Institutional complexity and sustainable development in the EU electricity sector

Ciulli, F.

Publication date
2016
Document Version
Final published version

CHAPTER 2
THE ELECTRICITY SECTOR AND SUSTAINABLE DEVELOPMENT: A LITERATURE REVIEW

2.1. INTRODUCTION

Sustainable development, defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (World Commission on Environment and Development (WCED), 1987: 43) has become a relevant topic in an increasing number of fields of human activity. In the last decades, numerous and diverse actors at national and international levels have highlighted the need for a more sustainable electricity generation and supply (e.g. Elysée, 2012a; European Commission, 2011; World Energy Council, 2013). Carbon Dioxide (CO_2) emission reduction, energy affordability, security of supply and nuclear safety are among the major sustainable development issues that have raised widespread debates and regulatory interventions in the electricity sector. In this context, the incumbent firms in the electricity sector have adopted a varied and changing set of actions over the years and have been challenged by the emergence and diffusion of new, more sustainable electricity producers. As sustainable development has been exerting an increasingly crucial impact on the life of electric utilities, it is particularly relevant to explore how management research has addressed sustainable development in the electricity sector. This chapter thus examines research conducted on this topic in the last twenty years (1994-2014) (Chapter 3 does the same but focused on the institutional dimensions).

Three main lenses have been adopted to review this literature. First, as the attainment of sustainable development requires the fulfilment of three principles (i.e. environmental sustainability, social sustainability and economic sustainability) (Bansal, 2005), we have analysed which principles and which issues within each sustainable development principle the literature has addressed. Second, since the electricity sector has experienced the emergence of novel, greener technologies, sub-sectors and power producers, we have examined the literature adopting an industry emergence or a technological system perspective to the analysis of the electricity sector' sustainability. Third, since electricity incumbents are the most affected by pressures for more sustainable practices, we have reviewed the literature focusing on their approaches to sustainable development, by identifying the range of responses and their drivers illustrated in the studies.

The literature reviewed shows scholarly interest for multiple sustainable development-related issues in relation to the electricity sector. Nevertheless, key gaps still persist, in particular as regards a cross-country perspective to incumbents' approach to sustainable development, a longitudinal view of incumbents' responses to multiple and heterogeneous sustainability-related demands and, finally, the interaction between market, state and sustainable development. These topics are discussed in section 2.5. of this chapter and will be explored further in chapters 4, 5 and 6 of the dissertation.

2.2. METHODOLOGY

The selection of papers suitable to be included in a literature review on the electricity sector and sustainable development followed four main stages.

First, the selection of the journal outlets was conducted. Twenty-five major peer-reviewed strategy, general management, and international business, drawing on the ABS (Association of Business Schools) 2010 ranking and the FT 2012 research rank, were selected (see Table 2.1), as well as the main business ethics journal (Journal of Business Ethics) and business strategy and sustainability journal (Business Strategy and the Environment). In addition, two top business history journals (Business History Review and Economic History Review) and two top entrepreneurship journals (Entrepreneurship Theory and Practice and Journal of Business Venturing) were included among the selected journal outlets, in order to capture other potentially relevant papers. While this selection obviously has limitations, the set was regarded as providing a good overview of main debates on the topic as conducted by business and management scholars.

Then the timeframe, on which to focus the article search, was defined. As the research was conducted in 2015, a twenty-year period, from 1994 to 2014, was considered a suitable period to explore the evolution of the management literature on the electricity sector and sustainable development. Due to limited access to databases or the publication of a journal starting at a later date, for eight journals it was not possible to collect papers starting in 1994 and the search thus was conducted from the first available year (see Table 2.1). Four studies, i.e. Kim and Lyon (2015), Miras-Rodríguez et al. (2015), Pacheco and Dean (2015) and Poisson-de Haro and Bitektine (2015), whose first version, in an early online view, was indicated with the year 2014 but were later included in a 2015 issue, were kept among the collected papers.

Subsequently, a set of keywords for the search of potentially relevant articles was established. The keywords selected were based on the terms mostly used by

practitioners and scholars to refer to the electricity sector and firms, they were: *electric/electricity*, *utility/utilities* and *energy*.

Journal outlets	Searched timeframe
Academy of Management Journal	1994-2014
Academy of Management Review	1994-2014
Academy of Management Perspectives	2006*-2014
Administrative Science Quarterly	1994-2014
British Journal of Management	1994-2014
Business and Society	1999*-2014
Business History Review	1994-2014
Business Strategy and the Environment	1996*-2014
California Management Review	1994-2014
Economic History Review	1994-2014
Entrepreneurship Theory and Practice	1994-2014
European Management Journal	1994-2014
Global Strategy Journal	2011*-2014
International Business Review	1994-2014
Journal of Business Ethics	1994-2014
Journal of Business Venturing	1994-2014
Journal of International Business Studies	1994-2014
Journal of International Management	1998*-2014
Journal of Management	1994-2014
Journal of Management Inquiry	1999*-2014
Journal of Management Studies	1994-2014
Journal of Operations Management	1994-2014
Journal of World Business	1997*-2014
Long Range Planning	1994-2014
Management International Review	1994-2014
Management Science	1994-2014
Organization Science	1994-2014
Organization Studies	1994-2014
Research Policy	1994-2014
Strategic Management Journal	1994-2014
Strategic Organization	2003*-2014

Table 2.1: Overview of the journal outlets and searched timeframe
** available only from this year in the University of Amsterdam journal database or publication of the journal only started from this year.*

Once the articles were collected using the keywords, they underwent an additional selection process, in order to retain only the most relevant papers for this literature review. For this purpose, the articles were examined to verify whether they fulfilled three main criteria.

1. As the core feature of the electricity sector is electricity generation and distribution, the articles needed to focus on **actors producing and/or distributing or aiming to produce and/or distribute electricity**. As a consequence, papers focusing on other actors, e.g. oil and gas companies or manufacturers of energy technologies or with an uncertain focus, were excluded.
2. The articles needed to **focus only on the electricity sector**. As the literature review aims to examine the research interest raised by the electricity sector among scholars, articles mixing electric firms with firms from other sectors do not signal a motivation specifically for the focal sector of this study. Therefore, articles mentioning the electricity sector only as an example among others or using electric firms within a sample including companies from other sectors were excluded.
3. Since this study focuses on reviewing the literature on the electricity sector and sustainability, the articles needed to **address topics involving environmental, social and/or economic sustainability issues**, in keeping with Bansal (2005)'s definition reported in Table 2.2 (see section 2.4 for more details).

A total of 41 articles published in 15 journals fulfilled the criteria and were selected for the literature review. Once the general characteristics in terms of journals they belonged to, year of publication, and geographic focus were assessed and all the articles were read fully multiple times in order to be examined through the three lenses presented in section 2.4.

2.3. GENERAL CHARACTERISTICS OF THE RESEARCH PUBLISHED IN MAIN ACADEMIC JOURNALS

2.3.1. Journal outlets

The studies selected for this literature review have been published in a range of different management journals (see Figure 2.1). Among them, Business Strategy and the Environment, with eight papers, has published the highest number of studies on the electricity sector and sustainability. If this does not appear to be very surprising, it is nevertheless interesting when compared with the number of studies, only three, selected from the Journal of Business Ethics, given its focus on business-related "action aimed at securing a good life" (Journal of Business Ethics, n.d.). This highlights, as explored in more detail in section 2.4.1, that among the three main sustainable development-related principles, environmental sustainability receives the most attention in research on the electricity sector. Interestingly Strategic Management Journal and Research Policy rank the highest after Business Strategy and the

Environment. This indicates, on one side, the critical role of sustainability in electric utilities' strategic management and, on the other side, the close relationship between sustainability and technological innovation in the electricity sector.

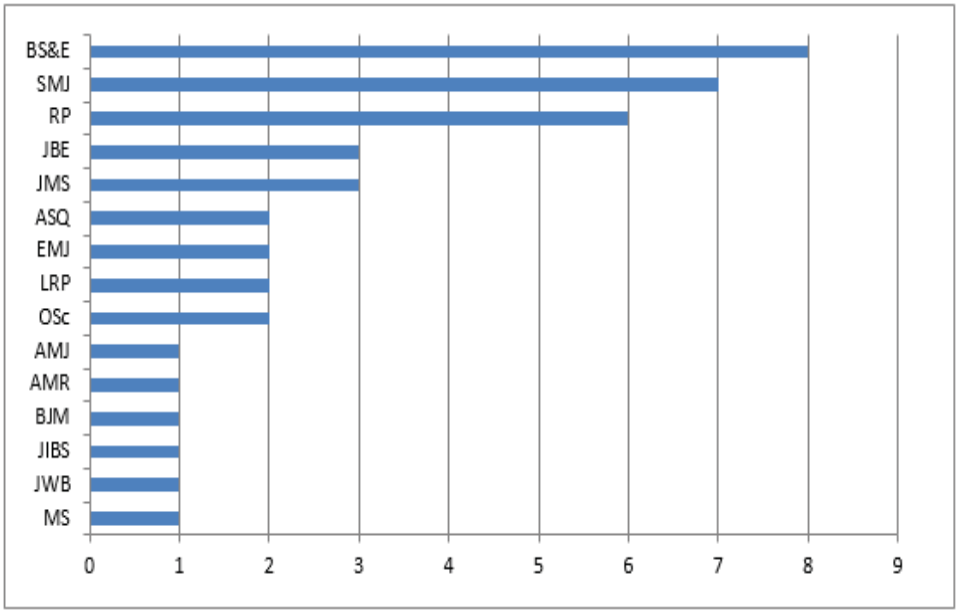

Figure 2.1: Number of articles per journal outlet

Similar to what emerged regarding the literature on institutions and the electricity sector, a very limited number of studies, two, have been published in international management journals, i.e. Journal of World Business and Journal of International Business Studies. The scant adoption of an international business perspective to the study of electric firms and sustainability is, as discussed in section 2.3.3., a relevant gap that needs to be addressed. Indeed while electric utilities operating internationally face the same or similar sustainability issues, e.g. climate change, they are also confronted with the heterogeneous approaches adopted by national actors to deal with these challenges. This raises questions on multinational electric utilities' responses to the same sustainable development issue in the different environments in which they operate.

2.3.2. Chronology of research

Regarding the publication of studies on sustainability and the electricity sector over the last 20 years, Figure 2.2 shows a limited interest in this topic until 2005 and a higher publication of studies in the last eight years, with 'peaks' in 2007 and, particularly, in 2014. However, as shown by García-Marzà et al. (1999), Marcus and

Geffen (1998), Olerup (1999) and others, sustainable development was also a relevant topic for the electricity sector in the 1990s.

The increased interest in the last decade might be explained by the rising concern over climate change in this period, epitomized by the entry into force of the Kyoto Protocol in 2005. The last years have indeed given researchers the opportunity to explore electric utilities' commitments to responding to climate change. This seems to be supported by the fact that, among the eight studies published in 2014, six address sustainability in the electricity sector by focusing on renewables and/or CO_2 emissions.

