capacity will be achieved mainly by auctions for larger PV, onshore and offshore wind and for biopower to a smaller degree. There are no details on whether and how Germany will provide support for roof-top solar installations. These policies and measures are considered insufficient as long as the problems of permitting and repowering onshore wind projects remain and the grid expansion keeps being delayed.

For **heating and cooling**, Germany aims to achieve a 27% share of renewables in 2030, which is in line with the indicative target of 1.3 percentage points for the overall share and 1 percentage point (up to 30% in 2030) for district heating as an annual average calculated for 2021-2025 and 2026-2030 respectively. However, although an increase of waste heat is expected, the contribution of waste heat is not quantified. The key policies and measures in the heating and cooling sector are financial incentives: setting a CO₂ price, a premium to replace oil boilers, and several (financial and advisory) support measures for households and bigger buildings, renewable heat production plants, to build new and transform existing heat networks.

Increases in the use of heat pumps, geothermal and solarthermal are also expected, although **biomass** remains the main source of renewable energy. However, the policies and measures set out in the plan appear, at this stage, not enough to achieve the target, because there is too little detail on the effects of each measure. It also lacks an assessment of the impact of forest biomass on the LULUCF sink.

When setting the target share of renewable energy in **transport** in the final plan, as requested in Articles 25-27 of Directive 2018/2001¹¹, the contributions of all eligible fuels should result in a share of 14% renewables. Instead, Germany aims to achieve a much higher national level of 27% (including multipliers set out by the recast Renewable Energy Directive). First generation biofuels are set to rise to 5.3% and advanced biofuels to 3.5% in 2030. The key policies and measures set out in the plan are an increase in the greenhouse gas savings obligation as regards fuel content, higher prices for CO₂, and the rollout of charging and refuelling infrastructure. In addition, Germany is putting in place financial incentives (purchase subsidies, tax incentives) to boost the market uptake of electric, gas, plug-in hybrid and battery fuel cell vehicles. The federal

¹⁰ Under Article 4(a)(2) of Regulation 2018/1999.

¹¹ Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources.

government also plans to support the production of advanced biofuels and renewable fuels of non-biological origin. These policies and measures, in combination with the above-described electrification policies and the projected 10% reduction in energy use, are considered sufficient to achieve Germany's target for renewables in the transport sector.

Energy production from **biomass** is expected to fall slightly, with a notable reduction in power production and small increases in transport and heat. Germany indicates that the **bioenergy** used is to be based more on waste and residues in the future and that no additional land is expected to be available in Germany for bioenergy production.

Energy efficiency

Germany's target is set out in the 2050 Energy Efficiency Strategy (EffSTRA, adopted in December 2019) and corresponds to a 30% reduction in gross inland consumption in 2030 compared to 2008. On this basis, Germany has aligned its contribution in primary energy consumption to the EU's 2030 energy efficiency target at 216 Mtoe in 2030. The contribution for final energy consumption results from modelling projections and amounts to 185 Mtoe.

The plan provides descriptive information on **policies and measures** beyond 2020, targeting all the main sectors (buildings and urban planning, public sector, industry, transport and agriculture). These are supported by cross-cutting measures related to consumer protection, financing, awareness raising and dialogue. These policies and measures do not appear sufficient to achieve the target, because Germany's primary energy consumption target is below the level projected under the WAM scenario (227 Mtoe in 2030).

Germany presents the **cumulative savings** to be achieved under Article 7 of the Energy Efficiency Directive¹² for the 2021-2030 period with a cumulative amount of 3996.5 PJ or 95.46 Mtoe. Germany does not envisage using an obligation scheme but relies on alternative measures under Article 7b of the Energy Efficiency Directive to yield energy savings. Annex III sets out 27 policies and measures to yield energy savings. The main measures include carbon pricing in the transport and heat sectors (M16 – 713 PJ), energy and electricity tax (M15 – 573 PJ), the Building Energy Act (M11 – 573 PJ), grants for energy efficiency in the economy (M01 – 480 PJ) and the Federal Aid for Efficient Buildings (M03 – 305 PJ). These policies and measures are considered credible with a view to achieving the target. Combined, they will deliver two thirds of cumulative energy savings. However, the projected savings of 3 371 PJ (71.6 Mtoe) currently fall 15.5% short of the target of 3 996.5 PJ (95.46 Mtoe). The NECP does not set a timeframe to close this significant gap.

On buildings, the German NECP already includes a wide range of policies to foster energy efficiency. It gives an indicative milestone for energy performance (non-renewable primary energy consumption) to fall from 4400 PJ in 2008 (base year) to 2000 PJ in 2030. The plan also presents measures to tackle a wide range of issues, including information and advice on energy efficiency for residential, non-residential buildings and SMEs; several support programmes to promote energy efficiency and renewables in heating systems; tax incentives for energy renovation of buildings; innovation programmes for the future of construction; energy efficient procurement for public buildings and buildings from municipalities; energy audits, labels and

¹² Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency as amended by Directive (EU) 2018/2002.

management systems. However, the measures set out in the NECP are often generic and lack detail. In particular, for new buildings and buildings undergoing major renovations, detailed efforts would allow to avoid the creation of accessibility barriers for persons with disabilities and, where possible, for existing accessibility barriers to be removed.

Energy security

To maintain the security of energy supply, Germany's NECP envisages measures such as grid optimisation and extension, market integration, balance of demand and supply and, lastly, electricity imports. As regards **oil and gas**, gas-fired power plants and **storage** facilities respond flexibly to fluctuating electricity generation. Flexibility and diversification of supply are planned to be based mainly on the internal electricity market (i.e. imports if needed). The plan does not mention sector-specific measures to increase cyber security in the energy sector.

Germany's plan provides a good description of the current situation of energy supply security in Germany, giving an overview of the legal framework and setting out the responsibilities of different bodies involved. The main responsibility for ensuring security of supply remains, under normal conditions, with market participants and system operators. However, the German NECP does not describe measurable targets, including targets for system flexibility, e.g. via demand response and energy storage, diversifying the oil or gas supply, reducing import dependency or the reliability of the electricity supply. It is therefore difficult to make an assessment of progress towards potential objectives related to energy security. The plan primarily describes the status quo without formulating clear (and quantified) objectives. However, the targets set for renewable energy and energy efficiency are expected to improve energy security.

The planned policies and measures are considered credible with a view to achieving the objectives, where they are available. In particular, the plan gives a detailed description of the legal framework and of the responsibilities of the various bodies involved.

