

Kungl, Gregor

Working Paper

The incumbent German power companies in a changing environment: A comparison of E.ON, RWE, EnBW and Vattenfall from 1998 to 2013

SOI Discussion Paper, No. 2014-03

Provided in Cooperation with:

Institute for Social Sciences, Department of Organizational Sociology and Innovation Studies,
University of Stuttgart

Suggested Citation: Kungl, Gregor (2014) : The incumbent German power companies in a changing environment: A comparison of E.ON, RWE, EnBW and Vattenfall from 1998 to 2013, SOI Discussion Paper, No. 2014-03, Universität Stuttgart, Institut für Sozialwissenschaften, Abteilung für Organisations- und Innovationssoziologie, Stuttgart

This Version is available at:

<https://hdl.handle.net/10419/100044>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

RESEARCH CONTRIBUTIONS TO ORGANIZATIONAL SOCIOLOGY AND
INNOVATION STUDIES / STUTTGARTER BEITRÄGE ZUR ORGANISATIONS-
UND INNOVATIONSSOZIOLOGIE

SOI Discussion Paper 2014-03

The Incumbent German Power Companies in a Changing Environment

**A Comparison of E.ON, RWE, EnBW and
Vattenfall from 1998 to 2013**

Gregor Kungl



University of Stuttgart
Germany

**Institute for Social Sciences
Organizational Sociology and Innovation Studies**

Gregor Kungl

The Incumbent German Power Companies in a Changing Environment. A Comparison of E.ON, RWE, EnBW and Vattenfall from 1998 to 2013.

SOI Discussion Paper 2014-03

University of Stuttgart

Institute for Social Sciences

Department of Organizational Sociology and Innovation Studies

Prof. Dr. Ulrich Dolata

Seidenstr. 36

D-70174 Stuttgart

Tel.: +49 (0) 711 / 685-81001

Fax: +49 (0) 711 / 685-81006

<http://www.uni-stuttgart.de/soz/oi/>

Research Contributions to Organizational Sociology and Innovation Studies

Discussion Paper 2014-03 (August 2014)

ISSN 2191-4990

© 2014 by the author(s)

Gregor Kungl is a PhD student at the University of Stuttgart (Germany), Institute for Social Sciences, and research fellow at the Helmholtz Alliance ENERGY-TRANS.

gregor.kungl@sowi.uni-stuttgart.de

Additional downloads from the Department of Organizational Sociology and Innovation Studies at the Institute for Social Sciences (University of Stuttgart) are available at:

<http://www.uni-stuttgart.de/soz/oi/publikationen/>

Abstract

This paper examines the actions and strategies of Germany's leading energy companies—E.ON, RWE, EnBW and Vattenfall—in the light of a changing regulatory framework and other circumstances. The liberalization of the German electricity market, measures to promote renewable energies, market developments as well as exogenous shocks such as the Fukushima nuclear disaster and the fiscal crisis all had far-reaching consequences for these companies. A comparative analysis of these companies from 1998 to 2013 shows their development from thriving growth at the start of liberalization up to the current state of crisis. Conducted with a focus on the context of the *Energiewende*—Germany's commitment to shift towards sustainable energy production—this article contributes to the current debate on the sustainable transformation of energy supply. The theory of strategic action fields by Fligstein and McAdam serves as a theoretical framework.

Zusammenfassung

Dieser Beitrag untersucht die Strategien der etablierten deutschen Stromkonzerne E.ON, RWE, EnBW und Vattenfall vor dem Hintergrund sich verändernder Rahmenbedingungen. Regulatorische Eingriffe wie etwa die Liberalisierung des deutschen Elektrizitätsmarktes oder Maßnahmen zur Förderung erneuerbarer Energien, Marktentwicklungen sowie exogene Schocks in Form der Nuklearkatastrophe von Fukushima und der Finanzkrise hatten weitreichende Folgen für die Stromkonzerne. Um die Entwicklung der Unternehmen – von einem florierenden Wachstum zu Beginn der Liberalisierung bis hin zur aktuellen Krise – verständlich zu machen, werden die Aktivitäten der Unternehmen in der Zeit von 1998 bis 2013 einer vergleichenden Analyse unterzogen. Den theoretischen Rahmen hierfür bildet die Theorie strategischer Handlungsfelder von Fligstein und McAdam. Ein analytischer Schwerpunkt liegt auf den Entwicklungen des deutschen Strommarktes im Zuge der *Energiewende*. Damit leistet der Artikel einen Beitrag zur aktuellen Diskussion über den nachhaltigen Umbau der Energieversorgung.

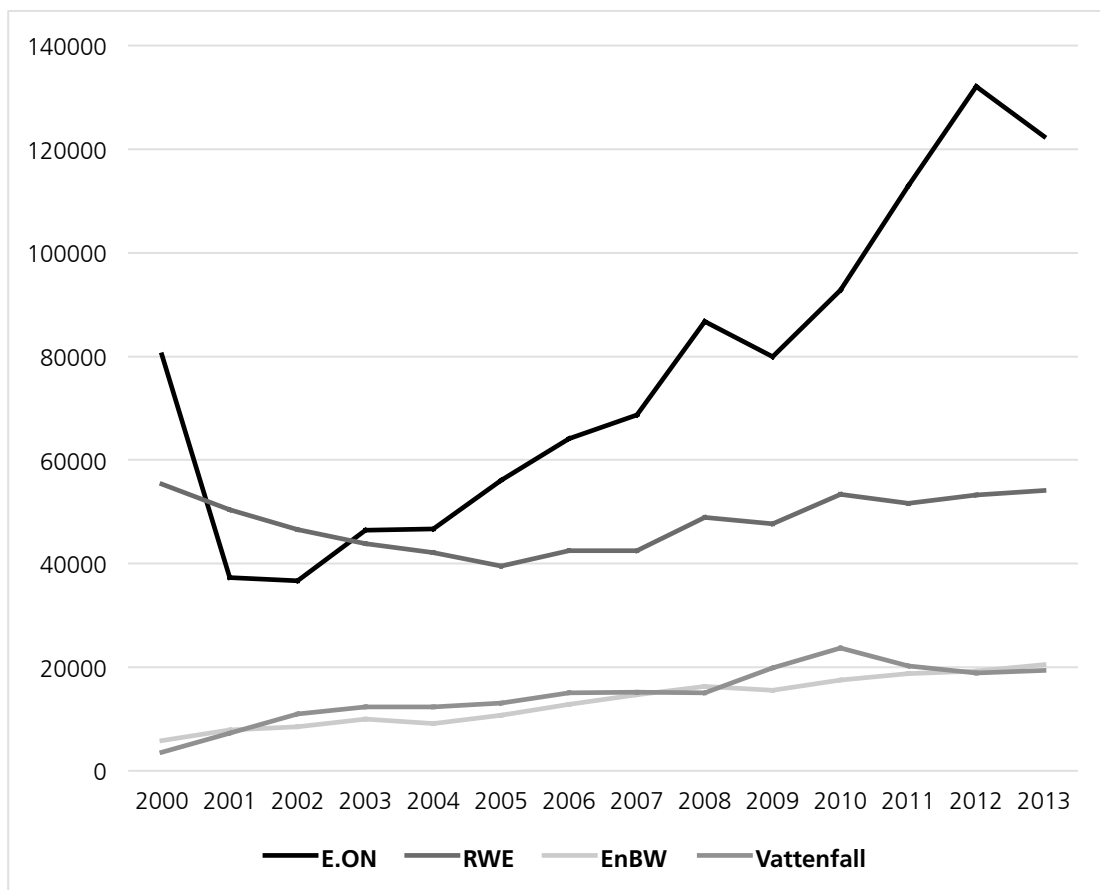
Contents

1	Introduction	5
2	Theoretical background—the theory of fields	8
3	Methodological approach	10
4	Changes in the field of electricity supply in Germany from 1998 to 2013	12
4.1	Impact from state fields—changes in the regulatory framework	12
4.2	Changes in the configuration of actors and the power balance of the field	13
5	Comparative analysis of the incumbents' actions	17
5.1	The incumbent power companies	17
5.2	Strategic phases	18
5.3	Differences between the incumbents	28
6	Conclusions and research outlook	31
	References	34

1 Introduction

There is an extensive body of research on Germany's transition to renewable energies, referred to as the *Energiewende* (for an overview, see Mallock 2012). While most studies recognize the important role of the established power companies in this transition, only few put them into the center of interest. Among these are Marquardt and Bontrup's (2011) work on the German electricity industry, the study by Hirsch et al. (2011) on the investment in renewable energies by the big energy companies, the "Stromwatch" series by Leprich et al. (2009, 2010) and the work by Becker (2011) in which he predicts the fall of the big energy suppliers. Yet, as none of these studies go beyond 2011, they do not cover more recent developments that have contributed to the pressure on the companies. For example, there is no research on the activities of these companies since the nuclear accident of Fukushima. Furthermore, to date the literature lacks a satisfactory analysis from a sociological point of view.

Figure 1: External sales in million Euro. Source: Annual reports of the companies¹



¹ In the case of Vattenfall, net sales were converted from Swedish Krona to Euro with the exchange rates used in the respective annual reports. External sales of the other companies are not fully comparable since reporting standards lacked consistency across companies and over time. When possible, previous year's figures were chosen.

Figure 2: EBITDA in million Euro. Source: Annual reports of the companies²

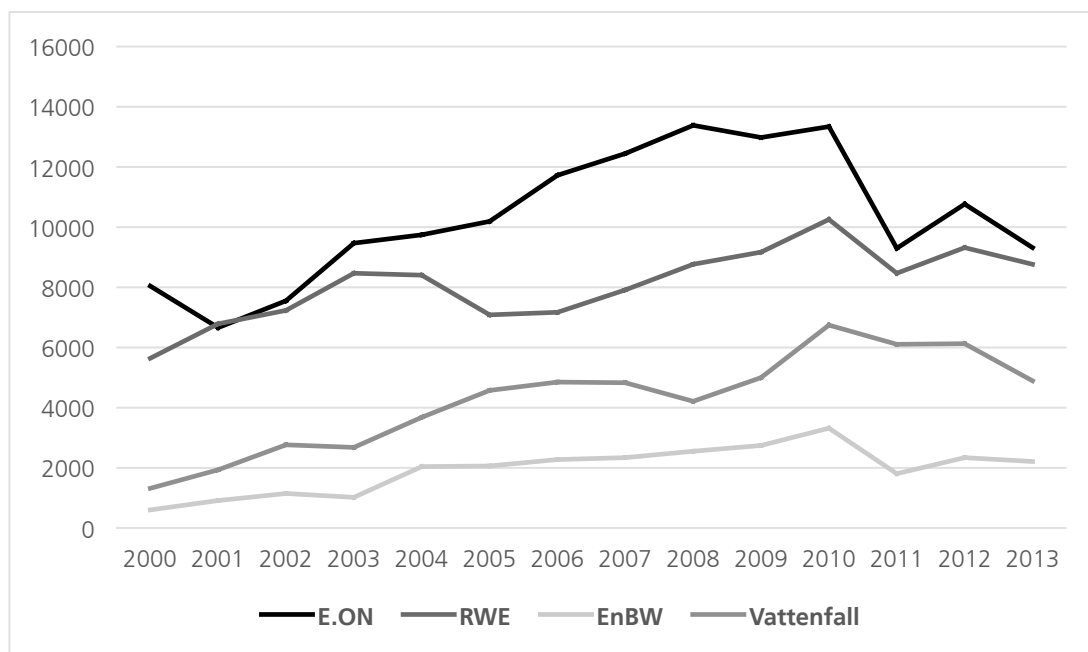
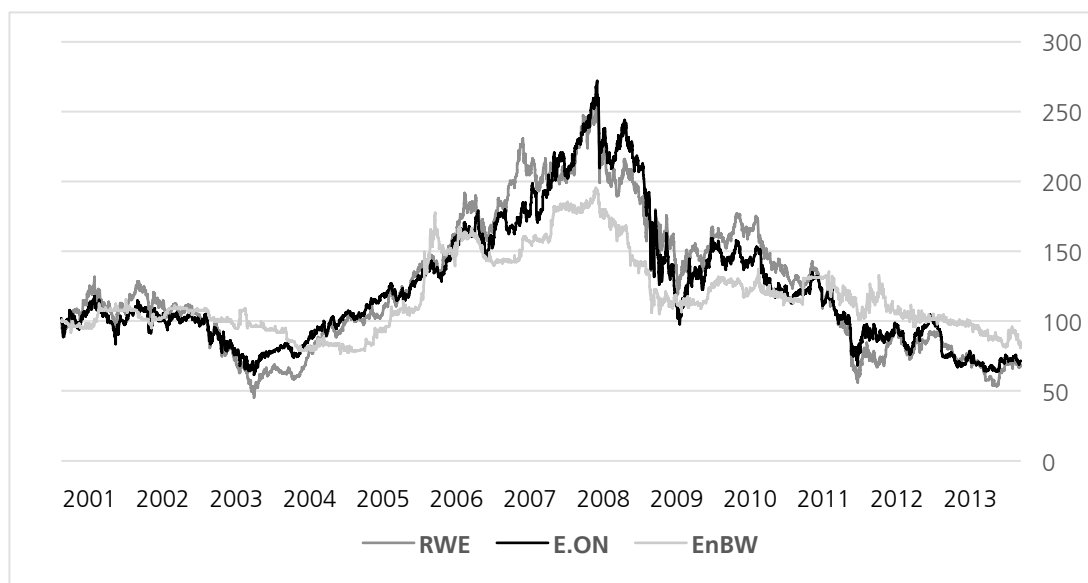


