

Changes in the field of energy supply in Germany 1998 to 2012 – reactions and co-creation by the established power companies

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Abstract:

Since 1998 various changes in the regulatory framework of the German energy supply system can be observed, which had multiple effects on its structure – considering the scope of relevant actors, interactions between them, the power balance as well as the institutional setting of the field. In 1998 the German electricity market was liberalized, two years later the government institutionalized its wish for a more rapid diffusion of renewable energies by implementing the EEG. These changes led to a profound transformation of the German energy system. This paper will offer first insights about the role of the established German power companies in this transformation process and the way they adapted to the changes in their environment.

Introduction:

Since the turn of the century there are two parallel lines of changes in the regulatory framework of the German energy system which exert a constant influence on its transformation. The liberalization of the German electricity market in 1998 led to a wave of mergers among various power companies which brought out the big four power companies (E.ON, RWE, Vattenfall and EnBW) as dominant actors. In 2000 the “Erneuerbare Energien Gesetz” (EEG) has been implemented which increased renewable power plants especially on a decentralized level. While the big power companies proactively reacted to the first-mentioned regulatory changes and mobilized plenty of resources to shape the opening market, they didn’t seem to react initially to the second line of the mentioned changes. While the liberalization offered them various opportunities to expand beyond the boundaries of their former areas, the competition that arose from new actors, producing energy from renewable sources, must have been less apparent to the companies. Investments in renewable energies in Germany were not attractive to the “Big-4” due to the special design of the EEG, which prioritized the feed-in of renewable electricity, and thus enabled competition to the companies’ base load power plants – to put it simple. Since they didn’t want to replace their own plants, it seemed for a long time, as if the companies just tried to ride out the situation, especially hoping for a running time extension of their nuclear power plants and thus holding on to their dominant position in the energy supply system.

This ignoring-strategy worked well for a long time – the sales of the companies steadily increased until about 2011. Then reacting on the Fukushima accident the federal government of Germany decided to shut down eight power plants instantly and to close the remaining ones until 2022. This caused high profit losses for the companies and reduced their financial flexibility. Some years earlier this would not have been that problematic but with the constantly growing amount of renewable electricity generation the structural effects of the EEG had become more threatening to the position of the big 4. Renewable energies had a price-lowering effect on the energy resell market. At the same time the fluctuating power generating curves of the renewables – in combination with their feed-in-priority – reduced the full-load hours of the conventional power plants. Thus the conventional power plants produced less electricity that was, in addition, paid less.

Thus it seems that the leading position of the “Big-4” is eroding. This paper wants to offer first insights about how the established power companies reacted to changes in their environment, how they co-created the transformation process and how their role within the field changed.

First I will present the theoretical framework and the methodological approach of my paper. Then the changes in the field of German energy supply from 1998 to 2012 will be outlined – which will give a first idea of the role of the established power companies – before I present first results of the comparative reconstruction of the strategies of the “Big-4”. Concluding, these two aspects will be brought together, giving a first impression of the capability of the companies to adapt to changes in their environment and about their role in shaping the transformation process.

Theoretical Background:

For the analysis a theoretical framework is needed, which properly explains the interdependencies between organizations and their environment. This means on the one hand the ways in which organizations take effect on their environment – intended or unintended – and on the other hand the multiple ways in which the organizational environment influences the organization. There are several aspects of an organizational environment that are relevant in this case. The most obvious aspect is the role of institutions – these might be legal regulations as well as diverse informal rules of interaction that shape the (economic) environment. Another relevant aspect is the role of different other actors whose actions the organization has to take into account – in whatever way. Since this routinely reciprocal “taking-into-account” may lead to institutionalization we become aware of the complexity of the issue right at the outset. But at first we want to take a closer look at two theoretical lines in organizational sociology which might be capable to provide insights about the issues mentioned above. These are evolutionary and neo-institutional approaches.

Taking evolutionary approaches into account the Population Ecology approach will be checked on its use, since it is one of the most popular and worked-out theories in this line. The Population Ecology approach analyzes organizations on the level of populations and utilizes basic assumptions of the Evolutionary Theory for organizational theory. Following Hannan and Freeman (1977) it isn't always easy to make out which set of organizations make out a population, or in other words which organization belongs to a certain population¹. A population thereby “consists of all the organizations within a particular boundary that have a common form” while an organizational form as a “blueprint for organizational action” is made of (1) the formal structure of the organization, (2) the patterns of activity within the organization and (3) the normative order (Hannan/Freeman 1977: 934 ff.). Thus we can understand economic sectors as populations of organization which makes the theory appropriate at first glance. The theory also attributes high importance to regulatory interventions by the state reshaping the populations' environment. (ibid 1977: 944f.) But it appears to be a problem that the theory is too much focused on the population level and offers too little insights about the actions of single organizations *within* a certain population. Divergent behavior as well as differences between apparently similar organizations are hardly explained. When it comes to single organizations the theory puts a focus rather on the ability of an organization to survive than to adapt, while survival in this context seems too much reactive. Even the initially interesting assumption of reasons for organizational inertia the theory offers aims more at explaining the obstacles of organizations to shift *between* populations than on adapting to changes *within* a population. So the theory is more adequate when it comes to understanding organizational stability more than change or analyzing developments on population level within a larger time-scale.

