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Position Paper

Incorporating the German Energiewende into a comprehensive European approach

New options for a common energy and climate policy

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New options for a common energy and climate policy

Preface

Global climate protection is one of the most pressing challenges of our time. A key objective of both the German energy transition and the European energy and climate policy is to reduce greenhouse gas emissions. As the energy sector is responsible for most of these emissions, a low-carbon energy generation plays a central role. Europe can be pioneer in climate protection, provided national and European measures can be shaped to be suitable as a model for other economies and thus also trigger global changes. The European Union has renewed this claim with the climate objectives for the year 2030.

How exactly these goals are to be achieved, is subject to political, public and scientific debate. On the one hand, discussions focus on the opportunities and risks of different leading climate policy instruments at the European and national level. On the other hand, existing policy options are increasingly evaluated in the context of supply security and economic efficiency. Finally, the challenge will be to induce as broad an alliance of states as possible to join the European initiative on global climate protection.

This policy paper worked out in the Academies' Project "Energy Systems of the Future" describes design options for an effective and efficient climate protection. In this context, the development of the European Emissions Trading Scheme (ETS) as a leading policy instrument plays a pivotal role. The policy paper identifies further accompanying instruments and decisions that may facilitate the integration of the European electricity market. With this policy paper, the academies endeavour to demonstrate to actors from politics and civil society how a common energy and climate policy in Europe could be designed.

We would like to thank the researchers of the ad-hoc group "Integration" who wrote this policy paper in the past year.

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Abbreviations

ACER	European Agency for the Cooperation of Energy Regulators
CWE	Central Western European Region
DSM	Demand Side Management
EEG	German Renewable Energy Sources Act
EU	European Union
ETS	Emissions Trading System
GDP	Grid Development Plan
HVDC	High Voltage Direct Current
NREAP	National Renewable Energy Action Plans
RE	Renewable Energy

Summary

Starting point and working hypothesis of this position paper is the assumption that climate protection – with due consideration of supply security and cost-effectiveness – is the overall priority of all efforts undertaken in Germany's energy transition known as *Energiewende*. Given the global nature of the climate problem, purely national measures with the aim of climate protection are, however, ineffective, unless they result in global changes.

A reduction of global emissions can only be achieved if a sufficiently large alliance of states unites in a common effort for climate protection. The European Union (EU) – unlike the individual member states – can play a central role in this effort. In order to provide an incentive for non-EU countries to join the European initiative, Europe must show how emission reductions can be achieved at reasonable costs while ensuring a secure energy supply.

With its Emissions Trading System – ETS, the European Union already has a leading climate-policy tool at its command, which was recently subject to intense discussions. It can achieve the agreed EU greenhouse gas reduction targets at low costs and can, at the same time, either be implemented directly or be linked to climate policies in third countries. This is a key lever for a globally coordinated approach. A largely comprehensive ETS is therefore the measure of choice in order to achieve effective climate protection. On the other hand, the purely national promotion of renewable energies (RE) as established in the German Renewable Energy Sources Act (EEG) does not result in any additional reductions in greenhouse gases in Europe.

The development of renewable energy capacities also affects the EU's internal electricity market. In the case of Germany for instance, the EEG was designed outside the usual market mechanisms. The result is that RE-facilities do not follow the electricity price signal. Decisions to invest into such RE-facilities neither factor in the market risk nor the simultaneous feed-in of renewable energy. Market integration of RE is therefore a central challenge. In addition, the promotion of renewables requires new standards of the energy infrastructure, which is as of yet under-developed both in Germany and Europe.

This position paper outlines policy options for a European strategy for an efficient and effective climate protection with a particular focus on the functioning of the internal market.

Strengthening the emissions trading system as the main instrument for climate policy

The policy options proposed center around the further development of the emissions trading system as the main instrument of climate policy in Europe. This system can ensure both climate protection and the market integration of RE and may be accompanied by other instruments.

By actively promoting the ETS in the European Council, the German federal government can play a determining

role in shaping such an energy and climate policy framework in Europe. Likewise, the German Government can start immediate action with voluntary steps towards a cross-border harmonisation of its energy policies. Only a harmonised and market-based coordination of climate protection policies in Europe can ensure a high level of cost-effectiveness.

Important steps towards developing the ETS as a guiding tool for climate policy involve: 1. The establishment of a price floor and ceiling for emissions allowances, 2. The phasing-out of national support schemes for renewable energies, as financial incentives for renewable expansion will be set through the ETS, 3. The extension of the ETS to further greenhouse-gas-emitting sectors (e.g. transportation, heating sector), 4. Linking the ETS with the emissions trading systems of other regions, or else having non-EU states directly join the ETS.

In terms of economic burdens, the ETS affects the EU member states to different degrees. In light of these differences, a compensation mechanism might prove effective to foster an agreement on the consistent and ambitious development of emissions trading. This could, for instance, involve the transfer of revenues from emissions trading to poorer EU member states.

A clear commitment from European politics to the stability of the emissions trading system is a key factor for its effectiveness. By introducing the greenhouse gas reduction target for 2030, the EU member states have taken an important step towards ensuring this stability. However, the current uncertainty regarding the future design of the ETS can discourage companies regulated under the ETS from investing in abatement measures and research and development. It is doubtful whether a measure such as the introduction of a market stability reserve will be able to sufficiently stabilise the market participants' expectations. Instead, investment security should be ensured by designing the emissions trading system as effectively as possible beyond 2020.

If the EU member states do not succeed in establishing a strengthened emissions trading system as the main European climate policy and abstaining from additional, potentially ineffective support schemes, the question will be what other strategy might promise results for an integrated European approach. In this case, and under certain conditions, a transition might be reached by harmonising national support schemes for renewables. Compared to an ETS-only procedure this would certainly increase the costs of achieving the climate targets. Still, such an approach could at least reduce the high costs of national support schemes and increase the market integration of RE. Nevertheless, an integrated European promotion of RE fails to meet the requirements of an effective and cost-efficient climate policy: these are to reduce emissions and to do so in a cost-effective manner, meaning that abatement takes place in those sectors and regions where the economic advantage is highest. In consequence, when it comes to climate protection, this course of action is no alternative to the ETS.

The gradual harmonisation of the European support schemes is already laid out in the EU Renewable Energy Directive. In a first step, member states with a similarly low level of administrative cost structures could be encouraged to implement joint pilot projects, common funding schemes and statistical transfers. Countries with high administrative barriers would then have an incentive to adjust their own structures. To ensure market integration and cost-effectiveness, a European support scheme would have to be designed in such a way that neutrality regarding location and technology type is ensured.

In any case, the expansion of renewables in Germany would fall short of the German federal government's current development targets – in favour of an expansion at the most suitable sites in Europe.

With the gradual abolition of national support schemes, the funds no longer tied up in such schemes could be partly used to expand research and development in low-carbon technologies. As a first step, a reliable price path for the ETS would set a strong incentive for these investments. This effect could be boosted by additional research funding.

The success of a common energy and climate policy in Europe largely depends on how strong the willingness to cooperate really is in Germany and the other EU member states. Existing mechanisms for cooperation and transfers could form the base for a more equal distribution of burdens and a deepened integration in the different fields of energy and climate policy.

Strengthening the internal electricity market

To strengthen the internal market, further measures can be implemented in addition to the integration of renewable energies. Here, the main aim should be to increase transmission capacities and avoid bottlenecks in order to trigger a further alignment of the electricity prices in Europe. The creation of a so-called capacity market to ensure sufficient electricity generating capacity will, however, not be necessary in the nearer future, as the system is currently experiencing overcapacity. In order to attenuate regional bottlenecks, a European mechanism controlling the generation capacity of power plants (so-called redispatch-mechanism) could be established. A market splitting into regional, cross-border price zones with regionally varying network charges would likewise promise good results, as would a further development of the grid. The financial side of this expansion of the internal market infrastructure could be secured via joint EU-instruments.

All measures and policies must take into account European and national regulatory frameworks, since legal certainty is a fundamental prerequisite for investment in climate-friendly technologies. The reform options outlined in this paper can safeguard legal certainty and even resolve discrepancies between European law and national RE-promotion policies.

1. Introduction

The Federal Government's 2010 energy concept sets out objectives for climate protection, the development of renewable energy (RE) and energy efficiency. Taken together, these objectives initiate a comprehensive transformation of the energy system. However, the endeavor to give equal coverage to all these aims is likely to be a double-edged sword.[1] Serious trade-offs threaten to arise particularly in the context of the three main goals of German energy policy – supply security, cost-effectiveness and environmental sustainability. Although a low-carbon energy system is only conceivable with a high proportion of renewables in electricity generation and with high standards of energy efficiency, this does not necessarily imply that the best and cheapest way to effectively reduce greenhouse gas emissions is a rapid increase in the share of renewables.

Since it is unlikely that political decision-makers will complement the set of objectives by prioritising them in the near future, each analysis of policies and proposals for the implementation of the energy transition needs to choose a working hypothesis specifying a hierarchy among these policy objectives. The energy transition is by no means identical with just the development of renewable energy capacities and the phase-out of nuclear power. Instead, it stands to reason to rate the goal of "climate protection" not only as the priority, but as the ultimate goal of the energy transition.[2] This is the working hypothesis the present document is based upon, without putting the advisability of this prioritization itself up for discussion. The federal government's 2011 resolution to phase out nuclear energy is regarded as a secondary objective set for Germany.

The choice of this starting point of the analysis inevitably bears upon the assessment of national energy and climate policies: Unless they lead to global changes, purely national attempts of climate protection are ineffective. After all, emission reductions in individual states have no significant impact on the global emission level. It is therefore necessary to adopt a broader, global perspective.

Effective climate protection is only possible if the introduced measures lead to the creation of a sufficiently large alliance of states to reduce the global emissions level.[3] Here, the European Union (EU) plays a central role.

In order to provide an incentive for non-EU countries to join the European initiative, Europe must show how emission reductions can be achieved at reasonable costs while ensuring a secure energy supply. It must be assumed that high costs and supply insecurities will significantly affect the willingness of third countries to adopt ambitious climate protection measures. Should it be possible, however, to cost-effectively achieve a substantial emission reduction in a large economy such as the EU, this could also serve as a model for other countries and regions.

1 acatech 2012.

2 Joas et al. 2014.

3 acatech 2012.

Specifically, this means that the climate protection measures employed at the European level must fulfill two strategic objectives: Firstly, they must enable the EU to achieve its 2030 greenhouse gas-reduction target at reasonable costs. Secondly, they must be compatible for implementation in third countries. This compatibility is a key lever for a globally coordinated approach which could pave the way for the gradual creation of a sufficiently large alliance of states for effective climate protection.

