SRU

German Advisory Council on the Environment

The Future of Coal through 2040

Comment on Environmental Policy

June 2015 **No. 14**

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Introduction

1. On 8 June 2015, the G7 Summit of major advanced economies hosted by Germany agreed to pursue a “decarbonisation of the global economy over the course of this century” and also greenhouse gas reductions at “the upper end of the latest IPCC (Intergovernmental Panel on Climate Change) recommendation of 40 to 70% reductions by 2050 compared to 2010 levels”. Germany’s own climate change targets and the targets for developing renewable sources of energy go considerably further. In accordance with the long-term goals of the European Union, Germany has set itself climate targets, including targets for developing renewable sources of energy and for increasing energy efficiency by 2050. The German government and the EU are working for a reduction in greenhouse gas emissions by 80 to 95% by 2050 in comparison with 1990 levels. It is important to keep the more ambitious target of 95% in focus because it is possible that only this level of reduction will ensure that the international two degree target can be achieved (SRU 2011, Chap. 2). Meanwhile, scientists are recommending a zero target for global CO_2 emissions from fossil sources by 2070 at the latest (WBGU 2014, p. 117f.). According to the calculations of the European Commission (2011) and various research institutes (MATTHES 2012, JONES 2010; SRU 2011, Öko-Institut & Fraunhofer ISI 2014), even an 80% target could only be achieved if the electricity sector is fully decarbonised. In other sectors, the relative potential for greenhouse gas avoidance is lower and more difficult to achieve. A medium-term end of coal-fired power generation is an irrefutable precondition if Germany and the EU are to achieve their targets for 2050.

If these climate targets are meant seriously, then it is also necessary for Germany to make unambiguous statements about the long-term future of coal- and lignite-fired power generation. Only then will it be possible to ensure that the business sector and society can have confidence in the progress of the energy transition and that Germany’s climate policy is credible internationally. However, the German government has so far avoided adopting a clear position in this respect.

2. Important decisions are currently being taken at national, European and international levels on energy and climate policies. In the view of the German Advisory Council on the Environment (SRU), these decisions should also reflect the long-term goals of the energy transition. With this position paper, the SRU hopes to encourage the German government to begin a consensus-finding process on the future of coal and lignite within the lifetime of the current parliament.

3. The most important decisions in 2015 are:

– At the end of 2015, the Paris Climate Conference is intended to reach a universal climate agreement. It is already clear that success will depend on the negotiating skills and the credibility of the leading nations, including Germany.

- At the European level, the EU Emissions Trading System will be reformed, and consultations held on implementation measures for the European Council's 2030 Climate and Energy Policy Framework concluded in October 2014.
- The German government will make decisions about the structure of the electricity market, aiming to ensure cost-effectiveness, security of supply, and the adaptation of the entire system to the increasing proportion of fluctuating renewable sources of energy.
- With the development of the German Climate Action Plan 2050, a pathway is to be formulated which extends the targets of the energy transition decisions of 2010 and describes further specific reduction steps.
- In the course of developing its Climate Programme 2020, the German government identified a shortfall of around 90 Mt CO_2 below what is required to achieve a 40 percent climate reduction target by 2020. According to the German government climate programme, 22 Mt CO_2 of this shortfall is to be covered by the power generation sector. In March 2015, the Federal Ministry for Economic Affairs and Energy (BMWi) presented a proposal which included a national instrument for additional emissions reductions in the power sector ('climate contribution', see Point 8). After intense political discussions, however, this proposal was withdrawn in July 2015 and an alternative instrument is currently in preparation (a 'strategic reserve' through which a number of coal plants are withdrawn from the market and deployed only in case of short-term power shortages). This document was written prior to the withdrawal of the 'climate contribution' and therefore does not analyse the recently proposed 'strategic reserve'.

These processes and decisions also establish economic boundary conditions for the future of coal-fired power generation. Nevertheless, the German government has yet to take relevant fundamental decisions. The Government Coalition agreement states: "The conventional power stations (lignite, coal, gas) remain an indispensable part of the national energy mix for the foreseeable future" (CDU et al. 2013, p. 56).

4. It is urgently necessary to establish how long the various conventional power stations are to remain indispensable, and what timescale will be required for cutting back coal-fired power generation in order to be able to meet the goals of the energy transition. This clarification is also necessary in order to give the energy sector and its employees, and also the affected regions, time to plan the necessary restructuring. The societal disagreement about the role and the future of nuclear power hampered Germany's energy policies for decades until consensus was reached on the nuclear power phase-out. Drawing on this experience, the German government should now play a more active role in the debate on the future of coal with the goal of reaching a socially- and economically-acceptable consensus leading to the long-term objective of climate-neutral power generation. In its two special reports in 2011 and 2013, "Pathways towards a 100% renewable electricity system" and "Shaping the Electricity Market of the Future", the SRU has argued that Germany's climate and energy policy cannot avoid addressing the coal problem: “An integrated energy policy should synchronise the phasing out of conventional power generation capacities and the increasing use of renewables” (SRU 2011, No. *11; also: SRU 2013, Nos. 57 and 73 f.).

5. In the following *ten points on the future of coal through 2040*, the SRU argues for national measures in Germany which go beyond the EU Emissions Trading System, and calls for a national consensus on coal and lignite.

1 Global perspective: In order to achieve the two degree target, a large part of the fossil reserves must stay in the ground

6. If the two degree climate target that was internationally agreed upon is to be pursued seriously, then there is no doubt that a large part of the global coal reserves and resources must remain in the ground. It is the task of policy-makers to establish the necessary political framework.

Background

7. The target of limiting the rise in the global mean temperature to a maximum of 2° Celsius above pre-industrial levels remains achievable and can be scientifically justified (EDENHOFER et al. 2015). However, the hope that climate policy would go hand-in-hand with an increasing geological scarcity of fossil fuels has proved to be illusory.

‘Reserves’ are the relatively small proportion of coal, oil or gas that can technically and economically be expected to be produced from a geological formation. In order to have a two-thirds probability of staying below the two degrees target, a considerable proportion of coal reserves will have to remain unused as fuel for power generation. Using all the reserves as fuel would lead to the release of nearly twice the agreed remaining budget of CO_2-emissions for compliance with the two degree target. The challenge is therefore to leave a large proportion of fossil reserves in the ground, even if this means dispensing with an otherwise inexpensive source of energy.

8. According to the latest IPCC report, if global warming is be held to 2°C, total emissions cannot exceed the equivalent of 1,000 gigatonnes of carbon. Taking into account the effects of other greenhouse gases such as methane and nitrous oxide in addition to carbon dioxide, the value for carbon falls to 790 gigatonnes (IPCC 2013, p. 25). By 2011, 515 gigatonnes of carbon had already been emitted, so that almost two-thirds of the global carbon budget had already been used up. Taking into account the effects of non- CO_2 greenhouse gases, this means that in 2011 the remaining carbon budget compatible with the two degree target was 275 gigatonnes of carbon. In contrast, the global coal reserves with an energy content of more than 20,000 exajoules (ANDRULEIT et al. 2014) correspond to some 500 gigatonnes of carbon. On the basis of a cost-optimised extraction pathway for all fossil fuels, a recent study (McGLADE & EKINS 2015) concludes that at least 80% of the global coal reserves (and approximately half of global gas reserves and a third of the global oil reserves) must remain unexploited. This restriction would apply even if a higher remaining emissions budget were assumed which would only offer a 50% probability of meeting the two degree target.