The impacts of climate change are not mentioned as a **risk to energy security**, despite the fact that Germany's national adaptation plan includes such measures for the energy sector. The plan lacks information on how climate change risks may affect energy supply (e.g. wildfires and storms destroying biomass resources and power networks, availability of hydro power) in line with impact and vulnerability assessments.

Internal energy market

The plan states that Germany sets no target **interconnectivity level** for 2030. However, it lists ongoing projects of common interest, which will increase interconnectivity.

The final plan provides an overview of measures related to the internal energy market, though it does not provide quantitative information on core market indicators (such as market concentration, liquidity or the share of market-based investments). Specifically, the plan refers to recent decisions on the closure of coal-fired electricity generation and describes the action plan to reduce structural congestion in the electricity network. The plan also refers to ongoing regional and European processes to improve market functioning (e.g. flow-based market coupling), without detailing national contributions to these processes. The plan includes precise measures to improve the flexibility of combined heat and power generation. It also indicates that barriers to flexible service provision in the tariff system are under review. Under the plan, Germany's planned flexibility checks will be agreed with its neighbouring countries to reduce regulatory barriers to flexible services, including energy storage and demand response.

The plan gives an overview of the development of different sources of **flexibility** needed to integrate the rising share of renewable energy into the electricity system. However, the NECP does not cover aspects related to system flexibility comprehensively. It contains only limited information on the potential and the sources for increasing system flexibility. It lacks a comprehensive analysis of the barriers to new market participants (e.g. aggregators) and of the expected uptake of different sources of flexibility (demand response, energy storage, and distributed generation). The plan includes only very limited policies and measures to promote flexibility. To unlock the full potential for system flexibility, tariff-based schemes are not sufficient and it is important to ensure all providers, including consumers, can access all electricity markets.

The plan argues that a large bidding zone reduces the need for storage. This is not a compelling argument on its own. Although a large bidding zone may reduce price incentives for storage by reducing price fluctuation, the technical need for services provided by storage remains unchanged. Furthermore, storage (like generation) may be installed in areas that provide less benefit to system stability, as revenues in a bidding zone with structural congestion provide no clear locational signals. Furthermore, structural congestion in the transmission system, which is not fully reflected in the wholesale market in a system with very large bidding zones, leads to additional loop-flows to neighbouring countries, thereby resulting in inefficient market outcomes. The lack of transmission capacity from north to south puts a strain on system operation, both inside Germany and in neighbouring countries. Ultimately, this creates inefficiencies for the single market and leads to a loss in overall economic welfare. Notwithstanding the question of price zones, the Commission highlights that, especially if investments in system flexibility keep being delayed, the lack of locational signals risks bringing forward investments (e.g. for storage) that do not meet system needs and could even increase the gap between market outcomes.

The NECP contains only limited quantitative parameters on the functioning of national retail markets. It does not detail policy objectives related to retail markets or the policies and measures planned to reach those objectives. The plan also lacks specific objectives for market integration or for improving the impact of market components in electricity prices.

Regarding **energy poverty**, the final plan extensively amended the section in comparison to the draft plan. However, Germany does not use the term “energy poverty” as a standalone concept. Instead, it takes a comprehensive approach to poverty reduction through social legislation, which does not focus on individual needs such as energy. The costs incurred by households in obtaining energy are taken into account in the same way as other vital needs. The legal arrangements in place include financial support for those in need over a longer period of time and in specific emergency situations, such as the threat of disrupted supply. The plan does not set any specific targets or policies and measures to address energy poverty. Instead, Germany explains its general social legislation and how it takes into account energy demand. There is no reference to poor, vulnerable or social housing households in the sections of the German plan covering energy efficiency and the long-term renovation strategy.

Research, innovation and competitiveness

The final plan provides information on Germany’s 7th Energy Research Programme in support of **research and innovation** measures up to 2022. It states that the federal government aims to step up energy research between 2020 and 2030, to support application-oriented research in view of reaching the country’s 2050 targets. The plan covers a wide range of RIC measures and appears to be very complete and well-structured. It identifies five main areas: (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, CO₂ technologies); (v) nuclear safety, both as part of and supporting the exit from nuclear energy. In the transport sector, changes to employment and value added are expected as a result of the shift from conventional to alternative drivetrains. However, the changes are not fully quantified in the plan. It also lacks a timeframe and funding targets or budgets needed to achieve the desired changes.

The final plan states that hydrogen will be indispensable for the successful decarbonisation of Germany’s economy, and for many other national economies, since alternatives will be needed to the fossil fuel energy that is currently still in use. Although the federal government considers only green hydrogen to be sustainable, the final plan indicates that other types of carbon-neutral hydrogen may be used during the transition period, due to Germany’s integration in the European energy supply infrastructure. Since Germany submitted its final plan, the federal government has adopted a national hydrogen strategy, which includes a suite of measures to ramp up hydrogen technologies.

As regards **innovation and competitiveness**, Germany puts the emphasis on cross-cutting issues (e.g. sector coupling, digitalisation, mobility and batteries) and better involvement of start-ups. Its plan states that energy research can increase the competitiveness of German companies by capitalising on new trends such as digitalisation, to maintain and develop technological skills, and to improve export opportunities for innovative energy technologies. The document refers to shortages of skilled workers in professions that may undergo an energy transition, such as technical and construction professions. It also acknowledges the difficulty of fully capturing energy transition-related occupational groups. Therefore it does not give a clear indication on the skills that will be needed and in which professions. Research funding will be directed towards technologies for global markets, while the plan emphasises the need to activate the innovation potential in small, medium-sized and young businesses. However it lacks clear and measurable objectives.

The plan clearly covers cooperation with the **strategic energy technology (SET) plan**, as well as broader international and bilateral cooperation with several countries and regions. However, it lacks detail on the funding allocations per work stream.

4. COHERENCE, POLICY INTERACTIONS AND INVESTMENTS

Considering the overall good set-up of national targets in energy and climate policy outlined in the final plan, the final plan identifies some **links** between the targets in terms of the level of national ambition and in terms of provisional, planned, additional and existing policy instruments. A comprehensive impact assessment helps address these policy interactions. In particular, the final plan discusses the links between the **energy-efficiency first principle** and other dimensions of the Energy Union. The impact of the principle is described in detail and it applies to all sectors. The principle will play a key role for heat pumps and electromobility in particular. It will be mainstreamed into all sectors via support programmes and standard setting. ‘Energy efficiency first’ will also be reflected in the building sector. Applying this principle to electricity grids is expected to lead to energy efficiency improvements of 5.7% by 2030, delivering 30 TWh of savings compared to 2016. Similar optimisation elements are also used in the gas infrastructure and related development plans. The principle also comes into play in balancing supply and demand, in particular in terms of smart control of heat networks to promote demand response by energy efficiency measures, monitoring load management and demand-

response measures under Article 15(8) of the Energy Efficiency Directive. Germany's plan also seeks to draw on energy efficiency measures to reduce energy costs for households and also tackle energy poverty. As regards market integration, efficient use of electricity from renewable energy sources plays a key role in sector coupling.