Figure 3: Stock price performance in percent. Source: finanzen.net³



At first glance, the developments in electricity supply in Germany appear simple. Profound and far-reaching regulatory changes were implemented, new actors entered the field, and additional external shocks ensued. The liberalization of the German electricity market in 1998 led to a wave of mergers, from which E.ON, RWE, EnBW

² Partly labeled as “adjusted EBITDA.” Concerning the comparability of the data, see Footnote 1.

³ Frankfurt Stock Exchange. Closed. As of February 3, 2014.

and Vattenfall⁴ ultimately emerged as the four dominant actors. These companies seized the opportunity to expand beyond the borders of their former supply areas and grew in size and power. Yet, by the end of the 2000s, these same companies were increasingly faced with challenges (for the development of the companies, see figures 1 to 3). One such challenge was renewable energies, which, backed by new government regulations, were beginning to gain ground and to create competition for conventional power plants. Further challenges included the fiscal crisis and unfavorable developments in foreign markets. At about the same time, in response to the nuclear accident of Fukushima, the German government decided to phase out nuclear power. From then on, at the very latest, these four companies can be considered to be in crisis, and a steadily growing one at that.

How might these developments be explained? This paper aims to contribute to the discussion about the ongoing changes in the German energy system by examining, in particular, the role of the established energy providers in this transition process. Thereby, it focuses on the supply of electricity. It seeks to give answers to the following three research questions:

- (1) What were the most important changes in the environments of the companies, and how did they react to these changes?
- (2) To what extent can the companies' rise to powerful market positions, and their subsequent decline, be explained by the strategies adopted by those companies?
- (3) Are there differences and similarities between the companies' actions and, if so, how might these be explained?

To achieve these research objectives, I apply a theoretical framework that not only offers a dynamic view of the interrelations between organizations and their environment but also allows including all relevant actors and influences within its scope. This framework is comprised of the theory of strategic action fields developed by Fligstein and McAdam. On that basis, I then reconstruct the actions of the energy providers.

The paper features four main sections: an introduction to the theoretical framework (Section 2); a presentation of the methodological approach (Section 3); an outline of the changes in the German energy supply sector from 1998 to 2013 (Section 4); and a comparative analysis of the strategies of the four companies (Section 5). This latter section, comprising the bulk of the paper, highlights the similarities between the companies' actions over time, such as the phases which the companies went through nearly simultaneously, and also points out the main differences between the companies. Section 6, the conclusion, will present further empirical implications of these findings.

⁴ In this case, Vattenfall refers to the German subsidiary of the Swedish company Vattenfall AB. This subsidiary was named Vattenfall Europe AG before being rebranded to Vattenfall GmbH in 2012. However, elsewhere in this paper, Vattenfall refers to Vattenfall AB.

2 Theoretical background—the theory of fields

When analyzing change processes in economic sectors from a sociological perspective, neo-institutional field theory (DiMaggio & Powell 1983; Scott & Meyer 1983, among others) proves to be very appropriate since it focuses not only on the economic actors or the organizations that actually interact but also on “the totality of relevant actors” (DiMaggio & Powell 1983: 148). In that sense, organizational fields spread beyond the borders of an economic sector in that they also encompass any actor who influences its institutional setting. Yet, the concepts of organizational fields, as originally formulated, appear to be too static for conceptualizing change processes. To offer a more dynamic view of organizational fields, Hoffmann (1999) points out the situational constitution of organizational fields.⁵ In this paper, I introduce a concept that is similar to Hoffmann’s yet more worked out in detail—the theory of strategic action fields by Fligstein and McAdam.

In their “theory of fields,” the authors analyze organizational fields⁶ using the term “strategic action field,” which they define as “a constructed mesolevel social order in which actors (who can be individual or collective) are attuned to and interact with one another on the basis of shared (which is not to say consensual) understandings about the purposes of the field, relationships to others in the field (including who has power and why), and the rules governing legitimate action in the field” (Fligstein & McAdam 2012: 9). All strategic action fields are themselves made up of multiple fields. For example, any collective actor is a strategic action field by itself, any division within an organization again, and so on. The authors use the metaphor of a Russian doll to illustrate this interlacing structure of the field. The constitution of the field as well as its borders may shift from time to time, since the fields are constructed on a situational basis and since its borders depend on the issues at stake. In this study, the field borders and the criteria of field membership are easily solved. Because we focus on electricity supply, any actor producing, feeding in and trading electricity is defined as a field member.

Fligstein and McAdam identify two types of field actors, the “incumbents” and the “challengers,” who constantly jockey for advantages with regard to the definition of field rules as well as spare resources.⁷ “Incumbents are those actors who wield disproportionate influence within a field and whose interests and views tend to be heavily reflected in the dominant organization of the strategic action field.” The

⁵ For an overview of further attempts towards a more dynamic concept of organizational fields, see Walgenbach and Meyer (2008: 74).

⁶ The authors understand their theory as a general social theory whose coverage is not limited to organizational fields.

⁷ According to the authors, the incumbent/challenger distinction is derived from the social movement theory and was first introduced by Gamson in 1975.

“purposes and structure of the field are adapted to their interests, and the positions in the field are defined by their claim on the lion’s share of material and status rewards. In addition, the rules of the field tend to favor them, and shared meanings tend to legitimate and support their privileged position within the strategic action field.” (Fligstein & McAdam 2012: 13) They have to defend their position against the challenger actors who “occupy less privileged niches within the field and ordinarily wield little influence over its operation” (ibid.). The four researched companies are the incumbents in electricity supply in Germany, which is the field under study in this research. The configuration of electricity production based on large centralized structures and big fossil and nuclear power plants promotes their interests and fosters their dominant position. On the other side, a heterogeneous block of challenger actors is seeking to establish an electricity supply based on renewable energy sources and decentralized structures. Fligstein and McAdam emphasize the contentious nature of strategic action fields. Moreover, given that a field is invariably subjected to a conflict, its configuration is continually being altered, even if only slightly.

But, the more significant destabilization comes from outside of the field. According to the theory, there are three potential ways this may occur—all of which are relevant in our case. First, any strategic action field is embedded in a broader field environment of various *proximate fields*, which are connected to the strategic action field by multiple ties between its actors. Changes in a proximate field can, then, have an intense impact on the strategic action field. The authors distinguish between two kinds of proximate fields: horizontal and vertical. The horizontal proximate fields that are the most relevant to this study are electricity markets in countries other than Germany which engage in cross-border electricity trade with Germany, or foreign markets in which the actors are also participating. Vertical proximate fields are hierarchically super- or subordinated, with the superordinated ones being more relevant for this study (Fligstein & McAdam 2011: 8). Macro-economic developments, for example, can be understood this way. A special form of vertically superordinate proximate fields are *state fields*, which represent the second possible source of external change pressure. The state is able to alter field rules, while the field actors’ capability to take influence on the state fields are limited. “The state’s unique claim to exercise sovereignty within a designated geographic territory means that state fields have tremendous potential to shape the prospects for change and stability in virtually all nonstate strategic action fields within those geographic coordinates.” (Fligstein & McAdam 2012: 67) The third destabilizing force can come from *exogenous shocks*—the most obvious example in this study being the nuclear disaster of Fukushima (ibid.: 19).

These pressures can give rise to so-called episodes of contention that are characterized by a shared sense of uncertainty or crisis concerning field rules and power relations. For such an episode to emerge, three conditions must be met: One, there must be a collective *attribution of threat or opportunity* by the actors. This underlines the relevance of the interpretation which the incumbents and challengers make of the

aforementioned destabilizing changes. Two, actors perceiving these changes must command the *organizational resources* needed to mobilize and sustain action. And most importantly, three, the actors must make use of *innovative action* in order to deal with those changes (ibid.: 20f.). Hence, according to the authors, the respective processes of field changes, though triggered from the outside, proceed along an incumbents-vs-challengers line of conflict. Nevertheless, in this research, the most significant threat to the incumbents' power comes from state interventions promoting challengers, followed secondarily by the threat of direct opposition through challengers.

Overall, Fligstein and McAdam offer a highly dynamic framework for analyzing organizational fields. In particular, their conception of membership combined with the idea of proximate fields allows us to position any relevant actor and any relevant environmental development within the scope of the theory.

3 Methodological approach

In this study, I examine the actions of the four companies—E.ON, RWE, EnBW and Vattenfall—from 1998 to the end of 2013 and present interim results from an ongoing research project. For this, I conducted a qualitative content analysis following the approach of Gläser and Laudel (2009)⁸ and derived data from annual reports and press reports issued by these companies as well as from business journals and daily newspapers. The sources of data used for the analysis of the 1998–2010 portion of the time frame are less exhaustive than those for the second phase of action, spanning from 2011 to 2013.⁹ For the entire time frame, the press reports were obtained from online archives. Articles were selected by searching the article headlines as well as by searching the full text according to a specific category system (see *Table I*). The same category system was applied for the coding and analysis of the content and was subject to constant adjustment.

The interim results presented in this paper draw data from 2548 documents. Of those, 365 are reports from the companies, while 1468 are drawn from business journals and 715 from daily or weekly newspapers. The documents were coded using the qualitative data analysis software MAXQDA. The data extracted this way was then

⁸ Gläser and Laudel's concept is based on the content analysis as worked out by Mayring (2007) but offers greater flexibility in the later stages of analysis through an ongoing adjustment of the underlying category system.

⁹ The data from 1998 to 2010 were derived from the annual reports of the companies and from the newspapers *Handelsblatt*, *Süddeutsche Zeitung* and *Die Zeit*. For the second phase of research, these sources were complemented with press releases from the companies, the newspapers and magazines *Frankfurter Allgemeine Zeitung*, *Westdeutsche Allgemeine Zeitung*, *Der Spiegel*, *Energiawirtschaftliche Tagesfragen*, and the news search engine *Paperball*.

processed using Excel. The final data sheets allowed to organize the data by source, (sub)category, company and date, thereby enabling quick access on any issue.