9. The oversupply is greater still when considering the much larger coal resources. The carbon contained in the coal resources and other fossil resources exceeds the emissions budget many times over. The discrepancy between the vast fossil carbon resources on the one hand and the limited emissions budget on the other hand is largely undisputed, despite differences in detail between the various analyses (e.g. WBGU 2011, Ch. 4; IEA 2012, Ch. 8; MEINSHAUSEN et al. 2009).

2 European perspective: Ambitious long-term climate targets, but an insufficient framework until 2030

10. The European Union is working towards ambitious long-term targets (2050) for an energy transition with similar long-term targets as Germany. However, the situation is different for mid-term targets for 2030: The decisions of the European Council from October 2014 for a 40% greenhouse gas reduction (relative to 1990 levels) and 27% targets for both renewables and energy efficiency fall behind the demands of the more ambitious EU Member States and will very probably result in the drifting apart of national policies.

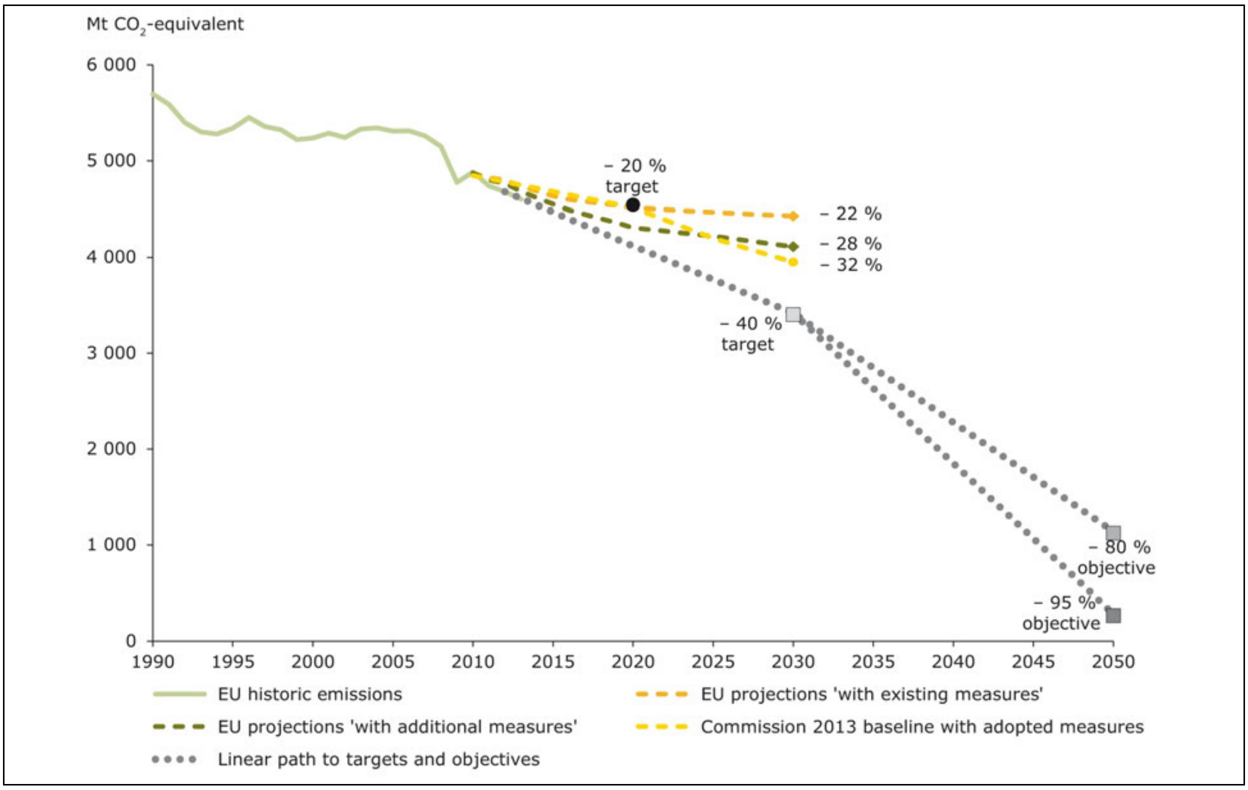
Background

11. The European Union has introduced a transformation in the power generation structures in the Member States by the Council decisions of 2008 and 2009. The overriding long-term target is a low-emissions economy with an 80 to 95% reduction in greenhouse gas emissions by 2050. It is widespread widely accepted that a low-carbon economy requires climate-neutrality in the power sector, because the relative reduction potentials in other sectors are smaller and can only be realised at higher costs (cf. SRU 2011, No. 89). Because of climate considerations, coal can only be used after 2050 in combination with carbon capture and storage (CCS), and then only for a limited period in view of limited storage capacity. A further proviso is that the technology should permanently exclude the release of greenhouse gases. Currently it is not foreseeable whether CCS technology will be developed in Europe. Despite considerable funding for CCS at the EU level and in some Member States, most demonstration projects have been discontinued (OEI et al. 2014a). Currently only the White Rose CCS project in the United Kingdom is receiving EU funding.

With the European Council decisions of 2008 and 2014, the European Union has set itself medium-term goals for 2020 and 2030 which mean that the long-term goals after 2030 can only be achieved with considerable effort. As the European Environmental Agency shows, the rate of reduction after 2030 will have to be increased considerably (Fig. 1). The decisions taken in October 2014 (at least a 40% greenhouse gas reduction, and 27% targets for both renewables and energy efficiency by 2030) have unsurprisingly slowed down the conversion of the energy sector. They lag behind the demands of the more ambitious EU Member States and could lead to a situation where national policies drift apart.

Figure 1

The development of greenhouse gas emissions



Source: EEA 2014, p. 61

12. Three governance elements of the current EU climate and energy policy are of particular importance for Germany's national coal debate (FISCHER 2014):

