Enel Foundation
Energy for Knowledge

Working Paper 1/2014

Research Project
Organizational evolution in global corporations

Organizational innovation in energy companies: a literature review

Luca SOLARI, Edoardo DELLA TORRE, Nicole CASANOVA

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ISSN 2282-7188 (Printed version)
ISSN 2282-7412 (Online version)

Acknowledgement
One of the authors recognizes the support of California Polytechnic State University in San Luis Obispo, CA that hosted him during his sabbatical and provided the ideal background for developing several of the ideas at the roots of the present research project.

Research Project *Organizational evolution in global corporations*

The present paper is part of the project "Organizational innovation in Global Corporations" that has been promoted as a joint research effort by Enel Foundation and the University of Milan. The overall project has the goal to analyze emerging forms of organizational innovation in global corporations, and within this global framework also to analyze in detail organizational innovation in Electric utilities at the global level. The research project encompasses a literature review of organizational innovation, that will be complemented by a specific focus on electric utilities, which is described in this working paper. On the basis of the literature review, we will conduct several qualitative interviews in leading companies in different industries. The results will lead to the adaptation of a survey that will be sent to leading, global corporations, and electric utilities in the global arena.

While organizational innovation is a key challenge for global companies, due to scenario changes at the economic, political, and social level, research has been focused on specific industries, and has not targeted systematically patterns of organizational innovation in global corporations. Within this lack of detail, electric utilities appear even less documented, notwithstanding the pressures they went through in the past decade.

The energy sector has been characterized by a growing pace of change since the '90s. The industry is affected by technological, political, social, and economic challenges at a global scale, and is interdependent with so many levels of society to be significantly at the forefront of societal and economic change. The rapid diffusion of new forms of production of energy, and the liberalization of many markets have favored on one side, the emergence of new, global players, and at the same time the proliferation of smaller, and targeted organizations at the local level.

The increased pace of competition, as a consequence of these changes, requires organization to invest in their ability to innovate at the organization, and management level. However, the prevalent national history of this industry has not originated much research that targets organizational innovation within a global perspective.

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Abstract

Institutional, technological, and competitive change poses a threat to established ways of managing and organizing processes, and activities within the electric utilities sector. These challenges require the ability to innovate organizational structures, human resource management strategies, and leadership competencies to remain at the forefront of complex process and product innovation in different domains, and across different national and global contexts. While the required change exerts a growing pressure on top managers, and Human resource managers more directly, research has not analyzed in detail patterns of organizational innovation, competence development, and their consequences for competitive positioning, and success in the coming years. Our paper is part of a research project that has been launched in partnership with Enel Foundation to fill this gap. The overall project is based on an extensive analysis of the existing literature, coupled with qualitative interviews with key actors in the industry to develop a global survey that will be sent to the most relevant players in the industry. In this paper, we describe what organizational innovation is, and how it has been subject to study. We then move to analyze the existing literature on Electric utilities, and describe some of the key players. Finally, we present our questionnaire and the sampling that will be used in collecting the data.

Keywords: *electric utilities, organizational innovation, strategy*
Jel Codes: *L16, L94, M12*

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1 Organizational innovation: adoption, outcomes and measures

Organizational innovation represents one of the main strands of inquiry in recent managerial and organizational economic literature. From our perspective, there are three topics that should be addressed in order to fully depict a scenario where energy firms can be properly inserted and analyzed. Such three topics regard: the change-adoption mechanisms, i.e. the factors that explain firm choices to engage in organizational innovation; their strategic relationships with firm outcomes, particularly in terms of economic performance; and, finally, the methodological limitations of the current studies that should be overcome by our research.

1.1 The adoption of organizational innovation

The literature comprises two principal approaches to the study of the choices underlying the decision of enterprises to introduce organizational and technological innovations (Kennedy and Fiss, 2009). The first, found mainly in the economics literature, is constructed on the model of a rational actor, and it explains those choices in terms of the search by enterprises for gains in efficiency, which generate improvements in corporate performance. The second emphasizes the social dimension of organizations and their desire to appear legitimate in the eyes of their stakeholders and other organisations (Strang and Macy 2001; Kennedy and Fiss, 2009).

As pointed out by Kennedy and Fiss (2009), the most important attempt to integrate the two approaches is probably the "two-stage model" developed by Tolbert and Zucker (1983). According to this model, the first users of an innovation (early adopters) act on the basis of the economic reasoning identified by the first approach, while those who adopt the new practices at a later stage (later adopters) are interested mainly in the social benefits of legitimation. Nevertheless, the two authors demonstrate that economic and social considerations can co-exist in the decisions to innovate taken by enterprises. Consequently, early adopters are also motivated to achieve better corporate performance through gains resulting from reputational advantages, while later adopters also introduce innovation to avoid economic losses (Kennedy and Fiss 2009).