The work done in the context of neo-institutional theory of organizations seems more appropriate for the object of study. Following this approach the environment of an organization is constituted by institutionalized expectation structures which wield extensive influence on the organizations. The

¹ We will be confronted with this problem later again, when we seek to identify borders of certain organizational fields.

term institution appears to be one of the densest terms in sociology which is used quite differently along various conceptions. Several scholars had a try at categorizing different kinds of institutions (see Scharpf 2000: 77). Schott developed a useful model of institutions which differentiates rather among dimensions of institutions than on categories of institutions – the “Three Pillars of Institutions” (Scott 2000: 51). These three “pillars” are the *regulative*, the *normative* and the *cultural-cognitive*, which make out analytically distinguishable elements of any institution. This conception appears to be very useful when it comes to differentiating and demarcating institutions.

One of the main concepts of the neo-institutional theory of organizations is that of “organizational fields” first specified by DiMaggio and Powell in 1983. “By organizational field, we mean those organizations that, in the aggregate, constitute a recognized area of institutional life: key suppliers, resource and product consumers, regulatory agencies, and other organizations that produce similar services and products” (DiMaggio, Powell 1983: 148)². They emphasize that they not only put the attention on economic actors or on organizations that actually interact, but on “the totality of relevant actors” (ibid 1983: 148). An organizational field can thus spread beyond the borders of an economic sector since it may include any actor which can influence its institutional setting. This is very important for this work because the field of energy supply obviously not only consists of economic actors – the developments of the last years have shown that institutional change on various levels can affect its constitution and that actors of different societal areas can influence it. The authors developed this concept to explain the phenomenon that organizations acting in one field tend to become similar to one another over time. Because of this focus, the concept offers not enough insights about organizational practice in changing (field-) environments and on institutional change in organizational fields in general. Since these are important aspects for our work we will examine further developments of this basic conception to see if they can possibly close those gaps.

Firstly there have been various attempts to counter the criticism, that field theories would be too static. Walgenbach and Meyer summarize some attempts to a more dynamic concept of organizational fields (Walgenbach, Meyer 2008: 74). The most important step forward on this issue is offered by Hoffman (1999). In his concept a field “is not formed around common technologies or common industries, but around “issues” which bring together various field constituents with disparate purposes” (Hoffman 1999: 4). This highlights that the totality of field members can change from situation to situation offering a more dynamic prospect on the field. To decide which organizations constitute a certain field emerging around an issue, Hoffman refers to social interaction patterns. This seems quite problematic – and on this aspect a step backwards from the conception of DiMaggio and Powell – , because it is obvious that actors within a field can possibly effect each other *without* directly interacting – by routinely shaping the surroundings which both actors have to take into account. Considering the stability of field rules Hoffman emphasizes the discordances of the field members and their opposing perspectives. Consequently he puts a focus on by which effects the forces, that commonly drive organizations into inertia and isomorphism, can change. He points out two aspects: The entry or exit of particular organizations and the alteration of power balances as well as interaction patterns between field actors. Despite its qualities this concept leaves two main gaps for the work at hand: Firstly the criterion of field membership – direct interaction – excludes possibly important field actors and secondly the role of state actors that may change institutional settings is only roughly conceptualized.

The most dynamic perspective on organizational fields is finally offered by Fligstein and McAdam (2012). Though it appears to be quite similar to Hoffman’s concept in many aspects, it is far more worked out in detail. In their “Theory of Fields” they describe organizational fields using the term

² At around the same time some similar conceptions were introduced by Scott and Meyer, Hirsch or Whitley to name a few.

“Strategic Action Field”. “A strategic action field is 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). The indication of membership in a certain field is based on subjective standing of the actors rather than on any objective criteria. These actor constellations may shift from time to time, since the fields are constructed on a situational basis and its borders depend on the issues at stake. 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. In addition any strategic action field is embedded in a broader field environment of various proximate fields, which are connected via ties between its actors. Thereby changes within a field that are not brought forth by the interactions of its members, can be explained. One important aspect is that Fligstein and McAdam emphasize the contentious nature of the strategic action fields. They make out two different types of field actors “incumbents” and “challengers” which constantly jockey for advantages considering the definition of field rules as well as spare resources.³ “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” (Fligstein, McAdam 2012: 13). They have to defend their position against the challenger actors which “occupy less privileged niches within the field and ordinarily wield little influence over its operation” (Ibid). When the field appears to be in an unstable state and challengers view advantages to alter the field’s constitution, they may engage in innovative action threatening the incumbents. A third type of actors the “governance units” oversee the compliance with the field rules and thus support the incumbent actors. Due to this constantly ongoing conflict in the field, its constitution slightly alters permanently. More radical or rapid changes may occur, when external shocks hit the field or via alteration of field rules by the state. “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” (Ibid 2012: 67). Thus by applying the theory of Fligstein and McAdam we can solve most of the aforementioned problems. They offer a highly dynamic prospect on organizational fields and their conception of membership combined with the idea of proximate fields allows us to position any relevant actor within the scope of the theory. The remaining problem is that the theory focuses mainly on how the field actors shape their environment through their interaction and does not offer that many insights about how they react to (institutional) changes that happened without their participation – for example rules set by the state.