The final plan provides significant information on interactions with **air quality and air emission policies**. It sets out projections of air pollutants emissions under the WAM scenario. It also mentions negative interactions in terms of the counter-productive effect of increasing the use of solid biomass and biogas production. Improved digestate management in agriculture may reduce NH₃. Decarbonising traffic will reduce 'energy-related' pollutants, mainly NO_x, but also particles, SO_x. The national air pollution control programme (NAPCP) links to the draft NECP (only the draft NECP was available when the NAPCP was submitted), in terms of policy priorities, methodology used and additional measures proposed. Synergies between the two programmes are mentioned in the NAPCP, in particular as regards reducing electricity production from coal. The same projections were used for the draft NECP and the NAPCP.

Climate change impacts are not mentioned as **risks to energy security**, although Germany's national adaptation plan includes such measures for the energy sector. There is no information on how climate change risks might affect energy supply (e.g. wildfires and storms destroying biomass resources and power networks, or the availability of hydro power) in line with impact and vulnerability assessments. Only one measure is described to increase the climate resilience of forests as a means to preserve them as carbon sinks. The plan also makes a mention of the need to use renovations to make buildings climate resilient.

The NECP relies on carbon pricing under the new emissions trading system and does not include other measures to significantly increase **environmental taxation**. In Germany, revenue from environmental taxes as a share of GDP is among the lowest in the EU. Environmental tax revenue in Germany is primarily generated by energy-related taxes (82.8% of environmental tax revenue), including the energy tax (69.2%) and the electricity tax (11.8%). Tax revenue from transport fuel taxes and taxes on resources are particularly low in Germany compared with other EU countries. Germany collects no tax revenue that is directly pollution-related.

The additional **investment needs** reported in the NECP are detailed and include grid-related investment, under the scenario that takes into account the climate action plan adopted in 2019. They are estimated to amount to approximately EUR 95 billion (accumulated over 2021-2030) for energy transformation sectors (mainly for renewable energy installation and for grids) and EUR 184 billion for different end-use sectors. The NECP does not include an estimate for non-energy-related investment needs for sectors such as agriculture and industry. It is not clear why the NECP states that it was not possible to provide an estimate of the investment flows under existing policies and measures. The information provided on absolute public funding amounts refers to the current situation; there is no projection or other forward-looking estimate.

The NECP provides a good summary of the **macroeconomic impact of the planned policies and measures**. However, it provides limited information on how the policies and measures are financed. Without this, it is difficult to interpret private consumption and investment numbers.

The plan includes a description of **existing fossil fuel subsidies**. It notes that Germany has been subject to a peer review by the G20 and produced a report on fossil fuel subsidies in 2016. As part of the federal government's subsidy reporting, a regular sustainability assessment of subsidies takes place every two years. The plan indicates a timeline to phase out coal subsidies, and expiry dates for other fossil fuel subsidies.

Regarding the **just and fair transition** aspects, Germany has assessed the impact of policies and measures on the economy, education, skills and on social aspects, including an analysis of the social conditions. Lastly, the plan includes an analysis of the environmental and health impacts. It makes reference to financial support provided for coal regions. Nevertheless, it does not give details on the socioeconomic impact of the transition.

The **circular economy** and resource efficiency are integrated in the strategy, being a critical part of many relevant policies (industry, construction), with a dedicated circular economy programme and advice centre. However, the plan lacks quantification of the impacts on GHG emissions and detailed funding figures related to the circular economy and resource efficiency.

Germany indicates that the **bioenergy** used is to be based more on waste and residues in the future. The sustainable supply of **biomass** for energy purposes is projected not to increase and is expected to shift towards more biowaste and residues. Consequently, land use for biomass is expected to decrease. The final plan even commits to phase out support to first generation biofuels. The plan does not give an estimate of the impact on the LULUCF sink. It acknowledges that trade-offs with other environmental, nature and **biodiversity** protection issues would need to be properly resolved, but the interactions between decarbonisation policies and biodiversity are hardly mentioned.

The final version of the plan fully complies with **data transparency** requirements and with the use of European statistics.

5. GUIDANCE ON THE IMPLEMENTATION OF THE NATIONAL ENERGY AND CLIMATE PLAN AND THE LINK TO THE RECOVERY FROM THE COVID-19 CRISIS

Germany needs to swiftly proceed with implementing its final integrated national energy and climate plan, as notified to the Commission on 11 June 2020. This section provides some guidance to Germany for the implementation phase.

This section also addresses the link between the final plan and the recovery efforts from the COVID-19 crisis, by pointing at possible priority climate and energy policy measures Germany could consider when developing its national recovery and resilience plan in the context of the Recovery and Resilience Facility¹³.

Guidance on the implementation of the national energy and climate plan

Germany's final national energy and climate plan sets a 2030 target to reduce **non-ETS greenhouse gas (GHG) emissions** by 38% compared to 2005, in line with the Effort Sharing Regulation (ESR)¹⁴. With the additional policies and measures specified in the plan, which are

¹³ On 17 September 2020, the Commission has put forward the Annual Sustainable Growth Strategy 2021 (COM(2020) 575 final), as well as guidance to help Member States prepare and present their recovery and resilience plans in a coherent way. The guidance has no bearing on the negotiations on the proposal for a Regulation on the Recovery and Resilience Facility in the European Parliament and the Council (Commission staff working document. Guidance to Member States – Recovery and resilience plans, SWD (2020) 205 final).

¹⁴ Regulation (EU) 2018/842 of the European Parliament and of the Council of 30 May 2018 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement and amending Regulation (EU) No 525/2013.

based on Germany's climate action plan and climate law, Germany expects to almost close the gap to the target to three percentage points, down from 14 percentage points with existing measures. The policies and measures would need to be implemented vigorously and further fleshed out.

Germany's contribution to the EU's 2030 renewables target is adequate, compared to the share resulting from the formula in Annex II to the Governance Regulation. On energy efficiency, Germany's contribution to the EU target is of sufficient ambition for primary energy consumption but the corresponding projection for final energy consumption is more modest and would merit additional action on the demand side.