The European Union already has a climate policy at its command which can achieve the agreed EU greenhouse gas-reduction targets at low costs and is, at the same time, compatible for an implementation in third countries. This instrument is the Emissions Trading System – ETS. A largely comprehensive ETS is therefore the measure of choice in order to achieve effective climate protection.

The fragmentation of European energy policy: effects on climate protection

The additional promotion of renewable energies apart from emissions trading tends to considerably increase the cost of achieving the EU reduction target for greenhouse gases without making a direct contribution to the reduction of greenhouse gases.[4] The ETS already effectively limits the emission of greenhouse gases in the sectors it covers, including the electricity sector.

Greenhouse gas reductions "bought" by national support schemes for renewable energy merely supersede the demand for emission allowances in the German electricity sector; however, these allowances can easily be used in other sectors covered by the ETS. The purely national promotion of renewable energies as established in the German Renewable Energy Sources Act (EEG) therefore results in no additional reductions in greenhouse gases in Europe.

The development of renewable energy capacity also affects the EU's internal electricity market. In the case of Germany for instance, the EEG established a system of fixed tariffs outside the usual market mechanisms. The result is that RE facilities do not follow the electricity price signal. At the same time, the feed-in of green power distorts the electricity price, which can lead to misallocations. In addition, the expansion of renewables requires a better energy infrastructure – as yet it is under-developed both in Germany and Europe.

These challenges can only be met by an explicitly European approach. However, this is precisely what is lacking so far in the German energy transition concept: the strategy is designed largely from a national angle and is detached from the climate and energy policies of the EU and its member states: The German development targets for renewable energies surpass the agreements reached at EU level by far. Consequently, the pace of development is significantly greater than in other member states.

However, the EU member states are not following this model. Instead, they are likewise pursuing their own national objectives, independent of the German approach. Many member states pursue a slower expansion of renewables, while conventional energy sources continue to play an important role. In this sense, the German energy transition is met with little enthusiasm and sometimes outright opposition within the EU. This is especially true where neighbouring member states are forced to have the peaks of German electricity fed into their own national grids.

4 Sachverständigenrat 2014.

Structure of the position paper

This statement describes transitions to (cost-) effective climate protection in Europe with a particular focus on the functioning of the internal market. The proposed policy options center around the further development of the emissions trading system as the leading instrument for climate policy. This system ensures both climate protection and the market integration of RE and may be accompanied by other instruments.

By actively promoting the ETS in the European Council, the German federal government can play a determining role in shaping such an energy and climate policy framework in Europe. Likewise, Germany can start immediate action with voluntary steps towards a harmonisation of its own instruments. The integration of national energy policies into a European scheme is the key to establishing a cost-effective climate policy. High cost-effectiveness, in turn, is a prerequisite for third party countries to join the European initiative, enabling the reduction of greenhouse gas emissions on a global scale.

The position paper is based on the following assumptions: Firstly, the European reduction of greenhouse gases is identified as the primary objective, assuming that climate protection is the overall priority. Secondly, a development of the internal market for electricity is considered to be desirable. Thirdly, it is assumed that there is no willingness to accept compromises in terms of technical supply security in the electricity sector. Fourthly, all measures must be consistent with both European and German law to ensure legal certainty for investment in climate-friendly technologies.

Chapter 2 gives an overview of European climate protection measures and the integration of the internal electricity market; it also identifies contradictions arising from the hitherto purely national design of the energy transition. Chapter 3 describes policy options for active political measures. The approach centers on the design of the emissions trading system as an effective tool for climate protection and market integration. Such an instrument may be flanked by mechanisms strengthening the internal market. An agreement on such measures, however, probably requires that the different national circumstances in the EU member states are dealt with, which could be done via cooperation and transfers. In Chapter 4, the policy options are assessed with regard to their legal implementation and their consistency with European law. Chapter 5 summarises the policy options and their respective trade-offs.

2. Status quo of European energy and climate policy

2.1 Possibilities for the development of the main instrument for climate protection

The European Emissions Trading System is the main common instrument in the EU to foster climate protection, although its specific design was recently intensely discussed. The ETS currently covers around 50 percent of the European Union's carbon emissions and 45 percent of its total greenhouse gas emissions.[5] However, important sectors such as the transport and heating sector as well as the agricultural sector and small power plants in the transformation sector remain to be included.

In addition, the ETS is highly compatible for mechanisms of international cooperation. As part of a bottom-up procedure aiming at the gradual establishment of a global climate protection alliance, the European system could be connected with emissions trading systems in other countries; monetary incentives might induce third countries to join.[8] The extension of the ETS would allow for an increasingly global control of greenhouse gases and could pave the way for a global agreement on climate change. Since the reduction of global greenhouse gas emissions is ultimately the pivotal point for climate protection, this compatibility is particularly important.

Initial observation 1
Its cost-effective achievement of the reduction target and its international compatibility distinguish the ETS as the instrument of choice for climate protection.

Initial observation 2
The uncertainty about the future structure of the ETS may create reluctance to invest in low carbon technologies.

The ETS is already an effective tool, successfully reducing the emissions within its regulation along the set abatement path. Thus, it enables the direct achievement of the European reduction target for greenhouse gases.[6] Furthermore, the evidence to date suggests that the ETS has also created incentives for innovation in the field of climate-friendly technologies.[7]

A clear commitment from European politics to the stability and permanence of the emissions trading system is a key factor for its effectiveness. In this context, the establishment of a common EU greenhouse gas-reduction target for the year 2030 has marked an important step on the way. Currently, however, there is increased uncertainty about the future shape of the emissions trading system. There is undoubtedly potential for improvement: The price of emission allowances is currently very low. Two direct triggers for this fall in prices can be identified: one is the decline in demand

5 EU 2014-1.

6 Abrell et al. 2011, Zachmann 2013. The determination of the abatement path for the years 2013 to 2020 was based on the cross-sectoral reduction target of 20 percent over the 1990 levels, upon which the European Council had agreed in 2007 (EU 2010): 2008-2012 allocation of 2.08 billion allowances, as of 2013 annual reduction by 1.74 percent (2013: allocation of 1.93 billion allowances. One allowance is equivalent to one ton of CO_2).

7 Calel/Dechezleprêtre 2014.

8 acatech 2012.

for emission allowances in the wake of the economic crisis, the other an over-allocation of allowances.[9] However, the fact that market participants do not appear to expect any effective regulation to reduce the allowance surplus in the fourth trading period from 2021 on, also has a share in the decline in prices.[10] In addition, it is doubtful whether a measure such as the introduction of a market stability reserve, designed to reduce the excess of allowances, will succeed in breaking through this dynamism.

This insecurity can discourage companies regulated under the ETS from investing in abatement measures and research and development. To ensure security of investment and to signal the political level's commitment to the system, the basic conditions for emissions trading beyond 2020 should be designed as effectively as possible.

Initial observation 3
The additional (and in the case of Germany massive) promotion of renewable energies can thwart a cost-efficient and thus ultimately effective climate protection.

In addition, it must be determined what role an additional RE promotion outside the emissions trading system can play at all. The ETS already is a technology-neutral promotion system for emission abatement, covering the major part of the sectors relevant in terms of climate policy. It stimulates both the development of renewable energies and innovations. Additional innovation policy efforts may nevertheless be useful, but require a rigorous justification and empirical evidence of their success.

With regard to climate protection, the separate promotion of renewable energies stands in stark contradiction to the functioning of the ETS: The German and European emissions are directly controlled by the ETS. In this situation, the separate promotion of renewables cannot lead to any reduction in the relevant amount of emissions[11], since subsidising the electricity sector causes a decrease in the price of ETS allowances. Consequently, supposed reductions of greenhouse gases in the German electricity sector are automatically compensated by rising emissions in other ETS-regulated sectors.[12]

Not only does this lead to the ineffectiveness of national support policies with regard to the relevant reduction target for greenhouse gases, but it also makes the achievement of the target significantly and unnecessarily more expensive. Since cost-efficiency is a major criterion for the implementation of climate protection measures in non-EU countries and thus for the global reduction of greenhouse gases, this aspect should by no means be neglected.[13]

In this context, frequent references are made to the supposed innovation-stimulating impact of support schemes[14], such as the EEG, that promote

9 On the one hand, market participants received international carbon credits for abating emissions in non-EU countries (so-called "offsets"). On the other hand, additional auctions were organised. Both issues may have contributed to the high amount of allowances in the system. The development of renewable energies could also have entailed a decline in demand.

10 Koch et al. 2014.

11 EFI 2014. In this context, only two theoretical ways are conceivable in which RE-development would lead to emission reductions. The first would be a scenario where emissions trading was completely stopped, which would result in the allowance price dropping to zero. The second possibility would occur if RE-promotion resulted in emission reductions in sectors outside the ETS. While the first case is presently not conceivable due to the agreement on the EU-wide climate target for 2030, there is no empirical evidence indicating an appreciable effect for the second case.

12 There is empirical evidence for this effect. Nevertheless, separate RE-promotion is probably not the key driver of the price decline in emissions trading (Koch et al. 2014).

13 If the burdens imposed on the public and the economy are too heavy, the risk is that acceptance of climate policies collapses and economic activity (and thus greenhouse gas emissions) is transferred abroad.

14 UBA 2014.

the development of already established technologies. To date however, no empirical evidence of any major effects has been found to confirm this assumption.[15] Should further innovation incentives turn out to be necessary in addition to the ETS, government funding of basic research and development might be a more promising solution.[16]

This does not imply that a national support of RE will, in the light of the inconsistencies listed above, inevitably thwart economic welfare. For this depends on the respective target system and the socially relevant additional goals outside the climate protection target. Avoiding local air pollution, conserving finite resources or becoming independent from imported fossil fuels could be such additional goals.[17] However, when recurring to national funding regimes for renewable energies, these benefits would require explicit justification and empirical evidence would have to prove that the existing mechanisms are indeed the most effective way of achieving these additional goals.[18] Above all, it would be paramount to weigh these potential benefits against the costs of their inconsistency with the ETS. Assuming that the working hypothesis of this paper is correct and that the primary aim of the energy transition is climate protection, an additional promotion of RE is certainly not effective, and may even turn out to be counterproductive. Incidentally, this diagnosis is likewise true with regard to other national tools, such as the promotion of measures to increase energy efficiency. Here, too, their use must be justified by a thorough evaluation of their effects on economic welfare.

15 EFI 2014.

16 Dechezleprêtre/Glachant 2014.

17 Edenhofer et al. 2013; McCollum et al. 2013.

18 As a rule, all such policy instruments must pass this test. Without empirical evidence, no reliable cause-and-effect relationship can be established between a measure and the achievement of the target it was designed for.