So we need further theoretical information to explain the capability of organizations to adapt to (institutional) changes on the one hand and to understand organizational inertia on the other hand. This problem cannot be solved sufficiently at this point. Nevertheless two more concepts shall be marginally discussed. The first one is the theory of path dependence first introduced by the economists Arthur and David and later utilized for sociological interests by North (among others). It offers insights about organizational as well as sectoral inertia through self-reinforcing historical processes that gradually reduce the scope of action and finally lead into a state of “lock-in”⁴. The reason why the concept is only marginally appropriate for the work at hand can be explained on two levels: On the sectoral level it seems that the main path dependent process that led into the fossil-nuclear centered German energy supply system has come to an end. The government implemented

³ Following the authors the incumbent/challenger distinction is derived from the social movement theory and was first introduced by Gamson in 1975.

⁴ For detailed information see for example Werle 2007.

regulatory changes that caused market dynamics that decreased the returns of a further usage of the fossil-nuclear technologies and thus “cracked” the lock-in. On an organizational level various path dependent processes can be identified which reduced the flexibility of the companies. When the regulatory framework was changed these lock-ins became visible. The theory would be useful to explain how these lock-ins occurred but it offers too little insights about what happens when the locked-in organization (or sector) faces changes that demand fast adaptability – simply: how to get locked-out⁵.

The second concept to be finally discussed is Dolata’s theory of the sectoral capacity to adapt to technological changes. It is interesting since his concept of adaption not only focuses on adaptive action but also takes the perception of actors into account. Furthermore adaption is not just seen as reactive but also describes the dealing with not yet established innovations. It includes “how a sector anticipates and adopts the possibilities emerging from technologies that are initially incomplete and malleable, and copes with the ways these technologies may affect existing structures, institutions, and organizations” (Dolata 2013: 57). This suggests to differentiate the ability of organizations to react on changes in their environment on different levels – the level of perception, adoption and coping (ibid). Yet the concept’s use in this case is limited since it is centered on technologies –which were not the drivers of change in the German energy system. It have not been rising technologies (as technologies to produce electricity from renewable sources) that brought forth the change. New (regulatory) institutions set by the federal government increased the profitability of certain technologies and thus promoted their diffusion which in turn altered the constitution of the field. It can be suggested that the technologies alone – without political support – would not have been able to lead to a change of the field’s constitution. Nevertheless it has to be checked whether the assertions of the theory about adaption to new technologies can be transferred on adaption to institutional changes.

Methodological approach:

The study reconstructs the actions of the four companies during the years 1998 (liberalization of the German electricity market) to 2015 (End of the running time of the project). It makes use of two scientific methods – qualitative content analysis and expert interviews. For both methods the approach of Gläser and Laudel (2009) is applied⁶. The content analysis derives data from annual reports and press reports by the companies as well as reports from business papers and daily newspapers. The reconstructive phase from 1998 to 2010 is characterized through a less exhaustive data collection, which is completed by deriving knowledge from existing studies while the second phase of the planned research – 2011 to 2015 – is based on a more widespread data collection using additional sources and is additionally completed by expert interviews. The collection of press reports draws on online archives. Articles were selected by headlines following a theory based category system. The superior categories are “Resources”, “Interaction with political actors”, “Alteration of organizational structure”, “Cooperation/coalitions”, “Innovative measures” and “Communication”. The same category system⁷ is applied for coding and analysis of the content. The interim results

⁵ The concept of „mindful deviations“ – the possibility of an organization to intentionally leave a path – as seen in Schreyögg/Sydow/Koch (2003) offers some insights on this issue.

⁶ Gläser and Laudel’s concept is based on the content analysis as worked out by Mayring 2007 but offers a higher flexibility in the later analysis phases through an ongoing adjustment of the underlying category system.

⁷ There are further sub-categories and an indication system. For space reasons the category system is only narrowly presented.

presented in this paper end with the beginning of the year 2012. It draws data from 1903 documents of which 189 are reports by the companies, 1357 from business papers and 357 from daily or weekly newspapers. At this early state of research two expert interviews have been conducted which so far confirm the results from the content analysis.

