FROM CONFLICT TO CONSENSUS?
DISCOURSES ON GERMAN ENERGY TRANSITION

vorgelegt von
Dipl.-Biol. Anna Leipprand, M.E.S.
geboren in Stuttgart

von der Fakultät VI – Planen Bauen Umwelt
der Technischen Universität Berlin
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Promotionsausschuss:

Vorsitzende:	Prof. Dr. Elke Pahl-Weber
Gutachter:	Prof. Dr. Ottmar Edenhofer
Gutachter:	Prof. Dr. Christian Flachsland
Gutachter:	Prof. Dr. Ortwin Renn

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Abstract

The German *Energiewende* – energy transition – is a process of fundamental policy change that has been the subject of intense public and expert debates over decades. In these debates, actors have traditionally grouped in two opposed coalitions, one characterized by a proactive discourse calling for ambitious energy transition policies, the other adhering to a reactive discourse more oriented towards the fossil-nuclear status quo. While a considerable degree of polarization between the two positions can be observed, discourses have also been converging, which is manifest in today's broad consensus on the basic long-term goals of energy transition. This thesis investigates policy debates on the future of energy supply in Germany from a discourse analytic perspective. It explores the tension between polarization and convergence in the debate by addressing three different aspects.

The first part investigates energy debates in German Federal Parliament. Through a content analysis of speeches, it reconstructs the two antagonist discourses with their major story-lines in detail, and it analyzes the changes in their use by different political parties between 1989 and 2011. It shows how the concept of a transition towards a nuclear-free, renewables-based energy system became hegemonic, and how the energy transition discourse experienced a transformation from radical to reformist in the process. At the same time, the story-lines of both discourses remain clearly distinguishable. This is partly due to the fact that the reactive discourse broadened, integrating elements of the proactive discourse without abandoning its focal concerns, while the proactive discourse tended to remain faithful to its traditional version.

The second part of this thesis investigates whether scientific policy advice (SPA) has contributed to convergence or deepened polarization of discourses. It draws on the Advocacy Coalition Framework and narrative theory, and is based on a qualitative text analysis of SPA studies. A major finding is that polarization also characterizes the SPA domain. The majority of studies clearly take sides in the debate, often making their normative positions transparent through the explicit use of elements of the respective discourses. Nevertheless, SPA provides differentiated information and alternative design options for policy instruments. A second conclusion from the research is that, notwithstanding the advocacy, SPA has facilitated the convergence of discourses and improved the conditions for political consensus and compromise. Collectively, SPA studies provide a basis for mapping different policy pathways and their consequences against the background of different normative assumptions.

The third part of the thesis explores the framing struggle taking place in the recent German debate on the future of coal. The analysis reveals a re-intensification of polarization and a strong emphasis on negative effects and conflictual issues. The chapter characterizes the solution space as perceived by opponent actor groups and locates scope for compromise. Management of structural change is identified as a promising entry point for future negotiations.

In summary, polarization between actors' positions has not been an obstacle to the convergence of discourses and to policy change in the case study. The concluding hypothesis is that even the intensification of conflict in the future-of-coal debate is unlikely to make the broad consensus on energy transition disintegrate. More likely, affected actors will lobby for financial compensation and discursively delegate responsibility away from the national level. Thus, the success of German energy transition might depend most strongly on whether solutions are found for an appropriate compensation of actors and regions likely to lose from the measures, and for a reconciliation of national level emission reduction policies with the EU ETS.

Zusammenfassung

Deutschlands Energiewende, ein Prozess grundlegenden politischen Wandels, wird seit Jahrzehnten in der Öffentlichkeit und in Expertenkreisen diskutiert. Die beteiligten Akteure lassen sich traditionell zwei gegnerischen Koalitionen zuordnen, von denen eine einen proaktiven Diskurs vertritt und ehrgeizige Maßnahmen für eine schnelle Energiewende fordert, während der reaktive Diskurs der anderen Koalition eher für eine Orientierung am fossil-nuklearen Status Quo steht. Während einerseits eine beträchtliche Polarisierung zwischen beiden Positionen zu beobachten ist, haben sich die verschiedenen Diskurse im Lauf der Zeit auch einander angenähert; dies zeigt sich im breiten Konsens über die grundlegenden langfristigen Ziele der Energiewende, wie er heute besteht. Die vorliegende Arbeit untersucht diese politischen Debatten zur Zukunft der Energieversorgung in Deutschland aus diskursanalytischer Perspektive. Drei miteinander verwandte Fragestellungen beleuchten das Spannungsverhältnis zwischen Polarisierung und Konvergenz aus unterschiedlichen Blickwinkeln.

Der erste Teil der Arbeit untersucht energiepolitische Debatten im Deutschen Bundestag. Basierend auf einer Inhaltsanalyse der Reden im Parlament werden die zwei entgegengesetzten Diskurse mit ihren prominentesten *story-lines* im Detail rekonstruiert, und es wird analysiert, wie die politischen Parteien im Bundestag zwischen 1989 und 2011 diese *story-lines* in sich verändernder Weise genutzt haben. Das Kapitel illustriert, wie die Idee einer Transformation hin zu einem auf erneuerbaren Energien basierenden System ohne Atomkraft allmählich vorherrschend wurde, und wie im Verlauf dieses Prozesses ein radikaler Diskurs zu einem reformistischen wurde. Gleichzeitig bleiben die *story-lines* beider Diskurse klar unterscheidbar. Dies lässt sich unter anderem darauf zurückführen, dass sich der reaktive Diskurs um Elemente des proaktiven erweiterte, während der proaktive Diskurs eher seiner traditionellen Version treu blieb.

Der zweite Teil der Arbeit untersucht, ob wissenschaftliche Politikberatung (wPB) eher zur Konvergenz der Diskurse oder zur Vertiefung der Polarisierung beigetragen hat. Grundlage ist eine qualitative Textanalyse von wPB-Studien; den konzeptionellen Hintergrund bilden das *Advocacy Coalition Framework* und Theorien politischer Narrative. Die Untersuchung zeigt, dass auch die wPB Teil der polarisierten politischen Landschaft ist. Die Mehrheit der Studien bezieht klar Position in der Debatte, wobei die normativen Ausgangspunkte oft durch die explizite Verwendung von entsprechenden Diskurselementen transparent sind. Nichtsdestotrotz liefert die wPB differenzierte Informationen und Vorschläge für alternative Gestaltungsmöglichkeiten. Eine zweite Schlussfolgerung aus der Arbeit ist, dass wPB, ungeachtet der beobachteten *advocacy*, die Konvergenz der Diskurse gefördert und die Bedingungen für politischen Konsens und Kompromiss verbessert hat. In ihrer Summe liefern wPB-Studien die Grundlage für eine Landkarte der Energiewende, die verschiedene mögliche Politikpfade und ihre Konsequenzen vor dem Hintergrund unterschiedlicher Wertvorstellungen darstellt.

Der dritte Teil der Arbeit untersucht die aktuelle deutsche Debatte zur Zukunft der Kohle als einen *framing struggle*, einen Wettstreit der unterschiedlichen Darstellungen von Problemen und Lösungen. Die Ergebnisse der Analyse zeigen eine Intensivierung der Polarisierung in der energiepolitischen Diskussion, wobei negative Auswirkungen und konfliktbeladene Themen besonders betont werden. Das Kapitel vergleicht mögliche politische Lösungswege aus der Perspektive der beiden Akteursgruppen und lotet so den Spielraum für Kompromisse aus. Die Diskussion über eine

sozialverträgliche Gestaltung des Strukturwandels bietet sich unter diesem Gesichtspunkt als Einstieg in zukünftige Verhandlungen an.

Die Polarisierung zwischen den Positionen der Akteure war in der deutschen Fallstudie kein Hindernis für die Konvergenz der Diskurse und für politischen Wandel. Abschließend stellt die vorliegende Arbeit die These auf, dass auch die Intensivierung des Konflikts in der Debatte um die Zukunft der Kohle den breiten Konsens über die Ziele der Energiewende nicht gefährdet. Wahrscheinlicher ist es, dass betroffene Akteure für finanzielle Entschädigung kämpfen und versuchen werden, im Diskurs die Verantwortung von der nationalen Ebene fort zu delegieren. Für den Erfolg der Energiewende könnte es deshalb ausschlaggebend sein, dass angemessene Lösungen für eine Kompensation derjenigen Akteure und Regionen entwickelt werden, die die Leidtragenden einer sinkenden Kohleverstromung sein werden. Zudem müssen Wege gefunden werden, nationale Maßnahmen zur Emissionsreduktion mit dem Europäischen Emissionshandelssystem vereinbar zu machen.

1 Introduction

1.1 The German Energiewende as a discursive process

When people started talking about *Energiewende* – energy transition – in Germany in the 1980s, they were eager to show that energy demand could be met safely without oil and nuclear power, that the country could free itself from the "dismal oil dependency" and "wake up from the nuclear dream before it has become a nightmare" (Krause et al., 1980, p. 42). Existing energy supply structures and regulations were perceived as destructive for society and democracy, as being rooted in Nazi Germany and made "for a centralist war economy" (Tatge, 1986). As in US American publications that inspired German authors speaking of "soft energy paths toward a durable peace" (Lovins, 1979), the proposed solutions based on renewable energy and energy efficiency were to bring salvation not only from specific environmental problems but from a generally doomed economic system as well as from the threats of nuclear warfare. Renewable energies would reunite humanity with their social, cultural and ecological basis and allow for "sustainable … and humane development" (Scheer, 1999, p. 54).

These early ideas were put forward by members of the environmental and anti-nuclear movement, by institutes associated with these movements (e.g. Öko-Institut: Krause et al., 1980), by members of the newly founded Green Party, and by renewable energy pioneers. Established political actors such as the conservative-liberal coalition ruling between 1982 and 1998 perceived them as subversive and threatening, and they were for many years fended off with derision and contempt.

Over the past decades the energy transition discourse has moved from the margin to the center. Support for renewable energy was installed tentatively, and strengthened by the Social Democrat-Green Federal Government after 1998. Phase-out of nuclear power was agreed in 2000 and confirmed after Fukushima in 2011 by the conservative-liberal government. Climate change was classified as the "most important environmental problem" early on (Kohl, 1987) and became one of the main motivations for energy transition. At European and national level a complex body of environmental and climate regulation was introduced that aimed at reducing greenhouse gas emissions from energy use. Since 2011, Energiewende officially describes the energy policy of the German government (BMWi and BMU, 2011), with conservative chancellor Angela Merkel asserting before parliament that "we want to reach the age of renewable energies" (Merkel, 2011).

This does not mean, however, that controversy has ended. In 2012, economic advisors warned government that [the implementation of the Energiewende would] „in the coming years [...] impair security of supply and cost effectiveness, without guaranteeing any noteworthy improvement in terms of environment-friendliness" (SVR, 2012, p. 249). Advisors for environmental issues by contrast asserted a year later that „The Energiewende responds […] to the risks and serious environmental costs of the current [...] infrastructure, […] provides the prospect of a sustainable energy supply system [and …] is a great chance for innovation and industry" (SRU, 2013, p. 20). Thus, actors in the policy debate still perceive and present the project of energy transition in very different lights.

This thesis is interested in how policy actors have been discussing the future of energy supply in Germany. It investigates the German Energiewende as a discursive process. This introductory chapter provides a background and conceptual basis for the three pieces of research that form the core of

the thesis (Chapters 2, 3 and 4). Section 1.2 presents the theoretical framework, discussing the concepts of discourse, story-lines, narratives and frames on which the research is based, and their relation to each other. Section 1.3 introduces the case study context of German energy transition in more detail. Section 1.4 presents the overarching theme and the more specific research questions that guide the core chapters, as well as an outline of the thesis.

1.2 Discourses, narratives and framings

This thesis presents three pieces of research in a discourse analytic perspective. It investigates discursive practices of actors in the case study, building on the different but related concepts of story-lines (Chapter 2), narratives (Chapter 3) and framings (Chapter 4). This section provides a brief introduction to discourse theory (1.2.1), and a synthesis of the literature on narratives and framings, conceptualizing them as closely related discursive practices that constitute essential elements of the policy process (1.2.2). Section 1.2.3 discusses the relation of discourse to different concepts of actor coalitions and actor groups in policymaking. Figure 1.1 provides a summary.

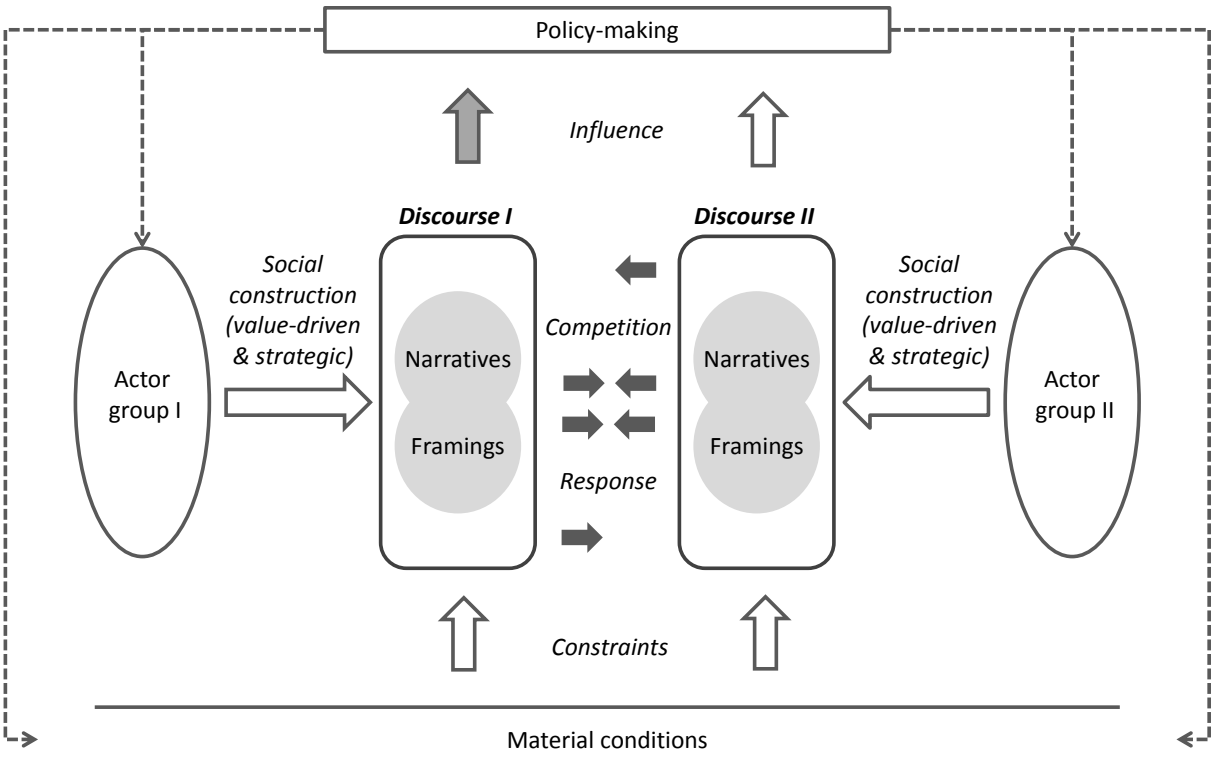

Figure 1.1. Discourses, narratives and framings. The three concepts and their role in the policy process are presented schematically. Discourses represent the social reality of the policy area as constructed in different ways by different actor groups. In day-to-day communication discourses take the form of narratives and framings. These relate to specific issues and facilitate decision-making in complex situations. The constructed reality is not independent of the material world. Narratives and framings of one group compete against those of the other, and may respond to the claims made by their counterparts. Both actor groups aim to influence policy-making through their discourses, although one of them may be dominant. The outcome of the policy-making process has repercussions on the material world that gives rise to the policy problem, and on the resources and interests of the actor groups, which in turn may cause them to adjust their discourses. A duality is often found, but there may be more than two actor groups and discourses.

1.2.1 Discourses

Discourse analysis is rooted in postpositivist and social constructionist scholarship. It acknowledges the "inherently normative and interpretive character of policy problems" (Fischer, 2003 p. 11) and deals with competing interpretations of issues in today's complex and uncertain world. The "struggle over ideas" (Stone, 2012, p. 13) enacted through rhetoric and communication is itself considered a worthwhile object of investigation.

While there are different conceptualizations (Fischer, 2003), the common basis of discourse analytic approaches is the assumption that through the use of language and other forms of symbols and signs the meaning of phenomena is socially constructed (Keller, 2011, p. 9). Discourse theory is interested in how the meanings of actions and objects "are shaped by the social and political struggles in specific historical periods" (Fischer, 2003, p. 73). This thesis builds on the definition provided by Maarten Hajer who describes discourses as broader sets of "ideas, concepts and categorizations" that together give meaning to physical and social realities (Hajer, 1995, p. 44). Environmental discourses and their interaction with other (economic, developmental) discourses are a major focus of discourse analysts (Feindt and Oels, 2005).

This thesis adopts a critical realist rather than a relativist approach to discourse analysis. With Sims-Schouten et al. (2007), it builds on the assumption that there is a material world independent of, but related to social construction through discourse. Constructions of social realities through language are understood "as being constrained by the possibilities and limitations inherent in the material world" (p. 102). While linguistic interaction between people constructs meaning, non-discursive elements also influence that meaning. In other words, the fact that "something is interpreted does not mean it is unreal" (Dryzek, 2005, p. 12).

This is particularly relevant with respect to Chapter 3 of this thesis, where the work of scientists as participants of discourses is under scrutiny. The realist perspective on discourse analysis allows understanding scientific work, on the one hand, as being a practice of social construction that itself contributes to discourses. Models, concepts, mathematical formulae and theories all serve to construct a reality that is not directly evident or visible to humans, and play an important role in communication about environmental problems. On the other hand, the particular character of scientific contributions can be conceptualized when science is understood as a process that pays particular attention to whether the constructed reality is congruent with the material world it aims to represent.

1.2.2 Narratives and framings

Narratives

Narrative is a basic and ubiquitous form of human communication and cognition (Fisher, 1987). Narrative analysis, a study of "narrative and narrative structure and the ways they affect our perception", has become a common approach in political science as well as in other research fields (Czarniawska, 2010, pp. 58–59). Through narrative, people construct, memorize and communicate their own autobiographies (Lahusen, 2013), build and develop social communities and cultures (Koschorke, 2012), make sense of historical and contemporary political events and developments (Gadinger et al., 2014a) and imagine the future (Bode and Dietrich, 2013). The narrative concept is

applied in economic research to investigate how popular narratives, spreading across populations and countries, influence economic decisions of individuals and thus cause or influence economic fluctuations (Shiller, 2017). Narratives also play a central role in politics and have thus stimulated much interest in political science (Fisher, 1987; Czarniawska, 2010).

The analysis of narratives and stories in policy studies may draw on different concepts brought forward by various authors. For the purpose of this thesis, story and narrative can be understood as synonyms. The literature on (policy) narratives and stories generally agrees that narratives are characterized by a temporal structure (beginning, middle, end) organized as a plot, that a story claims causal relations and provides explanations, that it may star typical characters such as heroes, villains and victims, and that it may lead to a solution or "morale" at the end (Gadinger et al., 2014a; Kaplan, 1993; McBeth et al., 2014; Roe, 1994; Stone, 2012).

Narratives may be regarded as a special form discourse can take, and they are often defined as being embedded in more complex discourses. Hajer's discourse theory has *story-lines* that actors use to reduce discursive complexity and to argue, criticize, propose solutions and persuade others (Hajer, 1993, p. 47). Stories are built by selecting elements from discourses and organizing them into comprehensible and manageable plots (Urhammer & Røpke, 2013, p.64), and they operate "mainly at everyday level of communicative interaction" (Fischer, 2003, p. 161).

Narrative analysis typically collects, re-tells, analyzes and possibly deconstructs the stories (Czarniawska, 2010). It may be driven by different research aims, such as uncovering underlying values and beliefs, explaining the origin and evolution of stories, explaining how they become hegemonic, analysing their persuasiveness, uncovering their political effects, or finding a meta-narrative to a polarized debate (Gadinger et al., 2014b, p. 80, Jones and McBeth, 2010; Fischer, 2003, p. 90, Roe, 1994). While narrative analysis most often follows a qualitative approach and a social constructionist epistemology, it is also being used in combination with quantitative research methods (Jones and Radaelli, 2015; McBeth et al., 2014).

Framings

The concept of "framing" is used in different social science disciplines and for different research purposes. Generally, frames describe both *templates* for interpretation and *tools* for interpretation. Firstly, frames denote "schemata of interpretation" (Goffman, 1974, p. 21), "structures of belief, perception and appreciation" (Schön and Rein, 1994, p. 23) or "implicit theories" (Hofmann, 1995) that *influence* actors' attitudes and their reception of new information. Frames in this sense are inherent to humans and connected to deep-seated worldviews. They resemble a pre-setting that determines the starting point of a person's argumentation, and that selectively directs his or her attention to certain aspects of an issue at the expense of others. It is applied not only to individuals, but also to "perceptual lenses" and worldviews that guide interpretation of issues by societies (Miller, 2000, p. 211). Research in psychology and neurology has shown that frames correspond to physical structures, that is, neural circuits in the brain, which are activated by words read or spoken, which form systems through connections with other frames, and which are also linked to the emotional regions of the brain (Lakoff, 2010, pp. 71–72).

Secondly, framing is investigated as an active discursive practice. According to Entman (1993, p. 52), to "frame is to select some aspects of a perceived reality and make them more salient in a communicating text." The framings thus generated fulfil four functions: they define problems,

diagnose causes, make moral judgements and suggest remedies. Similarly, by what Druckman (2004, p. 672) calls "issue framing", a speaker or writer emphasizes "a subset of potentially relevant considerations", thus leading his audience to focus on these aspects when forming their opinion. Research into framing effects shows that the way an issue is presented to an individual influences his or her attitude toward this issue (e.g. Kahneman and Tversky, 1984), which puts the assumption of stable and invariant preferences in the social sciences into question (Druckman, 2004).

Analyses of framing ask how actors present policy issues when talking or writing about them, and how different framings "compete on public stages to influence the general discourse" (Geels and Verhees, 2011, p. 913). Any issue can be understood and approached from different perspectives, and frame conflicts reflect different priorities and different values of competing groups (Fischer, 2003, p. 143). Framing is being studied in various research fields including communication and media studies, leadership and change management (Dewulf and Bouwen, 2012, p. 169; O'Neill et al., 2015). In research on social movements, the emphasis is on collective action frames as "action-oriented sets of beliefs and meanings that inspire and legitimate the activities and campaigns of a social movement organization" (Benford and Snow, 2000).

Narratives and framings as related discursive practices

The concepts of narratives and frames obviously bear a lot of similarities, and they are not always neatly distinguished in the literature. Stories may "frame policy problems" and policy frames may be "uncovered through the analysis of the stories" (Fischer, 2003, pp. 145, 179). In this dissertation, both narrative and framing are understood as discursive practices by which actors assign meaning to issues, interpret policy problems and suggest pathways for action. The framing perspective is less specific with regard to structure and form of the elements of communication under scrutiny; frames do not necessarily feature a temporal sequence, a plot and characters. Both approaches, however, have a number of characteristics in common:

1) They reduce complexity by being selective. Framing and story-telling both serve to create coherent interpretations of events and actions, and to enable actors to communicate and make decisions in the face of complexity and uncertainty (Fischer, 2003, p. 144, 162; Hajer, 1995, p.62; Gadinger et al., 2014a; Roe, 1994). They do so by being selective, guiding attention to specific aspects of a problem while ignoring others. Both narratives and frames may be evoked by extremely condensed rhetorical devices such as metaphors (Gadinger et al., 2014b, p. 75; Schön and Rein, 1994, p. 26) or by non-textual sources such as pictures and cartoons (Geels and Verhees, 2011).

2) They transport normative assessments. Frames and narratives reflect deeper-seated values and beliefs. By making certain causal claims, portraying actions and consequences in a certain way, allocating roles such as winners and losers or villains and victims and assigning blame and responsibility, they make normative statements about "good" and "evil" that resonate more strongly with certain value and belief systems than with others (Benford and Snow, 2000, p. 616; Fischer, 2003; Roe, 1994, p. 37; Shanahan et al., 2011; Stone, 1989, p. 282).

3) They strategically motivate action and are a resource in power struggles. At the same time, frames and narratives are a resource of actors in power struggles, and they may be created and used consciously and strategically in order to further certain interests and political goals. Actors "exercise power through trying to impose a particular frame or discourse onto a discussion" (Hajer and Versteeg, 2005, p. 177), and "unequal power relations work themselves out through the competition

and opposition of stories“ (Roe, 1994, p. 13). The strategic function of frames and narratives however merges and overlaps with the function of creating congruence with values and beliefs, and for a particular frame or narrative it is usually not possible to disentangle to what degree it is strategic or value-driven.

4) They typically compete against counter-stories and counter-frames. Analyses of framings and narratives very often find a duality between antagonists that reflect the conflict between proponents and opponents of a certain policy or technology (e.g. Aklin and Urpelainen, 2013; Arnold, 2015; Dodge and Lee, 2017; Roe, 1994; Rosenbloom et al., 2016; Shanahan et al., 2013). Interaction between the two may to a greater or lesser extent lead to the emergence of altered and possibly less conflictual frames (Dewulf and Bouwen, 2012). Re-framing (Schön and Rein, 1994) or the creation of metanarratives (Roe, 1994) may be ways of moving beyond policy impasses.

5) They provide stability and reliability, but can also change. Narratives and frames have an inherent tendency to persist, given that they are related to deep-seated, slowly changing value systems, and given that humans tend to actively seek or prefer information that is consonant with their existing attitudes or with decisions made previously (Aronson et al., 2014, pp. 181-190). In policy contexts, frames and narratives are something for policy-makers to rely on when faced with problems of high uncertainty, and they may thus “resist change or modification even in the presence of contradicting empirical data” (Roe, 1994, p. 3). At the same time, framing and narrative contests involve mutual responses between antagonist actors which may lead to concessions, changes in perspectives, learning among actors, and new discourses becoming hegemonic.

Both the narrative and the framing perspectives are suited to this thesis’ purposes, which are to analyze discursive dynamics in a case study of social and political change, to study the way actors talk about policy issues, and to investigate how these discursive dynamics relate to political developments and the wider historical and social context.

1.2.3 Actors and their discourses

Discourses cannot be explored without asking who participates in, uses, creates and shapes them. Narratives and frames are collectively produced by many individuals who each use and re-use them, drawing on and contributing to a common pool of meaning and understanding. They are “shared ways of apprehending the world” (Dryzek, 2005, p. 9) and “joint social productions” (Fischer, 2003, p. 162). In communication between actors, they provide familiar reference and enable shared understanding, or at least create the illusion of it (Hajer and Versteeg, 2005, p. 176). Competing actor groups with diverging values, beliefs and interests develop different discourses.

Discourses and discursive practices are being investigated in combination with different concepts of policy actor constellations. In Hajer’s theory, actors who share the same story-lines form loosely associated “discourse coalitions”. Different actors may be drawn to a certain story-line for various reasons. They do not necessarily share the same interests, and the “multi-interpretability” of a story-line may enhance its political power if it makes it attractive to a larger group of policy actors (Hajer, 1995, p. 61).

In Chapter 3 of this thesis, policy narratives on German energy transition and their relation to actor groups are investigated with the help of the advocacy coalition framework (ACF). Advocacy coalitions are groups of actors who share basic normative and causal beliefs, and who coordinate their actions

to a certain degree in order to achieve common political goals (Jenkins-Smith et al., 2014, p. 191; Weible et al., 2011, p. 196). The ACF is used, rather than the discourse coalition approach, because the chapter's research interest is in advocacy among scientific policy advisors, and because this allowed building on the literature on actor coalitions in the German case study which most often takes an ACF perspective (Gründinger, 2015; Hirschl, 2008; Joas, 2013; Maatsch, 2013; Reiche, 2004).

The ACF and discourse analysis originate in different schools of thought and are based on different epistemological assumptions, but at the same time are similar in many respects. Winkel et al. (2011) provide a detailed comparison and a justification for mixed approaches, which are summarized in the following. Discourse approaches, departing from a post-positivist perspective, are interested in how humans interpret and explain a confusing world. Analyses are based on interpreting statements of actors in their case-specific context with qualitative and interpretive methods. The ACF, by contrast, belongs to neo-positivist or critical rationalist approaches. It aims to systematically analyze belief systems and coalition behavior across case studies, and to provide hypotheses that can be empirically tested. However, there are large overlaps in research interests and concepts between the two approaches: both are interested in how actors characterize a policy issue, e.g. in terms of problem definition, assignment of responsibilities, and preferred solution strategy. Both investigate coalitions of policy actors who share policy ideas, and both are interested in the political struggles between these different ideas and in how they eventually influence policy-making. Actors in the ACF aim to translate their beliefs into public policies and programs, and members of discourse coalitions similarly attempt to organize policy-making around rival discursive concepts. In Chapter 3, narratives are regarded as a major resource of advocacy coalitions that incorporate their beliefs and are used to achieve a coalition's goals.

Chapter 4 also takes a discourse perspective, looking at the framing struggles in the more recent German future-of-coal debate. It uses the multi-level perspective (MLP; e.g. Geels, 2004) as a heuristic to conceptualize the German case study as an ongoing sustainability transition. The MLP explains transitions towards sustainability as a process that involves interaction between three levels: the socio-technical regime, niche innovations, and an overarching landscape. The regime, that is, the existing technologies, infrastructures, institutions, processes and associated actors, is the level that undergoes transition and reaches a new configuration as a result of the process. At niche level, new technologies are invented and promoted by another group of actors, who develop them shielded from regime-level pressures at the beginning but aim to lead them to competitiveness and introduce them into the regime. At landscape level, which is beyond the control of both regime and niche actors, slower change and processes take place that may create pressures on the regime and help niche innovations to break through (Geels, 2004; Geels and Schot, 2007). Whether actors belong to the regime, niche or landscape level likely influences their way of framing policy problems and solutions.

1.3 Energy transition: milestones in policy and discourse developments

This section provides the case study background. It introduces the historic developments leading to the 2011 Energiewende decisions and describes current challenges, summarizing key trends in policy and discourse developments with respect to nuclear power, renewable sources and coal (Sections 1.3.1-1.3.3). More comprehensive historic accounts can be found in the literature cited below (e.g. Grasselt, 2016; Gründinger, 2015; Hake et al., 2015; Jacobsson and Lauber, 2006; Morris and

Jungjohann, 2016; Renn and Marshall, 2016). Section 1.3.4 highlights insights from recent research on the role of actors and their discourses.

The German Energiewende includes long-term and short-term targets for greenhouse gas emission reductions, renewable energy shares, energy efficiency improvements and energy savings, and a roadmap for phasing out nuclear power. They are summarized by Table 1.1. Figures 1.2 and 1.3 illustrate the development of the use of different energy sources for electricity production in West Germany from 1950 to 1990, and in post-reunification Germany from 1990 to 2015.

Table 1.1: The goals of German energy transition.

	Climate	**Renewable Energy**		**Efficiency**		**Nuclear power**
	GHG emissions (comp. to 1990)	**Share in electricity consumption**	**Share in energy consumption**	**Primary energy consumption (comp. to 2008)**	**Electricity consumption**	
2020	-40%	35%	18%	-20%	-10%	To be phased-out by 2022
2030	-55%	50%	30%			
2040	-70%	65%	45%			
2050	-80-95%	80%	60%	-50%	-25%	

Source: BMWi and BMU (2011).

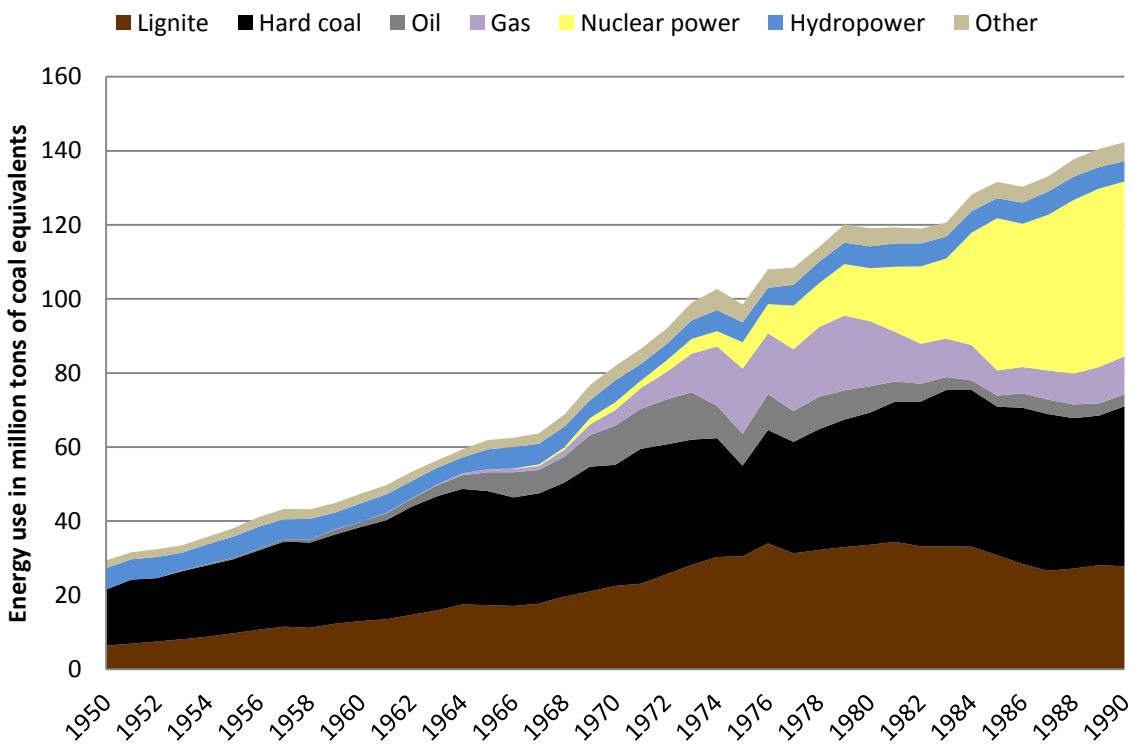

Figure 1.2: Use of energy sources for electricity production 1950-1990. Data for West Germany. Source: AGEB (2013).