2.2 Germany's unilateral action is an obstacle to the integration of the European electricity markets

The cornerstone of the liberalised electricity market (comprised of the three competitively organised stages of the supply chain: production, trading and sale) are the European wholesale electricity market and the prices formed on this market.[19] These prices are a tightly synchronised reflection[20] of the respective scarcity in the European electricity system and thus serve as important indicators for business decisions of investors, operators and customers. Particularly for so comprehensive a transformation process as the development of renewable energies, the high precision of these price signals is a key factor to success.[21]

Since electricity is increasingly traded across borders ("Market Coupling")[22], there is a tendency to align the prices of European electricity markets and to assign scarce transmission capacities efficiently. Overall, the integration of the wholesale electricity markets in Europe can be described as advanced:[23] In some sectors, price differences between European markets have almost completely disappeared in the last few years. However, the growing integration between Germany and its neighbouring markets

19 Bettzüge 2013. The current market comprises the futures market, the spot market, the intraday market and the energy balancing market.

20 To balance out the power system within the very short space of time, the wholesale electricity market is supplemented by reserve markets offering the individual buyers the choice between many suppliers.

21 Thus, the many individual decisions in the electricity market – such as investment in conventional generating plants, in various renewable energy technologies and locations, in local generation systems such as micro-cogeneration units, in storage technologies or in flexibility technologies on the demand side (demand side management, DSM) – can be coordinated.

22 Germany, France, Benelux, Denmark, Norway, Sweden and Finland are already interconnected. There is also a DC-powered high voltage line (HVDC) connecting Poland with Sweden. An extension to the Baltic States and subsequently to Spain and Portugal is currently in preparation.

23 EU 2012; ACER/CEER 2012.

underwent some reversal in 2012 when a renewed increase in price differences occurred.[24] This is, amongst others, due to changes in the German power generation mix in the aftermath of the nuclear power moratorium and the significant rise in the feed-in of renewable energy.

Initial observation 4

The integration of renewable energies and the new requirements for the German and European infrastructure are key challenges for the EU's internal electricity market.

The promotion of renewable energies harbours two fundamental challenges to the integration of renewable energies into the electricity market. Firstly, the feed-in guarantees existing under the EEG-regime prevent RE-facilities from following the electricity price signal. Secondly, a decision to invest into such a plant does not factor in the market risk, occurring, for instance, if demand falls short of expectations. This means that the simultaneous feed-in of energy by renewable energy plants is not taken into account, either.

The national subsidisation of power plants based on conventional, non-renewable energy sources such as coal and nuclear power also results in distortions in the European internal electricity market.[25] While such practices persist throughout Europe, the technology-specific promotion of renewable energies in Germany and the particular design of the EEG-promotion schemes are more significant, because the disincentives they entail are contrary to the basic mechanisms of the internal electricity market.[26]

The revised EEG attempts to address the problem of the market integration of renewables with a direct marketing strategy. Nevertheless, the odds are that RE-facilities will still only partly take electricity price signals into account in the feed-in process. For the consequence of the proposed surcharge on the electricity price (premium) is that even if the price level is negative, a feed-in will still generate positive revenue. Also, German renewable energy plants retain the priority feed-in privilege. Moreover, future RE generation capacities will be put out to tender separately for each RE technology. Whether such a tendering model will actually result in better market integration is doubtful, since a specific promotion of individual technologies does not give room for full competition between technologies. Hence, yet again, an adequate consideration of the actual market risk is thwarted.

The German federal government's current reform efforts do not indicate any tendency to refocus on the European perspective. This is also evident in the field of grids: On the one hand, both the German national and the European grids are still too poorly developed to incorporate a growing amount of electricity from renewable sources. This could result in supply bottlenecks. Furthermore, with regard to the European grid, the exact distribution of the costs of grid expansion remains still to be settled between the respective EU members. On the other hand, German "green power" triggers a decline in the wholesale electricity price in other European countries, jeopardising the profitability of foreign power plants. Again, a regulation in this matter is still absent.

Should the above-mentioned trends regarding the internal electricity market become more marked, this could result in Germany's decoupling from the European electricity market: Without the necessary expansion of transmission capacities, the

24 Monopolkommission 2013.
25 IEA 2011.
26 Bettzüge et al. 2011.

German electricity price could differ considerably from the price in neighbouring countries during a significant amount of hours. This could further increase the strain on foreign grids, while threatening the viability of foreign power plants.

From a legal point of view, it is currently discussed whether and under what conditions a national promotion of RE is at all compatible with the principle of competition which European law sets as the basic principle behind the conception of the European internal market.[27] This raises the question of whether, in the medium term, the promotion of RE should be shifted to the European level in order to avoid potential litigation.

To address the challenges outlined in this paper, we already have several concepts and mechanisms at EU level at our command. The European Commission's strategic framework for the creation of a European Energy Union, for instance, enumerates possible starting points for a closer integration of energy and climate policies in Europe.[28]

This statement is based on such concepts and presents specific policy options showing how a European framework could be designed.

27 Wolfrum 2014.
28 EU 2015-1.

3. Policy options

In the context of the indispensable reorientation of the European framework for effective climate protection, this position paper seeks to examine respective policy options in view of their possible effects and their political feasibility. If the mentioned fields of action shall be consistently shaped under the overarching goal of climate protection, various policy options are open to German and European politics.

For effective climate protection, the cost-efficient expansion of the emissions trading system to both third party countries and to further greenhouse gas emitting sectors is an obvious solution. An additional promotion of RE support would be phased out in favour of a revitalisation of the ETS. RE-facilities would thus be fully integrated into the market and would follow the electricity price signal.

As long as the EU member states do not succeed in establishing a strengthened emissions trading system as the main European instrument and cannot abstain from additional, potentially ineffective national support schemes, the question will be what other strategy might promise results for an integrated European approach. In this case, and under certain conditions, a transition might be reached by harmonising RE-support schemes on a European level. Compared to an ETS-only procedure this would certainly increase the costs of achieving climate targets. However, such an approach could at least reduce the high costs of national support schemes and increase the internal market integration of RE. With regard to climate protection, this course of action is, however, no alternative to the emissions trading system since an integrated European promotion of RE simply fails to meet the requirements of an effective climate policy instrument.

In any case, the expansion of renewable energies in Germany would fall short of the German federal government's current development plans – in favour of an expansion at the most promising locations in Europe.[29]

Apart from the integration of RE, the European internal market can be strengthened by additional measures. A further alignment of electricity prices in Europe can be achieved by increasing transmission capacities and avoiding bottlenecks. In particular, an extension of the physical exchange capacities would further reduce price differences.[30] The electricity wholesale branch in Central Western Europe (the so-called CWE region comprising Germany, France, Benelux, Austria, Switzerland and Western Denmark) could realise further efficiency potentials, particularly by adapting their price zones to the actual grid structure, resulting in cross-border price zones.

29 EWI 2012-1.

30 This is based on the assumption that the number of shortage hours or the level of the resulting price difference is rather high in relation to the cost of a further grid expansion. Otherwise, a difference in price does not necessarily trigger any urgent need for action.

3.1 Political feasibility of energy and climate policies in the context of the European Union

Political feasibility is central to the implementation of the policy options in this position paper. As the EU has no or only limited powers in many fields, a top-down-procedure will not directly yield "ideal" solutions:

- Concerning the design of the ETS, the exact emissions reduction path and the necessary price level for the allowances are subject to fundamental controversies. Certain member states with a high proportion of coal-based electricity generation are wary of an ambitious ETS development.
- There are obstacles to an EU-wide development of RE at the European level. As stated in article 194 of the Lisbon Treaty, member states determine their energy mix independently.[31]
- In the field of grids, national policy makers remain the decisive authority. The national governments continue to shape grid development using transmission system operators (as owners) or national grid regulations. Conflicting interests are usually resolved bilaterally or multilaterally, not however, at the EU level.

All in all, the member states' national competences in the fields of climate protection and the internal market are not compatible with the principle of subsidiarity. For both climate protection mechanisms and measures aimed at deepening the internal market could be more effective if organised at European level. This makes a European contribution to climate protection and resolving contradictions between national energy policies and the internal European market more difficult.

Since a transfer of competences to the EU level will not be that easily realised, policy options cannot be "ideal" solutions, but must contain transition schemes or pragmatic compromises. Some reform steps require a reallocation of powers – at European as well as at national level. Should an implementation in the entire EU-area turn out to be politically unrealistic in the medium term, it can be done at the regional level (in the case of Germany in Central Western Europe (CWE region)) as an intermediate step on the way to a pan-European solution.

The question of how the financial burdens of these measures are distributed between the member states is crucial for the development of the emissions trading system and the harmonisation of RE-promotion schemes and grid development. Transfer- and cooperation mechanisms can offer appropriate solutions. Such mechanisms can induce member states to accept measures contrary to their individual national energy policy interests, but reasonable in terms of the internal market and climate protection.

The German federal government can directly contribute to the successful establishment of a European regulatory framework by adopting a more cooperative attitude in the fields of grid development, grid regulation and RE promotion. It can also actively promote a consistent development of emissions trading in the European Council. To ensure the long-term stability of all measures taken, the frameworks of European and German law must be observed.

31 The Treaty on the Functioning of the European Union explicitly guarantees *"the right of a Member State to determine the conditions for the exploitation of its energy resources, its choice between different energy sources and the general structure of its energy supply"*.

3.2 Rearranging the European tools

3.2.1. Development of the emissions trading system

In order for the ETS to become a success for climate protection, several requirements need to be fulfilled. Firstly, the emissions cap laid down in the ETS needs to be steadily reduced. Here, the member states have already established a clear pathway by agreeing upon an EU-wide emissions reduction target for 2030.[32] Secondly, the ETS needs to be extended to further sectors, in order to include all relevant sectors emitting greenhouse gases. Thirdly, the ETS needs to be globally coordinated with other countries to induce them to join the emission reduction initiative – preferably by establishing national emissions trading systems compatible with the ETS or by joining the ETS altogether.

An immediate reform should, however, attempt to stabilise the market participants' expectations and convey that investing in abatement measures and research and development will eventually pay off.