The information about changes in the field of energy supply in Germany 1998 to 2012 outlined in this paper are based on a survey of existing research as well as quantitative data from different sources.

Changes in the field of energy supply in Germany 1998 to 2012:

There are different levels on which changes in the field of energy supply in Germany became visible. In this paper the following aspects will be illuminated: Changes in the regulatory framework, changes in the actor constellations as well as changes in the energy mix and its market effects.

Changes in the regulatory framework

As outlined in the beginning, there are two lines of regulatory changes relevant in this context. Changes of the Energiewirtschaftsgesetz (EnWG) that aim at the further liberalization of the energy market and various laws that privilege or discriminate certain technologies. The technology-specific laws relevant in this context are the "Gesetz für den Vorrang erneuerbarer Energien" (EEG), the "Atomgesetz" as well as the taxes on nuclear fuel implemented by the "Kernbrennstoffsteuer"-law. This paper will highlight the most important regulations along these lines, which are the (1) amendment to the EnWG in 1998, the (2) first-time implementation of the EEG in 2000 and the (3) amendment to the Atomgesetz in 2011.

(1) The amendment to the EnWG in 1998 followed an EU market directive aiming at liberalizing the European energy markets. The law required the electricity suppliers to separate their business activities along the supply chain by maintaining separate accounts for their business activities in generation, transmission and distribution as well as for non-electricity activities (legal unbundling). Furthermore demarcation agreements between energy suppliers were banned, while at the same time third-party access to their power grids had to be ensured. By this, the regional monopolies of the power companies were limited to the operation of the electricity grids⁸.

(2) The EEG of 2000 provided incentives for investment in renewable energy generation by obliging grid operators to connect such facilities with priority and by giving renewable energies feed-in-priority. It also guaranteed a consistent minimum payment for the produced electricity for a period of 20 years and thus ensured investment and planning security.

(3) After the nuclear disaster of Fukushima an amendment to the Atomgesetz was implemented. As a part of it the eight oldest reactors were shut down and it was decided to decommission the remaining nine ones until 2022. The taxes on nuclear fuel implemented with the Kernbrennstoffsteuergesetz in the beginning of 2011 were maintained, making nuclear energy additionally less profitable.

⁸ This was at least the intention of the law. Whether it worked sufficiently on this aspect has to be discussed.

Changes in the actor constellations

The liberalization of the German electricity market offered plenty of opportunities for the bigger energy suppliers to expand beyond the borders of their former service areas and led to a series of mergers among various firms. While at the beginning of the liberalization there were eight vertically integrated energy companies, four years later mergers resulted in the “Big-4” RWE (RWE plus VEW), E.ON (containing VEBA’s PreußenElektra and VIAG’s Bayernwerk), Vattenfall Europe (formerly VEAG, HEW and BEWAG) and EnBW⁹. To get access to more customers they acquired shares in smaller regional suppliers as well as municipal utilities. In 2010 Eon RWE and EnBW held shares in 135 of about 700¹⁰ municipal utilities which amounts to 19 percent. In 78 percent of the cases the participation exceeded the blocking minority of 25 percent¹¹. Thus the liberalization led to a strong market concentration. Based on data of the “Bundesnetzagentur”, in 2003 and 2004 the “Big-4” possessed 82 percent of the electricity production capacity in Germany and generated about 90 percent of the electricity (Bundesnetzagentur 2007: 60). In 2010 their share was reduced to 77 percent (capacities) and 82 percent (production) (Bundesnetzagentur 2011: 14). After Fukushima they still held 73 percent of the production capacities (Bundesnetzagentur 2012: 17). Since all these numbers exclude production capacity as well as produced electricity that are paid via EEG relocation charge, the realistic share of the “Big-4” can expected to be lower and the decline of the share of the “Big-4” to be more rapid.

But what led to this reduction of their share? Taking advantage of the EEG the number of new (challenger-) actors entering the field on a decentralized level rose. Since the electricity produced from renewable sources did not have to assert itself on the market, the “Big-4” had no chance to mobilize their (market) power against the rising competition¹². On the contrary, the niche could develop unaffected by free market mechanisms. These new entrants appeared to be quite heterogeneous. They comprised single actors as well as collective actors of different organizational and institutional form and size. Though it is an open question whether these actors are really *new* actors or if it is just actor types that were already active in the field that grew in number and thus became more visible. Following Mautz, Byzio and Rosenbaum the professionalization, stabilization and differentiation of decentralized actors and diffusion networks increased – although the developments proceeded differently in different technologies (Mautz, Byzio, Rosenbaum 2008: 83). The authors speak of a social opening up of the electricity sector as one of the most important factors for the diffusion of renewable energies. They name plenty of actor types involved in the different renewable technologies. These range from “green” company founders, investors with interests in “ethic” investment opportunities, farmers, private citizens to local initiatives (ibid 2008: 93p.). Due to

⁹ Badenwerk and Energie-Versorgung Schwaben merged into the EnBW in 1997.