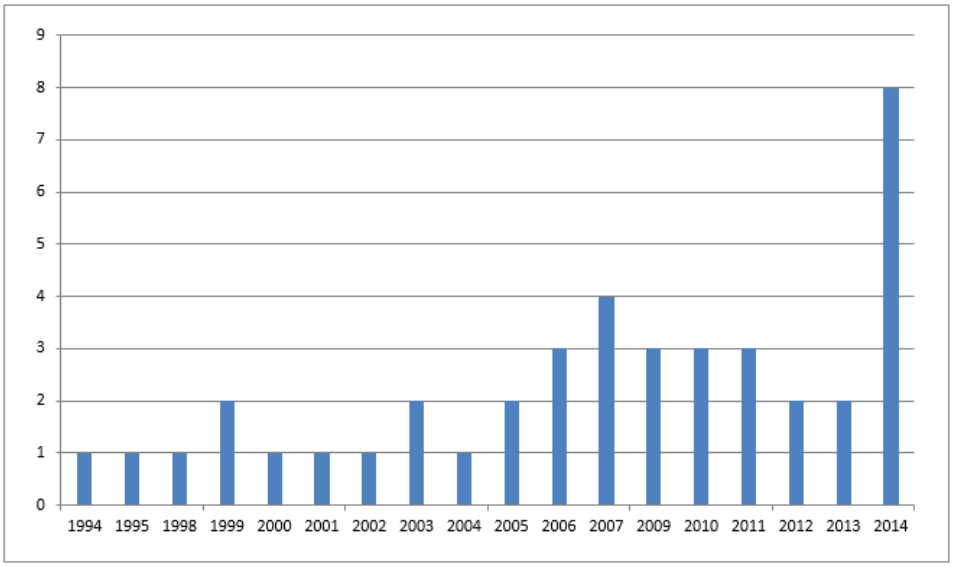

Figure 2.2: Chronology of research
Note: For the year 2014 also Kim and Lyon (2015), Miras-Rodríguez et al. (2015), Pacheco and Dean (2015) and Poisson-de Haro and Bitektine (2015) are counted as in the first accepted versions of the articles online 2014 was indicated as year.

2.3.3. Geographic focus

Several sustainable development issues, such as climate change, have in the last decades become increasingly 'global' in nature. Yet, differences still persist across countries and regions in the way in which specific sustainable development issues are addressed (Weinhofer and Hoffmann, 2010). It is therefore particularly important to examine the geographic focus of extant management literature on electric utilities and sustainable development. In particular it is interesting to identify first, which countries have been the subject of investigation and if some regions or countries have been preferred by extant studies, and second, whether the focus has mainly been on one

country or, instead, if multiple countries have been explored and/or compared in the same study.

As shown by Figure 2.3, research addressing sustainability in the electricity sector focuses mainly on specific European countries and the US, with very limited exceptions, represented by the studies of Griffiths et al. (2007) on Australia, Nebus and Rufin (2010) on the Dominican Republic (although in connection with Spain) and by research which has used, as sample, electric utilities from multiple countries (Kolk et al., 2014; Weinhofer and Hoffmann, 2010; Miras-Rodriguez et al., 2015).

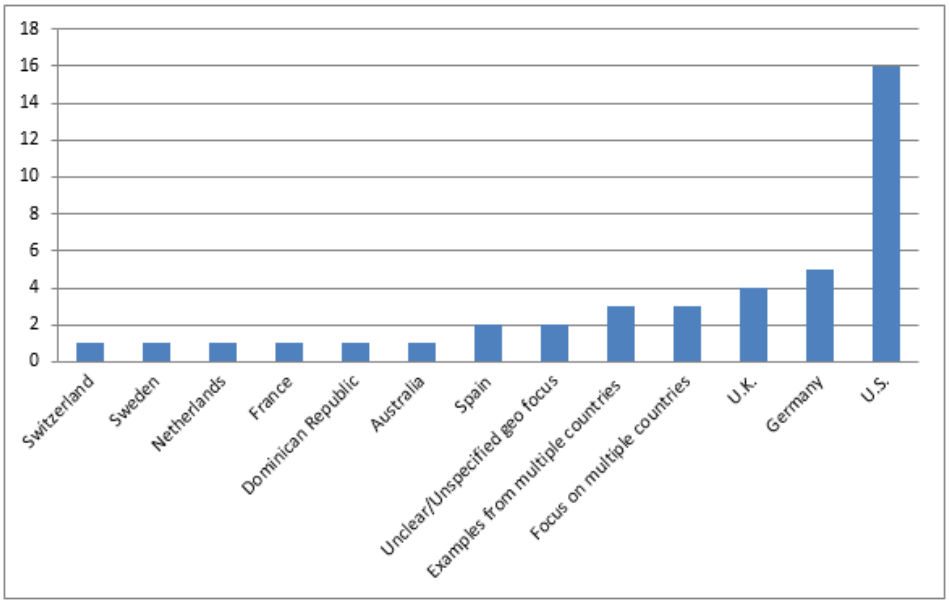

Figure 2.3: Geographic focus

While the justifications provided for the choice of the US have in general been limited, some reference has been made to sustainable development-related features of the US context. For example, Pacheco and Dean (2015: 1094), studying non-governmental organizations (NGOs)'s impact on electric utilities' adoption of wind power, argue that it is "an attractive context […] because rising concerns about climate change and air pollution have triggered increased activism for clean energy solutions". Similarly, Pacheco et al. (2014: 1618) mention the steep increase in the number of technology-focused NGOs "dedicated to renewable energy and energy conservation".

The focus of the studies concentrating on one country is heterogeneous, however the topics raising the greatest interest have been climate change, CO2 emissions and/or renewables. Interestingly, the importance of these issues at national level has often

been connected to the initiatives at EU level in terms of regulations (e.g. the EU Emission Trading Scheme and renewables' targets) and research programs (e.g. on biomass co-firing). Among these studies five have as setting Germany, which is thus the second most studied country for research on sustainability and the electricity sector. Interestingly, among the studies having Germany as setting, the majority concentrates either on electric utilities' strategies with regards to CO2 emissions or on a nuclear power company's responses after a nuclear accident. Germany represents a particularly suitable location for these two sustainability challenges because, on one side, "due to the heavy use of fossil fuels, the German electricity industry is a large contributor to overall German CO2 emissions" (Hoffmann, 2007: 466) and, on the other side, "Germany […] is characterized by a strong anti-nuclear movement" (Beelitz and Merkl-Davies, 2012: 101).

The majority of the literature on the electricity sector and sustainable development has as research context a single country, however a subset of these studies (e.g. Delmas et al., 2007; Fremeth and Shaver, 2014; Griffiths et al., 2007; Kim, 2013; Pacheco and Dean, 2015; Sine and Lee, 2009;) takes into consideration intra-national heterogeneity and explores its impact on power producers' approach to sustainable development. This literature examines within-country differences regarding, for example, regulations or political pressures for sustainable behaviour(s) (Delmas and Montes-Sancho, 2010; Fremeth and Shaver, 2014; Griffiths et al., 2007), deregulation policies (Delmas et al., 2007; Kim, 2013), citizens' 'environmental sensitivity' (Delmas et al., 2007; Delmas and Montes-Sancho, 2010), saliency of NGOs (Pacheco and Dean, 2015; Sine and Lee, 2009) and competitors' behaviour (Pacheco and Dean, 2015). Another, limited, set of studies (Pacheco et al., 2014; Russo, 2003; Sine and Lee, 2009), instead focuses on the influence of intra-national diversity in terms of, for example, membership of NGOs (Sine and Lee, 2009), public awareness (Pacheco et al., 2014) or natural capital (Russo, 2003), or on the emergence of a new green energy industry (see 2.4.2).

A group of papers, while analysing electric utilities' operations only in one country, incorporate an international and/or cross-country perspective in different ways. Poisson-de Haro and Bitektine (2015), Hoffmann (2007) and Hoffmann et al. (2009) integrate global/regional pressures for sustainable development. In particular, Poisson-de Haro and Bitektine (2015) make reference to the global pressures for climate mitigation exerted by the Kyoto Protocol on Spanish electric utilities. Hoffmann (2007) and Hoffmann et al. (2009) focus on the EU Emission Trading Scheme (EU ETS) and they examine its impact on German electric utilities' investment decisions. Nebus and Rufin (2010), focusing on a Spanish firm, Union Fenosa, in the Dominican Republic, illustrate the interaction between Union Fenosa, the home-country government, the

host-country government and customers. Patriotta et al. (2011), exploring the response of Vattenfall, a Swedish electric utility, to a controversy around its nuclear activities in Germany, also include the firm's home country, although to a very limited extent. Indeed, Sweden is taken into consideration only as location of an accident at one of Vattenfall's nuclear plants, which is the cause of the controversy over Vattenfall's activities in Germany. Despite the inclusion of international or cross-country elements, however, scant attention is given to the dynamics and interactions between different environments (e.g. national and supranational), as regards how sustainable development issues are addressed.

Only a very limited number of studies explores the approach to sustainable development of electric utilities from/in multiple countries. Weinhofer and Hoffmann (2010)'s research does not have a specific pre-defined geographic focus but investigates whether the type(s) of 'CO_2 strategy' adopted by electric utilities depend on "the geographic region in which [they] operate" (Weinhofer and Hoffmann, 2010). Kolk et al. (2014), instead focus on the major EU electric utilities and examine their internationalization of both 'traditional generation activities', i.e. fossil-fuels and nuclear energy, and renewables (Kolk et al., 2014). Miras-Rodriguez et al. (2014) also analyse firms from different countries, but, differently from Weinhofer and Hoffmann (2010) and Kolk et al. (2014), the geographic aspect is not a variable in the study.

The geographic focus of some of the literature on the electricity sector and sustainability has thus allowed different settings to be taken into consideration. However, the focus is still significantly US centric, addressing national issues and inter-state differences. The number of studies concentrating on the EU is significant, yet in these studies the location is typically limited to one member state and cross-country research is lacking, an exception being Kolk et al. (2014). Surprisingly, no study adopts a comparative perspective to explore the approach to sustainable development of the same firm(s) within multiple countries. Given the same or similar sustainability challenges faced by different countries and the diversity in the way they are addressed across countries, the adoption of an international business perspective seems particularly fruitful. Also, although the role of the EU institutions on the member states' sustainability commitment is highlighted in the literature, the sustainability-related interactions and dynamics between the national and the supranational levels are overlooked. This however is a particularly relevant phenomenon to study, as electric utilities may face or exploit misalignments between the EU and member states on how to address sustainability issues.

2.4. THE CONTENTS OF RESEARCH ON SUSTAINABILITY AND THE ELECTRICITY SECTOR: THREE LENSES

The literature on the electricity sector and sustainable development has been reviewed by adopting three main perspectives. First, the studies have been analysed in terms of the sustainable development principles and issues they have tackled. Second, industry emergence or systemic perspectives of the development or diffusion of (more) sustainable energy generation technologies (e.g. biogas, wind, PV) have been examined. In this set of studies electric utilities, i.e. the incumbents in the electricity sector, are disregarded or are considered only as one actor among the different types of power generators. Third, studies focusing on the electric incumbents have been reviewed in terms of the approaches to sustainable development and the drivers they have focused on.