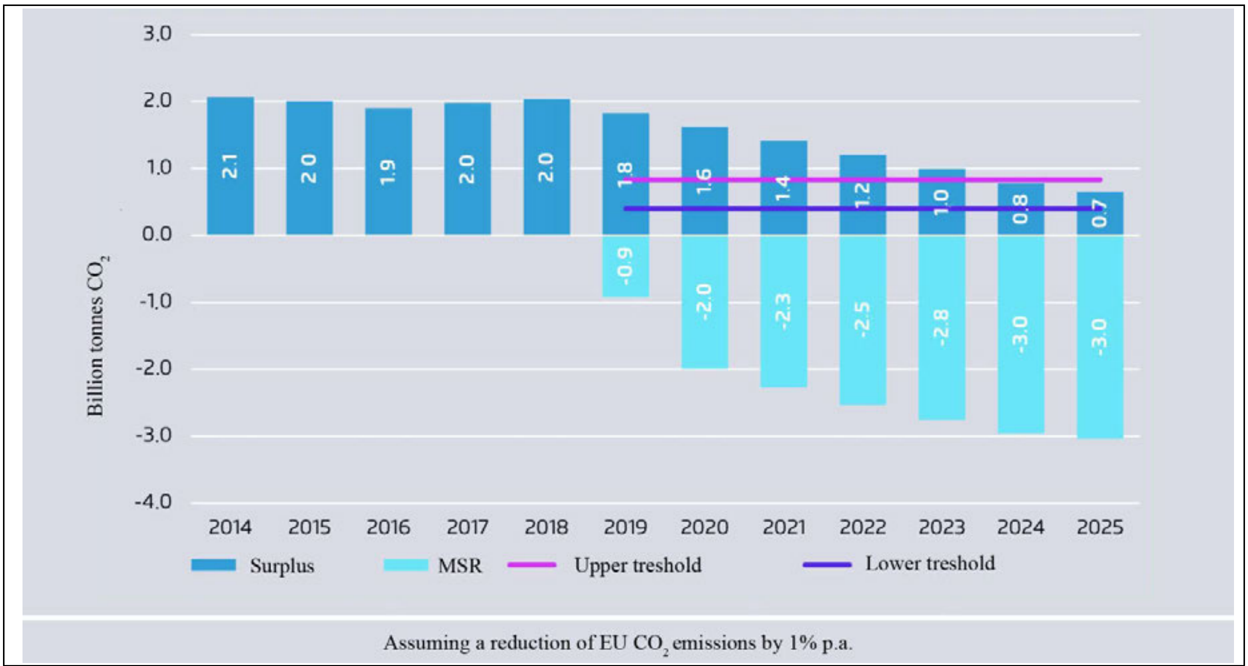
– A shift in significance can be observed from the “community method” to an “intergovernmental” decision-making system in which the European Council takes important strategic decisions, in particular relating to emissions trading and energy efficiency, in accordance with the consensus principle, which gives special weight to the voices of the least-willing countries. There are also concerns that this could lead to a weakening of the so-called Community method, involving co-decision of the European Parliament and requiring a qualified majority in the specialist Councils (MEYER-OHLENDORF 2015). Researchers and many other actors have called for a comprehensive reform of the EU Emission Trading System as the most efficient option for European climate policy, but this will be more difficult if the role of veto players is strengthened (on the role of veto players in general see TSEBELIS 2002).

– The European targets and policy instruments are so weak that it is probable that national measures will diverge (HEY 2014). The formulation used in the Council decision regarding indicative targets as minimum targets suggests the expectation that individual Member States will make additional contributions. New European policy mechanisms must be developed in order to achieve the 27% target for renewables by 2030 (HELD et al. 2014). The energy efficiency target is not legally binding.

– The weakness of the European targets also affects the sectors involved in emissions trading. Special provisions have been extended in the Emissions Trading System for the energy sector, in particular in the eastern European Member States. Until far into the 2020s, the foreseeable excesses will mean that no effective price signals will be given for the restructuring of the energy sector (cf. Fig. 2). The decision taken in May 2015 to introduce a market stability reserve as part of the reform of the European Emissions Trading System should at least lead to a significant reduction in the excesses in the first half of the 2020s (Agora Energiewende 2015b, p. 32; cf. Fig. 2; cf. Point 7).

Figure 2

Excesses resulting from the current agreement to introduce the market stability reserve (May 2015)



Source: Agora Energiewende 2015b, p. 32

13. There is a recognisable weakening of European climate policies as national policies gain in importance. For example, in 2013 the United Kingdom introduced a minimum price for CO_2-emissions and emission limit values for new coal-fired power stations (SRU 2013, No. 75). Strategically, European policy-makers face a choice between pursuing the ideal economic model of “one CO_2 price”, which would ensure an efficient emission reduction across all sectors and Member States (SINN 2008), or adopting a pragmatic approach of

European-wide measures in combination with additional further-reaching measures at the national level. The SRU has repeatedly called for such further-reaching measures if the price signals of the EU Emissions Trading System remain weak (SRU 2011, No. 444 f.; 2013, No. 75).

3 National perspective: The German government's use of targets for the energy transition until 2050 provides a sound and binding basis for the debate

14. The energy transition in Germany is based on clear targets and interim targets for greenhouse gas reductions, the development of renewable sources of energy, improved energy efficiency, and nuclear power phase-out. These targets are broadly accepted and will form a robust guideline for policy-makers across successive parliaments. In order to achieve the two degree target, the more ambitious climate target of a 95% CO_2 reduction (rather than only 80%) by 2050 should be used. The climate programme for 2020 represents a breakthrough in that it provides for more ambitious national measures in the emissions trading sector.

4 With more energy coming from renewable sources, conventional power stations must switch to making up the residual load

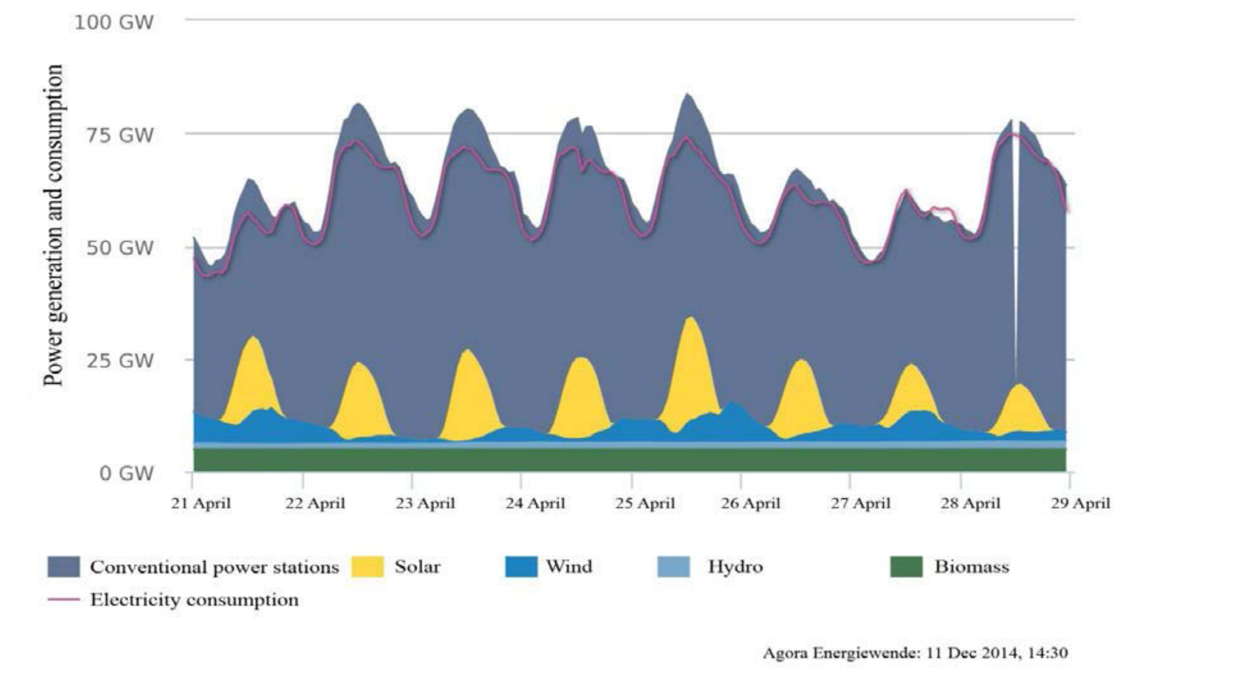
15. The main requirement in the future for Germany's electricity system will be flexibility. The electricity system must be restructured to integrate widely fluctuating inputs from renewable sources. Eventually, there will be no need for base-load power stations, i.e. power stations which for technical or economic reasons should operate at a constant production level. In the transitional period, flexible gas-fired power stations will have a significant role to play.