¹⁰ Following Bontrup and Marquardt 2011. The exact number of municipal utilities for 2010 could not be reconstructed.

¹¹ From 135 (105) participations 55 (38) are held by E.ON, 54 (43) by RWE and 26 (24) by EnBW (Behind in brackets is the number of shares that exceed blocking minority. For Vattenfall a complete list of shares and participations is not available.

¹² Though they were successful in making use of their political power in many aspects (see Bontrup, Marquardt 2010, Becker 2011), they were not able to alter the regulatory framework of renewable energies in their favor.

the heterogeneity of these actors and the insufficient data, it is not possible to quantify the development of the actor constellation in the electricity sector over time¹³.

But it is possible to get at least an impression about the shifting power balance in the energy sector by looking at the changes in the energy mix – since we will see that most of the rising share of renewable energies comes from plants built by smaller companies or single actors and the most significant pressure towards the “Big-4” comes from the growing amount of renewable energies.

Changes in the energy mix and its market effects

Since 1998 the amount of renewable energies in the German energy mix constantly rose¹⁴. Based on data by the “Bundesministerium für Wirtschaft und Technologie” the electricity generation from renewable energies rose from 29,8 TWh in 1998 to 137,4 TWh in 2012, from a share of 5,3 percent in 1998 to 22,2 percent in 2012. The installed capacity of renewables even multiplied by 5,8 within this time span. While the share of hydro power nearly remained constant and the amount of biomass as well as wind power rose very steadily, the share of photovoltaic began to grow more rapidly at about 2005/2006. The change in share of the conventional power plants same time is more diverse. Concerning installed capacity the share of all energy sources declined – especially that of bituminous coal (by 10 percentage points) and nuclear energy (by 12,2). Concerning production the share of lignite and gas rose insignificantly (0,7 respectively 1,5 percentage points) while the share of bituminous coal and especially nuclear energy sank considerably (by 8,5 respectively 13 percentage points).

But who built these new renewable energy plants? The “Bundesnetzagentur” provides a list containing all power plants connected to the German electricity grid including but not limited to information about operator, capacity and date of commission. We can draw information about which actors built which kind of plants since 1998 from this list. Regarding ownership in this context it is sufficient to differentiate between plants operated by the “Big-4” and the ones operated by other actors – plants built by companies in which the “Big-4” hold at least blocking minority are assigned to the “Big-4”. Following this 40,6 percent of all capacity commissioned since 1998 – and have not been shut down in the meantime - were built by the “Big-4” or companies in which they have significant influence. They built 59 percent of the capacity of conventional power plants and 20,9 percent of the capacity of renewable power plants. The renewable energies with most significant extension were biomass (929,1 MW), pumped storage (1577 MW), photovoltaic (702,7 MW) and especially onshore wind (9187,7 MW). The percentage of the “Big-4” in this extension accounts for 19,8 (biomass), 100 (pumped storage), 0 (photovoltaic) and 7,6 (onshore wind). These data apparently contradict with those of the BMWi and the BDEW, which put the total number of the extension of renewable energies much higher. This is due to the fact that the Bundesnetzagentur pools plants with an installed capacity lower than 10 MW by federal states and does not differentiate those smaller plants by operator and date of commission. Since the reports of the companies suggest that they did not build plants this small, it can be expected that the majority of these plants were built by other actors and thus the share of the “Big-4” in newly built renewable energy capacities would be even smaller. This supposition is affirmed by the information from the annual reports of the “Big-4” that imply they did not participate in the extension of photovoltaic and only marginally in wind power and biomass in

¹³ Different governmental departments offer data about the renewables sector as well as the whole energy sector. But the sources of these data make them incommensurable and thus quantification on macro level is not possible.

¹⁴ Of course the rise of renewable energies in Germany started before 1998 but since this work focuses on the time period from 1998 on, we will not expand on this.

Germany. Though it cannot definitely be deduced that these actors building renewable plants are new entrants to the field, these changes can be interpreted as changes in the power balance. To make this clear we have to take a look at the (market) effects of the expansion of renewables.

The extension of renewable energies led to a profound change of the energy market. Traditionally the production was divided into base load, medium load and peak load. The base load power plants (mainly nuclear, lignite and hydro) ran all day, while the medium load power plants (different thermal power plants, mainly bituminous coal) followed the demand curve in the course of the day. The peak load power plants (mainly gas and pumped storage) flexibly adapted to short term changes in demand. The complex of power plants of the “Big-4” was structured based on this model to guarantee security of supply within their regions. The compatibility of this traditional system with a rising share of renewables is limited. A growing amount of fluctuating power from wind and solar energy requires a higher amount of flexible power plants and makes base load power plants obsolete over time. The expansion of renewable energies caused overcapacities in the German electricity system which in combination with their feed in priority reduced the full load hours of the conventional power plants. Furthermore the renewables had a price lowering effect on the energy exchange by which the profitability of conventional power plants was decreased. Thus they became a relevant threat not only to the traditional business model of the “Big-4” but also to the traditional paradigm of electricity supply.