Frequent and not very promising interventions in the ETS during ongoing trading periods, on the other hand, increase the market participants' insecurity and contribute significantly to price volatility. Nevertheless, the so-called "back loading" was introduced for the current trading period. This mechanism postpones the auctioning of allowances worth 900 million tons of CO_2 equivalents from the original auctioning period 2014-2016 to 2019 and 2020.[33] This is little more than a political placebo, which, although signalling the political willingness for reforms, will have no material impact on the market participants' investment decisions and will, at best, result in a moderate and short-lived rise in the allowance price.[34]

Recently, however, more fundamental reforms of the ETS were likewise discussed.[35] The proposals differ greatly in their assessment of the problematic potential inherent in the current low price; this issue is closely linked to the fundamental question of the specific aim pursued with the ETS (is it mere compliance with the emission limit or should it be flanked by the creation of innovation incentives?). In order to counter a "lock-in" of major investments in abatement technologies and research and development, the credibility of the system must be restored and the price stabilised.

The introduction of a price corridor, consisting of a minimum and a maximum auction price, would give market participants a certain security as to the future price development and thus stabilise their expectations.[36] In this sense, the ETS could emanate a strong innovation incentive. The currently aspired implementation of a market stability reserve would, on the other hand, not enable the precise achievement of a certain price level, thus leading to a similar result as the "back loading" mechanism.[37] Instead, it must be assumed that the market has long since anticipated the intended temporary withdrawal of allowances and has adjusted the price accordingly.[38] As yet, the targeted higher price level has obviously not been reached.

In combination with an increasing proportion of auctioned allowances, a price corridor would result in increased revenues from the ETS, which could, in

32 Given the long investment cycles in various industrial sectors, targets beyond 2030 could likewise make sense.

33 EU 2014-2.

34 UBA 2012.

35 Grosjean et al. 2014.

36 Euro-CASE 2014.

37 The basic idea of the stability reserve is as follows: Once the allowance-surplus exceeds a critical limit (833 million allowances), a certain percentage (12 percent) of the surplus is taken off the market and fed into in a "reserve", withdrawing it from the pool available for future auctions. Should the surplus, however, drop below a critical limit (400 million allowances), or the allowance price surpass a critical value (the triple of the average price of the last two years), a 100 million allowances will automatically be auctioned into the market from the reserve.

38 Euro-CASE 2014.

turn, be used for further climate protection measures. It would also counteract an undermining of the ETS by national instruments, since a price drop below the fixed level would be impossible.

Ideally, the development of renewable energies would, at the same time, be gradually cut down. RE would then have to assert their superiority within the framework of the ETS solely on the grounds of their potential for cost-effective reduction of greenhouse gas emissions. However, different path dependencies, particular preferences in national support schemes and long-term energy policy strategies make such a solution appear unlikely in the foreseeable future. A realistic aim might therefore be to attenuate the undermining effect of the current RE-support schemes on the ETS to keep efficiency losses at a minimum. The member states would have to adapt their development objectives in order to avoid too rapid an expansion, or consider giving them up altogether in favour of the ETS. With the phasing-out of national support schemes, renewable energies would increasingly be promoted via the ETS and thus integrated into the market. The funds no longer tied up in RE-development schemes could be used instead to expand research funding, provided there are plans to create further incentives for innovation in addition to the price signal furnished by the ETS.[39] A similar approach appears suitable for other instruments, such as the promotion of energy efficiency measures, should they prove inefficient with regard to climate protection or not complementary to the ETS.

In the medium term, these measures would stabilise the allowance price and thus the market participants' expectations. Long-term investments in emission prevention that were previously too insecure to undertake, would then take place. The ETS could thus become a reliable source of income for the member states. This, in turn, could be the key to extending the ETS to other sectors (transport, private households, agriculture). The ETS could then replace existing national regulations, the abolition of which was previously not an option as the national governments relied on the revenues they generated.

The inclusion of other sectors would, however, increase the complexity of the ETS significantly, since a large number of companies and households would have to be registered. For the extension of emissions trading, the ETS would have to start at the uppermost level of trade, i.e. with the producers and importers of fuels containing greenhouse gases.[40] Accordingly, suppliers of fossil fuels would be holding emission allowances, whereas the plant operators responsible for the actual emissions would not. The obligation to hold so-called "fuel allowances" would then apply to refineries, oil importers, coal production and the trade with coal and natural gas across Europe. As a transitory step towards such a reformed ETS, the current system could be maintained for the integrated sectors while the emissions of previously excluded sectors are included on the first level of trade. In a second step, the other trade sectors would be integrated into the new system.

With regard to the extension of emissions trading, supporters of a "mix of instruments" point out that regulating these sectors in the ETS could diminish innovation incentives. The national regulations that would have to be phased out in favour of such a regulation are, from their point of view, much more dynamic in terms of their incentivising effect.[41] However, this point of view neglects the fact that the in-

39 Important research fields are, for example, energy storage, alternative energy generation, carbon capture and storage (CCS) and carbon capture and use (CCU).

40 SRU 2008. The inclusion of further greenhouse gases in the emissions trading system could also be considered in this context.

41 UBA 2014.

novation impact of these instruments is by no means accounted for and that empirical proof is required. Also, an emissions trading system fortified by a price corridor in combination with the set commitment to an emissions reduction path for 2030 can be expected to further increase the innovation effects of the ETS.[42]

An extension of emissions trading would not only unlock innovation potential in the newly added sectors, but would also result in the creation of a larger market for emissions reductions. In addition, considerable efficiency gains could be achieved due to the different abatement costs between the sectors. The economic costs of emission abatement would be lower, as emissions would be reduced in those sectors and regions where a reduction is economically most advantageous. Thus, the system would develop a much greater control effect on the overall amount of European emissions.

With respect to global climate protection, the ETS can be harmonised with other emissions trading systems. It can thus contribute significantly to globally triggering investment in abatement technologies. To this end, due negotiations with third party countries and regions with own emissions trading schemes would have to be promoted. Likewise, third party countries could be offered transfer payments as an inducement to join the EU-ETS.

Requirements and trade-offs

To what extent this policy option can contribute to climate protection largely depends on the political willingness of Germany and the other EU member states to actually focus their climate policy efforts on emissions trading and to enter into a permanent commitment. If some member states fear too heavy burdens for their domestic industries, while states with ambitious goals continue to pursue their national strategies, an expansion of emissions trading could indeed fail.

3.2.2 Market-oriented development of RE in the EU

If the EU member states fail to agree upon promoting the development of emissions trading as the main climate policy instrument, the odds are that individual member states will increasingly resort to different RE-promotion mechanisms. This strategy would probably be flanked by the introduction of new national carbon- or eco-taxes. Such taxes – already implemented in the UK and France – would, in turn, threaten to undermine the effectiveness of emissions trading.[43]

The insecurity as to the future design of the ETS would also discourage investment in abatement technologies. At the same time, the current low allowance price might encourage individual member states to boost investment in fossil fuels. Despite that, the effects of emissions trading would forestall the Europe-wide increase in emissions this might otherwise entail.[44] Once these investments have been made, however, the existing EU climate protection targets could, in the worst case, be adjusted downwards. This could occur if, for instance, member states attempt to protect their newly built coal plants from the financial pressure of the emissions trading system.

Such a scenario gives rise to the general question of how a relapse into ineffective, purely national climate protection schemes could be prevented in favour of a European strategy. Under certain conditions, a transition might be reached

42 Calel/Dechezleprêtre 2014.

43 The degree of this undermining effect would ultimately depend on the extent to which these instruments aim at sectors already regulated by the ETS. Cf. likewise Böhringer et al. 2007.

44 Instead, the allowance price would continue to rise until the additional emissions from e.g. coal-fired power plants would be compensated by reductions by other market participants.

by harmonising RE-support schemes on a European level, until the EU member states see their way to strengthening emissions trading and phasing out measures ineffective with regard to climate protection. If this is not seriously pursued, we will ultimately be thrown back to scratch, facing the initial situation where the development of RE is promoted without any positive effects on the amount of greenhouse gas emissions.

From a German perspective we must bear in mind that the previous development targets for renewable energies would very probably continue to be pursued by an EEG. This would tend to result in a further price decline on the wholesale electricity market, with the effect that both renewable and fossil power plants, especially the gas power plants, would become (or remain) unprofitable. Those benefitting from the current mechanism would be further prompted to campaign at the political decision-making level for an even greater promotion of renewable energies and for the subsidisation of fossil power plants (as supposedly necessary capacity reserve). This would ultimately lead to a further significant increase in government funding.

A European promotion of renewable energies would have several advantages over national support schemes: the costs of variability would be reduced and the price pressure on the European wholesale market would be mitigated, as would the incentive to subsidise fossil power plants. If, on top of this, investors are confirmed in their long-term expectations of a future expansion of emissions trading, this course of action could attenuate the difficulties of a purely national energy transition.

The redesigning of RE-development as a European instrument would require a graduated plan, including EU-wide pilot projects and the incremental convergence of support schemes.

Since the member states' preferences in terms of their energy mix vary considerably, a first step could be for those states willing to cooperate to merge their RE promotion systems. In principle, this option is already enshrined in the Renewable Energy Directive.[45] The national renewable energy targets set out in the allocation plans (NREAP) can either be achieved domestically or by statistical transfers, joint projects or even joint support schemes.

The conditions for a complete harmonisation of RE development and the market integration of renewables in a joint promotion tool such as a quota system[46] must be created in several steps. The specific obstacles to grid access and the administrative barriers vary widely between the member states.[47] These differences grossly distort the actual technical potential. The establishment of a harmonised European quota system could, in this situation, even lead to paradoxical effects. For instance, the exploitation of solar energy in Spain might ultimately fall short of its potential, since, from the investors' point of view, it is even more expensive than in Germany.

An enhanced development of the EU's transmission- and distribution grid (cf. chapter 3.3.3) would significantly reduce these barriers across Europe. Alternatively, states with a comparable administrative cost structure could aim at a common RE-promotion scheme. Coun-

45 EU 2009.

46 A quota system would be a simple means to take different national preferences for the expansion of renewable energy into account. Member states could have different quotas, the weighted average accounting for the European quota. This is a significant advantage over other promotion mechanisms that require a consensus on far more parameters (level of the premiums, locations, technology).

47 Ecorys 2010; EWEA 2010; PV Legal 2012. Grid access barriers for wind power, for instance, can account for up to eight percent of the total project costs in Greece (compared to Denmark: one percent). As regards photovoltaics, the administrative costs for small rooftop units make up 36 percent of the total project costs e.g. in Spain, compared to only eleven percent in Germany.

tries with high administrative barriers but great potential in the field of renewables would then have an incentive to adjust their own structures. In both cases, a small step further would then suffice to achieve a top-down harmonisation.[48] This, however, calls for investors to be included in grid development projects in order to ensure that the total system costs (production and distribution) are sufficiently taken into account.