2.4.1. Sustainable development issues

As mentioned in section 2.1., sustainable development has a multifaceted nature and requires the concurrent adoption of three principles: environmental, economic and social sustainability (Bansal, 2005). Extant literature has highlighted the challenges the attainment of multiple sustainable development objectives entails, due to the presence of trade-offs and tensions between them (Hahn et al., 2010; Hahn et al., 2015; Pinkse and Kolk, 2010; Van der Byl and Slawinski, 2015). This topic will be further discussed in chapter 5 (and applied to the case of a specific utility). In this section I will therefore focus on three main aspects, (1) whether and how each principle (see Table 2.2 below) has been addressed in the study of the electricity sector (see Figure 2.4), (2) whether multiple sustainable development issues have been examined in the same study and (3) whether trade-offs or tensions have been addressed. Although some issues (e.g. air pollution and employment) could be ascribed to more than one principle, they are discussed under the principle which corresponds most closely to the meaning given to each issue by the authors of the respective studies.

Environmental sustainability

As shown by Figure 2.4, the large majority of the research investigating sustainability in the electricity sector focuses on environmental sustainability issues.

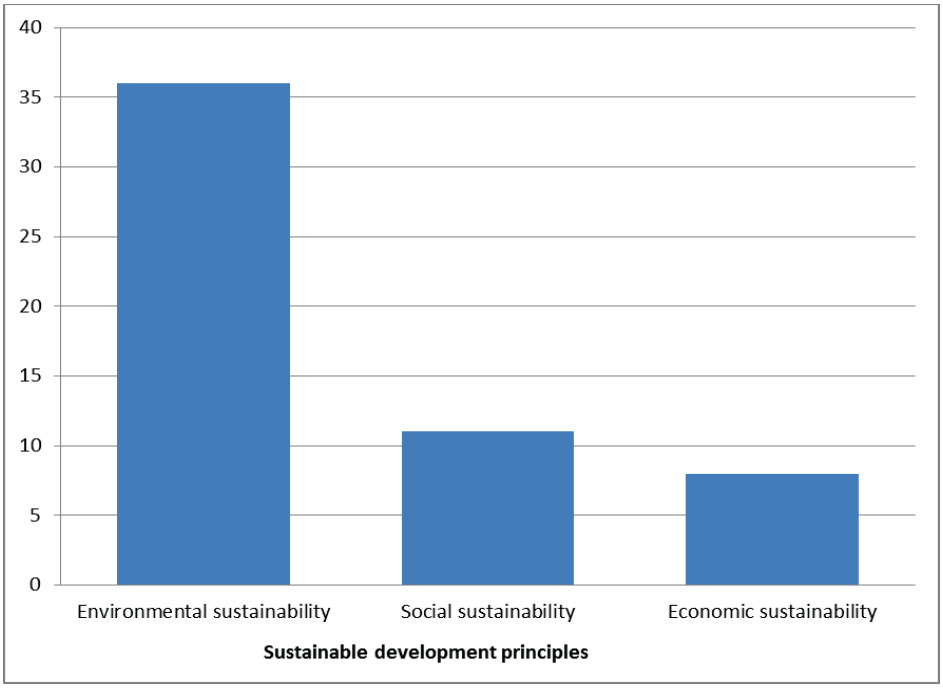

Figure 2.4: Number of studies per sustainable development principle

Among these studies, some (e.g. Atkinson et al., 2000; Delmas et al., 2007; Kim, 2013; Miras-Rodriguez et al., 2015; Morrow and Rondinelli, 2002: Pacheco et al., 2014; Russo, 2003) take into consideration environmental sustainability in a more 'general' sense without delineating more specific environmental issues that electric utilities may have to tackle. Another, more numerous, set of studies focuses on specific issues within the environmental sustainability pillar, e.g. climate change (e.g. Griffiths et al., 2007; Weinhofer and Hoffman, 2010).

The relationship between the electricity sector and **climate change** is examined from different perspectives. Some of the studies focus on the positive or negative role for global warming and/or CO_2 emissions played by specific energy technologies. As regards the 'climate-friendly' technologies, for example, Fremeth and Shaver (2014) make reference to the whole category of renewable energies, while Markard et al. (2009) concentrate on biogas, Raven (2006) on biomass and Smith and Raven (2012) on solar photovoltaics (PV).

Sustainable development principles	***Environmental sustainability***	***Social sustainability***	***Economic sustainability***
Definition	"Human activities [should] not erode the earth's land, air and water resources" (Bansal, 2005: 198)	"All members of society [should] have equal access to resources and opportunities" (Bansal, 2005: 198)	"A reasonable quality of life [should be promoted] through the productive capacity of organizations and individuals in society" (Bansal, 2005: 198)
Issues addressed within each principle	• Air pollution • Climate change and CO_2 emissions • Water pollution • Waste pollution ○ Radioactive waste • Biological deterioration of the flora	• Energy affordability • Health • Diversity	• Security of supply • Employment
Main insights for each principle	• Energy technologies' positive or negative role in the fight against climate change. • Deregulation as driver (or not) of investments in green energy. • Heterogeneity in electric incumbents' response to climate change. • Heterogeneity in regulators' response to climate change. • Coal plants as cause of biological deterioration of the flora.	• Positive or negative role of deregulation on energy affordability. • Heterogeneity in electric incumbents' response to the problem of energy affordability. • Risk for health represented by nuclear safety problems.	• Security of supply as adopted in a first era of the electricity sector. • Companies' focus on security of supply. • Positive or negative role of deregulation on security of supply. • Nuclear energy as ensuring security of supply. • Risks for employment due to the closure of a conventional plant. • Employment creation thanks to the rise in green energies. • Risks for employment in the supply chain due to deregulation.

Table 2.2: Sustainable development principles and issues addressed in the literature reviewed
Note: This threefold distinction is further explained and discussed in Chapter 5.

Beside renewables, nuclear energy is considered, by its 'supportive stakeholders' examined by Banerjee and Bonnefous (2011) and Patriotta et al. (2011), before the Fukushima event (see chapter 4), to be a 'virtuous' technology in the fight against global warming. Indeed, Banerjee and Bonnefous (2011: 130) argue that "growing concerns about climate change created a new set of allies for the nuclear energy industry". Patriotta et al. (2011: 1812) stress this phenomenon with particular regards to Germany, where "the advent of climate change as the dominant environmental issue in recent years has provided [the supporters of nuclear energy] with new arguments against the phase-out strategy[.] Nuclear energy should be kept because it is a clean source of energy." Another set of studies (e.g. Delmas and Montes-Sancho, 2010; Hoffmann, 2007; Hoffmann et al., 2009; Kim and Lyon, 2015), as analysed further in section 2.4.3., examines electric incumbents' decisions on CO_2 emissions' reduction and the external and internal drivers and mechanisms. As will be described in chapter 3, the literature reviewed to a limited degree signals the heterogeneity in the way climate change or CO_2 emissions are tackled, in particular by regulators, in different subnational (e.g. Delmas and Montes-Sancho, 2010; Fremeth and Shaver, 2014) or national locations (e.g. Griffiths et al., 2007).

While the majority of the studies explicitly focus on the issue of climate change and/or CO_2 emissions, some papers (Majumdar and Marcus, 2001; Marcus and Geffen, 1998; Raven, 2006) refer to **air pollution** as a critical environmental issue for electric utilities, while making no reference to climate change. Although this may be surprising, it also signals that scholars see electric utilities' management of air pollution as going beyond CO_2 emissions.

Water pollution (Majumdar and Marcus, 2001) and **waste pollution** (Banerjee and Bonnefous, 2011; Levendis et al., 2006; Majumdar and Marcus, 2001) are also addressed among the environmental sustainability objectives electric utilities have to fulfill. A critical type of waste pollution scholars have focused on concerns the radioactive wastes produced by nuclear plants. This issue, which has been framed both as affecting environmental sustainability and social sustainability, the latter due to the risks to the citizens' health, has been described as a key challenge for firms operating nuclear power plants. Banerjee and Bonnefous (2011: 131), while examining the stakeholder management of a nuclear power firm, describe one the main criticisms by 'obstructive stakeholders', i.e. stakeholders opposing nuclear energy, as "the long-term handling and storage of radioactive waste. At present there is no technology that can treat radioactive waste to make it less dangerous". The pollution created by radioactive waste is also the subject of a discussion between the support for state intervention or for market-based coordination in the US nuclear power sector (Levendis et al., 2006). Levendis et al. (2006) contend that, if radioactive waste is

managed in a free market framework, pollution will be lower than if under the control of the government. According to Levendis et al. (2006: 43), "if land is held in common, then […] the tragedy of the commons arises", which means that nuclear power firms will be more likely to pollute the environment. Instead, "where private property is concerned, people are far less likely to pollute their own land" (Levendis et al., 2006: 43); also, if nuclear power firms pollute a neighbouring land, they violate property rights and thus undergo high risks of being sued.

Finally, one study, by García-Marzà et al. (1999), focusing on the controversies around a coal plant operated by Endesa in Spain, discusses the "**biological deterioration of the flora**" for which the coal plant is deemed responsible, as a crucial cause of opposition by the local communities.

Social Sustainability

A group of studies analysing sustainability and the electricity sector have addressed, with more or less focused research, the social sustainability dimension. Three main sustainability issues have been taken into consideration in this framework: energy affordability (or fuel poverty), employment and health.

One paper, by Sharrat et al. (2007), has assigned specific attention to electric utilities' management of **energy affordability** and **fuel poverty**. The concept of fuel poverty, according to Sharrat et al. (2007: 1506), "stems from a recognition of fuel as an essential commodity and the significant regressive impact of price rises on household budgets". As discussed in more detail in section 2.4.3., Sharrat et al. (2007) examine the responses of UK electric incumbents to the 'social obligations' regarding fuel poverty imposed by the UK government.

Some scholars connect the issue of fuel poverty and energy affordability more generally to the deregulation undergone by the electricity sector in the last decades (see chapter 3). Different views and findings have emerged on this topic in the literature reviewed; while some studies describe deregulation and privatization as cause of affordability problems, others instead praise them as drivers of energy prices' reduction. Among the former, Sharrat et al. (2007) link the emergence of fuel poverty to the privatization of the UK electricity sector. According to Sharrat et al. (2007), while privatization at the time of its introduction was presented as (also) beneficial for consumers, as it would drive "more efficient and effective processes" over time, many have acknowledged that the "commercial market affords the scope for suppliers to 'cherry pick' profitable customers" (Sharrat et al. 2007: 1506) and disregard disadvantaged ones. A similar negative relationship between deregulation and fuel poverty is described by Boscheck (1994), who raises the reduction of subsidies for

disadvantaged customers by ENEL, when preparing for privatization, in order to attract potential investors.