The information presented in this paper about the changes in the energy supply sector in Germany between 1998 and 2013 is based on desk research. Their respective sources will be indicated.

Table 1: Category system¹⁰

Main categories	Sub-categories
Resources	Investments/divestments in stake
	Investments/divestments in production capacities
External communication	Opinion communication (different issues)
	Strategy communication (business activities, business model, regional orientation, etc.)
Cooperation	Joint ventures
	Contracts
	Services
Organization	Changes in the organizational structure
	Management changes
Innovation	Research and development
	Model projects
Politics	Communication towards policy-makers
	Legal actions (against or by the group)
	Information activities/lobbying

¹⁰ The table features a simplified version of the category system. Further sub-categories exist. In addition, the system applies a set of indicators for determining how text segments are allocated to the categories.

4 Changes in the field of electricity supply in Germany from 1998 to 2013

As an introduction to Section 5, on the actions of the incumbents in the electricity supply sector, this section will present the overall developments of the strategic action field that applies to our study—the field of electricity supply in Germany from 1998 to 2013. The main changes in this field were triggered by state interventions that altered the field rules. Essentially, a first set of regulatory changes—aiming for the liberalization of the German electricity market—led to a swift and strong market concentration that fostered the incumbents’ dominant position in the field. Concurrently, a second set of regulatory changes that promoted renewable energies and discouraged nuclear power led to a gradual and much slower shift in the power balance in favor of the challengers.¹¹ To illustrate these changes in the power balance, I will present the changes in the energy mix in Germany. After showing that most of the renewable energy plants were built by challenger actors, I will explain the impacts of the renewables on the market. This will clarify why their expansion finally led to a decline of the power of the incumbents.

The aforementioned developments in proximate fields will be referred to alongside the subsequent presentation of the companies’ actions.

4.1 Impact from state fields—changes in the regulatory framework

A number of state regulatory changes were particularly relevant to our context. One was the enactment, in 1998, of the *Gesetz zur Neuregelung des Energiewirtschaftsrechts*, which is a revised version of the *Energiewirtschaftsgesetz* (EnWG) (Energy Industry Act). It aims at the further liberalization of the energy market. The other changes concern the enactment or amendment of laws that either privilege or impede certain technologies, in particular the *Gesetz für den Vorrang Erneuerbarer Energien* (EEG) (Renewable Energy Sources Act), the *Atomgesetz* (Nuclear Energy Act) and the *Kernbrennstoffsteuergesetz* (Nuclear Fuel Tax Law). This paper will examine the following three changes: (1) the amendment to the EnWG in 1998, (2) the first-time implementation of the EEG in 2000, and (3) amendments to the Nuclear Energy Act in 2002, 2010 and 2011.

Change 1. The revised EnWG from 1998 accommodates an EU market directive aiming at liberalizing the European energy markets. The new Act requires electricity suppliers to itemize their business activities based on the supply chain and to keep

¹¹ Of course, such political changes do not occur in a vacuum. However, examining the role of public sensibility in environmental issues and its influence on political decision-making would exceed the scope of this paper. For the work at hand, I take laws and legal decisions as given without scrutinizing their genesis.

separate accounts for their activities in power generation, transmission and distribution as well as for non-electricity activities (legal unbundling). The revision also banned territorial agreements between energy suppliers and stipulated that third-party access to power grids must be ensured. Through this change, the regional monopolies of the incumbent power companies were limited to the operation of the electricity grids.¹²

Change 2. The EEG of 2000 provided incentives for investment in renewable energy generation by obliging grid operators to give priority to renewable energy facilities, including through advantageous feed-in tariffs. The Act also guaranteed, for a period of 20 years, a consistent minimum payment for electricity generated from renewable sources, thereby promoting investments and planning security. The amendments made to the EEG in 2004, 2009 and 2012 are less relevant for this study since they did not contribute to resolving the basic conflict between investments in renewable energies and the established business model of the incumbents.

Change 3. The Nuclear Energy Act was amended in 2002, following the so-called *Atomkonsens* of 2000, a consensus between the German Federal Government and power companies. This amendment banned the construction of new nuclear power plants and mandated the decommissioning of existing ones. While the ban on new constructions has been retained to date, the provisions of the amendment concerning the phase-out have been altered. A further amendment, passed in 2010, saw for an extension of the operating life of nuclear power plants, albeit in conjunction with the Nuclear Fuel Tax Law, enacted in early 2011. Yet later in 2011, following the nuclear accident of Fukushima, the 2010 amendment was repealed. In that context, Germany's eight oldest reactors were shut down immediately and the remaining nine are slated to be shut down by 2022. The Nuclear Fuel Tax Law, it should be noted, remains in force. Together, these changes to the legislation on nuclear energy were significant since all nuclear power plants in Germany were operated by the incumbent power companies.

4.2 Changes in the configuration of actors and the power balance of the field

The liberalization of the German electricity market offered exceptional opportunities for the bigger energy suppliers to expand beyond the borders of their former service areas. In addition, it led to a wave of mergers that changed the playing field from eight vertically integrated energy companies to, four years later, the "Big 4," comprised of RWE (RWE plus VEW), E.ON (containing VEBA's PreußenElektra and VIAG's Bayernwerk), EnBW and Vattenfall Europe (formerly VEAG, HEW and

¹² This was at least the intention of the revision. There are vivid discussions about whether the revision fulfilled this purpose.

BEWAG).¹³ To get access to more customers, the latter acquired shares in smaller regional suppliers as well as municipal utilities. By 2010, E.ON, RWE and EnBW held shares in 135 municipal utilities, and in 78% of these cases, with a participation that exceeded the blocking minority of 25%.¹⁴ Thus, the liberalization led to a strong market concentration. Based on data from the Bundesnetzagentur (Federal Network Agency for Electricity, Gas, Telecommunications, Post and Railway), in 2003 and 2004 the incumbents possessed 82% of the electricity production capacity in Germany and generated about 90% of the electricity (Bundesnetzagentur 2007: 60). For the year 2010, their estimated production capacity had dropped to 77% and their share in the actual production to 82% (Bundesnetzagentur 2011: 14). After Fukushima, their estimated production capacity was still 73% (Bundesnetzagentur 2012: 17). Since all these numbers exclude production capacity as well as produced electricity that are paid for through the EEG reallocation charge, the realistic share of the Big 4 can be expected to be lower and its decline even more rapid.

But, what led to this reduction of their share? Essentially, the electricity produced from renewable sources was not exposed to free market competition as the EEG had created a kind of sheltered niche for this segment. And in so doing, the Act gave advantages to the challenger actors in the field of electricity supply, who then grew in number and degree of professionalization. The challenger side appears to be quite heterogeneous, comprising single actors as well as collective actors of different organizational and institutional forms and sizes.¹⁵ Due to the heterogeneity of these actors, and to a lack of available data, it was not possible to quantify the development of this configuration of actors in the electricity sector over time.¹⁶

Nevertheless, it is possible to at least obtain an overview of the shifting power balance in the electricity supply sector, namely by looking at the changes in the German energy mix. Because the most significant pressure towards the Big 4 from *within* the field can be ascribed to the growing amount of renewable energies, the bulk of which is generated by plants built by smaller companies or single actors.

¹³ Badenwerk and Energie-Versorgung Schwaben merged into EnBW in 1997.

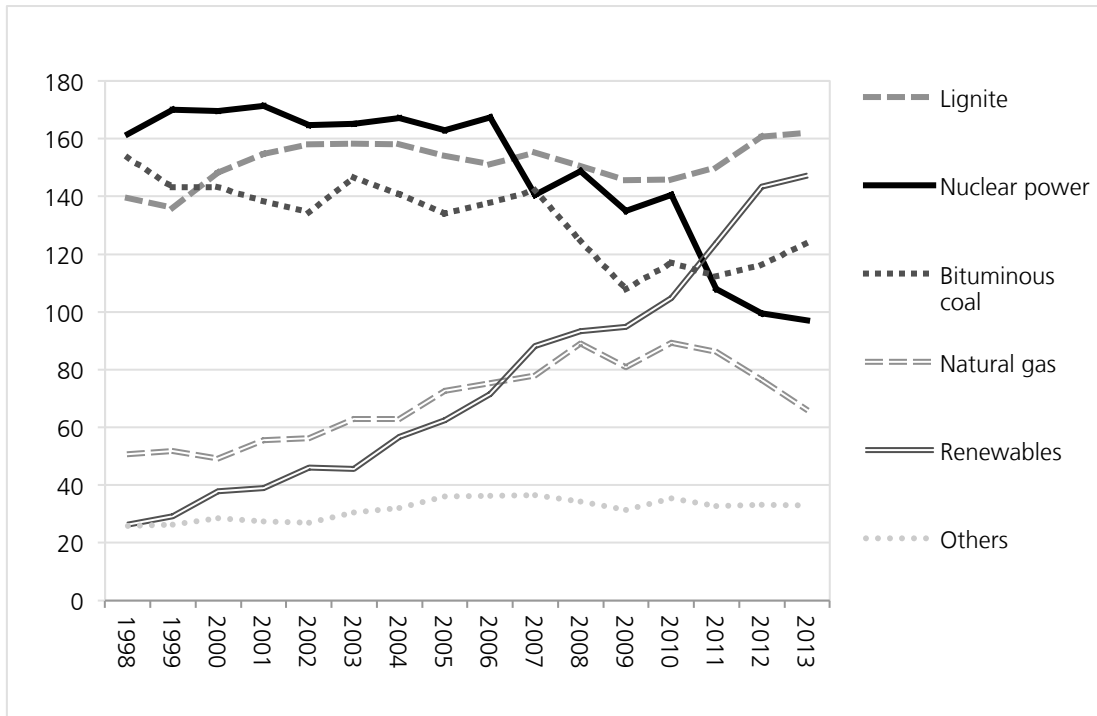
¹⁴ The total number of municipal utilities could not be identified. Bontrup and Marquardt (2011) estimate it at 700. The number of municipal utilities in which the companies held shares is taken from the annual reports of the companies, which—except in the case of Vattenfall—include complete lists of their shareholdings from 2010 on. Of 135 (105) participations, 55 (38) are held by E.ON, 54 (43) by RWE and 26 (24) by EnBW. The numbers in brackets refer to the participations in which the number of shares exceed the blocking minority.

¹⁵ For a detailed description, see Mautz, Byzio and Rosenbaum (2008), who offer a vivid description of this rising sector in Germany.

¹⁶ Different government departments offer data about the renewables sector as well as the entire energy sector. However, as the sources of these data render them incomparable, they do not lend themselves for quantification at a macro level.

Since 1998, the share of renewable energies in the German energy mix has been on a constant rise (see figure 4).¹⁷ Based on data provided by AG Energiebilanzen, electricity generation from renewables rose from 26.3 TWh in 1998 to 143.5 TWh in 2012, which constitutes a share of 4.7% in 1998 and 22.8% in 2012. While the share of hydro power remained nearly constant and that of biomass as well as wind power rose steadily, the share of photovoltaic power generation grew rapidly from 2009 to 2012—from 6.6 TWh to 26.4 TWh. The change in the energy mix of the conventional power plants for the same time period is more diverse, depending on the type of power source. Lignite rose by about 20 TWh. Gas rose steadily from 1998 on starting with 50.7 TWh, peaked at nearly 90 TWh in 2008 and 2010, yet had decreased to 76.4 TWh by 2012. Bituminous coal sank steadily but showed a slight rise from 2011 on. Nuclear power was on a downward slide from 2006 on, dropping from 167.4 TWh to 99.5 TWh between 2006 and 2012. As for the more recent developments from 2010 on, the declining production from nuclear power and gas-fired power plants was replaced by renewable energies (about two thirds) and coal (about one third) (AG Energiebilanzen, 2013).