Background

16. Wind and photovoltaics are weather-dependent sources of power, currently accounting for some 16% of the electricity generated in Germany, while controllable renewable energy sources such as hydroelectricity and biomass account for 12% (BMWi 2015c). Nevertheless, the fluctuations of power generation depending on the weather, seasons and the time of day are already clearly apparent, as can be seen for a week in April 2014 (see Fig. 3).

Figure 3

Fluctuations in the generation of electricity from wind and photovoltaic sources in Germany in April 2014

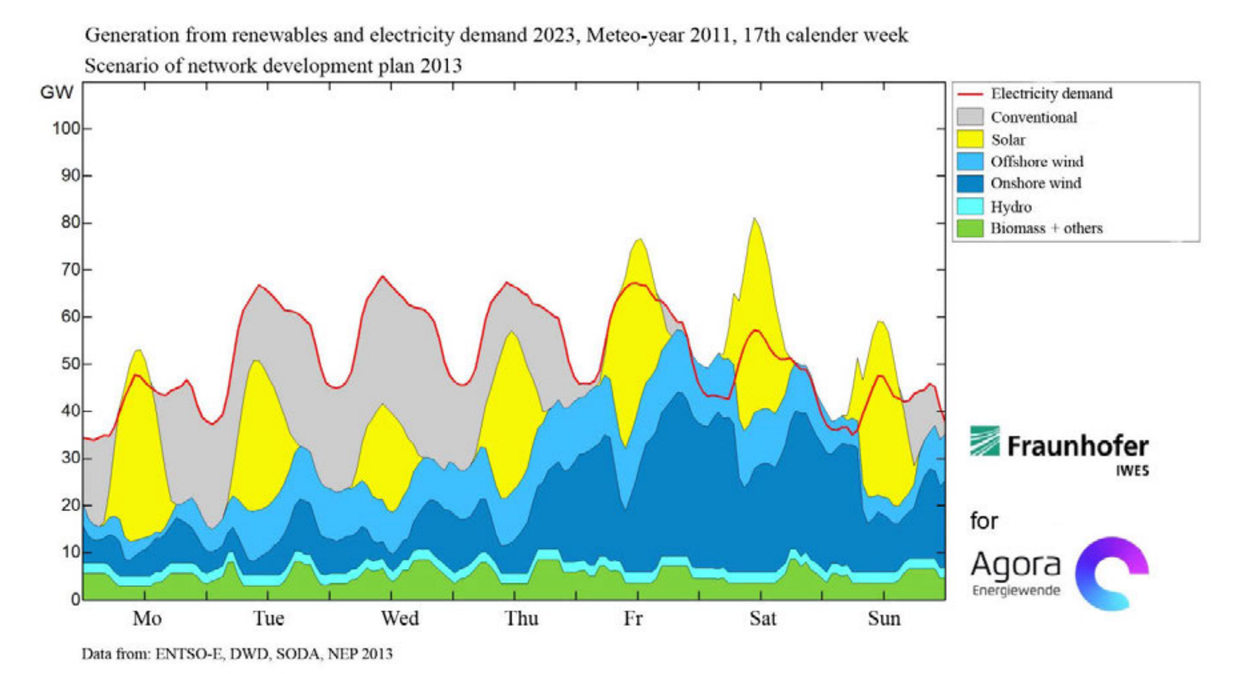


Source: Agora Energiewende 2015a

17. In the future, wind and photovoltaics will expand considerably because they are relatively cost-effective (cf. SRU 2011). Biomass and hydroelectricity only offer relatively little scope for further development in Germany. Simulations show that the increasing proportion of weather-dependent renewable resources in coming decades will lead to a massive increase in the amplitude of fluctuations. This is shown by a model of a sunny April week in 2023 (see Fig. 4). In accordance with the Grid Development Plan (Scenario B 2023), it is assumed that the installed capacity of renewable sources of energy will have more than doubled in comparison with 2011 (50Hertz Transmission et al. 2013b).

Figure 4

Modelled fluctuations in the electricity inputs from wind and photovoltaics in Germany in April 2023



Source: Fraunhofer IWES 2013, p. 53

18. The main requirement in the future will be flexibility. The electricity system must be restructured to integrate widely fluctuating inputs from renewable sources.

In the long term there will be no need for base-load power stations, i.e. power stations which for technical or economic reasons operate at a constant production level (SRU 2011, Nos. 234f.). Power from wind and photovoltaics are fed into the electricity grid first – not only because a priority feed-in is specified in the German legislation on renewable sources of energy (EEG), but also because it would be uneconomical to continue to burn fossil fuels when power can be generated from technology operating without fuel costs. Rather than providing the base load, conventional power stations will be used to meet the residual load after electricity from renewable sources has been fed in.

In the near future, there will only be a need for flexible peak-load power stations which can contribute to the provision of a widely fluctuating residual load. For new plants, the market itself will introduce the necessary structural change from base load power stations to peak load plants in the medium term. As it becomes apparent that future conventional power stations will only operate for a few hours every year, no more investments will be made in base-load power stations with a high capital intensity as they have to operate near to full capacity if they are to be profitable. The situation is more complicated when it comes to the existing power plant fleet. Here the higher fuel prices will initially force the flexible, lower-emission gas-fired power stations out of the market, followed later by the coal- and lignite-fired power stations. This problem is made worse by the currently very low CO_2-allowance prices in EU emission trading, which is benefitting the emissions-intensive power stations. Gas-fired power stations in Germany were operating at only about 15% of capacity in the period January to September 2014 (BURGER 2015). This is not only problematic in terms of climate policies, but is also counter-productive in terms of a long-term structural transformation. Gas-fired power stations will only become profitable again once excess capacities have been eliminated, when CO_2-prices begin to rise, and the demand for flexibility develops.

5 Simultaneous phasing out of coal and nuclear power is not called for

19. Germany has committed itself to phasing out nuclear power by 2022. The reduction of power generation from coal, in contrast, is an implicit consequence of the energy transition decisions. The reduction of the capacity for power generation from coal will stretch over a longer period after nuclear power has been phased out. Coal-fired power stations will possibly continue to operate until 2040.