Among the scholars stressing deregulation's positive impact on affordability, Sine and David (2003) argue that the monopoly structure that was adopted originally in the US, because it was considered more suitable to ensure low electricity prices, among other goals, was severely questioned once prices started to rise significantly. The high prices increased the number of those in favour of a more competitive structure, as "the current structure of the electric power industry had created a climate where organizations were unable to 'fully respond to the political pressure to insulate consumers from dramatic cost increases' (Joskow and Schmalensee, 1983: 159)" (Sine and David, 2003: 199). Similarly, Wallis (1995: 15), drawing on the case of Power Gen's privatization, posits that "competition has had a much greater effect on reducing prices than regulation". According to Wallis (1995), this is mainly due to the fact that competitive pressures have driven electric utilities to conduct significant cost reduction strategies, which have in turn allowed them to cut prices without reducing their profitability. In line with this Boscheck (1994: 117) argues that "competition can be expected to substantially reduce prices". Nebus and Rufin (2010) adopt an international business approach to energy affordability, and illustrate a situation where affordability was, together with security of supply, the subject of 'privatization disputes' between Spanish electric utility Union Fenosa operating in the Dominican Republic, its local customers, and governments in the Dominican Republic and Spain.

Another social sustainability issue addressed by extant literature is **health**. Mc Williams et al. (2014) refer to air pollution caused by power plants with regards to its impact on health and not only to the environment. However, the major risk for health identified by the literature is represented by nuclear safety. All the studies focusing on nuclear energy (Banerjee and Bonnefous, 2011; Beelitz and Merkl-Davies, 2012; Levendis et al., 2006; Patriotta et al., 2011) refer to nuclear safety as major argument raised by electric utilities' stakeholders against this energy source, in particular after an accident (Beelitz and Merkl-Davies, 2012; Patriotta et al., 2011).

Economic sustainability

A crucial economic sustainability issue for the electricity sector addressed in the selected literature is **security of supply**, defined as "the reliable provision of energy whenever and wherever needed" (European Commission, 2015b). Although this issue is given limited attention, a set of studies signal its relevance for electric utilities. In particular, Olerup (1999: 65), who identifies "four eras characterizing the Swedish energy sector", argues that the electricity sector was committed to secure delivery in the first era, during which "generators invest[ed] in capital-intensive base-load

capacity, aiming for the long-term perspective". While Olerup (1999) stresses the role played by security of supply obligations in the past but gives scant attention to its present degree of relevance, other studies provide some insights to this economic sustainability issue's importance, also in the current 'era'. In particular, Poisson-de Haro and Bitektine (2015: 332) mention that one of the Spanish electric utilities analysed in their study, Endesa, expressed as "its primary responsibility [as the one of] providing a stable and secure supply of electricity" to justify its lower commitment to environmental sustainability. Boscheck (1994: 114), instead relates security of supply to deregulation, and posits that "it appears [that] at no point in time since privatization had the security of supply been threatened" in the UK, thanks to the fact that both the incumbents and the independent power producers had increased or planned to increased their generation capacity. Henisz and Zelner (2005) instead, illustrate power blackouts as triggers for citizens' protests against foreign investors and for the retrenchment of privatization by the government as a consequence.

Security of supply is also linked to nuclear energy. Indeed, Banerjee and Bonnefous (2011: 130) include, among the positive features supportive stakeholders mention about nuclear energy, the fact that "the nuclear power industry can produce continuous energy". Similarly Patriotta et al. (2011: 1828) mention, as a key justification used by pro-nuclear stakeholders in Germany, the fact that "nuclear energy was crucial for enhancing Germany's energy autonomy".

Employment is another economic sustainability issue that raised interest, in particular when the focus of a study was on a specific power plant or energy technology. In the study by García-Marzá et al. (1999) the maintenance of employment and of job security is a key sustainable development issue emerging following the contestation of a coal plant's environmental performance. The study by García-Marzá et al. (1999) records, in the debate around the coal plant, the local authorities' and the plant workers' request for keeping the plant operational to safeguard the jobs created around it, as the Spanish region in which the plant was constructed "suffered the highest unemployment rate" (García-Marzá et al., 1999: 262). The jobs created around coal are also addressed by Boscheck (1994), although in a different perspective. Boscheck (1994) argues that UK electric utilities, which in a regulated environment had accepted un-economic fuel supply solutions in order to support other national (e.g. coal) industries, following deregulation and due to competitive pressures would have to revise their commitments, with consequent risks for employment in fuel extraction. This is in keeping with the argument that "a utility's pursuit of commercial interests is likely to reshuffle the distribution of welfare associated with its previously regulated mission" (Boscheck, 1994: 118).

While García-Marzá et al. (1999) and Boscheck (1994) relate employment to fossil fuel power plants, this sustainability issue is instead presented by Smith and Raven's (2012) study from the perspective of green energy sources. The argument of the creation of green jobs driven by solar PV is a component of the 'narratives' adopted by the advocate of PV to 'empower' this innovation and create a favorable environment for its emergence.

Relationships and tensions between different sustainable development issues

The research focusing on multiple sustainability issues and on their tensions is rather limited (see table 2.3).

Subject of the tension between sustainable development issues	**Type of tensions between sustainable development issues**	**Source(s)**
Nuclear energy	Low CO_2 emissions *vs.* radioactive wastes and safety problems	(Banerjee and Bonnefous, 2011; Patriotta et al., 2011)
Biogas	Low CO_2 emissions *vs.* higher food imports	(Markard et al., 2009)
Biomass	Low CO_2 emissions *vs.* high level of other types of emissions (e.g. mercury, heavy metal, dioxins, etc)	(Raven, 2006)
Coal power plant	Environmental degradation *vs.* Local employment and economic development	(García-Marzá et al., 1999)
Range of energy technologies available	Renewable energies: environmentally sustainable but cannot ensure security of supply Fossil fuels: environmentally unsustainable but ensure security of supply	(Poisson de-Haro and Bitektine, 2015)

Table 2.3: Tensions between sustainable development issues mentioned in the literature

Five, out of the seven studies identified, address the complexity related to sustainable development objectives with regards to a specific technology (Banerjee and Bonnefous, 2011; Markard et al., 2009; Patriotta et al., 2011; Raven, 2006) or a specific power plant (García-Marzá et al., 1999). Within this set of studies, Banerjee and Bonnefous (2011) and Patriotta et al. (2011) focus on the tensions inherent in **nuclear energy**: if on the one hand it is a clean energy source with regards to CO_2 emissions, on the other hand it is seen as a threat to the environment and to health due to the radioactive wastes it creates and to the uncertainty around its current and future safety. Both studies focus on the 'symbolic' management of these tensions around nuclear energy's sustainability by the focal nuclear power firm, as explained in more detail in section 2.4.3.

Markard et al. (2009) mention, yet without making it the focus of the study, the sustainable development-related tensions emerged around **biogas** in Switzerland. Biogas is seen as environmentally sustainable, in terms of emissions, however, as argued by Markard et al. (2009: 662), one of the possible inputs for biogas, i.e. "energy crops […] is a controversial environmental issue", causing a "discussion in Switzerland [on] whether energy crops should be supported by governmental subsidies while simultaneously food imports increase". The case described by Raven (2006) and concerning **biomass** co-firing, instead of showing a conflict between different sustainable development issues, illustrates a conflict within the issue of air pollution. On the one hand, biomass co-firing was supported and developed respectively by the government and the electric utilities as it reduced the fossil fuels employed for electricity generation, thus limiting CO_2 emissions. On the other hand, environmentalists and local communities opposed biomass co-firing due to the other kinds of emissions (e.g. mercury, heavy metal, dioxins etc) the combustion of biomass was permitted to produce, according to the standards for electricity generation.

García-Marzá et al. (1999) examine the sustainable development-related conflicts around a **coal power plant** in Spain. The study illustrates the conflicts and the search for solutions between actors denouncing the environmental degradation caused by the power station and those defending its importance for local employment and economic development.

Poisson de-Haro and Bitektine (2015) do not address sustainable development-related trade-offs emerging around a specific energy technology, but they highlight a key tension existing between **different energy technologies** an electric utility may employ. As consistent with environmental sustainability objectives, electric utilities have been called to invest increasingly in renewable energies, yet these cannot currently ensure security of supply, because they "depend on highly variable weather conditions" (Poisson de-Haro and Bitektine, 2015: 328). Conversely, fossil fuels are contested for environmental reasons, but are still crucial to ensure a secure and stable electricity supply (Poisson de-Haro and Bitektine, 2015). Endesa, whose power generation was largely based on fossil fuels, exploited this tension with the aim of maintaining an unchanged technical core. It thus chose a positioning which "was focused not so much on being perfectly 'green', but on being a 'guarantor' of stability of electric power supply throughout the country" (Poisson de-Haro and Bitektine (2015: 332). Particularly interesting is the following statement by Endesa reported by Poisson de-Haro and Bitektine (2015: 332):

> "For any utilities, the first objective is to make sure that its production mix guarantees its ability to provide continuously electricity (. . .) with the lowest impact on the environment. The

> trade-off is between the guarantee of providing electricity and respecting the environment. Renewable energies are great but you cannot guarantee your production only on them because without wind or little rain, you are in trouble".

A different type of relationship, not encompassing an explicit view of tensions between security of supply and environmental sustainability, is presented by Olerup (1999). As mentioned previously, security of supply is seen as occupying the first one of the 'four eras characterizing the Swedish energy sector' (Olerup, 1999), while in the following ones environmental concerns are increasingly represented. Olerup (1999) thus considers security of supply and environmental sustainability in sequence, while overlooking the way security of supply has been addressed in the following eras.

The review of the sustainability 'dimensions' encompassed by the literature on the electricity sector shows a degree of variety in the issues taken into consideration, the dominance of studies focusing on environmental sustainability and a very limited and incomplete analysis of the tensions between different sustainable development issues and of how electric utilities tackle them. Indeed, although, as illustrated in this section, scholars have made reference to critical relationships and trade-offs between sustainable development issues within and across energy technologies, they have not examined in depth how electric utilities address them over time.

2.4.2. An industry emergence or system perspective to sustainable development

A key stream of the literature examines the emergence of new, greener, technologies for electricity production from the perspective of new industry emergence (Pacheco et al., 2014; Russo, 2003; Sine and Lee, 2009) or of a technological system (Markard et al., 2009; Smith and Raven, 2012) (See Table 2.4). A relevant feature characterizing this set of studies is that the incumbent electric utilities are either not examined or they are integrated as only one of the actors in the new sector/system. The studies thus provide insights on the impact of new, greener energy technologies on the electricity sector, by highlighting different degrees of transformation of the electricity sector (Markard et al., 2009; Smith and Raven, 2012) and the emergence of new types of electricity producers (Markard et al., 2009; Pacheco et al., 2014; Russo, 2003; Sine and Lee, 2009; Smith and Raven, 2012).

More specifically, Pacheco et al. (2014); Russo (2003), and Sine and Lee (2009) associate the introduction of a novel sustainable technology in the electricity sector with the emergence of a new industry, the US **wind** energy industry, and of a new type of electric power generator; independent producers of energy from wind installations.

Within this framework, the focus of Russo (2003) differs from the one of Pacheco et al. (2014) and of Sine and Lee (2009).