Comparative reconstruction of the actions of the “Big-4”:

The changes in the field of energy supply presented, already give a first impression of the role of the established power companies in its alteration. I will now expand on this having a look at the actions taken by the companies, to detect similar action patterns. These patterns will be checked on congruencies and finally be affiliated to strategic phases by the companies.

Before starting with this comparative reconstruction, I will highlight some important structural differences between the four companies, since some differences in action can be easily explainable on this basis.

Structural differences between the „Big-4“

The most obvious difference between the four actors concerns their size, which results in a different financial scope. The external sales, EBITDA, number of employees, electricity sales, and installed capacity all show the same tendency (See table 1). E.ON is the biggest of the four companies, followed by RWE. If one compares these benchmarks over time RWE outnumbers E.ON at certain points. EnBW and Vattenfall follow with distance. On the European market Vattenfall surpasses EnBW, while the share of EnBW in Germany is higher than Vattenfall’s.

	External Sales (mil €)		EBITDA (mil €)		Employees		Electricity Sales (bn kWh)		Installed Capacity (MW)	
	2000	2012	2000	2012	2000	2012	2000	2012	2000	2012
E.ON	80279	132093	8041	10786	186788	72083	211	740	29021	69557
RWE	55398	53227	5642	9314	157240	70208	213	278	?	51977
EnBW	5829	19246	600	2293	33940	19998	78	135	10211	13400
Vattenfall	3579	19496	1318	6349	13123	33059	83	202	?	37428

Table 1: Benchmarks Big-4. All data accounts for the whole group with all its business units.

Another important differentiating criterion is the structure of their shareholders. In 2012 E.ON has 81 percent of free-floating shares. No single shareholder exerts a significant control. In the case of RWE most of the time the municipal shareholders held the blocking minority and thus wielded significant influence on the actions of the company¹⁵. The shareholder structure of EnBW was always characterized by a balance of two main powers. On one hand the „Zweckverband Oberschwäbische Elektrizitätswerke“ (OEW) – a union of municipalities – and the federal state of Baden-Württemberg (until 2000 and again from 2010 on) respectively the French power company Electricite de France (between 2000 and 2010) on the other hand. The Swedish company Vattenfall as well as its German subsidiary are governed by the Swedish state. The basic assumption in this context is that municipal shareholders represent local interests in addition to their financial ones which may complicate profit oriented decisions at certain points – the history of RWE for example has seen this for several times – while shareholders from the financial market as well as free floating shareholders demand a stronger focus on the market value of a company.

Reconstruction of strategic phases

Analyzing the actions of the “Big-4”, three strategic phases can be identified: The phase of expansion through acquisitions and focus on core business, the phase of reduced acquisitions and organic growth and the recent phase of reorientation¹⁶. These phases represent interim results. They are modeled on the basis of the research categories “Resources” and “Communication” alone. The other categories mentioned above have to be included too, but are not analyzed yet. Additionally the investments and disinvestments have so far been only analyzed based on qualitative data and have to be controlled via additional data sources.

At the moment the three phases represent the strategies of the four companies differently precise. E.ON and RWE went through these phases nearly synchronically while in the case of EnBW and especially Vattenfall phase one and two are less distinct. Phase three is representative for all four companies.

Phase 1: Expansion through acquisition and focus on core business - 1998 to 2005

Right off from 1998 the companies took the advantage to expand beyond the borders of their former service areas by acquiring various companies (See table 2 for a selection of acquisitions). Their expansion was initially focused on Germany until at around 2002 the boundaries permitted by antitrust law were reached. Then the focus shifted to the European level. E.ON expanded mainly in Eastern Europe, Great Britain, and Scandinavia. RWE enhanced their market position in the worldwide water supply additionally to their expansion in European electricity supply – the regional focus of RWE in Europe is less distinct than that of E.ON. EnBW was less observed by the German cartel office and thus their national expansion phase went on until at least 2006. They generally focused more on Germany and only acquired shares in a few companies in Spain, the Czech Republic, Austria and Switzerland. Vattenfall appears as a special case. They had one phase of big acquisitions from 1999 to 2002 when they entered the German and Polish market and parallel strengthened their position in Scandinavia. Beside that there is no structure in their investment practices identifiable.

¹⁵ The share of the municipal shareholders in the RWE shifted over time. At certain points they lost their blocking minority. Depending on the sources consulted, information on this matter is contradictory so further information has to be gathered on this issue.