Figure 4: Gross electricity production in Germany in billion kWh. Source: AG Energiebilanzen e.V. 2013



¹⁷ Of course, the rise of renewable energies in Germany started well before 1998; however, since this study focuses on the time period from 1998 on, I will not expand on this.

But, who built these new renewable energy plants? The aforementioned Bundesnetzagentur provides a list of all power generation units connected to the German electricity grid, including but not limited to information about the operator, capacity and date of commission. This list thus allows drawing information about what actors built what kind of plants since 1998. Based on this list, 40.6% of all plants commissioned since 1998, and which have not been shut down or changed ownership in the meantime, were built by one of the Big 4 or by companies in which the Big 4 hold at least blocking minority. The Big 4 built 59% of the capacity of conventional power plants and 20.9% of the capacity of renewable power plants. In the renewables sector, the most significant expansions took place in onshore wind (9187.7 MW), pumped storage (1577 MW), biomass (929.1 MW) and photovoltaics (702.7 MW). The participation of the Big 4 in this expansion accounts for 7.6% of the growth in onshore wind, 100% in pumped storage, 19.8% in biomass, and 0% in photovoltaics. It should be noted, however, that these data are not consistent with those of AG Energiebilanzen, BMWi and the BDEW, who estimate the total expansion of renewable energies, and especially of photovoltaics, to be much higher. This discrepancy in the data is due to the fact that the Bundesnetzagentur groups all smaller plants, meaning those with an installed capacity lower than 10 MW, according to the federal state in which they are located, without distinguishing between operator and date of commission. Since the annual reports of the Big 4 seldom refer to plants this small, the majority of these plants were likely built by other actors, whereby the incumbents' share in newly built renewable energy capacities would be even smaller. These findings and conclusions were confirmed by a 2011 study conducted by trend:research on the market actors in renewable energies. According to this study, the share of the Big 4 in Germany's total installed capacity of renewable energies rose only slightly, up to 6.5% (excluding pumped storage), between 2004 and 2010. The bulk of this share concerned hydro power, while shares in every other form of renewable energy remained below 10% (trend:research 2011: 43ff.).

To illustrate how these changes in the energy mix—which were driven mainly by the challenger actors—can be interpreted as changes in the power balance of the field, I point to the market effects of the expansion of renewables. In the traditional electricity supply system dominated by fossil fuels, production was differentiated into base load, medium load or peak load. Base load power plants (mainly nuclear, lignite and hydro) typically ran on a 24/7 basis. Medium load power plants (some thermal power plants, mainly bituminous coal) operated according to the demand curve in the course of the day. Peak load power plants (mainly gas and pumped storage) were responsible for handling short-term changes in demand. The power plant complexes of the incumbents were structured according to this logic. Their main task was to guarantee security of supply within their service areas.

Yet, this traditional system does not accommodate the rising share of renewables. The growing quantities of intermittent production from wind and solar energy re-

quires more flexible power plants and less base load power plants. Moreover, photovoltaics represent significant competition for peak load power plants. This is because photovoltaic power production usually peaks at noon, when electricity demand is high, thereby driving down the prices that could formerly be achieved. Due to the overcapacities in the German electricity system, in combination with the feed-in priority for renewable energies, the full load hours of the peak load power plants were reduced. Overall, renewables had a price-lowering effect on the energy exchange, thereby compromising the profitability of conventional power plants. Through this, they became a threat not only to the traditional business model of the Big 4 but also to the traditional (incumbent) paradigm of electricity supply.

5 Comparative analysis of the incumbents' actions

The above outlined changes in the field of electricity supply in Germany already provides an overview of the role of the incumbent power companies. In this section, I provide some basic information on the Big 4, followed by an analysis of their actions from 1998 to 2013. I group these actions into three overriding strategic phases and point to some striking similarities among the actors.

5.1 The incumbent power companies

E.ON was established through the merger of the multi-industry companies Vereinigte Elektrizitäts- und Bergwerks AG (VEBA) and the Vereinigte Industrieunternehmen AG (VIAG) in 2000. The incorporation marked the biggest industrial merger in Germany to date (Bontrup & Marquardt 2011: 184). With 19.6 GW of installed capacity and 85.9 TWh of electricity generation in Germany in 2012, E.ON is the second biggest player on the German market.¹⁸

The history of RWE traces back to 1898, when it was founded under the name Rheinisch-Westfälische Elektrizitätswerk AG, and is the longest-established firm among the Big 4. RWE is the biggest player on the German market. In 2012, the company had an installed capacity of 30.6 GW and produced 158.1 TWh of electricity in Germany.

EnBW was formed in 1997, when the Badenwerk AG and the Energie-Versorgung Schwaben AG (EVS) merged under the name EBW, which was re-branded to EnBW in 1998. It is the fourth biggest energy company on the German market with an installed capacity of 13.4 GW and 59.1 TWh of produced electricity in 2012.

¹⁸ Data from RWE. The company refers to data by the four companies and by the BDEW.
<https://www.rwe.com/web/cms/de/2074482/transparenz-offensive/stromdaten-kompakt/> (3/2014).

Vattenfall, a Swedish state-owned company, was formed in 1909 by the Swedish government as part of a restructuring of the Trollhätta Canal and its associated hydro power plant. The company entered the German electricity market in the context of an international growth strategy charted out in 1995. Between 1999 and 2002, it acquired the energy companies Hamburgische Elektrizitäts-Werke AG (HEW), Vereinigte Energiewerke AG (VEAG), Berliner Städtische Elektrizitätswerke AG (Bewag) and the mining company Lausitzer Braunkohle AG (Laubag) and merged them to Vattenfall Europe.¹⁹ In 2012, Vattenfall owned 16.4 MW of installed capacity and produced 66.1 TWh of electricity in Germany, thereby figuring as the third biggest player on the market.

5.2 Strategic phases

My analysis of the incumbents' actions identifies three strategic phases: (1) growth and a focus on the core business, (2) pressure to grow in the face of limited opportunities, and, more recently, (3) crisis and reorientation. All four companies went through all of these phases, although, as shall be discussed later, not necessarily with the same intensity or for the same duration. E.ON and RWE went through all three phases nearly simultaneously. For EnBW and Vattenfall, phase one and especially phase two were less pronounced. Phase three was experienced by all four companies, yet to different degrees. The exact time span of each phase also differed slightly between the four companies. The three phases are presented as follows.

Phase 1: Growth and a focus on the core business—1998 to 2005

During this time span, the incumbents strengthened their position in the field while at same time expanding into foreign markets. Right from the start, they seized the opportunity to expand beyond the borders of their former service areas by acquiring various companies in the energy supply sector (see *Table 2* for a selection of acquisitions) as well as shares in a great number of municipal utilities. This expansion was initially focused on Germany. At around 2002, it became foreseeable that the boundaries permitted by German antitrust law would soon be reached. From then on, their investment focus shifted to the European level. E.ON expanded mainly into Eastern Europe, Great Britain and Scandinavia. RWE enhanced its market position in the global water supply sector in addition to strengthening and expanding its presence on the European electricity market, with a main focus on Great Britain and Central and Eastern Europe. EnBW, less monitored by the German Federal Cartel Office, contin-

¹⁹ The foundation of Vattenfall Europe is directly linked to the big mergers RWE/VEW and VI-AG/VEBA. The antitrust authorities required the merging companies to sell their shares in HEW, VEAG, Bewag and Laubag. At the same time, Werner Müller, Minister of Economics and Technology, promoted the idea to form a “fourth power” on the German electricity market and advocated that E.ON’s and RWE’s shares in the four power companies be acquired by one single company (*Berliner Zeitung*, September 28, 2001). Vattenfall was blatantly favored over the competition.

ued its national expansion until about 2008. Overall, EnBW focused the most on Germany and acquired shares in only a few companies in Spain, the Czech Republic, Austria and Switzerland. Vattenfall had one major phase of acquisitions from 1999 to 2002, when it entered the German and Polish market and strengthened its position in Scandinavia.

Table 2: Selected acquisitions by the Big 4

Big 4	Timespan	Company	Share	Country
E.ON	2000 to 2004	<i>Ruhrgas</i>	100	Germany
	2001 to 2008	<i>Sydkraft</i>	100	Sweden
	2002	<i>LG&E</i>	100	US
	2002	<i>Powergen</i>	100	GB
	2002	<i>TXU Europe Group</i>	100	GB
	2002 to 2004	<i>Thüga</i>	100	Germany
	2003 to 2004	<i>Gräninge</i>	100	Sweden
	2003 to 2005	<i>Jihoceska Energetika (JCE)</i>	100	Czech Rep
	2003 to 2005	<i>Jihomoravska Energetika (JME)</i>	100	Czech Rep
	2004	<i>Midlands Electricity</i>	100	GB
	2004 to 2006	<i>MOL Földgázellátó</i>	100	Hungary
	2007 to 2008	<i>OKG-4</i>	78.3	Russia
	2007 to 2008	<i>Miscellaneous</i> ²⁰		Southern Europe
RWE	2000	<i>Vereinigte Elektrizitätswerke Westfalen (VEW)</i>	100	Germany
	2000	<i>Thames Water</i>	20	GB
	2000 to 2003	<i>Thyssengas</i>	100	Germany
	2001	<i>Hidrocantabrico</i>	100	Spain
	2001 to 2002	<i>American Water Works</i>	100	USA
	2001 to 2002	<i>Vereinigte Saarländische Elektrizitätswerke (VSE)</i>	69.3	Germany
	2002	<i>Innogy</i>	100	GB
	2002 to 2005	<i>Stoen</i>	100	Poland
	2006	<i>Electrica Muntenia Sud</i>	100	Romania
	2008	<i>Excelerate Energy</i>	50	USA
EnBW	1998 to 2003	<i>Neckarwerke Stuttgart</i>	100	Germany
	1999	<i>Illerkraftwerke</i>	100	Germany
	2001	<i>Hidrocantabrico</i>	59.5	Spain
	2002	<i>GESO</i>	100	Germany
	2004	<i>Watt Deutschland</i>	100	Germany
	2004	<i>MVV Energie</i>	15.1	Germany
	2005 to 2006	<i>Energieversorgung Niederösterreich (EVN)</i>	35	Austria
	2005 to 2010	<i>Pražská energika Holding (PRE)</i>	70	Czech Rep
	2008	<i>EWE</i>	26	Germany
Vattenfall	1999	<i>Revon Sähkö</i>	100	Finland
	1999 to 2001	<i>Oslo Energi</i>	100	Norway
	1999 to 2001	<i>Hamburger Elektrizitäts-Werke (HEW)</i>	100	Germany
	2001	<i>Berliner Städtische Elektrizitätswerke (Bewag)</i>	100	Germany
	2002	<i>Vereinigte Energiewerke (VEAG)</i>	100	Germany
	2005	<i>Elsam</i>	35.3	Denmark
	2009	<i>Nuon</i>	100	Netherlands

²⁰ Miscellaneous shares in France, Italy and Spain acquired from Enel and Accioma as compensations for the impeded takeover of Endesa.

At the same time, the four companies focused on their core business (energy supply) and sold shares in other activities.²¹ E.ON and RWE started selling border activities in 2000, while EnBW and Vattenfall began large-scale divestments later in 2003.