New sustainable energy technology	Impact on the electricity sector/system
Wind	Emergence of a new industry (wind energy industry) and of a new type of electricity generator: independent producers of energy from wind installations (Pacheco et al., 2014; Russo, 2003; Sine and Lee, 2009).
Solar PV	Maintenance of a centralized energy generation system, with utilities as electricity generators from solar PV (Smith and Raven, 2012: 1033). Emergence of a decentralized solar energy generation system, with "households, community groups, new energy companies as well as utilities with new business models all becoming producer-consumer in this new energy system" (Smith and Raven, 2012: 1033).
Biomass co-firing	Five possible models based on the 'actor groups' engaged in energy generation from biomass and on their 'tasks': farmer, manufacturer, waste company, utility and newcomer model (Markard et al., 2009).
Green energy technologies	Entry in the electricity sector of new actors producing electricity from novel greener technologies (Sine and David, 2003)

Table 2.4: Overview of the literature adopting an industry emergence or system perspective to sustainability

Russo (2003), the first among the studies reviewed, studying the emergence of the wind energy industry, demonstrates the influence of natural, economic and social factors on the establishment of wind energy projects. In particular, by focusing on California, Russo (2003: 321) shows the impact both of "the interaction of the wind speeds in a county and project economics" and of the degree of concentration of wind energy projects within the 'county' on the establishment of wind projects in that county.

Both Pacheco et al. (2014) and Sine and Lee (2009) examine the relationship between environmental NGOs, institutions and the wind energy industry emergence. The key driver of the energy industry emergence is represented by NGOs' work of delegitimization of 'current methods of electricity generation' (Since and Lee, 2009) (i.e. coal, oil and nuclear) and 'valorization' of wind energy by framing it as an environmentally sustainable technology (Since and Lee, 2009). NGOs affected the emergence of the US wind energy industry both directly, by motivating and supporting wind energy 'entrepreneurs', and indirectly, by calling for regulations more favourable to wind energy (Sine and Lee, 2009). As illustrated by Pacheco et al. (2014), in turn the growth of the wind industry fostered by NGOs drove the development of 'technology-focused' NGOs, which have been critical for boosting the change of norms and regulations in favour of wind energy, thanks to their capabilities in clean energies.

While Pacheco et al. (2014), Russo (2003), Sine and Lee (2009) take an industry emergence perspective, Markard et al. (2009) and Smith and Raven (2012) adopt a 'systemic' approach to the expansion of novel, green technologies for electricity generation. With their studies, they signal that the development of new sustainable technologies can engender different degrees of transformation of the electricity sector, both from a technological perspective, in terms of the shift from a centralized to a decentralized power supply, and from an organizational perspective, in terms of the type of actors in charge of electricity generation from these new technologies.

Smith and Raven (2012) examine the 'protective space' created around the path-breaking sustainable innovation of **solar PV** and its role in innovation 'empowerment'. Empowerment is described by Smith and Raven (2012) as a political process which is enacted by networks of actors through narratives and can take two forms: 'fit and conform' and 'stretch and transform'. While the former implies making an innovation competitive 'under conventional, incumbent regime terms', the stretch and transform empowerment of innovations consists in "undermin[ing] incumbent regimes and transmit[ing] niche-derived institutional reforms into re-structured regimes" (Smith and Raven, 2012: 1030). As regards solar PV, the solar advocates adopting a fit-and-conform narrative urged electric utilities and regulators to support a "centralized form of PV socio-technical configuration", maintaining that it would "provide scale economies that will result in grid-parity with conventional electricity generation technologies" (Smith and Raven, 2012: 1033). Conversely, advocates using a stretch-and-transform approach promoted 'small solar PV units', thus a decentralized energy generation system, with "households, community groups, new energy companies as well as utilities with new business models all becoming producer-consumer in this new energy system" (Smith and Raven, 2012: 1033).

The possibility that the development of an innovative, sustainable, technology unfolds through different degrees of change to the existing socio-technical regime of electricity generation also emerges in Markard et al. (2009), which explores the 'development options' of **biomass** anaerobic digestion and of its outcome, biogas, in Switzerland. Biomass anaerobic digestion, while an established technology in other fields, "significantly deviates from the existing energy supply system for electricity […] mainly because it draws on a new type of energy source and represents a decentralized energy supply" (Markard et al., 2009: 660). The development of biogas in Switzerland presents both technological and organizational variations. While the technological variants of biogas plants are based on the substrate, energy output, operating mode, plant size and location, organizational variation unfolds in five models, based on the combination of 'tasks' and 'actor groups': farmer, manufacturer, waste company, utility and newcomer model. Combining technological and organizational variations to

identify the most 'promising' development options, Markard et al. (2009) identify significant opportunities in the combination encompassing the utility, waste and newcomer models, with uncertainty regarding the future role of the farmer model, which was the dominant one for electricity generation from biogas, at the time of the study.

Although not adopting an industry emergence or system perspective, Sine and David (2003) do highlight the change the US electricity sector has undergone, due to the emergence of new actors generating electricity through novel, **green energy technologies** following deregulation. According to Sine and David (2033: 204), the monopoly structure had "led to a series of strategies that overlooked […] decentralized generation technologies, such as most green power alternatives". The crisis of this structure and the gradual deregulation of the sector created "entrepreneurial opportunities to implement technical power generation alternatives" (Sine and David, 2003: 204), thus driving the entry, in the electricity sector, of new electricity producers and the rise of production through renewables and cogeneration.

The studies reviewed in this section show that the introduction of a greener energy generation technology may engender a more or less radical change in the electricity sector. This can entail the emergence of new industries, of new types of power producers and of a new kind of energy supply system.

2.4.3. Electric incumbents' approaches to sustainable development

The management literature has created a range of taxonomies of firms' approaches to sustainable development and corporate social responsibility. The most widely applied classification is the one developed by Carroll (1979), which includes four main categories distributed along a continuum from 'do nothing' to 'do much': reaction, defence, accommodation and proaction. As a number of studies examine electric incumbents' responses and practices with regards to sustainable development, they have been analysed through the lens of Carroll's (1979) classification, enriched by its interpretation in studies on corporate sustainability (e.g. Bansal and Roth, 2000; Slawinski and Bansal, 2012). The association between incumbents' practices and Carroll's (1979) categories has been made by following two main steps. First, the statements describing the electric incumbents' responses and practices in the studies have been identified. Then these statements have been compared with the definitions of Carroll's (1979) categories. Based on their consistency between statements and definitions, electric incumbents' practices have been associated to a specific approach. More detailed information on this topic is presented in the following paragraphs. Since the studies have also identified factors or mechanisms triggering electric utilities'

approach to sustainable development, both approaches and their drivers have been highlighted and summarized in Table 2.5.

Approaches to sustainable development	**Key features of the approaches adopted**	**Drivers**
Reactive	• No commitment to greener practices but renewed investment in electricity generation from conventional energy sources (Kim, 2013) • Opposition to the introduction of new, more sustainable energy technologies (Markard and Truffer, 2006) • Disengagement from commitments towards employment and fuel poverty (Boschek et al., 2006)	• Deregulation (Boscheck, 1994; Kim, 2013) • Monopoly (Markard and Truffer, 2006) • Prior resource configuration / Technical core (Kim, 2013)
Defensive	• 'CO_2 compensation' (Weinhofer and Hoffmann, 2010) • 'Conflict with commerce', 'business as usual' or 'management deliberation' responses to social obligations (Sharrat et al., 2007) • Symbolic management of emission reduction (Poisson-de Haro and Bitektine, 2015) • Symbolic management of energy efficiency (Olerup, 1999) • Symbolic management of opposition to nuclear energy (Banerjee and Bonnefous, 2011; Beelitz and Merkl-Davies, 2012; Patriotta et al., 2011)	• Technical core (Olerup, 1999; Poisson-de Haro and Bitektine, 2015) • Non-market capabilities (Poisson-de Haro and Bitektine, 2015) • Economic criteria (e.g. cost reductions, efficiency gains and customer preferences) (Banerjee et al., 2011)
Accomodative	• CO_2 reduction strategy (Hoffmann et al., 2007; Hoffmann et al., 2009; Weinhofer and Hoffmann, 2010) • Combination of CO_2 reduction and work towards carbon independence (Weinhofer and Hoffmann, 2010) • Combination of CO_2 compensation and carbon independence (Weinhofer and Hoffmann, 2010) • Combination of CO_2 reduction, CO2 compensation and work towards carbon independence (Weinhofer and Hoffmann, 2010) • Investment in biomass co-firing technology (Raven, 2006) • R&D for CO_2 emissions reduction through participation in wider	• Regional affiliation (Weinhofer and Hoffman, 2010) • Size (Weinhofer and Hoffman, 2010) • Absolute CO_2 emissions (Weinhofer and Hoffman, 2010) • Technical core rigidity (Poisson de Haro and Bitektine, 2015) • Institutional pressures for sustainable development (Hoffmann et al., 2009; Poisson de Haro and Bitektine, 2015) • Securing competitive resources (Hoffmann et al., 2009) • Leveraging complementary resources (Hoffmann et al., 2009) • Economic criteria (cost reduction) (Marcus and Geffen, 1998)

	research programs rather than through development of autonomous projects (Hoffmann et al., 2007)	• Regime instability (Raven, 2006) • Flexibility of the energy technology (Watson, 2004)
Proactive	• CO_2 independence (Weinhofer and Hoffmann, 2010) • Development of a 'green technical core' (Poisson-de Haro and Bitektine, 2015) • Adoption of the 'renewable case' (Olerup, 1999) • Environmental differentiation (Delmas et al., 2007) • Investments in renewables 'before statutorily required' (Fremeth and Shaver, 2014) • 'Embracing social initiatives' (Sharrat et al., 2007)	• Technical core / prior resource configuration (Delmas et al., 2007; Kim, 2013; Olerup, 1999; Poisson de Haro and Bitektine, 2015) • Productive efficiency (Delmas et al., 2007) • Deregulation (Delmas et al., 2007; Markard and Truffer, 2006) • Institutional pressures for sustainable development (Poisson de Haro and Bitektine, 2015) • Stringency of environmental regulation faced by peers in other jurisdictions (Fremeth and Shaver, 2014) • Market dependence (Pacheco and Dean, 2015) • Citizens' environmental sensitivity (Delmas et al., 2007) • Citizens' actual green demand (Kim, 2013) • Market opportunity (Sharrat et al., 2007) • Competitors' actions in accordance to NGO pressures (Pacheco and Dean, 2015) • NGO pressures (Pacheco and Dean, 2015)

Table 2.5: Drivers of electric incumbents' approaches to sustainable development

Reactive approach

Reactive electric utilities do not respond and/or "resist responding to social and environmental issues" (Slawinski and Bansal, 2012: 1539). Among the studies reviewed, three (Boscheck, 1994; Kim, 2013; Sharrat et al., 2007) illustrate the adoption of this type of approach by electric utilities. More specifically, Kim (2013) describe a reactive response of US electric incumbents with regards to environmental sustainability. Examining the impact of both wholesale and retail deregulation on electric incumbents' investments in renewable generation, Kim (2013: 1166) observes that both types of deregulations are "associated with lower entry into the renewable generation market".

