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Assessment of the drafted German Integrated National Energy and Climate Plan

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Abstract

Germany is struggling to meet its 2020 greenhouse gas (GHG) emission and climate goals. Against this background, we analyze the current draft National Energy and Climate Plan (NECP) that sets out how Germany aims to achieve its national and European climate goals by 2030. We introduce the current stage of the country's climate policy and, by looking at the different emission reduction measures under discussion, examine why Germany will probably miss its CO₂ emissions reduction goals. We conclude that, based on the climate package announced in September 2019, Germany will get closer to the achievement of its 2030 targets than was anticipated in the NECP draft; nevertheless, the new climate package leaves a significant gap between the new measures and the 2030 climate goals.

Keywords: German climate policy, energy and climate goals, emission reduction measures

JEL classification: L38, L98, Q28, Q48, Q58

1 Introduction

Germany is struggling to achieve its ambitious greenhouse gas (GHG) emission and climate goals for 2020 and might miss these for 2030 as well. The measures in the current NECP draft

¹ This paper gained from many helpful inputs and comments by Roland Meyer and Luigi De Paoli.

do not suffice to reach these climate goals. This holds true for both the national targets, as well as the German share in the European Energy Union's objectives. The final version of the NECP will be submitted at the end of 2019 (BMWi, 2018). Hence, it should contain more climate policy measures than does the draft.

In line with the national climate and energy targets included in the draft NECP, Germany aims to reduce its GHG emissions by 40% by 2020, 55% by 2030 and 80-95% by 2050 compared to 1990 levels (see the Table 1 below).

Table 1: Germany's CO₂ reduction and renewables targets 2016-2030

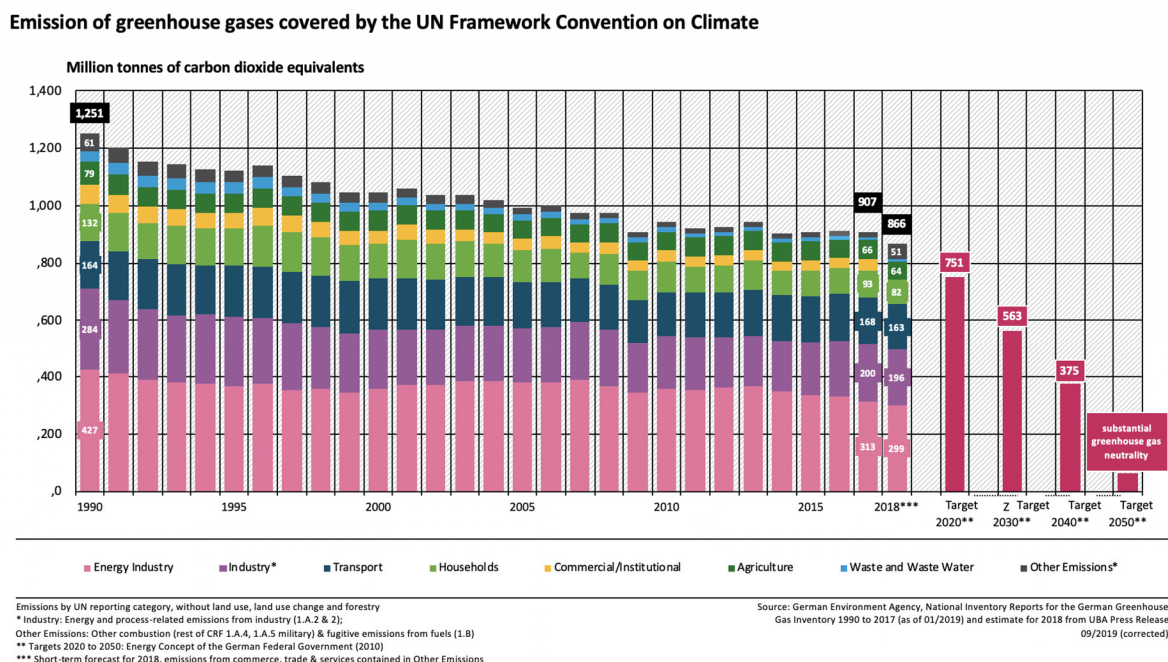
	2016	2017	2020	2030
GHG compared to 1990	-27,3%	-27,5%	-40%	-55%
Non-ETS emissions		-1.7%		-38%
RES share in gross final energy consumption	14.8%	15.9%	18%	30%
RES share in gross power consumption	31.6%	36%	Minimum 35%	Minimum 50%
RES share in heat consumption	13.5%	13.4%	14%	
RES share in transport sector	5.2 %	5.2%	10% (EU goal)	

Source: BMWi 2019 (translation by authors).