On **renewables**, Germany committed to increasing the share of renewables in gross final energy consumption to 30% in 2030. However, additional policies and measures appear necessary to reach this level of ambition, especially considering the high target for renewables in electricity, and the heating and cooling target. The additional measures would need to be based on a detailed and more specific planning for renewable energy generation sources, including implementing national legislation. Furthermore, the initiatives included in the recast renewables directive to make energy self-consumption more attractive need to be implemented.

On **energy efficiency**, Germany would benefit from adopting and implementing additional policies and measures that would deliver additional energy savings by 2030 and enable Germany to meet the obligation under Article 7 of the Energy Efficiency Directive (EED). It is important to ensure the proposed measures are effective by having a clear estimate of expected energy savings, implementation timelines and budget requirements. In addition, a robust approach is needed to ensure that Article 5 EED requirements on central government are met. Building on the application of the energy efficiency first principle, it would be beneficial to develop and collect best practices that could promote the principle in other sectors.

Improving energy efficiency in buildings has much potential to accelerate energy savings and contribute to the recovery of the economy after the COVID-19 pandemic. Building on the momentum of the **Renovation Wave** initiative¹⁵, Germany could step up action to improve the energy performance of its existing building stock by leveraging action in the context of the Germany's Climate Action Program 2030 and by identifying additional specific measures, targets and action, while giving due attention to energy poverty. Further support for renovating public and private buildings could be provided through increased public funding and by leveraging EU and national budgets with private money, combining grants, lending, guarantees and loan subsidies. Germany would need to boost the substantial energy saving potential of its existing building stock by implementing its long-term renovation strategy under Article 2a of the Energy Performance of Buildings Directive¹⁶.

Regarding **energy poverty**, Germany is encouraged to consult the Commission Recommendation of 14 October 2020 on energy poverty and its accompanying staff working document providing guidance on the definition and quantification of the number of households in energy poverty and on the EU-level support available to Member States' energy poverty policies and measures.

¹⁵ Communication 'A Renovation Wave for Europe – greening our buildings, creating jobs, improving lives', COM(2020)662 and SWD(2020)550.

¹⁶ Germany submitted its long-term renovation strategy in accordance with Article 2a of Directive 2010/31/EU on the Energy Performance of buildings on 03.07.2020.

Energy poverty could be, among other measures, addressed through specific support to socially innovative solutions and social enterprises that work on addressing this challenge (e.g. energy-awareness campaigns, retraining unemployed as energy advisors, supporting green installations by cooperatives, buying energy-saving appliances for social enterprises to rent out). It will be important to ensure the upskilling of the workforce in the construction sector.

Regarding **energy security**, Germany would benefit from further developing measures to ensure system resilience and flexibility. This includes specific measures to maintain and strengthen cybersecurity in the energy sector.

Concerning the **internal energy market**, unlocking the full potential of system flexibility and giving providers of flexibility access to all electricity markets would help integrate the rising share of renewable energy into the electricity system. Germany would benefit from measures to reinforce market signals and to improve the effective impact of market components in the electricity price. In view of structural congestion in the transmission network, bringing in locational signals, be it via bidding zones or alternative means, would contribute to investments that are better aligned with the current and expected future needs of the system. Given that major new electricity generation investments focus on the North and Baltic Sea regions, the challenge of locational signals is not a transitory issue and would benefit from a structural solution.

Germany would benefit from having clear indicators tracking the achievement of milestones on its **research and innovation and competitiveness** objectives. Over time, collecting granular research, innovation and competitiveness data would be useful. Germany would also benefit from further strengthening the link between the competitiveness objective and underpinning policies and measures in different sectors.

Germany does not provide quantitative information on total **investment** needs or corresponding funding. It indicates the intention to allocate a three-digit billion euro sum to climate and energy. For Germany, it is important to focus investment on the green and digital transition, in particular on sustainable transport, clean, efficient and integrated energy systems, digital infrastructure and skills, housing, education and research and innovation. Germany's national energy and climate plan can support the implementation of these recommendations formulated in the context of the European Semester process of macroeconomic coordination.

Germany has been very pro-active on **regional cooperation** in a number of cooperation settings. Germany is invited to continue ongoing efforts to step up such exchanges and initiatives that facilitate implementation of its national energy and climate plan, in particular as regards cross-border issues¹⁷. Germany is also invited to unlock the potential of **multilevel climate and energy dialogues** to actively engage with regional and local authorities, social partners, civil society organisations, business community, investors and other stakeholders and to discuss with them the different scenarios envisaged for its energy and climate policies.

¹⁷ In this context, the Commission will help address related issues in a strategic manner in its upcoming Strategy for Offshore Renewable Energy by identifying key actions in the area of maritime planning, upscaling technologies, and a new approach to infrastructure planning and offshore renewables capacity building.

Germany is invited to extend and update reporting on **energy subsidies** and continue action to phase out subsidies, in particular fossil fuel subsidies, by further developing and implementing specific plans with associated timelines, (coupled with measures to mitigate the risk of household energy poverty).

For all investments implementing the national energy and climate plan, Germany is invited to ensure these are in line with national, regional or local plans for **air pollution** reduction, such as the National Air Pollution Control Programme (NAPCP), and relevant air quality management plans.

In implementing its plan, Germany is invited to make the **best possible use of the various funding sources available**, combining scaled-up public financing at all levels (national and local, as well as EU funding) and leveraging and crowding in private financing. An overview of EU funding sources which should be available to Germany during the forthcoming multiannual financing period (2021-2027), and of EU funding addressed to all Member States and companies, is provided in tables 1 and 2 of annex I. For the forthcoming period, the European Council has committed to the mainstreaming of climate action into all EU programmes and instruments and to an overall target of at least 30% of EU funding to support climate objectives. At the same time, EU expenditure should be consistent with the Paris Agreement and the ‘do no harm’ principle enshrined in the European Green Deal. At EU level, funding will also be available for Germany under the Innovation Fund, based on revenue from auctioning allowances under the EU Emissions Trading System.

Link to the recovery from the COVID-19 crisis

The vast majority of Member States’ final national energy and climate plans were drafted before the COVID-19 crisis, and the present Staff Working Document assesses Germany’s plan in that context. Nevertheless, the implementation of Germany’s final integrated national energy and climate plan will need to fully take into account the recovery from the COVID-19 pandemic.