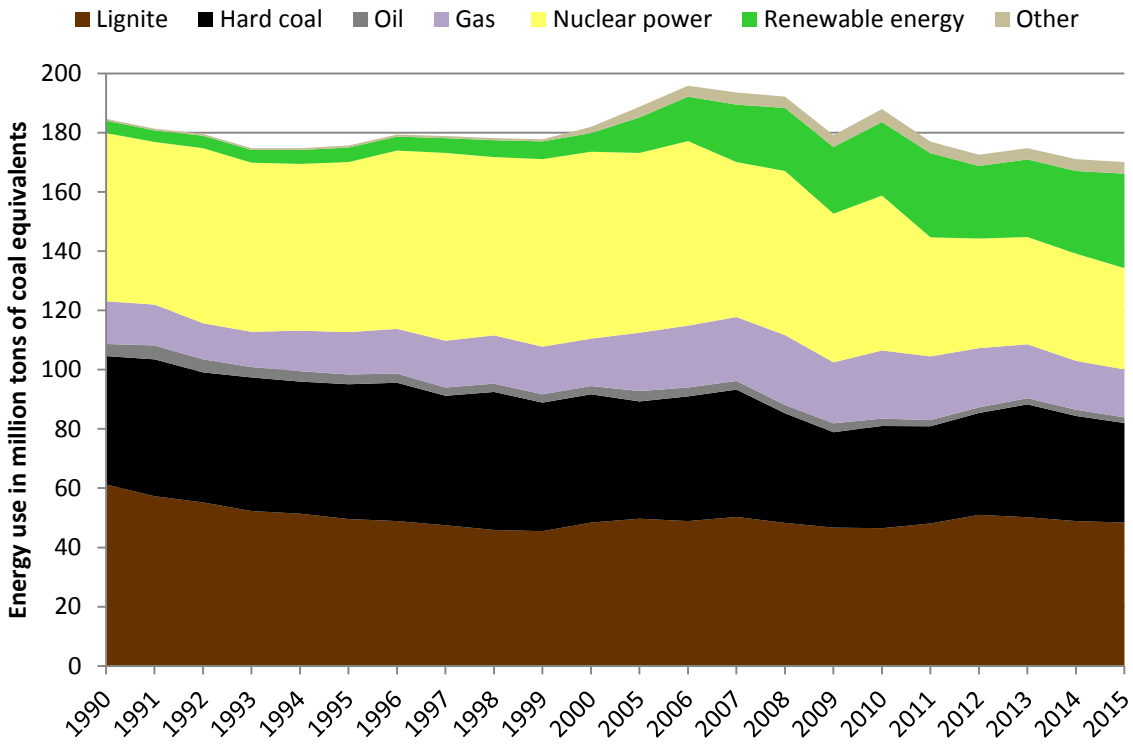

Figure 1.3: Use of energy sources for electricity production in Germany 1990-2015. Data for 2015 are preliminary. "Other" includes pumped-storage hydroelectricity. Source: AGEB (2016).

1.3.1 Dynamics originate in discourses over nuclear energy

Today's energy transition discourse in Germany has historic roots in the conflict over nuclear energy, which emerged around 1970 and remained a major controversy until Fukushima in 2011. In post-war Germany, energy supply rested on coal (Figure 1.2). Nuclear power at first was a military concern in the first place, and German governments most likely continued to hedge a military interest in the use of nuclear power after 1945, although they could not do so openly (Radkau and Hahn, 2013, pp. 120, 213). In an effort to build a positive image of nuclear power, which since the atomic bombing of Hiroshima and Nagasaki was associated with death and destruction, scientists and the media in the 1950s launched the vision of the "nuclear age", which presented nuclear power as a super-technology that would enhance civil human life in manifold ways (Geels and Verhees, 2011; Radkau and Hahn, 2013, pp. 56–78). Walt Disney's childrens' book "Our Friend, the Atom" spread the word (Disney and Haber, 1958), as well as German authors cheering that "we will live through atoms" (Löwenthal and Hausen, 1956).

The civilian use of nuclear energy in Germany was promoted by the Ministry of Atomic Affairs, which later became the Ministry of Research and Technology. Politicians of all three major political parties (Christian Democrats, Social Democrats, and Free Democrats) were responsive to pro-nuclear arguments that came mostly from research and development. They supported nuclear power and in fact forced its introduction against the reluctance of energy companies, with federal government investing billions in the technology. Commercial use began in the late 1960s (Hake et al., 2015, p. 3; Renn and Marshall, 2016, p. 227).

Anti-nuclear protests began to form in the late 1960s. Very diverse groups of people joined forces in the movement. It was linked to the 1968 socialist and student protests and to the peace movement against nuclear armament in Western Europe, but it also included farmers and local citizens who opposed power plants or storage of radioactive waste in their neighborhoods (Radkau and Hahn, 2013, pp. 302–303). The anti-nuclear movement had large publicity through partly violent and spectacular protests, and was successful in stopping a number of nuclear projects in court. It also played a large role in the formation of the Green Party in 1980. Sensitivity to environmental risks from nuclear power was high among Germans, and after Chernobyl in 1986, the majority of the population opposed nuclear power. In the densely populated country and with nuclear weapons use a looming possibility during the cold war, many people perceived nuclear power as a dramatic threat to their personal lives (Pausewang, 1987, 1985).

Chernobyl also made the previous consensus among established parties crumble, Social Democrats abandoning their support for nuclear energy (Hake et al., 2015; Radkau and Hahn, 2013; Renn and Marshall, 2016, p. 228). Over the years, the anti-nuclear movement mobilized support by societal actors in policy-making, administration, the courts and science, and increasingly acquired own technical expertise and political standing (Radkau and Hahn, 2013, pp. 305-306). Federal policy on nuclear power changed when a coalition of Social Democrats and the Green Party was elected in 1998. The new government negotiated a scheme for nuclear phase-out with the utilities and adopted it against the resistance of conservatives and liberals, who in 2009 reversed the policy. After Fukushima in 2011, however, Christian and Free Democrats changed their position to confirm and accelerate nuclear phase-out (Schreurs, 2013).

The conflict over nuclear power turned energy policy from a quiet realm of experts to a deeply polarized public debate. The anti-nuclear discourse is at the core of the identity of many

environmental organizations and of the Green Party, and it is historically linked to a critical stance vis-á-vis the political establishment and its linkages with energy business. While the conflict over nuclear is now history, it has dug trenches in German society that partly persist. It was associated with values and feelings of identity that still reverberate with today's political landscape and constituted the basis for subsequent climate-related discourses. At the same time, the conflict over nuclear power forced policy actors to acknowledge that different energy futures were possible, and to start thinking in terms of energy paths and scenarios. In response to the anti-nuclear protests, the German Federal Parliament set up a commission to discuss future nuclear energy policy in 1979, which was followed by parliamentary commissions on environment, climate and energy issues that started work in 1987, 1992 and 2000.[1] Enabling extended dialogue across parties and involving scientists and experts, these commissions established a new culture of discussion and of dealing with uncertainty (Altenburg, 2010).

1.3.2 Renewables support quietly sets energy transition in motion

The perceived success of German energy transition is linked closely to the increase in electricity production from renewables that has taken place over the past decades (Figure 1.3). This development was not foreseen, however, when the first modest policy efforts at renewables support were introduced.

While Federal Government had invested billions in R&D funding on nuclear power by 1980, towards the end of the 1970s – after the oil crisis – R&D programs were set up also for renewable energy, so that small niche markets began to form (Jacobsson and Lauber, 2006, p. 263). In the 1980s, when Chernobyl reduced the acceptance of nuclear power and climate change rose to the top list of environmental policy concerns, legitimacy of renewable energy support was further enhanced. In 1991 the Electricity Feed-In Tariff Act (*Stromeinspeisegesetz*) entered into force, which required utilities to connect renewable electricity generators to the grid and buy the electricity at a price defined as a percentage of the average tariff for final customers. The law was initiated by conservative and green parliamentarians and passed with the support of a large majority.

With political debates in this period focused on German reunification, and with utilities busy taking over the East German electricity sector, the Feed-In Tariff law was not perceived as a significant threat by incumbent actors. Conservative supporters considered renewables as a helpful additional option, but not as capable of constituting substantial shares of supply in the foreseeable future. The law did, however, lead to a considerable expansion of the market for renewable energy and to a strengthening of actors related to the new technologies, such as renewable energy associations (Jacobsson and Lauber, 2006, pp. 264–265). The share of renewables in gross electricity production increased from 3.6 percent in 1990 to 5.2 percent in 1999 (AGEB, 2017).

The Renewable Energy Sources Act (EEG), introduced by the Social Democrat-Green government in 2000, significantly improved conditions for wind and solar energy investors. It introduced fixed rates that were guaranteed for 20 years, with rates declining every year for new installations. Through a

[1] Enquete-Kommission „Zukünftige Kernenergiepolitik" (1979-1983); Enquete-Kommission „Vorsorge zum Schutz der Erdatmosphäre" (1987-1995), Enquete-Kommission „Schutz des Menschen und der Umwelt" (1992-1998), Enquete-Kommission „Nachhaltige Energieversorgung unter den Bedingungen der Globalisierung und der Liberalisierung" (2000-2002).

surcharge on electricity prices, consumers compensate the difference between market prices and the guaranteed feed-in tariffs. By contrast to the 1991 Feed-In Tariff law, the EEG was not adopted in broad consensus, but opposed by Christian and Free Democrats. It led to an acceleration of renewables expansion, with electricity produced from renewable sources making up 10 percent of electricity production in 2005, 16.5 percent in 2010, and 29 percent in 2015 (AGEB, 2017). The EEG was amended several times, but, despite the original opposition, not abolished by subsequent Christian Democrat-led governments. While, as shown above, early energy transition ideas were closely related to anti-nuclear sentiments, climate protection soon became a major legitimating argument for renewables support. Since the first EEG 2000, "climate and environmental protection" are named in §1 as priority aim of the law.

The actual and projected increases in renewable electricity production created new challenges. A steep increase of the EEG-surcharge, and thus of the overall volume of money paid by consumers, began to take shape after 2009. Calls for reform to keep costs under control and to improve incentives for greater market orientation became more urgent. The guaranteed fixed-price payment of the EEG did not encourage demand-oriented feed-in behavior, but rather set incentives to maximize the overall volume of electricity generated. With increasing shares of renewable energy and given the limited possibilities for electricity storage, this gave rise to turbulences on the electricity market, including negative prices at times of high (renewable) electricity production and low demand (BMWi, 2012, p. 31). Legislative changes attempted to respond for instance by considerably reducing feed-in tariffs for photovoltaics, and by increasing incentives for direct marketing by plant operators.

The EEG has always been challenged in terms of its economic efficiency, and criticized as a subsidy and a state intervention into the choice of technologies by Christian and Free Democrats. After the start of the European emissions trading scheme (EU ETS) in 2005, its environmental effectiveness has also been questioned based on the fact that under the EU-wide cap for carbon dioxide emissions, national additional measures are at high risk of being neutralized by rising emissions in other EU countries (Fankhauser et al., 2010). More recently, the feed-in tariff system is also being criticized in social terms, with the argument that private, often wealthier, producers of renewable energy enjoy a guaranteed income from the tariffs which is paid for also by poorer parts of the population (Renn and Marshall, 2016, p. 231). From the point of view of economic efficiency, "neater" concepts have been proposed regularly, such as quota systems or pricing carbon dioxide through a tax or reformed emissions trading (Edenhofer et al., 2017, 2015; Monopolkommission, 2011; SVR, 2011).

From a political economy perspective, however, the EEG's feed-in tariffs may be seen as performing exceptionally well. As Meckling et al. (2015) argue, providing economic benefits to low-carbon industries creates new economic stakeholders that join coalitions for progressive policies, defend existing policies and support further measures. This seems to be improving the conditions for stronger regulation for decarbonization. By contrast, policy measures that are theoretically more efficient, such as pricing carbon, usually impose costs on few powerful incumbent actors while benefits are weak and dispersed among many, which means that they meet strong resistance and often fail or are weakened by accommodating the interests of polluters. From the regulators' perspective, support to renewables is attractive because it can be implemented realistically, whereas powerful incumbent actors would employ their lobbying power to oppose instruments that more directly target their interests (Gawel et al., 2016). Later however, it may in turn prove difficult to adapt renewables support policies to new challenges, such as integrating high shares of volatile

renewables into the system without compromising supply security, due to the new lobbies that now oppose change. Whether the EEG is assessed as a successful policy instrument or a waste of public resources thus depends on the perspective: whether it is about the search for an ideal policy, or for ways that "enable the transition to proceed" at all in a complex setting of interests and actors that allow for incremental change only (Gawel et al., 2016, p. 12).

1.3.3 Coal is today's elephant unwilling to leave the room

Coal has been a major pillar of German energy supply for decades (Figures 1.2 and 1.3). Today, nuclear phase-out is politically settled and no longer binds the resources of environmental campaigners, renewable energies are envisaged to provide the main basis of the system, and climate protection is a key policy priority. In this context, the future of coal is rising to the top of the agenda. The connotation of coal power has changed dramatically – from "unchallenged champion" (Renn and Marshall, 2016, p. 227) in the 1950s to "enemy number one" in today's climate change-sensitive energy transition discourse.

In the 1950s, coal power accounted for almost 90% of primary energy consumption. Industrialization in the 19th century and the two world wars had kept the demand for coal and steel high and created a strong industry, which also played a key role for rebuilding the country after 1945. Coal and steel also were at the center of the first efforts for a European unification. Towards the end of the 1950s, however, domestic hard coal began to be replaced by oil and cheaper imported coal. Massive subsidization was put in place. It did not succeed in ensuring the competitiveness of German hard coal, but was kept up as long as 2007 when a decision was made to phase-out hard coal subsidies until 2018. Coal policies and mining subsidies were supported by the Social Democrats, who were traditionally closely affiliated with coal workers organized in influential union IGBCE (*Industriegewerkschaft Bergbau, Chemie, Energie*), but also by the Christian Democrats. The environmental movement for a long time focused activism on nuclear power, with anti-coal and anti-mining protests remaining at low intensity (Hake et al., 2015; Renn and Marshall, 2016).

The decline of hard coal mining entailed major structural changes in the affected regions. While mining in the West German hard coal regions employed up to 600.000 people in the 1950s, less than 10.000 work there today (Statistik der Kohlenwirtschaft, 2017a). While the decline of mining was certainly associated with negative experiences for affected workers, efforts to develop new business and to redefine and reuse old industrial sites for cultural purposes, tourism, and recreation have been successful more recently (Baur and Schwartzkopff, 2015, p. 26). In contrast to hard coal, domestic lignite is still competitive, since transport of the resource over large distances and thus import is not economical due to its high water content. Abrupt structural change has taken place in the former GDR, where lignite had been the central energy source until 1989, but where major capacities were abandoned after re-unification and more than 86.000 jobs were lost between 1990 and 1995 (AGORA Energiewende, 2016, pp. 35-36; Statistik der Kohlenwirtschaft, 2017b).

The use of coal for electricity production has declined over the past decades. In 1990, coal made up 56 percent of gross electricity production, with the production from hard coal and lignite amounting to 141 and 171 billion kWh respectively. In 2016, coal provided 40 percent of gross electricity production, with contributions from hard coal and lignite at 111 and 150 billion kWh (AGEB, 2017). However, the decrease in coal power use does not parallel the increase in renewables. Between 2011 and 2013 carbon dioxide emissions from coal use actually increased, mostly due to low prices for

carbon dioxide emission certificates in the EU ETS which made coal more economical than gas. This "climate paradox" (Graichen et al., 2014) or "coal conundrum" (Jungjohann and Morris, 2014) has given rise to concerns over the prospects of German energy transition and the achievement of national climate targets. In response, environmental organizations have started calling for a coal phase-out. This recently unfolding argument adds a new quality to German energy transition debates. While the promotion of innovations and new structures has long been the focus, policy-making might now have to turn towards the less pleasant issue of exiting from established non-sustainable infrastructures and technologies (Heyen, 2016; Kivimaa and Kern, 2016).

1.3.4 Insights from recent literature: actors, discourses and the science-policy interface

The following section highlights some insights from the more recent literature on actors and their discursive strategies in German energy transition that are particularly relevant as context of this thesis. It also briefly reviews key studies on the role of scientific policy advice as a background to Chapter 3.

Generally, actors in German energy policy have been observed to form coalitions around two antagonist positions: one promoting energy transition and ambitious climate and renewable energy targets and policies (here labeled proactive coalition), one sceptical or opposed and more oriented towards the status quo (here labeled reactive coalition) (Gründinger, 2015, pp. 111–112; Hirschl, 2008, pp. 192–196; Joas, 2013; Maatsch, 2013; Reiche, 2004, pp. 139–144). Table 3.1 (p. 56) provides an overview of coalitions and discourses. The proactive coalition is led by environmental NGOs, the Green Party and environmental experts in other parties and Green business associations. In the reactive coalition, ties between the large energy companies, conventional industry associations, the mining labor union IGBCE and the established parties (Christian, Social and Free Democrats) come to bear. The Ministry for economic affairs (BMWi) is perceived as the "chief ally" of energy utilities in government (Jacobsson and Lauber, 2006, p. 261), while the Ministry for Environment (BMU/BMUB) traditionally sides with the proactive coalition. Research institutes and advisory bodies also often join coalitions and have played an important role in driving discursive dynamics (see Chapter 3).

A number of recent books and papers add more differentiated and specific insights into the role of actors and the development of discourses. The role of interest groups and of incumbent actors has been investigated by Gründinger (2015) and Kungl (2015). Gründinger (2015) shows how new actors competing with the fossil and nuclear incumbent industry acquired power over time, and how this led to more pluralism in lobbying and interest intermediation. He argues that trust became more relevant as a factor in the competition for asserting interests to policy-makers, while economic power has declined in relevance. According to the study, mainstream parties – Social Democrats and Christian Democrats – were under pressure to "green" their profile in order to respond to the concerns of increasing numbers of people voting for the Green Party, and in order to access them as potential coalition partner, which contributes to explaining the consensus among political parties on fundamental environmental policy goals. At the same time, the four big energy companies as the major incumbent actors were slow to adjust to changes in their situation which resulted from public and interest group pressure and state interventions for energy transition (Kungl, 2015). Kungl diagnoses re-orientation only in response to crisis after 2011. However, differences in power plant inventories and shareholder structure also led to different pressures experienced and strategies developed by the four big electricity companies.

Schmid et al. (2016) review German energy transition integrating the perspectives of technologies, actors and institutions. Focusing on the degree of centralization envisaged for the future energy system, they show that actors involved in the policy process differ strongly with respect to their motives and underlying worldviews. They argue that the decision for more or less decentralized structures depends not so much on technological constraints, but that it will have to be made in the political arena. They conclude that a greater sensitivity to normative aspects is imperative when debating energy futures.

Joas et al. (2016) explore the current discourse among policy experts on energy transition, asking how they prioritize the different goals energy transition may be claimed to achieve. They find that most policy experts in Germany see climate change as the most important, but not the only goal of energy transition. The majority of experts would in fact favor energy transition even if climate change did not exist. Given the complexity of goals and motivations driving the Energiewende and potential discrepancies between them, the authors recommend a public debate to identify the priority goals.

Grasselt (2016) investigates the interesting period between 2009 and 2013, when a governing coalition of Christian and Free Democrats, traditionally sceptical, adopted ownership of the energy transition project including nuclear phase-out. Grasselt looks at argumentative patterns of the conservative-liberal Federal Government of this period and the effects of their discursive strategies. The study shows that on the one hand, the conservative-liberal coalition embraced the key aim of transformation towards a renewables-based system, but that on the other, they considered themselves in charge of reconciling the project with their own paradigms of economic efficiency, market principles, and rationalization. This effort created a high discursive tension, and argumentation of government after 2009 wavered between ambition and scepticism. Grasselt argues that the conservative-liberal coalition, by reducing the normative power of ecological aims in energy transition, de-mystified the energy transition project. The study, moreover, raises the question whether the alleged commitment of conservative and liberal actors to energy transition is sincere or strategic, and indicates that the perceptions among the members of these parties vis-á-vis energy transition are not homogenous.

The discursive dynamics that accompanied the shifting relevance between renewable and conventional energies are highlighted by Lauber and Jacobsson (2016), Strunz (2014) and Hermwille (2016). Lauber and Jacobsson (2016) show how protected space for renewable energies was discursively constructed and contested over the years. While in the context of the initial 1990 Feed-in Law renewable energies were framed as an additional energy source of probably marginal relevance, the EEG of the year 2000 already envisaged renewable energy to become the “mainstay of power supply” (p. 160). Lauber and Jacobsson argue that framings around the 2014 EEG reform changed again dramatically, with the current trend to greater emphasis on (non-external) costs representing the defensive reaction of the incumbent industry. Strunz (2014) illustrates how with energy transition becoming a consensual aim, a key framing of the fossil-nuclear narrative, namely the presentation of renewables as marginal and unable to contribute significant shares of energy, had to be adjusted, and how this required the conventional technologies to be framed as “bridging” solutions that ensured supply security during a transitional period only. According to the study, the changes in narratives reflect the erosion of the fossil-nuclear regime’s resilience.

Hermwille (2016) focuses on the interplay between the Fukushima Daiichi disaster and the narratives on nuclear energy prevailing in three countries, among them Germany. He shows that as an external

shock Fukushima amplified the perception of risks from nuclear that constituted one of two competing narratives on nuclear energy. A narrative presenting nuclear as an uncontrollable threat was boosted, while the competing narrative of nuclear as a bridging technology "virtually vanished from official statements" after 2011 (p. 16). Hermwille argues that the constellation of nuclear narratives, together with the existence of a positive and credible narrative on renewable energy, explains the unique policy response in Germany to the Fukushima event.

The relationship between science and policy, which is the focus of Chapter 3 of this thesis, has been explored widely in the context of climate policy (Beck, 2009; Kowarsch, 2016; Leuschner, 2012). For German energy transition, Dieckhoff (2015) and Schmid (2013) offer relevant insights into the role of scenario modelling as a key tool of scientific policy advisors. Dieckhoff (2015) investigates how energy scenarios are explained and understood by modelers, and to what extent the commissioning actors are involved in their creation. His analysis shows that while scenarios are valuable as decision support instruments in situations where there are manifold possible future developments, there are limitations and challenges related to the specific nature of the knowledge they contain, and related to the process of their creation, which need to be considered and made transparent. Similarly, Schmid (2013) argues that the techno-economic assumptions in modelling and institutional requirements for implementation of the policies need to be made more transparent. Her results also confirm that scenario creation is often driven by normative targets, with input parameters being determined based on expert judgements and thus most likely chosen in a way that allows for an achievement of these targets.

1.4 Objective and outline

The review of German energy transition in Section 1.3 shows that a fundamental change in political strategy and policies was interwoven with similarly fundamental changes in discourse. Change was, however, mostly evolutionary rather than revolutionary (Hake et al., 2015), with small changes in policy, introduced during historic windows of opportunity, triggering self-reinforcing dynamics that eventually led to more significant impacts. At the same time, external shocks such as Chernobyl and Fukushima also played a role in enabling policy change.

During the process, actors have tended to group in two opposed coalitions. The review of relevant literature on the one hand points to deep-seated differences in positions and a considerable degree of polarization. On the other hand, there is a general agreement on the basic and long-term goals of energy transition today, and actors have been shown to adjust their framings and narratives over time. Moreover, institutionalized dialogue between opponents, for instance in parliamentary commissions, has been a constant feature of German environmental and energy policy-making.

While many aspects of the interplay between actors, discourses and policy change have been investigated, understanding of the discursive dimension of energy transition remains incomplete. This thesis is guided by the observation that in the German debate on energy transition, polarization among actors can be observed as well as a convergence of discourses towards consensual aims and strategies. It aims to contribute to the literature by exploring the following overarching research theme:

Is the contemporary German energy debate more strongly characterized by a persistent polarization between opponent positions, or by a convergence of discourses towards consensus? Have discursive practices contributed to overcoming deep-seated conflicts, or have they stabilized existing polarization?

The question whether polarization or convergence is the more relevant trend holds implications for the future prospects of energy transition. If discourse convergence was robust and far progressed, and if it overlaid the remains of polarizing differences in values and beliefs about energy policy, this would imply that Germany's energy transition is safely on track. Controversy should then only be expected over the best ways of implementation, but not over the direction of energy system development in broad terms. Conversely, the apparent consensus on energy transition might be superficial, relating to vague ideas and a distant future only, hiding a persistent underlying polarization between perspectives on the energy system. In this second case, consensus would be put into question easily, and further progress of the transition towards a renewables-based energy system would be all but guaranteed.

The three core chapters of this thesis address this theme from different perspectives, each addressing one of the following specific research questions.

1. **How did energy discourses in German Federal Parliament evolve over the past three decades?**
2. **How did scientific policy advice interact with the evolution of energy discourses and narratives?**
3. **How does the current debate on the future of coal relate to the historic energy transition discourse, and what are prospects for constructive dialogue and consensus?**

Chapter 2 investigates energy debates in Federal Parliament, using the speeches of Members of Parliament of the different political parties as a proxy for the variation of positions in the wider societal debate. The research identifies discourses and traces their development from the first emergence of energy transition as a concept in the late 1980s until the formation of political consensus in 2011. In a content analysis based on a coding of speeches, two major discourses and their story-lines are described. The chapter analyzes their evolution over time and shows how the energy transition discourse became hegemonic. It offers an interpretation of the apparent convergence of discourses across political parties. The text has been published in *Innovation: The European Journal of Social Science Research* as part of a Special Issue on Energy and Culture.[2]

Chapter 3 investigates the role of scientific policy advice (SPA) in the discursive dynamics of German energy transition. Scientists, research institutes, think tanks and advisory bodies have always been involved in energy debates. They have proactively provided impulses and been commissioned with research to facilitate political decision-making. This chapter asks whether SPA has contributed to convergence or cemented polarization of discourses. The research draws on the Advocacy Coalition Framework (ACF) and the literature on narratives, and is empirically based on a qualitative text analysis of 50 SPA reports. It analyzes the relationship between SPA reports and the discourses and narratives of the two advocacy coalitions, and offers a hypothesis on how the contributions of

[2] Leipprand, A., Flachsland, C., Pahle, M., 2017. Energy transition on the rise: discourses on energy future in the German parliament. *Innovation: The European Journal of Social Science Research* 30, 283–305. doi:10.1080/13511610.2016.1215241.

scientific policy advisors may have interacted with the evolution of energy discourses. The chapter has been published in *Energy Policy*.[3]

Chapter 4 focuses on the future of coal power as a particularly controversial and qualitatively new issue in today's German energy transition debate. Given its high potential for conflict, the future-of-coal debate serves to challenge the hypothesis of discourse convergence and suggests that polarization has not yet been overcome. Drawing on transition theory and framing analysis, this chapter reconstructs the debate against the background of traditional energy discourses as analyzed in Chapters 2 and 3. A qualitative text analysis is performed on documents for public consumption in order to identify the contents and dynamics of framing struggles. The chapter goes beyond outlining the newly highlighted lines of conflict, and aims to contribute to overcoming polarization and identifying scope for compromise by comparing the solution space as seen by opponent actors. The text is under review at *Energy Research and Social Science*.[4]

Chapter 5 summarizes the results of the three core chapters (2-4) and discusses their contributions to the overarching research theme. It also reflects on the theories and methods used in the thesis, and it provides an outlook on possible future research.

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[4] As Leipprand, A., Flachsland, C. Global climate, local jobs: Framing struggles in the German debate on the future of coal.

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2 Energy discourses in Federal Parliament 1989-2011*

Anna Leipprand
Christian Flachsland
Michael Pahle

Abstract

In this paper we describe energy policy discourses and their story-lines in German parliamentary debates, and trace their evolution over the past decades. Through content analysis and coding with MAXQDA, changes in the discourses and in the use of story-lines by different political parties are analyzed. Our study shows that while the concept of a transition towards a nuclear-free, renewables-based energy system became hegemonic within three decades, the discourse itself underwent major changes. Energy Transition was de-radicalized and became part of a discourse of Ecological Modernization, thus aligning with mainstream economic logic. There are still considerable differences in the story-lines narrated by parliamentarians about pathways to Energy Transition and its effects. Discursive struggles into the meaning and the means of the transition project continue, suggesting that discourse structuration is far from complete.

Keywords: discourse analysis; story-lines; energy transition; renewable energy; energy policy; Germany

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2.1 Introduction

'Does one have to listen to this nonsense?'[1] When in 1986 a Green Party representative outlined his ideas on the future of the energy system in the German Federal Parliament, his speech was met with derision by the well-established parties (Deutscher Bundestag 1986, 17725). The publication by the newly founded Öko-Institut which coined the term 'Energiewende' (Krause, Bossel, and Müller-Reißmann 1980) was considered ideological and non-rational by mainstream scientists at the time (Schmitz and Voß 1980). Three decades later, in 2011, the transition to a renewables-based, nuclear-free energy supply was declared a national project by a conservative-liberal government. Today, 'Energiewende' is embraced by a large majority of policy actors in Germany (Joas et al. 2016), and the term (here translated as energy transition) is spreading around the globe (Hockenos 2012).

Shifts in the German political discourse on energy over recent decades have been intertwined with processes of changing power constellations, societal dynamics and a number of path-defining policy decisions (Hake et al. 2015; Strunz 2014). While the movement against nuclear power has been fueled by salient external events such as the Chernobyl and Fukushima accidents, renewable energy has expanded more continuously and largely through national political processes and decisions. Over time and in interaction with these developments, statements of policy actors on the feasibility of major changes in the energy system, on the effects of a transition, and on the boundary conditions and goals of energy policy have changed remarkably.

However, do these changes imply that the Energy Transition discourse of the early pioneers has become hegemonic? To what degree did the discourse itself adjust, adapt and change on its way to hegemony? Do representatives of the political parties today really share the same discourse, or do they tell different stories under the same label? In this paper we take a closer look at energy debates in the German Federal parliament in a historical perspective, in order to better understand the dynamics of the fundamental discursive changes that have taken place.

By drawing on discourse analysis, we take an 'idea-based perspective on the policy process, assuming that […] policymaking tends to be about institutionalizing policy ideas in a competitive political environment' (Winkel et al. 2011, 372). Idea-based perspectives help to address the social and cultural dimensions of policy problems that at first glance seem to be of a technical or physical nature. We assume that ideas play a particularly important role in large-scale transition projects which, entailing fundamental changes in economic structures and living conditions, affect virtually all members of society. Such transitions may challenge major discursive pillars on which legitimacy and political support for existing regulation, markets, business models, individual behavior and political ideas rest. While technical details may be dealt with by relatively small groups of experts, the overall debate involves major parts of society and requires exchange between experts, policy makers, media and the public.

It has been previously shown in analyses of framings, discourses and policy narratives that ideas and conceptualizations of energy policy problems are important for policy outcomes. Scrase and Ockwell (2010) argue that overcoming existing high-carbon energy policies will require a reframing of problems and solutions in a way that speaks to core government priorities such as economic growth

[1] All citations from parliamentary debates in this paper were translated into English by the authors.

and national security. The implementation of energy transition policies may be hindered by policy narratives that strengthen the status quo (Curran 2012). Tensions and emerging shifts in story-lines may be an indicator for imminent changes of coalitions and power relations within national energy regimes (Bosman et al. 2014). Discursive structures of the debate on hydraulic fracturing in Germany have been shown to be reflected in the legislative process on this novel technology (Schirrmeister 2014). Thus, investigating discourses on policy can make a contribution to understanding and possibly better managing the policy processes in question.

Our study contributes an analysis of the discursive dimension and evolution of story-lines during a constitutive phase of German energy transition to the large body of research that already exists on its technical, economic and political implications. Our research questions are: (1) what major discourses on the energy future have been present in the German Parliament in the past three decades, (2) how did the discourses evolve over time and (3) how can the apparent convergence of discourses across political parties be interpreted? By addressing the first question we want to better understand parliamentary arguments by looking at them from a discourse perspective. Through the second and third question we aim to trace and understand changes in the discourses themselves and in the story-lines used by different actors. The analysis reveals that while the general concept of an Energy Transition clearly became hegemonic, parliamentarians continue to tell different stories about pathways to achieve it and about the side-effects of the transition. Discursive struggles into the meaning and the means of Energy Transition continue.

2.2 Research design

2.2.1 Discourse analysis

Adopting a constructivist approach, our research starts from the assumption that the meaning of objects and processes is socially constructed through the use of language (Fischer 2003, 48; Keller 2011, 9). Contemporary policy problems are often so complex that understanding remains limited and uncertainty high, no matter how much scientific research is undertaken. In addition, facts and values are closely entangled, not only in everyday discourse, but also in scientific argument (Kowarsch, 2016, section 5.2). Humans have no choice but to construct their social realities based on limited information and previously acquired values and beliefs. There are good reasons to be skeptical ‘toward claims of single rationality and objective truth’ (Feindt and Oels 2005, 163), and to assume that the ‘struggle over ideas’ plays an essential part in policy processes (Stone 2012, 13).

For our analysis of parliamentary debates, we draw on discourse analysis and on the literature on policy stories and policy narratives. With Hajer (1995) we understand discourse to be ‘a specific ensemble of ideas, concepts and categorizations that are produced, reproduced, and transformed in a particular set of practices and through which meaning is given to physical and social realities’ (44). There may be several or multiple social constructions of a single reality (Hajer and Versteeg 2005, 176), that is, different co-existing discourses. Discourses are collectively produced and used, representing ‘shared ways of apprehending the world’ (Dryzek 2005, 9). Different discourses may be promoted by competing discourse coalitions, that is, groups ‘of actors who share a social construct’ (Hajer 1993, 45) and who aim to establish their ideas as a basis for policy-making. A discourse becomes hegemonic if the conditions of both ‘discourse structuration’ and ‘discourse institutionalization’ are met. Discourse structuration occurs when actors are under pressure to draw

on a certain discourse in order to be credible, or when the discourse dominates the conceptualization of a policy problem across actors. Discourse institutionalization occurs when a discourse is 'translated into institutional arrangements', for example, concrete policies (Hajer 1995, 60-61).

In order to reduce discursive complexity and create coherent images of problems and processes, actors make use of story-lines. Story-lines are the format in which actual everyday communication and argument between actors occurs; they are 'the medium through which actors try to impose their view of reality on others, suggest certain social positions and practices, and criticize alternative social arrangements' (Hajer 1993, 47). Discourse coalitions are formed as networks of actors using the same story-lines (Hajer 1995, 65).

Other authors who have highlighted the relevance of policy stories as a medium of political argument emphasize their structural set-up and provide helpful tools for their analysis. Policy stories have a plot that constructs causal relationships between events and actions; they often start with a problem and end with a solution. Recurring plot types are 'stories of decline' that claim a (rapid) worsening of the situation, predict crisis and propose action to avoid it, or 'stories of rise' that present the original state of affairs as dismal, and describe how some event or action remedies the problems and leads to widespread improvements (Stone 2012, 158-164). Policy stories typically have characters such as heroes, villains and victims, and the definition of characters and their relationships may be used as a strategic tool to attribute blame and responsibility and to create justification for action (Roe 1994, Stone 2012; McBeth, Jones, and Shanahan 2014).

Our analysis is based on a content analysis of transcripts of parliamentary debates. Coding is used to construct competing discourses from parliamentarians' accounts, to identify the story-lines they use and to trace their development over time. Since we look at one type of actor only – parliamentarians as members of parliamentary groups – the definition of discourse coalitions is beyond the scope of this paper. However, studies on German energy policy in an advocacy coalition framework (ACF) perspective (e.g. Jenkins-Smith et al. 2014) are informative to illustrate the different parties' positions in the wider society's argumentative landscape.[2]

During the period covered by our analysis, there were five parliamentary party groups in the German Bundestag: Christian Democratic and Christian Social Union (CDU/CSU, conservatives), Social Democratic Party (SPD), Free Democratic Party (FDP, liberals), Green Party (Alliance 90/The Greens since 1993) and Left Party (PDS – Party of Democratic Socialism between 1990 and 2007). ACF studies on German energy policy usually sketch a dichotomy between an 'ecological' coalition in favor of energy transition or of ambitious expansion of renewables and an 'economic' coalition opposed to these goals. The Green Party and the Social Democrats (SPD) tend to be positioned in the ecological coalition, with the Christian Democrats (CDU/CSU) and the Free Democrats (FDP) in the economic coalition. However the large CDU/CSU and SPD parties may include members of both coalitions, and lines have become blurred more recently (Hirschl 2007, 192–196; Joas 2013, 36–46; Reiche 2004, 139–144).