However, there is a large gap between the national decarbonization targets and their actual implementation so far. The actual GHG emission reduction in the period from 1990 to 2017 only reached the level of 27.5%². Current estimates are that Germany will reduce its emissions by 33% till 2020 (BMU, 2019). This means that the 40% emission reduction target by 2020 will not be met (EWK, 2019). For a detailed overview of the current emission levels and target values see Figure 1.

² Current estimate for 2018: 31% reduction (BMU, 2019)

Figure 1: Development of GHG emissions (and CO2 equivalent) in Germany from 1990 to 2018



Source: UBA, 2019

In order to close the foreseeable gap in the achievement of the 2020 emission reduction target, the German government adopted the Climate Action Programme 2020 in 2014 (BMUB, 2014). Since the measures implemented in this programme have failed to achieve the necessary emission reduction, the governing parties declared in the coalition agreement of March 2018 their intention to take steps to close the current CO2 emission reduction gap “as much as possible” and to reach the target for 2020 “as soon as possible”.

This gives rise to the question if and how Germany will achieve its climate targets by 2030, which go far beyond the 2020 targets. As an answer to this question, the national NECP must provide detailed insights on how Germany (as the EU member state) will achieve its climate goals and how these goals correspond with the European 2030 climate and energy framework (EU Commission 2014). The national NECP must include measures for the GHG reduction by around 24% in the period from 2020 to 2030 (i.e. 55% compared to 1990), or by more than 200 mio. tCO2.

The data in Figure 1 puts this into perspective: in the period from 2017 till 2030 (13 years), Germany needs to achieve the same reduction of roughly 350 million tons of CO2, as it did

from 1990 till 2017 (27 years).³ Notably, in the last 13 years, from 2005 to 2018, CO₂ emissions fell by only 127 mio. t. This data clearly illustrates the huge challenge Germany is facing to achieve its 2030 climate goals.

We analyze the German NECP draft in terms of how it relates to the national and the EU's 2030 climate goals. Chapter 2 introduces the current state of German energy and climate policies based on the Climate Action Programme 2020 and Climate Protection Plan 2050 and examine why Germany will not be able to fulfill its 2020 climate targets. In chapter 3, we focus on the draft NECP and discuss its main climate policy objectives and measures, its strengths and weaknesses. Chapter 4 sums up the additional measures that are discussed in this context. We show that a higher RES-share, the phase-out of coal-fired power plants and a CO₂ price for transportation and building sector are necessary measures, but they are not sufficient to achieve the 2030 climate goals. Rather, further measures are required, especially in the transportation and building sectors. Chapter 5 concludes.

2 Status quo of the climate policy in Germany

The German climate and energy policies are embedded in European and international agreements and legal obligations. The guiding principles for the national policy are the agreements of the UN Framework Convention on Climate Change (UNFCCC), the Kyoto Protocol and the Paris Agreement. Particularly the obligations of the Paris Agreement, and related to it the European climate and energy regulations, provide the basis for the German emission reduction policies. The following two European mechanisms are of greater importance: 1) Emissions Trading System (ETS) and 2) the Effort Sharing Decision (ESD). The ETS covers emissions from the domestic energy industry, heavy industry and airlines. The ESD includes emissions for the sectors of the economy outside the ETS (the so-called non-ETS sectors). The ESD framework, that covers years up to 2020, stated that all EU member states will achieve a 10% cut in GHG emissions by 2020 comparing to 2005. Based on the ESD Germany aims to reduce national emissions by 14% by 2020 compared to 2005.

³ Importantly, the effects of the reunion alone account for about 100 mio. t of the reductions achieved by 2017 (ISI et al., 2001).

As the next step on the way to the 2050 climate targets, the European Council adopted the 2030 climate and energy framework in February 2014 that sets the following binding targets for the period 2021-2030: reducing internal GHG emissions by at least 40%, increasing the use of renewable energy sources to at least 32% of EU energy use and increasing energy efficiency by at least 32.5% below 1990 levels (EU Commission 2014).