A European RE-development scheme would have to be designed in such a way that neutrality regarding location and technology type is ensured. Also, the benefits of RE-expansion would have to be weighed against the costs of grid expansion by including RE-investors in the cost allocation. Thus, RE-expansion could be designed cost-efficiently, using the technologies and locations most suitable in each respective case. The decision of the European Council to replace the previous system of country-specific compulsory RE-targets with a single "soft" EU-wide target could provide an appropriate framework. Particularly an explicitly all-EU RE-target could thus incentivise a closer European cooperation in the field of energy policy. It might even serve as a common platform to coordinate the development of renewable energies.

A shift from direct expansion funding towards a more research-centered approach could provide important incentives for climate-friendly technologies. Empirical evidence suggests that public funding of research and development may largely exceed the effects of pure promotion funding.[49] However, the current allocation schemes in Germany and Europe, tending to distribute funds in favour of a large-scale development of established technologies, are inconsistent with this result.[50] A substantial redistribution of funds in favour of research in and development of new technologies would unlock significant innovation potential, particularly in combination with a reliable price path for emissions trading.

The promotion of European pilot projects could, for instance, be included as a further component into the graduated plan. This could, in particular, effectively reduce costs and support a European perspective in the case of technologies with very high administrative barriers.[51] Such a promotion scheme might be an option for e.g. large-scale solar thermal systems. The NER300 programme as the main EU-funding programme for greenhouse gas emission prevention technologies already provides an appropriate regulatory framework at European level that could be further extended.

Requirements and trade-offs

If the policy option "Market-oriented EU-renewable funding" is to successfully implement the transition into a fully developed ETS, the cost of renewable energy must decrease considerably relative to the cost of fossil fuels. This can be achieved either by a significant fall the in costs of renewables (in combination with e.g. (currently not conceivable) breakthroughs in storage technology or an enhanced grid expansion) or else by an increase in the prices of fossil fuels. Currently, there is no indication that either is about to occur, especially not the latter option. However, in a few years' time the situation on the world market may have changed.

If neither of these conditions is met, the policy option could, in the worst case, result in a scenario where the increase in

48 Kitzing et al. 2012.

49 Dechezleprêtre/Glachant 2014.

50 Whereas the funding for energy research has steadily decreased since the 1980s, the funds provided under the EEG are substantially higher.

51 The administrative costs for offshore wind, for instance, are estimated at almost 14 percent, compared to a Europe-wide rate of less than four percent for onshore wind (EWEA 2010).

the share of renewables in Europe is accompanied by a simultaneous increase in the use of coal. It might come to a regional splitting-up, with, for instance, North Western Europe ensuring an increasing share of renewables and the Eastern European States capitalising the construction of new coal-fired power plants. As an ultimate result, a subsequent expansion of the ETS would then be too late. For the countries capitalising coal would certainly not commit to a strengthening of emissions trading, and might even question already adopted EU climate targets, once their new coal-fired power plants are in operation.

This path would lead to a dead end. An integrated European promotion of RE fails to meet the requirements of an effective climate policy instrument, which must be able to control the amount of greenhouse gases in all relevant sectors, be compatible for an implementation in third party countries and, in the long run, enable the abatement of emissions on a global scale.[52]

As regards economic viability, a European RE-development scheme that ensures neutrality regarding location and technology type would indeed achieve the same extent of development to a significantly lower price than with national funding. It could not, however, guarantee that the expansion continues to be implemented mainly in Germany. Compared with a direct development of the ETS without separate RE-promotion, the economic costs this option entails are still high, without the development of RE being able to directly contribute to achieving the climate protection goal.

52 Emissions trading systems basically meet these criteria. Only if emissions trading were stopped, would RE-development lead to an emissions reduction – and this probably at the expense of the emissions balance of sectors no longer regulated by the ETS. If the ETS really was stopped, an expansion of the RE-promotion system to all relevant greenhouse gas emitting sectors would be neither politically feasible in Europe nor at all acceptable with regard to the ensuing socio-economic costs.

3.3 Strengthening the internal electricity market with accompanying measures

The transformation of the energy system in Germany and Europe also implies new challenges for the European electricity market. The market integration of renewable energies is a basic prerequisite for its consolidation. As shown above, this goal could be achieved through the expansion of emissions trading as well as by an integrated European RE-promotion scheme.

In addition to the economic challenge – market integration – the further development of the internal electricity market also includes the technical side of system integration. In other words: How to design a sustainable pan-European system that can ensure supply security? The transformation of the electricity sector towards an increasing share of renewable energy entails the fragmentation of energy production (growing number of local producers) and the higher volatility of electricity feed-in. This implies new challenges for German and European energy infrastructure: If, in order to strengthen the internal market, deeper market integration and more competition are aspired, thus allowing for the realisation of efficiency potentials, this infrastructure would not only have to be adapted, but altogether expanded.

A pivotal point is that the expansion of renewables leads to a geographical redistribution of power generation in the individual countries. In Germany, for instance, new wind power generating capacities are being established in the northern and eastern parts of the country. The main share of the generated power is, however, consumed in western and southern Germany. Hitherto, the provision of those regions was secured locally by conventional power plants; but their share in electricity generation is to be gradually reduced in favour of renewable energies. In order to keep up the direct connection between electricity production and consumption, the transmission grids designed for transporting electricity over long distances need to be significantly expanded. The distribution grids responsible for transmitting electricity to the consumer and taking in decentralised power supplies likewise require expansion – in this case, however, due to the increase of solar power plants.

If grid development fails to keep up with the pace of RE-expansion, regional shortages may ensue. This risk is particularly high in southern Germany, where large nuclear power plants will be closed down in the process of the nuclear phase-out.[53] A shortage will occur when the demand for electricity transmission exceeds the available grid capacity.

The extent, pace and regional distribution of future promotion schemes for power generation from renewable sources in Europe is therefore paramount for the development and planning of the transmission and distribution grids in Europe. If the climate policy options described in this paper are implemented and the development of renewable energies is effected via emissions trading or a harmonised European funding, this will inevitably result in a specialisation: RE-capacities would tend to be established across Europe (only) at locations with the most favourable conditions. This would imply a slowing-down of the RE-development pace Germany has previously been keeping up. On the one hand, this offers the perspective of a mitigated need for grid development and a reduced likelihood of regional supply bottlenecks in Germany. On the other hand, the transmission capacities between the member states would certainly require substantial extension. The pace and scope required for this cross-border grid expansion would, however, be altogether smaller with RE-promotion implemented within an emissions trading system than via a European RE-development scheme.[54]

The expansion and restructuring of the power system must be carried out as efficiently as possible in order to keep both cost and scope of the overall project at bay. This is particularly important with view to the general public's willingness to pay for the transformation of the system and to accept the local implementation of large-scale projects. On the other hand, efficiency may reduce the probability of supply bottlenecks by diminishing the need for grid expansion.

To consistently design the system architecture, its essential elements, i.e. generation sites (both for renewable energy and conventional power plants) and grids must be arranged as optimally as possible: Accordingly, decisions to invest in generating capacities should take the final costs for the overall system into account. This includes not only the suitability of the respective generation site, but also possible additional costs for grid expansion coming with the choice of a particular site. If these overall costs are not considered, the grid expansion will ultimately be significantly more expensive than necessary. To enable an appropriate consideration of the resulting grid costs in the calculations for investment in generating capacities, the regulatory framework needs to be adjusted. A European design is more promising in terms of efficiency than national adaptations, as more countries and market participants would be involved in the development of a consistent system structure.

In addition, the extent of the future grid expansion in Europe remains to be determined. A massive development of the European and German grid would

53 Stiftung Marktwirtschaft 2014.

54 In an emissions trading system, the comparatively cheap technologies for emission abatement will be applied first. Accordingly, the expansion of renewables would proceed more slowly than if renewable energies were granted an additional funding.

allow for more market transactions in the so-called European Energy-only market, where electricity generation capacities are traded at short intervals. In such a closely integrated internal electricity market, greater competition would be possible between producers across Europe, because electricity could be transmitted over long distances.

At the same time, such an approach would entail high costs for grid expansion. A possible alternative could aim at keeping the extent of grid expansion and its costs low. In this case, however, possible efficiency gains, which a more closely integrated market can offer, could not be realised. In both cases, the management of the grids would have to be further split up and redistributed locally, the performance of both transmission and distribution grids would have to be enhanced and would require additional "intelligent" equipment.[55]

Until the following mechanisms[56] for the conversion of the power system are fully implemented, regional supply bottlenecks may still occur. In such cases, there is no alternative but to stabilise the system by short-term interventions by the grid operators.

55 The integration of a multitude of small-scale RE-units requires much coordination. Transmission grids need more access to distribution grids and require the latters' support in questions of e.g. frequency and voltage stability and intelligent shortage avoidance. This calls not least for a standardisation of ICT-interfaces and processes.

56 Unless technological breakthroughs lead to significant cost reductions, storage devices will play a minor role in grid expansion. Even compared to the cutting-down of electricity they do not, for the time being, constitute an economically viable alternative. In comparison to the costs of cutting down five percent of every 2000 full load hours of onshore wind (about 3 to 5 €/MWh), new investment in whatever existing storage technology is significantly more expensive.

The question of capacity mechanisms

A question to be considered well apart from the aspect of regional supply security is whether sufficient reserve capacity is available to compensate fluctuations in electricity generation. The question arises because the development of renewables significantly increases the volatility of the entire electricity feed-in. When the wind blows and the sun shines, the share of RE feed-in is very high. Otherwise, flexible power plants will be required to increase their electricity generation to meet the demand.

Currently, there is a heated debate on whether, in view of these developments, it will be necessary in the short or medium term, to establish a mechanism to ensure sufficient electricity generating capacity (a so-called capacity mechanism).[57] Here, one central question is what price peaks an electricity wholesale market operating at the limit of its capacity is able to shoulder; it also remains to be seen how reliable the investment signals suggested by such price peaks really are.[58] If price peaks occur frequently, it would point to relatively scarce power supply in relation to demand at that point in time. Accordingly, high prices would create incentives for market participants to invest in the creation of new generating capacities. However, the wholesale market of continental Europe has not yet experienced any critical accumulation of such price peaks, not even in times of low feed-in rates from renewable energy plants. For this reason, it can be assumed that the system is currently experiencing overcapacity.