Under the Recovery and Resilience Facility, which is expected to be operational on 1 January 2021, **the final plan constitutes a strong basis for Germany to design climate and energy-related aspects of its national recovery and resilience plan**, and to deliver on broader European Green Deal objectives.

In particular, **mature investment projects outlined in the plan, as well as key enabling reforms that address inter alia, investment-barriers, should be frontloaded as much as possible**. The link between investments and reforms is of particular relevance for the national recovery and resilience plans, to ensure a recovery in the short to medium term and strengthening resilience in the longer term. In particular, Member States’ recovery and resilience plans should effectively address the policy challenges set out in the country-specific recommendations adopted by the Council.

In addition, **the Commission strongly encourages Member States to include in their recovery and resilience plans investment and reforms in a number of ‘flagship’ areas**¹⁸. In particular, the ‘Power up’, ‘Renovate’ and ‘Recharge and refuel’ flagships are directly related to energy and climate action and to the final national energy and climate plans. Investments and measures under

¹⁸ Cf. Annual Sustainable Growth Strategy 2021 (COM(2020) 575 final), pp. 9-12.

the ‘Reskill and upskill’ flagship, in particular as regards green technologies, are also essential to foster the climate and energy transition in all Member States.

In turn, the Recovery and Resilience Facility will provide opportunities to accelerate Germany’s green transition while contributing to economic recovery. In order to follow the commitment of the European Council to achieve a climate mainstreaming target of 30% for both the multiannual framework and Next Generation EU funding, **Germany’s recovery and resilience plan will have to include a minimum of 37% expenditure related to climate action.** Reforms and investments should effectively address the policy challenges set out in the country-specific recommendations of the European Semester, and will have to respect the principle of ‘do no harm’.

Based on Germany’s final national energy and climate plan, and on the investment and reform priorities identified for it in the European Semester, **the Commission services invites Germany to consider, while developing its national recovery and resilience plan, the following climate and energy-related investment and reform measures:**

- Measures to promote investments in sustainable mobility projects and infrastructure, backed by investments in greener energy infrastructure and R&D on clean technologies;
- Measures to reform green taxation, phase out fossil fuel subsidies and address inconsistent price signals;
- Measures addressing investment bottlenecks related to electricity networks, offshore wind and sustainable transport by simplifying administrative procedures and building capacity in the public sector.

The above mentioned measures are indicative in nature and not meant to be exhaustive. They aim to orient reflections in the development of the national recovery and resilience plan. They do not prejudge the position of the Commission on the actions to be proposed. This position will, inter alia, need to comply with the agreed legislative text on the Recovery and Resilience Facility.

ANNEX I: POTENTIAL FUNDING FROM EU SOURCES TO GERMANY, 2021-2027

Table 1: EU funds available, 2021-2027: commitments, EUR billion

Programme	Amount	Comments
Cohesion policy funds (ERDF, ESF+, Cohesion Fund)	18.4	In current prices. Includes funding for European territorial cooperation (ETC). Does not include amounts transferred to the Connecting Europe Facility.
Common agricultural policy – European Agricultural Fund for Rural Development, and direct payments from the European Agricultural Guarantee Fund.	42.3	In current prices.
Recovery and Resilience Facility	22.7	In 2018 prices. Indicative grants envelope, sum of 2021-2022 and estimated 2023 commitments. Based on the Commission’s summer 2020 GDP forecasts.
Just Transition Fund	2.3	In 2018 prices. Commitments both under the multi-annual financial framework (MFF) and Next Generation EU.
ETS auction revenue	2.9	Indicative: average of actual 2018 and 2019 auction revenues. The amounts in 2021 to 2027 will depend on the quantity and price of auctioned allowances.

Table 2: EU funds available to all Member States, 2021-2027, EUR billion

Programme	Amount	Comments
Horizon Europe	91.0	In current prices. Includes Next Generation EU credits.
InvestEU	9.1	In current prices. Commitments both under the multi-annual financial framework (MFF) and Next Generation EU. Includes the InvestEU fund (budgetary guarantee to public and private investment) and the advisory hub (technical advice). Does not consider appropriations available to beneficiaries through implementing partners, such as the European Investment Bank.
Connecting Europe Facility <ul style="list-style-type: none"> • Transport • Energy 	24.1 5.8	In current prices. The commitment for transport includes the contribution transferred from the Cohesion Fund. Excludes Connecting Europe Facility Military Mobility funding for dual use infrastructure.
Recovery and Resilience Facility	360.0	In 2018 prices. Non-allocated commitments for loans. Loans for each Member State will not exceed 6.8% of its gross national income.
Technical Support Instrument	0.9	In current prices.
Programme for Environment and Climate Action (LIFE)	5.4	In current prices.
European Agricultural Fund for Rural Development	8.2	In current prices. Commitments under Next Generation EU.
Innovation Fund	140.0	Approximation: 7/10 of the allocations of ETS allowances to provide revenue to the Innovation Fund for 2021-2030 and assuming a carbon price of EUR 20 per tonne.

Note to both tables

The figures provided by programmes under the EU budget include both the proposals under the forthcoming multiannual financial framework, and the reinforcement of these under the Next Generation EU instrument outside the EU budget.

The figures quoted in this document are based on the conclusions of the European Council of 17-21 July 2020. They however do not prejudge the outcome of the ongoing discussions between the European Parliament and the Council on the elements of the recovery package, such as the Multiannual Financial Framework, the sectoral programmes, their structure and budgetary envelopes, which will be concluded in accordance with their respective adoption procedure.

For most of the above funds, support to the climate and energy transition is one objective among others. However, for the forthcoming period, the European Council has committed to the mainstreaming of climate action into all EU programmes and instruments and to an overall target of at least 30% of EU funding to support climate objectives. EU expenditure should also be consistent with the Paris Agreement and the 'do no harm' principle of the European Green Deal.

Some of the programmes listed in Table 2 provide funding through open calls to companies, not public administrations.