¹⁶ Of course there have been acquisitions and disinvestments of stake in phase two and three and organic growth in phase one and three. The model just points out the focus of activities by the companies and its shift over time.

Big-4	Timespan	Company	Share	Country
E.ON	2000 to 2004	Ruhrgas	100	Germany
	2001 to 2002	Sydkraft	100	Sweden
	2002	LG&E	100	US
	2002	Powergen	100	GB
	2002	TXU Europe Group plc	100	GB
	2002 to 2004	Thüga	100	Germany
	2003 to 2004	Granninge	100	Sweden
	2003 to 2005	Jihoceska Energetika (JCE)	100	Czech Rep
	2003 to 2005	Jihomoravska Energetika (JME)	100	Czech Rep
	2004	Midlands Electricity	100	GB
	2004 to 2006	MOL Földgázellátó Zrt.	100	Hungary
	2007 to 2008	OKG-4	78,3	Russland
RWE	2000	VEW	100	Germany
	2000	Thames Water	20	GB
	2000 to 2003	Thyssengas	100	Germany
	2001	Hidrocantabrico	100	Spain
	2001 to 2002	American Water Works	100	USA
	2001 to 2002	VSE	69,33	Germany
	2002	Innogy	100	GB
	2002 to 2005	Stoen	100	Poland
	2006	Electrica Muntenia Süd	100	Romania
	2008	Excelerate Energy	50	USA
2009	Essent	100	Netherlands	
EnBW	1998 to 2003	Neckarwerke Stuttgart	100	Germany
	1999	Illerkraftwerke	100	Germany
	2001	Hidrocantabrico	59,5	Spain
	2002	GESO	100	Germany
	2004	Watt Deutschland	100	Germany
	2004	MVV Energie	15,05	Germany
	2005 to 2006	EVN	35	Austria
	2005 to 2010	Prazska energika Holding (PRE)	70	Czech Rep
2008	EWE	26	Germany	
Vattenfall	1999	Revon Sähkö Oy	100	Finland
	1999 to 2001	Oslo Energi AS	100	Norway
	1999 to 2001	HEW	100	Germany
	2001	Bewag	100	Germany
	2002	VEAG	100	Germany
	2005	Elsam	35,3	Denmark
	2009	Nuon	100	Netherlands

Table 2: Selected acquisitions by the Big-4

At the same time E.ON, RWE, and EnBW focused on their core business energy supply and sold shares in other branches¹⁷. E.ON and RWE started selling border activities straight off while EnBW began

¹⁷ The exact definitions of the core business differed among the companies and differed over time. But in this context it is sufficient to name energy supply as the core business and to abstain from further differentiations.

later in 2003. Vattenfall is a special case again on this matter, since it had much less shares in other branches.

This phase ended around 2005 simply because there were only few takeover opportunities left that appeared profitable to the companies and were not blocked by national or European cartel authorities. The concentration on the core business was most widely completed in 2005¹⁸ though single shares in non-core-market activities were held still.

Phase 2: Reduced acquisitions and organic growth – 2005 to 2011

After 2005 the number of acquisitions declined. Beside that the information drawn from the qualitative data is contradictory at certain points, making this phase rather blurry. E.ON and RWE communicated a focus on organic growth at regular intervals between 2005 and 2008. The information about planned and built plants drawn from the annual reports only partly confirm these investments. In the case of E.ON a rising amount of start of construction works is noticeable in the years from 2007 to 2009 while 2009 and 2010 are showing a rising amount of commissions. A list of all RWE power plants operating in 2011 that includes the date of commission does not show a rising amount of commissions in this time span – the years with the highest number of newly installed capacity appear to be 2002 (1094 MW), 2006 (690 MW), 2010 (1879 MW), and 2011 (780 MW). EnBW did not communicate any plans but at around 2006 an increase in power plant investments is noticeable. Vattenfall did invest in organic growth constantly over time with a significant boost in 2009 and 2010. So a tendency in organizational growth can be detected but has to be further examined. Beside this the actions of the companies in this phase are rather opaque. Especially the fact that RWE and E.ON had a very strong financial standing at the beginning of the phase that somehow crumbled along the way cannot be ascribed to certain happenings. Though the need of depreciations in foreign companies has been communicated. The analysis of the other categories may offer further insights on this issue.