It must also be considered that the demand side can likewise contribute to overcoming temporary shortages. In the last few years, significant investments have been made to develop demand flexibility (demand side management, DSM).[59] Accordingly, the quantitative estimations as to the future development of consumption and capacity in Germany indicate no need of action for the coming decade.[60] Whether eventually the establishment of a capacity mechanism may be advisable in order to guarantee the safe and smooth creation of new generating capacities (this will be of increasing importance from about 2020 onwards) can currently not be reliably assessed.[61]

In addition, capacities for transmission between Germany and its European neighbours (so-called interconnection capacities) enable the cross-border coverage of regional consumption peaks. Such capacities are partly already available or else to be created in the medium run. Thus, a European integration further reduces the need for action. Introducing a capacity mechanism at German or European level would be premature.[62]

The premature introduction of a capacity mechanism for the entire wholesale electricity market would be tantamount to an unnecessary subsidisation of power plants which, left to themselves, would be unable to generate sufficient profit margins. Such a scheme would not only entail substantial costs, but would also create legal claims on the part of the power plant operator for a long period of time. Once introduced, a capacity mechanism would not be easy to abolish.

57 BMWi 2013; EWI 2012-2. The following section largely corresponds to the presentation in Bettzüge 2013.

58 EWI 2012-2; Cramton et al. 2013; Cramton/Ockenfels 2012; Joskow/Wolfram 2012.

59 The International Energy Agency launched an international technology programme on DSM as early as 1993 (IEA Demand-Side Management Programmes).

60 EWI 2012-2.

61 Important factors for the evaluation are the development of demand-side flexibility on the one hand and the feed-in profiles of renewable energies on the other.

62 Monopolkommission 2013; EWI 2012-2.

What reasonable and efficient ways are there to prevent regional supply bottlenecks threatening the desired transformation of the electricity system in Germany and Europe? The following chapters outline a number of policy options.

3.3.1 Optimising the site selection in the European context

Several measures must be taken to enable an appropriate consideration of the relevant costs to the power system when selecting sites for electricity generation capacity.[63]

The Europe-wide harmonised implementation of those measures (in closely integrated electricity markets) will only succeed if there is a clear political will in the respective countries. For this reason, a step-by-step approach could ensure supply security at the national level until more efficient measures at the European level are completely implemented. Interventions from grid operators within the context of so-called re-dispatch mechanisms (§ 13.2 Energy Act in conjunction with § 11 EEG or under § 13.2 of the Energy Act) can serve as appropriate ad-hoc measures[64]. Bottlenecks occur at junctions between different parts of the grid, where there inevitably is a limited voltage capacity and where therefore only a certain amount of energy can pass through. Frequently, however, the power feed-in "before" the junction surpasses this voltage capacity whereas the demand "behind" the junction, where the energy is redistributed, can, at times, exceed the junction limit. The re-dispatch mechanism ensures that power plants before the bottleneck are temporarily shut down to avoid overvoltage at the critical junction and that, if necessary, power plants behind the junction are ramped up in order to fill the gap and supply sufficient power for the region in need. This mechanism would have to be extended to include capacity securing measures like, for instance, transferring the fixed costs of power plants to the respective grid operator.

The introduction of cross-border re-dispatch mechanisms, flanked by the coordination of the national regulations in closely integrated electricity markets, can enhance the effectiveness of the mechanism even further and establish the structural basis for an EU-wide cooperation. An according cooperation between Germany and France, Austria and Switzerland would be an important first step. It would not least provide a suitable platform, should, in the long run, a European capacity mechanism indeed prove necessary.

A second step could be to optimise the selection of sites for electricity generating capacity. Basically, the electricity price signals would have to be adjusted. Germany, for example, currently has a single national price area. The problem is that national electricity prices do not reflect power shortages or bottlenecks in specific regions. So-called "market splitting" could be applied here, dividing the electricity market into regional price areas. Supply shortages, for instance in southern Germany, would be reflected in higher prices. This would set an incentive to establish generating capacities in regions with higher supply insecurity. As a consequence, supply security would increase significantly whereas the necessity for grid expansion would diminish (as would the financial requirements involved). In the medium term, this could result in the cross-border grid structure increasingly superseding national borders as reference for price zone boundaries.

63 Bettzüge 2013.

64 Such an ad-hoc measure was, for instance, enforced in southern Germany in April 2013: The power plant units Irsching 4 and 5, although generating losses for the operators, were left in operation after the grid operator TenneT (in coordination with the Federal Network Agency) had committed to partially bearing the fixed costs of the power plant (TenneT 2013). This procedure was subsequently codified in the Federal Government's temporary reserve power plant decree, expiring on 31.12.2017 (ResKV 2013).

The Scandinavian power market "Nord Pool Spot" is a good example of such a market splitting in regional price zones.[65] The implementation should begin in the closely integrated regions of Europe; in the long term, a market splitting in the European electricity wholesale market would follow.[66] For this purpose, a coordination process would have to be launched between Germany, Nord Pool and the other direct neighbouring states. As an intermediate step, Germany could be split up into two price zones – within the German borders.

Another important measure is the further development of grid tariffs, paid by electricity producers for the transmission of electricity. Currently, the tariff levels are determined regardless of the distance over which the electricity is transmitted. The introduction of an additional distance-based charge, the so-called "G-Komponente" (G standing for "generation"), could include electricity producers into grid-expansion schemes.[67] The level of the charge could be differentiated by region, so that producers would pay lower tariffs in regions with higher demand than in areas with less demand. Currently, EEG-regulations oblige the grid operators to connect all renewable energy plants to the grid, regardless of their geographical location. This obligation must be abolished in order to discourage the construction of power plants ensuing particularly high grid expansion costs, such as is frequently the case with offshore installations. Such measures would encourage further investment in power plants in regions with an unstable energy supply, thereby reducing the extent and cost of grid development.[68]

Such medium-term measures as well as various ad-hoc steps would not only significantly attenuate bottlenecks and substantially increase the efficiency of the overall system, but would likewise further reduce the necessity to introduce a capacity mechanism.

3.3.2. Optimising the site selection at the national level

A purely national policy scheme to foster the choice of the best locations for generating capacities must basically follow a similar pattern to a respective European solution. Here, too, an incremental approach could be envisaged, starting with ad-hoc measures before gradually defining regionally differentiated price zones and grid tariffs. Such measures would, however, be introduced without any coordination with the European partners. While this should perceptibly increase their political feasibility, it would also diminish possible efficiency gains, as the electricity systems of neighbouring European countries would not be included.

If the measures have to be implemented without including foreign generation capacities, Germany will have to increase its number of new power plants. This means a rise in the costs of a national approach with reference to a European solution. The odds are that this national scenario also heightens the need for enhanced grid expansion in Germany in order to ensure system stability. Otherwise, the lack of coordination with the European neighbours could result in more frequent interferences of neighbouring grid operators and in the cutting-down of German electricity. This, in turn, would exacerbate the bottleneck-issue.

65 In the catchment area of the energy exchange of the Nordic and Baltic countries, Nord Pool Spot, Norway is currently split into five price zones, Sweden into four and Denmark into two. The remaining countries represent one price zone each.

66 The transition to such cross-border price zones may result in transaction and transition costs that have to be balanced against the potential benefits.

67 To this purpose, the transmission system operators would identify grid bottlenecks, calculate the long-term marginal utilities and costs of the grid load and define price zones charging a negative/positive grid tariff.

68 As yet, however, studies assessing the marginal utilities and costs and quantifying the extent of savings are pending.

3.3.3. Massive grid expansion

In addition to the inevitable grid development in Germany, an expansion at the European level is likewise necessary. Such an expansion of the transmission and distribution grids across Europe could aim at diminishing all obstacles to large-scale transportation of electric energy (the so-called "copperplate" refers to perfect transmission of electricity through Europe), in order to enable as many market transactions as possible in a uniform, Europe-wide "energy-only"-market.

In such a scenario, states would surrender much more autonomy and autarky in terms of energy supply than they do today.

Currently, legal regulations at national level make grid expansion mandatory whenever a grid bottleneck has led to the cutting-down of RE-generation. A similar mechanism might be established to reduce bottlenecks in the transmission grids at European level. In the medium- and long-term, the construction of a high-voltage direct current super grid (HVDC) is imperative: A more competitive internal electricity market will be able to generate efficiency benefits and bolster the expansion of renewables across Europe.

According to the European association of transmission grid operators, investments to the amount of 150 billion euros will be necessary in the European transmission grids over the next ten years.[69] Most of the bottlenecks the continued development of fluctuating renewable energy feed-in would otherwise entail could thus be dissolved. According to estimates, the German transmission system operators would have to bear the bulk of the investment costs, amounting to about 44 billion euros.[70]

Such a grid expansion would, in particular, allow for the transmission of large amounts of electricity from the south of Europe to the north and vice versa. Abiding by the premise that power plants are to be built across Europe at sites with the best possible generating conditions, the Europe-wide grid development would have to be taken even further. A growing share of Germany's power demand would then be covered via importation.

Due to the distance of up to several thousand kilometers between different generation sites, the distribution of wind and solar power plants across Europe could partially enable the compensation of RE-typical fluctuations and contribute to consolidating the energy supply. Moreover, a thus enhanced grid would allow for the inclusion of a greater number of power plants in case of imminent instabilities or shortages. In the medium term, new planning methods and analysis mechanisms will make it possible to plan the re-dispatch and the cutting-down of RE-plants more in advance and over larger areas than today.

A complete implementation of this policy option requires a further integration of the European energy supply system as well as a political willingness in the member states to give up national autarky and other location-specific elements of their national policies. In order to reduce the high costs of this approach, it would, in particular, need to be coupled with a Europe-wide regional splitting up in price zones and grid tariffs. A consequent transitory step towards achieving this target would be a gradual implementation through coordinated grid expansion and the creation of such a regulatory framework for those regions already boasting a high level of integration (in the case of Germany the CWE region).

3.3.4 Cost-oriented grid expansion

A cost-oriented approach would chiefly aim at keeping down the costs of expand-

69 ENTSO-E 2014.

70 According to the Grid Development Plan (GDP), which takes further expansion plans into account, the development of renewables offshore and onshore will require 22 billion each over the next few years for (Grid Development Plan 2014).

ing both the transmission and the distribution grids. In such an approach, grid development could therefore not be used to offset fluctuations in generation and consumption across Europe.

To avoid regional bottlenecks in a system increasingly characterised by the volatile generation of RE, the procedure would have to be adjusted. Plants generating excess energy would have to be cut down. As far as possible, energy demand, too, should be made more flexible (*demand side management*) by creating incentives for consumers to increase their electricity consumption at certain times.[71] To a small extent, energy surpluses could be stored in according storage devices.

In the event of generation bottlenecks, the reserve capacity of adjustable power plants would be the primary source of compensation, followed by pump storages and water reservoirs as well as demand flexibilisation.[72]

A cost-oriented approach would also depart considerably from the current model, where all market transactions are permitted and all renewable energy facilities feed in the maximum possible energy load at all times. In a cost-oriented grid expansion scenario, the cutting-down of RE-plants would accordingly be decoupled from the obligation to expand the respective grid.