ANNEX II – DETAILED ASSESSMENT OF HOW COMMISSION RECOMMENDATIONS HAVE BEEN ADDRESSED

Recommendations		Assessment	
Decarbonisation - GHG	Specify cost-efficient additional policies and measures, notably in the building, transport and agriculture sectors, to address the significant projected gap to its greenhouse gas target for sectors not covered by the EU emissions trading system for 2030 of -38% compared to 2005.	Fully addressed	<p>The NECP lists multiple measures relevant to the transport sector, including the start of a national emissions trading system for sectors not covered by the EU-ETS. This builds the basis for CO₂ pricing in transport, for fiscal and financial support for purchases of zero- and low-emission vehicles, a masterplan for recharging infrastructure with several regulatory and planning measures and further incentives such as differentiated national tolling for zero- and low-emission vehicles, measures to increase the attractiveness of public transport (ticketing, pricing) and support for active modes of mobility in urban areas.</p> <p>The plan lists a number of actions for the building sector, ranging from carbon pricing, energy efficiency measures, including renovating existing building stock and standards for new buildings, to renewable energy measures, including district heating.</p> <p>The plan also contains a detailed list of actions on agriculture, focusing on reducing nitrogen emission sources and surpluses in soils, increasing the production of biogas, developing organic farming, and reducing emissions from livestock sectors. Moreover, energy consumption is addressed with specific legislative initiatives and actions, including consumption and demand-side measures. Certification of soil organic matter and awareness raising are also among the proposed actions.</p> <p>The CO₂ price path provided for in the climate action programme is assessed to be too low to achieve the 2030 target.¹⁹</p>

¹⁹ Edenhofer et al., (2020), Das Klimaschutzprogramm der Bundesregierung: Eine Wende der deutschen Klimapolitik? <https://doi.org/10.1515/pwp-2020-0001>

Decarbonisation - renewables	Provide detailed and quantified policies and measures; in line with the obligations laid down in Directive (EU) 2018/2001 of the European Parliament and Council, to enable a timely and cost-effective achievement of the German contribution of 30% renewable energy share to the Union's renewable energy target for 2030.	Partially addressed	Although the plan provides much more detail than the draft NECP, it sometimes lacks detail on the expected impact of each measure, especially in the heating and cooling sector. Doubts remain as to the feasibility of reaching the high target in the power sector in view of the problems in extending the grid and the permitting procedures for wind turbines.
	Put forward trajectories and provide specific measures to meet the transport target pursuant to Article 25 of Directive (EU) 2018/2001.	Largely addressed	The plan includes a number of policies and measures to achieve the transport target: it strengthens the greenhouse gas reduction target and the new CO ₂ price for transport will lead to an increase in the use of electricity and renewable fuels in the transport sector. Moreover, the federal government will support the production of advanced biofuels and renewable fuels of non-biological origin, which is set to reach a share of 1.75% (3.5% if double-counted). In 2030, first generation biofuels will make up 5.3% of the energy consumed in the transport sector. Renewable electricity used in vehicles and trains will play an increasing role. Germany expects 7-10 million electric vehicles to be registered by 2030. To achieve this, Germany has brought in several financial incentives and plans to expand charging infrastructure. Germany has an indicative sectoral target to reach 27% (multipliers included) for 2030, clearly exceeding the EU target of 14%.
	Provide additional details on the enabling frameworks for renewable self-consumption and renewable energy communities, in line with Articles 21 and 22 of Directive (EU) 2018/2001, including simplification of administrative procedures.	Largely addressed	The plan underlines the role of energy communities and outlines the legal framework, which is already well established in Germany. It also sets out the framework for energy self-consumption in Germany, which already provides certain incentives for energy self-consumption. In the context of transposing the provisions on energy self-consumption in the recast renewable energy directive, Germany will evaluate the need to adapt certain measures.
Energy efficiency	Provide a sufficiently ambitious national contribution for both primary and final energy consumption, which takes into account the need to increase, collectively, the level of efforts necessary to reach the Union's 2030 target.	Largely addressed	The NECP sets a target to reduce PEC by 30% against 2008 values. Germany's national energy efficiency target for 2030 is set for PEC and corresponds to 216 Mtoe (240 Mtoe with non-energy consumption). This translates to a reduction of FEC of 185 Mtoe in 2030. The difference between the WEM and WAM scenarios is 9.10% PEC and 7.23% FEC. When applying the figures for 2030 and 2008 presented in the NECP, this leads to a reduction of only 28%. Overall there is clarity on the definition of both the WAM and WEM scenarios but the savings impact of the overall objective needs to be

			<p>clarified. Germany envisages reducing energy consumption continuously over the period covered by the national energy and climate plan. It considers that its national energy efficiency target for 2030 is an appropriate contribution to reaching the EU's 2030 target. With a view to the EU's 2030 energy efficiency target, Germany's contribution is sufficient regarding PEC, but more modest regarding FEC. Compared to the draft version, the national energy and climate plan is less ambitious in one aspect: the final version [Table A1] no longer mentions increasing heat supply efficiency in buildings as key national objectives. The national energy efficiency action plan 2.0 (NAPE) seeks to frame energy efficiency as a profitable business model and increase ownership of energy efficiency. This is very important to overcome market failures related to energy efficiency.</p>
	<p>Support the national contribution with policies and measures at a scale adequate to deliver the corresponding energy savings.</p>	<p>Largely addressed</p>	<p>The final national energy and climate plan has substantially developed policies and measures on energy efficiency. It introduced 34 new policies and measures in this area, bringing the total number of policies and measures to 70. The policy mix is balanced and covers all the main sectors (buildings and urban planning, public sector, industry, transport or agriculture) with support in the form of cross-cutting measures related to consumer protection, financing, awareness raising and dialogue. Looking across the four main sectors, the bulk of final energy savings linked to policies and measures in the final national energy and climate plan [comparing 2030 values in table B29 with latest 2018 data on energy consumption in table B12] is to be borne by industry (2030 consumption is 80% of consumption in 2018) and households (84%). The contribution of the transport sector is more modest (90%) and negligible in the trade and services sector (98%). Beyond 2030, transport will become the main vehicle for generating savings with continued electrification of mobility [consumption in 2040 is projected to be 80% of consumption in 2030, comparing columns for 2030 and 2040 in table B29]. The German PEC target under the WAM scenario shows that policies and measures outlined in the national energy and climate plan may not be enough to reach the national target [table B29 refers to FEC of 7765 PJ in 2030 which is equal to 185.5 Mtoe – identical with the target].</p>