This, according to Kim (2013) is due to the fact that deregulation engenders price competition, thus the electric incumbents with higher capabilities in fossil fuel generation would be more likely to "focus on their relative strength – low-cost and

large-scale electricity generation from traditional sources, such as coal or nuclear –" (Kim, 2013: 1167) than to invest in new and more expensive (greener) technologies.

Boscheck (1994), as illustrated in section 2.4.1., identifies electric utilities' potential reactive approach to social and economic responsibility as among the effects of deregulation. According to Boscheck (1994), key impacts of deregulation concern the firms' disengagement from their commitments towards national employment and from their support for disadvantaged customers.

While Kim (2013) and Boscheck (1994) refer to reactive responses in a liberalized market, Markard and Truffer (2006) describe this type of approach as adopted under monopoly conditions. In this situation, Markard and Truffer (2006: 620) argue that "public authorities had the task to represent interests of consumers and citizens, e.g. with regard to electricity prices, technology choices, security of supply or environmental issues". Electric incumbents generally contested the adoption of new technologies for electricity generation (nuclear, combined cycle gas turbine (CCGT) or wind), even if they were more sustainable. This suggests that under monopoly conditions, these innovations had to be promoted and imposed by the government.

Defensive approach

Electric utilities' defensive approach to sustainable development is limited to 'do[ing] only what is required' and/or to adopting a 'public relations approach' (Carroll, 1979). The electric utilities seeking to 'minimize risks and costs' (Bansal and Roth, 2000) through mere compliance with external pressures and/or through symbolic management fall in this category. A defensive response is identified by the studies in relation to different sustainability issues.

With regards to climate change, Weinhofer and Hoffmann (2010) identify a defensive approach among the 'CO_2 strategies' adopted by electric utilities to tackle it. This strategy, named '**CO_2 compensation**', consists of "the action taken by a company to balance or offset its CO_2 emissions, such as buying CO_2 credits or enhancing carbon sinks" (Weinhofer and Hoffmann, 2010: 80). This can be considered a defensive strategy because it allows electric utilities "to decrease the pressure to reduce their own emissions but do[es] not solve the underlying cause of such pressure" and it "tend[s] to be focused on the short term" (Weinhofer and Hoffmann, 2010: 80).

For what concerns incumbents' responses to fuel poverty, Sharrat et al. (2007) identify three responses which can be considered to consist of a defensive or, to a limited extent, an accommodative orientation. UK electric utilities adopting the orientation called '**conflict with commerce**' (Sharrat et al., 2007) maintained that the government's establishment of social obligations threatens the fulfilment of

shareholders' demands and the maintenance of the firms' competitive advantage. These electric utilities contested the view that fuel poverty was their responsibility and argued that it should be addressed by the government as a 'welfare issue'. However, none of the utilities identified by Sharrat et al. (2007: 1517) as belonging to this category "said that their company intended to minimize or avoid the delivery of social obligations". Another group comprise electric utilities adopting a '**business as usual**' orientation. These firms "had reviewed their policies and practices and where necessary were acting to enhance services or were intent on complying with the regulatory obligations", but with "little or no proactive intervention" (Sharrat et al., 2007: 1514). The third group of electric utilities, which adopted a rather passive orientation named '**management deliberation'**, had not developed a clear response to social obligations yet and focused on assessing "the balance between risks and opportunities from social action" (Sharrat et al., 2007: 1516).

As mentioned above, a defensive approach to sustainable development can also involve a **symbolic response**. This "allow[s] firms to demonstrate their legitimacy and commitment to the social norms (Ashforth and Gibbs, 1990; Meyer and Rowan, 1977; Powell, 1988)", while at the same time excluding the costs related to "changes in their operations (Figge and Hahn, 2005), technologies and structures" (Poisson-de Haro and Bitektine, 2015: 327). A set of studies (Banerjee and Bonnefous, 2011; Beelitz and Merkl-Davies, 2012; Olerup, 1999; Patriotta et al., 2011; Poisson-de Haro and Bitektine, 2015) show that electric incumbents may not address pressures for sustainability through concrete changes to their practices but they may limit their actions to framing their current activities, in order to legitimize them with their stakeholders. Based on the literature reviewed, Endesa, Stockholm Energi, Vattenfall and an undisclosed French nuclear energy company have adopted symbolic management responses to pressures for sustainability.

The case of Endesa is particularly interesting and illustrated by Poisson-de Haro and Bitektine (2015). Despite the pressures to fight climate change, Endesa managed to keep its generation capacity, mainly coal and oil plants, unchanged over the period examined (2002-2007), with no real engagement in emission reduction. Its response as regards environmental sustainability was thus only symbolic, entailing the exploitation of its "strong capability in government relations, proactive management of environmentalist groups, and [its] importance for the country's economy" (Poisson-de Haro and Bitektine, 2015: 335). As illustrated in section 2.4.1., Endesa promoted itself as "guarantor of stability of electricity supply throughout Spain" (Poisson-de Haro and Bitektine, 2015: 335), with the aim of maintaining its fossil fuel-based capacity. Endesa's response to pressures for emissions' reduction was thus driven, on the one hand, by its technical core and, on the other hand, by its non-market capabilities,

which allowed the Spanish firm to maintain its legitimacy despite the absence of substantive commitment to environmental sustainability.

Stockholm Energi, a Swedish electric utility studied by Olerup (1999), is another case of a defensive response, although with regards to a 'component' of an electric utility's approach to environmental sustainability. Stockholm Energi, which, differently from Endesa, was quite proactive in substituting fossil fuels with renewables (see 'Proactive' section), instead proved rather defensive in terms of committing to increasing the efficiency of energy use (i.e. to embrace the 'efficiency case'). As argued by Olerup (1999), this was caused by the considerable changes that would be needed to implement the efficiency case, due to the potential conflict between Stokholm Energi's core business, relying on energy sales, and energy efficiency. As a consequence, Stockholm Energi's "efficiency efforts stayed at a symbolic level, while renewables moved on to action" (Olerup, 1999: 70).

Three studies focus on electric utilities' symbolic responses regarding specific energy technologies which are not strongly legitimized as sustainable, or whose sustainability is questioned after a disruptive event. Interestingly, three out of the four studies examining electric utilities' symbolic management are focused on nuclear energy (Banerjee and Bonnefous, 2011; Beelitz and Merkl-Davies, 2012; Patriotta et al., 2011) and two of them address the contestation of this energy source after an accident occurred to a nuclear plant (Beelitz and Merkl-Davies, 2012; Patriotta et al., 2011). Both studies analyse the symbolic response of a Swedish nuclear power firm, Vattenfall, after a nuclear incident to one of its plants. In particular, Beelitz and Merkl-Davies (2012) examine Vattenfall's symbolic management to restore nuclear energy's legitimacy following an incident to one of its German plants. They show that Vattenfall first adopted a 'technocractic response', by using facts and figures to curtail the accident's significance. Due to the protests of anti-nuclear stakeholders, this response was replaced by a 'stakeholder engagement' response. However, Vattenfall is argued to have embraced a stakeholder engagement approach to "signal[…] a change in stakeholder orientation, yet maintaining the status quo" (Beelitz and Merkl-Davies, 2012: 115).

While Beelitz and Merkl-Davies (2012) assign limited attention to the 'rationales' mobilized by Vattenfall to legitimize nuclear energy, these are instead explored by Patriotta et al. (2011), through the lenses of the 'orders of worth'. These are "higher order principles that structure social spheres and can be mobilized […] to resolve disputes between actors" (Patriotta et al., 2011: 1809). Facing a dynamic and 'multi-polarized' debate and a 'collision of multiple orders of worth' mobilized by stakeholders to (de)legitimize nuclear energy, Vattenfall's first response was limited to

'a technocratic defence' (Patriotta et al., 2011), analogously to the response observed by Beelitz and Merkl-Davies (2012). This response was then replaced by the mobilization of a more balanced mix of orders of worth, aiming to achieve a compromise with the different German stakeholders. Vattenfall's justification increasingly encompassed the legitimization of nuclear energy as cheaper energy source (market rationale), as contributor to 'solving the problem of energy in Germany' (civic rationale), as critical for 'enhancing Germany's energy autonomy' (domestic rationale), but interestingly, with limited reference to nuclear as a green energy source (green rationale).

Different from Patriotta et al. (2011), who illustrate the electric utility's symbolic management as aimed to maintain nuclear energy's legitimacy, Banerjee and Bonnefous (2011) connect symbolic management explicitly to the firm's goal of 'sustain[ing] its economic growth strategy'. In particular, according to Banerjee and Bonnefous (2011: 127), "corporate sustainability strategies developed and implemented through stakeholder management tend to be driven by economic criteria with mainly symbolic gestures to environmental and social sustainability". In order to manage its different stakeholders, the French nuclear power firm adopted targeted symbolic management strategies. To strengthen the backing of supportive stakeholders, the firm used a 'reinforcement strategy' that sought to frame nuclear energy as 'clean, safe and efficient' (Banerjee and Bonnefous, 2011). It adopted a 'containment strategy' with obstructive stakeholders, in order to isolate them and reduce their influence. This consisted of organizing 'stakeholders' sessions', of framing nuclear plants as cleaner than coal power stations and of denouncing obstructive stakeholders' practices as illegal. Finally, 'stabilization strategies' were adopted to reassure passive stakeholders' by designing communication campaigns to promote nuclear energy as clean and safe. While the French nuclear firm also adopted concrete actions that seemed to address sustainability concerns, according to Banerjee and Bonnefous (2011), the fact that these initiatives were only taken based on economic criteria makes the 'transition to sustainable development' symbolic, given that the initiatives were not supported by change in the firm's business model.

Accommodative approach

Electric utilities adopting an accommodative approach "go beyond compliance" (Slawinski and Bansal, 2012) and embrace a longer term perspective than those committed to a defensive response, yet they do not take a leadership role in their actions towards sustainable development. For example, electric utilities adopting an accommodative approach are more committed to CO_2 reduction rather than to

independence from carbon sources. A set of studies, discussed in the following paragraphs, illustrate electric utilities' accommodative approach to sustainability.

An accommodative response, labelled by Weinhofer and Hoffmann (2010) as a '**CO_2 reduction strategy**', is one of the possible ways to manage climate change. Electric utilities adopting this orientation "change production processes and products with a view to lowering their CO_2 emissions" (Weinhofer and Hoffmann, 2010: 80). Weinhofer and Hoffmann (2010: 81-82) identify three ways in which CO_2 reduction can be attained: replacing carbon intensive power stations with plants using "less carbon intensive fuels (e.g. gas instead of coal) and/or […] improved technologies (e.g. integrated gasification combined cycle […])"; "changing the fuel in existing fossil fuel power plants, either totally (e.g. gas instead of coal) or by co-firing CO_2-neutral energy sources such as biomass"; increasing existing fossil fuel plants' efficiency.