In order to show how the story-lines put forward by parliamentarians are grounded in overarching worldviews, we look at the relationship between energy discourse and the broader discourses on

[2] Although the ACF and Hajer's discourse coalition approach are based on different epistemological assumptions, there is a certain amount of comparability (Winkel et al. 2011).

environment and economy. Here we draw on Dryzek's (2005) work, which describes different environmental discourses classifying them as either 'reformist' or 'radical' based on their stance towards the dominant economic paradigm; a 'general overarching commitment to growth in the quantity of goods and services' (13). We hypothesize that energy discourses that resonate with *reformist* environmental discourses are more likely to become widespread or hegemonic, because they will not tend to entail a 'radical redistribution of power or wealth' (Stone 1989, 294), rather being compatible with core imperatives of policy-making such as sustaining economic growth (Dryzek 2003, 1 and 11; Scrase and Ockwell 2010).

2.2.2 Selection of time periods

We are interested in the dynamics of German federal parliamentary debates between the late 1980s, when parliamentarians started talking about Energy Transition, and 2011, when the government officially adopted plans to build an energy supply without nuclear, based mainly on renewable energy, by 2050. While the violent conflicts around nuclear energy certainly prepared the ground for later developments (Hake et al. 2015, 4), the notion of an Energy Transition required renewable energy to become conceivable and eventually available as an alternative. Therefore, our analysis focuses on three time periods that encompass major policy decisions which shaped the way renewable energy was promoted and laid the ground for their substantial expansion. The second and third period also include major policy decisions on the future of nuclear power. The policy developments captured by these three periods correspond to major 'path defining developments' for German energy transition identified by Hake et al. (2015). An analysis of energy policy debates from these three periods provides a snapshot of parliamentary arguments during decisive legislative moments.

Period 1: 1989-1991. During this period, the first feed-in tariff law for renewable energies (Electricity Feed-In Tariff Act) entered into force. It required utilities to connect renewable electricity generators to the grid and buy electricity at a price defined as a percentage of the average tariff for final customers. Its financial implications were thought to be minor, and minds were focused on the challenges of German reunification at the time (Berchem 2006), so the law received limited attention in parliament. It was passed with the support of a large majority of MPs in 1990, and led to a considerable expansion of the market for renewable energy (Jacobsson and Lauber 2006, 264). The share of renewables in gross electricity consumption increased from 3.4% in 1990 to 5.2% in 1999 (BMWi and AGEE 2015). Conflicts over nuclear energy ran deep in this period. After the Chernobyl accident in 1986, the majority of the German population was opposed to nuclear power (Radkau and Hahn 2013, 309), while the conservative-liberal government under Chancellor Helmut Kohl held on to it. Around the time of period 1, policy-makers started to acknowledge climate change as a serious problem (e.g. Kohl 1987).

Period 2: 1999-2001. In this period, the newly elected Social Democrat-Green government passed the Renewable Energy Sources Act (EEG) and made an agreement with the energy industry to phase out nuclear power. Both policies were fiercely opposed by Christian and Free Democrats. After the liberalization of energy markets in 1998, electricity prices had dropped, and with them the feed-in tariffs to which they were linked. The EEG introduced fixed rates that were guaranteed for 20 years and declined every year for new installations. Feed-in tariffs were financed through the EEG surcharge which was paid by all electricity consumers. The EEG further accelerated the expansion of

renewables: by 2009, electricity produced from renewable sources made up 16.3 percent of consumption (BMWi and AGEE 2015, 5; 7).

Period 3: 2009-2011. At the beginning of period 3, the conservative-liberal government launched an initiative to extend the lifetime of nuclear power plants, thus reactivating the large anti-nuclear protest potential within the population. This decision was part of a more comprehensive energy concept (BMWi and BMU 2010), which contained ambitious long-term targets for renewables development (shares of 80% in electricity and 60% in total energy consumption) and greenhouse gas emissions (cutback of 80-95% compared to 1990) until 2050. After the Fukushima Daiichi disaster in 2011, the extension of nuclear power plant life spans was reversed, and a legislative package on energy transition was passed.

2.2.3 Document sample

The empirical work in this study is based on plenary debates in the German Federal Parliament (*Bundestag*). We assume that speeches of parliamentarians of the different political parties reflect wider societal debates to a significant degree. Members of parliament (MPs) are situated at the interface of policy, science and society: they interact with the media and scientists, being informed about relevant scientific publications through their secretariats and scientific services, and for example through their offices in their electoral districts they can be expected to be in touch with the general public. As elected representatives, and as members of a legislative body at the federal level, their views expressed in parliament can be considered both representative of public opinion and influential for the policy process. In the scoping phase of the research, approximately 100 speeches of members of government (chancellors, ministers of environment and ministers of economic affairs) between 1980 and 2014, before and outside of parliament, were screened.[3] Relevant political documents as well as texts by pioneer writers on Energy Transition (e.g. Huber 1982; Krause, Bossel, and Müller-Reißmann 1980; Scheer 1989, 1999) were evaluated as background information to better understand the origins of the Energy Transition discourse.

We selected five transcripts of plenary debates for each of the three periods. Transcripts were retrieved from the parliament's database (http://pdok.bundestag.de/). Key word searches were conducted for each period, using terms such as '(promotion of) renewable energy', 'Energy Transition'; 'Energy Mix' and 'Renewable Energy Sources Act (EEG)' (in German). Both the number and length of debates on energy increase over time. The several dozens of plenary debate transcripts obtained were screened individually in order to identify five highly relevant debates for each period. Debates were firstly excluded where the key words featured as minor references to energy issues in other contexts (e.g. budget consultations, general debates on climate change). They were also excluded if they focused on specific or more technical aspects such as nuclear energy risk assessment, external energy policy, carbon capture and storage, and grid management or grid extension. From the remaining debates (8 in period 1, 9 in period 2 and 17 in period 3), we selected those relating to the period's major policy decisions (see above), as well as those with fundamental

[3] Speeches were retrieved from the federal government's bulletin, http://www.bundesregierung.de/Webs/Breg/DE/Service/Bulletin/_node.html. The electronic version covers documents starting from 1987. Speeches dating before 1987 were retrieved from the archive of the Federal Press Office.

arguments about the general set-up and the future of energy supply, particularly with respect to the role of renewable energies. In view of time and resource constraints, the analysis was restricted to 15 parliamentary debates (Deutscher Bundestag 1989, 1990a, 1990b, 1990c, 1991, 1999, 2000a, 2000b, 2001a, 2001b, 2010a, 2010b, 2011a, 2011b, 2011c), which were then coded using MAXQDA. Each transcript contains the speeches of several parliamentarians (typically between 10 and 30) of all parties speaking on the subject in question, often including ministers or the chancellor.

2.2.4 Coding and reconstruction of discourses and story-lines

We used a content analysis to understand and structure the statements of MPs in the parliamentary debates. Inductive coding was used to reconstruct competing discourses on energy future and the story-lines employed by parliamentarians. The analysis focuses on the most prominent elements of energy transition, that is, the expansion of renewables in the electricity sector and nuclear phase-out. We thus share a pragmatic approach with Strunz (2014, 151), who points to the fact that 'the German Energiewende discourse focuses on electricity while employing the term energy'. Text segments referring to related but less central issues and instruments (e.g. ecological tax reform, nuclear waste storage, subsidies for domestic coal, combined heat and power generation, liberalization of the energy sector and others) were not coded to keep the material manageable and focused. The coding of references to environmental discourses was based on the work of Dryzek (2005) and thus deductive. In addition to the qualitative evaluation and comparison of the coded text segments, we perform a quantitative evaluation of the codings which allows us to illustrate broad trends in the evolution of the debate.

A first draft of the code system was developed based on a screening of speeches and parliamentary debates, and was applied to six speeches and two plenary parliamentary debates for each period using MAXQDA. After the retrieval and evaluation of these preliminary codings, the system was revised. The final code system (Table 2.1) was then applied to the full set of 15 parliamentary debates. The codes were grouped into six main categories that were found to represent key components of the speakers' accounts.

(1) Motivation: Problems and challenges to energy policy
(2) Vision for the future energy system
(3) Expected effects of Energy Transition policies
(4) Policy preferences on renewable energy support
(5) International dimension
(6) Overarching environmental discourse

Table 2.1. Code system.

Category	Codes	Operational definition
Motivation	Nuclear Risk Climate Change Environment Sustainability Economic Viability Resource Scarcity Supply Security	References to these issues as challenges to energy policy or motivation for policy change.
Vision	Energy Transition	The future energy system should or will be completely or mostly based on renewable sources. Germany is heading for an Energy Transition or the 'solar age'.
	Decentralization	The energy system should be less centralized. Citizens and SMEs are important actors; the power of the big industrial energy suppliers should be reduced.
	Energy Mix	A broad energy mix is necessary. Renewables cannot replace conventional energy sources.
Effects of Energy Transition	Benefits	Renewable energy/Energy Transition policies make things better, with benefits for the environment, economy, or supply security.
	Costs and Risks	Renewable energy/Energy Transition policies make things worse. They negatively impact the environment, cause economic risks or high costs or a particular burden for poor households, or they endanger security of supply.
International dimension	Germany's Leadership	Germany's climate and renewable energy policies are particularly ambitious in the international sphere. Germany takes on a leadership role and serves as an international role model.
	International Coordination	The climate problem is global and calls for global solutions/coordinated action at international/European level. Isolated national action does not help.
Policy preferences	Support for Renewables	Renewable energy needs state support to succeed in the market.
	Market-orientation of RE Policy	The current support scheme for renewable energy is not cost-efficient; there should be a stronger role of market mechanisms.
Environmental discourse	Survivalism	References to environmental limits to growth and/or the need to place the environment above economic concerns.
	Economic Rationalism	Statements of confidence in the market and/or opposition to market intervention.
	Ecological Modernization	Statements of belief in reconcilability of environmental and economic concerns.

The same operational definitions were used for all three time periods. The codes thus represent lines of argument that are recognizable over time. The qualitative evaluation of the codings and their comparison between the periods, however, reveals more subtle changes in how these arguments are used and combined by the members of the different parties (see Section 2.3.2). We applied the codes to text segments of variable length, from several paragraphs to single sentences and words, assuming that a common argument may be evoked by a key word or brief reference.

All coded text segments were assigned an additional code for the speaker's party membership. Using the complex retrieval function and the code relations browser in MAXQDA, the use of these discourse elements by members of the different political parties was traced. The size of the parliamentary groups determines how much time is allocated to speakers in the debates (Deutscher Bundestag 2014). Thus, when interpreting the number of codings per political party (Figures 2.2, 2.3, 2.4), the differences in time taken to deliver the speech have to be considered.

The statements of individual MPs may not always exactly represent the opinion of the majority of their parliamentary party group. For instance, Hermann Scheer (SPD), pioneer writer on Energy Transition and one of the initiators of the EEG, pushed more urgently for renewable energy expansion than other Social Democrats might have done. Similarly, Norbert Röttgen (CDU) as environment minister in period 3 made statements on Energy Transition that not necessarily all members of his own party, and particularly their coalition partner FDP, are likely to have supported. Our method registers what was said in the debates, without any cross-checking for congruence with the party's majority opinion. However, the fact that these individuals spoke on energy issues in parliament on behalf of their party groups indicates that their positions were at least accepted by their colleagues.

2.3 Results

2.3.1 Two major energy discourses

From the codings we first construct two general antagonist discourses. These represent an aggregate of the accounts of the numerous parliamentarians who spoke in the debates and thus can be regarded as 'constructed text' (Yanow 1995, 113). Closest to these prototypes are the arguments of the Social Democrat-Green governing coalition ('Energy Transition') and the Christian Democrat-Free Democrat opposition ('Energy Mix') in period 2. However, there is no exclusive association between the codes and the political parties, and speakers combine the different lines of argument as represented by the codes in different ways over time. Section 2.3.2 analyzes in more detail how the story-lines of these two major discursive traditions changed and partly converged.

Energy Transition

The 'classic' Energy Transition discourse is characterized by strong environmental concerns, in particular with respect to climate change and the risks of nuclear energy, and the conviction that fundamental changes in the energy system will be needed to address them. The long-term vision is an energy system without nuclear power and based primarily on the decentralized use of renewable energy sources. The stories employed by parliamentarians promoting Energy Transition are usually 'stories of rise' (Stone 2012) and win-win situations, where the rapid expansion of clean and abundant renewable energy will build a system of environmentally friendly energy supply that will also create new jobs, benefit the economy, reduce import dependence and improve supply security:

> The renewable energies are inexhaustible, and using them saves finite fossil energy resources. They are environmentally friendly and significantly contribute to climate protection, since their use gives rise to no or very small quantities of pollutants and CO_2 emissions. Renewable energies are innovative technologies which open up new export chances and create and secure jobs particularly in small and

> medium-sized business. The Federal Government is doing everything to secure these innovative jobs for tomorrow. (Siegmar Mosdorf, SPD, in Deutscher Bundestag 2000a, 8428)

The incumbent utility companies tend to be presented as villains who obstruct the transition with the aim of securing their high profits from nuclear and coal plants: 'The electricity giants are already trying to raise dams against the logical continuation of the support to regenerative and rational energy sources' (Wolfgang Daniels, Green Party, in Deutscher Bundestag 1990c, 17754). Citizens and small businesses who invest in renewables or protest against nuclear power are the most prominent heroes in the story-line:

> However, he is right in one aspect: It is the citizens who carry out the energy transition. But they have been doing this … for almost 30 years already. The truth is that citizens have fought this through against you and your government coalition. This is what happened here … . (Sigmar Gabriel, SPD, in Deutscher Bundestag 2011c, 13371)

The benefits of Energy Transition will reach beyond German borders. Germany is seen as adopting a leadership role through ambitious climate and renewables policies, eventually convincing others to follow its course. For the proponents of Energy Transition, the renewable energy law (EEG) with its feed-in tariffs for renewable energies is a central and indispensable building block of the transition, in addition to efforts to increase energy efficiency and phase out nuclear power. The benefits of transition are often ascribed directly to the EEG itself: 'This law is the birth certificate of the solar age' (Hans-Josef Fell, Green Party, in Deutscher Bundestag 2000a, 8441). Its costs are presented as negligible or at least tolerable compared to the avoided environmental costs and given the widespread benefits.

Energy Mix

The discourse among Christian and Free Democrats in period 2 is antagonistic to the Energy Transition discourse in many respects. We label it 'Energy Mix'. Although it shares concerns about environmental challenges, in particular climate change, at its heart are problem definitions that center around the economic viability of energy supply and its security. Statements reflect a status quo-oriented position, emphasizing that a broad energy mix continues to be necessary in order to ensure a reliable supply. Parliamentarians drawing on this discourse up until 2011 portray nuclear energy and renewables as necessary 'partners' in the fight against climate change.

The story-lines tend to warn of the risks of major changes and of decline, portraying plans that build on major contributions of renewable energies as illusionary and dangerous given their limited technical and economic potential:

> It is our goal to … increase the share of renewables in our energy supply in the long term. At the same time, there must be an urgent warning of exaggeratedly high expectations with respect to the economic potential of regenerative energy. (Matthias Engelsberger, CDU/CSU, in Deutscher Bundestag 1989, 9463)

The stories warn of harmful consequences of the policies proposed by the Social Democrat-Green government, for instance rising electricity prices and resulting damages to the German industry's competitiveness. Victims are numerous, with both citizens and businesses as electricity consumers being affected by rising prices or loss of jobs that result from the deteriorating competitiveness:

> The price of electricity … must not rise. It is wrong to regulate this based on a surcharge and thus to reduce the competitiveness of German industry and endanger jobs.' (Walter Hirche, FDP, in Deutscher Bundestag 1999, 7273)
>
> Again, energy has to be inexpensive. Energy policy without cost awareness is a policy at the expense of jobs, of families and of ordinary people. (Dagmar Wöhrl, CDU/CSU, in Deutscher Bundestag 2000b, 8755)

While proponents of the Energy Mix discourse may also praise Germany's exceptional performance in terms of climate protection and renewable energy, they tend to emphasize the country's negligible contribution to global emissions. National climate protection efforts in the absence of international coordination are considered futile in terms of the reduction of global greenhouse gas reduction but dangerous to the national economy – a useless self-sacrifice to a green ideology. Within the Energy Mix discourse, policy preferences for energy efficiency and renewables development are expressed, but the feed-in tariff system of the EEG is criticized or rejected, and stronger market-orientation of policy instruments is called for.

2.3.2 Evolution of discourse

The following sections describe the development of energy discourses and their coded components in the parliamentary debates over the three periods. The figures show the numbers of codings for selected codes over time periods and for different political parties. They are illustrative for broad trends and comparisons. However statistical relevance cannot be claimed given the limited sample of documents, the differing lengths of speeches of the political party groups and the increase in the overall length of plenary debates over time.

Motivation

Figure 2.1 shows how often the different codes for policy challenges were applied in the three periods. Overall, climate change is the challenge most frequently mentioned. It is referred to regularly by members of all parties (not disaggregated in Figure 2.1) with a sometimes catastrophic framing in period 1 subsequently yielding to more factual commitments to politically established climate policy goals. However, the issue of climate change generates different conclusions: while Green Party and Social Democrat MPs use it to justify calls for increasing energy efficiency and use of renewable energy, Christian and Free Democrats routinely build on climate change to make a case for nuclear energy.

In period 3, there are fewer references to climate change than in periods 1 and 2, and the coded text segments also tend to be shorter. We assume, however, that this does not necessarily point to a decreasing relevance of climate protection perceived by parliamentarians, but that climate change has become 'institutionalized' as a term, so that key words are sufficient to evoke the full story on emissions, climate impacts and the need for policy action (Viehöfer 2004, 254).

While there is a consensus on climate change, nuclear risk as a motivation for policy change is proposed exclusively by Social Democrats, Green Party and Left Party members up until 2010. It is only after Fukushima that conservative and liberal MPs adopt nuclear risk as a major concern and explicitly commit to nuclear phase-out. Economic viability features more and more often as a boundary condition for energy policy over time, frequently framed as part of a 'golden triangle' presenting economic viability, environment-friendliness and supply security as equally important

goals of energy policy. The need to protect scarce resources is a key argument for the expansion of renewables in some speeches of period 1 and 2, but is of limited and decreasing relevance overall.

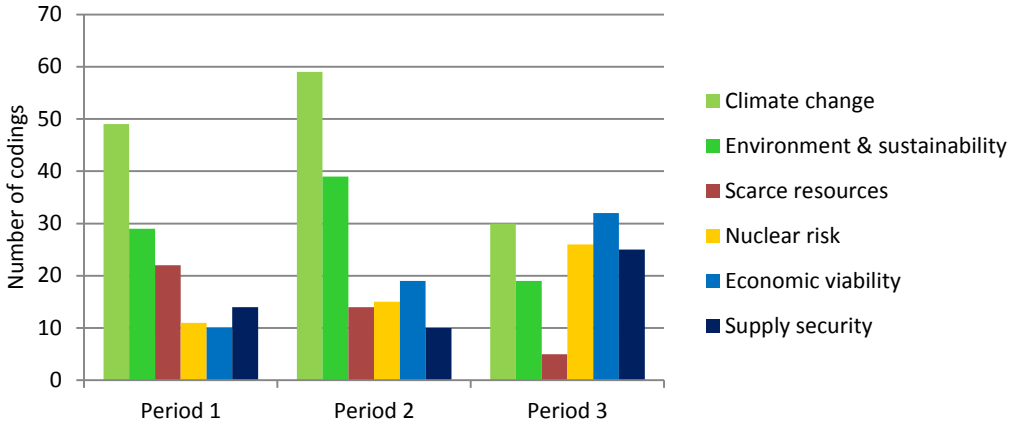

Figure 2.1. Number of codings of major challenges.

Vision for the future energy system

Figure 2.2 shows the development of codings for visions on the future of energy in the speeches of MPs from the five political parties. In the debates of period 1, the vision of an Energy Transition towards an electricity supply system without nuclear power and with large increases in efficiency and share of renewables is spelled out twice by Green Party MPs; the term is also used twice by Social Democrats. The dominant view at the time, put forward by CDU/CSU, SPD and FDP, however claims that a broad, well-balanced 'Energy Mix' is necessary to secure supply. Christian and Free Democrats stress the need to use both nuclear and fossil energy sources, while Social Democrats, having abandoned their pro-nuclear position after Chernobyl, focus on the merits of domestic coal.

By the end of the 1990s, 'Energiewende' has become a familiar term in parliamentary debates. In period 2, some protagonists start establishing the idea that energy demand might be covered completely by renewables by 2050. However Energy Mix is coded as often as in period 1. The idea of replacing the safe and solid nuclear base-load energy with renewables is still considered preposterous (e.g. Kurt-Dieter Grill, CDU/CSU, in Deutscher Bundestag 2000b, 8749). Despite this, opposition party MPs cautiously start adopting aspects of Energy Transition in their own story-line, stating the need to *eventually* replace fossil fuels with renewables or envisaging substantial shares of renewable electricity by 2050.

In period 3, Energy Transition features prominently in speeches of all parties' MPs, even in those of Free Democrats who had previously avoided the term. As in period 2, lines of conflict run primarily between CDU/CSU and FDP on the one hand and SPD and Green Party on the other. However, both groups' energy discourses are now largely aligned with each other. SPD and Green Party members express more ambition in terms of targets and speed of transition. They envision 100% renewables in electricity and want this to be achieved 'as soon as possible' (Hermann Scheer, SPD, in Deutscher Bundestag 2010a, 2201). CDU/CSU and FDP MPs support the government's 80% target for the year 2050 and are generally less hurried. They continue to refer to the necessity of an 'Energy Mix', now as a condition *in the nearer-term future* for a successful transition towards renewables *in the longer*

term. Before Fukushima, the role of nuclear energy as a 'bridge' towards the solar age was highlighted; after March 2011 new, efficient fossil power plants are called for to ensure supply security.

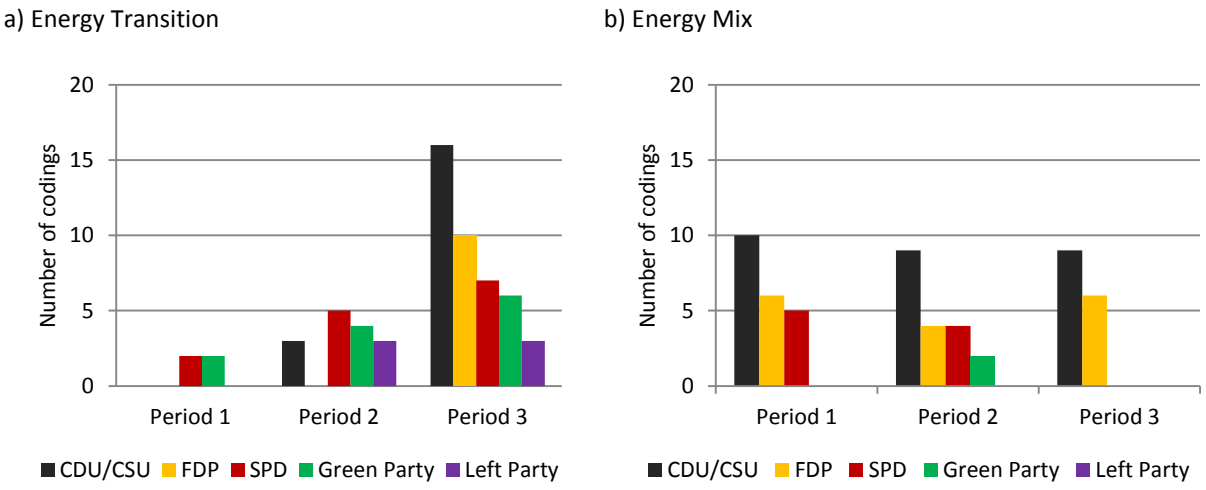

Figure 2.2. Number of codings of a) 'Energy Transition' and b) 'Energy Mix'. Note: The number of codings for the different parties in part reflects different proportional speaking times. Approximate shares of speaking times are as follows: period 1, governing coalition CDU/CSU & FDP 55%, SPD 30%, Green and Left Party 8%; period 2, governing coalition SPD & Green Party 51%, CDU/CSU 31%, FDP 10%, Left Party 7%; period 3, CDU/CSU 38%, FDP 15%, SPD 23%, Green and Left Party 12% (Deutscher Bundestag 2014, chapter 7.11).

The vision of a decentralization of energy supply structures is a distinctive feature of the early Energy Transition discourse. Green MPs in period 1 want the old monopolist, centralist, capitalist structures and 'sclerotic large-scale technology' to be replaced, in order to pave the way for 'modern efficient decentralized' technologies (Wilhelm Knabe, Green Party, in Deutscher Bundestag 1990a, 15875; similarly Wolfgang Daniels, Green Party, Deutscher Bundestag 1990a, 15865). 'Villainization' of the big utility companies and criticism of their market power in the early Green Party story-line is combined with calls for breaking up monopolies and transferring their energy production capacities into communal public entities (Die Grünen 1990a, 6). There is a perception among left-wing Energy Transition pioneers that decentralized energy structures will not only respond to environmental challenges, but also remedy broader economic and social deficits and thus be a 'catalyst for a more thorough transformation of the whole society' (Strunz 2014, 154).

In period 2, decentralized energy supply is still seen as preferable by the Social Democrat-Green coalition and the Left, but framings are more compromising. An efficient, 'in many cases decentralized' energy structure is the goal to be achieved (Jürgen Trittin, Green Party, in Deutscher Bundestag 2001a, 14289). Interestingly, the frequency of 'Decentralization' codings increases in period 3 (Figure 2.3), and they feature in speeches of all parties except those of the Free Democrats. CDU/CSU MPs acknowledge the contributions of small, decentralized actors, albeit without criticizing the big suppliers. The focus on citizens and small business actors is broadened; Energy Transition becomes a 'society's project', where the size of the challenge demands *everyone*'s contribution (e.g. Norbert Röttgen, CDU/CSU, Deutscher Bundestag 2011b, 12987).

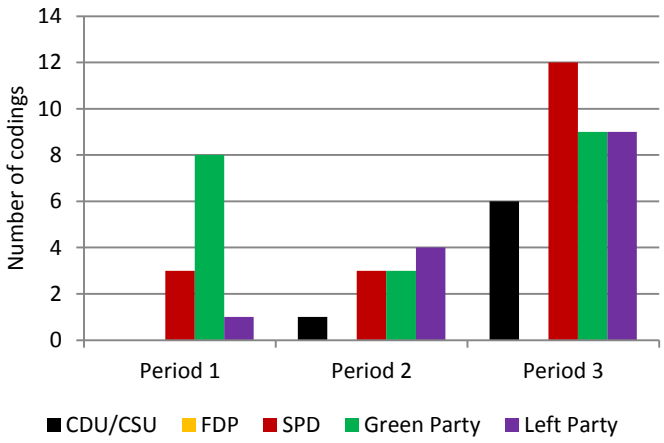

Figure 2.3. Number of codings of 'Decentralization'.

Effects of Energy Transition

The graphs in Figures 2.4 a and b show how often the codes 'Benefits' and 'Costs and Risks' of Energy Transition were applied to the speeches of MPs of the different parties. Those in Figures 2.4 c and d show how many of these codings refer to environmental, economic, supply-side or social effects.

In period 1, the environmental and supply security benefits of renewables are highlighted by MPs of all parties except the Left, reflecting the broad support for the 1990 feed-in tariff law. Energy Mix proponents, however, take care to emphasize that while renewables deserve support as a supplementary source, they will not become a serious competitor to conventional energy. In period 2, positive effects of Energy Transition are almost exclusively highlighted by Social Democrats and Green Party members. In this period they praise economic benefits as often as (Greens) or more often than (SPD) environmental benefits. They stress that a large number of jobs would be created in the renewables industry, which would be boosted by the increasing chances of exporting their technologies to global emerging markets. In period 3, benefits are talked about evenly by all parties, with an even stronger focus on economic aspects than in period 2. Statistical data are used to substantiate a *success* story, with repeated references to the number of (approximately) 300,000 jobs that have already been created in the renewable energy industry. Government members extensively use stories about economic co-benefits, promising 'technological modernization, innovation, the opening up of new markets, the creation of hundreds of thousands of jobs, the strengthening of competitiveness and provision for the future' (Norbert Röttgen, CDU/CSU, in Deutscher Bundestag 2010b, 7179).

Costs of Energy Transition are hardly an issue in period 1, but start playing a key role in the story-line of the opposition parties in period 2. Economic aspects clearly dominate from the start. The typical argument claims that nuclear phase-out and the renewables support scheme would cause increases in electricity prices, which in turn would lead to job losses in the nuclear or energy-intensive industry and be damaging to German industry's international competitiveness.

In period 3, Christian and Free Democrats refer even more frequently to actual or expected costs of Energy Transition. Sometimes they also describe negative environmental effects, warning mostly of damages to landscapes resulting from renewables; some speakers conjure up threats to supply

security and large-scale blackouts. A new version of the cost argument emerges in period 3, which criticizes transition policies, in particular the EEG surcharge, for creating a disproportionately large burden for poor households. It is used by conservatives and liberals, who criticize the profits of renewable investors from the guaranteed feed-in tariffs, and by Left Party members, who tend to blame the incumbent utility companies. However, in period 3, references to costs are no longer targeted against Energy Transition as such, but are used to motivate reforms of policies.

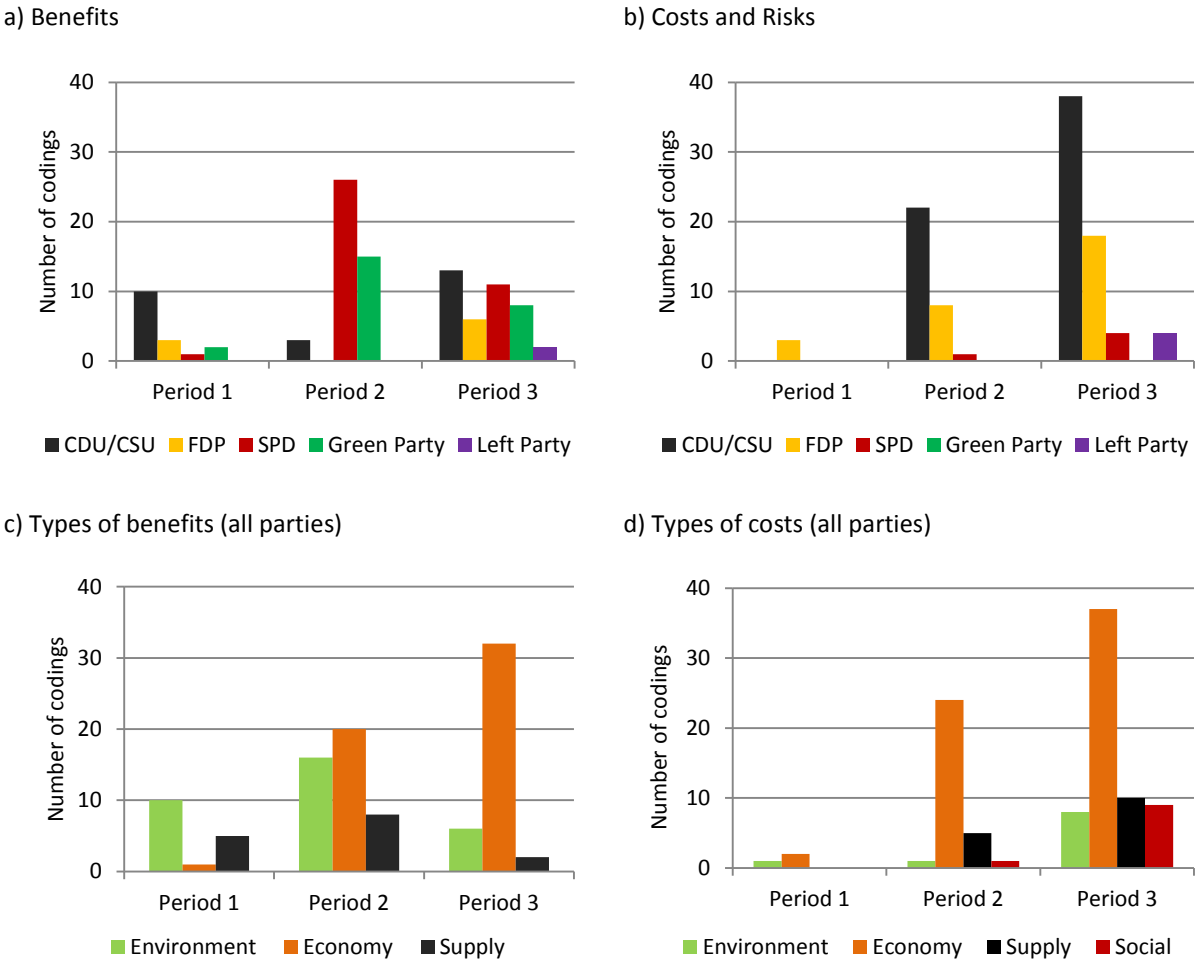

Figure 2.4. Number of codings on effects of Energy Transition. Graphs a) and b) show the number of codings for 'Benefits' and 'Costs and Risks' for the five parties. Graphs c) and d) show how many of these codings refer to environmental, economic, supply-side or social effects (all parties).

International dimension

From the beginning, the international leadership aspect is present in speeches of MPs of all parties except the Left. Speakers praise Germany's exceptional effort or performance, or emphasize that the country's pioneering action on renewable energy and climate protection will eventually convince others to follow suit. They argue that Germany's negotiating position in international climate negotiations will be improved. In period 2, Social Democrat and Green MPs present the EEG as an act of leadership, underlining its globally unique character and its potential to be an example for others. In period 3, references to leadership become more frequent. They often imply that Germany has a

unique capacity to perform, and at the same time tend to emphasize the competitive advantages a leading country might enjoy on international markets.

Christian and Free Democrats – sometimes in the same speeches – also use an argument that runs counter to leadership, emphasizing the need for *global* action on climate protection. It often refers to Germany's negligible contribution to global emissions and marginal effects of isolated national action, and to ensuing risks for national competitiveness. In its strongest version, it paints a lose-lose picture where national efforts do nothing for the climate but cause harm domestically.

Policy preferences

The differences between the Christian Democrat-Free Democrat discourse on the one side and the Social Democrat-Green discourse on the other shrink also with respect to policy preferences over time. The division over the use of nuclear power, previously the most prominent conflict between the two camps, vanishes after Fukushima. All parties consistently call for measures to increase the efficiency of energy use. From the beginning both coalitions in principle support the expansion of renewables, but present differences in the level of ambition and in positions on the specific design of renewables support.

In period 1, there is a general agreement that support for renewables in the form of Feed-in Tariffs is necessary and justified. Many MPs argue that given the external costs of fossil energy use, the tariffs would not in essence be a subsidy, but make prices tell the ecological truth. Social Democrat and Green Party MPs hold on to this position in period 2 when making a case for the EEG. At this point, in contrast, Christian and Free Democrats start calling for greater market-orientation. They heavily criticize the EEG support scheme for being an overly large intervention in the market, for not being 'technology-neutral', and for not creating sufficient incentives for renewables to become competitive. As alternative policy options, Free Democrats in period 2 propose quota systems, while Christian Democrats suggest the maintenance of the coupling of tariffs to market prices.

In period 3, however, with a Christian and Free Democrat government that is not prepared to abolish an established policy instrument, the conservative-liberal coalition in parliament also commits to the EEG. The conservative-liberal coalition now turns a stronger market-orientation into a condition: the Energy Transition project can only be successful if renewables eventually become competitive without subsidization (e.g. Hermann Otto Solms, FDP, in Deutscher Bundestag 2011a, 11295), and it will only be accepted by the public if costs are kept under control.