	Clearly identify policies which are planned to be adopted and implemented in the period from 2021 to 2030, their expected impacts as well as their timeline for implementation and budgetary requirements.	Partially addressed	Compared to the draft national energy and climate plan, the final plan almost doubles the number of policies and measures on energy efficiency and provides more details on policies and measures. On the one hand, it gives a very good description of 27 policies and measures relevant under Articles 7a and 7b of the Energy Efficiency Directive, made under Annex III to the Governance Regulation, despite some shortcomings. On the other hand, other (non-Article 7) policies and measures are not described in the detail necessary to assess their individual merit. Although the policies and measures are mostly well described and clear on their substance and policy objectives, details are very often lacking on the energy savings to be generated by individual policies and measures, their implementation timelines and budget requirements. Moreover, many policies and measures on energy efficiency are the same as in other areas (mainly areas of German climate policies) and a simple reference is made in the NECP to a description of these policies and measures in other parts of the plan. It is welcome that synergies are used across various dimensions but the description of policies and measures in other parts of the plan does not cover energy efficiency aspects. This makes it difficult to assess the impact of these measures in terms of energy efficiency and their relevance. In addition, in many cases it is difficult to ascertain whether the measures are updates of existing measures. As regards buildings, Germany officially submitted its long-term renovation strategy on 3 July 2020.
Energy security	Specify the measures supporting the energy security objectives on diversification and reduction of energy dependency, including measures ensuring flexibility, as well as information on phase-out from nuclear.	Partially addressed	Germany intends to replace all nuclear (and coal/lignite) electricity production (due to the phase-out) with renewables (mostly wind and solar). To maintain the security of energy supply it has set out measures such as grid optimisation and extension; market integration; balance of demand and supply; and lastly electricity imports. In the power system, gas-fired power plants and storage facilities respond flexibly to variable (wind and solar) electricity generation. System flexibility and diversification is based mainly on the integrated electricity market (i.e. imports if needed). When this increases the use of gas-fired generation, this could increase energy dependency.
Internal energy market	Define forward-looking objectives and targets concerning market integration, in particular measures to reinforce	Partially addressed	Germany has not set specific objectives for market integration or for improving the impact of market components in electricity prices.

	market signals and to improve the effective impact of market components in the electricity price.		Notwithstanding the question of price zones, the Commission would highlight again that, especially if network investments keep being delayed, the lack of locational signals risks bringing forward investments (e.g. for storage) that do not address system needs and could even increase the gap between market outcomes and physical realities.
	Include a timetable with appropriate measures to remove structural congestion in the electricity system and to provide efficient dispatch and locational signals to the market as an important element of the final integrated national energy and climate plan, notably as a basis for further cooperation and coordination with other Member States and in view of the functioning of the internal energy market.	Not addressed	The plan contains clear information on infrastructure investments, notably in the electricity transmission network. It provides dates for individual projects and refers to the action plan under Article 15 of Regulation 2019/943. The plan expressly rejects locational price signals, thus rejecting this recommendation.
Research, innovation and competitiveness	Further clarify national objectives and funding targets in research, innovation and competitiveness, specifically related to the Energy Union, to be achieved between 2022 and 2030, so that they are readily measurable and fit for purpose to support the implementation of targets in the other dimensions of the final integrated national energy and climate plan.	Partially addressed	<p>The plan specifies the 7th energy research programme in support of R&D action up to 2022. It also states that the federal government aims to step up energy research between 2020 and 2030, to support application-oriented R&D in support of the country's 2050 targets. It specifies seven priority areas with commensurate objectives, but it lacks a timeframe and funding targets or budgets to achieve the objectives.</p> <p>As regards innovation and competitiveness, the emphasis is put on cross-cutting issues (e.g. sector coupling, digitalisation, mobility and batteries) and better involvement of start-ups. However, measurable objectives are not clearly identified.</p> <p>The plan clearly covers cooperation with the Strategic Energy Technology (SET) Plan, and broader international and bilateral cooperation with several countries and regions.</p> <p>References to RIC can be found across the German NECP's four other dimensions. In particular, under the first dimension, it makes reference to further research on climate protection in the agricultural sector, including to reduce the environmental impact of fertilisers; on the climate-friendly and innovative use of wood; on nutrition and consumption. There is a link with the sustainable finance strategy as the federal government plans to issue green federal securities, which will also support research. Under the second dimension, the</p>

			<p>objective is to increase renewables in the energy mix to 65% by 2030. In this context, the plan makes reference to the promotion of innovative mobility technologies (including batteries, hydrogen/fuel cell or gas powered vehicles, plug-in hybrids, advanced biofuels and renewable energy-based). Existing research and development gaps in innovative renewable biofuels (e.g. straw-based fuels) will be filled through projects and demonstration projects with a view to achieving large-scale production in the medium term. They include “innovation calls”, which are technology neutral and will test new pricing mechanisms and tender procedures for RES. Under the innovation calls, 650 megawatts will be launched in 2020, and 500 megawatts in 2021. Other topics include plans to integrate RES into the grid, heating and cooling technologies, and district heating (including a reference to innovative pilot projects “heat grid systems 4.0” for renewable local and district heating systems), geothermal energy, solar thermal, some of which can be considered innovative technologies and thus linked to R&I. However, it does not make explicit reference to R&I. Under the third dimension, it refers to a range of innovation programmes in the buildings and construction sector (e.g. the “future of construction innovation programme” (no quantitative target is mentioned), “energy efficient buildings support initiative 2050”, as well as federal government buildings serving as an example through innovative technologies). Under the fourth dimension, it mentions support for grid research projects and support for research and funding programmes or for setting up federal institutions in lignite regions.</p>
	<p>Underpin such objectives with specific and adequate policies and measures, including those to be developed in cooperation with other Member States, such as the European Strategic Energy Technology Plan.</p>	<p>Partially addressed</p>	<p>Germany has responded by presenting the following three objectives underpinning its federal energy research programme: 1) advancing the energy transition through systematic approaches, 2) strengthening the industrial base, and 3) protecting against societal risks by developing a wide spectrum of technical options. However, no measurable objectives have been set, other than a vague target to upscale the designated EUR 1.3 billion funding for 2020-2022 up to 2030. Although Germany provides a list of innovation-relevant initiatives under the policy section, there are no policies and measures specifically designed to achieve the three objectives mentioned.</p>