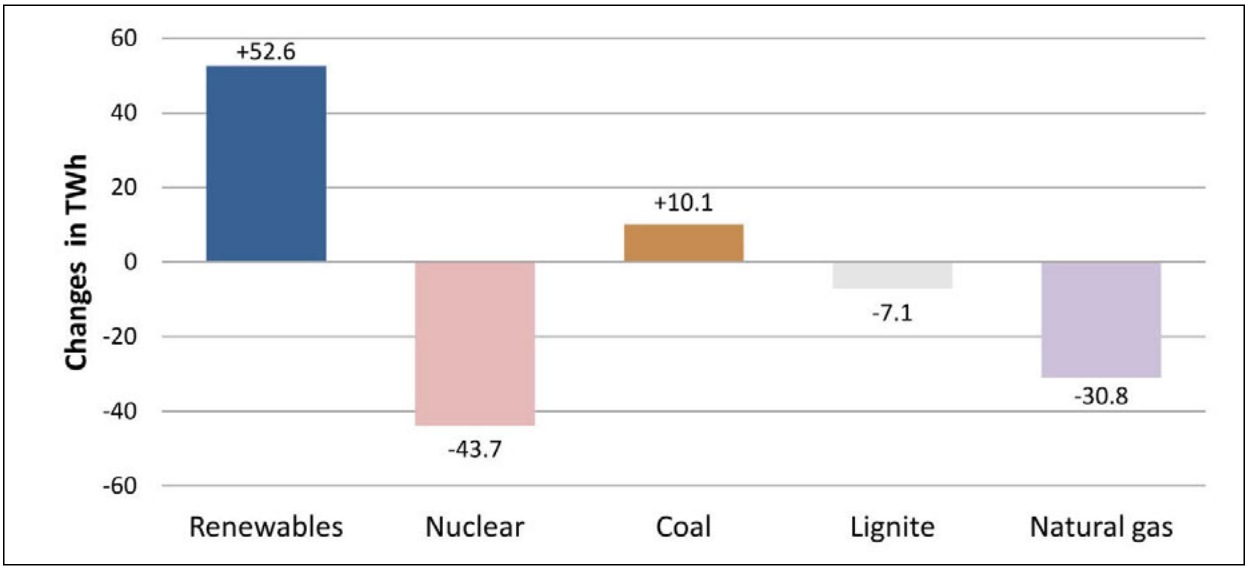
Background

20. Germany is already phasing out its nuclear power stations. Since 2011 some 10 gigawatts (GW) of capacity have been taken off-line and by 2022 further nuclear power stations with a capacity of 11 GW will have been closed down. Indirectly, the long-term reduction of the coal-fired power generation capacity is also part of the government programme: At least 80% of electricity is to be generated from renewable sources by 2050 (BMWi 2014a). The remaining power requirement must then be generated in flexibly controllable plants and can therefore not be provided by coal-fired power stations (SRU 2011, pp. 171–175). Furthermore, the use of coal would be technically and economically inefficient and would not be in accordance with climate targets. By 2040 at the latest, all coal-fired power stations should have been taken offline, preferably beginning with those with high specific greenhouse gas emissions.

There is currently an intensive debate in Germany about whether it would make sense to start reducing the power generation from emissions-intensive coal- and lignite-fired power stations in the coming years, i.e. in parallel with the phasing out of nuclear power. At present, whereas lignite-fired power stations are continuing to generate electricity unabated, market forces are actually resulting in the “phasing out” of efficient gas-fired power generation plants. Coal has also lost some of its market share recently (cf. Fig. 5).

Figure 5

Changes in power generation 2010 – 2014



SRU/KzU No. 14–2015/Fig. 5; Data source: AGEB 2014

Of course, it is important that the closure of coal-fired power stations does not threaten the security of supply. However, in Germany and in Europe as a whole there is currently a considerable excess of secure generating capacities. According to estimates of the German transmission system operators, there will be an overcapacity of 10 GW in Germany alone in the period until 2017 (50Hertz Transmission et al. 2013a). The German Institute for Economic Research (DIW) calculates that lignite- and coal-fired power stations with a total capacity of 9 GW could be closed down without affecting the security of power supplies. In addition, there are excess capacities in relevant neighbouring countries and in Italy totalling 60 GW which further increase the security of supplies in Germany (BMWi 2014b).

6 The long-term benefits of reducing excess capacities outweigh the short-term impact on the price of electricity

21. In order to meet long-term climate targets, plans must be developed for the timely restructuring of the power plant fleet. If coal-fired power stations are taken offline at a faster rate this will lead at first to an increase in electricity prices. However, the increase will be moderate and will more or less make up for the fall in wholesale electricity prices in recent years. There is no reason to expect that this will lead to a substantial weakening of the German manufacturing sector or of Germany as an industrial location. In the longer term, an early reduction in excess capacities in coal-fired power generation could also offer macroeconomic benefits. It will support planning for the necessary transformation of the power plant fleet.

Background

22. Climate concerns are the main reason for the gradual phasing out of coal-fired power generation. This also applies to the closure of a limited number of emissions-intensive coal-fired power stations in the short- to medium-term. But because the plants replacing them will often have higher variable costs, the decommissioning of the coal-fired power stations will lead to an increase in electricity prices.

Nevertheless, the timely elimination of excess capacity in the fossil-fired power plant fleet does offer macroeconomic advantages when the dynamics are viewed over the longer term. Reducing the excess capacities in the base-load sector in the coming years would help to consolidate the necessary restructuring of the electricity supply system – through to the establishment of flexible cover for residual demands. The stepwise reduction in the use of coal for electricity generation should be pursued as part of a long-term strategy to develop a renewable, climate-neutral power supply. If these measures make the restructuring process more predictable, then planning confidence for the transition will be improved. An early market shake-out would mean that gas-fired power stations could continue to operate. Their flexibility and comparatively low emissions mean that they form a crucial element of the energy transition process in Germany. Targeted measures will help to avoid “lock-in effects” and reduce costly frictions in the course of transforming electricity supplies.

23. An increase in wholesale electricity prices will in any case be unavoidable in the medium term in order to cover the costs of the power plant fleet. At present many power stations are unable to meet their fixed costs, and covering the variable costs for their operations may often be a problem, in particular for gas-fired power stations. The level of increase in electricity prices resulting from taking coal-fired power station capacity off line will be affected by a variety of factors. These include the speed with which new renewable capacity goes on line, progress with load management, consumption reduction and energy efficiency measures, the development of cross-border electricity trade, and of course the precise reduction pathway adopted for coal-fired power generation.

Two recent studies (REITZ et al. 2014; r2b energy consulting und HWWI 2014) have calculated that reducing coal-fired power station capacities by approx. 10 GW would result in a rise in the wholesale price of some 50 euros per MWh for 2015 or 2020. This would correspond to an increase of 7 to 13 euros per MWh compared with the relevant reference scenario (ibid). The unpublished results of a model developed by *enervis* on behalf of *Agora Energiewende* for a scenario with a reduction of coal-fired power station capacities in the order of some 14 GW by 2020 show an even lower electricity price rise of 4 euros per MWh (HERRMANN 2015). Since the DIW study (REITZ et al. 2014) with the simulation year 2015 neglects the effect on foreign trade in electricity of reducing coal-fired power station capacities in Germany, the calculated rise is to be regarded as an upper limit for the price effect. In terms of their depth of intervention and the avoided national CO_2 emissions, all these studies go beyond the proposals made by the Federal Ministry for Economic Affairs and Energy, which would only lead to an increase in the wholesale price of some 2 euros per MWh (BMWi 2015a; MATTHES et al. 2015; see also Point 8).

It should also be borne in mind that an increase in market prices for electricity would lead to a reduction in the renewables surcharge in Germany, so that in fact private households and non-privileged commercial customers would hardly be affected. Only industries not subject to the renewables surcharge would face appreciable additional costs. But even if the wholesale price rose to approximately 50 euros per MWh, this would only neutralise the effect of the fall in prices since 2011. In an international comparison, the competitiveness of manufacturing sectors in Germany with high levels of electricity consumption is only moderately dependent on electricity prices (KÜCHLER & WRONSKI 2014; GRAVE & BREITSCHOPF 2014; KÜCHLER 2013). These sectors benefit from considerable tax reliefs and reduced levies, and in view of the fall in wholesale electricity prices in recent years the effective prices they face for electricity are meanwhile below the European average (KÜCHLER & WRONSKI 2014).