To achieve the EU GHG emissions reducing target by at least 40%, a common ETS target was settled. It states that the industrial and power sectors covered by the ETS should reduce GHG emissions to 43% by 2030 compared to the 2005 level. For the non-ETS sectors, a new Effort Sharing Regulation (ESR) policy framework was established. It sets individual binding targets for each EU member state to cut GHG emissions by 30% till 2030 compared to 2005 levels. Germany has a national emissions target based on the Effort Sharing Regulation (ESR) to cut emissions by 38% till 2030, compared to 2005 levels (EU Commission 2014).

To fulfill the European obligations and the obligation related to the Paris Agreement, Germany redefined its climate policy goals and committed itself to reduce emissions to 55% by 2030 and 80-95% by 2050 compared to 1990 levels (BMU 2016). These goals were also adopted by the German government in the NECP draft.

Today, around 85% of the GHG emissions in Germany are energy-related and mainly composed of electricity generation (43%), heat generation (34%) and road transport (22%). Therefore, the decarbonization of these three fields is of great importance for the fulfillment of climate policy targets. In line with the EU and national climate policies, the German government adopted the Climate Action Programme 2020 in December 2014, with additional measures in order to close the foreseeable gap in the achievement of CO₂ emissions reduction by 40 % by 2020, compared with 1990.

The Climate Action Programme 2020 contains nine components with more than 100 individual measures: 1) National Energy Efficiency Action Plan (NAPE), 2) Strategy on climate-friendly building and housing, 3) Climate action measure in the transport sector, 4) Reducing non-energy-related emissions in industry, commerce, trade, services, waste management and agriculture, 5) Reforming emission trading, 6) Energy sector, 7) The model function of the state, 8) Research and development and 9) Consultation, awareness raising and initiatives at all levels (BMU 2014).

According to the government's estimates, the implementation of the Action Programme 2020 shall lead to a reduction of around 62 to 78 mio. tCO₂ by 2020. However, the recent evaluation of these measures reveals that all these measures are expected to reduce emissions by 41 up to 53 mio. tCO₂ by 2020 (Loeschel et al. 2019). This equals only two-thirds of the expected reduction. According to the current projections, the measures adopted and implemented by 2020 will only lead to a GHG reduction of 33-34% compared to 1990 levels (BMU 2018).

The question then is why will Germany miss its 2020 goals? Taking a closer look at the assumptions the emission reductions trajectory in Germany were based on reveals that especially the following assumptions did not hold. Most prominently, economic growth was higher than expected, which caused an increase in energy demand. Forecasts for the 2020 targets were based on annual economic growth of 1.3%. In fact, it reached the level of 1.7% in 2015, 1.9% in 2016, 2.5 % in 2017 and 1.5% in 2018 (destatis 2019).⁴ Apart from this, energy prices were lower than projected, especially the price for oil and CO₂-certificates on the EU ETS were far lower than expected, even though both prices are increasing in 2019 again. E.g. the price on CO₂ emission certificates in the EU ETS was estimated at 15 €/t for 2020, but it was actually around 5 €/t in 2017. However, since summer 2018 it has been above this level. As for oil, the calculations were based on an estimated cost of 50 €/MWh, but current prices are far below this rate.

What did the adoption and the implementation of the 2020 climate measures achieve so far? According to first estimates, GHG emissions in Germany reached the level of 30.8% below the 1990 level at a total of 866 mio. tCO₂ in 2018, which is 385 mio. t less than in 1990. Three economic sectors – energy, heating & building, and industry – have caused this decline in combination. However, the development in the individual sectors was quite different. Driven by renewable expansion the emissions in the energy sector fell by 33% to 385 mio. t (155 mio.t fewer than in 1990). A decline of 24% (93 mio. t) was reached in the heating and buildings sector, which is partially due to higher winter temperatures in the recent years, and

⁴ Note that the NECP draft estimates an economic growth from 2020 till 2025 of 1.3% annually, and 1% annually from 2025 till 2030 (BMWI 2018). If the actual growth deviates from these estimates, it will have a significant effect on the CO₂ emissions and the potential to reach the climate targets.

the implementation of modern gas systems, more district heating use, high building efficiency standards and energy-efficient renovation. The emissions in the industry sector dropped by 31% till 2018 (88 mio. t). Responsible for this were the decommissioning of industrial plants in East Germany after the reunification, increase in efficiency, technical improvement as well as greater use of gas for electricity production and heating and lower primary energy consumption in some energy-intensive industries. However, CO₂ emissions fell less than average in agriculture (minus 22%) and especially in the transport sector (minus 1%). The transport sector has the lowest emission reduction, mostly because of growing road goods and passenger transport (BMW_i 2019, Agora Energiewende 2017 and 2019).