- In 2000, electricity accounted for 14% of E.ON's sales and 42% of its EBITDA. In 2004, concentration was nearly completed. The core business energy accounted for 98% of the company's sales and 93% of its EBITDA.
- In the 1999–2000 reporting period, 28% of RWE's sales, 66% of its EBIT and 26% of its employees were allocated to the business area energy. In 2004, energy accounted for 92% of the company's external sales and 97% of its EBITDA.²²
- EnBW appears as a special case. It started into the liberalization period as a near energy-only company and then acquired shares in other business areas until 2001. In 1998, 94.5% of its external sales and 81.6% of its employees were assigned to the business area energy. By 2003, these percentages had dropped to 78% (external sales) and 29.3% (employees). In the same year, EnBW began limiting its activities to the core businesses electricity, gas, and energy and environmental services. That consolidation was accomplished in 2005, when all sales were derived from one of these three areas.²³ The EBIT of its non-core business was negative through all of these years.
- In the case of Vattenfall, an analysis according to business area was not possible since the company did not differentiate its data clearly with regard to business areas. But, the relevance of Vattenfall's non-energy business activities can be considered marginal. When the company announced a focus on core business in 2003, it stated that business along the value chain from production to sales within electricity and heating would account for 95% of its total turnover.

Additionally, the Big 4 were confronted with rising pressure against their coal-fired power plants. In 2003, the Council of Europe and the European Parliament decided to implement emissions trading, which came into force in the beginning of 2005. In that context, the four companies embarked on various research and development programs for CO₂ emissions reduction, mainly with a focus on carbon capture and storage (CCS). E.ON, RWE and EnBW began pilot projects as well as research programs for that technology in 2005/2006. Vattenfall already started its first CCS project in 1998 and intensified its engagement from 2003 on. The projects, often done in cooperation with partners, explored different methods of CCS.

²¹ The exact core business differed among the companies and also changed over time. However, for the purposes of this paper, "energy supply" suffices as the core business.

²² In 2004, water supply was still seen as part of RWE's core business. Its separation was completed in 2009.

²³ The waste subdivision was removed later in 2007.

During phase one, the four companies hardly invested in the expansion of production capacities, mainly because the regional monopolies in Germany had led to overcapacities, and because investments in other companies generally promised more profitable and faster growth. Renewable energies, in particular, did not fit into their business model and were hardly taken serious. For example, Gerhard Goll, CEO of EnBW, called wind, solar and hydro power “models for dollhouses” (*Die Zeit*, September 23, 1999, own translation) when it comes to their potential for climate change mitigation. Moreover, because of the above-mentioned market effects of renewables, an intense investment in renewable energies in Germany would have created additional competition to the companies’ own conventional power plants. Their engagement in the promotion of renewable energies was thus limited to a few isolated projects.

In this phase, the field of electricity supply was going through major changes, throughout which the incumbent players managed to maintain their dominant position. Concerning the liberalization of the German electricity market, they quickly adapted their framing concerning the fields rules to the regulatory changes set by the state, and they began selling off border activities and used earnings to expand within their core business. They were even able to bolster their dominant position, namely by wielding control over potential competition through the acquired shares in municipal utilities and regional suppliers. At that time, the incumbents did not yet see the state promotion of renewable energies as a threat, and subsequently hardly reacted to it. Phase one ended when the profitable takeover opportunities not blocked by national or European cartel authorities had dwindled to a minimum, and when the incumbents’ focus on their core business was mostly accomplished.

Phase 2: Pressure to grow in the face of limited opportunities—2005 to 2011

This time span represents a transition phase between the phasing out of the main activities of phase one and the emergence of the central characteristics of phase three. It shows the first signs of the decline of the companies in phase three.

In this phase, the activity of the incumbents in the field of German electricity supply was reduced, mainly due to growth limitations. They took most of their actions in proximate fields of European and partly global energy markets. Generally, from 2005 on, the number of acquisitions declined. And while some isolated big acquisitions were made, or attempted, during this phase, most of these proved to be bad business decisions in retrospect. In one case, E.ON had placed a bid to take over the Spanish company Endesa, then pulled out of the bid and, as a compensation, in 2008 settled to buy a package of shares mainly in Spain, Italy and France for more than 10 billion Euro. Between 2008 and 2011, these acquisitions then lost over 6 billion Euro in value. In another case, RWE invested 7 billion Euro in Dutch Essent in 2009, which had depreciated to 5.3 billion by 2012. Similarly, the value of EnBW’s two billion Euro investment in EWE in 2008 had lost about 380 million Euro by 2011. Or,

of the nearly 10 billion Euro which Vattenfall paid to buy the Dutch company Nuon in 2009, some 1.5 billion were lost between 2010 and 2012. These depreciations were ascribed to unexpected negative developments in the respective foreign markets and illustrate the influence of the developments in the proximate fields in which the incumbents are active. The only big acquisition in this phase that proved to be profitable over the long term was E.ON's investment in the Russian company OKG-4 in 2007/2008.²⁴

Since the incumbent companies had a very good financial standing at the beginning of phase two, and because only few reasonably priced takeover targets remained, the main focus shifted to organic growth through building or buying production capacities. RWE communicated its focus on organic growth in 2004, and E.ON and Vattenfall in 2006. EnBW, for its part, started an initiative for the renewal of its power plant complex in 2008. Whether or not these plans were actually implemented was difficult to assess as only qualitative data are available, such as information on power plant projects communicated by the companies themselves or by the media.²⁵ This shift in focus was followed by the construction of a larger number of new power plants, by E.ON and RWE primarily between 2005 and 2009 and by EnBW and Vattenfall between 2006 and 2010. E.ON and RWE built a relatively large number of gas-fired and combined cycle power plants,²⁶ whereas EnBW and Vattenfall did not concentrate on any distinct type of plants.

Phase two showed a slight revaluation of renewable energies, especially wind power, which were institutionalized with the setting up of separate renewables business divisions. In 2007, RWE founded RWE Innogy and Vattenfall bundled its activities in climate-neutral electricity generation in Vattenfall Europe New Energy.²⁷ On a group-wide level, Vattenfall created the subdivision Wind in its business group Pan Europe as part of its 2009 restructuring. In 2008, E.ON founded E.ON Climate and Renewables and EnBW launched EnBW Renewables. At the same time, the incumbents' activities in wind power increased, albeit mainly in foreign markets. The

²⁴ The amount of depreciation of the different companies is taken from annual reports and is reduced to the unplanned depreciations explicitly assigned to these companies. The total numbers might be even higher.

²⁵ With the exception of RWE, for which a full list of production capacities is available. This list includes the date of commission of every plant yet offers no information on the planning start date and the time span in which they were constructed. Since the time span between the planning of a power plant project and its final commissioning can differ widely, it is difficult to assess the strategic motives behind these projects.

²⁶ In 2013, the CEO of RWE Power AG Matthias Hartung referred to the company's former investment focus on gas-fired plants as a strategy to adapt to the growing shares of renewable energies (*Aachener Zeitung*, November 22, 2013).

²⁷ As a "group-wide concept," New Energy was already established in 2004 (Vattenfall Europe Geschäftsbericht 2004: 22)

widely promoted offshore projects they started in Germany appear to be more public relation activities than serious attempts to expand in this area.²⁸

In Germany, the incumbent's engagement concentrated on securing their dominant position. The aforementioned research programs begun in phase one were maintained. Especially those in CCS proved to be important for the companies, since mounting local protests against coal power plants once more challenged the legitimacy of this form of energy production.²⁹ The Big 4 responded to these protests with public relations activities promoting CCS technology. At the same time, they ramped up their advocacy efforts for nuclear power. With the end of the red-green coalition in 2005, these companies saw a chance of achieving a repeal of the decision to phase out nuclear power and began to promote nuclear power as being important for the German energy supply. Especially RWE—and its CEO Jürgen Grossmann, in charge from 2007 on—were highly engaged in this matter. The advocacy can be considered successful, since the operating life of nuclear power plants was extended in 2010.³⁰ In parallel, the incumbents started publicly criticizing the regulations in favor of renewable energies, especially towards the end of phase two, when the threat to the incumbents' vision of the field coming from the expansion of renewables became more and more apparent. Of the four, E.ON was the fastest to respond to the social and political developments, namely by reducing its activities in the German market. In 2009, it sold its transmission grid and several power plants as well as parts of Thüga AG, an association of municipal utilities of great value to E.ON in wielding influence at the regional level. In its public statements concerning these disinvestments, E.ON communicated them as being reactions to the growing pressure from national and European cartel authorities; however, it is safe to assume that its decision to disinvest quickly was a pragmatic move based on the foresight of the impending crisis in the German market.

Towards the end of phase two, the financial situation of the companies had slightly deteriorated. The unfavorable developments in foreign markets mentioned above were not fully noticeable yet. However, the fiscal crisis—as an exogenous shock from the field of the financial market—had its first indirect effects, mainly the reduced demand for electricity. The companies responded with several cost-cutting

²⁸ At the end of 2013, the Big 4 were operating or planning a total of 12 offshore projects in Germany: two were in operation, four under construction and six in planning. Of the latter, three were put on hold.

²⁹ EnBW had to stop its plant project in Dörpen in 2010 due to local protests. Vattenfall likewise had to cancel a project in Berlin in 2009. E.ON was embroiled in long-lasting disputes concerning its planned plant in Datteln, which were still ongoing at the end of 2013.

³⁰ Of course, the lifetime extension of nuclear power plants in 2010 is not only the fruit of successful lobbying by the nuclear sector. However, the increased pro-nuclear communication towards the end of phase three was very pronounced. The daily newspaper *Die Tageszeitung* reported about a large-scale campaign launched by the German Nuclear Forum in 2008 aiming at improving public perception of nuclear energy. That coverage referred to internal documents of the public relations agency, which were also published. (*Die Tageszeitung*, October 28, 2011)

programs in 2009 and 2010. Aside from the fiscal crisis, they named additional reasons for these measures, among them the nuclear fuel tax (EnBW), depreciations (E.ON) and decreased prices of electricity (Vattenfall).

During this phase, the opportunities for fast and profitable growth within the field of German electricity supply and on proximate European markets had dropped considerably. Yet at the same time, especially the biggest incumbents—E.ON and RWE—were faced with rising profit expectations from their shareholders. In hindsight, the investments made by these companies during this phase, concerning acquisitions of foreign companies as well as organic growth, proved to be suboptimal and also seemed to be, in part, second choices made under mounting pressure from shareholders. In combination with the first effects of the fiscal crisis, this phase appears to augur the decline of the incumbents' power. The actions of the two smaller companies, EnBW and Vattenfall, were less pronounced since they were less exposed to growth restrictions and growth pressures. The end of phase two is marked by the nuclear accident of Fukushima, which made the crisis all too apparent.

Phase 3: Crisis and reorientation—2011 to 2013

The negative developments for the incumbents, and their first attempts to cope with these, began as early as the end of the second phase. Yet the year 2011 saw three significant changes that worsened the overall situation, some of them shaped by the developments of the previous phases. Firstly, following Fukushima, the Nuclear Energy Act was amended. The companies were forced to instantly shut down eight reactors, causing high profit losses. The second, and maybe more important, change is that the above-mentioned market effects of the EEG became visible, causing additional profit losses. The third change consists of unfavorable market developments in various foreign countries, in part a result of the fiscal crisis, which led to the aforementioned depreciations. Together, these effects put enormous pressure on the incumbents, a pressure that steadily rose throughout the phase.