<p>Investments and funding sources</p>	<p>Extend its analysis of investment needs provided for electricity transmission infrastructure to a general overview of investment needs to reach its energy and climate objectives.</p>	<p>Largely addressed</p>	<p>Section 5.3 of Germany’s plan provides an estimate of the additional investment needs (compared to a reference scenario) over the 2021-2030 period to implement the 2030 climate protection programme adopted in 2019 by the German government. Under this scenario analysis, the cumulative additional investment needs over the 2021-2030 period amounts to EUR 279.2 billion, of which EUR 95.2 billion for the supply side and EUR 184 billion for the end use (2016 prices). It would be useful to also provide the total investment needs as well. On this issue, it is not clear why the plan mentions that it was not possible to provide an estimate of the investment flows under existing policies and measures. Furthermore, the investment needs are primarily identified for <i>energy-related</i> activities. The plan does not include an estimate for non-energy-related investment needs for sectors such as agriculture and industry. The plan would be clearer if it were explicit to understand the relationship between Table B37 and Sections 2 and 3, for example by defining the perimeter of the categories in this table. It would ensure that it takes into account the different amounts referred to in the previous sections, as they sometimes come from different scenarios and do not totally match (e.g. gas transmission infrastructure).</p>
	<p>Provide a general assessment of the sources of that investment, including appropriate financing at national, regional and Union level.</p>	<p>Partially addressed</p>	<p>The plan lacks a comprehensive overview of the source of additional investment needs reported up to 2030. The role of public finance is mentioned in a dedicated section (5.3.iii). However, the information provided is not quantitative, as it does not specify the share of each level in the overall funding. The central role of the energy and climate fund (Energie- und Klimafonds (EKF)) as the key funding instrument for energy transition and climate change in Germany is emphasised. By 2030, it will allocate some three-digit billion euros to climate action and the energy transition. Other support measures are mentioned however without being described. The relationship between the different sources of investment is unclear. The role of EU funds such as the CEF or the cohesion policy funds is mentioned. The Just Transition Fund is mentioned for regions particularly affected by structural change, such as coal regions. For the current period, Section 5.3.i provides an overview of investment in the energy sector in 2018, both on the supply and</p>

			demand sides. It does not quantify the share of public-sector funding in this investment or indicate the different levels of financing (national, European). For instance, more information could be added on the EDRF resources used by German regions (Länder) to compare it with the new period.
Regional cooperation	Continue, both in the finalisation of the integrated national energy and climate plan and during its implementation, regional cooperation in respective high-level groups and consultation of neighbouring Member States.	Fully addressed	Germany received a recommendation to reinforce regional cooperation and it fully addressed this recommendation. Specifically, Germany engaged in a number of regional cooperation settings, which are listed and briefly described in the final plan. This includes multi-faceted bilateral cooperation with France on energy and climate policy, declarations of intent with Belgium and the Netherlands, and aspects of energy and climate policy in the context of the strategic dialogue with Czechia. It also includes multilateral cooperation in the context of the European Climate Initiative (EUKI), the Baltic Energy Market Interconnection Plan, the North Seas Energy Forum, the Pentalateral Energy Forum, and the Pentalateral Gas Forum on issues ranging from market coupling, maritime spatial planning and offshore renewable energy.
	In that context, focus on the coal and lignite phase-out, renewables deployment and the internal energy market, addressing issues such as interconnection levels and capacity from 2021 onwards, regional cooperation measures related to assessing system adequacy, just transition and energy system changes required for accommodating higher shares of renewables that are expected to modify cross-border electricity trade while enhancing the need for system flexibility.	Fully addressed	The final plan details the contacts of the German administration with their counterparts on phasing out coal and lignite in a regional setting. The other topics are all addressed in these fora for cooperation.
Energy subsidies	List all energy subsidies.	Partially addressed	The final NECP represents a meaningful upgrade of the draft plan, though it does not mention subsidies for renewable energy production.
	List in particular fossil fuel subsidies.	Largely addressed	Germany has included a list of 22 indirect and direct subsidies taken from the most recent federal government subsidy report.
	List actions and plans to phase out energy subsidies, in particular for fossil fuels.	Largely addressed	Actions and plans to phase out fossil fuel subsidies are now included, in comparison with the draft plan. The final plan also gives a

			timeframe for phasing out coal subsidies, as well as expiry dates for other fossil fuel subsidies.
Air quality	Complement the analysis of the interactions with air quality and air emissions policy, presenting and quantifying the impacts on air pollution for the various scenarios, providing underpinning information, and considering synergies and trade-off effects.	Fully addressed	Section 5.1 of the NECP analyses the implications of decarbonisation measures on air pollution. Projections of air pollutants emissions (reflected in tables B31-B33) are taken into account in the reference scenario of the climate change programme for 2030 and it is consistent with the greenhouse gas projections. The synergies and trade-offs between air and climate/energy objectives are discussed, particularly as regards biomass use (which remains the main source of renewable energy) and increased biogas production. Both greenhouse gas and ammonia emissions from the agriculture sector are planned to fall. The reduction of greenhouse gas emissions from urban traffic will have a synergetic effect to reduce air pollution in cities.
Just transition and energy poverty	Integrate just and fair transition aspects, notably by providing more details on socioeconomic impacts of the energy transition and the planned coal phase out or of adjustments in other carbon-intensive sectors. Describe the associated social, employment and skills impacts of planned objectives, policies and measures.	Partially addressed	The document sets out the expected impact on employment. Based on a macro model, employment is set to increase by 185 000 jobs in the 2030 timeframe under the climate protection scenario, compared to the baseline scenario. Technological change in the energy and automotive sectors are highlighted. On the skills front, the documents identifies a shortage of skilled workers in professions subject to a potential energy transition, such as technical and construction professions. However, it does not specify the kind of skills needed. Technological change in the energy and automotive sectors are highlighted as the document states that there has been a noticeable shift in employment from traditional, mostly conventional, energy sectors to renewable energies since 2000. In the transport sector, changes in employment and value added are expected as a result of the shift from conventional to alternative drivetrains. However, these changes are not fully estimated. On the skills front, the document refers to shortages of skilled workers in professions that may undergo an energy transition, such as technical and construction professions. At the same time it acknowledges the difficulty to fully capture energy transition-related occupational groups and the share affected by the energy transition in the whole profession. Accordingly, it does not specify the skills that

			will be needed or the potential professions affected. It would also be relevant to provide a distributional impact assessment on households' income (including impact on housing costs) of the planned transition measures.
	Further develop the approach to addressing energy poverty issues, including by providing a dedicated assessment of energy poverty as required by the Regulation (EU) 2018/1999.	Not addressed	The plan does not use the term "energy poverty" as a standalone concept. It takes a comprehensive approach to combating poverty in social legislation, which does not focus on individual needs, such as energy needs. The plan stresses that it is important for Germany that energy remains affordable during the energy transition. It describes the social legislation in place. The plan explains that supply disruptions due to customer arrears are in principle only possible in Germany under strict conditions laid down by law. The German social security system also offers a wide range of support to prevent supply disruptions in case of acute need, when the reason is late payment by the customer. Although additional information is provided in the corresponding chapter, the final plan lacks a dedicated assessment of energy poverty and related targets, objectives and measures to address the issue.