Considering the Paris Climate Agreement and meeting its targets, the German government has further specified sector targets for 2030 in the national Climate Protection Plan 2050 (BMU 2016) (see the Table 2 below).

Table 2: Emissions from areas of action set out in definition of the target:

Sector	1990 (mio tCO ₂ eq.)	2014 (mio tCO ₂ eq)	2030 (mio tCO ₂ eq)	2030 (reduction in % compared to 1990)
Energy	466	358	175-183	62-61%
Buildings	209	119	70-72	67-66%
Transport	163	160	95-98	42-40%
Industry	283	181	140-143	51-49%
Agriculture	88	72	58-61	34-31%
Subtotal	1209	890	538-557	56-54%
Other	39	12	5	87%
Total	1248	902	543-562	56-55%

Source: Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety, 2016. Climate Action Plan 2050, p. 4.

According to the Climate Action Plan, Germany's GHG emissions shall fall by at least 340 mio. tCO₂ equivalents from 2017 to 2030. The NECP should explain how these reduction levels will be met within the next decade. We consider this plan in more detail in the next chapter.

3. The German NECP draft – what will it achieve and what not?

Since the current version of the NECP is just a first draft, the expectations on the measures provided by the draft should not be too high. In the case of Germany, the timing of the NECP draft preparation and submission was less than ideal. It was misaligned with other ongoing policy-making processes on issues related to the climate action policy, such as the coal phase-out. The German government is aware that the current climate policy measures will not suffice to reach the 2030 climate goals. Hence, to catch up to its targets, the German government set up the so-called climate cabinet in March 2019, a group of ministers with responsibilities for climate issues, to prepare climate action proposals and legislation for individual economic sectors, which substantially contribute to Germany's GHG emissions. On 20th September 2019, the climate cabinet proposed new package of measures, which should be incorporated by the government in a new climate regulation package by the end of 2019.⁵ Therefore, we can expect that the final version of the NECP will be different from the current draft.

Taking a closer look at the data provided in the Annex of the NECP draft reveals that the implementation of the NECP measures will probably lead to a CO₂ reduction of 41% by 2030 and leave a gap of 14% (i.e. 180 mio. tCO₂) between achieved and settled emission reduction targets. More importantly, compared to 2018 levels, the NECP draft describes climate action measures that will reduce CO₂ emissions by less than 10% within a period of 12 years. This puts the remaining gap in a different perspective: the measures described in the NECP draft will not even take us half the way, since emissions in 2018 were already 31% lower than in 1990. Between 2018 and 2030, emissions need to be reduced by 24%, out of which the draft NECP's measures will only achieve 10% by 2030. Hence, the final NECP needs to incorporate much more ambitious climate measures to reach the 2030 goals.

⁵ We discuss the potential CO₂ reductions associated with these measures in more detail in chapter 4.

The European Commission criticizes the German NECP draft for not explaining how the additional 14% of CO₂ reduction will be achieved (EU Commission 2019). The European Commission has also pointed out that the German draft does not contain any sufficient measures to achieve the climate targets set at the EU level for Germany for the non-ETS emissions by 2030 (EU Commission 2018). Moreover, there is neither detailed explanation how the measures, particularly in the fields of non-ETS emissions, will be realized, nor a concrete timetable for their implementation, e.g. in the agriculture sector. Consequently, the missing non-ETS measures might cause a huge problem for Germany, because they are associated with considerable costs.⁶ Furthermore, the NECP draft describes already existing measures for achieving the 2020 objectives, e.g. with respect to energy efficiency, while lacking details on their expected impact till 2030.