During phase three, the incumbents also became more aware of the intense public pressure on policy-makers, and on themselves, to align themselves with the phasing-out of nuclear power, due to which they downscaled their pro-nuclear communications with the public. Nevertheless, they still tried to fight the legislation on nuclear power in court. E.ON, RWE and Vattenfall began proceedings against the nuclear fuel tax law. These proceedings were referred to the European Court of Justice in 2013. In 2011/2012, the incumbents also filed constitutional complaints against the 2011 amendment to the Nuclear Energy Act.³¹ Vattenfall—as a foreign enterprise—additionally tried to fight the shut-down of the power plants through international ar-

³¹ EnBW restrained from participating in the proceedings due to pressure coming from the federal state of Baden-Württemberg (for further information, see the subsequent section). Nevertheless, it stated that it consents to the legal position taken by the other companies.

bitration. At the end of 2013, the proceedings in this regard were still ongoing and the outcome unknown. Moreover, as the market effects of the rapid growth of renewables—most importantly that of the photovoltaics boost of 2010 and 2011—became significant,³² the incumbents also fought for the profitability of their conventional power plants. At that time, although no longer criticizing renewable energies as such, the incumbents nevertheless focused on criticizing the difficulty of integrating them into the market, to the extent of claiming that they would pose a serious threat for the security of supply. They also began demanding political regulations that would ensure the profitability of their conventional power plants.³³ In 2013, RWE, EnBW and E.ON signaled their plans to shut down unprofitable plants if there would not be any political regulations subsidizing them. They submitted applications for the decommissioning of several power plants to the Federal Network Agency in 2013.

To cope with the general market developments as well as their own deteriorating financial performance, the incumbents implemented several measures. They expanded their cost-cutting programs including job cuts, reduced investment plans and the decrease of shares in other companies.

- In 2011, E.ON announced the biggest restructuring in the history of the company, including measures to cut costs by 1.5 billion Euro, a reduction of staff by 11,000, and divestments in the order of 15 billion Euro by 2013. By 2012, the divestments had already amounted to 14 billion Euro. In 2013, the scale of divestment was raised to 20 billion Euro and investments were curbed, despite company announcements from 2011 that this would not be necessary.
- At the end of 2010, RWE announced a cost-cutting program which was then steadily tightened over the course of the following year. It included cost cuts of 1.5 billion Euro, divestments of 11 billion Euro and the cutting of 8,000 jobs. Since the company had difficulty achieving reasonable prices for many of the planned divestments—by 2013, only 2.1 billion Euro had been earned—the program progressed slowly. To compensate, the cost- and job-cutting measures were tightened and investment plans and dividends were reduced. Between 2011 and 2013, staff was reduced by 6,200 and the cutting of another 6,750 jobs was to be completed by 2016.
- EnBW also expanded its 2010 cost-cutting program steadily. In 2011, it targeted divestments amounting to 1.8 billion Euro, investment cuts by one third, and cost cuts of 300 million Euro annually. In 2012, the company's cost-cutting

³² The greater part of the negative effects of the low wholesale prices for electricity had most likely not yet set in at the end of 2013, since the companies were then still engaged in long-term supply contracts that served as a buffer for one or two more years (see: *Der Spiegel*, November 14, 2013; <http://corporate.vattenfall.com/news-and-media/>, October 29, 2013; <http://www.iwr.de/>, November 18, 2013).

³³ Their main complaints were the diminishing profitability of gas-fired power plants, followed by the low wholesale prices for electricity, which were affecting the profitability of all conventional plants.

measures had already risen to 750 million Euro per year and the planned divestments to 2.6 billion Euro. That said, the realization of the disinvestment program proceeded slowly, garnering the company only 500 million Euro from 2011 to 2013. Additionally, EnBW announced the cutting of 1,350 jobs by the end of 2014. And in 2013, it also announced divestments in the order of 2.5 to 3 billion Euro within the coming seven years.

- Vattenfall had the lowest cost reduction plan, which was nevertheless also expanded since its initial announcement in 2010. In 2013, the revised plan saw for 2,500 job cuts, a hiring freeze, a 7.5 billion SEK (about 850 million Euro) cost cut by 2015 and reduced investment plans.

Further, the incumbents adjusted their organizational structure to the new situation. E.ON in 2010 implemented restructuring measures aimed at streamlining the group and strengthening the central management. EnBW's 2013 restructuring targeted the reduction of the group's complexity. RWE bundled its power generation business at the European level in 2013 and also announced plans to merge other activities. Vattenfall implemented two large-scale restructurings. One, realized in 2010, consisted of a shift from a region-based structure to a business-led structure. The other, slated to come into effect in early 2014, involves the segmentation of the company into two regional units (Scandinavia and Central Europe plus Great Britain). Both measures were interpreted by the media as strategies to weaken the independence of the German subsidiary and thus as devaluating the German market.

To restore their financial flexibility, the incumbents additionally made—for the first time since the liberalization—significant disinvestments from their core business. This included the withdrawal of their engagement in several foreign markets. E.ON and RWE sold regional suppliers in Germany³⁴ and various shares in the rest of Europe. At the end of 2013, E.ON announced plans to completely leave the Southern European market due to unexpected negative developments. Vattenfall already announced, in 2010, to focus on Sweden, Germany and the Netherlands and later to give up all of its activities in Belgium, Finland and Poland; the sell-off was directly started in 2011. In 2013, speculations that Vattenfall was preparing to leave the German market entirely became more frequent, although the company had not issued any clear statements to this effect. The divestments of EnBW mainly concerned shares in the Swiss Energiedienst Holding AG and minority shareholdings.

Furthermore, the incumbents also began taking innovative action and to search for new business activities. They expanded their service activities and provided services in the areas of decentralized electricity production, energy efficiency and direct marketing. E.ON implemented these plans through the creation of a new business unit, E.ON

³⁴ In 2013, E.ON sold E.ON Westfalen Weser AG, E.ON Thüringer Energie AG and E.ON Mitte AG and closed its location in Munich. In 2012, RWE sold its shares in Berliner Wasserbetriebe A.ö.R., Koblenzer Elektrizitätswerk und Verkehrs-AG (KEVAG) and reduced its shares in VSE AG.

Connecting Energies, in 2012. It stated that the sales in the area of decentralized energy and energy efficiency solutions in Germany had meanwhile risen to nearly one billion Euro. For RWE, developments in new business areas, such as customized eco-power and efficiency concepts for households, were slower than expected. Although the company does speak of 600 million in sales, it hardly made any profit. Concurrently, the incumbents announced plans to form partnerships for building new production capacities, in order to spread risk. This decision can be interpreted as a strategy for preventing the recurrence of sunk investments under unpredictably changing regulatory conditions. Moreover, the more regionally grounded companies EnBW and RWE expanded their cooperation with municipal utilities. Finally, the Big 4 signaled a stronger orientation towards renewable energies. E.ON, RWE and EnBW even communicated a re-assessment of solar energy. However, these developments being fairly recent, it is not possible to assess whether these plans will in fact be realized.

In summary, during phase three the incumbents acknowledged that their traditional business models were eroding. For example, EnBW CEO Frank Mastiaux stated: “I see a paradigm shift in the energy landscape in that the traditional business models of many power supply companies are increasingly being questioned.” (EnBW Annual Report, short version, 2012: 8, own translation) Or, in its 2012 annual report, Vattenfall summarized the situation of the power companies as follows: “2012 was a tough year for the entire European energy sector, and the industry is facing considerable challenges. Demand stayed low as a result of the economic recession. At the same time, new capacity is being added, especially in renewable energy generation, which has led to low electricity prices. Low margins on electricity generation based on natural gas have put heavy pressure on the profitability of our gas-fired power plants, which a couple of years ago were considered to be a very good long-term investment. Previous market forecasts have been brushed aside, and what used to be considered “normal” no longer applies. This is the new normal.” (Vattenfall Annual Report, 2012: 5) While all companies complained about the negative market developments and the unpredictable political decisions, the rhetoric of RWE, in particular, became increasingly gloomy over the course of 2013. In a confidential document entitled “RWE Corporate Story,”³⁵ the company states that the “massive erosion of the wholesale prices caused by the growth of German photovoltaics constitutes a serious problem for RWE which may even threaten the company’s survival” (*Energy Post*, October 21, 2013). According to press reports, CEO Peter Terium was even deliberating a merger with a partner company. In an article published in *Der Spiegel* in October 2013, he is quoted as saying: “Some 30 to 40% of our [conventional power] plants are generating losses [...] Their earnings are not enough to pay our debts. To put it bluntly: a dangerous situation.” (*Der Spiegel*, October 29, 2013; own translation)

In phase three, the changes in the field and in proximate fields, including those from prior phases that then manifested in full force, together with the state intervention after Fukushima, culminated to an intense pressure to change. As the incumbents’ fi-

³⁵ This paper is quoted by some German newspapers. Its authenticity is credible, but not proven.

nancial situation worsened to dangerous levels, they were no longer able to maintain their dominant position within the field. Eventually they perceived the episode of contention that had started with the implementation of the EEG in 2000 and mobilized an innovative search for new business models. Nevertheless, given the severity of the situation, it is difficult to assess whether these measures will suffice to prevent their further decline.

5.3 Differences between the incumbents

The above descriptions illustrate the decline of a formerly healthy industrial sector into a state of crisis within the course of about three years. To allow for a thorough analysis of these developments, I begin by outlining three main differences between the Big 4 with regard to how the crisis impacted them and how they responded to it. These differences concern the companies' *power plant complex*, their *regional positioning* and their *shareholder structure*. Though there are astonishing parallels between the actions of the Big 4, it is a focus on the differences that will advance our understanding.

(1) One difference of crucial importance concerns the *power plant complex* of each of the companies. As detailed, quantifiable information about the companies' energy mix for Germany was not always available, I will focus more on the major differences. In 2010, about one third of the installed capacities in Germany of E.ON and EnBW accounted for nuclear energy. After Fukushima, about one third of that capacity was instantly shut down. EnBW was hit harder than E.ON by this since it was more dependent on the German market (see below). Vattenfall, also in 2010, had the smallest share of nuclear power plants, yet a large amount of lignite-fired power plants, about 50% of its installed capacity. The operation of these power plants then grew after the shut-down of the nuclear power plants.³⁶ A comparison between E.ON and RWE in this regard is more complex. RWE's energy mix was more favorable—more lignite, less nuclear power—than E.ON to adapting to the consequences of Fukushima. Nevertheless, in the case of RWE the recent crisis seems more severe. To explain this, other variables have to be taken into account.

(2) The second major difference concerns the *regional positioning* of the companies, which determines the degree to which companies are affected by negative developments in the German market and the positive and negative impacts of proximate field developments. There are no detailed (and comparable) key performance indicators available that allow an assessment of the profitability of different regional markets over time. Furthermore, any data available might lead to false conclusions as the sales of some business divisions that operate across regional markets are nevertheless allocated to their regional location only. Thus, we have to, once more, resort to qualitative data that do not allow for a final assessment. Essentially, we must rely on the companies' own evaluation of the different regional markets.

³⁶ In 2013, Vattenfall called it a "favourable generation mix" (Interim Report January–March 2013: 1) and stated that "Vattenfall's lignite-fired generation showed very good availability" (Year-End Report 2013: 2).

In the case of EnBW, over time about 90% of its sales and over 90% of its employees were in the German market. Hence, of the four companies, EnBW was the most dependent on the developments on the German market. The other three companies on average realized about 50% of their sales in Germany, a percentage that decreased slightly over time for all three; the same applies to their shares of employees in Germany. Nevertheless, the situations of the three companies differ in other respects. E.ON reduced its activities in Germany sooner than the others (see above) and managed to develop an —according to its own statement—highly profitable outpost in the Russian market in 2007. This move also helped to compensate for negative developments in other regions. The regionally differentiated data offered by E.ON shows that the EBITDA of its Russian division constantly rose from 2010 on, reaching 7% of the group-wide EBITDA in 2012. As for Vattenfall, its EBIT for Germany was on a downward slide from 2009 on. For the Benelux countries, Vattenfall even reported a negative EBIT for all years except 2011 since its market entry in 2009. But the developments in its Nordic home markets were positive. RWE, finally, only lists the number of sales by region, provides no information about earnings and only differentiates between Germany, Great Britain, other EU countries, other European countries and countries outside Europe. Thus, an assessment was not possible for RWE. While this overview may not allow drawing final conclusions, it does show that the economic and regulatory developments of different foreign markets play a significant role for the companies, a topic that merits further evaluation.