There is then a third (neo-institutional) approach, which cross-cuts the previous two. This sees the institutional context as a fundamental determinant of the investments that enterprises make in innovation (e.g. Paauwe and Boselie 2003, Bélanger et al. 2002, Totterdil 2002). By adopting an approach that combines neo-institutionalism and co-evolution and absorptive capacity theories, and by focusing on HRM innovation, Paauwe and Boselie (2005) develop a framework in which the rationale for adopting HR best practices may be normative or economic according to the category (based on the time of adoption) to which the adopter belongs. They speculate on the findings of the studies by Rogers (1985) and Mirvis (1997) to identify three broad categories of adopters. "Leaders are open to change and therefore more than willing to develop and implement new HR practices. Their drive is to gain competitive advantage based on economic rationality […] The *fast followers* are also seeking for opportunities to achieve competitive advantage through mimetic behavior (competitive isomorphism) of leading firms […] Presumably their rationality is based on economic considerations. *Slow followers* appear to look to their branch of industry with respect to HR innovations […] The considerations of the slow followers might be based on normative rationality. In order to maintain fairness towards their individual

employees and legitimacy towards the society, in the end the slow followers are forced to introduce a successful HR practice" (Paauwe and Boselie 2005: 998, emphasis added). Interestingly, the authors argue that both the innovators and the fast followers achieve some form of competitive advantage through early adoption of HR practices, but in the end fast followers are more successful than leaders. Indeed, the latter have high R&D costs and their strategy is more risky, whilst fast followers adopt only the practices that have been proven to work well and to generate competitive advantages.

Of course these frameworks also apply to the decisions made by enterprises not to adopt new organizational practices. The economics literature tends to attribute these decision to uncertainty concerning the profitability of innovations (which require a long time to introduce and particular conditions to be successful), while the more sociological approaches tend to attribute them to social and cultural resistances to change. In this case too, it is nevertheless likely that the two reasons co-exist, and that one or the other prevails according to the specific characteristics of each enterprise and of the context in which it operates.

With regard to cultural explanations, the difficulties associated with making changes to organizational culture established over the years are considered to constitute one of the major obstacles to the introduction of organizational innovation. The non-monetary costs of transition are of crucial importance here (Ichniowski et al. 1997). According to this theory, the new work practices are much more common on greenfield sites and in enterprises that have recently changed ownership, compared to those on brownfield sites. In enterprises which have old organizational models, managers and workers have already invested a great deal in specific work skills and relations which would lose much of their usefulness with the introduction of HPWP. Traditional organizational models are also characterized by high levels of mistrust between managers and workers, which would therefore need to be eliminated before innovating work organization. Moreover, it has been demonstrated that the dissatisfaction of workers who filled strategic roles in the old organization, and who see the usefulness of their roles placed in doubt with the introduction of new practices (e.g. managers with respect to autonomous or semi autonomous groups), is by itself sufficient to make attempts to modernize the organization fail (Batt, 2004).

These studies therefore confirm the importance of non-economic factors in hindering the diffusion of innovative practices in work organization. Nevertheless, a study performed on a sample of Italian firms has shown that neither the age of the enterprise nor the length of service of the employees are significantly related to the degree of organizational innovation in an enterprise, whilst a positive, but weak correlation has been found with the level of education of the workforce (Della Torre 2009). Therefore, what seems also important is the presence of organizational resources able to off-set the non-monetary costs of innovation.

1.2 The conditions for organizational innovation effectiveness

In the last decades, the managerial and economic literature has reported increasingly robust results in support of the idea that the organizational innovation stands in a positive relationship with firms' economic results. In particular, since the seminal works of Milgrom and Roberts (1990, 1995), a growing body of studies maintain that if the new organizational practices are to have positive effects, they must be introduced at system level, because the different "clusters" of practices (e.g. coordination, hierarchy, work organization, communication) are interconnected by complementarities in relation to the effects on the firm's economic and productive results. This holds in terms of both internal coherence among the various "bundles" of organizational practices and external coherence, i.e. with the other strategies pursued by the firm.

Internal coherence

As regards internal coherence, the existing evidence suggests that the best results are obtained if the practices introduced are coherent with each other (MacDuffie 1995, Ichniowski et al. 1997), supported by suitable personnel management practices (Brown et al. 1992; Ichniowski et al. 1997; Becker et al. 1997), and designed consistently with managerial capabilities (Thompson and Heron 2005).