24. The unit costs for energy in many sectors (and for German industry as a whole) are frequently lower than the costs for international competitors (GERMESHAUSEN & LÖSCHEL 2015; LÖSCHEL et al. 2014). Furthermore, the energy costs are only one of many location factors. With an average energy cost intensity in the manufacturing sector of approx. 2% of the gross production output, energy costs are only of secondary importance for the majority of sectors. Therefore the argument that a rise in electricity prices would lead to a massive relocation of manufacturing companies is not plausible. In many cases, changes in the industrial structure and the relocation of production in a specific industry are more a reflection of fundamental economic developments and an autonomous structural change. The growing international division of labour and the rapid development of emerging economies are leading to the emergence of increasingly important new markets which in turn are attracting production capacity.

Germany cannot and should not compete to offer the lowest electricity prices, but should rather focus on innovative, high-value products and processes that are environmentally compatible. Instead of regarding ambitious energy and climate policies as a constraint on economic development, the focus should be on the opportunities they can generate. For example, an increase in energy efficiency and a switch to regenerative sources of energy can reduce the pressure of energy costs and the dependence on fuel imports. Substituting domestic value creation for fuel imports generates economic multiplier effects and innovations that create opportunities for the growth of “green” markets (PEHNT et al. 2011; LEHR et al. 2012; WALZ et al. 2008).

7 National climate policy measures will be more effective after the reform of the EU Emissions Trading System

25. In the EU Emissions Trading System there is currently a massive surplus of CO_2 allowances. With its reform, surplus allowances will beginning in 2019 gradually be transferred to the planned market stability reserve. National climate policy measures will therefore no longer be compensated for by increased CO_2 emissions in other countries, but will increase the stock of allowances in the market stability reserve. This will make ambitious national climate policy measures more effective. As the European emissions pathway becomes more flexible, this will contribute to a reduction of the macroeconomic costs of ambitious targets. This will create scope for even more ambitious EU climate policies.

Background

26. A frequently expressed criticism of national measures to reduce CO_2-emissions from power generation is that they will be ineffective. This claim is justified by reference to the waterbed effect (Netherlands Environmental Assessment Agency 2008) in the EU Emissions Trading System. If less coal is used in a country to generate electricity, CO_2-allowances will be free for other emitters to use. Lower CO_2-emissions from German coal-fired power stations would lead to an equivalent increase in greenhouse gas emissions in other EU Member States and sectors. The overall emissions at the European Union level would therefore remain unaffected by national reduction activities in the sectors affected by the Emissions Trading System.

27. The ‘climate contribution’ (*Klimabeitrag*) proposed by the German Federal Ministry for Economic Affairs and Energy (see Point 8) reduces domestic CO_2-emissions while at the same time removing allowances (to an equivalent amount, according to expert opinion) from the Emissions Trading System. According to an external evaluation, the transfer of emissions could be largely or completely avoided (MATTHES et al. 2015). But even if a reduction in the amount of coal used nationally for power generation did make more allowances available elsewhere, the criticism of the effectiveness of national measures would not be convincing in the context of the current situation and the agreement reached in May 2015 on the introduction of a market stability reserve for the EU Emissions Trading System. Currently there is a massive surplus of allowances on the market and it is predicted that this will increase in the near future (EEA 2014). With already more than two billion surplus emission allowances, those released following a reduction in coal-fired electricity generation in Germany would not have any appreciable effect on the trading price. For example, the planned avoidanced 22 Mt CO_2 in the power plant fleet targeted in the Climate Programme for 2020 corresponds to some 1% of the current surplus. Even if further reductions are necessary in the electricity sector in order to achieve Germany’s national climate targets, no significant effect on allowance prices is to be expected, and therefore no additional demand for allowances is anticipated as a result of falling prices.

In the future, the market stability reserve is to correct imbalances in the allowances market in order to improve the system's resilience and ensure that there are incentives to reduce emissions. This will involve reducing allowance surpluses, which are a key factor pushing down the prices on the allowances market. According to the Commission proposal agreed on by the European Parliament and Council, if the accumulated allowance surplus exceeds a threshold of 833 Mt CO_{2eq}, then in the future 12% of this surplus will be transferred to the market stability reserve ("ETS market stability reserve: MEPs strike deal with Council", Press release of the European Parliament, 6 May 2015).

Under foreseeable market conditions in the short and medium term, allowances released by the reduced use of coal for power generation would not be used by other emitters within the Emissions Trading System, but would further increase the accumulated surplus. This would then be transferred in part to the market stability reserve and the greenhouse gas emissions in the EU would be reduced. In the long term, the emissions allowances from the market stability reserve can be returned to the market if the accumulated surplus is less than 400 Mt CO_{2eq}. Even though this would in part counteract initial emissions reductions, making the emissions pathway more flexible can prove to be economically efficient (GILBERT et al. 2014). If increased use is made now of relatively cost-effective mitigation options, then this can cushion the expected rise in avoidance costs in the future (KNOPF et al. 2013).

28. If Germany seizes the opportunity to implement cost-effective mitigation activities nationally and through the EU, this will open up new options. These can and should also be used for a permanent reduction of greenhouse gas emissions. A high level of allowances in the market stability reserve makes it easier to agree on more demanding targets for the EU Emissions Trading System in the future or to tighten up current goals. When the market stability reserve has been filled up, it would be possible to cushion the effects of the more demanding goals. If stricter climate goals lead to fewer allowances being issued, this can be made up by releasing allowances from the market stability reserve. This would make it possible to avoid a significant increase in the emissions reduction costs, even if the climate targets are tightened. Although in this case the emissions would be above the tighter future emission targets, the accumulated emissions would nevertheless fall, because full market stability reserves show that targets have been over-fulfilled in the past. By bringing forward the emission reductions, the market stability reserve mechanism leads to a cost-reducing smoothing out of the avoidance pathway.

In the coming decades, opportunities will repeatedly arise to make improvements to the European climate targets. For example, in the light of new climatological findings or in the course of international negotiations about a climate agreement, the EU could declare itself prepared to give more demanding reduction commitments. If there are large numbers of allowances in the market stability reserve then it would also be conceivable to remove some of these from the market completely (in accordance with specific rules). In order to make use of such opportunities it would be desirable to have a more ambitious structuring of the market stability reserve. In particular it would be appropriate if the proportion of surplus allowances going into the market stability reserve were significantly higher than the current value of 12%. Recommendations about this are made for example by GILBERT et al. (2014) and DEHSt (2014).

These arguments also apply with respect to a long term strategy for reduce coal-fired power generation capacities. By playing a leading role in the reconstruction and the decarbonisation of electricity supplies, Germany can open up additional scope for a more ambitious European climate policy. This can also be supported by the market stability reserve. Planned, long-term emissions reduction measures – extending beyond 2020 – would reduce the national demand for allowances and thus contribute in the future to the slower reduction in the growing numbers of allowances that will have accumulated in the market stability reserve in the coming years. This supports the implementation of stricter European climate targets or the elimination of allowances in the market stability reserve.

29. However, the actual climate effects of a reduction in coal-fired power generation in Germany depend not only on the interaction with emissions trading (through the allowance price). The adaptations within the electricity market must also be taken into consideration. A reduction in power generation from coal can be compensated for by an increase in power generation from other sources in Germany and by a reduction in power consumption. Otherwise, electricity imports would lead to an increase in emissions in Germany’s neighbouring countries, in particular if the imports were generated by CO_2-intensive coal-fired power stations. This could render Germany’s climate policies ineffective. The foreign trade effects of unilateral climate measures have been estimated, with national emissions reductions set off in part against increased emissions in other countries (r2b energy consulting & HWWI 2014; LORECK et al. 2014; HERRMANN 2015). However, further studies are required on the short-term and long-term effects on the electricity market. For the scenario of removing 10 or 14 GW of coal-fired power generation capacity from the German market, r2b energy consulting & HWWI (2014) and enervis (HERRMANN 2015) calculate that about half the national greenhouse gas reduction would be effective for Europe as a whole.