Relationship with environmental discourses

Early Energy Transition proponents strongly draw on a 'Survivalist' environmental discourse (Dryzek 2005, 27). Radically departing from the dominant paradigm of industrialism and economic growth, Survivalism predicts collapse should the carrying capacity of environmental systems be surpassed, and calls for fundamental changes in the ways of producing and living. In a survivalist spirit, Green Party and some Social Democrat MPs in period 1 perceive environmental crises as imminent and describe their consequences as catastrophic: 'the chances that the blue planet will be saved are getting worse and worse' (Wolfgang Daniels, Green Party, in Deutscher Bundestag 1989, 9455). A fundamental conflict between the growth-bound economic system and the long-term health of the planet is diagnosed (e.g. Die Grünen 1987, 33); environmental protection needs to be placed above economic interests (Die Grünen 1990b, 8; Scheer 1989, 20).

The mainstream discourse of the conservative-liberal governing majority in period 1, however, is characterized by a strong commitment to the market economy. It leans towards 'Economic Rationalism', with a high level of confidence in the 'deployment of market mechanisms to achieve public ends' (Dryzek 2005, 121), and skepticism towards government intervention. The collapse of the German Democratic Republic in 1989, which exposed the immense environmental problems within its territory, strengthened the belief in the superiority of market-based systems also in terms of environmental protection (Haussmann 1990).

In period 2, the Social Democrat-Green government makes Ecological Modernization the overarching discourse that guides policy-making (Mez 2003). Reformist in Dryzek's classification (2005), Ecological Modernization aims to reconcile economic development and environmental protection through more efficient use of resources, product and process innovation, and economic instruments (e.g. Jänicke 1985). It requires 'conscious and coordinated intervention' into market systems in order to achieve the desired outcomes, but advocates cooperation with business (Dryzek 2005, 167). In the speeches of Social Democrat and Green MPs in period 2, warnings of ecological catastrophe and critiques of capitalism largely give way to a concept more easily compatible with mainstream economic thinking: greening the economy will also boost the economy.

Ecological Modernization becomes the mainstream discourse after period 2 and is also adopted by Christian Democrats (Jänicke 2010, 491) although Social Democrats and Green Party MPs tend to more strongly emphasize the need for rules to ensure that the forces of the market support environmental goals. In period 3, the idea of absolute environmental limits to economic activity receives new impulses (Rockström et al. 2009), and a broad new debate on economic growth and the environment also takes place in parliament (CDU/CSU et al. 2010). However, this does not fundamentally shake the mainstream confidence in the possibility to reconcile environmental and economic goals (Röttgen 2010).

2.4 Discussion

We identify two different discourses in German parliamentary debates on energy policy. One promotes Energy Transition towards a nuclear-free, renewables-based regime. It is primarily motivated by environmental concerns, and emphasizes the benefits of policy change. The proponents of Energy Transition tell 'stories of rise', conjuring up positive expectations and benefits accruing across society, and present citizens as the most prominent heroes. The antagonist Energy Mix discourse emphasizes the economic impacts of energy policy changes, and tends to hold on to conventional energy sources. Parliamentarians skeptical towards Energy Transition tell 'stories of decline' that emphasize the costs and risks and assign a central role to the alleged victims of the adverse impacts of the transition, which are presented as widespread and overwhelming.

Hegemony of Energy Transition?

Over time, the proponents of Energy Transition have clearly been able to impose major elements of their discourse on the majority in parliament. By the end of period 3, Energy Transition as a vision was voiced by all parliamentarians, being understood not only as a transition to any low-carbon energy system (Bosman et al. 2014), but specifically to a renewables-based, nuclear-free energy supply. Furthermore, members of all parties mention beneficial economic effects of the transition,

and many praise the role of citizens and small businesses. Thus, discourse structuration has clearly occurred.

Moreover, the discourse has clearly been institutionalized in the form of legislation, government programs (e.g. BMWi and BMU 2010) and processes (e.g. the Energiewende monitoring process[4]). In fact, the establishment of the Energy Transition discourse was interdependent with the substantial associated changes in policy between the 1980s and 2011. Before the Energy Transition discourse itself had become influential, a discursive consensus on the need to fight climate change, and on the environmental merits of renewable energy, facilitated the introduction of the Feed-in Tariff law in 1990 and later the EEG. These 'path-defining developments' (Hake et al. 2015, 7; 10) institutionalized major elements of the Energy Transition discourse. They caused changes in economic structures of the electricity system and in political power relations which in turn required political parties and parliamentarians to adapt their story-lines. The story of Energy Transition was reinforced by some of these changes, for instance by the fact that the renewables industry actually created a significant number of jobs, and that other countries introduced similar feed-in tariff legislation.

On the one hand, it can thus be argued that the Energy Transition discourse has become hegemonic within a brief period of time. On the other hand however, our analysis suggests that the discourse itself has undergone major changes over this period. It also shows that the story-lines regarding Energy Transition still exhibit fundamental differences, which indicates that, under the surface, discourse structuration is far from complete.

Changing discourse

On its way to hegemony, the Energy Transition discourse was transformed from a radical to a reformist discourse and today it strongly resonates with Ecological Modernization. Survivalist and critical towards capitalism in its left-wing origins, it was integrated into a worldview that envisions the ecological renewal of industrial structures within the existing market economy and through market mechanisms. By putting an ever stronger focus on economic benefits of transition policies, the perception of a win-win situation was established; 'trading a radical stance for a more respectable one' (Hajer 1993, 64) proved a successful strategy.

The pressure to portray environmental policy problems in terms of economic logic and economic efficiency concerns may be discussed critically (e.g. Shaw and Nerlich 2015), but its existence cannot be empirically doubted. A body of research shows that economic co-benefits are a strong driver for national and sectoral action on climate change (Edenhofer et al. 2015, 19; Somanathan et al. 2014, 1152). Economic framing has been identified as a success factor for renewable energy policy formulation (Lauber and Schenner 2011). It is likely to gain relevance in discourses on climate change in developing countries, where climate change protection measures are presented as supportive of domestic economic priorities such as poverty alleviation or growth (Thaker and Leiserowitz 2014). Our case study confirms these results and supports the hypothesis that winning environmental discourses align with mainstream economic logic and key economic imperatives.

Similarly, the discourse has shed some of its radical concepts concerning energy supply structure. In its early years Energy Transition was targeted against established political and economic structures and associated with calls for fundamental re-organization and decentralization. While the EEG in

[4] http://www.bmwi.de/DE/Themen/Energie/Energiewende/monitoring-prozess.html.

effect did lead to some degree of decentralization of material energy structures and to the emergence of new business and lobby groups (Sühlsen and Hisschemöller 2014), the idea of a more decentralized energy production was sufficiently flexible to allow for a change in character from conflict towards consensus and inclusiveness. In period 3, the Green Party no longer called for a break up of monopolies, but rather suggested measures to enhance competition and improve the market position of small competitors. Christian Democrats created a story-line that conjured up a national, common project, the realization of which needed *everyone*'s efforts and invited almost everyone to identify with the project. Thus, while actors in German energy policy still hold different visions on the desirable degree of decentralization (Schmid, Knopf and Pechan 2016), trenches are less deep than they used to be.

Persistently different story-lines

While the long-term vision of a renewable energy future clearly structures the discourse by the end of period 3, the story-lines on routes to achieve this still differ considerably, revealing many of the old divisions. The story-lines continue to differ fundamentally in the time horizon of their plot. While the starting point for Greens and Social Democrats is the long-term need to decarbonize the economy, Christian and Free Democrats tend to focus on the more short-term securing of reasonable electricity prices and supply security. Social democrats and Greens adhere to a "pure" version of the Energy Transition story, claiming that new fossil power plants are not necessary and calling for rapid expansion of renewables. They continue to talk about benefits and hardly mention costs and risks (Figure 2.4). They often insinuate that the transition towards a clean and renewable energy future is in fact *endangered* by government action and that the conservative-liberal commitments to Energy Transition are not sincere:

> What you are aiming at is to replace nuclear energy as baseload by coal as baseload. (Jürgen Trittin, Green Party, in Deutscher Bundestag 2011b, 12974)

> How should the expansion of renewable energy still be possible if in the details you build in such obstacles? (Hans-Josef Fell, Green Party, in Deutscher Bundestag 2011b, 12987)

The story of the conservative-liberal coalition, by contrast, still assigns an important role to conventional energy in the short to medium term and is much less ambitious with respect to transition speed. Nuclear energy before Fukushima or new coal plants after March 2011 are described as "bridges" to the solar age. There are persistent, ever more urgent references to economic costs and risks of the new national Energy Transition project, often used to question the design of the policy instruments in place:

> One thing, in any case, cannot work. We must not make energy so expensive in Germany that we drive away industries at the end of the day. I still would like Germany to remain an industrialized country. (Michael Fuchs, CDU/CSU, in Deutscher Bundestag 2010a, 2204)

> A de-industrialization which is directed against jobs and wealth in Germany will not be possible with [the Christian and Free Democrat government]. (Rainer Brüderle, FDP, in Deutscher Bundestag 2011a, 11286)

Statements of this kind are no longer used to openly question the transition project as such, but to caution against overly large ambition, raise awareness of the size of the challenge and illustrate the need for '*repair work* on the undesirable consequences related to the energy transition' (Hake et al. 2015, 13, emphasis original).

The persistent differences in the stories that are told by parliamentarians by the end of period 3, all under the heading of Energy Transition, suggest that conflicts are far from solved. These conflicts now center on the implementation rather than the overall feasibility and desirability of the transition. Many CDU/CSU/FDP members appear to have subscribed to Energy Transition more or less reluctantly because it could no longer be avoided (although there is also some enthusiasm), while Greens and SPD constantly fear their achievements in initiating the Ecological Modernization of industrial society are endangered. To conclude, while *Energiewende* as a term has become commonplace, discursive struggles continue into the meaning and the means of the transition project.

2.5 Conclusions and outlook

From our case study we raise two questions for further study. Firstly, the persistent presence of different story-lines under the shared discursive 'roof' of Energy Transition invites further exploration. Does this tension between story-lines imply that the conservative-liberal commitment to Energy Transition in period 3 was not sincere – as insinuated by the Social Democrat-Green coalition? In other words, to what extent is the change in rhetoric and strategy of the Christian and Free Democrats the product of a policy learning process, that is, reflects an enduring alteration of ideas and beliefs (Heikkila and Gerlak 2013, 486)? Alternatively, have Social Democrats and Greens failed to recognize the dimension of economic risk inherent in the Energy Transition policies they proposed, and will they have to adjust their story-line? Research into the more recent energy discourse could explore whether story-lines develop to appropriately address these inner tensions.

Secondly, our results support calls for more intensive research into processes and conditions of consensus-building and convergence in environmental policy discourses (Lovell, Bulkeley, and Owens 2009). We observe dynamics of convergence and broadening of discourses with a shifting of conflicts to lower levels. Are these typical for countries following a consensus model of democracy (Lijphart 2012) and more cooperative, coordinated types of political and economic systems (Hall and Soskice 2001), where power is shared across different dimensions and where compromises are a prerequisite for successful policy-making?

In addition, the German case may lend itself well to researching the relationship between policy stories, science and policy learning. Changes in policy narratives have been postulated to be more decisive to policy learning and policy change than science (McBeth, Jones, and Shanahan 2014, 243). However, scientists may be influenced by their own beliefs when advising policy-makers (Spruijt et al. 2014). In the German Energy Transition debate, scientists and scientific policy advisors clearly participate in creating and changing stories, being intensely engaged for instance in the construction of the costs and benefits (e.g. Pahle et al. 2012; SRU 2011; SVR 2011). Therefore, rather than trying to determine the influence of science versus discourses as separate domains, we suggest that studying their *interaction* could yield important insights into processes of policy learning and policy change.

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3 Scientific policy advice in the German energy transition discourse*

Anna Leipprand
Christian Flachsland
Michael Pahle

Abstract

Political debate on energy in Germany has been shaped by two historically opposed discourses, one pushing for a transition to renewables, the other holding on to the status quo. Scientific policy advice (SPA) has been involved in their evolution from the beginning. This paper draws on the Advocacy Coalition Framework and on discourse and narrative theory to study the role of SPA in recent German energy policy. We explore 1) whether scientific advisors have been members of advocacy coalitions, and 2) how their contributions may have interacted with the evolution of the discourses and major narratives. We perform a qualitative text analysis of 50 SPA reports published between 2000 and 2015.

We find that the majority of studies clearly take sides in the debate, and that in most cases the reports' positions are fully transparent. Despite the polarization, SPA provides differentiated information on key aspects of the discourses, and alternative design options for policy instruments. We conclude that SPA contributions have improved the conditions for political consensus and compromise. Collectively, SPA studies provide a basis for mapping different policy pathways and their consequences. In the future, SPA should address additional critical issues such as coal phase-out and international leadership.

Keywords: Energy transition; Scientific policy advice; Discourse; Narratives; Advocacy coalitions; Germany

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3.1 Introduction

Political debate on energy transition in Germany has been shaped by two historically opposed discourses. Proponents of energy transition have been pushing for a rapid transformation to a renewables-based energy supply, claiming that it would provide both environmental and economic benefits. Their opponents have been defending the status-quo, warning of the economic risks of transition (see section 3.2.3). Scientific policy advice (SPA)[1] has accompanied the debate from the beginning. In the early 1980s, scientists were among the first to dispute whether an "Energiewende" – at that time being understood as a transition to a nuclear-free supply system with high shares of renewables – was possible (Krause et al., 1980; Schmitz and Voß, 1980). Since then, innumerable studies have been published on future prospects of the energy system, including scenario and modelling efforts, conceptual work on criteria of sustainable energy systems, policy appraisals and suggestions for policy instrument design. Scientists and experts regularly discuss such issues with policy-makers in formal and informal venues, and evidence from SPA is commonly used in political argument. In a study of 15 debates on energy policy in the federal parliament between 1989 and 2011 (Leipprand et al., 2016), we found speakers routinely referring to scientific sources.

Different models of science-policy interaction have been proposed and critically discussed (for a comprehensive review see Kowarsch, 2016, pp. 81-96). Today, any model assuming a clear division of responsibilities, with scientists in charge of "getting the facts straight" (Brown, 2008, p. 485) and policy-makers tasked with value judgments and implementation, seems inadequate to capture the essence of the relationship. Science cannot be value-free (Putnam, 2004, Kowarsch, 2016, pp. 106-122), particularly in policy contexts where there is no value consensus and high uncertainty (Pielke, 2007). Scientific actors have pre-dispositions and stakes that necessarily cause them to arrive at different constructions of scientific reality (Jasanoff, 1994, p. 12). Psychological research generally suggests that "we often use reasoning not to find the truth but to invent arguments to support our deep and intuitive beliefs" (Haidt, 2006, p. 37). In addition, the diversity of scientific approaches which are applied to highly complex research subjects can provide evidence that legitimately supports different "competing, value-based political positions" (Sarewitz, 2004, p. 386).

Scientists advising policy-makers can deal with this situation in different ways. They may decide to be what Pielke (2007) calls "issue advocates", offering their work as ammunition in political battle. Alternatively, scientific policy advisors may attempt to be "honest brokers" (Pielke, 2007) or "cartographers of policy pathways" (Edenhofer and Kowarsch, 2015). Given the unavoidable interdependence of objectives, means and consequences in policy-making and the entanglement of facts and values, Edenhofer and Kowarsch (2015) argue that a refined understanding of science-policy interaction is necessary. They suggest a "pragmatic-enlightened model" (PEM) of the science-policy interface with three core characteristics: "(1) the thorough exploration of diverse practical means-consequences, including co-effects; (2) stakeholder engagement and public discourse; and (3) the mapping of alternative viable policy pathways, with transparency of important assumptions, value judgments and uncertainties" (p. 61). While the PEM appears attractive conceptually as an ideal to be approached, procedures and formats for its practical application are yet to be developed.

[1] A list of abbreviations including the names of German policy and science institutions is provided in Annex B.

Here we aim to investigate how scientific policy advice has interacted with the major discourses of the recent German energy policy debate, and to explore whether science advisors rather tend to engage in advocacy through their research or to act as cartographers. We discuss the implication of our results for the relevance and usefulness of SPA work; our research thus contributes to a better-informed and more deliberate production and use of scientific policy advice. In addition, our work contributes an empirical case study to the literature on the science-policy interface, which, so far, draws more strongly on theoretical than empirical work (Spruijt et al., 2014, p. 16).

We build our analysis on the Advocacy Coalition Framework (Section 3.2.1) and on the literature on discourse and narrative analysis (Section 3.2.2). The research is guided by two sets of questions: 1) Are scientists members of advocacy coalitions? How does the association with a specific advocacy coalition reveal itself? Are there changes over time? 2) How may the contributions of scientific policy advisors have interacted with the evolution of energy discourses? Which elements of the major energy narratives were supported or challenged by the empirical work of scientific advisors?

Section 3.2 of this paper introduces the theoretical framework for the research design (3.2.1 & 3.2.2), some background on the case study (3.2.3) and the methodology (3.2.4 & 3.2.5). Section 3.3 presents and discusses the results of the qualitative text analysis. Our conclusions and implications for the cooperation between SPA and policy-making are presented in Section 3.4.

3.2 Research design

3.2.1 Scientists and advocacy coalitions

We draw on the Advocacy Coalition Framework (ACF) (Jenkins-Smith et al., 2014) to analyze whether scientists take sides in the political debate. The ACF aggregates actors with shared beliefs about policy issues into advocacy coalitions. The belief systems characterizing policy actors are three-tiered, comprising fundamental normative values not specific to the policy subsystem (deep core beliefs), beliefs of normative or empirical nature concerning the policy subsystem (policy core beliefs), and secondary beliefs relating to the "instrumental means for achieving the desired outcome in policy core beliefs" (ibid, p. 191). Individuals take up new information through the filter of their previously adopted beliefs, so the same piece of information may be interpreted in different ways by actors of different coalitions, and core beliefs tend to be resistant to change (Sabatier and Weible, 2007, p. 194). Coalitions in a subsystem compete for influence on the policy output utilizing the resources – such as political or financial power – at their disposal. When successful, they translate their policy beliefs and causal theories into public policies and programs (ibid, pp. 192-194).

The ACF conceptualizes scientists as actors who can affect a policy subsystem, alongside government officials, members of the media, representatives of the private sector, and nongovernmental organizations (ibid, p. 190). Information generated by scientists can contribute to policy-oriented learning, a process that slowly alters the beliefs of policy actors (Weible, 2008, p. 619). At the same time, scientists may be bonded, to a greater or lesser degree, to advocacy coalitions; certain analytical approaches and disciplines will match a coalition's beliefs better than others, and coalition members are more likely to listen to those experts whose approach and results are compatible with their own beliefs (ibid, p. 626). The ACF thus allows for different roles of science: It may reinforce and

legitimize existing beliefs and thus constitute a valuable coalition resource in argument, or it may alter the beliefs of actors and thus eventually contribute to changing the coalition landscape.

3.2.2 Narratives as resources of ACF actors

Analyses of discourses and narratives share the assumption that humans rely on social constructions to interpret the reality around them (Fischer, 2003, p. 48; Keller, 2011, p. 9), and that the linguistic framing of policy problems and solutions plays an important role in shaping actors' perception of what is relevant and conceivable (Scrase and Ockwell, 2010). According to Hajer's often-cited definition, discourses are "ensembles of ideas, concepts and categorizations … through which meaning is given to physical and social realities" (Hajer, 1995, p. 44). Different groups of actors may promote competing discourses, as they interpret objects and processes differently.

With Urhammer and Røpke (2013), we consider narratives as particular discursive practices that "organise elements of these ensembles into comprehensible plots", and are thus "embedded in discourses" (p. 64). The concepts of narratives (e.g. Roe, 1994; Gadinger et al., 2014; McBeth et al., 2014), stories (Stone, 2012) and story-lines (Hajer, 1995) are closely related, and we do not sharply distinguish between them for the purpose of this research. All focus on stories as a communicative tool in policy processes. Narratives serve to simplify complex issues and enable actors to make decisions in the face of high uncertainty, complexity and polarization (Roe, 1994, p. 2). On the one hand, they are vehicles through which policy actors create congruence between their pre-existing beliefs and the facts and observations with which they are confronted. On the other, they may be strategically designed – be it consciously or not – to influence the policy preferences of the target audience (McBeth et al., 2014, p. 241), and thus constitute a key resource used by advocacy coalitions to influence policy-making. Narratives rest on normative views, but also on assumptions about causal relationships. They are simplifications of reality, but not independent of it. They may be challenged or supported by ethical and logical arguments, or empirical results fed into the debate by scientific advisors.

The defining feature of narratives is a plot that constructs causal relationships between events and actions in a temporal sequence (beginning, middle, end). The plot is often set in motion by a problematic situation and ends with a solution. Deborah Stone (2012, pp. 158–164) identifies several typical plots. These include "stories of decline" that warn of things getting (rapidly) worse and predict crisis unless certain action is taken, and "stories of rise" that describe how some event or action leads the way out of a currently dismal state of affairs and brings widespread improvements and benefits. Typically, narratives feature characters such as heroes, villains and victims. The construction of certain roles for the actors of a story is a powerful tool to attribute blame and responsibility and to create justification for action (Gadinger et al., 2015; McBeth et al., 2014; Roe, 1994; Stone, 2012). Leading metaphors may be a tool to allocate such roles (Gadinger et al., 2015, pp. 15–16). The temporal dimension of a story-line might provide insights into political priorities of the narrator (ibid, p. 16). Overall, narratives usually "take sides" and express a stance towards the policy issue in question (McBeth et al., 2014, p. 229).

The epistemological assumptions of discourse and narrative analysis are different from those of the ACF, the former departing from a social constructionist perspective, the latter belonging to neo-positivist or critical rationalist approaches. Combining the two approaches may nevertheless be justified on the ground of large overlaps between the concepts they use (see Winkel et al., 2011, p.

370 for a detailed comparison between the discourse and the advocacy coalition approaches), and it is helpful for our purposes. The ACF allows us to conceptualize scientific advisors as more or less closely associated with advocacy coalitions. We regard narratives as major coalition resources, and use discourse and narrative theory to investigate the relationship between SPA and advocacy coalitions.

3.2.3 Advocacy coalitions and discourses in the case study

The landscape of actor coalitions in German energy policy has been investigated by several studies using an ACF perspective. They traditionally describe a dichotomy between an "ecological" or "environment-first" coalition, whose members support energy transition and ambitious expansion of renewable energy, and an "economic" or "economy-first" coalition opposed or skeptical towards these ideas (Gründinger, 2015; Hirschl, 2008; Joas, 2013; Reiche, 2004). This categorization suggests that the principal distinction in policy core beliefs between the coalitions is in whether they prioritize environmental or economic concerns. Although this difference in fundamental motivation is likely to have played an important role in shaping the coalitions and has traditionally been a defining feature of their respective discourses (Leipprand et al., 2016), the dichotomy no longer captures the complexity of today's policy debates, and in particular does not account for the fact that both coalitions today build their arguments around environmental *and* economic goals. We thus follow Maatsch (2013, p. 27) in labelling the two coalitions "proactive" and "reactive", based not on their presumed policy beliefs but on the action they have been taking or proposing.

Table 3.1: Traditional actor coalitions and their discourses and narratives in the case study.

	Proactive	**Reactive**
Discourse	▪ Energy transition towards renewables is necessary & feasible ▪ Fragile environment threatened by human activities ▪ National responsibility ▪ Address market failures	▪ Energy mix is indispensable; (rapid) transition not feasible ▪ Economic viability and supply security threatened by environmental policy ▪ Balance between national & international action ▪ Avoid market intervention
Narratives	▪ "Story of rise": transition brings environmental & economic benefits ▪ Hero citizens enabled through EEG against villain incumbents ▪ Through international leadership role Germany makes other countries follow	▪ "Story of decline": transition brings costs & risks for economy & supply ▪ EEG and other policies create multiple victims: business, consumers, employees ▪ Exaggerated national ambition is a useless self-sacrifice
Actors	▪ Federal Environment Ministry, Federal Environment Agency ▪ Green Party, SPD ▪ Renewable energy business associations ▪ Environmental NGOs ▪ Left-wing media ▪ SPA: Öko-Institut, SRU, DIW	▪ Federal Ministry of Economic Affairs ▪ CDU, FDP ▪ Business associations & trade unions ▪ Incumbent energy suppliers ▪ Right-wing media ▪ SPA: SVR, RWI, EWI

Based on Gründinger, 2015, pp. 111-112; Joas, 2013, pp. 36-46; Leipprand et al., 2016.

Table 3.1 shows the traditional association of actors to the two coalitions and summarizes their discourses and narratives. Among the members of the proactive coalition are the Federal Environment Ministry and the Federal Environment Agency, the Green Party, most Social Democrats and smaller parts of the Christian Democratic Union, renewable energy associations, environmental NGOs and some left-leaning media. The reactive coalition traditionally comprises the Federal Ministry of Economic Affairs, established business associations and the large energy suppliers, energy- and coal mining-related trade unions (IGBCE), the Free Democrats, the majority of the Christian Democrats and the "coal wing" of the Social Democrats, some right-wing tending media, and civil society organizations such as the taxpayers' association and local protest groups opposing renewable energy installations (Gründinger, 2015, pp. 111-112; Joas, 2013, pp. 36-46).

As in the case of the larger political parties, boundaries between the coalitions may run also through heterogeneous organizations such as industry associations (e.g. BDEW, BDI) that comprise actors with different beliefs and interests (Hirschl, 2008, p. 193). Also, coalition set-up has not been completely static over time, and some actors have re-positioned themselves in the coalition landscape after the major policy changes of 2011. For instance, since the administrative division on renewable energy was transferred from the Ministry of the Environment to the Ministry of Economic Affairs after the 2013 federal election, the latter can no longer unambiguously be located in the reactive coalition.

The discourses of the two coalitions started off as antagonists in the 1980s (Leipprand et al., 2016). The traditional proactive discourse is rooted in a deep core belief that locates all human activity in a fragile and threatened planetary environment, and that assumes a need for fundamental changes in energy production and use in order to address climate change and nuclear energy risks. Prominent actors of the coalition began establishing the idea of energy transition in the 1980s, a long-term vision of an energy system without nuclear power, based on a decentralized use of renewable energy (e.g. Scheer, 1989). The proactive discourse is fueled by a strong feeling of national responsibility, and generally argues for ambitious national climate and energy goals.

The proactive discourse materializes in several characteristic narratives. While the stories of the environmental and anti-nuclear movements often employed stories of looming disaster (e.g. Dryzek, 2005; pp. 27-50; Hermwille, 2016, p. 13), in the discourse on energy transition the warnings of environmental catastrophe took on a background position to a "story of rise" (Stone, 2012, pp. 158-164), where the expansion of renewable energy and a more efficient use of energy eliminate the environmental threats of the current system. Over time, this narrative has increasingly highlighted also the expected *economic* benefits of the transition, such as the growth of an industry with high export potential, the creation of jobs, and decreasing import dependence.

A related story-line features citizens and small business as the major heroes, who are in an initially weak position compared to the incumbent energy utilities. The latter are portrayed as villains who attempt to obstruct energy transition. With the help of feed-in tariffs (Renewable Energy Sources Act, EEG), the small decentral actors are enabled to succeed. A third narrative expands the story of rise beyond national borders: Acting as an international leader with ambitious policies for energy transition, Germany will make other countries follow its course. Positive effects on the climate will thus be multiplied, and the national economy will benefit from enhanced export of green technologies.

The reactive coalition's discourse, by contrast, is rooted in a worldview that acknowledges environmental problems but never prioritizes them above economic concerns. Reactive coalition actors have always tended to defend the status quo, holding on to the idea that only an "energy mix" including fossil and nuclear energy can guarantee secure and affordable energy supply. This is reflected by doubts about the economic potential of renewable energy, about the necessity and feasibility of fundamental and rapid changes to the energy system, and warnings of negative economic effects of energy transition policies. Nuclear energy is not perceived as risky, but as part of the solution to the climate change problem. The policies proposed by the proactive coalition, in particular the EEG, are often criticized on the basis of market-liberal economic arguments, focusing on the inefficiencies of subsidies and politically motivated market interventions.

As most characteristic narrative, actors of the reactive coalition tend to tell a "story of decline", where the security and economic viability of the existing energy system is being threatened by the (over-ambitious) energy transition policies proposed by the competing coalition. In a common variant of the story, rising electricity prices will damage the domestic industry and its competitiveness, and as a result, jobs will be lost. The most prominent characters in this story are the victims: German citizens (especially the poor), and German industry and workers. Another manifestation of the reactive discourse is a story-line that denounces ambitious but isolated national action as useless self-sacrifice, causing a decline of competitiveness of the German industry, but no environmental benefits. The proactive coalition's belief in leadership effects is not shared, instead the narrative expects freeriding by other countries and "leakage" of CO_2 emissions under the roof of international agreements and European emissions trading.

Over time, the discourses of the two coalitions have converged to some degree. After the Fukushima incident in 2011, a government of Christian and Free Democrats, traditionally leaning strongly towards the reactive coalition, embraced nuclear phase-out and the transition to a renewables-based system as key national political goals and passed a legislative package for their implementation. This change of action was paralleled by discursive changes. For instance, the reactive coalition adopted their opponents' story of rise in a slightly modified version: energy transition will be successful and beneficial ONLY IF implemented more carefully and with greater focus on economic efficiency. The range of heroes is expanded, with virtually everyone's contribution called for to help meet the size of the challenge (Leipprand et al., 2016, p. 13). Energy transition as a long-term concept thus has become hegemonic (Hake et al., 2015; Strunz, 2014), while at the same time many elements of the traditional story-lines are still powerfully present, and argumentative struggles over the appropriate pathways of the transition continue (Grasselt, 2016, chapter 4.2).

Historically there is a strong association between certain policy advising institutes and political positions in our case study. The Environment Ministry and the Ministry for Economic Affairs have each worked over the years more closely with certain research institutes than with others, and the widespread commissioning of studies makes it likely that their results support the political goals of the commissioning institutions (Frey and Kirchgässner, 2002, p. 449). Thus, we expect to find associations between science and advocacy coalitions. However, we aim to go beyond an empirical confirmation of this relationship and to explore the nature of these associations in more detail.

3.2.4 Sample

In accordance with Weingart and Lentsch (2008), we define *scientific policy advice* (SPA) not just as the provision of scientific information to policy-makers, but as "a process that makes expert knowledge available for identifying, diagnosing, treatment or even solution of policy problems" (p. 43). Scientific policy advice is thus a mode of knowledge production that may differ from academic research, being oriented more towards problem solution than finding the truth. It is often transdisciplinary and project-based. Criteria and processes of quality control for SPA may not be as well developed and institutionalized as in academic research (ibid, pp. 19-21). The knowledge from SPA is produced or conveyed by scientifically educated staff in a systematic and methodologically guided way (p. 44), but it does not have to originate from academia and may also be delivered by think tanks, consultants, or governmental bodies. Deviating from Weingart and Lentsch (2008, p. 45), our sample not only includes reports commissioned by government, but also non-commissioned contributions or studies commissioned by non-state actors such as NGOs and business associations. These may also be influential in the debate.

This broader definition allows us to capture the rich and diverse landscape of SPA on energy policy in Germany. The relevant institutional actors include permanent scientific commissions such as the German Council of Economic Experts (SVR), the Advisory Council on the Environment (SRU), or the scientific advisory board to the Federal Ministry of Economic Affairs (Beirat BMWi). There are ad-hoc commissions or commissions established for a policy-specific purpose, such as the Expert Commission on the monitoring of Energiewende.[2] Additionally, there are committees where scientific experts collaborate with experts from other fields, for instance in parliamentary commissions. In addition to the councils and commissions, there are numerous academic institutes, think tanks and consulting firms that have been providing scientific policy advice on energy policy, and that usually do the actual modelling and empirical work. Advisory commissions often draw on the work of these institutes, or commission studies on specific research questions.

We compiled a list of roughly 180 studies on national energy issues for the period between 2000 and 2015 from research in the databases of the Federal Environment Agency, the online archive of the Federal Ministry of Economic Affairs, university library catalogues, and the reference lists of reports with large-scale literature reviews. The list focuses on reports specifically addressed to national level policy-makers, and does not include academic publications in scientific journals or book publications. The beginning of the period covered by our analysis is marked by the entry into force of the Renewable Energy Sources Act in 2000 and fierce political conflict over energy policy between the ruling Social Democrat-Green government and the Christian and Free Democrat opposition. The sample covers another period of major policy change around 2010 and 2011, when a conservative-liberal government made energy transition up to 2050 a national project. We reviewed the list of 180 reports in order to gain an overview of the SPA contributions and to identify shifts in their focal issues over time.

From the list we selected 50 reports for a qualitative text analysis (Creswell, 2013, pp. 179–188). The selection was made by balancing different criteria. Firstly we focused on those studies that adopted a general perspective on the German energy system and its future, assessing for instance the feasibility

[2] Expertenkommission zum Monitoring-Prozess "Energie der Zukunft"; established 2011, http://www.bmwi.de/DE/Themen/Energie/Energiewende/monitoring-prozess.html (accessed 13.12.2016).

or potential effects of energy transition. We excluded purely technical studies and studies on specific aspects (e.g. on energy efficiency options, risks of or technical options for nuclear energy, demand management, CCS, electricity storage, grid expansion), and the sample includes only exemplary reports on large sub-debates (e.g. on EEG design, capacity markets, electricity market design). Additional criteria included (1) a high relevance of the study in terms of its visibility in the political debate (authors' judgment from own experience); (2) coverage of a wide range of authoring institutes; and (3) coverage of the entire time period. In the case of sequel reports written and updated by the same authors over a certain period, we chose the most recent ones or those considered most relevant. The sample includes more studies from recent years, reflecting a general increase in the number of studies over time. A list of the 50 studies is presented in Annex A.

3.2.5 Text analysis and coding

For the analysis we used a codebook extracting the following information from each report:

1) **General information**: Year of publication, title, institutes authoring the study, and financing or commissioning institution were registered first.
2) **Aim and methods**: The codebook then noted the aim of the report as stated in the text, and methods or approach used such as scenario modelling, literature review, data-based argument, or interviews.
3) **Explicit advocacy**: In order to investigate whether the authors of the report explicitly reveal an association with one of the advocacy coalitions, we noted statements of normative or causal assumptions, i.e. characteristic content elements of the two discourses and their typical narratives described above.
4) **Narrative-ness**: In addition, we assessed the "narrative-ness" of the reports, looking for the presence of the rhetoric and linguistic elements constitutive for narratives outlined above (e.g. characters, metaphors, typical plot type).
5) **Relationship of reports' contributions to narratives**: The codebook also asked for the specific contribution of each report, looking at how study design and evidence presented related to the traditional energy discourses and their narratives. Information was collected on which of the typical statements were supported or challenged by the report, and on whether it presented evidence or information that suggested changes to the narratives.

Based on the notes taken for each codebook question, we classified the reports according to coalition membership (PROACTIVE; REACTIVE; NO COALITION). We assigned a report to one of the coalitions if it either explicitly reproduced major elements of the respective discourse, or if the aim, design and results of the study were clearly congruent with only one of the two discourses. Reports were classified as NO COALITION if either (1) none of the discourses and their narratives was expressed in the text or (2) if elements of both discourses were combined, and if their design and results did not unambiguously support the narratives of one or other coalition.