Some research results also suggest that the relationship between the extent to which reforms are adopted and their effectiveness is not linear, but instead exponential. Becker and colleagues (1997), for instance, on studying more than 1500 American firms, have found that the returns on investment in new organizational practices grow greatly at an initial stage, when the firm takes its first steps towards adoption of the innovations, diminish for levels of medium adoption, in which the marginal results are limited, and substantially increase at higher levels of adoption. Dividing the levels of adoption into percentiles, the best results are achieved between the first and the twentieth percentile, and between the sixtieth and the hundredth. At intermediate levels of adoption, the new practices have exhausted their positive effect due to the shift from a situation of absence, and therefore of impediment, to one of "renewal". In this situation, the effect on performance (measured as market value per employee) is not harmful, but has little marginal impact. At levels of very sophisticated adoption, the closer integration of the new system of practices into the firm's operational fabric produces greater benefits.

Adopting a more critical approach, Godard (2001) analyses a longitudinal sample of 78 Canadian firms and argues instead that the economic results grow at moderate levels of introduction, stabilize at intermediate levels, and decline at high levels. Godard's results are therefore very similar to those obtained by Becker and colleagues (1997) up to the sixtieth percentile, but then assume the reverse pattern at the highest levels of sophistication.

According to MacDuffie (1995), for innovative organizational practices to have positive effects on performance, three conditions must be fulfilled: a) the workers must possess knowledge and skills which the managers do not; b) the workers must be committed to applying the knowledge and skills (discretionary effort); c) the workers must decide to make this discretionary effort to fulfil the firm's productive (or business) strategy. In conclusion, therefore, "the *organizational logic* of flexible production links together a bundle of manufacturing practices (related to the minimization of buffers) with a bundle of human resource practices (related to the expansion of work force skills and motivation). The to bundles are complementary in that they affect separate aspects of a plant's operations and yet mutually reinforce each other" (p. 200).

Becker and colleagues (1997) also show that the combination of pay levels above the market average with the intense use of high performance management practices has a 50% greater effect than the use of the two practices separately. Likewise, the use of a system of internal promotions has significantly better effects on performance if it combined with suitable training and pay practices.

External coherence

Complementarity with other strategies instead requires that organizational innovations be coherent with the technologies employed and with the competitive strategies and the characteristics of the market in which firms operate (Milgrom and Roberts, 1990, 1995; McDuffie, 1995; Black and Lynch, 2001, 2004; Gittell et al. 2004). This applies both to the effects that these variables (jointly) exert on the firm's economic and productive performance (Milgrom and Roberts 1990, 1995; Black and Lynch 2001, 2004; Evangelista and Vezzani, 2010), and to the effects that they exert on each other, i.e. in terms of the firm's overall innovative performance (Laursen and Foss, 2003; Mohnen and Röller, 2005). According to Adams (2002), moreover, attention

should also be paid to the characteristics of the market in which the firm operates, and especially to the volatility of orders. Adams's theoretical model, which is confirmed by the econometric analysis, establishes that the use of autonomous work groups of job depends on the intention to remove at least some decision-making power from the management ("off-line decision maker") and give it to the workers on the production line ("on-line decision makers"). Thus established is a trade-off between the rapidity of the decisions taken on-line and the greater slowness – though accompanied by the greater preparedness (in the sense of education, and therefore quality) – of the decisions taken off-line. The results show that, provided that training programs are organized, firms employ work groups more if they have a very volatile production. Further corroborating the thesis of internal coherence is the finding that work groups and training programs are integrated and reinforce each other. Also Becker et al. (1997) argue that there must be a close linkage between organizational innovation and the firm's strategic and business initiatives if the workers' behavior is to focus on the firm's key priorities and ultimately generate profits, growth and market value.

Other studies have shown that also organizational variables and the specific features of the firm warrant particular attention. On studying the effects of employee financial participation on productivity, Robinson and Wilson (2006) note that both profit-sharing (PS) and ownership-sharing (OS) suffer from a problem of free-riding by some workers. On the basis of their results, these authors state that closer controls (supervision and monitoring of workers) may obviate the problem in both cases. Likewise, the possibility for employees to intervene in the organization of work and technological choices may increase productivity in the presence of OS, whilst PS has harmful effects in the presence of a large male component and in white-collar environments. Overall, OS strategies are more productive than PS ones, but the effects are such because PS is adopted in contexts where the technological challenge is strong, workers have low-skilled profiles, and business prospects are uncertain, whilst OS is adopted in environments where the workers are higher-skilled and market pressures are less.