(3) The third major difference concerns the *shareholder structure* of the companies. In 2012, the ratio of free-floating shares to total shares at E.ON was 81%. Thus, no single shareholder exerted a significant control. Subsequently, it can be assumed that E.ON's managerial decisions were not restricted by any shareholder interests apart from financial ones. In the case of RWE, most of the time the municipal shareholders held the blocking minority.³⁷ These not only tried to enforce regional interests but also opposed certain organizational restructuring plans.³⁸ The shareholder structure of EnBW was always characterized by a balance between two main powers. One was the Zweckverband Oberschwäbische Elektrizitätswerke (OEW), which is a union of municipalities, and the other was, until 2000 and again from 2010 on, the federal state of Baden-Württemberg or, between 2000 and 2010, the French power company Électricité de France. No other shareholder ever had significant influence at EnBW. In addition to the regional interests of the OEW, the state of Baden-Württemberg put pressure on the company. In 2011, under a red-green state government, it demanded a stronger orientation towards renewable energies. These pressures finally led to a change of management. The Swedish company Vattenfall as well as its German sub-

³⁷ The share of municipal shareholders in RWE shifted over time. At a certain point in the late 2000s, they possibly lost their blocking minority. Information on this matter varies, and is often contradictory, from one source to the next. RWE itself states that the municipalities still had a blocking minority at the end of 2013 but does not offer specific data.

³⁸ A very good example is the resistance of the municipal shareholders of RWE Gas to the company's large-scale restructuring plans in 2003 (RWE Annual Report 2003: 3).

sidiary were governed by the Swedish state.³⁹ In 2010, the Swedish government imposed a directive demanding, among others, a reduction of CO₂ emissions. In 2013, public opinion in Sweden also became highly critical of the high amount of lignite combustion of Vattenfall's subsidiary in Germany. In that context, there was even speculation that these pressures were the cause of the company's alleged plans to reduce its operations in Germany. This is indicative of how different types of shareholders exert different kinds of pressures on companies. It thus appears that politically-minded or regional shareholders can, in certain situations, reduce the flexibility of a company to adapt to environmental changes, namely in that they can hinder a company in basing its decisions solely on economic criteria. Conversely, shareholders who are solely interested in financial gain can raise the pressure on a company to achieve positive short- to mid-term results. At the same time, these kinds of shareholders give the company more freedom concerning the strategy for achieving these results. *Table 3* lists the most important structural differences between the incumbents as well as additional non-structural differences associated with these.

Table 3: Main structural differences between the Big 4 and additional non-structural differences linked to these⁴⁰

	E.ON	RWE	EnBW	Vattenfall
Power plant complex in Germany	Conventional (much nuclear)	Conventional (diversified)	Conventional (much nuclear)	Conventional (much coal)
Impact of nuclear phase-out	High	High	Very high	Mid
Impact of sinking electricity wholesale prices	High	High	High	Mid
Regional diversification	High (Europe and partly global)	High (mainly Europe)	Low	High (mainly Europe)
Possibilities to compensate negative developments on the German market	Mid	Low	Very low	Mid
Shareholder structure	Mainly free-floating	Free-floating, institutional, plus approx. 25% regional shareholders	Regional and political shareholders (together over 90%)	State
Shareholder value orientation	Very high	Very high	High	High
Subjected to regional interests ⁴¹	Low	High	Very high	Medium
Subjected to political interests ⁴²	Low	Medium	High	High

³⁹ In the case of the German subdivision, the Swedish state is the sole owner since the squeeze-out in 2008.

⁴⁰ The table represents the companies by 2013 – respectively 2010 regarding the power plant complex. Of course, some of the aspects changed over time.

⁴¹ Excluding regional interests in countries other than Germany.

⁴² Political influences here means political demands made to one single and specific company and excludes political regulations or the like that address all companies in the same way.

6 Conclusions and research outlook

In this last section, I summarize the main empirical findings and interpret them according to Fligstein and McAdam's line of reasoning. My summary is presented in three parts and respond to the three research questions stated in the introduction of this paper. In closing, I point to research gaps and suggest avenues for further research.

(1) The most important changes in the companies' environments were triggered by *state interventions* altering the field's rules. The *liberalization* of the German electricity market offered plenty of opportunities to the incumbents to expand beyond the borders of their former supply areas and to foster their dominant position in the field—among others by wielding influence at the regional level. In parallel, the implementation of the EEG promoted the challengers within the field of electricity supply in Germany. These formed a niche that was sheltered from the incumbents' market power, namely through the EEG,⁴³ which guarantees renewables producers priority for feeding electricity into the grid. The rising quantities of intermittent renewable energy supplies increasingly threatened, especially from about 2010 onward, the profitability of the incumbents' conventional power plants. At the same time, there were social movements opposing nuclear power, alongside fossil fuels. Although these movements were not initially a threat to the incumbents' position, they were eventually able to bring the government to withdraw support of, and even oppose, *nuclear power* altogether. At that point, the incumbents could only fight these developments at a political or normative level, in other words, by trying to influence politicians. Yet the latter, although receptive to economic arguments, were also eager to retain their legitimacy in the eyes of a public sensitive to environmental issues. It took until about 2008 until the incumbents stopped to overtly oppose renewable energies at the communications level, and it took an additional two years before they reluctantly began adapting to the German energy transition, the *Energiewende*, and to mobilize innovative action for engaging in new business areas.

This pressure on the Big 4 was intensified by important *developments in proximate fields* that took place concurrently. These were indirect effects of the fiscal crisis—on the horizontal, superordinated field of the capital market—and unexpected negative developments in several foreign markets—vertical proximate fields—in which the companies had invested.⁴⁴

(2) The incumbents' strategies, and their repercussions, correlate to the main two regulatory changes: the liberalization of the German electricity market and the promotion

⁴³ Of course, the niche already existed before the implementation of the EEG, and through the *Strom-einspeisungsgesetz* (the 1990s' precursor of the EEG), it had already been partly sheltered before. However, this does not invalidate the central line of reasoning of this paper.

⁴⁴ These two effects are partly linked. The fiscal crisis not only had effects on the capital market but also led to a reduced demand for electricity in many countries.

or discouragement of certain technologies by state intervention. The steady rise to power of the incumbents until about 2007 can be traced back to their fast and proactive adaptation to the liberalization of the German electricity market. This was possible because the adaptation did not conflict with the companies' institutional logics that focus on large-scale centralized structures, and because of the opportunities for fast and profitable growth offered by liberalization. The incumbents' gradual decline that followed from about 2008 on is linked to the changes that resulted from the second line of regulatory changes as well as to external shocks. The incumbents could hardly have anticipated the fiscal crisis or the nuclear accident of Fukushima and its political aftermath; thus, they could not have strategically prepared for these events. However, they failed to adapt to the promotion of renewable energies. The fact that the incumbents criticized the EEG right from its enactment in 2000 suggests that they were aware of its threatening potential early on. But in contrast to the challenger actors, who quickly seized the opportunities the Act offered and who engaged in innovative action, the incumbents remained rather passive. Indeed, it took ten years until they adapted to these changes. In hindsight, this was a strategic mistake and can be seen as one of the main reasons for the companies' recent crisis.

(3) The comparative analysis of the incumbents' actions brought forth a series of striking *parallels*. The four companies went through three strategic phases nearly simultaneously: the phase of *growth and a focus on the core business* (1998 to 2005), the phase of *pressure to grow in the face of limited opportunities* (2005 to 2011) and the recent phase of *crisis and reorientation* (2011 to 2013). However, the three phases are most representative of the biggest players, E.ON and RWE, while especially phase two does not match EnBW and Vattenfall in all respects. Additionally, the four companies were not equally hit by the crisis in phase three. To understand these variations, important structural *differences* between the incumbents must be taken into account. One major difference concerns the *power plant complex* of the companies in Germany, which influenced the impact of the nuclear phase-out decision by the Federal Government as well as the impact of the sinking wholesale prices for electricity, caused mainly by the expansion of renewable energies. Moreover, the companies' *regional positioning* differs, which effects their vulnerability to negative developments on the German market as well as in particular proximate fields. Furthermore, the different *shareholder structures* of the companies also generate different types of pressures. It is safe to assume that, in general, shareholders put a certain degree of pressure on their companies to grow. If, then, companies respond to this pressure by prioritizing share price and credit rating above all else, their longer-term strategic planning may be compromised. However, in certain contexts or situations, some types of shareholders are more likely to defend non-financial causes or interests. Among these are municipal shareholders representing regional interests or political shareholders representing political interests.

In closing, I wish to point out two research gaps that deserve further attention. The first gap concerns research question two and the capability of organizations to adapt to a changing environment. My study showed that the incumbents were slow to adapt to the German *Energiewende*, despite recognizing the threat early on. Yet, how might we explain their switch from ignoring the energy transition to reluctantly adapting to it? Was it solely the pressure of the crisis that finally *forced* them to adapt? This explanation appears too simplistic. The more interesting, and challenging, question is thus how or why a formerly nonadaptive organization shifts towards adaptivity. This includes the question of whether this shift is triggered more by actual field changes that force an organization to adapt or more by a change in an organization's interpretation of its environment. Associated topics include the lock-in of organizations, the creation of new organizational paths (Sydow, Schreyögg & Koch 2003, 2005, 2009) as well as sectoral adaptability to technological changes (Dolata 2013).

The second research gap refers to research question three and the comparison of the incumbents' actions. Although this study identified important structural differences between the companies, it was not able to sufficiently explain the variation of differences and similarities of companies' actions over time. An important avenue for future research would thus be to perform a more in-depth situational comparison that incorporates an analysis of issues such as organizational restructuring measures and research and development activities, including their development over time. This could contribute to a more dynamic perspective on isomorphism and heterogeneity in organizational fields (DiMaggio & Powell 1983).

Overall, this study offered a broad analysis of the strategies of the incumbent players in the German electricity market and serves as a catalyst for further research in the field.