Phase 3: Reorientation – since 2011

This phase was initiated by two main changes in the environment. Firstly as a reaction to the nuclear disaster of Fukushima the Atomgesetz was amended causing high profit losses to the companies. The second and maybe more important aspect is that the market effects of the EEG mentioned above became visible causing additional profit losses. The third phase is characterized by two main action patterns. First to be mentioned are actions dealing with reduced earnings. These are cost-cutting programs and a higher amount disinvestment in shares in their core business for the first time since the start of the liberalization. E.ON and RWE sold regional suppliers in Germany and various shares in the rest of Europe. Vattenfall already announced in 2010 to focus on Sweden, Germany and the Netherlands and later to part with its entire business in Belgium, Finland and Poland – the sell-off was directly started in 2011. EnBW announced sales too, but did not start off yet. Second it is the search for new business strategies. The companies criticized that the developments in energy policy are highly unpredictable and making investment decisions difficult. Thus it is not surprising that so far no clear strategic line is identifiable. The overall strategic announcements appeared to be rather blurry, but nevertheless showed the awareness of the need to adapt to a changing environment. The Chief operating officer of EnBW Frank Mastiaux proclaimed “just like the energy sector is changing, the EnBW will change” (Press release EnBW: 01.10.2012) and RWE’s Peter Terium announced “Our business will change fundamentally” (Handelsblatt: 25.10.2012). Or as Vattenfall has summed it up: “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

¹⁸ The disinvestment of certain parts of the non-core-business took longer. RWE completed the separation of the water divisions until 2009. EnBW sold its waste subdivision in 2007.

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). Nevertheless the companies communicated some plans to deal with the new situation. They announced to expand their service sector, to realize new power plant projects in cooperation with partners more frequently to spread risks, and to expand decentralized cooperation models to name a few. But at the moment there is no reliable indication whether these practices were implemented. But the “Big-4” are obviously in a phase of reorientation and look for new business models to persist in the future energy system.

Conclusion – adaption and co-creation by the established power companies:

The illustration of the three phases combined with the changes in the field of energy supply presented before, give a first impression of the capability of the companies to adapt to changes in their environment and about their role in shaping the field’s constitution. Adaption as well as co-creation have to be analyzed along the two regulatory lines introduced in the beginning. At the same time it seems appropriate, to distinguish between three aspects of adaptability – perception, adoption and coping. I will conclude with interim assumptions on this issue.

Line 1: The market liberalization

The “Big-4” proactively adapted to the liberalization of the energy market and highly shaped its constitution. They took the risks of the regionally unbounded electricity supply as a chance, and expanded regionally, while growing in size and financial power. They showed high adaptability on all three aforementioned levels.

Line 2: The German energy transition

The way they dealt with the regulatory changes to promote renewable energies is obviously more diverse. The communication by the “Big-4” concerning the EEG suggests that their awareness towards their environment was very sensitive on this aspect. They realized the emerging threat right from the start – as can be seen in their annual reports from 2000, where they criticized the “market-distorting” effects and apprehended a reduction of competition – and announced to mobilize their political power to prevent or at least to alter the law. EnBW for example states to be “active at all levels to prevent inefficient new subsidies” (EnBW annual report 2010: 15). Though they were successful in taking influence on the legislation concerning nuclear energy at certain times, it does not seem they had relevant influence on renewable energy legislation.

On the second level of adoption it seems at first sight the “Big-4” just rode out the situation. They only marginally participated in the expansion of renewable energies in Germany¹⁹. The reason seems simple. The design of the EEG made investments in renewable energies unattractive to the operators of base-load power plants. Since the renewable electricity is fed in with priority and the base-load

¹⁹ Their reservation with expanding renewables in Germany does not go for their activity in renewables in other countries. All four companies started building wind farms about at the turn of the century – though in limited amounts. In 2008 there is a shift in dealing with renewables recognizable noticeable, institutionalized with the founding of business divisions focusing on renewables. E.ON founded “Climate and Renewables” in that year, EnBW launched “EnBW Renewables”. RWE did same one year earlier with “RWE Innogy”. Vattenfall did in 2009 by creating the subdivision “Wind” in their business group “Pan Europe”. At the same time their activities in wind power increased.

power plants are not flexible enough to react on the fluctuating power curves of wind energy and photovoltaic, any investment in these technologies would have created competition to their own power plants. It seems the role they initially assigned to themselves was in complementing the energy mix by building gas fired power stations and more flexible modern coal power plants, since it was obvious that the fluctuating power curves would increase the demand for control energy. This did not work for two main reasons. First the lack of public acceptance especially of coal fired plants impeded the construction works²⁰. Second they underestimated the speed of the expansion of renewables – especially photovoltaic – whose market effects decreased the profitability of the newly built power plants.

So the influence of the “Big-4” on the German energy transition so far is only marginal. Concerning the third level of adoption it is an open question to which extent the established companies are able to cope with the changes of their environment, since this search for a coping strategy just started. The further developments on this aspect have to be monitored.

Thus the capability of the established companies to adapt to changes in their environment, as well as their role in shaping the constitution of the field of energy supply is complex and at certain points diverse. The analysis of the remaining categories and the consultation of additional data may help to further review the assumptions presented in this paper and to answer the open questions.

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²⁰ EnBW had to stop their plant project in Dörpen in 2010 due to local protests. Same accounted for a project of Vattenfall in Berlin which had to be cancelled in 2009. E.ON had yearlong conflicts with their planned plant in Datteln.

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