Additional national measures are above all desirable if they support the structural change towards a climate-friendly energy system based on renewables. In this case, unfavourable short-term effects for the inner-European greenhouse gas balance can be justified.

8 The ‘climate contribution’ is ground-breaking, but is not yet sufficient

30. Emissions trading remains the central instrument of European climate policy. However, the price signal it provides will remain too weak for Germany’s more demanding national targets, even after the reform. The SRU therefore welcomes the fact that the German government wishes to adopt additional national measures. The ‘climate contribution’ proposed by the Federal Ministry for Economic Affairs and Energy takes into account the alternatives that have previously been discussed. It represents a step in the right direction, is compatible with the EU Emissions Trading System, promotes the structural transformation in the power plant fleet, and therefore offers an opportunity to close the climate policy gap efficiently by 2020. The overall economic consequences are minimal. However it is still necessary to decide on an effective long-term instrument with which the climate targets of the German government can be achieved with certainty by 2050.

Background

31. The main European instrument to reduce CO_2-emissions is the EU Emissions Trading System. However, as discussed above (Point 2), the allowance prices are too low to provide the desired control. In addition, the targets and instruments of the EU climate policies are weaker than the targets of the German climate policies. Various national measures have been adopted to complement emissions trading. For example, the UK has introduced absolute emissions budgets for thermal power stations and minimum prices for CO_2 allowances. In the past, minimum efficiencies for power stations have also been discussed, as well as specific emissions standards (CO_2-limit values) (SRU 2013, No. 75; OEI et al. 2014b, p. 603; SCHÄUBLE et al. 2014; VERHEYEN 2013).

32. On the basis of earlier recommendations, the Federal Ministry for Economic Affairs and Energy presented an “Electricity market” key issues paper on 21 March 2015 in which a proposal is developed for the electricity sector aimed at closing the climate policy gap (BMWi 2015b). This proposal was the subject of a controversial political debate, and various alternatives and compromises were put forward.

The Federal Ministry for Economic Affairs and Energy proposed a national ‘climate contribution’. This applies above all for older power stations with high specific emissions. The ‘climate contribution’ is levied on emissions above a specified threshold. As well as the obligations under the EU Emissions Trading System, additional allowances have to be submitted at a specified market value and these are then permanently eliminated. The threshold is set to ensure that some 90% of the fossil-fired power generation would remain unaffected. All power stations receive an annual fuel-neutral emissions waiver based on the age of each power station block. The emissions waiver covers the full requirement of all power stations that are not more than 20 years old. It then declines linearly from 7 Mt CO_2

per GW output for power stations that are 21 years old to 3 Mt CO_2 for power stations that are 40 years old or more. This means that the ‘climate contribution’ affects above all old power stations with particularly high emissions. Additional emissions allowances are only due above the relevant threshold. Their value should be in the order of EUR 18 to 20 for each tonne of CO_2 emissions above the threshold. The effect should be to close the calculated climate policy gap of 22 Mt CO_2.

The proposal offers an innovative, forward-looking instrument based on the EU Emissions Trading System that promotes structural change in the power plant fleet. Such an additional national measure does not necessarily increase the surplus of EU emission allowances and may even reduce it. It can at least compensate for the so-called waterbed effect (see also Point 7). This is the case in particular if power station operators decide to continue to emit more greenhouse gases than are covered by the relevant emissions waiver. For each tonne of CO_2 emitted above the threshold, they would have to submit additional emissions allowances for approx. 3 t CO_2 (at the present allowance price). But even if a power station is closed down, no significant transfer effects are to be expected because with the introduction of the market stability reserve surplus emission allowances in future will be introduced gradually into the reserve (cf. Point 7). This therefore introduces a higher level of protection (cf. SRU 2011, No. 449).

As an economic instrument, the ‘climate contribution’ offers power station operators various ways to react to the price signal. These range from acquiring additional emissions allowances, through adopting a more flexible mode of operation, to closing down older power stations. However, price mechanisms cannot lead to precise quantitative targets in a dynamic market. If there is a fundamental change in the market data then it will be necessary to make adjustments to the quantity and price parameters of the proposal (contribution amounts, thresholds, age levels) in order to be able to achieve the German government’s climate targets.

33. Various actors are worried that the ‘climate contribution’ could have massive effects on the German power plant fleet, jobs, or the energy-intensive industry (see also Point 6). Initial studies suggest extremely low overall effects on the EU Emissions Trading System, on market prices for electricity, and therefore on competitiveness (GRAICHEN et al. 2015; HILMES et al. 2015; KÜCHLER & WRONSKI 2015; BMWi 2015d; MATTHES et al. 2015).

The proposals made in the discussion, for example from the Mining, Chemical and Energy Industries Union (IG BCE), the German Emission Trading Association (BVEK), or from the CDU Parliamentary Party have the aim of freeing emission-intensive lignite power stations from the ‘climate contribution’. But in view of existing surplus capacities, this would mean instead that flexible gas-fired power stations will be taken offline (see Point 5). Thus all these proposals lead in the wrong direction. The suggestion that the German government should buy up CO_2 emission allowances (Reuters 2015) would involve additional budget costs but would in fact result only in a small reduction in the surplus allowances in the EU Emissions Trading System and would not have any effect on the real emissions in Germany. Other proposals shift the reduction obligations to other sectors (transport, heating) (BVEK 2015; IG BCE 2015). It should be noted that considerable reductions are also being planned and are necessary in these sectors, and that such reductions should not be counted twice. Creating a reserve of coal-fired power stations (Frontier Economics 2015a; BDI & IG BCE 2015) was also already envisaged in the key issues paper of the Federal Ministry for Economic Affairs and Energy (BMWi 2015b) so that it does not represent an additional measure. Finally, increased subsidies have been recommended for combined heat and power systems (CHP) (Frontier Economics 2015b). Leaving aside the question of whether additional subsidies for CHP are economically and environmentally sound or would contribute to making the power plant fleet more flexible, the increase will not be sufficient to lead to the self-declared climate targets. In addition, increased CHP subsidies could contribute to a further increase in electricity exports.

34. In general, more attention should be paid in the ongoing debate to the fact a reduction is required which goes beyond the 22 Mt CO_2 currently being discussed. According to the Projection Report 2015, if no further measures are adopted by 2020, greenhouse gas reductions of 31.9 to 35% are to be expected, depending on the scenario (BMUB 2015, p. 20). For the reference scenario this means a climate policy gap of 91 Mt CO_2-equivalent (CO_{2eq}) compared with the target of 749 Mt CO_{2eq} (ibid., p. 171). In the Climate Action Programme 2020, scope for a reduction of 40 to 56 Mt was identified outside the electricity sector and of 22 Mt by further measures in the electricity sector (BMUB 2014, p. 20). But how is the remaining reduction of 22 to 38 Mt CO_{2eq} to be achieved? It is obvious that Germany will hardly be able to reach its climate targets for 2020 unless it also implements measures which affect coal-fired power generation (GRAICHEN 2014; see also Points 7 and 10).