For a further cost reduction, system services could be tendered at the distribution level. Only if the market participants do not succeed in resolving a bottleneck of their own accord would the grid operator cut down or switch off the respective power plants (so-called "traffic light principle").[73] Extending this approach across Europe would result in lower overall development costs.[74]

A scenario of cost-oriented grid expansion would tend to result in less stable grids, since adjacent and subordinate grids would not be fully able to stand in should the grid stability be in jeopardy. However, the measures outlined above could lead to significant cost savings. Greater market interventions would be necessary to keep grids stable than in the massive grid expansion-scenario. Here, too, a Europe-wide splitting in price zones and grid tariffs could increase the incentives for a decentralised local power generation and reduce grid bottlenecks. Inevitably, RE-plants would be cut down more frequently.

Conflicting goals in the reduction of bottlenecks and grid development

Measures with the double target of stabilising the system and strengthening the internal market invariably lead to trade-offs. A high level of supply security inevitably implies a certain level of costs either for grid expansion or for the construction of new power plants. Mechanisms optimising the choice of location can contribute to ensuring supply security while keeping the costs at bay; in the medium term, the same is true for grid expansion. The closer the implementation is coordinated with neighbouring countries, the lower the costs.[75]

Altogether, the policy options enable a reduction of bottlenecks without requiring the introduction of a capacity mechanism. Precondition for a closer integration of the internal market is the

71 A good example for such measures are contracts allowing consumers to achieve efficiency benefits, for instance by shifting their electricity demand or increasing/reducing it at certain hours. Again, the precise extent of such savings has not been quantified.

72 However, the potential of demand side management is largely limited to the daytime.

73 CEN et al. 2012; a first technical step would have to be the establishment of a "power information grid" on the distribution-grid level (Appelrath et al. 2012).

74 Again, the precise extent of such savings has not been quantified.

75 In German border areas, for example, fewer inefficient power plants would have to be used, provided there are sufficient capacities abroad.

national governments' willingness to relinquish the pursuit of greatest possible autarky and autonomy. Last but not least, grid planning and expansion cannot succeed without public acceptance. According analyses must be taken into account.

3.4 Facilitating political feasibility: cooperation and burden sharing

Basis for the efficient implementation of European energy and climate policy is a closer cooperation between the member states. Such cooperation is an important prerequisite for the policy options presented in this position paper: A clearly defined and socially acceptable distribution of the financial burdens between the EU member states would increase the national governments' willingness to cooperate both with view to the design of emissions trading as to a European grid development. This, in turn, would facilitate the implementation of the necessary measures.[76] Cooperation mechanisms are likewise helpful with regard to the gradual establishment of an integrated European RE-promotion scheme.

There already are appropriate instruments at the European level that need to be more broadly applied. Some of these include transfers mechanisms, designed to compensate the different national circumstances and levels of development between the member states. This perspective has been laid down in the climate and energy package of 2007 ("20-20-20 targets") and is based on the principle of solidarity as the foundation of the European Union.[77]

Both the ETS and the Renewable Energy Directive provide for cooperation and transfers mechanisms. Since the start of phase III of the ETS in 2013, at least 40 percent of the emission allowances are auctioned. 88 percent of the revenues go back to the member states. However, ten percent of the auction proceeds are distributed directly amongst the poorest EU member states. Further two percent are allocated to states boasting a particularly high emissions reduction rate since 2005. In effect, this comes down to a financial transfer in favour of the Eastern European member states. A better developed load balancing mechanism with a more extensive redistribution of the ETS-revenues might prove effective to foster an agreement between the EU member states on the development of emissions trading.[78]

Financial transfers are likewise provided for in the Renewable Energy Directive.[79] As a first step, the directive obliges the member states to comply with their national allocation plans (NREAP). This obligation can be fulfilled domestically or else by resorting to one of the three existing cooperation mechanisms. These are statistical transfers, joint projects or collaborative funding schemes for renewables. Thus, there is a regulatory framework enabling different levels of cooperation, from non-binding bilateral cooperation mechanisms on statistical transfers at the end of the billing period in 2020 to a complete harmonisation of development schemes.

A further aspect is important in this context. The NREAP were not fixed on the basis of the potential of RE in the respective countries, but according to a scheme of burden sharing.[80] The efficiency gains achieved by an increasingly integrated European promotion of RE would free funds that could, in turn, be transferred

76 A transparent public discussion of the possible allocation formula could increase the willingness to reach an agreement.

77 EUV.

78 However, this implies a prior agreement to an according allocation formula.

79 Kleßmann et al. 2010.

80 This scheme is based on the 2005-RE-share as a starting point, a common "flat rate" of 5.5 percent growth and a share calculated according to the gross national product per capita.

to the member states to support national climate protection schemes.

With regard to the European grid expansion, the “EU Energy Union Package” provides for a closer cooperation in order to strengthen the internal market.[81] The EU target to increase the interconnection capacity of each member state to at least ten percent of the installed generating capacity by 2020 and to 15 percent by 2030 is a first step. The regional cooperation between neighbouring EU member states as already established in the four “Regional Groups for Electricity” can be further enhanced. The “Connecting Europe Facility” (CEF) and the “Projects of Common Interest” (PCI) already provide mechanisms for the selection, financing and implementation of projects. The use of both could be expanded. While the PCI’s function is limited to the selection of projects, the CEF is equipped with financial resources. The budget plan for 2014-2020 includes, amongst others, 5.3 billion euros for the expansion of the energy infrastructure. Given the lack of European transmission grids, this sum probably still falls short of the true costs.[82] The resources in this budget plan could be extended and used for a joint funding of the internal market infrastructure. Likewise, the suitability of further financing options like, for instance, the “European Fund for Strategic Investment” (EFSI) proposed by the Commission, could be evaluated.

Although many of the mechanisms described in this paper are indeed regularly pointed out by the European Commission, they are as yet but rarely applied.[83] The Renewable Energy Directive allows for common renewable energy projects, e.g. with Poland. The same goes for a convergence of the development schemes. The transfer mechanisms laid out in the ETS could be used and expanded so as to compensate the comparatively high financial burdens that emissions trading imposes on some countries. A well-developed “EU Energy Union package” could provide a framework for a fair distribution of the costs of the European grid expansion for the further integration of the internal market.

81 EU 2015-1.

82 EU 2015-2.

83 EU 2013-1.

4. Evaluation of policy options in European Law

To enable investment in climate-friendly technologies and, in consequence, the reduction of greenhouse gases in Europe, the design of the European regulatory framework suggested in this paper must be consistent with the provisions of European and German law. After all, the legal framework is a decisive factor with regards to both the implementation of an energy and climate policy measure and its long-term sustainability.

Prior to the EEG-reform in 2014, the European Commission had serious doubts with view to the national promotion of renewable energies in Germany and its compatibility with European Law. From a legal point of view, these concerns at least partly continue to exist.[84] The legal dispute[85] between the Federal Government and the European Commission regarding the compatibility of the EEG in particular with the prohibition on aid (Art. 107, 108 AEUV) was ultimately resolved in an agreement in the 2014 EEG-reform.[86] A leading ECJ-decision of 1 July 2014 likewise consolidated the member states' scope of action.[87]

Possible legal conflicts continue to exist between the promotion of renewable energies and the principle of competition of the European single market. For in the case of Germany, the current feed-in prerogative for German green energy blocks the export of renewable energy generated in other EU member states. It remains to be determined whether this principle of supremacy is legally permissible. It is by no means certain that the discretion which Directive 2009/28/EC grants the member states in the field of RE-promotion covers a comprehensive curtailment of competition on the generation market.[88] The ECJ does not touch on the question in its leading decision of 1 July 2014.

The policy options outlined in this paper are now to be reviewed with regard to their consistency with European law in order to determine whether their implementation will be able to establish long-term legal certainty for German and European energy and climate policies.

In a second step it will be assessed whether these options can suggest ways to resolve the contradictions between national RE-promotion schemes and applicable European law. From a German perspective is must be borne in mind that, even if the options are implemented, the future legal security will nevertheless also depend on the design of the EEG. Prior to the EEG reform this was especially true for old exceptions to the EEG-levy as well as for already built or authorised renewable energy

84 Wolfrum 2014.

85 On 18 December 2013, an according examinations procedure was initiated (EU 2013-2).

86 The Commission's approval of the EEG 2014 was given before 23 July 2014, allowing the EEG's coming into force according to schedule on 8 January 2014 without legally risking a complaint by the Commission. This was particularly important to enable the timely submission of applications under the exemption rules (§§ 64 ff. EEG 2014).

87 EU 2013-3. According to the decision, a restriction of national promotion systems to the level of the national power plant operators and combined with the use of renewable energies is considered compatible with the prohibition of trade barriers under Art. 34 AEUV.

88 Cf. Directives 2009/28/EC and 2009/72/EC. The question whether Directive 2009/28/EC constitutes an exhaustive set of special rules with regard to Directive 2009/72/EC, which legally requires competition likewise on the generation market, has not yet been settled in court and is a subject of controversy in the relevant literature.

plants.[89] A continued close coordination with the European Commission is therefore inevitable to avoid long-term legal uncertainty. This regards pending question like, e.g., the admissibility of the priority principle for renewable energy plants.

4.1 Evaluation of the concept "Development of emissions trading"

The European emissions trading system as a Community instrument for climate protection is fully compatible with the European regulatory framework. The same applies to the expansion of the ETS, which includes more auctioning of emission allowances as well as the introduction of a price corridor. The agreement on reduction targets for greenhouse gas emissions is likewise unobjectionable from a legal perspective.

As outlined above, the current concerns mainly focus on the question of the conformity of national support schemes for renewable energies with European law. A solution within the scope of this policy option requires Germany's and the other EU member states' readiness to modify their promotion systems, i.e. to reduce national funding and switch to promoting RE-development primarily via the ETS. A further possible procedure would be the above-mentioned shift in the funding schemes in favour of more research and development, e.g. via pilot projects. This raises no concerns with regard to competition law.

The extent to which the policy option is covered by European primary law is defined by its compatibility with the principle of competition and the prohibition on aid. Consequently, the more extensive the development of renewable energies is implemented via the ETS and the less store is set by purely national promotion mechanisms, the smaller the risk of legal collision – and vice versa.

This aim is best achieved by legally obliging all EU member states to adapt their national funding schemes accordingly and grant the ETS a total or substantial priority in the development of renewables. The currently existing national legislative powers with regard to the design of the energy mix must accordingly be abolished or at least curtailed. As Article 194 AEUV guarantees these very competences, this implies an amendment of European primary law.