Our analysis thus looks at the relationship between scientific contributions and policy discourses; our interest is in how SPA authors present their work in the context of the political debate. We do *not* assess or compare the reports in terms of the validity of their methods or academic standards.[3]

3.3 Results and discussion

3.3.1 Overview of SPA studies and issues

While there were continuous SPA contributions over the whole period, the number of studies increased steeply after the major political decisions taken in 2010 and 2011. Approximately half of the studies in our list of 180 were published between 2012 and 2015; the issues explored by SPA studies became more diverse and more specific around this time (Figure 3.1). From the beginning, and more or less continuously over the period, SPA has been concerned with the feasibility of energy transition and of a major expansion of renewable energy. SPA has contributed to this debate mainly through modelling of scenarios, but also through exploring and assessing different technological options. The scenarios very often also investigate economic implications of policy changes, for instance projected differences in future GDP between scenarios. Similarly, options for the design of support schemes for renewables or appraisals of the EEG have been an issue in SPA work from the beginning of the period, accompanying the introduction of the policy instrument in 2000 and subsequent reforms. After 2011, the costs associated with the EEG as the major support instrument for renewables were increasingly placed under scrutiny and the pressure on policy-makers to reform the support system increased. Correspondingly, studies on EEG reform abound in 2012 and 2013.

After 2011, SPA has also been concerned more generally with the design of the future electricity market, with the pros and cons of capacity mechanisms, grid expansion, technical options for increasing flexibility in the system to deal with fluctuating renewable energy, and public acceptance. Scientific policy advisors engaged in, and contributed to, each of these sub-debates. For our analysis we focus on the evolution of the general conceptual discussion of energy transition and on the issues that were present throughout the period, assuming that these are the reports that most clearly reflect their authors‘ general opinion and that matter most for the public debate. We consider individual sub-debates as examples.

[3] The full codebook is available upon request.

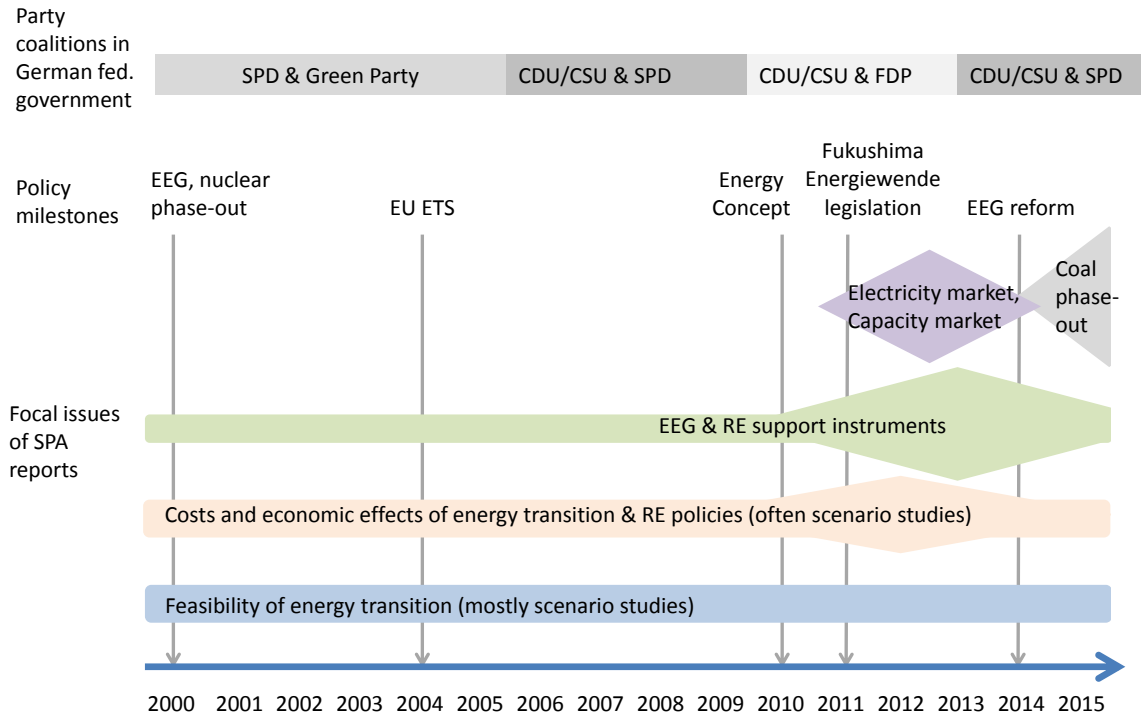

Figure 3.1: Major issues in SPA studies on energy policy and energy transition between 2000 and 2015. The figure is based on a review of the list of 180 studies and indicates how many of the studies address which of the core issues over time. For the sake of clarity, we abstract from the numbers and only show the broad trends. Other issues that feature in the reports but are less central for our purposes, such as nuclear energy risks, grid expansion, and emissions trading, are not shown.

3.3.2 Advocacy and story-telling

As Table 3.2 illustrates, the majority of the SPA studies that were coded can be clearly assigned to one of the two advocacy coalitions. Of the 50 reports, 23 were in support of the proactive coalition's discourse and 15 in support of the reactive coalition's. There were 12 studies which could not be associated with either coalition. For the studies that were commissioned by policy actors, there is either congruence between the coalition membership of the commissioning institution and the report's association (21 of 30), or the report has no clear coalition association (9).

Table 3.2: Studies of the coding sample and their association with advocacy coalitions.

Type of report	PROACTIVE	NO COALITION	REACTIVE
Council / Commission	▪ *Enquete 2002 main report* ▪ *SRU 2004* ▪ *Ethikkommission 2011* ▪ *SRU 2011* ▪ *Löschel et al. 2014*		▪ *Enquete 2002 dissenting votes* ▪ *Beirat BMWi 2004* ▪ *Beirat BMWi 2011* ▪ *SVR 2011* ▪ *Monopolkomm. 2013* ▪ *SVR 2013*
Academy, science association		▪ *Leopoldina 2011* ▪ *Elsner et al. 2015*	▪ *Blum et al. 2005* ▪ *DPG 2010* ▪ *acatech 2012*
Study authored by single institute or consortium	▪ Nitsch et al. 1999 ▪ Matthes & Cames 2000 ▪ Fischedick et al. 2002 ▪ Diekmann et al. 2005 ▪ Krewitt & Schlomann 2006 ▪ Staiß et al. 2006 ▪ Barzantny et al. 2009 ▪ Öko-Inst. & Prognos 2009 ▪ Lehr et al. 2011 ▪ Küchler & Meyer 2012 ▪ Nitsch et al. 2012 ▪ *Jacobs et al. 2013* ▪ Consentec & Fh IWES 2014 ▪ Lechtenböhmer et al. 2014 ▪ enervis 2015 ▪ Hauser et al. 2015 ▪ Lehr et al. 2015 ▪ Öko-Inst. & Fh ISI 2015	▪ Fleischer et al. 2000 ▪ Bohnenschäfer et al. 2003 ▪ Schlesinger et al. 2007 ▪ Consentec & r2b 2010 ▪ Edenhofer et al. 2013 ▪ Gerbert et al. 2013 ▪ *Kopp et al. 2013* ▪ Lutz et al. 2014 ▪ Schlesinger et al. 2014 ▪ Connect EE et al. 2015	▪ Schulz et al. 2005 ▪ *Frondel et al. 2009* ▪ Fahl et al. 2010 ▪ Frontier ec. & EWI 2010 ▪ Schlesinger et al. 2010 ▪ Bertsch et al. 2013

PROACTIVE and REACTIVE: Explicit reproduction of respective discourse, or clear support of respective discourse by aim, design and results. NO COALITION: No explicit statement of position, results not clearly supporting one or the other discourse. For full titles of studies see Annex A. Studies in italics are not directly commissioned by policy actors (councils and commissions acting within the scope of their general mandate).

Studies with explicit or implicit positioning

Of the 38 studies that are associated with one of the two coalitions, most (29) explicitly and unambiguously share elements of the respective discourse and its characteristic narratives. The authors of these studies clearly have different normative starting points, which are often stated openly. For nine reports, no explicit positioning in the advocacy coalition landscape was found, but an attachment to a coalition was established based on the design and contributions of the study. In these studies, the choice of research question or method indicates inspiration by one of the coalitions, and the results of the study clearly support one of the major discourses.

Studies coded as PROACTIVE place greater emphasis on environmental problems, and characteristically derive from them a duty to fulfill the national contribution to international climate protection (reminiscent of a "deontological" ethics where one should do what one recognizes to be "right"). In REACTIVE studies, in contrast, achieving ambitious national climate targets is not necessarily considered a satisfying goal if its effect on international climate protection is unclear

(suggestive of consequentialist ethics where action is assessed by looking at consequences rather than intentions).

While PROACTIVE studies do not dismiss economic concerns as irrelevant, there are gradual differences between how PROACTIVE and REACTIVE reports rate the relevance of economic efficiency. In PROACTIVE studies, sometimes a preference is expressed for ensuring the success of renewables expansion over achieving it at lowest possible cost (e.g. Fischedick et al., 2002, p. 248). The market is not trusted to automatically lead to environmental protection; an "active state" is seen as necessary for achieving the transformation (e.g. Enquete-Kommission, 2002, p. 30). In contrast, REACTIVE studies usually express a lower priority of environmental compared to economic goals, or are characterized by an *absence* of strong commitments to environmental goals, and in particular to the specific pathway of a transition to renewables. The stronger focus on economic efficiency is often associated with skepticism towards state intervention into markets.

The different normative starting points translate into different research aims and approaches. Most notably, PROACTIVE SPA is very often based on long-term scenarios that are essentially normative (Lehr et al., 2015, p. 94) defining the desired *outcomes* of policies and aiming to show which policy and emission developments are necessary over time to arrive at the (long-term) goal. REACTIVE SPA generally tends to take a shorter-term perspective on energy policy and uses reference scenarios and trend extrapolations to substantiate doubts surrounding the feasibility of major changes in supply structures. It usually takes a greater interest in the immediate effects of transformation policies (2020-2030), while often ignoring the question of whether or not long-term decarbonization will be achieved. Scientists from the two coalitions thus essentially work on different – albeit related – research questions.

Generally, while most studies openly commit to certain policy beliefs and (partly) reproduce the content of the two major discourses, they make limited use of narrative structures, rhetoric and linguistic tools, such as simple plots, strong characters or prominent metaphors. The narratives that do occur in the SPA studies tend to differ from the typical narrative in that they often do not name the heroes, villains and victims as human actors. Instead, there may be "problem-causing" and "problem-solving" entities, such as the state, renewable energy, fossil industry, or the EEG, and victims may be implied by phrases such as "loss of jobs". Agency is also often hidden by the passive tense. Thus, SPA reports usually avoid allocating blame or responsibility directly to human actors. Interestingly, we find the clearest advocacy and most narrative features in studies written by independent advisory bodies and commissions (Table 3.2). This might be due to the fact that they are addressed to a larger audience and are more directly aimed at influencing public (and policy-makers') opinion through argument, while the authors of commissioned studies tend to see their task more in the provision of information and the generation of data.

Studies without clear association to advocacy coalition

There are 12 studies in our sample that could not be associated with either coalition. Most (8) of them were published between 2011 and 2015 (see Table 3.2 and Annex A).

All of the NO COALITION studies are characterized by a very low degree of "narrative-ness". In particular, there is usually no statement of any urgent externally imposed problem (such as climate change or economic threats). Instead, the studies are motivated by the task they have been assigned by the commissioning institution (e.g. Schlesinger et al., 2007) or by politically decided goals which

provide certain challenges to be addressed (e.g. Consentec and R2B Energy Consulting, 2010). After 2011, the NO COALITION reports usually reference the political *Energiewende* decisions, and often compare elements of one discourse against the other. For example they might acknowledge the need to achieve high shares of renewables, while simultaneously increasing cost efficiency (Elsner et al., 2015; Kopp et al., 2013), or commit to economic efficiency and technology neutrality, while placing them in the service of a successful energy transition (Connect EE et al., 2015). Correspondingly, the results often support the archetypal narratives of both discourses in a "yes-but" fashion: energy transition is feasible *but* challenging; it is not for free *but* it is likely to pay off later; there are opportunities *and* risks for industry (Gerbert et al., 2013). With respect to policy instruments, NO COALITION studies integrate concerns of both camps and deliver proposals for smooth, "evolutionary" reform, avoiding the recommendation of immediate radical system change (Edenhofer et al., 2013; Kopp et al., 2013).

From the (limited) sample it seems that NO COALITION studies are often authored by institutes that are relatively new to the field, i.e. that do not have a traditional position in the advocacy coalition landscape (e.g. Consentec, r2b, BCG, Connect EE); by consortia where institutes traditionally associated with different coalitions work together (GWS with EWI and Prognos; PIK with EWI); by institutes working for a commissioning institution of the "wrong" coalition (e.g. Prognos commissioned by UBA in the case of Bohnenschäfer et al., 2003); or for a commissioning institution that itself has modified its position (e.g. studies commissioned by the Ministry for Economic Affairs after 2011).

3.3.3 Trends in SPA and evolution of discourses

In the following section we explore how SPA contributions to the debate changed over time, and discuss how these trends may have interacted with the evolution of the general discourses on energy transition. We focus our argument on the role of SPA here; the limits of the analysis and further research needs are discussed at the end of this section.

Point of departure: Science fueling irreconcilable narratives

In the early 2000s, conflict between the two advocacy coalitions and their narratives ran deep, with each being supported by different scientists. The focus of many SPA studies at the time was on scenario modelling with the aim of proving (or disproving) the feasibility of transition towards an energy system without nuclear and with high renewable shares, based on assumptions regarding the technical and economic potential of renewable energy sources (e.g. Bohnenschäfer et al., 2003; Diekmann et al., 2005; Fischedick et al., 2002; e.g. Fleischer et al., 2000). In 2002, a parliamentary commission on sustainable energy supply published its final report. In the commission, parliamentarians of all party groups, and scientists or experts nominated by the parties, had been in discussion over more than two years. The general aim of parliamentary commissions – developing a shared understanding of long-term complex policy challenges and creating conditions for dialogue and consensus across party groups – was not achieved in this case. The report, with the main body of text supported only by the parties and experts of the governing majority (SPD and Green Party), and peppered with dissenting opinions from the conservative-liberal and left-wing opposition, clearly reflects the unresolved conflict between the two competing discourses and the supporting science. The commission considered different scenarios on the potential future development of the energy system that were delivered by SPA institutions. The Social Democrats and Greens defined two

scenarios labeled “conversion efficiency” and “renewable energy offensive”, while the third scenario, “fossil-nuclear energy mix”, was defined by the conservative-liberal opposition (Enquete-Kommission, 2002, p. 19). Not surprisingly, the scenarios allowed both coalitions – parliamentarians and experts alike – to reproduce their traditional narratives in the report, drawing on those results that suited their political goals and worldviews.

Trend 1: Differentiation of cost estimates

In the following years, under the social democrat-Green government and the grand coalition succeeding it in 2005, the publication of scenarios on energy future became routine. While the feasibility of energy transition was still an issue, particularly addressed by the PROACTIVE studies, the focus generally shifted toward the analysis of environmental and, most of all, the economic consequences of energy system changes. Overall, studies provided more differentiated information on the costs of energy transition. For instance, REACTIVE reports increasingly focused their argumentation on the specific costs of renewables support under the EEG (e.g. Frondel et al., 2009). While PROACTIVE reports continued to highlight the need to consider external costs and to defend basic EEG principles, they could not deny that costs from renewable energy support were, in fact, substantial (e.g. Küchler and Meyer, 2012, p. 11). Traditional members of the proactive coalition, such as the Environment Advisory Council, began carefully acknowledging the need to reform the support system for renewables under the EEG in order to achieve higher cost efficiency (SRU 2011, p. 34).

Most notably, SPA results on economic indicators barely supported story-lines claiming extreme positive or negative effects, such as fears of a “de-industrialization” from energy transition still conjured up by politicians in recent years (e.g. Brüderle, Minister of Economic Affairs, 2011). NO COALITION reports, and even reports associated with the reactive coalition, more recently project negligible or even moderate positive effects on employment and GDP (Lutz et al., 2014, p. 149; Schlesinger et al., 2014, p. 34, 2010, p. 159), while PROACTIVE SPA tends to project significant positive effects on economic variables only after 2030 (Lehr et al., 2015, p. 170; Nitsch et al., 2012, p. 30; Öko-Institut and Fraunhofer ISI, 2015, p. 46). The EEG is assumed to have had positive effects on GDP up to 2014 and is projected to have negative effects between 2015 and 2030 (Löschel et al., 2015, 2014; Lutz et al., 2014). The proactive coalition’s claim that energy transition would boost employment, strongly contested by science supporting the reactive coalition (e.g. Frondel et al., 2009; Hentrich et al., 2004; Pfaffenberger et al., 2003), has been formulated in more careful terms with respect to net effects since 2006 (Staiß et al., 2006, pp. 107–108). Net effects are more recently rated relatively low (Lutz et al., 2014, p. 148), while the positive gross effect on employment in particular regions, and of high-quality jobs, is not contested (e.g. Lehr et al., 2015).

We argue that this trend has helped to de-radicalize the narratives, and to change the boundary conditions for political argument. For a policy-maker taking a larger sample of studies into account, or a scientist reviewing her colleagues’ work, it has become more difficult over the years to recount any of the narratives of the coalitions without modification or concessions, and to employ science in support for dramatic stories of rise or decline. This may have made it easier for coalition actors to respond to the other side’s policy beliefs, to engage in more constructive dialogue, and to produce new versions of the narratives that could integrate concerns of both sides.

Trend 2: More scope for compromise in sub-debates on implementation after 2011

In 2010 and 2011, the political goals for the German energy transition were formulated by government. They included targets for renewables development (shares of 80% in electricity and 60% in total energy consumption) and greenhouse gas emissions (cutback of 80% to 95% compared to 1990) up to 2050 (BMWi and BMU, 2011). The majority of SPA studies in subsequent years takes the energy transition project as given. They are concerned with progress made, and the question of how energy transition can be implemented *as economically efficiently as possible*. This is illustrated by a large number of publications on reform of the EEG and on design options for the electricity market (Figure 3.1), and encompasses a shift of focus on technical details and policy design. Since only some of the studies from these sub-debates are part of our coding sample, we draw on existing reviews of studies on EEG reform and capacity markets (Maatsch, 2013; Pahle et al., 2014).

Studies on EEG reform published in 2012 and 2013, prior to a change in legislation which took place in 2014 (Pahle et al., 2014), all emphasize the role of costs and economic efficiency, but propose reforms that substantially differ in the degree to which they place the risks of investment on the investors[4] and thus deviate from the guaranteed feed-in tariffs of the traditional EEG system. Proposals associated with the proactive coalition (AGORA Energiewende, 2013; Jacobs et al., 2013; Leprich et al., 2013; SRU, 2013) favor "softer" reform options, such as a "sliding market premium", that still allocate relatively little risk to renewable energy investors. They resonate with narratives starring citizens and small business as heroes responsible for the success of energy transition, which makes them more likely to conclude that energy transition will be slowed down by higher investment risks. They argue that higher risk premiums would generally increase support costs (Jacobs et al. 2013, p. 7), and that there might be less investment as a result (SRU, 2013, p. 105), particularly by risk-averse small investors such as individual citizens or energy cooperatives (Jacobs et al., 2013, p. 7). Other reports resonate with a discourse that prioritizes economic efficiency and trusts in the ability of the market to achieve desired outcomes, and thus are closer to the reactive coalition (Frondel et al., 2012; Haucap et al., 2012; Monopolkommission, 2013; SVR, 2013). These reports argue in favor of quota systems, which do not differentiate between technologies, and allocate risks fully to renewable energy investors.

However, there are also a considerable number of studies that make proposals for compromise between the two extremes. They for instance favor fixed market premiums for renewable electricity that may (in a second step) be determined through auctions (e.g. frontier economics, 2012; Kopp et al., 2013; Löschel et al., 2013). This would increase the risk of investment vis-à-vis the then-existing fixed feed-in tariffs, but, crucially, would allow the system to be transformed in "evolutionary" steps, ensuring robustness and smoothness of transition while also contributing to higher cost-efficiency (Kopp et al., 2013).[5]

[4] Pahle et al. (2014) point out here that the total economic risk to society remains the same, but that the choice of instrument determines how it is distributed between renewable energy investors, consumers, and investors in conventional energy.

[5] The actual reform of the EEG 2014 did not make any immediate large steps towards greater market integration. Direct marketing of renewable electricity became mandatory for larger installations, but the floating market premium that was already implemented in 2012 in principle remained in place. However, the new law envisages a transition to an auction-based system by 2017, which is to be tested in pilot projects.

A debate surrounding the need for, and options to, design capacity markets, gave rise to a large number of SPA studies around the year 2012. Again, the traditional advocacy coalitions continued to exist, and differences in normative positions still were a crucial determinant of how SPA actors assessed policy instruments (Maatsch, 2013, p. 99). Nevertheless, as in the case of EEG reform, the studies overall illustrate that there is a multitude of options for policy design. The accumulation of specific knowledge by the actors involved contributed to making the debate less ideological and increased the readiness of actors for compromise (ibid, p. 107).

These examples show that, while discourses and their characteristic narratives continue to influence the basic stance of SPA authors, and even controversies over details of policy design are related to policy beliefs, the shift of focus towards implementation and policy instrument design seems to have opened space for SPA to bridge the traditional discursive trenches. Using this space, SPA offered different alternative options, showing that compromise and step-wise reform was possible. For the policy-makers using the studies, it became easier to see that, rather than choosing between extremes, theirs was a task of balancing interests.

Limitations and further research needs

It has to be noted that, looking at one factor among many, our analysis does not allow establishing the relative importance of SPA contributions for the evolution of the discourse. It is likely that changes in discourse were caused primarily by factors other than SPA, such as the self-reinforcing effects of new policies introduced during particular historic windows of opportunity, the emergence of new lobby groups, changes in political power constellations, decreasing costs for renewable energy technologies, or external events such as the Fukushima nuclear disaster in 2011 (Gründinger, 2015; Jacobsson and Lauber, 2006; Stefes, 2010; Strunz, 2014; Sühlsen and Hisschemöller, 2014). These factors also affected the work of scientific policy advisors themselves. The political situation at each point in time to a large extent determined the issues, research questions and approaches of SPA work. Figure 3.1 shows, for instance, how the focal issues of SPA reports changed after 2010/2011 as a result of changed political priorities.

However, while external events and changes in the political and economic situation certainly affected the discourse strongly, the influence is not just one-way. Discursive practice in many ways interacts with political power struggle (Fischer, 2003, p. 76-81), and narratives are an important resource wherever actors seek to exercise power by influencing and shaping someone else's preferences (Lukes, 2005, p. 27). For instance, it has been shown that policy responses to external events such as the Fukushima incident may be influenced by the prevailing narratives (Hermwille, 2016), and that shifts in story-lines might be an indicator of accelerating transition dynamics (Bosman et al., 2014).

Thus, while we do not claim that SPA contributions were decisive for the evolution of the discourse, we argue that they constituted a relevant source of discursive power. The credibility and utility of narratives are enhanced if they receive a "stamp of approval" from science (Stone 1989, p. 294); conversely if a story is challenged by scientific evidence, it will be less convincing. Moreover, scientists themselves play a part in shaping discourses through selecting, framing and interpreting information, being "part of a larger knowledge-power relationship" (Fischer 2003, p. 45). Our approach, however, does not disentangle these various mutual influences and describes contributions by SPA without quantifying them.

While our analysis takes a first step by analyzing the SPA studies, further research should also investigate the reception and use of SPA reports by policy actors. The spectrum of potential uses of SPA ranges from contributions to "policy-oriented learning", that is, changes in beliefs within and across advocacy coalitions (Jenkins-Smith et al., 2014, p. 198) to conscious misuse to legitimize decisions already made (Kowarsch, 2016, p. 60) or to prevent regulation (Stone, 2012, p. 318). Whether SPA is closer to advocacy or cartography also depends on how it is used by policy-makers.

3.4 Conclusions and policy implications

From the results of this study, we draw three main conclusions. Firstly, we find widespread advocacy in scientific policy advisory documents on German energy transition. The majority of the reports are associated with one of two advocacy coalitions, i.e. scientific resources are used to make arguments for a certain political standpoint. In most cases, the reports' position in the coalition landscape is transparent from the presence of elements of the respective discourse. Our case study provides further empirical support to the claim that SPA operates in a context where facts and values are inextricably linked (Kowarsch, 2016). The fact that scientific policy advisors, like other human beings, are motivated by values has to be acknowledged as a reality, but is not, as we argue, necessarily a bad thing. There is a high degree of transparency on the relationships between beliefs, assumptions, research aims and results (Sarewitz, 2004): For an informed reader of the SPA studies, it is easy to understand that preferred policy options are not solely derived from scientific claims, but that they also follow from normative propositions regarding desired achievements. Also, since different normative starting points lead to different approaches and research aims, the polarization within SPA ensures that different aspects of the policy problem are being investigated.

Secondly, we find that despite taking a clear position, SPA studies do not ignore the arguments of opponents, but respond to them and even partially integrate them into their own reasoning. Over time, reports supporting the proactive coalition have increasingly cared about costs of transformative policies, while studies associated with the reactive coalition have accepted energy transition as a politically given goal and built arguments based on climate protection needs. In more recent sub-debates on instrumental details, SPA has collectively opened up perspectives for compromise between extreme positions, and signaled that step-wise reform and different ways of distributing burdens are possible.

Our analysis does not disentangle the mutual influences between developments in the policy arena, the evolution of the discourses, trends in SPA, and external events, and the convergence of discourses was most likely driven primarily by factors other than SPA. However, we argue that, as a relevant source of discursive power, SPA contributed to this convergence by providing differentiated information on key claims of the respective narratives, such as the feasibility of transition, the costs and benefits of policy changes, and options for policy instrument choice, and by not lending itself to dramatic stories of rise or decline. We conclude that *despite* a considerable degree of polarization in the SPA landscape, the contributions from scientific advisors have helped to build bridges between originally irreconcilable narratives, and thus improved the conditions for political consensus or compromise.

In order to continue fulfilling this facilitating function in the future, SPA will need to address elements of the discourses that it has so far neglected, but that may become new crystallization points for conflict. One example is the emerging debate on coal phase-out (AGORA Energiewende, 2016): while

a consensus on the need to expand renewables has generally been reached, there is much less agreement on the flip-side of the coin – how and how fast the use of coal for electricity generation should be terminated. A second example is the international outreach of national German efforts. Given the high relevance of climate protection as a goal of energy transition in the debate (Joas et al., 2016), the reactive coalition's claim that national action has none or marginal effects on global greenhouse gas emissions constitutes a powerful challenge to one of the central narratives of the proactive discourse, which counts on German leadership to create followers around the world. The extent to which this actually happens, and how leadership effects can be enhanced, is currently under-researched, but might become a focal point of the debate in the future (Steinbacher and Pahle, 2015).

Our third conclusion is that collectively, the SPA studies we analyzed provide a basis for a "cartography of policy pathways" as suggested by Edenhofer and Kowarsch (2015) in their outline of a pragmatic-enlightened model (PEM) of science-policy interaction. We argue, however, that decisive features of a PEM-type assessment can actually develop in a bottom-up process, and that a large-scale, centralized endeavor is not necessarily required. The SPA landscape in our case study provides for a large degree of transparency about value judgements and assumptions, and an ample pool of information about alternative potential policy pathways and their consequences. While it seems unrealistic to expect pathway cartography to be delivered by every individual SPA endeavor, a number of studies do acknowledge both discourses, and are designed to provide options for compromise. In addition, several platforms for interdisciplinary dialogue and stakeholder involvement exist, such as the *Forschungsforum Energiewende*[6] or the process preparing the forthcoming national Climate Action Plan 2050 (*Klimaschutzplan 2050*).[7]

However, several gaps between the status quo and an ideal PEM-type assessment of policy options still exist. Firstly, knowledge is scattered across a large number of SPA studies, and for policy-makers with limited time the sheer quantity of information is likely to be a challenge. In this situation they may be even more strongly tempted to prioritize studies that are in line with their own coalition's narratives and that may not give a full account of the consequences, particularly the unwanted side-effects of suggested policies. Secondly, the existing formats for dialogue and participation could be further developed in order to provide for more integrated and iterative linkage between researchers' activities and public discourse (Edenhofer and Kowarsch, 2015, p. 61), which is key to ensuring that different values and interests are adequately identified and addressed (Renn, 2015, pp. 81-82). Thirdly, while insiders to the debate, as we argue, easily recognize the relationship between SPA studies and advocacy coalitions, the public debate might benefit from addressing ethical and value issues directly and making them an object of the debate themselves.

In the case of the German Energiewende, setting up a new large-scale PEM-type assessment process would be redundant with existing efforts and thus be neither economical nor practical. Instead, we suggest that a cartography of policy pathways could be produced with limited effort from the existing SPA. Decision-makers in need of an overview might for instance commission a small number of institutes (e.g. one from each coalition) to distill a map of several alternative policy options from the available body of studies, identify their contributions to different policy objectives, side effects,

[6] E.g. Forschungsforum Energiewende, https://www.bmbf.de/de/forschungsforum-energiewende-573.html (accessed 13.12.2016).
[7] http://www.klimaschutzplan2050.de/en/ (accessed 13.12.2016).

synergies and trade-offs, and discuss how they respond to the different discourses and their beliefs and values. The activity could be linked to existing platforms for stakeholder participation, particularly as regards the choice of pathways to be considered, and the discussion of results.

This mapping process would not aim at reaching consensus about which policy solution to choose (an attempt likely doomed to fail as illustrated by the case of the 2002 Enquete Commission's report), but at delineating the solution space. If successful, it could contribute to a more constructive exchange about values and objectives between coalitions, and further support the identification of solutions that resonate with different discourses and narratives.

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3.6 Annex A: List of SPA reports

No.	Year	Study	Commissioning institution(s)	Authoring institution(s)	Coalition
1	1999	Nitsch, J., Fischedick, M., Allnoch, N., Baumert, M., Langniß, O., Nast, M., Staiß, F., Staude, U., 1999. Klimaschutz durch Nutzung erneuerbarer Energien. Report commissioned by BMU and UBA. BMU, Berlin.	BMU, UBA	DLR, WI, ZSW, IWR, FfZ	PROACTIVE
2	2000	Fleischer, T., Oertel, D., Paschen, H., 2000. TA-Projekt "Elemente einer Strategie für eine nachhaltige Energieversorgung". Vorstudie. TAB, Berlin.		TAB	NO COALITION
3	2000	Matthes, F.C., Cames, M., 2000. Energiewende 2020: Der Weg in eine zukunftsfähige Energiewirtschaft. Heinrich Böll Stiftung, Berlin.	Heinrich Böll Stiftung	Öko-Institut	PROACTIVE
4	2002	Enquete-Kommission Nachhaltige Energieversorgung unter den Bedingungen der Globalisierung und Liberalisierung, 2002. Endbericht. Deutscher Bundestag, Berlin.		Enquete-Kommission 2002	PROACTIVE
5	2002	Enquete-Kommission Nachhaltige Energieversorgung unter den Bedingungen der Globalisierung und Liberalisierung, 2002. Endbericht. Deutscher Bundestag, Berlin. Dissenting votes.		Enquete-Kommission 2002	REACTIVE
6	2002	Fischedick, M., Nitsch, J., Lechtenböhmer, S., Hanke, T., Barthel, C., Jungbluth, C., Assmann, D., Brüggen, T. vor der, Trieb, F., Nast, M., Langniß, O., Brischke, L.-A., 2002. Langfristszenarien für eine nachhaltige Energienutzung in Deutschland. UBA, Berlin.	UBA	WI, DLR	PROACTIVE
7	2003	Bohnenschäfer, W., Koepp, M., Scheelhaase, J.D., Schlesinger, M., Kaschenz, H., 2003. Perspektiven für elektrischen Strom in einer nachhaltigen Entwicklung. Grundsätze, Kriterien und Szenarien für eine nachhaltige Stromnutzung und -erzeugung. UBA, Berlin.	UBA	Prognos	NO COALITION
8	2004	Beirat BMWA (Wissenschaftlicher Beirat beim Bundesministerium für Wirtschaft und Arbeit), 2004. Zur Förderung erneuerbarer Energien. Gutachten. BMWA, Berlin.		Beirat BMWi	REACTIVE
9	2004	SRU (Sachverständigenrat für Umweltfragen), 2004. Umweltgutachten 2004. Umweltpolitische Handlungsfähigkeit sichern. Nomos, Berlin.		SRU	PROACTIVE
10	2005	Blum, W., Breyer, W., Gelfort, E., 2005. Klimaschutz und Energieversorgung in Deutschland 1990-2020. DPG, Bad Honnef.		DPG	REACTIVE
11	2005	Diekmann, J., Hopf, R., Ziesing, H.-J., Kleemann, M., Krey, V., Markewitz, P., Martinsen, D., Vögele, S., Eichhammer, W., Jochem, E., 2005. Klimaschutz in Deutschland bis 2030. Endbericht zum Forschungsvorhaben - Politikszenarien III. UBA, Berlin.	UBA	DIW, FZJ-STE, Fh-ISI, Öko	PROACTIVE
12	2005	Schulz, W., Bartels, M., Gatzen, C., Lindenberger, D., Müsgens, F., Peek, M., Seeliger, A., Steuber, D., Wissen, R., Hofer, P., Kirchner, A., Scheelhaase, J., Schlesinger, M., 2005. Energiereport IV. Die Entwicklung der Energiemärkte bis zum Jahr 2030. Energiewirtschaftliche Referenzprognose. EWI, Prognos, Köln, Basel.	BMWA	EWI, Prognos	REACTIVE
13	2006	Krewitt, W., Schlomann, B., 2006. Externe Kosten der Stromerzeugung aus erneuerbaren Energien im Vergleich zur Stromerzeugung aus fossilen Energieträgern. DLR, Fh-ISI, Stuttgart, Karlsruhe.	BMU	DLR, Fh-ISI	PROACTIVE
14	2006	Staiß, F., Kratzat, M., Nitsch, J., Lehr, U., Edier, D., Lutz, C., 2006. Erneuerbare Energien: Arbeitsplatzeffekte. Wirkungen des Ausbaus erneuerbarer Energien auf	BMU	ZSW, DLR, DIW, GWS,	PROACTIVE