An accommodative approach can also be seen for those electric utilities adopting a combination of CO_2 strategies (Weinhofer and Hoffmann, 2010). These can consist of "engag[ing] in activities to **reduce CO_2 emissions and also work towards gaining independence** from carbon resources", in **combining CO_2 compensation and independence**, or in **committing concurrently to CO_2 compensation, CO_2 reduction and work towards CO_2 independence** (Weinhofer and Hoffmann, 2010: 80). Weinhofer and Hoffmann (2010) demonstrate the impact of electric utilities' 'regional affiliation', size and absolute CO_2 emissions on their CO_2 strategies. In particular, Weinhofer and Hoffmann (2010: 86) show that the proportion of firms adopting concurrently CO_2 compensation, CO_2 reduction and work towards CO_2 independence, "is significantly higher in the EU and Japan and significantly lower in the US compared to the worldwide sample". The study also signals that these type of firms have on average a larger size and higher CO_2 emissions than the firms adopting other strategies.

An accommodative approach by electric utilities to the reduction of CO_2 emissions also emerges in Hoffmann (2007), who explores the impact of the EU ETS on German electric utilities' investment decisions. While the EU ETS are found to have an influence on electric utilities in terms of the integration of CO_2 allowance prices in their strategic decisions, "actual technological changes induced by the EU ETS seem to be moderate at best" (Hoffmann, 2007: 472). The study shows that German electric companies continue to invest in coal- and lignite-fire power plants, making "low carbon investments with limited risks", for example retrofit investments that improve the performance of existing plants, or "investments with an inherent option character (R&D)" (Hoffmann, 2007: 472). Hoffmann (2007) observes a strong commitment of German electric companies in R&D to reduce CO_2 emissions, however this is

channelled through the participation in wider research programs more than in the development of autonomous projects. The German electric utilities' R&D efforts seem "driven by the insight that large CO_2 reductions are inevitable in the long term" (2007: 469) rather than by the EU ETS. Investments in large-scale projects with long payback periods are as yet limited, in particular due to the uncertainties related to the future of the EU ETS and to other issues (e.g. increase in gas prices).

The accommodative approach adopted by German electric utilities seems to also be confirmed by Hoffmann et al. (2009), who focuses on the impact on their investment decisions of the uncertainty associated with the EU ETS. Hoffmann et al. (2009: 1246) argue that three motivations, i.e. "securing competitive resources, leveraging complementary resources, and alleviating institutional pressure", led electric companies to not postpone and, in some cases, even to accelerate investments for CO_2 emission reduction, despite regulatory uncertainty. Yet the examples provided by Hoffmann et al. (2009) suggest that the investments were mainly intended to realise performance improvements of existing conventional plants or for R&D in carbon capture and storage. A CEO's quote illustrates this response well: "We want to position lignite as sustainable. Thus we have to invest in new technologies…We need to position modern lignite in order to attract trainees" (Hoffmann et al., 2009: 1246).

A situation where electric utilities exceed compliance, by adopting **pollution prevention**, yet remain within the boundaries of emissions' reduction, is illustrated in Marcus and Geffen's (1998: 1146) study of "the [US] electric utility industry's responses to the 1990 amendments to the Clean Air Act". The response of the US electric utilities is seen as resulting from a dialectic process for change, where the thesis is represented by the government goals for emission reduction and the antithesis is market competition, which generates variations and retentions of technological options for emission reduction (Marcus and Geffen, 1998). Indeed, on one side, the US government supported the implementation of 'end of pipe solutions', because even if they conflicted with a pollution prevention objective, they allowed the maintenance of a balance between US federal states' interests. On the other side, contrary to the government's instructions, the electric utilities committed to reduce emissions by investing in lower-sulphur coal and, increasingly, gas plants, considering them 'more efficient' solutions than end-of-pipe ones. Thus in Marcus and Geffen (1998) the accommodative approach of electric utilities emerges from the market's outdoing of the government's requests for cost reduction reasons. Efficiency motives therefore triggered the choice for pollution prevention instead of end of pipe solutions of the pollution problem.

Among others, cost-related reasons seem to also drive Union Fenosa's accommodative approach to sustainable development, as illustrated by Poisson-de Haro and Bitektine (2015). As Union Fenosa's core electricity generation technology was coal, the greening of its capacity, in which the firm nevertheless strongly engaged, resulted necessarily in a long term process. In order to "compensate for the illegitimacy of its technical core" (Poisson-de Haro and Bitektine, 2015: 336), the company thus started focusing on "**'green' projects outside the technical core**", consisting of the promotion of energy efficiency among its customers, vocational training and the construction of 'greener' power stations in developing countries. Union Fenosa's response to global pressures for environmental sustainability was thus strongly affected by the rigidity of its technical core, i.e. "the difficulties and costs associated with changes to [the] firm's technical core" (Poisson-de Haro and Bitektine, 2015: 336).

The technical core seems to also play a role, at least initially, in the development of **biomass co-firing** illustrated by Raven (2006). Dutch electric utilities in the late 1990s faced a destabilization of the existing 'electricity regime', driven by climate change regulations, the emergence of a green market and liberalization policies (Raven, 2006). Investing in the co-firing technology, which allowed biomass combustion within existing, originally coal-fired, plants, seemed a 'problem solver' to electric utilities, both in terms of costs and of market opportunities. Biomass co-firing was also increasingly supported by the Dutch regulators, because it was in keeping with targets for emission reduction and renewable energy targets (Raven, 2006). While the electric utilities initially co-fired biomass with no or limited modifications to the existing coal plants, over the years they made more substantial adjustments, with the aim of improving the performance of the biomass 'combustion process' (Raven, 2006). This was driven on the one hand by the decreasing stability of the electricity regime and, on the other hand, by the emergence of visions, expectations and networks around biomass co-firing. The increased commitment of electric utilities to biomass co-firing could thus be seen as an accommodative approach, since gradually "the alternative trajectory branched out of the dominant trajectory of coal firing and [became] more radical along the innovation journey" (Raven, 2006: 592).

An electric utility adopting an accommodative approach to environmental sustainability has the choice between different types of energy technologies. Watson (2004: 1065) explored why, in a period of "increased emphasis on environmental protection", faced with "two fossil fuel power generation technologies that both produce cleaner electricity", CCGT and fluidized bed boiler, electric utilities invested more heavily in the former than in the latter. Analysing how the two technologies developed internationally, Watson (2004) argued that the key driver of CCGT's success as the 'electricity industry's technology of choice' was its flexibility. Indeed, the

multiple applications of the gas turbine, CCGT's core technology, and the possibility to benefit from technological improvements attained in other sectors encouraged electric utilities to concentrate significant investments on CCGT. Watson's (2004) study therefore provides another interesting perspective on electric utilities' response to pressures for sustainability. Investment decisions might not only be driven by the current technical core, but also by the given availability of different clean(er) technologies, flexibility and potential synergies with other sectors may play a role.

Proactive approach

A number of studies describe electric utilities' adoption of a 'proactive' approach. It should be noted that in some of the literature it is not clear what share sustainable practices (e.g. investments in renewables) represent within the whole set of electric utilities' activities or investments (e.g. in electric utilities' energy portfolio). However, we associate them with a proactive approach when the activities illustrated appear consistent with a longer term perspective, are not the results of mere compliance with regulations and when they are more socially and/or environmentally sustainable than those adopted by accommodative firms, as in the case of investments in renewables.

Weinhofer and Hoffmann (2010) identify a proactive response, called '**CO_2 independence**', among the strategies electric utilities can adopt for climate change. This strategy represents a proactive orientation because it focuses on a longer time horizon and consists of "tak[ing] measures that transform business operations towards achieving independence from fossil resources, i.e. [to] substitute carbon resources with non-carbon resources such as renewables" (Weinhofer and Hoffmann, 2010: 80). Yet, no electric utility among those examined by Weinhofer and Hoffman (2010), emerges as adopting only a CO_2 independence strategy, but the most proactive ones adopted a combination of CO_2 strategies and worked towards carbon independence (see 'Accomodative' section).

Poisson-de Haro and Bitektine (2015) show that, for electric utilities, being proactive does not necessarily mean undergoing a radical strategic change. Indeed, Iberdrola's 'green positioning' (Poisson-de Haro and Bitektine, 2015), which the other electric utilities could not match, was made possible through relatively limited incremental investments. Iberdrola, originally a hydroelectric power firm, could become leader in terms of independence from carbon sources by building on its existing **'green technical core'** and by exploiting this advantage to secure governments' subsidies for renewables. Also Olerup (1999) relate Stockholm Energi's proactive approach as regards renewables to the firm's technical core. As mentioned previously, Stockholm Energi has adopted a rather defensive response as regards energy efficiency, but has embraced fully the '**renewable case**'. Stockholm Energi's "renewables moved on to

action" (Olerup, 1999: 70), because the renewable case matched the electric utility's core business, which was based on selling energy. As argued by Olerup (1999: 72), "the pattern of response depended on whether the pressures from outside conformed to the rational aspects of the technical core".

Some studies (Delmas et al., 2007; Markard and Truffer, 2006) indicate deregulation as a driver of a proactive approach to sustainable development. In particular, Delmas et al. (2007: 205) find that US electric utilities in response to 'the early stages of deregulation' adopt '**environmental differentiation**' strategies, which "blend together traditional differentiation strategies with an element of conscious contribution to the common good". According to Delmas et al. (2007), while in a regulated industry electric utilities had no incentives to innovate and exploit differences between customers, with deregulation, 'new freedoms' and increasing competition, electric incumbents started differentiating through the supply of green power, as a means of gaining a competitive advantage. While deregulation acted to trigger environmental differentiation, the adoption of this proactive strategy was shown to be less likely for more efficient electric utilities and for those with an existing coal-based technical core. Conversely, in the US states with a more environmentally sensitive population electric utilities were more likely to invest in environmental differentiation. As mentioned in the 'reactive approach' section, Kim (2013) observed an opposite impact of deregulation on electric incumbents' commitment to environmental sustainability. Yet, similarities with Delmas et al. (2007) study consist in the relevance of the technical core and of the citizens' characteristics. Indeed, Kim (2013) observed that incumbents 'with previous investments in renewables' and those facing 'greater actual green demand' are more likely to invest in renewables under deregulation.

Similar to Delmas et al. (2007), Markard and Truffer (2006) illustrate a proactive approach to environmental sustainability in liberalized markets. Markard and Truffer (2006) argue that under deregulation customers have the power to affect the innovation process in the electricity sector, by selecting or negotiating the electricity supply offer they prefer. This, together with the will to not be "swept away by a new technology", and to possibly gain a competitive advantage, has driven incumbents to engage in more radical innovations. As shown by the case of fuel cells illustrated in Markard and Truffer (2006), radical innovations can also take place in clean technologies.