4.2 Evaluation of the concept "Market-oriented development of RE in the EU"

In principle, a promotion of renewable energies at the European level is compatible with European law. The implementation of such a concept must, however, be carried out at the level of European primary law. This is due to the fact that both the European principle of competition and the prohibition on aid are (with exceptions) part of primary law, which ranks highest in the hierarchy of European norms. Both potentially conflict with RE-promotion. A directive on the pan-European development of RE at the level of secondary law therefore only provides sufficient legal cover if the primary law is open to specification by secondary legislation.[90] This would require an analysis of the fundamental legal principles of European law, which is beyond the scope of the present paper.

89 It should be noted that the political level in Germany has decided on a comprehensive grandfathering with regards to existing or already authorised renewable energy plants, although from a legal perspective – the admissibility being controversial – limitations to the grandfathering would indeed be possible. In practice, the matter was settled with the entry into force of the EEG 2014.

90 The European legislature must therefore strictly observe the predetermined relationship of primary law (here in the AEUV) and secondary law (in this case in the directives on competition and on RE-promotion, Directives 2009/72/EC of 13 July 2009 and 2009/28/EC of 23 April 2009).

From a legal perspective, a European RE-promotion scheme eliminates the conflict between national promotion mechanisms and European law. This conflict arises due to the provisions of European law discussed above – i.e. the regulations on competition in the electricity industry, especially in the power generation sector, and the general prohibition on aid (with exceptions). The design of national development schemes must comply with these provisions. Every promotion of a specific form of power generation with the ensuing exceptions in national legislation is potentially conflicting with respect to mandatory European regulations.

The conformity of national RE-promotion schemes with European law is, indeed, doubtful and clarification is still pending due to several complex legal issues. At least for the time being, this issue is politically solved for the 2014 version of the EEG, to which the Commission consented. These difficulties will be eliminated once the promotion scheme for renewable energies is consistently designed and shifted to the European level, superseding national legislative powers.

In such an approach, the same European legislator is responsible for developing a pan-European RE promotion scheme that is consistent with the principle of competition and the general prohibition on aid, for example by introducing legally secure exceptions into the European regulations. Contradictions between national and European law can thus be avoided. From the perspective of aid rules, the uniform application of a European RE-promotion scheme would permanently resolve the issue of national protection of energy-intensive industries in EU member states, since all companies would be equally affected.

With regard to the competitiveness of particularly energy-intensive companies from the EU vis-à-vis companies outside the EU, unequal burdens would persist if countries outside the EU have no or only partly developed RE-promotion schemes. Incidentally, the same would be true for the concept of "Development of the emission trading system". Therefore, it should be considered to establish an EU-wide special regulation for energy-intensive industries, aiming at protecting their competitive position against companies from outside the EU. However, it has to be borne in mind that this issue already persists under the EU ETS.

Incidentally, international treaties between individual member states wishing to merge their promotion schemes can improve a European harmonisation of RE-development within the European legal system. Notwithstanding their admissibility, such agreements are neither practical nor efficient, as they are concluded on a voluntary basis only. Realistically, a low level of participation and low Europe-wide efficiency would have to be expected at most. Such treaties will therefore certainly not allow for a comprehensive pan-European harmonisation of RE-promotion schemes and EU climate policies.

4.3 Evaluation of mechanisms to address supply bottlenecks

The issue of regional bottlenecks can be addressed without new legislation. On a contractual level, power plants all over the EU can already contribute substantially to a solution in individual cases, which reduces the need for a legal solution in the Federal Republic of Germany.

In fact, however, we already have such a legislative solution in form of a dirigiste capacity market according to §§ 13 a to 13 c EnWG[91] and the temporary reserve power plant decree (expiring 31 December 2017). Such "assistance", i.e. the provision

91 German Energy Act (EnWG).

of capacity from another EU region in the event of a shortage, is provided under two conditions: There must be sufficient grid capacity, and the Federal Network Agency must accept the performance price. The preconditions for this are laid down in the ARegV[92], supplemented by the normative evaluation derived from § 13 German Energy Act. In the interest of the common market, such EU-wide solutions are preferable to purely national ones, if only for legal reasons. Should according offers from the EU area exist, their consideration is even compulsory.

The development of European grids for the purpose of a more integrated internal market is already subject of in existing regulations. In §§ 11 para. 1, 65 Energy Act, German Federal law contains an obligation, enforceable by regulatory authorities, to invest in grid expansion if it is necessary and reasonable. Similar regulations exist in other EU member states. Insofar, a new European grid investment obligation is neither necessary to foster European grid development, nor is it enshrined in European primary law.

As a complementary means, the instruments provided in Regulation (EC) No. 714/2009[93] on grid access conditions, in particular Article 17, can be used as an investment incentive to coordinate grid development. The Agency for the Cooperation of Energy Regulators ACER could then take over the responsibility for coordination. A hitherto lacking harmonisation of plant license provisions for the European grid segment would facilitate the development of cross-border grids.

4.4 Assessment of new cooperation and transfer mechanisms

The above-mentioned directives can serve as a basis for cooperation and transfer payments connected with the ETS, RE-promotion and the development of the internal market. However, since there are no legal constraints, voluntary agreements between the parties are the only solution.

Considering the distribution of financial burdens between EU member states in the field of transmission grid development, an agreement can be sought with national regulatory authorities as to the recognition of these expenses as cost items in grid tariff regulation. On the basis of Regulation (EC) No. 713/2009[94], ACER can again play a coordinating role.

Consequently, even from a legal point of view there is a good institutional foundation on which cooperation schemes within the EU can be based in order to gradually achieve an integrated climate and energy policy.

92 Incentive Regulation Decree (ARegV).

93 Regulation (EC) No. 714/2009.

94 Regulation (EC) No. 713/2009.

5. Conclusion

Currently, the German energy transition is a chiefly national policy scheme, lacking a consistent target system. The trade-offs inherent to the overall scheme call for a prioritisation of goals. Therefore, the working hypothesis of the present statement is the assumption that climate protection – with due consideration of supply security and profitability – represents the overall priority of the comprehensive energy transition process. Given the global nature of climate change and the irrelevance of emission reductions in individual states, the energy transition can only succeed if it contributes to the creation of a sufficiently large alliance of states to incrementally reduce the global emissions level.

The European Union can contribute significantly to climate protection if it succeeds in cost-efficiently reducing European greenhouse gas emissions. This may provide an incentive for other countries to join the European initiative and to harmonise the existing climate policy instruments. The German federal government can play a determining role in shaping such an energy and climate policy framework in Europe. Assuming that climate protection is the overall priority, the German energy transition would have to be implemented within this European framework.

With the Emissions Trading System the European Union already has a leading climate-policy tool at its command which can be further reinforced and expanded. Together with the already established common EU greenhouse gas-reduction target for the year 2030, the still pending ambitious expansion of the ETS can create investment security and reduce European greenhouse gas emissions. For this purpose, additional, potentially ineffective promotion mechanisms at the national level need to be phased out. Diverging interests in the member states could, however, jeopardise an according political agreement.

In this case, and under certain conditions, a transition might be reached by an integrated European promotion of RE. With regard to climate protection, this course of action is, however, no alternative to the emissions trading system, although such an approach could at least reduce the high costs of national support schemes. In any case, the expansion of renewables in Germany would fall short of the German federal government's current development targets – in favour of an expansion at the most suitable sites in Europe.

To foster the Europe-wide transformation of the energy system and achieve efficiency gains, the integration of the European internal market for electricity would have to be further strengthened. This could be achieved by promoting European grid development and adopting additional measures to ensure supply security.

The success of a European energy and climate policy largely depends on how strong the willingness to cooperate really is in Germany and other EU member states. Existing mechanisms of cooperation and transfer could form the base for a more equal distribution of burdens and a deepened integration in the different fields of energy- and climate policy.

Last but not least, all measures and policies must consider the European and national regulatory frameworks, since legal security is a fundamental prerequisite for investment in climate-friendly technologies. From a legal perspective, the policy options outlined in this paper can safeguard legal security and even resolve discrepancies between European law and national RE-promotion schemes.

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The Academies' Project

With the initiative 'Energy Systems of the Future' acatech – National Academy of Science and Engineering, the National Academy of Sciences Leopoldina and the Union of the German Academies of Sciences and Humanities provide input for an evidence-based discussion of the challenges and opportunities inherent to the German energy transition. Eight working groups (WGs) pool expert knowledge and identify relevant issues. Interdisciplinary ad-hoc groups develop policy options for the implementation of a secure, affordable and sustainable energy transition.

The Academies' Project seeks to provide systematic expertise and a set of reference points for decisions concerning the common goal "energy transition" on the basis of the following principles:

The energy supply of our country is a complex system

Raw materials and resources, technology, economy, society and law: In the energy system, we find multiple, cross-sectoral interactions. If not sufficiently taken into account, selective interventions can have paradoxical, unintended consequences. A prudent conversion of the energy supply system therefore requires a comprehensive understanding and assessment of the system as a whole. This must be developed in a common effort and in accordance with the highest scientific standards. However, there can be no master plan for the transformation because energy transition implies the continuous transformation of the energy system with all its inherent dynamics.

The aim of the energy transition is sustainability

Therefore, we have to agree on the criteria to apply to a sustainable energy supply and on how progress towards more sustainability can be benchmarked. In the energy concept of the German Federal government, supply security, economic efficiency and environmental sustainability form the basic conditions for a sustainable energy supply. Equally, social acceptability and social justice must be adequately taken into account. To determine whether or not these aims must be accorded equal significance, a discussion on values and suitable mechanisms for dealing with conflicts of values is required.

Science and research develop alternative approaches

Based on academically sound alternative options, players from politics, business and civil society can make well founded, ethically responsible and politically feasible decisions. In contrast to recommendations promoting one specific proposal, such options sketch out the consequences to be expected from one or the other approach. Thus, science can specify the advantages and disadvantages each solution would entail according to the current state of knowledge. The task of dealing with conflicting goals and the uncertainty invariably inherent to any such decision-making process is then a political one and requires a constant dialogue with the social groups involved.

Participants in the project

Eight working groups (WGs) pool expert knowledge and identify relevant issues. Interdisciplinary ad-hoc-groups then develop policy options to address these problems.

Working groups in the project

WG Current Situation	WG Legislation	WG Technologies
WG Society	WG Resources	WG Options for Implementation
WG Economics	WG Scenarios	

Ad-hoc-group "Integration"

The group of scientists listed below has developed this policy paper, which was submitted to four reviewers. Their comments were included in the final document, as were the annotations from the Board of Trustees of the Academies and the Standing Committee of the National Academy of Sciences Leopoldina.

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Basic data

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