No.	Year	Study	Commissioning institution(s)	Authoring institution(s)	Coalition
		den deutschen Arbeitsmarkt. BMU, Berlin.			
15	2007	Schlesinger, M., Hofer, P., Rits, V., Lindenberger, D., Wissen, R., Bartels, M., 2007. Energieszenarien für den Energiegipfel 2007 (Inklusive Anhang 2 %-Variante). Endbericht. Prognos, EWI, Basel, Köln.	BMWT	Prognos, EWI	NO COALITION
16	2009	Barzantny, K., Achner, S., Vomberg, S., Groscurth, H.-M., Böhling, A., Breuer, T., 2009. Klimaschutz: Plan B 2050. Energiekonzept für Deutschland. Greenpeace, Hamburg.	Greenpeace	EUTech, arrhenius	PROACTIVE
17	2009	Frondel, M., Ritter, N., Vance, C., 2009. Die ökonomischen Wirkungen der Förderung Erneuerbarer Energien: Erfahrungen aus Deutschland. Projektbericht. RWI, Essen.		RWI	REACTIVE
18	2009	Öko-Institut, Prognos AG, 2009. Modell Deutschland - Klimaschutz bis 2050: Vom Ziel her denken. Endbericht. WWF Deutschland, Frankfurt am Main.	WWF	Öko-Institut, Prognos, Ziesing	PROACTIVE
19	2010	Consentec, r2b Energy Consulting, 2010. Voraussetzungen einer optimalen Integration erneuerbarer Energien in das Stromversorgungssystem. Consentec & r2b, Aachen, Köln.	BMWT	Consentec, r2b	NO COALITION
20	2010	DPG (Deutsche Physikalische Gesellschaft), 2010. Elektrizität: Schlüssel zu einem nachhaltigen und klimaverträglichen Energiesystem. DPG, Bad Honnef.		DPG	REACTIVE
21	2010	Fahl, U., Blesl, M., Voß, A., Achten, P., Bruchof, D., Götz, B., Hundt, M., Kempe, S., Kober, T., Kuder, R., Küster, R., 2010. Die Entwicklung der Energiemärkte bis 2030. Energieprognose 2009. IER, RWI, ZEW, Stuttgart, Essen, Mannheim.	BMWT	IER, RWI, ZEW	REACTIVE
22	2010	Frontier Economics, EWI, 2010. Energiekosten in Deutschland - Entwicklungen, Ursachen und internationaler Vergleich. Frontier Economics, London.	BMWT	frontier economics, EWI	REACTIVE
23	2010	Schlesinger, M., Hofer, P., Kemmler, A., Kirchner, A., Strassburg, S., Fürsch, M., Nagl, S., Paulus, M., Richter, J., Trüby, J., Lutz, C., Khorushun, O., Lehr, U., Thobe, I., 2010. Energieszenarien für ein Energiekonzept der Bundesregierung. Studie. Prognos, EWI, GWS, Basel, Köln, Osnabrück.	BMWT	Prognos, EWI, GWS	REACTIVE
24	2011	Beirat BMWi (Wissenschaftlicher Beirat beim Bundesministerium für Wirtschaft und Technologie), 2011. Brief an Rainer Brüderle, Bundesminister für Wirtschaft und Technologie: Zur Novelle des Erneuerbare-Energien-Gesetzes.		Beirat BMWT	REACTIVE
25	2011	Ethikkommission Sichere Energieversorgung, 2011. Deutschlands Energiewende – Ein Gemeinschaftswerk für die Zukunft. Ein Bericht im Auftrag der Bundeskanzlerin Dr. Angela Merkel. Ethikkommission Sichere Energieversorgung, Berlin.		Ethikkommission	PROACTIVE
26	2011	Lehr, U., Lutz, C., Edler, D., O´ Sullivan, M., Nienhaus, K., Nitsch, J., Breitschopf, B., Bickel, P., Ottmüller, M., 2011. Kurz- und langfristige Auswirkungen des Ausbaus der erneuerbaren Energien auf den deutschen Arbeitsmarkt. DIW, DLR, GWS, Fh-ISI, ZSW, Osnabrück, Berlin, Karlsruhe, Stuttgart.	BMU	DIW, DLR, GWS, Fh-ISI, ZSW	PROACTIVE
27	2011	Leopoldina (Nationale Akademie der Wissenschaften), 2011. Ad-hoc-Stellungnahme: Energiepolitische und forschungspolitische Empfehlungen nach den Ereignissen in Fukushima. Leopoldina, Berlin.		Leopoldina	NO COALITION
28	2011	SRU (Sachverständigenrat für Umweltfragen), 2011. Wege zur 100% erneuerbaren Stromversorgung. Sondergutachten. Erich Schmidt, Berlin.		SRU	PROACTIVE

No.	Year	Study	Commissioning institution(s)	Authoring institution(s)	Coalition
29	2011	SVR (Sachverständigenrat zur Begutachtung der gesamtwirtschaftlichen Entwicklung), 2011. Jahresgutachten 2011/2012: Verantwortung für Europa wahrnehmen. Kapitel 6: Energiepolitik: Erfolgreiche Energiewende nur im Europäischen Kontext. SVR, Wiesbaden.		SVR	REACTIVE
30	2012	acatech, 2012. Die Energiewende finanzierbar gestalten. Effiziente Ordnungspolitik für das Energiesystem der Zukunft. acatech, München, Berlin, Brüssel.		acatech	REACTIVE
31	2012	Küchler, S., Meyer, B., 2012. Was Strom wirklich kostet. Greenpeace Energy and Bundesverband WindEnergie, Hamburg, Berlin.	BWE, Greenpeace Energy	FÖS	PROACTIVE
32	2012	Nitsch, J., Pregger, T., Scholz, Y., Naegler, T., Sterner, M., Gerhardt, N., Oehsen, A. Von, Pape, C., Saint-Drenan, Y.-M., Wenzel, B., 2012. Langfristszenarien und Strategien für den Ausbau der Erneuerbaren Energien in Deutschland bei Berücksichtigung der Entwicklung in Europa und global. DLR, Fraunhofer IWES, IFNE, Stuttgart, Kassel, Teltow.	BMU	DLR, Fh-IWES, IFNE	PROACTIVE
33	2013	Bertsch, J., Bettzüge, M., Growitsch, C., Hecking, H., Lorenczik, S., Liebenau, V., Rehtanz, C., Schwippe, J., Seack, A., 2013. Trendstudie Strom 2022 - Belastungstest für die Energiewende. EWI, Köln.	BDI	EWI, ie3, ef Ruhr	REACTIVE
34	2013	Consentec, Fraunhofer IWES, 2013. Kostenoptimaler Ausbau der Erneuerbaren Energien in Deutschland. Agora Energiewende, Berlin.	Agora	Consentec, Fh-IWES	PROACTIVE
35	2013	Edenhofer, O., Bettzüge, M.O., Pahle, M., Growitsch, C., Knopf, B., Hagspiel, S., Joas, F., Jägemann, C., Tietjen, O., Nagl, S., 2013. Strommarktdesign der Energiewende. PIK, EWI, Potsdam, Köln	TMWAT	PIK, EWI	NO COALITION
36	2013	Gerbert, P., Herhold, P., Heuskel, D., Klose, F., 2013. Trendstudie 2030+ Kompetenzinitiative Energie des BDI. BCG, München, Düsseldorf.	BDI	BCG	NO COALITION
37	2013	Jacobs, D., Schäuble, D., Bayer, B., Sperk, C., Töpfer, K., 2013. Eckpunkte für die Gestaltung der Energiewende. Policy Brief 2/2013. IASS, Potsdam.		IASS	PROACTIVE
38	2013	Kopp, O., Engelhorn, T., Onischka, M., Bode, S., Groscurth, H.-M., Klessmann, C., Gebhart, M., Nabe, C., Grave, K., Ehrhart, K.-M., Pietrzyk, S., 2013. Wege in ein wettbewerbliches Strommarktdesign für erneuerbare Energien. MVV, Mannheim.		MVV Energie AG, arrhenius, Ecofys, Takon	NO COALITION
39	2013	Monopolkommission, 2013. Energie 2013: Wettbewerb in Zeiten der Energiewende. Monopolkommission, Bonn.		Monopolkommission	REACTIVE
40	2013	SVR (Sachverständigenrat zur Begutachtung der gesamtwirtschaftlichen Entwicklung), 2013. Energiepolitik: Warten auf die dringend notwendigen Weichenstellungen. Kapitel 10 des Jahresgutachtens 2013/14. SVR, Wiesbaden.		SVR	REACTIVE
41	2014	Lechtenböhmer, S., Knopf, B., Bauer, N., Durand, A., Hanke, T., Luhmann, H.-J., Samadi, S., Schmid, E., Schneider, C., 2014. Kosten- und Modellvergleich langfristiger Klimaschutzpfade (bis 2050). UBA, Dessau-Roßlau.	UBA	WI, PIK	PROACTIVE
42	2014	Löschel, A., Erdmann, G., Staiß, F., Ziesing, H.-J., 2014. Stellungnahme zum ersten Fortschritts-Bericht der Bundesregierung für das Berichtsjahr 2013. Expertenkommission zum Monitoring-Prozess “Energie der Zukunft”, Berlin, Münster, Stuttgart.	BReg	Individual experts	PROACTIVE
43	2014	Lutz, C., Großmann, A., Lehr, U., Lindenberger, D.,	BMWi	GWS,	NO

No.	Year	Study	Commissioning institution(s)	Authoring institution(s)	Coalition
		Knaut, A., Malischek, R., Paulus, S., Tode, C., Wagner, J., Kemmler, A., Ley, A., Piegsa, A., Schlesinger, M., Straßburg, S., Koziel, S., 2014. Gesamtwirtschaftliche Effekte der Energiewende. Projekt Nr. 31/13 - Endbericht. GWS, Prognos, EWI, Osnabrück, Basel, Köln.		Prognos, EWI	COALITION
44	2014	Schlesinger, M., Lindenberger, D., Lutz, C., Hofer, P., Kemmler, A., Kirchner, A., Knaut, A., Nick, S., Panke, T., Lehr, U., Ulrich, P., 2014. Entwicklung der Energiemärkte – Energiereferenzprognose. Prognos, EWI, GWS, Basel, Köln, Osnabrück.	BMWi	Prognos, EWI, GWS	NO COALITION
45	2015	Connect Energy Economics GmbH, Consentec, Fraunhofer ISI, r2b Energy Consulting, 2015. Leitstudie Strommarkt 2015. Connect EE, Berlin.	BMWi	Connect Energy Economics, Consentec, Fraunhofer ISI, r2b	NO COALITION
46	2015	Elsner, P., Fischedick, M., Sauer, D.U., Lunz, B., Erlach, B., 2015. Flexibilitätskonzepte für die Stromversorgung 2050. Analyse aus der Schriftenreihe Energiesysteme der Zukunft. Leopoldina, acatech, Union der deutschen Akademien der Wissenschaften, München, Halle (Saale), Mainz.		Academies; authors from Fraunhofer ICT, WI, RWTH, acatech	NO COALITION
47	2015	enervis 2015. Der Klimaschutzbeitrag des Stromsektors bis 2040. Agora Energiewende, Berlin.	Agora Energiewende	enervis energy advisors	PROACTIVE
48	2015	Hauser, E., Hildebrand, J., Dröschel, B., Klann, U., Heib, S., Grashof, K., 2015. Nutzeneffekte von Bürgerenergie. IZES, Saarbrücken.	Greenpeace und BBEn	IZES	PROACTIVE
49	2015	Lehr, U., Edler, D., O'Sullivan, M., Peter, F., Bickel, P., 2015. Beschäftigung durch erneuerbare Energien in Deutschland: Ausbau und Betrieb, heute und morgen. GWS, DIW, DLR, Prognos, ZSW, Osnabrück, Berlin, Stuttgart.	BMWi	GWS, DIW, DLR, Prognos, ZSW	PROACTIVE
50	2015	Öko-Institut, Fraunhofer ISI, 2015. Klimaschutzszenario 2050. Öko-Institut, Fraunhofer ISI, Berlin, Karlsruhe.	BMUB	Öko-Institut, Fraunhofer ISI	PROACTIVE

3.7 Annex B: Institute names and abbreviations

acatech	National Academy of Science and Engineering (Deutsche Akademie der Technikwissenschaften)
ACF	Advocacy Coalition Framework
Agora	Agora Energiewende
arrhenius	arrhenius Institute for Energy and Climate Policy (arrhenius Institut für Energie- und Klimapolitik)
BBEn	Bündnis Bürgerenergie
BCG	Boston Consulting Group
BDI	The Voice of German Industrie (Bundesverband der Deutschen Industrie)
Beirat BMWA/BMWi	Wissenschaftlicher Beirat beim Bundesministerium für Wirtschaft und Arbeit/ beim Bundesministerium für Wirtschaft und Technologie
BMWi/BMWT/ BMWA	Federal Ministry for Economic Affairs (Bundesministerium für Wirtschaft; Bundesministerium für Wirtschaft und Technologie, Bundesministerium für Wirtschaft und Arbeit)
BMU/BMUB	Federal Ministry fort he Environment, Nature Conservation (, Building) and Nuclear Safety (Bundesministerium für Umwelt, Naturschutz (, Bau) und Reaktorsicherheit
BReg	Federal Government (Bundesregierung)
BWE	German Wind Energy Association (Bundesverband Windenergie)
CDU/CSU	Christian Democratic Union, Christian Social Union
Consentec	Consentec – Consulting für Energiewirtschaft und Technik GmbH
Connect EE	Connect Energy Economics

DIW	German Institute for Economic Research (Deutsches Institut für Wirtschaftsforschung)
DLR	German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt)
DPG	Deutsche Physikalische Gesellschaft
EEG	Renewable Energy Sources Act (Erneuerbare Energien Gesetz)
ef.Ruhr	Energieforschung Ruhr – Die Energiedenkfabrik
enervis	enervis energy advisors
Enquete-Kommission	Enquete-Kommission "Nachhaltige Energieversorgung unter den Bedingungen der Globalisierung und der Liberalisierung"
EUtech	EUtech Scientific Engineering
EWI	Energiewirtschaftliches Institut an der Universität zu Köln
FDP	Free Democratic Party
FfZ	Forum für Zukunftsenergien
Fh-ICT	Fraunhofer Institute for Chemical Technology (Fraunhofer Institut für Chemische Technologie)
Fh-ISI	Fraunhofer Institute for Systems and Innovation Research (Fraunhofer Institut für System- und Innovationsforschung)
Fh-IWES	Fraunhofer Institute for Wind Energy and Energy Systems Technology (Fraunhofer Institut für Windenergie und Energiesystemtechnik
FÖS	Green Budget Germany (Forum für Ökologisch-Soziale Marktwirtschaft)
FZJ-STE	Forschungszentrum Jülich, Institute of Energy and Climate Research, Systems Analysis and Technology Evaluation
GWS	The Institute of Economic Structures Research (Gesellschaft für Wirtschaftliche Strukturforschung)
IASS	Institute for Advanced Sustainability Studies
ie3	Institut für Energiesysteme, Energieeffizienz und Energiewirtschaft, Technische Universität Dortmund
IER	Institute of Energy Economics and the Rational Use of Energy (Institut für Energiewirtschaft und Rationelle Energieanwendung, Universität Stuttgart)
IFNE	Ingenieurbüro für neue Energien
IWR	Institute for Renewable Energy (Internationales Wirtschaftsforum Regenerative Energien)
IZES	Institut für ZukunftsEnergieSysteme, Universität des Saarlandes
Leopoldina	German National Academy of Sciences (Nationale Akademie der Wissenschaften)
Öko-Institut	Institute for Applied Ecology (Institut für angewandte Ökologie)
PEM	Pragmatic Enlightened Model
PIK	Potsdam Institute for Climate Impact Research (Potsdam-Institut für Klimafolgenforschung)
r2b	research to business energy consulting
RE	Renewable energy
RWI	Rheinisch-Westfälisches Institut für Wirtschaftsforschung
RWTH	Rheinisch-Westfälische Technische Hochschule Aachen
SPA	Scientific policy advice
SPD	Social Democratic Party
SRU	German Advisory Council on the Environment (Sachverständigenrat für Umweltfragen)
SVR	German Council of Economic Experts (Sachverständigenrat zur Begutachtung der gesamtwirtschaftlichen Entwicklung)
TAB	Office of Technology Assessment at the German Bundestag (Büro für Technikfolgenabschätzung beim Deutschen Bundestag)
Takon	Takon Spieltheoretische Beratung
TMWAT	Thüringer Ministerium für Wirtschaft, Arbeit und Technologie (Ministry for Economic Affairs, Employment and Technology Thuringia)
UBA	Federal Environment Agency (Umweltbundesamt)
WI	Wuppertal Institut für Klima, Umwelt, Energie
ZEW	Centre for European Economic Research (Zentrum für Europäische Wirtschaftsforschung)
ZSW	Zentrum für Sonnenenergie- und Wasserstoff-Forschung Baden-Württemberg

4 The debate on the future of coal 2015-2016*

Anna Leipprand
Christian Flachsland

Abstract

Greenhouse gas emissions are stagnating in Germany despite the Energiewende. As a result, policy measures are being discussed that specifically reduce coal-fired power production. Drawing on transition theory, discourse and framing analyses, this paper aims to reconstruct the German debate on the future of coal against the background of previous energy transition discourses, and to contribute to identifying scope for compromise by comparing the solution space as seen by opponent actor groups. We perform a qualitative text analysis on documents for public consumption in order to identify the contents and dynamics of framing struggles. The future-of-coal debate is found to re-intensify polarization over energy transition. Framing strategies emphasize negative effects and conflictual issues rather than shared values and attitudes, and most actors assemble with their traditional allies in two antagonist groups. This indicates that a broad societal consensus on a long-term national energy transition is severely challenged when it comes to implementing specific measures for short-term emission reduction. Nevertheless, we conclude that a constructive dialogue after the next German federal election is possible. Management of structural change is identified as a promising entry point for future negotiations. Measures for the compensation of regions, businesses and employees likely to lose from coal reduction policies will have to be developed in more detail. Solutions need to be found to reconcile national level emission reduction measures with the EU ETS.

Keywords: Sustainability Transitions; Energy; Coal; Discourse; Framing; Germany

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4.1 Introduction

Germany's *Energiewende* (energy transition) has come a long way. Within a quarter of a century, the share of renewable energy in electricity consumption has increased from around 3% in 1990 to over 30% in 2015 (BMWi, 2016). The introduction of support policies for renewables – at a time when this was not regarded as a serious challenge by the conventional industry (Strunz et al., 2015) – built constituencies that promoted further progress (Meckling et al., 2015). Renewable energy companies became relevant players with considerable lobbying power (Sühlsen and Hisschemöller, 2014), and German federal states were motivated to pursue ambitious plans for renewables development with the expectation of local co-benefits such as jobs and tax revenues (Ohlhorst, 2016). Therefore, policies introduced during historic windows of opportunity created self-reinforcing effects, which in conjunction with external events enabled major policy and energy system changes (e.g. Jacobsson and Lauber, 2006; Renn and Marshall, 2016; Strunz et al., 2015). Today, the transition to an energy system based mainly on renewable energy is an official government strategy (BMWi and BMU, 2011).

The discourses on the future of the energy supply in Germany, which initially were deeply polarized, converged over time. The "story of rise" told by energy transition proponents, which promised not only the solution to environmental problems but also a modernization of the industrial system, job creation, and an enhanced position on world markets for renewable technologies, became the mainstream narrative motivating energy transition (Leipprand et al., 2017a). None of the established parties of the political system or the major stakeholders involved publicly questions the project today.[1]

A widespread expectation is that Germany's energy system is on a "substitution pathway", where renewable technologies will eventually replace the incumbent technologies fueled by nuclear and fossil resources (Geels et al., 2016; Scheer, 1999). Conventional power plant operators have experienced decreases in profitability due in part to the expansion of renewable energy (Hirth, 2016; Kallabis et al., 2016), and the resilience of the fossil-nuclear system appears to be declining (Strunz, 2014). On the other hand, considerable economic interests remain associated with the coal industry. Lignite and hard coal still provide 40 percent of the German electricity supply (AGEB, 2017), and the coal industry still employs around 30.000 people (AGORA Energiewende, 2016a; enervis energy advisors, 2016; Statistik der Kohlenwirtschaft, 2017). Lignite continues to be produced from open cast mines in three regions (*Rheinisches Revier, Lausitzer Revier, Mitteldeutsches Revier*). Hard coal is mostly imported today, but the history of domestic mining still is a deeply-felt part of regional cultural identities. Incumbent electricity providers in Germany were slow to adapt to energy transition and still use their lobbying power to maintain the status quo (Kungl, 2015; Kungl and Geels, 2015). Moreover, the process of substitution seems to stagnate. The use of coal for electricity production has decreased only slowly, and carbon dioxide emissions from electricity production even rose between 2011 and 2013 (UBA, 2016). This "coal conundrum" (Jungjohann and Morris, 2014a) constitutes a major inconsistency in the communication surrounding energy transition.

In response, an intensive debate on the future of coal has emerged recently, pushed by NGOs and think tanks. A government proposal for a financial instrument to target lignite in 2015 gave rise to

[1] This may change with the new Eurosceptic and climate-sceptic party AfD (*Alternative für Deutschland*) making its way in to regional and federal parliaments.

heated controversy. Potential dates and processes for an exit from coal were debated in the preparation of the national Climate Action Plan 2050 (CAP 2050) in 2015 and 2016. The future-of-coal debate represents a new phase in the German energy transition process, since it centers on removing old structures rather than empowering new technologies. This "flipside of energy transitions" (Turnheim and Geels, 2012) requires a process of "regime destabilization" (Turnheim and Geels, 2013) or "creative destruction" (Kivimaa and Kern, 2016) which is likely to meet severe resistance from established actors (Geels, 2014; Heyen, 2016).

The tone of the debate reflects that stakes are felt to be high by incumbent players who evoke the "social blackout of entire regions" as a consequence of proposed coal reduction policies (IGBCE, 2015a),[2] but also by environmentalists who describe a delay in coal phase-out as the "death sentence to international climate protection" (BÜNDNIS 90/DIE GRÜNEN, 2015). Partly violent anti-coal activism in Lusatia in 2016 entailed escalating conflicts with local coal workers (Kreutzfeldt and Kaul, 2016). The final draft of the national CAP 2050 reflects the depth of the conflict in that it remains vague on critical issues and postpones further debate until after the federal elections in September 2017 (Bundesregierung, 2016a).

Drawing on transition theory and framing analysis, this paper investigates the German debate on the future of coal in 2015 and 2016. Our first research aim is to reconstruct the debate against the background of analyses of the traditional energy transition discourse. To this end, we analyze how actors frame problems and possible solutions and how their framings produce or challenge the legitimacy of proposed actions. We map actors with respect to their position in the debate. Our second aim is to contribute to facilitating future policy discussions. Polarization between worldviews and positions may be an obstacle to finding solutions for complex policy problems (Goodin, 2008; Kowarsch et al. under review; Sarewitz, 2004). Science may help to overcome stalemate by "honest brokerage" (Pielke, 2007), by designing policies that are robust under different worldviews, and by increasing transparency about the relationships between policy pathways, their consequences and different value systems (de Vries and Petersen, 2009; Edenhofer and Kowarsch, 2015; Michaels, 2009; Neblo et al., 2017). Many actors in our case study express their apprehension that coal power could become an issue as divisive for German society as nuclear power has been for decades. We aim to help overcome polarization by characterizing the solution space as seen by opponent actor groups and identifying scope for compromise.

The following section presents the theoretical framework (4.2.1), a brief summary of the debate during the period under investigation (4.2.2), and the methodological approach and empirical material upon which the research is based (4.2.3). The results are presented and discussed in Section 4.3. Section 4.4 provides a summary of the main conclusions.

4.2 Research design

4.2.1 Theoretical framework

Our research framework conceptualizes the more recent history of German energy policy as a socio-technical transition, building on the multi-level perspective (MLP). We draw on the discourse and

[2] A list of acronyms and abbreviations can be found in Annex A.

framing literature for the empirical analysis. The MLP explains sustainability transitions at the level of socio-technical regimes as a result of their interaction with two other levels:

According to the MLP, sustainability transitions of socio-technical regimes are driven by influences from niche innovations, and from the overarching sociotechnical landscape (Geels, 2004, 2002; Geels and Schot, 2007). The socio-technical regime is formed by the dominant technologies, the institutions, the infrastructures and practices surrounding their use, and by the associated actor groups with shared perceptions and norms. A number of processes work to stabilize the existing regime and to put innovations at a disadvantage, which may lead to a lock-in of unsustainable technologies (Smith and Raven, 2012; Unruh, 2000).

Niches are located below the regime level. They provide a protected space where innovations can be developed and nurtured by small actor networks, possibly to become competitive with established technologies (Smith and Raven, 2012, p. 1025). Niche-innovations can break through and contribute to a regime shift if support comes from the sociotechnical landscape, which is "an exogenous environment beyond the direct influence of niche and regime actors" (Geels and Schot, 2007, p. 400). Because it pressures the energy sectors and triggers policy changes, climate change is a landscape-level process, as are changes in societal values or political coalitions. Investigating a national case study, we explicitly consider conditions, regulations and processes at higher political levels (European, global) to be landscape factors. If a regime transition happens as a result of the interplay between the three MLP levels, the new regime configuration may also cause changes at landscape level (Geels, 2004).

Discursive practices play an important role in transition processes, both as strategic resources to actors and as indicators of ongoing changes. Niche actors use framing and narrative tools to empower niche technologies (Geels and Verhees, 2011; Smith and Raven, 2012). Incumbent actors employ discourse in combination with other forms of power to enact resistance against low-carbon transitions (Geels, 2014). A repositioning in incumbents' discourses may indicate increasing pressures and pending regime destabilization (Bosman et al., 2014). Policy responses to external events may be influenced by the dominant narratives in a given country or regime (Hermwille, 2016).

We use a framing approach to analyze discursive dynamics in our case study of the German future-of-coal debate. Framing is a tool through which a writer or speaker emphasizes a certain aspect of an issue while omitting others (Druckman, 2004). The way issues are framed have been shown to influence the perceptions, engagement and intentions of the addressees in studies on climate change communication (Gifford and Comeau, 2011; Morton et al., 2011; Wiest et al., 2015). Framings construct meaning, present an issue in a certain (normative) light, create boundaries between "good" and "evil", allocate blame and define victims, and may serve to justify certain action to be taken (Benford and Snow, 2000). Frames are often met by counter-frames that offer alternative interpretations (Aklin and Urpelainen, 2013). We consider framing struggles to revolve around specific issues, while being embedded in broader discourses that represent full ensembles "of ideas, concepts and categorizations" (Hajer, 1995, p. 44).

We build on the concepts of Rosenbloom et al. (2016) and Geels and Verhees (2011), both of which combine discursive approaches with transition research, investigating how actors in transition processes create or challenge the legitimacy of innovations. Rosenbloom et al. conceptualize the framing struggles between actors as "multi-dimensional discursive interactions". They specifically look at how the different actor groups respond to one another in the discourse, and how they link

claims related to niche innovations to those about the regime and landscape levels. Geels and Verhees provide an approach for defining and analyzing cultural legitimacy in discursive interactions surrounding transition processes, building on Suchman (1995) and Johnson et al. (2006). Actors create legitimacy by making actions appear "desirable, proper or appropriate", and by presenting them as anchored in the existing "cultural framework of beliefs, values and norms" (Geels and Verhees, 2011, p. 911). The function of legitimacy-creation also depends on whether a framing resonates with the addressees' interests and real-world experiences.

Geels and Verhees suggest five dimensions to measure how framings perform with respect to creating legitimacy. We use a slightly modified and simplified version of this list, focusing on those factors that appear most relevant for our case study and drawing on the wider literature on discourse, framing and narrative analysis. Whether framings or narratives are effective in the sense of being persuasive to individuals and likely to become "the dominant belief and guiding assumption for policy-makers" (Stone, 1989, p. 294) is influenced by their score on, among others, the following three criteria (Benford and Snow, 2000; see also Fischer, 2003, p. 166; Geels and Schot, 2007; Hajer, 1995, p. 63; Jones and McBeth, 2010; Stone, 2012):

1) **Relevance**: Their perceived relevance to peoples' daily lives;
2) **Plausibility**: Their logical coherence and congruence with empirically derived data; and
3) **Resonance**: Their congruence with deep-seated cultural beliefs and values.

We use these criteria to guide our assessment of how well the framings operating in our case-study's multi-level discursive interaction create legitimacy.

4.2.2 The German debate on the future of coal 2015-2016

This section provides background on the milestones of the debate on the future of coal in Germany in 2015 and 2016. Figure 4.1 provides a timeline summary. After the nuclear meltdown in Fukushima in 2011, the German Federal Government accelerated the phase-out of nuclear power and combined it with national targets for reducing greenhouse gas emissions and increasing renewable energy shares until 2050 (Schreurs, 2013). When it became clear that the interim goal of reducing emissions by 40 percent until 2020 would not be achieved without additional action, the Federal Government proposed in 2014 that an additional 22 million tons of carbon dioxide equivalents should be saved "with particular regard to the electricity sector" (Bundesregierung, 2014, p. 34). Since the coal sector is covered by the European emissions trading scheme (EU ETS), interactions between additional national measures and the EU ETS have to be taken into account.

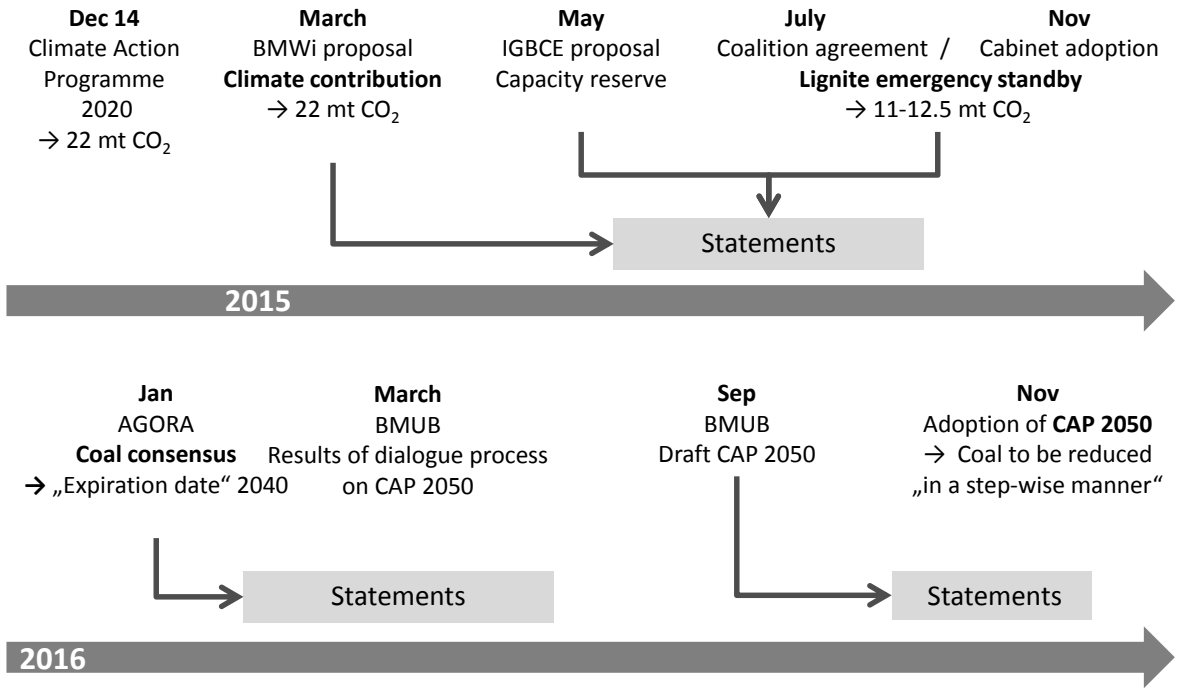

Figure 4.1: Milestones of the German coal phase-out debate 2015-2016.

In March 2015 the Federal Ministry for Economic Affairs (BMWi) proposed an instrument to reduce carbon dioxide emissions from power plants. The “climate contribution” (*Klimabeitrag*) (BMWi, 2015; Matthes et al., 2015) targeted emissions of power plants beyond a certain free amount. For these emissions, plant operators were to buy additional certificates under the EU ETS at a fixed price set to increase to 18 to 20 Euro per ton of carbon dioxide in 2020. The certificates would have been decommissioned, which was supposed to ensure that the scheme actually induced additional emission reductions at the European level, and to avoid a mere reshuffling of emissions in space and time under the cap of the EU ETS (Fankhauser et al., 2010). The instrument was calibrated such that it would have reduced emissions at European level by 22 million tons as required. A number of studies supported this proposal; analyses predicted effectiveness in terms of emissions savings and non-dramatic effects on plant operators and economic indicators (e.g. Burger et al., 2015; Matthes et al., 2015; Oei et al., 2015a; SRU, 2015).

Affected actors such as utilities, labor unions and the governments of federal states with coal mining regions lobbied heavily against the climate contribution proposal. They commissioned studies which concluded that the proposal would in fact force operators to close plants, which would result in ETS certificates remaining on the market, emissions leaking to other European countries, and significant price increases (frontier economics and HWWI, 2015). In May 2015, mining labor union IGBCE presented an alternative proposal for a “capacity reserve for security of supply and climate action” (*Kapazitätsreserve*), which was backed by industry association BDI (IGBCE, 2015b). IGBCE claimed that this instrument, in combination with other measures in the heat sector, would be a cheaper way to achieve the same emission reductions.

In July 2015 it became clear that the German government would follow the IGBCE proposal. A “lignite emergency standby reserve” (*Braunkohle-Sicherheitsbereitschaft*) was adopted in November 2015 and passed by parliament in June 2016. Beginning in 2016, a total of 2.7 GW of lignite power plant

capacity are being gradually transferred into the reserve. These plants will no longer produce electricity, but will be kept on hold for re-activation in extreme cases for instance of long-duration weather extremes. After four years they will be shut down permanently. Plant operators receive a financial compensation equivalent to the revenues they would otherwise have achieved from the electricity market during this period. The measure is expected to save between 11 and 12.5 million tons of carbon dioxide, and to cost around 230 million euros annually for seven years (BMWi, 2015). The government's decision for the lignite reserve was widely criticized. Experts argued that the reserve was unlikely to achieve significant emission reductions, would pay operators for a service unnecessary for security of supply, and possibly would not even accelerate structural change because plants would have been shut down soon anyway (enervis energy advisors, 2015a; FÖS, 2015; Heddrich and Lenck, 2015; Litz and Graichen, 2015; Oei et al., 2015b).

A more general debate on coal phase-out gained momentum in 2015 and 2016 in the context of the dialogue process that informed the Federal Government's CAP 2050, fueled by contributions from think tanks and NGOs (e.g. AGORA Energiewende, 2016b; BUND, 2014; Jungjohann and Morris, 2014b; SRU, 2015). In 2015 AGORA Energiewende published a study modelling an early retirement of lignite and coal-fired plants along the emission path necessary to achieve national targets for 2030 and 2040 (enervis energy advisors, 2015b). In January 2016 they proposed "Eleven principles for reaching a consensus on coal" (AGORA Energiewende, 2016b) and suggested a dialogue to negotiate a plan for incrementally phasing-out of coal power by 2040.

Though policies for coal reduction and phase-out were discussed intensely with stakeholders and citizens,[3] such an "expiration date" was not included into the final draft of the national CAP 2050 that was adopted in November 2016 (Bundesregierung, 2016a). However, the plan sets targets for emission reductions for individual sectors. The need to reduce coal use is implicit in the statement that "in the long term, electricity generation must be based almost completely on renewable energies" (p. 29), and that "the climate targets can only be achieved if coal-fired power generation is reduced in a step-wise manner" (p. 30).

4.2.3 Methodology and approach

We perform a qualitative text analysis (Creswell, 2013, pp. 179–188) on a sample of approximately 100 public documents including press releases, position papers, speeches, and online newspaper reports. The statements they contain refer primarily to specific policy proposals discussed during this period (see Figure 4.1). The analysis of the sample was accompanied by an evaluation of relevant media reports.

Sample

We considered statements of the major political actors and stakeholders in the debate. The sample includes:

- actors who have an obvious stake in the debate, such as lignite plant operators or environmental NGOs;

[3] http://www.klimaschutzplan2050.de/dialogprozess/.

- actors whose positions are directly relevant for the outcome of the policy process, e.g. political parties and governments of federal states; and
- actors representing larger groups such as business associations, and documents published jointly by several relevant organizations or individuals.

If a given actor's contribution was marginal in terms of document numbers and text length, it was excluded from the actor mapping. We attempted to achieve a balanced coverage of the different actor groups while keeping the number of documents manageable. Where actors issued several statements on the same issue, we focused on the most relevant or the most comprehensive.