References

- Becker, Peter, 2011: *Aufstieg und Krise der deutschen Stromkonzerne*. Bochum: Ponte Press.
- Bontrup, Heinz-Josef/Marquardt, Ralf-Michael, 2011: *Kritisches Handbuch der deutschen Elektrizitätswirtschaft*. Berlin: Edition Sigma.
- Bundesnetzagentur, 2007: *Monitoringbericht 2007*. http://www.bundesnetzagentur.de/SharedDocs/Downloads/DE/Sachgebiete/Energie/Unternehmen_Institutionen/DatenaustauschUndMonitoring/Monitoring/Monitoringbericht2007.pdf?__blob=publicationFile&v=2 (3/2014).
- Bundesnetzagentur, 2011: *Monitoringbericht 2011*. http://www.bundesnetzagentur.de/SharedDocs/Downloads/DE/Allgemeines/Bundesnetzagentur/Publikationen/Berichte/2011/MonitoringBericht2011.pdf?__blob=publicationFile&v=2 (3/ 2014).
- Bundesnetzagentur, 2012: *Monitoringbericht 2012*. http://www.bundesnetzagentur.de/SharedDocs/Downloads/DE/Allgemeines/Bundesnetzagentur/Publikationen/Berichte/2012/MonitoringBericht2012.pdf?__blob=publicationFile&v=2 (3/2014).
- DiMaggio, Paul/Powell, Walter, 1983: The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields. In: *American Sociological Review* 48(2), 147–160.
- Dolata, Ulrich, 2013: *The Transformative Capacity of New Technologies. A Theory of Sociotechnical Change*. London: Routledge.
- E.ON AG, 2000–2011: *Geschäftsberichte 2000–2011*. Düsseldorf: E.ON.
- E.ON SE, 2012–2013: *Geschäftsberichte 2012–2013*. Düsseldorf: E.ON.
- EnBW AG, 1998–2013: *Geschäftsberichte 1998–2013*. Karlsruhe: EnBW.
- Fligstein, Neil/McAdam, Doug, 2011: Towards a General Theory of Strategic Action Fields. In: *Sociological Theory* 29(1), 1–26.
- Fligstein, Neil/McAdam, Doug, 2012: *A Theory of Fields*. Oxford: Oxford University Press.
- Gläser, Jochen/Laudel, Grit, 2009: *Experteninterviews und qualitative Inhaltsanalyse*. Wiesbaden: VS.
- Hirschl, Bernd/Neumann, Anna/Vogelpohl, Thomas, 2011: *Investitionen der vier großen Energiekonzerne in erneuerbare Energien, Stand 2009. Planungen und Ziele 2020 – Kapazitäten, Stromerzeugung und Investitionen von E.ON, RWE, Vattenfall und EnBW*. Schriftenreihe des IÖW 199/11. Berlin: IÖW.
- Hoffman, Andrew J., 1999: Institutional Evolution and Change: Environmentalism and the US Chemical Industry. In: *Academy of Management Journal* 42(4), 351–371.
- Leprich, Uwe, 2009: *Stromwatch 2. Die vier großen deutschen Energiekonzerne*. Kurzstudie im Auftrag der Bundestagsfraktion Bündnis 90/Die Grünen, Februar 2009. <http://www.htw-saarland.de/wiwi/fakultaet/personen/professoren/dozenten-h-o/leprich/leprich/publikationen/Leprich%20Kurzstudie%202008%20EVU%20Gewinne%2019022009.pdf> (1/2014).
- Leprich, Uwe/Junker, Andy, 2010: *Stromwatch 3. Energiekonzerne in Deutschland*. Studie im Auftrag der Bundesfraktion Bündnis 90/Die Grünen, Oktober 2010. <http://www.folkcenter.dk/mediafiles/folkcenter/Stromwatch3.pdf> (1/2014).
- Mallock, Wolfgang, 2012: *Energiewende*. GESIS Recherche-Spezial 2012/01. Köln: GESIS. <http://www.ssoar.info/ssoar/bitstream/handle/document/37176/ssoar-2012-mallock-Energiewende.pdf> (3/2014).
- Mautz, Rüdiger/Byzio, Andreas/Rosenbaum, Wolf, 2008: *Auf dem Weg zur Energiewende. Die Entwicklung der Stromproduktion aus erneuerbaren Energien in Deutschland*. Göttingen: Universitätsverlag Göttingen.
- RWE AG, 1997–2013: *Geschäftsberichte 1997–2013*. Essen: RWE.
- Schreyögg, Georg/Sydow, Jörg/Koch, Jochen, 2003: Organisationale Pfade – von der Pfadabhängigkeit zur Pfadkreation? In: Schreyögg, Georg/Sydow, Jörg (eds.): *Strategische Prozesse und Pfade*. Managementforschung Bd. 13. Wiesbaden: Gabler, 257–294.

- Scott, W. Richard/Meyer, John W., 1983: The Organization of Societal Sectors. In: Schott, W. Richard/Meyer, John W. (eds.): *Organizational Environments. Ritual and Rationality*. London: Sage.
- Sydow, Jörg/Schreyögg, Georg/Koch, Jochen, 2005: *Organizational Paths: Path Dependency and Beyond*. Second Draft. http://www.wiwiss.fu-berlin.de/forschung/pfadkolleg/downloads/organizational_paths.pdf (6/2014).
- Sydow, Jörg/Schreyögg, Georg/Koch, Jochen, 2009: Organizational Path Dependence: Opening the Black Box. In: *Academy of Management Review* 34(4), 689–709.
- trend:research GmbH, 2011: *Marktakteure. Erneuerbare-Energien-Anlagen in der Stromerzeugung*. Bremen: trend:research.
- Vattenfall AB, 1998–2013: *Annual Reports 1998–2013*. Stockholm: Vattenfall.
- Vattenfall Europe AG, 2002–2011: *Geschäftsberichte 2002–2011*. Berlin: Vattenfall Europe.
- VEBA AG, 1999: *Geschäftsbericht 1999*. Düsseldorf: VEBA.
- VIAG AG, 1999: *Geschäftsbericht 1999*. München: VIAG.
- Walgenbach, Peter/Meyer, Renate, 2008: *Neoinstitutionalistische Organisationstheorie*. Stuttgart: Kohlhammer.

Further Publications

Research Contributions to Organizational Sociology and Innovation Studies

Dolata, Ulrich/Schrape, Jan-Felix, 2014: *Masses, Crowds, Communities, Movements. Collective Formations in the Digital Age*. SOI Discussion Paper 2014-02.

Neukirch, Mario, 2014: *Konflikte um den Ausbau der Stromnetze. Status und Entwicklung heterogener Protestkonstellationen*. SOI Discussion Paper 2014-01.

Dolata, Ulrich/Schrape, Jan-Felix, 2013: *Zwischen Individuum und Organisation. Neue kollektive Akteure und Handlungskonstellationen im Internet*. SOI Discussion Paper 2013-02.

Kosche, Robert, 2013: *Kollektive Identitäten in Industrial Cultural Districts*. SOI Discussion Paper 2013-1.

Fuchs, Gerhard/Hinderer, Nele/Kungl, Gregor/Neukirch, Mario, 2012: *Adaptive Capacities, Path Creation and Variants of Sectoral Change*. SOI Discussion Paper 2012-2.

Fuchs, Gerhard/Wassermann, Sandra, 2012: *Organising a Market. Photovoltaics in Germany*. SOI Discussion Paper 2012-1.

Werle, Raymund, 2011: *Institutional Analysis of Technical Innovation. A Review*. SOI Discussion Paper 2011-04.

Dolata, Ulrich, 2011: *Radical Change as Gradual Transformation. Characteristics and Variants of Socio-technical Transitions*. SOI Discussion Paper 2011-03.

Dolata, Ulrich, 2011: *The Music Industry and the Internet*. SOI Discussion Paper 2011-02.

Schrape, Jan-Felix, 2011: *Der Wandel des Buchhandels durch Digitalisierung und Internet*. SOI Discussion Paper 2011-01.

Books

Dolata, Ulrich, 2013: *The Transformative Capacity of New Technologies. A Theory of Sociotechnical Change*. London: Routledge.

Dolata, Ulrich/Schrape, Jan-Felix (Hg.), 2013: *Internet, Mobile Devices und die Transformation der Medien. Radikaler Wandel als schrittweise Rekonfiguration*. Berlin: Edition Sigma.

Dolata, Ulrich, 2011: *Wandel durch Technik. Eine Theorie soziotechnischer Transformation*. Frankfurt/New York: Campus.

Schrape, Jan-Felix, 2012: *Wiederkehrende Erwartungen. Prognosen, Visionen und Mythen um neue Medien seit 1970*. Boizenburg: Hülsbusch.

Schrape, Jan-Felix, 2011: *Gutenberg-Galaxis Reloaded?* Boizenburg: Hülsbusch.

Schrape, Jan-Felix, 2010: *Neue Demokratie im Netz? Eine Kritik an den Visionen der Informationsgesellschaft*. Bielefeld: Transcript.

Journal Articles and Contributions in Edited Volumes

Dolata, Ulrich/Schrape, Jan-Felix, 2014: Kollektives Handeln im Internet. Eine akteurtheoretische Fundierung. In: *Berliner Journal für Soziologie* 24(1), 5–30.

Dolata, Ulrich/Schrape, Jan-Felix, 2014: Markt und Macht in der App-Economy. In: *Blätter für deutsche und internationale Politik* 4/2014, 31–34.

Dolata, Ulrich, 2012: Radikaler Wandel als graduelle Transformation. In: Michael Decker, Armin Grunwald, Martin Knapp (Hg.): *Der Systemblick auf Innovation*. Berlin: Edition Sigma, 95–106.

Dolata, Ulrich, 2011: Soziotechnischer Wandel als graduelle Transformation. In: *Berliner Journal für Soziologie* 21(2), 265–294.

Dolata, Ulrich, 2011: Google vs. Facebook: Der Kampf um das Internet. In: *Blätter für deutsche und internationale Politik* 9/2011, 26–29.

Dolata, Ulrich, 2009: Technological Innovations and Sectoral Change. Transformative Capacity, Adaptability, Patterns of Change. In: *Research Policy* 38(6), 1066–1076.

Dolata, Ulrich, 2008: Das Internet und die Transformation der Musikindustrie. Rekonstruktion und Erklärung eines unkontrollierten sektoralen Wandels. In: *Berliner Journal für Soziologie* 18(3), 344–369.

Dolata, Ulrich, 2008: Technologische Innovationen und sektoraler Wandel. Eingriffstiefe, Adaptionfähigkeit, Transformationsmuster: Ein analytischer Ansatz. In: *Zeitschrift für Soziologie* 37(1), 44–61.

- Fuchs, Gerhard, 2014: Die Rolle lokaler Initiativen bei der Transformation des deutschen Energiesystems. In: *GAIA* 23(2), 135–136.
- Fuchs, Gerhard, 2014: The Governance of Innovations in the Energy Sector: Between Adaptation and Exploration. In: *Science & Technology Studies* 27(1).
- Fuchs, Gerhard/Wassermann, Sandra, 2012: From Niche to Mass Markets in High Technology: The Case of Photovoltaics in Germany. In: Johannes Bauer, Achim Lang, Volker Schneider (eds.): *Innovation Policy and Governance in High-Tech Industries*. Heidelberg/Berlin: Springer, 219–244.
- Fuchs, Gerhard, 2010: Path Dependence and Regional Development: What Future for Baden-Wuerttemberg? In: Georg Schreyögg/Jörg Sydow (eds.): *The Hidden Dynamics of Path Dependence. Institutions and Organizations*. Houndmills: Palgrave, 178–196.
- Neukirch, Mario, 2013: Ausbau der Stromnetze – Konflikte und Perspektiven der deutschen Energiewende. In: *GAIA* 22(2), 138–139.
- Neukirch, Mario, 2012: Grüner Netzausbau für schmutzigen Strom? In: *Blätter für deutsche und internationale Politik* 6/2012, 25–28.
- Schrape, Jan-Felix, 2011: Social Media, Massenmedien und gesellschaftliche Wirklichkeitskonstruktion. In: *Berliner Journal für Soziologie* 21(3), 407–429.
- Schrape, Jan-Felix, 2011: Was ist die „Markenidentität“ der Soziologie?. In: *Sozialwissenschaften und Berufspraxis* 34(2), 141–153.
- Werle, Raymund/Troy, Irene, 2012: Wissen handelbar gemacht? Politik und Patente. In: *Politische Vierteljahresschrift Sonderheft* 46, 152–189.
- Werle, Raymund, 2012: Institutions and Systems: Analysing Technical Innovation Processes from an Institutional Perspective. In: Johannes Bauer, Achim Lang, Volker Schneider (eds.): *Innovation Policy and Governance in High-Tech Industries*. Heidelberg/ Berlin: Springer, 23–47.
- Werle, Raymund (et al.), 2010: Software als Institution und ihre Gestaltbarkeit in: *Informatik Spektrum* 31(6), 626–633.
- Werle, Raymund/Jürgen Feick, 2010: Regulation of Cyberspace. In: Martin Cave, Robert Baldwin, Martin Lodge (eds): *The Oxford Handbook of Regulation*. Oxford: University Press, 523–547.

<http://www.uni-stuttgart.de/soz/oi/publikationen/>