As discussed in chapter 2, the recent evaluation done by the federal government of the different, already applied climate action measures in Germany reveals that these measures will reduce CO₂ emissions by 41 up to 53 mio. tCO₂ by 2020 (Loeschel et al. 2019). More importantly, the effect of this reduction is much lower than it was projected in 2014. At that time, the government assumed that the climate measures will reduce emissions by 62 to 78 Mio. tCO₂ by 2020. This means that the implemented measures will achieve only two-thirds of the previously projected emission reduction.

What are the primary measures the draft NECP is based on?

- First, according to the NECP reference scenario, emissions in the energy sector will fall by 21 mio. tCO₂ between 2021 and 2030, primarily due to the EU ETS and an increasing share of renewable energies of up to 54%. Additionally, subsidies for combined-heat-and-power (CHP) shall secure a CHP-production of 120 TWh in 2025.
- Second, about 16 mio. tCO₂ shall be saved in the transportation sector by toll charges for heavy duty vehicles and stronger support for public traffic, subsidies for gas-fired vehicles till 2022/2026 and other accompanying measures, such as subsidies for electric vehicles.

⁶ If climate targets will not be met by a member state, the CO₂ emissions above the aimed level have to be covered by buying certificates from those states that achieve a reduction level above their targets. Since Germany will miss its effort sharing goal in the non-ETS sectors, it will have to buy these certificates starting from 2020. Estimates are that these costs can add up to several billions for Germany (Kohlekommission, 2019).

However, the recent ministry projection report estimates that these measures (in their current form, based on their current time frame) will reduce emissions only 1.2 mio. tCO₂ by 2030 (BMU 2019).

- Third, CO₂ emissions caused by private household consumption shall be reduced by 16 mio tCO₂, mainly through the implementation of the Energy Efficiency Directive (EnEV), the Ecodesign Directive and the Energy Labelling Directive for energy-related product groups. These estimates are supported by the ministry projections report 2018 (BMU 2019).
- Fourth, even though the industrial sector has already achieved a large share of its emissions reduction targets, it still needs to cut its emissions to 140-143 mio. tCO₂ equivalents. To achieve this level, the federal government has been discussing the implementation of draft the research and development programs for developing new technologies and processes with the option of industrial CO₂ recycling through carbon capture and utilization and Carbon Capture and Storage (CCS).
- Fifth, with respect to agriculture the draft NECP discusses potential measures like financial support for research and development projects and the development of organic farming. Additionally, the federal government aims to use the EU Common Agriculture Policy's financial instrument.

Together, the measures in the first three sectors (energy, transportation and buildings) shall secure an emissions reduction of 53 mio. tCO₂ till 2030. The reduction of remaining 28 mio. tCO₂ should be achieved through the EU ETS and tax programs for industrial and commercial users (together 16 mio. t CO₂) as well as regulations on non-ETS related CO₂ emissions (10 mio. tCO₂). Nevertheless, these measures combined will not suffice to reach the national 2030 climate targets. The main weaknesses of the NECP draft is that it is primarily based on the existing documents that regulate current energy and climate policy in Germany, instead of presenting a future design. It does not contain sufficient measures to reach the 2020 goal in time, and do not provide enough reduction potential to achieve the 2030 goals. Inter alia, this was the primary criticism by the EU on the German draft NECP (EU COM 2019a).

The following chapter summarizes the ongoing discussion about further necessary climate action measures, that could be included in the final NECP, based on the government's policy decisions at the end of September 2019.

4. State of the debate: what measures are discussed in Germany to fill the gap till 2030

Experts from different backgrounds have been discussing different options to fill the gap of roughly 180 mio. tCO₂ between the measures included in the draft NECP draft and the national 2030 climate targets. In the following, we discuss different climate action measures to fulfill the respective sector goals. We note that the measures below are in most cases modeled separately. Hence, if we discuss a combination of the different measures, the resulting CO₂ reduction might overestimate the real potential for emissions reduction due to overlaps in the effects of these measures.

We start with the energy sector, since the decarbonization of the electricity supply is the backbone of the German strategy to reduce CO₂ emissions. Besides the EU ETS, the expansion of renewable electricity and the coal phase-out are the most important determinants for the sector's CO₂ emissions. Currently, the RES-expansion policy in Germany is based on so-called expansion corridors. These corridors define the maximum annual capacity expansion of renewables (PV + 2.5 GW, onshore wind +2.9 GW (EEG 2019)). The current expansion path in accordance with the Renewable Energy Sources Act (EEG) volume structure will potentially reach a renewable electricity production in 2030 of roughly 290 TWh (Loeschel et al. 2019). However, to reach the goal of at least 65% RES in gross electricity production till 2030, as it was agreed in the German coalition agreement, about 350 TWh of RES is required in 2030 (Öko-Institut 2019). According to Loeschel et al. (2019) this target can only be reached with an annual renewable capacity increase of around 13 GW.