Fremeth and Shaver (2014) and Pacheco and Dean (2015) identify other factors affecting electric utilities' investments in renewable energies. Fremeth and Shaver (2014) examine the impact of stringent environmental regulations (i.e. renewable portfolio standards), faced by peers (i.e. 'firms in the same regulatory jurisdiction') in

other jurisdictions on US electric utilities' **investments in renewables 'before statutorily required'**. The study shows that electric utilities "adopt[ed] more renewable-power generation when their peers […] face[d] greater renewable-power standards in other jurisdictions" (Fremeth and Shaver: 629). However, interestingly electric utilities did not respond to policies established in neighbouring states or 'imitate' their peers' environmental performance. Instead, they adopted a forward-looking behaviour, when they "chose to take costly action consistent with how those peers would be statutorily bound elsewhere" (Fremeth and Shaver, 2014: 646). Pacheco and Dean (2015) instead show that strategic factors, i.e. competitors' actions and market dependence, 'can take precedence' over NGO pressures in motivating electric utilities to invest in wind energy. Specifically, Pacheco and Dean (2015: 1098) demonstrate that increases in NGO pressures "are positively related to the probability of adding new wind power for firms confronting little to average competitor adoption of wind power". Conversely, when competitors have a greater degree of wind power activity, higher NGO pressures have a lower impact on electric utilities' wind power investments. The study also finds that the positive relationship between NGO pressures and the likelihood of electric utilities' investments in wind energy is higher 'at low levels of market dependence', i.e. at low levels of dependence of a firm's revenue on a specific US state. Thus, NGO pressures have lower influence on the wind power investments of electric utilities with high dependence on a specific market.

While the studies reviewed focus on electric utilities' proactive approach to environmental sustainability, Sharrat et al. (2007) identify electric utilities adopting a proactive stance to social responsibility, which they name '**embracing social initiatives'**. Proactive electric utilities, confronted with social obligations, 'embrace' them, because they see "disadvantage[d] consumers [as] a potentially untapped market worth pursuing, giving prospects for market leadership and growth in terms of customer retention and acquisition" (Sharrat et al., 2007: 1512). As stated by Sharrat et al. (2007:1513), these firms adopting 'social differentiation' (Delmas et al., 2007) are "seen as proactive in the delivery of new products and services" to disadvantaged customers.

Reflections on incumbents' responses based on the literature review

The review of the literature addressing electric incumbents' responses to sustainable development leads to three main considerations. First, electric incumbents have faced in the last decades environmental, social and economic sustainability-related demands and they have adopted different approaches to tackle them. The focus of the studies has however largely been on the firms' response to one sustainability issue, e.g.

climate change, overlooking thus the sustainability-related complexity electric utilities have been confronted with and their responses to this complexity.

Second, a key factor of electric incumbents' responses to sustainability-related demands seems to be the liberalization of the sector. A connection thus seems to emerge between sustainable development and deregulation/privatization. However, the literature reveals a contested picture of the impact of deregulation and privatization on electric utilities' engagement in sustainable development. Also, limited attention is given to the potential contradictions between a process like deregulation that reduces government intervention on electric incumbents' behaviour and the issuing of regulations imposing them sustainable practices.

Third, almost all the studies take a rather 'static' perspective to electric incumbents' responses to sustainable development. Very scant attention is given to the changes and the evolution of electric utilities' responses to sustainable development issues over time. For example, it is not clear whether and to what extent the symbolic management response adopted by Endesa and its decision to focus on ensuring security of supply, is viable in the longer term, given the rising pressures for environmental sustainability. Similarly, Stockholm Energi's defensive approach with regards to energy efficiency does not capture electric utilities' rising investment in energy efficiency-related services observed in the last years; partly this may be due to the fact that the study is from 1999. It thus seems that the literature on electric incumbents' responses to sustainable development has mainly focused on a specific point in time and has given limited attention to the radical transformation the electricity sector has been undergoing, highlighted in section 2.4.2.

2.5. DISCUSSION AND CONCLUSION

The literature review conducted in this chapter highlights the interesting and varied nature of the research on the electricity sector and sustainable development. In particular, the analysis of the sustainable development issues addressed in the selected studies shows that the electricity sector has raised scholarly attention regarding diverse environmental, social and economic sustainability concerns. Furthermore, a number of studies, with their focus on the emergence of new kinds of power producers and/or of new subsectors, have highlighted the sustainable development-driven radical transformation the electricity sector has undergone in the last decades. In addition, the review of the research conducted on electric incumbents' approach to sustainable development has pointed to the adoption of heterogeneous behaviours and strategies with regards to environmental, social and economic sustainability objectives.

As signalled in the previous sections of the chapter, the literature review also reveals the existence of unexplored areas deserving further investigation. I have identified three main avenues for research on the electricity sector and sustainable development which are discussed in the following paragraphs: (1) a cross country perspective to electric incumbents' responses to sustainable development challenges (2) the evolution of electric incumbents' responses to tensions between sustainable development issues and (3) the nexus of the market, state and sustainable development.

A cross-country perspective to electric incumbents' responses to sustainable development-related challenges

Section 2.3.3. shows that extant research investigates the electricity sector and sustainability mainly in one country, with particular focus on the US context. Yet, at the same time, some studies signal the existence of national specificities in sustainability-related demands. For example, Patriotta et al. (2011) and Beelitz and Merkl-Davies (2012) describe a dominant view of nuclear energy's sustainability in Germany that differs from the one illustrated by Banerjee and Bonnefous (2011) with regards to France. Indeed, on one side Beelitz and Merkl-Davies (2012) and Patriotta et al. (2011) illustrate the German government's decision to phase out nuclear energy in 2001 for safety reasons and a tough national political debate around nuclear energy's sustainability in the following years, in particular after nuclear accidents. On the other side, Banerjee and Bonnefous (2011: 130) argue that in France "the government has always been proud and supportive of its nuclear industry and promoted its expansion". This cross-country heterogeneity, if combined with the expansion of European electric utilities across multiple countries (Kolk et al., 2014), highlights the need to examine how these firms address the misalignment of sustainability-demands across the national environments in which they operate. In chapter 4 we aim to provide an answer to this question, by exploring how European multinational electric utilities have tackled heterogeneous dominant views of nuclear energy in multiple countries, after a nuclear accident.

The evolution of electric incumbents' responses to tensions between sustainable development issues

As highlighted in section 2.4.3., research on electric incumbents' approach to sustainable development has provided an interesting picture of the heterogeneous responses given by electric utilities to different types of sustainable development issues. Yet, the literature review has revealed the adoption of a narrow focus both in

terms of the extent of sustainable development issues examined and in terms of the timeframe considered.

As regards the former, the large majority of the literature focuses on one sustainability issue. The limited number of studies taking into consideration more than one sustainability issue, do not manage to capture the high degree of complexity electric utilities have been facing and their responses to it. Indeed, as shown in section 2.4.1. and 2.4.3., the studies exploring the tensions faced by electric utilities in more detail, focus on a specific technology or plant and examine largely or exclusively the electric utilities' symbolic management of these tensions. Although this research provides valuable insights, it fails to inscribe the complexity around specific technologies within a wider, fundamentally more complex situation electric utilities have been facing. Indeed, as the main decision for electric utilities concerns their energy technology portfolio, their responses to the tensions around nuclear energy are strictly connected to their stance regarding other energy technologies (e.g. renewables and fossil fuels). In addition, the studies adopting a wider perspective to electric utilities' strategies towards sustainable development, by for example examining investment decisions across different technologies, either focus only on a narrow sustainable development issue (e.g. Hoffmann, 2007) or, as in the case of Poisson-de Haro and Bitektine (2015), they only signal trade-offs between different issues (e.g. security of supply and carbon independence). However, they do not explore electric utilities' responses to multiple sustainable development issues in depth and with a long-term perspective.

The adoption of a longitudinal perspective is particularly crucial in the study of electric incumbents' commitment to sustainable development. As highlighted in previous sections, the transformation of the electricity sector has been a rather lengthy process, with rising and changing pressures for sustainability, and it has still not ended. This process has been leading to a radical change of the industry, encompassing the entry of new actors generating energy from more sustainable sources, as shown in section 2.4.2. We thus argue that, in order to investigate electric incumbents' responses to sustainable development, it is highly important to adopt a longitudinal perspective and to examine them within the framework of the transformation undergone by the electricity sector. This would allow the assessment of whether the chosen responses could be maintained by the firms over time and whether there have been changes in the way they have addressed tensions between different sustainability issues. Olerup (1999) is one of the very few studies adopting a longitudinal approach, yet it does not consider the fact that electric utilities' have to tackle multiple and heterogeneous sustainable development issues at the same time. Indeed, while Olerup (1999) describes a 'security of supply' era experienced by electric utilities in the past, the European Commission's 2014 'Energy Security Strategy' signals that security of supply

is still a crucial concern which electric utilities have to consider together with other key issues, e.g. carbon reduction and energy affordability.

Building on the literature reviewed, we thus argue that research is needed that takes a long-term perspective to the whole set of electric utilities' strategic decisions and examines them through the lenses of the sustainable development-related complexity these firms have been facing. The study of E.ON, illustrated in Chapter 5, aims to integrate these components. To this purpose, it explores how the German electric utility has addressed the multiple sustainable development issues it was called to tackle, from its establishment in 2000 throughout the subsequent 15 years.

Market, state and sustainable development

As will be illustrated in more detail in chapter 3, the electricity sector, once defined by "regulated, territorial monopolies" (Markard and Truffer, 2006: 610), has in the last decades undergone a process of deregulation and privatization, which has significantly changed it. This has raised the interest of management scholars and "a rich and diverse literature explores how economic regulation and deregulation have impacted the behaviour of firms" (Delmas et al., 2007: 190). The literature review conducted in this chapter shows that a set of studies has explored or made reference to the impact of deregulation and/or privatization specifically on the way electric incumbents have addressed sustainable development issues. Yet, two main features of the literature reviewed signal the need for additional investigation on the relationship between the state, market and sustainable development in the electricity sector.

First, extant literature provides conflicting views and findings regarding the impact of deregulation on electric utilities' approach to sustainable development. This is epitomized by the divergent findings of Delmas et al. (2007) and Kim (2013) on the impact of deregulation on US electric utilities' environmental differentiation. It is thus not clear whether and to what extent market-led coordination has fostered the commitment to sustainable development objectives or if instead it has engendered tensions and irresponsible behaviours.

Second, the literature has focused on addressing the impact of state- and/or market-based coordination on sustainable development. Yet, in the last years, debates have emerged, especially in countries where liberalization and privatization policies have reached the fullest implementation (e.g. the UK), around the need for the government to refrain from a 'laissez faire' position and the need for the state to intervene to ensure, for example, security of supply or greener power generation. Despite the high importance of this topic to electric utilities, an analysis of whether and to what extent the increasing concerns about sustainable development have affected the

maintenance of a 'neoliberal solution' for the electricity sector and has relatedly driven calls for a 'return of the state' is lacking.

We therefore consider particularly relevant to explore the interaction between market, state and sustainable development in the electricity sector. Chapter 6 provides a first conceptual exploration of different dynamics that may be enacted between state, market and sustainable development and drawing on the electricity sector as an illustration. The chapter will also pay attention to the heterogeneity of sustainability issues faced by electric utilities and to a cross-country perspective that, as mentioned previously, is overlooked in extant research.