Even with the ‘climate contribution’ of 22 Mt CO_2, the target of reducing greenhouse gas emissions by 40% remains challenging. In the opinion of the SRU, the German government should therefore bear in mind that over and above the proposed climate contribution there remains a considerable need for short- and medium-term actions.

35. Despite the short-term national climate contribution, it is still necessary to continue the political and societal debate about the future of coal. Indeed, the objections raised by various Länder and the affected industrial sectors against a carefully formulated short-term proposal show the need to begin a process of developing a consensus. Without a long-term plan on phasing out coal-fired power generation, the energy transition will not be achievable.

9 The necessary structural change in the coal mining regions can be made socially acceptable by accompanying measures and long-term planning

36. The reduction in coal-fired power generation leads to structural changes that are concentrated in particular regions, involving job losses in the affected sectors. However, this can be organised in a socially acceptable form and compensation is possible at least in part by creating new jobs in other sectors. A structural change of this size is in fact not exceptional. Germany has already successfully coped with grave structural ruptures. A suitably funded programme should be developed between the German government and the relevant Federal States.

Background

37. An orderly phasing out of coal and lignite in power generation over several decades will involve redundancies along the value-creation chain in this sector. There had been an overall increase in the number of employees in the energy industry over the past ten years. This is due above all to the expansion of the renewables sector as a result of the energy transition (BMWi 2014a, p. 93). Coal-fired power generation provides employment in the power stations and in the open-cast mining of lignite. The specific regions in which these jobs are concentrated will be hardest hit by the structural transformation. However, in comparison with other processes of industrial restructuring, the impact will not be exceptionally large. Social hardships can be avoided by long-term planning and the timely implementation of regional policy measures.

According to a study commissioned by the Federation of German Industries (BDI) some 15,000 people are currently employed in lignite open-cast mining, and a further 9,000 in lignite-fuelled power generation (cf. r2b energy consulting & HWWI 2014, p. 38). There are estimated to be similar numbers of jobs in coal mining (which will come to an end in the near future), and in coal-fired power generation. According to various analysts, the peripheral employment effects relating to lignite-fired power generation in Germany account for 40,000 to 86,000 jobs. Many of these employees, for example in the customer services department of an electricity company, will still be required if the power is generated on the basis of renewables. According to the study, the short-term shutdown of some 7 GW of lignite-fired generating capacity would lead to the loss of approx. 7,000 jobs.

38. Other major restructuring events in recent German industrial history have had a greater impact. For example, more than 45,000 jobs were lost in the solar industry between 2012 and 2013. Overall, the numbers of employees in the renewables sector fell from 400,000 to 371,000 (BMWi 2014a, p. 93). In part, these redundancies were also regionally concentrated. Between 1970 and 1984, 500,000 jobs were lost in the German textile industry (FRÖBEL et al. 1986, p. 58) and from 1975 to 1984 nearly 300,000 jobs were lost in the steel industry (SCHUCHT 1998; BINDER & SCHUCHT 2001). The lay-offs in the steel industry caused unemployment levels in Saarland and North Rhine-Westphalia to rise well above the West German average and the unemployment in these regions remains relatively high.

The structural upheavals were the result of economic policy decisions (above all deregulation, reduced subsidies, market liberalisation) and changing global market conditions. As a response, the following combination of social policy instruments was found to be effective:

– Social plans, in particular in order to compensate for income losses due to redundancies.
– Avoiding redundancies by providing replacement jobs and income guarantees.
– Early retirement with wage compensation.
– Active labour market policies – in part offering employment opportunities in the public sector.
– Retraining and further training measures.
– Regional economic support (e.g. under the joint Federal Government/Länder scheme for improving regional economic structures) und supplementary Länder programmes.

The various options for a socially acceptable restructuring should be used in the development of a Federal Government/Länder “Coal Transformation” programme, which should be provided with the necessary funds. It would bring together and coordinate the various relevant state subsidy programmes and should be developed in consensus with all the stakeholders. The programme could also include targeted investments for the future, for example in regions where open-cast mining has been discontinued or coal mines closed down.

10 A national consensus on the future of coal in Germany promotes planning and investment security, increases the trust in the energy transition and sends out an important international signal

39. The discussion of the role of coal and lignite for power generation in Germany reflects a new political and societal conflict similar to the debate on the phasing out of nuclear power. The lessons learned in that debate should be used to develop a strategy for phasing out coal. A long-term coal consensus will promote trust in the energy transition and establish a sound base on which all the actors can plan for the future. A coal consensus also makes it possible to take timely measures to cushion the impact on employees and consumers and makes an important contribution to a targeted restructuring of the electricity market.

Background

40. The political conflicts about nuclear power in previous decades acted as a constraint on energy policy implementation in Germany (SARETZKI 2001). This situation changed fundamentally with the nuclear consensus of 2000 and the commitment to the energy transition (*Energiewende*). But there are now increasingly intense conflicts about the role of coal and lignite in the energy mix. The goals of the energy transition are clearly incompatible with guarantees to continue coal-fired power generation. Such guarantees call into question the credibility of climate policies and lead to a polarisation in society. Opinion polls indicate that a clear majority of the German public are in favour of phasing out coal by 2040 (TNS Emnid 2015; NIPPA et al. 2013).

The German government's Climate Action Programme 2020 presented in December 2014 (BMUB 2014) represents a breakthrough. The SRU welcomes the fact that the programme no longer argues that climate policies regarding power generation should only be implemented through the EU Emissions Trading System.

It is important that the discussion of the coal consensus should also include instruments that can be developed with a view to the longer term. This is also necessary for the national Climate Action Plan 2050 which is envisaged for 2016. Instruments should be chosen that effectively target climate goals and that are relatively straightforward to implement.

The advantages offered by a public debate on the orderly, long-term coal consensus include the following:

– If the necessary capacity reduction is well-prepared, then the implementation will be smoother, more cost-effective, more socially acceptable, and also more acceptable to the companies affected.

– Polarising conflicts can be defused. Political and societal trust in the energy transition will be promoted.

– A consensus establishes a stable foundation on which all economic actors can plan for the future and thus provides security for investments.

– A consensus can contribute to the functioning of the electricity market and make risky and expensive market interventions unnecessary.

– A consensus makes it easier to reach policy decisions for numerous measures which are necessary for the progress of the energy transition (electricity market design, power network development, etc.).

The coal consensus should be organised by representative of the energy industry (including the renewables sector), the German government and Länder, associations (including environmental associations and trade unions) and scientific experts. This could be modelled along the lines of the Ethics Commission for a Safe Energy Supply. Political steering should be at the level of the Federal Chancellery, Federal Ministry for Economic Affairs and Energy, and Minister Presidents of the Länder, with active support from federal agencies and ministries and backed up by scientific studies.

Key questions could include:

– Which development pathway is most compatible with the goals of security of supply, climate policy, promotion of renewable sources of energy, and economically acceptable energy costs?
– What are the pros and cons of the various options for action in terms of economic policies, energy policies, and climate policies? What viable balance can be reached between the various objectives?
– What instruments can promote progress along the chosen development pathway?
– How do the national instruments and the German consensus fit in with EU climate and energy policies? Which complementary EU policies should be promoted?
– What social problems and regional economic problems are to be expected and how can their impact be minimised?

The goal should be to reach consensus in a joint statement on a coal phase-out, which would then be actively implemented by the German government, the Länder, representative associations, and businesses.

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