An internet search for statements on the policy proposals identified key actors. Statements were then retrieved from the websites of individual institutions (e.g. power utilities, environmental NGOs, political parties and business associations). Statements covering the different phases of the debate were collected. These included the discussion centering on 1) the climate contribution in the first half of 2015; 2) the lignite reserve in the second half of 2015; 3) the AGORA Energiewende proposals; and 4) the CAP 2050 in 2016. We evaluated documents summarizing stakeholder contributions during the participation process and statements provided by actors on the near final draft of the CAP 2050 in autumn 2016. From these documents we only analyzed text referring specifically to the future of coal use in Germany. A full list of the document sample is provided in Annex B.

Studies and reports published by scientific policy advising institutes and think tanks on coal policies were also analyzed. Those research institutions and think tanks who proactively issued statements and analyses on policy proposals or contributed concepts were included in the mapping of actors. Studies that were commissioned were not included based on the assumption that their results would likely support the positions of the commissioning institution (Leipprand et al., 2017b).

Coding

In order to retrieve the relevant text passages we used the coding software MAXQDA. Coding was deductive, starting from the major arguments known or expected to be present in energy transition discourses. In the recent German energy discourse, actors advocating for an ambitious energy transition traditionally employ stories of rise which focus on expected benefits of policy change, while actors skeptical or opposed build on stories of decline, warning of costs and risks. Both positive and negative effects are regularly located in the three domains of environment, economy, and supply security (Leipprand et al., 2017a, 2017b). This general structure can be found in other country case studies as well (e.g. Rosenbloom et al., 2016). Assuming that the coal phase-out debate follows traditional structures, we set up the coding scheme along three sets of antagonist arguments that link coal reduction policies to environmental, economic and supply-side effects (Table 4.1), and that are either *change legitimizing* (CL1-3) or *status quo defending* (SQD1-3) in character.

Additional codes (CL4 and SQD4) were used to collect other relevant framings that did not fall under any of the three pre-defined groups of arguments. None of the additional framings were used by more than one or two actors, and as a result are not reported in Section 4.3.1. For the identification of the solution space as seen by different groups (Section 4.3.3), additional codes (CL5 and SQD5) were defined to collect actors' suggestions for and assessments of policy instruments. Each text passage thus identified was additionally assigned a code for the respective actor, and for the specific policy proposal to which it referred.

Table 4.1: Coding scheme.

Change legitimizing arguments (CL)		Status quo defending arguments (SQD)
CL1: Coal reduction policies are needed to address climate change and other (environmental) problems	versus	SQD1: Coal reduction policies are not appropriate action to address climate change
CL2: Coal reduction brings no major economic costs, even benefits	versus	SQD2: Coal reduction policies are economically damaging
CL3: Coal reduction does not endanger supply security	versus	SQD3: Coal is needed to ensure supply security
CL4: Other framings		SQD4: Other framings
CL5: Positions on policy instruments		SQD5: Positions on policy instruments

Evaluation and analysis

The coded text passages were analyzed in terms of the specific framings that were employed under each of the three broad sets of arguments (Section 4.3.1). In a second step codings were used to map actors (Section 4.3.2). Based on the record of the framings actors use and of the intensity of their engagement, actors were classified as strong or moderate "change legitimizers" or "status quo defenders". If they could not be assigned to either group based on their statements, they were classified as "intermediate".

We integrated information on framings, the map of actors, and actors' positions on policy instruments to delineate the solution space inherent in the discourses of different actor groups, and to indicate the degree of disagreement or openness for compromise respectively (Section 4.3.3).

4.3 Results and discussion

The analysis reveals how actor groups struggle to frame issues related to coal reduction and phase-out. This section presents the framings identified by the coding exercise (Section 4.3.1 and Table 4.2), and groups actors in relation to their use of these framings (Section 4.3.2, Figure 4.2). The more specific positions of actors on policy options are compared in Section 4.3.3 (Figure 4.3).

4.3.1 Framings

In the first set of framings actors battle over whether coal phase-out is a measure needed to address environmental problems. Change legitimizing arguments build on two prominent framings: ***climate change*** and ***coal kills***. The ***climate change*** framing typically focuses on the high risk of national emission reduction targets being missed if no additional action is taken. It sometimes refers to the particularly harmful climate impacts of lignite power plants. ***Coal kills*** elaborates on the negative effects of coal use on the global climate, as well as on human health at the local and regional scale (e.g. nitrous oxide and mercury emissions from coal plants) and on local landscapes where lignite is mined.

These framings are not met by direct counter-framings, which reflects the broad consensus in Germany on climate protection and energy transition. The most prominent challenge comes from a different angle, suggesting ***inappropriateness*** and ***ineffectiveness*** of national coal reduction policies. In the SQD perspective, these policies constitute a "double-regulation" to the EU ETS (BDI, 2015), creating an additional burden to a country that is already doing enough, while they would not even further reduce overall emissions beyond the EU-wide cap. This framing is flanked by the more general, traditional market-liberal call for ***technology neutral regulation***, and by the claim that coal use will end anyway making additional policy neither necessary nor helpful and thus a ***waste of effort***.

CL framings respond by attempting to provide justification for national action additional to the EU ETS. They do so in three ways. Firstly they criticize the current workings of the EU ETS, arguing that the currently ***dysfunctional ETS*** scheme will not lead to sufficient emission reductions and that it will not incentivize technological change. Secondly, they evoke a national duty to act, and highlight the international repercussions of national action (***national duty/international leadership***). To be a credible voice in international negotiations and to fulfil a leadership role, "chancellor Merkel now at last must do in Berlin what she is preaching internationally" (Greenpeace, 2015). Thirdly, proponents take care to equip their proposed solutions with mechanisms designed to ensure their compatibility with the EU ETS.

The second set of framings clashes over the expected economic impacts of coal phase-out or coal reduction policies. The most frequent SQD framings claim detrimental effects of coal phase-out policies on the regional and national economies (***suffering regions***, ***suffering national economy***). In the 2015 debate on the "climate contribution" these framings were staged most dramatically. Opponents claimed that it would lead to a "domino effect" and to the "social blackout of entire regions"; the closure of one lignite plant would entail closure of associated mines, other plants and eventually the entire regional coal industry. Massive loss of jobs would result through indirect effects, as well as severe "structural disruptions". Actors alluded to threatened livelihoods and "existential fears" among the regional population (IGBCE, 2015a; Lämmel, 2015; MIBRAG, 2015). This is emphasized further in the ***injustice*** framing that presents the lignite industry as being over-proportionately burdened: "We now see that one wants to reach the climate targets … solely at our expense." (Vassiliadis, 2015). Damage to the national economy is evoked as a result of rising electricity prices that would endanger the competitiveness of (energy-intensive) industry.

The CL community offers counter-framings to these arguments, which either question the claimed negative effects (***minor negative effects***) or build on potential ***economic benefits,*** such as the creation of new jobs and wealth in clean and sustainable business. They also refer to the modernization of the national industry. However, the ***economic benefits*** framing is rarely used, in contrast to traditional energy transition discourses that build largely upon positive effects from renewable energy expansion on jobs and industry. Actors supporting coal phase-out regularly call for managing structural change in a socially compatible way (see Section 4.3.3), which indicates that they acknowledge the likelihood of negative impacts for affected regions and industries. With a view to future decarbonization, the ***investment security*** framing emphasizes the need to create reliable conditions and to avoid investment in fossil structures that will no longer be economical once more stringent climate policy is implemented.

The third set of framings debates over the consequences of the proposed policies for the security of electricity supply. SQD framings suggest that they represent a ***threat***: "Nuclear power is gone, coal power is gone, but no one tells us how we are to fill the gaps" (Frenzel, 2015). Also, since electricity from renewable energy capacities is not produced evenly over time, they argue that back-up from reliable coal plants is needed. A related framing integrates a general commitment to energy transition: ***coal enables the transition*** since it will ensure supply security during the transition phase and as long as technological solutions for storage are lacking. CL counter-framings sometimes directly respond to the ***threat*** framing by providing reassurance based on the argument that even with coal phase-out there will be no shortage of supply, and that it will even be beneficial to get rid of ***excess capacities***. More often, CL framings present coal-fired power plants as an ***impediment for transition,*** claiming that they are not flexible enough to adjust to fluctuating renewable electricity production.

Discussion

The framings enhance or challenge the legitimacy of coal reduction or coal phase-out policies in multi-level discursive interaction, in which issues from the three MLP levels may be creatively and strategically linked by actors (Rosenbloom et al., 2016). The following paragraphs evaluate the framings in relation to the three criteria of relevance, plausibility and resonance, and discuss how their operation at the different MLP levels influences their performance.

Relevance: SQD framings score high on the criterion of relevance. Through the suffering regions framing, they star victims that are located at regime level (coal regions, employees, industry), and are thus familiar, tangible and clearly identifiable. Members beyond the affected groups may find that the framings resonate with their real-life experiences and personal priorities, as may individuals who imagine wider economic impacts or feel empathy and solidarity for coal industry employees. CL framings do not offer winners of the proposed policies of the same quality. While energy transition proponents traditionally have emphasized the expectation of economic benefits, similar claims are rather cautious and unspecific in the future-of-coal debate. Framings rarely evoke direct positive effects for economic actors from the niche level, such as the renewable energy industry. The focus of CL framings on climate protection means that beneficiaries are found at landscape level and with a less direct link to the daily lives of German citizens. In addition, CL framings are often formulated in negative terms, building on victims rather than benefits (coal kills). Such strategies of environmental advocacy that focus on increasing alarm may run the risk of becoming perceived as exaggerated and of reinforcing the partisan nature of the debate (Pielke, 2010). However, there are also framings that highlight possible local health improvements from reduced air pollution (Heinrich-Böll-Stiftung and BUND, 2015; Tebert, 2015). Such positive frames might be more suitable to trigger action (Morton et al., 2011), and could add to the perceived relevance of CL framings.

Plausibility. Both CL and SQD framings have weak points in terms of plausibility. SQD arguments do not counter the climate change framing, but use it to justify their own policy proposals, even claiming that "lignite and employees [in the lignite industry] contribute to climate protection and supply security" (RWE, 2015). However, they usually do not address the question of how maintaining coal use and decarbonizing the electricity sector are to be reconciled in the longer term. Thus, climate change as a landscape pressure is acknowledged in principle, but is inadequately addressed, which creates a tension within the argument and reduces its plausibility. CL arguments, on the other hand, suffer from the vulnerability of the climate change framing to the potential neutralization of national

emissions reduction under the EU ETS. Climate policy at European level, an MLP landscape factor, is routinely exploited by status quo defenders to challenge the framing's plausibility.

Resonance. Both CL and SQD framings resonate with deep-seated beliefs and values. Environmental and climate protection, economic growth or welfare and security of supply are all widely shared values in Germany, and unlike for instance in the USA, there is no fundamental conflict over the need for national climate protection efforts. However, the different actor groups do assign different priorities to these values, with energy transition proponents motivated primarily by environmental concerns, and sceptics and opponents by economic concerns (Leipprand et al., 2017a, 2017b). In the future-of-coal debate, both CL and SQD framings strongly build on their group's values and thus seem to be designed to achieve resonance with their own members as a priority.

Table 4.2: Framings.

Change legitimizing arguments (CL)			**Status quo defending arguments (SQD)**	
Argument	**Key framings**		**Key framings**	**Argument**
CL1: Coal reduction policies are needed to address climate change and other (environmental) problems	• **Climate change**: We need to fight climate change. If coal is not phased out (or reduced), we will miss our emission reduction targets. • **Coal kills**: negative impacts, including local health effects and landscape destruction.	→	[Occasional agreement or borrowing of "climate change" framing to motivate alternative proposals.]	**SQD1: Coal reduction policies are not appropriate action to address climate change**
	• **Dysfunctional EU ETS** will not do the trick. Additional national action is necessary. • **National duty and international leadership**: Germany has to live up to the rhetoric and action it displays at international level, fulfil own commitments in order to ensure international credibility and leadership.	→ ←	• **Inappropriateness & ineffectiveness**: with EU ETS in place national action creates additional burden but does not influence total EU-level emissions. • **Technology neutral regulation**: Market forces (under EU ETS) should determine future technologies, no regulation targeted specifically at coal/lignite. • **Waste of effort**: coal phase-out will happen anyway.	
CL2: Coal reduction brings no major economic costs, even benefits	• **Minor negative effects**: the proposed measures will have limited economic effects, they are cost-efficient, the dramatic impacts claimed by opponents will not occur. • **Economic benefits**: There will be new jobs and wealth in clean, sustainable business. Coal phase-out policies contribute to the modernization of our industrial society and national economy. • **Investment security**: Clarity about future pathway reduces economic risks and increases investment security.	→ ←	• **Suffering regions**: proposed measures will hurt the lignite regions badly: shut-down of plants and pits, loss of jobs, "deep structural disruptions". • **Suffering national economy**: rising electricity prices, competitive disadvantage for (energy-intensive) industry. • **Injustice**: only already-suffering lignite industry is being targeted, unfair burden.	**SQD2: Coal reduction policies are economically damaging**
CL3: Coal reduction does not endanger supply security	• **Excess capacities**: Coal is not necessary for supply security - on the contrary, there are excess capacities. • **Impediment for transition**: Coal plants are an impediment to the creation of a renewables-based system because they are not flexible enough to compensate fluctuations.	→ ←	• **Threat**: Coal reduction and phase-out policies threaten security of supply. • **Coal enables transition**: Coal will be needed for a considerable while to enable a successful energy transition.	**SQD3: Coal is needed to ensure supply security**

Structure and format of this table are adapted from Rosenbloom et al. (2016).

4.3.2 Actor mapping

Based on their use of the aforementioned framings, actors are characterized in Figure 4.2 as strong or moderate change legitimizers, strong or moderate status quo defenders, or as intermediate (non-assignable to either group).

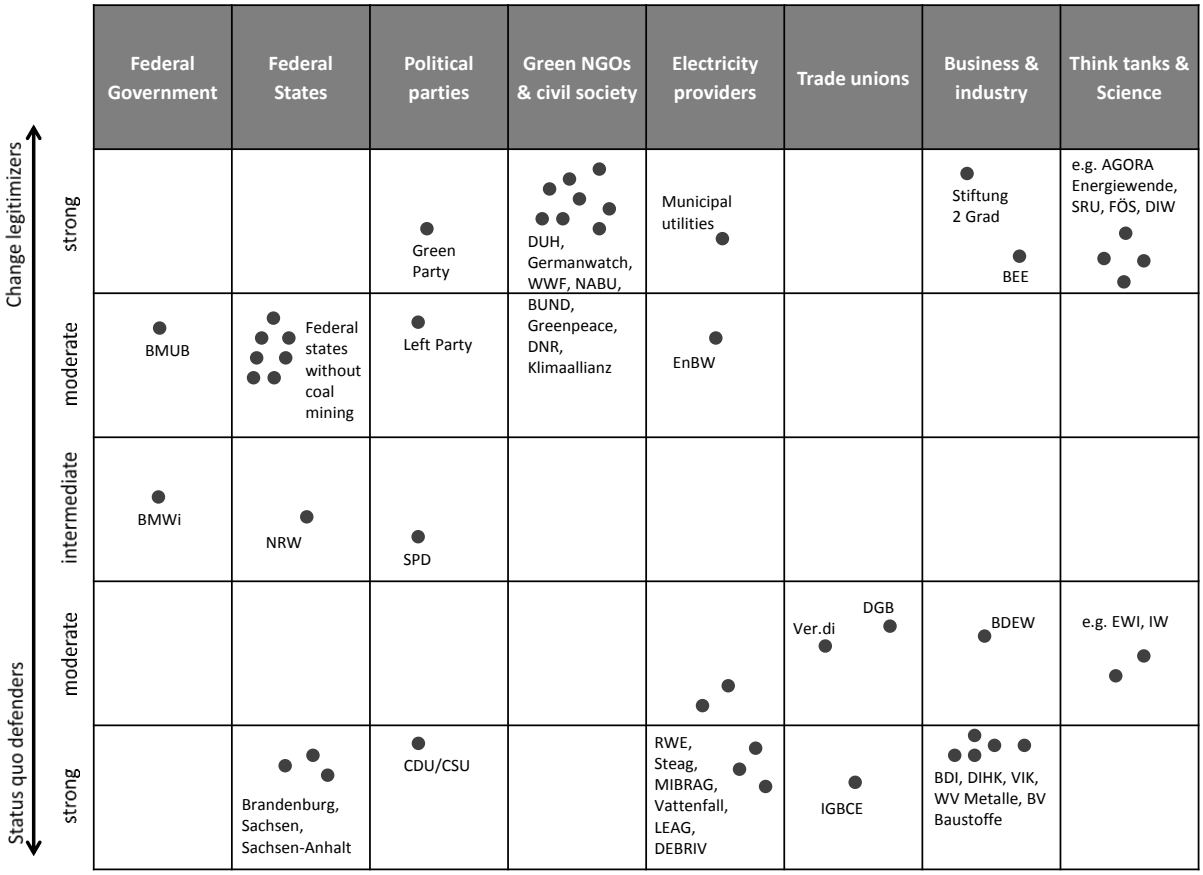

Figure 4.2: Actor mapping. Actors are classified as strong change legitimizers or strong status quo defenders if their position is unambiguous, if they use *only* framings of the respective category, and if they engage in intense lobbying. Moderate change legitimizers or status quo defenders primarily but not exclusively use the respective category of framings, lobbying may be less intense, but the position is still unambiguous. Actors are classified as intermediate if they use framings of both categories, if their statements are inhomogeneous, their position ambiguous, or if they change positions over time. The intensity of lobbying is assessed based on the relative number of statements and supporting information from media reports. The third column shows the positions of those political parties present in Federal Parliament.

The future-of-coal debate reveals the traditional divide between the Federal Ministry for Environment (BMUB) and the Federal Ministry for Economic Affairs (BMWi). BMUB explicitly supports coal phase-out policy proposals such as the climate contribution or AGORA Energiewende's proposal (Bundesregierung, 2016b) and builds its arguments exclusively on CL framings, while BMWi uses both CL and SQD framings. Though BMWi initiated the climate contribution proposal, it later was more responsive to the interests of incumbent actors and also removed some of the more ambitious elements from the national CAP 2050 (Tartler, 2016). BMWi is thus classified as an intermediate actor, BMUB is a change legitimizer.

The governments of federal states that host lignite regions act as status quo defenders, and have been influential behind the scenes (Dohmen et al., 2016). Their behavior reflects particular regional conditions and interests, as well as traditional political and economic ties between state-level social democrats and the coal industry. NRW, however, does not act homogeneously, since the statement on the CAP 2050 prepared by the Green Party-led environment ministry builds on CL framings and argues for planned coal phase-out. Federal states without coal mining are not particularly active in the debate. In the deliberation process on the national CAP 2050, these states tend to use CL framings in favor of coal phase-out. We classify them as moderate change legitimizers.

The conservative party group in Federal Parliament (CDU/CSU) as well as the conservatives in affected federal states share SQD framings, thus rhetorically uniting more strongly with the influential labor unions than the social democrats (SPD) who have traditionally been the unions' allies. Federal level social democrats, by contrast, are guarded in the debate (e.g. Westphal, 2015). Both the Ministers for the Economy and for the Environment at federal level are social democrats, but the SPD is also part of government coalitions in the federal states with coal mining, making the party overall an intermediate actor. Both CL and SQD framings are present in party members' statements. The Green Party is a prominent change legitimizer, actively campaigning for coal phase-out. It uses model versions of CL framings, claiming for instance that "coal kills the climate, coal destroys homelands, coal deprives us of the air to breathe" (BÜNDNIS 90/DIE GRÜNEN, 2015). The federal Left Party also supports a planned phase-out of coal through national law.

Environmental NGOs are among the most active advocates for coal reduction and phase-out policies and all appear as strong change legitimizers. In addition to publishing statements individually, they have joined forces with green business associations and stakeholders with a non-environmental focus such as churches, development, social and consumer organizations (e.g. Klima-Allianz, 2016).

The coal industry (plant and lignite mine operators RWE, Steag, MIBRAG, Vattenfall, LEAG), the coal industry association (DEBRIV) and related labor unions (in particular IGBCE) form the core group of status-quo defenders. One of the big electricity suppliers, EnBW (located in Green Party-led Baden-Württemberg and with no lignite in its portfolio) is an exception – EnBW welcomed the climate contribution proposal (Balser and Bauchmüller, 2015). Municipal utilities belong to the change legitimizers. Services union Ver.di participated in the status quo defending position regarding the climate contribution proposal. However, commissioning and publishing a study that identifies financial compensation needs in case of coal phase-out (enervis energy advisors, 2016), they moved to a more moderate position.

Most conventional industry associations are strong status quo defenders. The BDEW (German association for energy and water industries) is classified as a moderate status quo defender because it rejects CL policy proposals less rigorously than other industry associations. Green energy business associations such as BEE (German Renewable Energy Federation) are natural change legitimizers, but there are also major German business players who argue for a planned coal phase-out with a clear exit date, emphasizing the investment security framing (Stiftung 2 Grad).

Both change legitimizers and status quo defenders rely on support from scientists and experts. Scientific policy advisors are traditionally closely associated with actor coalitions and their discourses in the German energy debate. The actor mapping in Figure 4.2 includes some scientific advisory institutions and think tanks that proactively published statements or studies related to coal phase-out, to indicate that they actively contribute to shaping the discourse. CL framings are backed by

AGORA Energiewende, SRU, FÖS and DIW, while SQD framings have been supported by statements and reports by EWI and IW.

Discussion

The debate on coal phase-out is associated with a re-intensified polarization of actor groups and their discursive strategies compared to preceding energy transition debates. With some exceptions, actors group along traditional arguments and framings and with their traditional allies (Hirschl, 2008; Reiche, 2004). While there had been a convergence of discourses in the wider energy transition debate, with decreasing expert support for dramatic stories of rise or decline (Leipprand et al., 2017a, 2017b), the coal debate re-emphasizes conflict. This raises the question of whether the national consensus on energy transition will be resilient in the face of challenges posed by specific measures for emission reduction and their negative effects for influential players.

4.3.3 Characterizing the solution space

While there is broad consensus on the goal of protecting the climate in general, actors fundamentally disagree over what action German policy-makers should take. This section compares the positions of the two major antagonist groups of actors on policy solutions in the future-of-coal debate. Figure 4.3 presents five possible directions of policy action to delineate the solution space: 1) National regulation (such as a phase-out law); 2) a coal reserve (as example for national regulation *with compensation*); 3) a reform of the EU ETS, that is, Germany pursuing action *at European level*; 4) measures to manage structural change (as *supporting action*); and 5) a dialogue for a consensus on coal (as a *process* proposal). Figure 4.3 shows the degree to which CL and SQD actors support the respective policy measures. For the creation of the figure, the codings were evaluated to assess whether the CL and SQD actor groups as identified in Figure 4.2 expressed high, medium or low support for the respective measures.

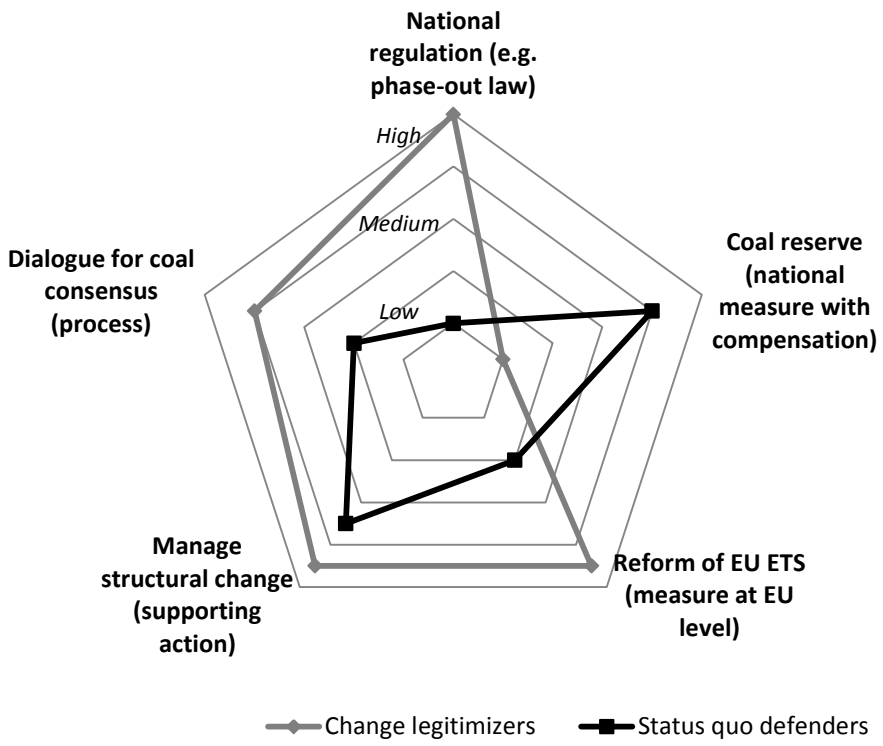

Figure 4.3: Characterization of the solution space from the perspective of CL and SQD actors. The graph indicates whether actors in the respective actor groups express high, medium or low support to the policy measures. Data are derived from the qualitative evaluation of the codings.

Unilateral coal reduction or phase-out policies are highly contentious. CL actors promote various **national regulation** measures such as phasing-out coal with a fixed exit date, limits to the lifespan of coal plants and carbon dioxide emission limits, and a ban on the development of new lignite mines and on investment in new coal plants. A unilateral decommissioning of EU ETS certificates is envisioned to avoid carbon leakage as a result of national action, as well as unilateral measures to enhance the effect of the ETS such as a national carbon dioxide minimum price. SQD actors routinely and rigorously reject proposals for unilateral measures, their framings working to delegate responsibility for action to the European level instead. The divide is partly normative. In the perspective of CL actors, every individual (country) should do its duty, and Germany should strive to be a role model for others. SQD actors perceive the national efforts already undertaken as more than sufficient, and place the focus on ensuring a level playing field with other countries. Beyond ethical concerns, incumbent actors perceive their economic interest as directly threatened, which gives them a reason to strategically employ any plausible SQD framing.

However, solutions that include compensation for affected actors, such as a **coal reserve**, might enhance the chances for an implementation of national measures. This is illustrated by the episode on the lignite emergency standby reserve. Though being an additional national-level instrument, the reserve received a high level of support by many SQD actors and was eventually implemented. CL actors criticized it as being insufficient and highly expensive. Nevertheless, it does contribute to the central CL mission of shutting down coal power plants, which led CL actor Germanwatch to interpret it as “the beginning of the end of lignite electricity” (Germanwatch, 2015). The lignite reserve case thus indicates that coal phase-out is already acknowledged as a long-term inevitability by the

affected industry representatives (Gammelin, 2015), and that they use their discursive resources in the first place to pressure for financial compensation.

Strengthening the EU ETS might also contribute to achieving national climate targets and to incentivizing structural change in individual countries (Bundesregierung, 2016a). In the MLP terminology, by driving EU ETS reform the German government would contribute to changes at landscape level that would in turn facilitate regime transformation. However, this policy dimension offers only slightly larger scope for consensus than proposals for national action. CL actors generally support strengthening the EU ETS to remedy its deficiencies, in particular the excess availability of certificates and low prices. Options for reform include tightening the linear reduction factor, decommissioning excess certificates, and focusing carbon leakage-related exemptions on fewer sectors (BMUB, 2016). A minimum price might be a reform option that could serve to reconcile additional unilateral action with the EU ETS, since it would reduce the leakage of emissions to Member States with weaker national policies (Edenhofer et al., 2017). Despite their frequent references to the EU ETS as the central instrument for climate protection, however, many SQD actors oppose a tightening of European rules (e.g. DEBRIV, BDI, VIK, DIHK, WV Metalle). Only few SQD actors call for a strengthening of the EU ETS instead of national measures (Vattenfall, Sachsen, Ver.di, BDEW).

The proposal for socially sensitive **management of structural change**, that is, for supporting actors and regions likely to be negatively affected by changes in energy supply structures, has relatively high potential for compromise. CL actors regularly call for such action to accompany ambitious coal reduction policies. Measures could relate to the development of new business and (renewable energy) industry on the areas of former mines and coal plants, the provision of infrastructures for traffic, information technology, and tourism. Managing structural change might also involve the direct financial compensation for coal industry employees who lose their jobs, as well as re-training or early retirement schemes (AGORA Energiewende, 2016a; Baur and Schwartzkopff, 2015; enervis energy advisors, 2016). SQD actors often agree in principle, although they attempt to separate structural change management discursively from coal policies, and to make action on coal phase-out contingent upon successful structural change aid. The CAP 2050 provides a starting point, envisioning regional funds to support investment (Bundesregierung, 2016a).

Scope for compromise is also relatively high with respect to the set-up of a dialogue to discuss the future of coal. In order to avoid a society-dividing conflict as experienced over nuclear power, several actors proposed a **dialogue process for a consensus on coal** with broad stakeholder participation (e.g. AGORA Energiewende, 2016b; Müller, 2015; SRU, 2015). The national CAP 2050 envisions a commission on “growth, structural change and regional development“ that should start work in 2018 after the upcoming federal elections. Although coal policies are not explicitly mentioned, they are likely to be a focus of the commission. Positions on the commission are mixed. Many CL actors (e.g. Germanwatch, SRU, Germanwatch, VKU, Stiftung 2 Grad, Green Party) and some moderate SQD actors (BDEW, DGB) support it. The commission is not recommended by some environmental NGOs (BUND, Greenpeace) and it is rejected by a number of business associations (e.g. DEBRIV, BDI, VIK, DIHK). However, the statements suggest that criticism is less targeted at the dialogue process itself, and more toward the aims it is meant to achieve. Thus, the mandate and scope of the commission’s work are likely to be controversial. Careful design and communication will be needed to convince all relevant actors to participate.

Discussion

The comparison of perspectives on the solution space indicates that scope for consensus is greatest in negotiation over structural change management. A dialogue process on the future of coal receives support by actors from both groups, and is already partly conceptualized in the CAP 2050 by the proposed commission. However, for constructive dialogue on the more controversial contents of potential future pathways, both sides will have to make concessions.

CL actors may need to accept a mandate for the commission that is more open than they would wish it to be. If the process is perceived to be bound towards a certain exit date for coal from the start, SQD actors might feel sidelined and be less inclined to engage in discussion. Moreover, the chances for implementation of unilateral action may be enhanced if compensation to affected industries and regions is included in negotiations. SQD actors oppose unilateral measures, and delegate responsibility for action to the European level. They also tend to reject a strengthening of EU ETS rules, which may cause a discursive stalemate. If SQD actors were to review their positions on national versus European-level instruments, they could improve the chances for a consensus on the future of coal.

4.4 Conclusions

This paper analyzes the recent German debate on the future of coal from a discourse perspective, with a special focus on discursive links between the levels of regime, niche and landscape, and on the way actors create or challenge the legitimacy of discussed policies. There are two major findings.

Firstly, the future-of-coal debate appears to re-intensify polarization. Framing strategies emphasize negative effects, dangers and risks, and conflictual issues rather than shared values and attitudes. Most actors assemble in one of two opponent groups and behind their traditional allies. Unlike policies for renewables support, coal reduction and phase-out policies create immediate and specific costs for a small group of influential actors who are part of the existing regime. Beneficiaries are less clearly identified and are located at landscape (climate protection) or niche level (renewable energy industry). The broad societal consensus on long-term national energy transition is therefore severely challenged when it comes to implementing specific measures for short-term emission reduction, whether it be a national coal phase-out or measures at the European level to improve the effectiveness of the EU ETS.

Secondly, there is scope for compromise. Different actors have called for a dialogue process for a consensus on coal, in order to avoid a deepening of societal conflict, as was experienced in Germany over nuclear power. Dialogue could take place for instance in the commission envisioned by the CAP 2050. In order to avoid stalemate over the controversial contents of negotiations, both actor groups may have to accept conditions that are in conflict with their core values. CL actors may have to accept an open mandate for the dialogue process without a specified date for coal exit. SQD actors could improve the chances for constructive dialogue by revisiting their positions on national versus European-level instruments. The most promising entry point for future negotiations is management of structural change. Solutions for the compensation of regions, businesses and employees likely to lose from the measures will have to be developed in more detail. To address the contentious issue of unilateral German action, solutions that reconcile national level emission reduction measures with

European emissions trading might be pursued by the German government, such as a minimum price reform of the EU ETS.