Additionally, a phase-out of coal-fired power production is required to reach the energy sector's emission reduction goal till 2030. The draft NECP does not include any measures with this regard. However, in January 2019, shortly after the NECP draft was published, the Commission „Growth, Structural Change, and Employment“, known as the Coal Commission, published the final report on the gradual reduction and cessation of coal-fired power generation in Germany. It is proposed to phase-out all coal capacities till 2038. Hence, the report foresees a reduction of coal capacity from 43 GW in 2017 to 17 GW in 2030. The combination of increasing the RES share to 65% and the coal phase-out suggested by the Coal Commission is estimated to achieve a CO₂ reduction in the energy sector that would be in line with the 2030 sector's target. Despite these two measures, there would be still a gap of 100 mio. tCO₂ between the 2030 goals and the measures described in the draft NECP

(Loeschel et al. 2019, Öko-Institut 2019). Hence, the remaining gap of 100 mio. tCO₂ needs to be addressed in the transportation and building sectors.

The introduction of a national price on CO₂ emissions (in addition to the EU ETS) for the transportation and building sectors is at the heart of the current climate debate in Germany. In general, there are two options to introduce a carbon price in the transportation and heating sector: either a (national or supranational) emission trading scheme (ETS) or a carbon tax. A national ETS for transportation and heating (potentially in cooperation with Denmark and the Netherlands; see for example UBA 2014) would be implemented in addition to the EU ETS. However, it is expected that a national CO₂ tax can be implemented much faster than a national or supranational emission trading scheme for the transportation and buildings sector⁷. The Federal Ministry of the Environment has recently published different studies on the potential effects of a carbon tax implementation. These studies discuss the introduction of a CO₂ tax on fossil fuels of 35 €/tCO₂ starting from 2020, which shall increase annually on a linear basis to 80 €/tCO₂ in 2023 and reach 180 € tCO₂ in 2030 (DIW 2019, FÖS 2019).

As for the transportation sector, such a CO₂ tax might lead to savings of at least 3 Mio. tCO₂ to a maximum of 25 Mio. tCO₂ till 2030 (DIW 2019). This means that a CO₂ price of 80 €/tCO₂ in 2023 might only take us half the way to fill the gap between the NECP measures and the 2030 climate targets for transportation (DIW 2019). In the buildings sector, this CO₂ tax could achieve approximately 17 or 43% of the necessary additional emission reduction till 2030 (DIW 2019). Hence, even with a CO₂ price, emissions in the transportation and building sector will still be far above the targeted levels for 2030 (potentially up to 80 mio tCO₂ combined, if the effects of the CO₂ price are at the lower bound of the estimates).

The EU ETS, a RES expansion to 65% in the electricity production, the coal phase -out and a CO₂ price (limited to 80 € in 2023 and 180 € in 2030) will probably not suffice to reach the 2030 goals. Rather, additional measures in the transportation and building sector are required to reduce emissions further till 2030. Different studies analyze different policy mixes to achieve the required reduction levels.

⁷ Matthes (2019) estimates that it would take 2-4 years to introduce a national ETS scheme for the non-EU ETS emissions.

For the transportation sector, Agora Verkehrswende (2018) shows that to fill the gap between the existing measures and the sector emission reduction goal for transportation in 2030, a carbon price must be accompanied by a combination of at least one rather drastic measure, such as very ambitious CO₂ emission standards, a toll charge per km or significant electrification of transport system⁸, with some less drastic measures, like a speed limit or a change in company car tax credit system.

In the building sector, the CO₂ tax of 80 €/t CO₂ is estimated to reduce CO₂ emissions from housing/private and commercial buildings by 8-20 million tons (DIW 2019). This leaves a gap of 27-39 mio tCO₂ to reach the 2030 goal. Hence, further measures are needed in this sector as well. To address this gap, dena (2019) discussed the following measures: 1) extension of subsidies for efficiency investments in buildings beyond the current support schemes (e.g. through a relieve of taxation of refurbishing for private self-utilizing home owners or the improvement of depreciation for efficiency investments by landlords); 2) information programs (e.g. for contracting solutions); 3) an adaptation of legal requirements and stricter efficiency standards from 2025.