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4.6 Annex A: List of acronyms and abbreviations

AGORA	AGORA Energiewende
BDEW	German Association of Energy and Water Industries (Bundesverband der Energie- und Wasserwirtschaft)
BDI	The Voice of German Industry (Bundesverband der Deutschen Industrie)
BEE	German Renewable Energy Federation (Bundesverband Erneuerbare Energien)
BMWi	Federal Ministry for Economic Affairs (Bundesministerium für Wirtschaft und Energie)
BMUB	Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (Bundesministerium für Umwelt, Naturschutz, Bau und Reaktorsicherheit)
BÜNDNIS 90/DIE GRÜNEN	Germany's Green Party
BBS	German Building Materials Association (Bundesverband Baustoffe – Steine und Erden)
BUND	Friends of the Earth Germany (Bund für Umwelt und Naturschutz Deutschland)
CAP	National Climate Action Plan 2050 (Klimaschutzplan 2050)
CDU/CSU	Christian Democratic Union, Christian Social Union
CL	Change legitimizer
DEBRIV	German association of lignite industry (Bundesverband Braunkohle)
DGB	German Trade Union Confederation (Deutscher Gewerkschaftsbund)
DIHK	Association of German Chambers of Commerce and Industry (Deutscher Industrie- und Handelskammertag)
DIW	German Institute for Economic Research (Deutsches Institut für Wirtschaftsforschung)
DNR	German League for Nature and Environment (Deutscher Naturschutzring)
DUH	Environmental Action Germany (Deutsche Umwelthilfe)
EEG	Renewable Energy Sources Act (Erneuerbare Energien Gesetz)
EnBW	Energie Baden-Württemberg AG
EU ETS	European Emissions Trading Scheme
EWI	Energiewirtschaftliches Institut an der Universität zu Köln
FDP	Free Democratic Party (Freie Demokratische Partei)
FÖS	Green Budget Germany (Forum Ökologisch-Soziale Marktwirtschaft)
HWWI	Hamburg Institute of International Economics (Hamburgisches WeltWirtschaftsInstitut)
IW	Cologne Institute for Economic Research (Institut der deutschen Wirtschaft, Köln)
IGBCE	Union for Mining, Chemicals and Energy Industries (Industriegewerkschaft Bergbau, Chemie, Energie)
LEAG	Lausitz Energie Bergbau AG
MIBRAG	Mitteldeutsche Braunkohlengesellschaft
MLP	Multi-level perspective
NABU	Nature and Biodiversity Conservation Union Germany (Naturschutzbund Deutschland)
NGO	Non-Governmental Organization
NRW	North-Rhine Westphalia (Nordrhein-Westfalen)
RWE	German electric utilities company; until 1990: Rheinisch-Westfälisches Elektrizitätswerk AG
SPD	Social Democratic Party (Sozialdemokratische Partei Deutschlands)
SQD	Status quo defender
SRU	German Advisory Council on the Environment (Sachverständigenrat für Umweltfragen)
Steag	German electric utilities company; formerly Deutsche Steinkohlen-Elektrizität AG
Stiftung 2 Grad	"German entrepreneurs for climate protection", initiative of CEOs, managers and family run businesses
UBA	Federal Environment Agency (Umweltbundesamt)
Vattenfall	Swedish electric utilities company, until 2016 owner of Lausitz lignite mining and generation
Ver.di	German multi-service trade union (Vereinte Dienstleistungsgewerkschaft)
VIK	German Association of the Industrial Energy and Power Sector (Verband der Industriellen Energie- und Kraftwirtschaft)
WV Metalle	German Metal Industry Association (Wirtschaftsvereinigung Metalle)
WWF	World Wide Fund for Nature

4.7 Annex B: List of documents

Author/source	Document title
Federal Goverment	
BMUB	Hendricks begrüßt Gabriels Eckpunkte zur CO2-Reduzierung bei fossilen Kraftwerken (2015)
BMWi	Eckpunkte-Papier „Strommarkt“ (2015), Gabriel: Das Fundament für den Strommarkt der Zukunft steht (2015)
Federal States	
Baden-Württemberg	Statement on CAP 2050 (2016)
Bayern	Statement on CAP 2050 (2016)
Berlin	Statement on CAP 2050 (2016)
Brandenburg	Statement on CAP 2050 (2016)
Bremen	Statement on CAP 2050 (2016)
NRW	Geplante Klimaabgabe für Kraftwerke sorgt für Streit (2015, NRW parliament publication), Statement on CAP 2050 (2016, NRW Environment Ministry)
Rheinland-Pfalz	Statement on CAP 2050 (2016)
Sachsen	Statement on CAP 2050 (2016)
Sachsen-Anhalt	Kein einseitiger Klimabeitrag zu Lasten der Braunkohle (2015, Minister President Haseloff), Zusätzlicher nationaler „Klimabeitrag“ endgültig vom Tisch (2015, ministry for science and economy), Statement on CAP 2050 (2016)
Schleswig-Holstein	Statement on CAP 2050 (2016)
Thüringen	Statement on CAP 2050 (2016)
Political parties	
BÜNDNIS 90/DIE GRÜNEN	Einstieg in den Kohleausstieg jetzt! (2015), Fahrplan Kohleausstieg (2016)
CDU/CSU	Interview Joachim Pfeiffer: Deutscher Kohle-Ausstieg nicht Regierungspolitik (2014), Speech Andreas Lämmel: Die Braunkohle ist der einzige heimische Energieträger (2015), Speech Klaus-Peter Schulze: Es geht um die Menschen im Revier (2016)
Die Linke	Kohleausstieg einleiten - Kohlebosse entmachten (2015), Kohleausstieg ist sozial verträglich machbar (2016),
SPD	Interview Bernd Westphal in Greenpeace-Magazin: Die SPD und der Kohleausstieg: Ja, nein, vielleicht (2015)
Green NGOs	
BUND	Klimaschutzplan 2050: "Kleines Karo" statt Fahrplan für Klimaschutz (2016), Offener Brief: Ablehnung des Klimaschutzplans 2050 (2016, with Greenpeace, NABU, WWF)
DNR	Statement on CAP 2050 (2016)
DUH	Kohleländer dürfen Klimaschutzziel nicht blockieren (2015), Gewerkschaften und Kohleländer müssen sich am notwendigen Strukturwandel in den Regionen beteiligen (2015), Kohledeal verteuert Klimaschutz (2015), Kohlelobby setzt sich durch – Beitrag der Bundesregierung zum Klimaschutz nicht nachvollziehbar (2015), Deutsche Umwelthilfe begrüßt Vorschlag von Bundeswirtschaftsminister Gabriel für einen Runden Tisch zur Kohle (2016), Statement on CAP 2050 (2016)
Environmental NGOs	Elmau ernst nehmen, Klimaschutzbeitrag beschließen (2015), Klimaschutzplan 2050 der deutschen Zivilgesellschaft (2016)
Germanwatch	Das BMWi-Eckpunktepapier „Strommarkt“ und das neue Klimaschutzinstrument. Zusammenfassende Bewertung (2015, with WWF), Einigung bei Klimareserve: Der Beginn der Kohledämmerung (2015), Statement on CAP 2050 (2016),
Greenpeace	Greenpeace-Analyse: Teure Reserve für Energieversorgung überflüssig (2015), Kanzlerin Merkel fährt ohne glaubhaftes Klimaprogramm nach Paris (2015)
Klima Allianz	Kohlestrom und Tagebaue kontinuierlich zurückfahren (2015)

Author/source	Document title
NABU	Stellungnahme zum Entwurf des Strommarktgesetzes (2015)
Electricity providers	
DEBRIV	Statement on CAP 2050 (2016)
LEAG	Alarmstufe Rot für die Lausitz: Klimaschutzplan 2050 gefährdet die Zukunft des Reviers (2016), Klimaschutzplan 2050: Gefahr für Lausitz vorerst abgewendet (2016)
Mibrag	Unsere Existenz steht auf dem Spiel (2015)
Municipal utilities	79 Stadtwerke befürworten Klimaabgabe von Gabriel (2015), Statement on CAP 2050 (2016, VKU)
RWE	BMWi-Vorschläge gefährden Braunkohle in ihrer Existenz (2015), Matthias Hartung: „Braunkohle und Beschäftigte tragen zu Klimaschutz und Versorgungssicherheit bei“ (2015), “Standby” of lignite-fired power plants contributes to climate targets (2015), RWE: Runder Tisch zum Kohleausstieg ist überflüssig (2016)
Vattenfall	Zwei 500 MW-Blöcke im Braunkohlekraftwerk Jänschwalde/Brandenburg sollen Sicherheitsbereitschaft leisten (2015)
Unions	
DGB	Statement on CAP 2050 (2016)
IGBCE	IG BCE warnt vor Fehlentscheidungen in der Energiepolitik (2015), Demonstration und Kundgebung: „Wir wehren uns – Gegen die sozialen Blackout ganzer Regionen“ (2015), 15.000 Bergleute und Kraftwerker vor dem Kanzleramt (2015), Klimaschutz durch Investition in Effizienz und Versorgungssicherheit (2015), Vassiliadis zum Kohle-Konzept der Agora Energiewende: Ausstiegswettlauf führt in die Irre (2016), Statement on CAP 2050 (2016)
Ver.di	Eckpunkte-Papier „Strommarkt“ vom 21. März 2015 (2015), Sozialverträglicher Kohleausstieg ist machbar! (2016)
Business & industry	
BDEW	Klimadebatte: Ein Appell der Energiewirtschaft (2015), Statement on CAP 2050 (2016), Kapferer: Überstürzter Klimaschutzplan wird teuer (2016)
BDI	Nationale Zusatzbelastung der Braunkohle gefährdet Arbeitsplätze (2015), Bundesregierung löst Entscheidungsstau bei der Energiewende auf (2015), Statement on CAP 2050 (2016)
BEE	BEE begrüßt Klimaschutzabgabe für besonders schmutzige Kohlekraftwerke (2015), Statement on CAP 2050 (2016)
BBS	Statement on CAP 2050 (2016)
DIHK	Statement on CAP 2050 (2016)
Stiftung 2 Grad	Unternehmenserklärung zur Diskussion um einen Kohlekonsens: Transformation ambitioniert, verlässlich und planbar gestalten (2016), Statement on CAP 2050 (2016)
VIK	Stellungnahme zu den „Eckpunkten für eine erfolgreiche Umsetzung der Energiewende“ vom 01.07.2015 (2015)
WV Metalle	Statement on CAP 2050 (2016)
Think tanks & science	
FÖS	Declaration of energy economists: „Nationalen Klimabeitrag“ des Stromsektors konsequent umsetzen - 2020-Ziel einhalten (2015), Teurer Klimaschutz mit Kapazitätsreserve (2015), Statement on CAP 2050 (2016).
IW Köln	Ein Plan mit Nebenwirkungen (2016)
SRU	10 Thesen zur Zukunft der Kohle bis 2040 (2015), Zum Entwurf des Klimaschutzplans 2050 (2016)
AGORA Energiewende	Elf Eckpunkte für einen Kohlekonsens. Konzept zur schrittweisen Dekarbonisierung des deutschen Stromsektors (2016), Was bedeuten Deutschlands Klimaschutzziele für die Braunkohleregionen? (2016)

Author/source	Document title
EWI	Ökonomische Effekte eines deutschen Kohleausstiegs auf den Strommarkt in Deutschland und der EU. EWI, Köln. (2016)
DIW	Oei, P.-Y., et al.: Effektive CO2-Minderung im Stromsektor: Klima-, Preis- und Beschäftigungseffekte des Klimabeitrags und alternativer Instrumente. DIW (Deutsches Institut für Wirtschaftsforschung), Berlin (2015), Oei, P.-Y., et al.: Kurzbewertung des neuesten "Kompromissvorschlags" vom 24.06. zur Reduktion der zusätzlichen 22 Millionen t CO2 bis 2020 (2015).
Online media sources	
EURACTIV.de	Studie entkräftet Angst vor Gabriels Kohle-Abgabe (2015), Gabriel stemmt sich gegen "Masterplan zum Kohleausstieg" (2016)
Handelsblatt.com	Vattenfall-Chef zur Kohleabgabe: „Gabriels Tempo ist zu hoch" (2015), Gabriel verteidigt Abgabe für alte Kohlekraftwerke (2015)
N-TV.de	100.000 Arbeitsplätze in Gefahr? Bsirske: Kohleabgabe ist Jobkiller (2015), Widerstand aus der CDU - Gabriel bessert bei Kohle-Abgabe nach (2015)
RP online	Krisen-Treffen zu Braunkohle-Aus bei RWE (2015), Deutsche Industrie warnt vor Kohle-Ausstieg 2050 (2016)
Spiegel online	Klimaschutz: Gabriel will neue Abgabe für alte Kohlemeiler einführen (2015)
Sueddeutsche.de	Klimaschutzplan des Umweltministeriums: Das Endspiel um die Braunkohle hat begonnen (2016)
Tagesspiegel.de	Energiewende – Schon wieder Zoff um die Kohle (2016)
WELT.de	Plan zum Kohleausstieg könnte Versorgung gefährden (2016)

5 Synthesis and outlook

5.1 Summary and discussion of findings

The work presented in this thesis is motivated by the observation that in the German debate on energy transition, a polarization between actors can be observed *as well as* a convergence of discourses towards consensual aims and strategies. The three core chapters explore the relationship between polarization and convergence and its implications for future prospects of energy transition.

Chapters 2, 3 and 4 approach this overarching research theme from three different angles, motivated by three specific research questions:

1. **How did energy discourses in German Federal Parliament evolve over the past three decades?**
2. **How did scientific policy advice interact with the evolution of energy discourses and narratives?**
3. **How does the current debate on the future of coal relate to the historic energy transition discourse, and what are prospects for constructive dialogue and consensus?**

The following sections summarize the findings of the three core chapters (5.1.1 – 5.1.3) and synthesize their contributions to the overarching theme (5.1.4). Section 5.2 reflects on the theoretical underpinning and on the relative merits of the different approaches to discursive analysis employed in this thesis. The outlook in Section 5.3 considers energy narratives in a global climate governance perspective and outlines ideas for further research.

5.1.1 Energy transition: discourses and discursive dynamics

This thesis is based on a reconstruction of discourses and their elements in German energy policy debates. As Chapter 2 shows by means of an analysis of parliamentary debates, the concept of a transition towards a nuclear-free, renewables-based energy system, *Energiewende*, became hegemonic as a result of changes in discourses between 1989 and 2011. At the same time, two prototype antagonist discourses remain recognizable.

A proactive discourse has been promoting energy transition and ambitious policies for supporting renewables, phasing out nuclear power and more recently also phasing out coal. Its motivation stems primarily from environmental concerns, and it is rooted in a worldview that considers the environment to be fragile and threatened, and to be saved only through fundamental changes in production and consumption of energy and resources. However, the discourse also builds on the economic benefits of policy change. Its typical narrative is a “story of rise”, where energy transition policies not only remove the looming environmental threats of current technologies but also bring an economic boost through the creation of new industry, jobs and export chances. Citizens and small business are typically presented as heroes, who are initially suppressed by established structures but enabled to succeed with the help of feed-in tariffs, a policy that remedies major market failures. This way, the renewable industry can be strengthened to stand up to incumbent energy utilities, which are regularly portrayed as villains attempting to obstruct energy transition. The story of rise reaches

beyond national borders: Acting as an international leader, Germany will make other countries set course towards energy transition too, and environmental benefits will thus be multiplied.

The prototype reactive discourse, by contrast, is hosted by a worldview that acknowledges environmental problems but prioritizes economic concerns. It is status quo-oriented, holding on to the idea that only an "energy mix" that includes fossil and nuclear sources can guarantee secure and affordable energy supply. The economic potential of renewable energy is rated low, and doubts are cultivated regarding the necessity and feasibility of fundamental and rapid changes to the energy system. The typical narrative is a "story of decline" which emphasizes the costs and risks of policy changes. German citizens, industry and its employees are presented as victims suffering from the adverse impacts of energy transition. Rising electricity prices are expected to damage the domestic industry and reduce its competitiveness, and job loss will be the result. The discourse is critical vis-à-vis market interventions and opposes the feed-in tariff system as an economically inefficient subsidy. The discourse tends to denounce isolated national action as a useless self-sacrifice which causes economic disadvantage domestically, but no environmental benefits at global level due to leakage effects.

The proactive discourse on energy transition was introduced into parliamentary debate by Green Party members. Chapter 2 shows how over time, its major elements were successively adopted by the established parties, first by the Social Democrats and the Left Party, later also by Christian Democrats and at least in part by the Free Democrats. By 2011, all parties present in parliament share the basic vision of energy transition, all mention its beneficial economic and environmental effects, and all praise the role of citizens and small business. At the same time, however, the story-lines of both discourses remain clearly distinguishable. This is mostly due to the fact that the reactive discourse retains its original focus on concerns over economic and supply risks, but *combines* it with a commitment to energy transition in principle. Conservatives and liberals thus essentially broaden and expand their discourse and their repertoire of story-lines. Social Democrats and in particular the Green Party, by contrast, seem to stick to their traditional version of energy transition, calling for an ever more rapid transition, hardly talking about costs and risks, and sometimes insinuating that the commitment of their opponents is not sincere. Moreover, story-lines continue to differ with respect to the time horizon of their plot. Story-lines belonging to the proactive discourse are oriented towards the long-term need to decarbonize the economy, while Christian and Free Democrats' story-lines focus on the more short-term securing of low electricity prices and supply security.

Those parts of the original proactive discourse that became mainstream themselves were adjusted and experienced a transformation from radical to reformist. While proactive statements of the early years often were critical towards capitalism and radical in terms of changing not only the energy system but society as a whole, the idea of energy transition today strongly resonates with mainstream economic logic. For instance, the vision of a more decentralized energy system, originally associated with the wish to break up and remove established energy structures, underwent a major change in character. Christian Democrats specifically created a story-line that evoked inclusiveness rather than conflict between small and large actors, and that invited everyone to identify with the big national project of energy transition.

5.1.2 Scientific policy advice: advocacy enabling convergence

In a second step, this thesis explores how scientific policy advice (SPA) has interacted with the evolution of discourses on German energy policy. The first main finding is that polarization also characterizes the SPA domain. The analysis presented in Chapter 3 suggests that more often than not, SPA constitutes advocacy and takes sides in the debate. Most of the reports published between 2000 and 2015 that were analyzed can be classified as being associated either with the proactive or the reactive actor group (here conceptualized as advocacy coalitions).

This association can be explicit from the text of the report, or implicit in its design and contribution. Reports are classified as explicitly positioned if they reproduce elements of the respective discourse and its characteristic narratives. This means that elements of the typical narratives and their normative assumptions are revealed in those parts of the reports that present its motivation and aims (for instance the introduction, the conclusions, or the summary), independently of the presentation of results. Reports are classified as implicitly positioned if the association of the study is not evident from the use of narratives but from the design and contributions of the study. The fact that explicit positioning is mostly found means that usually, normative assumptions and the reports' position in the coalition landscape are fully transparent. Scenario modelling for energy policy support has been criticized for a lack of transparency on how normative assumptions and targets translate into the choice of parameters and set-up of scenarios (Dieckhoff, 2015; Schmid, 2013). The present analysis however suggests that at a more general level, most SPA reports are fairly open about the relationships between beliefs, desired achievements, research approaches and recommended policy options. Even in the case of implicit positioning these relationships are usually easy to recognize for an informed reader. The presence of different normative starting points ensures that different aspects of the policy problem are being investigated.

The second finding of Chapter 3 is that despite the fact that many SPA studies take a clear position, in sum they have facilitated the convergence of discourses. The analysis cannot establish the relative relevance of the influence from SPA compared to that of policy developments and external shocks on the evolution of discourses. However, SPA may be considered a relevant source of discursive power. Congruence with SPA findings can be assumed to enhance the legitimacy and persuasiveness of discursive claims while a missing "stamp of approval" from science (Stone, 1989, p. 294) would reduce it. Based on these considerations, Chapter 3 concludes that through several mechanisms SPA has contributed to enabling discursive convergence.

- SPA reports, even if they are clearly motivated by the normative prepositions of one or the other discourse, provided differentiated information on key claims of the respective narratives, such as the feasibility of transition, the costs and benefits of policy changes, and options for policy instrument choice. To make their stories congruent with SPA and thus reap the benefits of SPA support, policy actors had to reduce drama and resist the use of extreme narratives of rise or decline.
- SPA studies generally were responsive to the concerns and claims of their opponents, and reasoning was adjusted to integrate them. For instance, reports associated with the proactive coalition have increasingly cared about the costs of transformative policies, while studies associated with the reactive coalition have increasingly operated within the politically given perspective of energy transition.

- More recently, the number of studies that do not appear to be associated with either coalition seems to increase. Some of these studies explicitly recognize the dualism of discourse and search for solutions that are compatible with the narratives of both coalitions. In particular in more recent sub-debates that focus on the implementation of energy transition and on specific instrumental details, the spectrum of different SPA recommendations illustrates that perspectives for compromise between extreme positions exist, and that step-wise reform towards more viable solutions is possible.

With respect to the overarching theme of this thesis, Chapter 3 suggests that *not even polarization among scientists and experts* prevents convergence. Despite widespread advocacy and an obvious entanglement of facts and values, SPA has broadened the basis for dialogue, improved the conditions for political compromise, and built bridges between narratives that started off as irreconcilable antagonists. In the critical realist perspective that informs the research of this thesis (p. 3), the primary task of science may be characterized as checking the claims contained in narratives and framings against the conditions of the material world. Certainly there are manifold mechanisms that may lead scientists to come to conclusions congruent with their own or their clients' pre-defined perspectives (Jasanoff, 1994; Sarewitz, 2004). Nevertheless, the specific tools and resources through which scientists construct meaning may be assumed to impose stronger limitations to their narrative freedom than apply to general public discourse.

5.1.3 The future of coal: renewed conflict or final show-time?

In the framing struggle of the recent debate on the future of coal, a re-intensification of polarization and a strong emphasis on negative effects and conflictual issues are observed (Chapter 4). Nevertheless, constructive dialogue after the upcoming federal election will be possible if issues with a high potential for compromise are used as entry points, and if both actor groups are prepared to make concessions that touch upon their core concerns.

Actors largely group with their traditional allies and around the core elements of their traditional discourses (Figure 4.2), and their framings re-emphasize the differences. The proactive (change legitimizing) discourse now advocates coal phase-out or a rapid reduction of coal. Framings focus on the negative impacts of coal and coal mining on the climate, human health and local landscapes. Reactive (status quo defending) framings emphasize the negative economic consequences that the proposed policies would have on the affected regions and possibly on the national economy. The reactive discourse thus points to victims that are highly tangible and immediately conceivable, which is likely to increase their salience and relevance in the eyes of many audiences. The proactive framings do not offer beneficiaries of the proposed policies of the same quality. They draw much less on ecological modernization and associated economic benefits than the story-lines on energy transition identified in the parliamentary debates in Chapter 2; a "story of rise" is not recognizable.

Both sides appear to strongly answer to the values prioritized by their own group, and framings seem to be designed to resonate with group members in the first place. As in traditional discourses, the framings reveal differences in normative assumptions with regard to national responsibility. Proactive actors emphasize the country's duty to achieve its own climate targets, and the role model and leadership function national action is assumed to entail, while the reactive actor group perceives

national action without an international level playing field as dangerous and unwarranted, arguing that Germany is already doing enough.

Status quo defenders in the future-of-coal debate hold on to their general commitment to climate protection (Chapters 2 and 3). They challenge the proposed measures to reduce coal use mainly on the ground of lacking effectiveness, based on the argument that emission reductions from national level action will be neutralized through carbon leakage within the EU ETS. At the same time, however, their framings very often leave out the question *how else* the issue might be solved, it being obvious that maintaining coal use and protecting the climate will be hard to reconcile in the longer term.

In a second step, Chapter 4 identifies scope for constructive dialogue despite the intensified controversy. Entry points are delineated for the resumption of dialogue after the upcoming federal elections. A characterization of the solution space from both groups' perspectives indicates that scope for consensus is greatest with respect to active management of structural change. The chances for an implementation of national coal reduction strategies and policies will likely depend on appropriate solutions for compensation to affected industries and regions that are acceptable to both sides. The episode on the lignite emergency reserve illustrates that incumbent actors might be prepared to accept national action (against their framing strategy) if compensation for economic losses or risks is part of the deal.

Proactive actors may have to accept a dialogue process with an open mandate that does not impose an exit date for coal from the start. Reactive actors, on the other hand, might have to review their positions with respect to national and European level action. Currently, their framings in the future-of-coal debate oppose unilateral measures and delegate responsibility for action to the EU level. At the same time they tend to be defensive towards a strengthening of the EU ETS. By eliminating this inconsistency they could make a significant contribution to improving the basis for dialogue.

The findings from Chapter 4 challenge the conclusions from Chapters 2 and 3 by showing that as proposed by Heyen (2016) the exit from existing non-sustainable structures might be the hardest part of transition processes. While the general consensus on energy transition is not openly put into question in the future-of-coal debate, conflict is re-emphasized in discursive strategies. The framings of the incumbent actors leading the reactive discourse in the debate reflect the difficulty of reconciling their general commitment to energy transition with more short-term economic interests. At the same time, given the discursive path dependency, the commitment to climate protection held up over decades, and also the changes in business strategies in response to energy transition already made, questioning the overall consensus on climate protection and energy transition would create a major credibility problem for actors from the reactive coalition.

5.1.4 Synthesizing results: from polarization to convergence?

This thesis finds that in German public and expert debates on energy transition, convergence has occurred with regard to long-term goals, without polarization between opponent positions disappearing. The analysis of parliamentary debates shows that the reactive discourse broadened over time, integrating proactive story-lines and a commitment to energy transition, while retaining its focus on economic concerns. Members of political parties associated with the proactive coalition

tended to hold on to the traditional version of their discourse on energy transition, but omitted some of its more radical elements.

Scientific policy advice has most likely contributed to the convergence, notwithstanding its tendency for advocacy. SPA provided differentiated information, checked narrative claims against the material world, and in some cases actively attempted to build bridges. In the polarized SPA landscape, any claim was certain to be challenged by the opponent side, which forced SPA actors to either provide better evidence and more convincing arguments to defend it, or to moderate their claims. Polarization in the well-developed SPA landscape may thus actually have been a factor supporting discourse convergence.

In a historical perspective, polarization has thus not been an obstacle to a convergence of discourses and to policy change. This phenomenon may be related to the corporatist structure of German policy-making, which allows for the participation and influence of societal actors (Renn and Marshall, 2016, p. 231), and to the presence of manifold mechanisms facilitating dialogue between opponent actors.

But will the consensus on the goals of energy transition hold in the future? Based on the findings of this thesis, it can be argued that more likely than not, it will. Certainly, it is placed under increased pressure when the focus turns on specific measures for short-term emission reduction. Measures targeted at existing structures – such as policies for reducing coal-fired electricity production – that have immediate negative effects on influential actors trigger strong discursive resistance. This is illustrated by the intensification of the polarization and the emphasis on conflictual framings observed in Chapter 4. However, if reactive actors were to step out from the general consensus on energy transition in an obvious attempt to secure special and short-term economic interests, they would incur a major credibility problem. Moreover, discourses work back on the attitudes and values of the actors practicing them (Hajer, 1995, p. 68). Thus, even if the adoption of proactive discourse elements by reactive actors in the past may in part have been strategic, there is no reason to assume that it is only a pretense today. The more convenient option for affected actors, as suggested by the findings of Chapter 4, is lobbying for financial compensation and discursively delegating responsibility for action away from the national level. The success of the German energy transition in the future might thus depend most strongly on whether suitable solutions are found for a compensation of affected actors in the context of managing structural change, and for the reconciliation of the EU ETS with national level action.

5.2 Reflection on concepts and methods

This thesis investigates German energy transition from a discourse analytic perspective, drawing on the concepts of story-lines, narratives and framings. These concepts stem from distinct strands of the literature, and are originally associated with different frameworks. The term “story-line” belongs to the classic discourse coalition approach developed by Maarten Hajer (1993, 1995), while “narrative” is a concept employed by many authors in different endeavors on theory development and case study research. In an applied context as given here, the rationality of both concepts is very similar, and the narratives of Chapter 3 easily build on the story-lines identified in Chapter 2. The framing concept has closer ties to psychological research and cognitive science than that of narrative. As applied in Chapter 4 however, its rationality is also in many respects comparable to that of narrative and story-line (p. 5).

The two concepts (narrative/story-line and framing) have proven useful for studying the social construction of policy issues and the way actors present problems and solutions. The analysis of text in terms of narrative offers tools for a differentiated and in-depth characterization of the elements of a discourse, directing the researcher's attention to their inner structure, and to the nature of the relationships that are created between actors, actions, circumstances, events, and expectations. The framing concept is less specific, but also imposes fewer restrictions: there are linguistic constructions that may be classified as framing, but not as narrative. Framing analysis may thus be more suitable where the research interest is to broadly identify and label different ways of presenting an issue in the first place.

For the purpose of this thesis it was helpful to conceptualize narratives and framings as distinct sub-units of larger discourses that are concerned with specific aspects of the policy issue. This fits with situations where actors employ linguistic constructions that are not necessarily related to each other in coherent ways, but still all belong to the same overarching policy issue. The investigation of several framings or story-lines that together constitute a discourse thus appears a natural approach to complex debates.

Discourse analysis, naturally, has limitations. As a qualitative, interpretive approach, its aim is in the first place to understand the "why" and "how" of processes in the specific case study, rather than to produce "hard" data with statistical relevance or results that are generalizable across different contexts (Lazaraton, 2002). Also, as pointed out by many colleagues in discussions and by reviewers of the research articles, it is hardly possible to trace the influence of discursive processes *on* policy change, and thus to determine the relevance of discourse as a factor. Does discourse change as a consequence of altered policy conditions, or do changes in discourse cause policy change?

Policy change and discursive change are tightly interwoven, and in policy-making, talking and acting are not necessarily distinct activities. Thus, rather than attempting to isolate the effect of discourse on policy-making, discourses should be analyzed as integral parts of the policy process. The process of choosing and designing policies is played out through competing proposals for problem definition and solutions that are packaged in discursive practices such as narratives and framings. For analysis of policy processes, discourse approaches help to capture the relationships and overlaps between values, interests and strategies. Moreover, they naturally include a consideration of actors, which makes discourse analysis appropriate for investigating the political economy of policy debates.

Methodologically, the reconstruction of discourses and their analysis in this thesis is based on qualitative text analysis aided by manual coding of text sources. Being time-intensive, this approach required limitations to the size of text samples, so that the analyses presented in Chapters 2, 3 and 4 highlight individual sections of the debate rather than providing comprehensive accounts. Where more resources are available and several researchers can share the coding work or even repeat the coding of the same text sources, larger samples of sources can be evaluated, and the reliability of the coding can be enhanced (Leifeld, 2013; McBeth et al., 2005).

Given the research interest of this thesis – reconstructing discourses and analyzing variations across actors and over time – the appropriate approach was qualitative. Nevertheless, coding for qualitative text analysis may give indications on broad quantitative trends, as shown in Chapter 2. In the analysis of parliamentary debates, the presentation of coding frequencies has proven helpful to illustrate how discourse elements have made their way into the speeches of different political parties. However, a

number of methodological caveats had to be acknowledged, and the method employed at this scale does not allow making claims with statistical relevance.

Quantitative linguistic analysis might yield additional insights into the development of the energy transition discourse. Quantitative approaches can explore large samples of text sources, ideally if these sources are available from existing databases (e.g. media or parliamentary archives), and if the process of coding is automated via computational methods. While simple actor-action relationships may be revealed by algorithms (Sudhahar et al., 2011), quantitative automated text analysis cannot provide information on the context in which the coded term is embedded, or on the specific linguistic framing of issues. However, they allow evaluating large samples, tracing the use of certain words and changes in their frequencies over time, as well as investigating for instance which words occur in close proximity to each other (Moretti and Pestre, 2015). Quantitative methods thus might be valuable tools for discourse analysis if key words can be defined that reliably transport a certain narrative or framing, or if they are combined with qualitative approaches.

5.3 Outlook

5.3.1 Energy narratives in a global climate governance perspective

German energy transition is meant to contribute to global efforts for climate change mitigation. As illustrated by this thesis, its policies and discourses interact with mitigation policies at other levels of governance, and achieving consistence between them is all but straightforward. Multilateral coordination of action to address climate change at global level is hampered by collective action dilemmas and free-riding incentives (Barrett, 1994), and to date it is insufficient to meet the goal of limiting global warming to below 2° Celsius (UNEP, 2016). While traditional approaches to climate governance are centered on nation states and problems of coordination between them, a *polycentric approach* to global climate governance has been proposed by Dorsch and Flachsland (2017) to account for the empirically observed diversity of actors and coordinative processes at different governance levels. The polycentric approach focuses on these actors' specific and diverse preferences and competencies, and aims to shift the focus from the global dilemma situation to cooperation potential in various settings. It envisions an "adaptive system of multiple self-governing units of different scale at different levels, interacting with each other and realizing their site-specific capabilities for a common goal" (p. 50).

When efforts for climate change mitigation around the globe are conceptualized this way, the relevance of discourses and discursive practices to their success is easy to recognize. Narratives and framings may play a key role for the self-organization and coordinative adaptation between multiple actors that, according to the polycentric perspective, take place without a central authority and beyond hierarchical governance systems. Shared narratives might help to unite multiple actors – including individuals, NGOs, governmental bodies and transnational initiatives – by defining the common goal, delineating everyone's contribution and creating a shared identity (Bushell et al., 2015). At the same time, discourses as sets of interrelated narratives and framings allow for diversity and dynamic changes. They can accommodate different roles as well as changing perceptions of problems and solutions. Thus, they may catalyze experimentation and learning, knowledge and policy diffusion, and trust building, which are essential features of a polycentric approach to global climate governance (Dorsch and Flachsland, 2017, p. 60).

Since discourses are the results of collective social construction (p. 6), they cannot be created from scratch or imposed on others by any single actor. However, in a complex polycentric setting, actors could strive to strategically enhance the ability of narratives and framings to mobilize, engage and inspire actors by making them resonate with the concerns of specific target groups, for instance by highlighting implications for justice and equality or economic co-benefits. Strategic impulses to narrative development may facilitate stronger action and closer coordination across nations and governance levels (Bushell et al., 2015; Jerneck, 2014), and might thus support global climate mitigation efforts.

5.3.2 Further research

Apart from exploring the role of discourses in a polycentric governance perspective, further research could take one of the following three directions.

Firstly, the debates analyzed in this thesis all took place in a context where the relevant political actors were united in a broad consensus on the need to protect the climate, which might have been a precondition for the consensus on energy transition (Chapter 2). This situation may be changing with the new political party AfD (*Alternative für Deutschland* – Alternative for Germany) making its way into regional parliaments and possibly into Federal Parliament with the September 2017 elections. The AfD, a right-wing party founded in 2013 that has Euroscepticism at its core and argues for a return to traditional family structures and for measures against "mass immigration", considers climate policy to rest on "non-proven, hypothetical climate models", wants to abolish the EEG and reactivate nuclear plants and nuclear research (AfD, 2016). Their future activities and statements on energy transition and the reactions of other actors might provide further insights about the depth and reliability of the existing consensus.

Secondly, taking up the possibility of quantitative research discussed in section 5.2, future analyses of energy discourses could employ computational methods and, possibly, automated coding of larger text bodies. Such a study could for instance explore the history of the coal or nuclear discourses in a longitudinal perspective based on a larger-scale analysis of parliamentary debates or media sources. Similarly, quantitative studies could investigate the relationship of energy issues with basic economic and environmental paradigms such as sustainability or economic growth, or the relative weight actors have assigned to the elements of the "triangle" of energy policy goals (economic viability, supply security, environment-friendliness). Also, a quantitative analysis could be used to assess the relative importance of concepts such as decentralization or leadership for the energy transition discourse in different time periods.

Thirdly, energy transition discourses could be compared across different countries in order to explore which conditions or characteristics of political or economic systems might facilitate convergence and consensus (Lovell et al., 2009). In fact, some "varieties of capitalism" may be better equipped than others to reap economic, social and environmental benefits from promoting renewable energy: In Germany, the "coordinated and locally embedded government–industry–finance–science–society interactions" are, among other factors, assumed to have contributed to the success of energy transition, compared to countries such as the UK with a more liberal market economy (Ćetković and Buzogány, 2016). A comparative analysis might also further our knowledge about whether economically "kinder, gentler societies" are also greener (Bernauer and Böhmelt, 2013). While a cross-country comparison based on a review of existing literature would face significant challenges

given that case studies rest on different concepts and methodologies (e.g. Bosman et al., 2014; Curran, 2012; Goodman, 2016; Hermwille, 2016; Lovell et al., 2009; Rosenbloom et al., 2016; Thaker and Leiserowitz, 2014; West et al., 2010), extracting general similarities and differences in discourse structures might nevertheless be possible and rewarding.

5.4 References

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Statement of Contribution

The three research articles that form the core chapters of this thesis were written by the author in collaboration with her advisor Prof. Dr. Christian Flachsland. Dr. Michael Pahle co-authored chapters 2 and 3. The author of this thesis had the lead in all three papers, with respect to conceptual design, data collection and analysis, production of figures and tables, and writing. The following paragraphs detail the contribution of the author to the three papers and acknowledge major contributions of others.

Chapter 2[1]

The author of this thesis created the research design, collected the sample of documents, developed the coding scheme, performed the analysis, and was responsible for the overall handling and writing of the article. Christian Flachsland and Michael Pahle both contributed to the development of the research design and the theoretical framework in extensive discussions and through commenting on early drafts. Christian Flachsland provided advice throughout the process, and contributed to the production of the final manuscript by commenting and selective editing.

Chapter 3[2]

The author of this thesis developed the research design, collected the sample of SPA studies, developed the codebook, performed the analysis, and was responsible for the overall handling and writing of the article. Christian Flachsland and Michael Pahle provided comments on drafts of the concept and of the paper in several iterations as well as advice in extensive discussions. Christian Flachsland contributed to the final manuscript by commenting and selective editing.

Chapter 4[3]

The author of this thesis created the research design, collected the sample of text documents, developed the coding scheme, performed the analysis, and was responsible for the overall handling and writing of the article. Christian Flachsland provided advice throughout the process, and contributed to the production of the final manuscript by commenting and selective editing.

[1] Leipprand, Anna, Flachsland, Christian, Pahle, Michael, 2017. Energy transition on the rise: discourses on energy future in the German parliament. *Innovation: The European Journal of Social Science Research* 30, 283–305. doi:10.1080/13511610.2016.1215241.

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Tools and Resources

All texts were written with Microsoft Office Word 2010.

In the empirical analyses for chapters 2 and 4, coding was performed using MAXQDA. The codebook for chapter 3 is a Microsoft Office Excel 2010 document.

Figures were prepared using Microsoft Office Excel 2010 and Microsoft Office PowerPoint 2010.

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