On 20th September 2019, the federal government announced new climate policy measures, out of which the following list comprises the most prominent measures (Klimakabinett 2019):

- Introduction of an emission trading scheme for the transportation and building sectors with a fixed price of 10 €/tCO₂ starting from 2021. The scheme plans a fixed price till 2025, while the certificate trading scheme starts in 2026. The fixed price shall increase to 35 €/t till 2025. From 2026, the certificate price will be determined by the market, but will be limited to at least 35 €/t and should not exceed 60 €/t.
- Phase-out coal-fired power plants as proposed by the Coal Commission (reduction of coal-fired power generation to 17 GW by 2030 and 0 GW by 2038).
- Increase of the RES share in gross electricity production to 65% by 2030.
- Increase of subsidies for electric vehicles.

⁸ Electrification in the transport sector refers to a mix of different technologies that allow a use of electricity directly (e.g. battery electric vehicles) and indirectly (e.g. hydrogen fuel cell vehicles) in transportation. To reach climate policy targets in this sector through electrification a significant additional capacity of renewable electricity is needed.

- To compensate for the potential impact on low income households, the commuter allowance shall increase from 2021 (by 5 €cent) and the renewable surcharge will decrease by 0.25 €cent starting from 2021 (0,5 €cent in 2022, 0,625 €cent in 2023) (Klimakabinett 2019).

If we compare the measures in the new climate package with the estimates in the studies cited above, then we can see that the sector goal for the energy sector might be achieved based on the increasing share of RES and the coal phase-out. However, the low CO₂ price in combination with the other measures proposed for the transportation and building sector is probably not sufficient to achieve the respective sector goals. Rather, the estimates above hint at a potential gap of at least 80 mio t CO₂ of further reduction requirements that needs to be addressed by additional measures till 2030 to fulfil the climate targets.

5. Conclusions and outlook

Our objective was to examine the climate policies and emission reduction targets within the German NECP draft. A key message is that Germany is likely to miss its national 2020 targets. In addition, the current NECP draft does not suggest that the country will meet its 2030 climate targets. However, the NECP is currently at a draft stage and its time frame was misaligned with other important policy initiatives. A new climate package unveiled by the German government in September 2019 will be incorporated into the final version by the end of this year. Nevertheless, the NECP provides a good estimate of the new climate package's required impact on CO₂ levels in Germany.

In our analysis of German climate policy, we have summarized the different reasons for the country's failure to cut its emissions by 40% by 2020. High economic development alongside low CO₂ and oil prices were the key drivers in weakening the impact of the German government's climate policies and measures.

With some minor exceptions, the NECP draft is based on the same policies that were applied in 2014 and 2016. Therefore, it is not surprising that the NECP only foresees a reduction of CO₂ emissions to 41% below 1990 levels. This leaves a gap of 14% (or 180 mio. t CO₂ in absolute terms) in relation to 2030 targets. Consequently, there are high expectations for the final NECP to fill this gap. The government published new climate measures on September 20th, 2019 which aim to reach the energy and climate targets till 2030. One of the primary

measures is the introduction of a CO₂ price (fixed till 2025, from 2026 as a CO₂ certificate trading scheme) for a wide range of CO₂ emitting activities, including transportation and buildings. The government aims for an initially relatively low CO₂ price, which can be raised later if necessary.

Based on the insights from the current literature and policy analysis, we expect that the new climate policies will achieve the sector target in the electricity sector. However, the new climate measures announced in September 2019 will not suffice to reach the sector goals for transportation and buildings. Since the CO₂ price is limited to a much lower level than the studies cited in the main text suggest, we should expect that the effect of the CO₂ price will be in the lower band of the estimates, probably leaving a gap of 80 mio. t CO₂ between the 2030 goals and the emissions reduction anticipated based on the existing and new measures announced by the climate cabinet. Though the new climate policy measures proposed by the government will take Germany closer to the 2030 emission reduction targets, they will not secure that Germany can achieve its climate goals. The future challenge is to define additional policies that will provide a basis to achieve the 2030 goals.

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