1.3 Methodological issues: the need for a multi-methods approach

Generally speaking, the majority of current studies report results which support the existence of a positive relation between the adoption of HPWPs and better business performance. It is well known, however, that various methodological obstacles considerably hamper the extendibility of the results obtained, and therefore the possibility of reaching cumulative conclusions. Moreover, this is a problem which affects the entire strand of studies on organizational innovations, and not just the studies analyzing the relationships with firm performance. The two main methodological issues in the field regard the heterogeneity in the definition of organizational innovation and the methods of inquiry.

Definition

The main problem encountered in the study of organizational innovation is the lack of an unambiguous definition of what falls under that heading. The large majority of studies use such label referring to innovation in work organization and human resource management. In these cases too, however, the terminology used to denote the set of new work practices also varies greatly: "high performance work organization", "new forms of work organization", "employee involvement practices", "new work organization", "high commitment organizations", are some of the expressions currently employed. Moreover, the differences of institutional contexts among countries, as well as the different approaches taken by researchers even within the same country (each survey of practices has its own methodology), hamper comparison among the results obtained. On the one hand, in fact, studies on innovation in

work organization refer to very different practices; on the other, even when they deal with the same practices, they do not use directly comparable indicators.
A certain degree of consensus can be found only at a general level; in this regard, a valid example is that of the European Work Organization Network (EWON), which adopts the following definition of New Work Organization: "[*it*] is the application of principles and practices within enterprises which aim to capitalize on, and develop the creativity and commitment of employees at all levels in achieving competitive advantage and in meeting the business and service challenges posed by the social, economic and technological environment in which an enterprise exists" (EWON, 2002, p. 5). It should be said, however, that because every firm adopts its own particular practices, or ones tailor-made for its organization, it is largely pointless, as well as difficult, to draw up a systematic list of what practices can be considered innovative. Instead, it is much more sensible to identify a set of features shared by such practices. In this regard, the changes brought by the new forms of work organization can be arranged along three main dimensions, each with its own component (EC 2002), viz.: the ways in which work is organized in regard to operational activities, including, for example, multi-skilling, job rotation, and semi-autonomous work groups; the ways in which work is coordinated within the organization, including, for example, measures to flatten hierarchies, information flows, interactions between workforce and management (participation), and measurement of performance: personnel management policies including investments in training and performance bonuses.
Therefore, in order to be considered such, new work practices must at least partly change the way in which work is organized, coordinated or managed.
However, organizational innovation is not simply a matter of work organization; it also include other organizational dimensions that should be considered jointly to work organization. On this regard, we can adopt the definition of organizational innovation developed by the Oslo Manual, which is adopted by the Community Innovation Survey (CIS) of the European Commission and currently represents the most widespread methodology to collect data on innovation. The third edition of the Oslo Manual defines organizational innovation, which represents the most important form of non-technological innovation, as "the implementation of a new organizational method in the firm's business practices, workplace organization or external relations" (OECD 2005: 51). Together with product innovation, process innovation and marketing innovation, organizational innovation represent one of the main type of innovation identified by the Oslo Manual. In the following box we report the definition of the three different kinds of organizational innovation (business practices, work organization and external relations) as identified by the Oslo Manual.

A definition for organizational innovation

*An **organizational innovation** is the implementation of a new organizational method in the firm's business practices, workplace organization or external relations*.

Organizational innovations can be intended to increase a firm's performance by reducing administrative costs or transaction costs, improving workplace satisfaction (and thus labor productivity), gaining access to non-tradable assets (such as non-codified external knowledge) or reducing costs of supplies.

The distinguishing features of an organizational innovation compared to other organizational changes in a firm is the implementation of an organizational method (in business practices, workplace organization or external relations) that has not been used before in the firm and is the result of strategic decisions taken by management.

Organizational innovations in ***business practices*** involve the implementation of new methods for organizing routines and procedures for the conduct of work. These include, for example, the implementation of new practices to improve learning and knowledge sharing within the firm. An example is the first implementation of practices for codifying knowledge, e.g. establishing databases of best practices, lessons and other knowledge, so that they are more easily accessible to others. Another example is the first implementation of practices for employee development and improving worker retention, such as education and training systems. Other examples are the first introduction of management systems for general production or supply operations, such as supply chain management systems, business reengineering, lean production, and quality-management systems.

Innovations in ***workplace organization*** involve the implementation of new methods for distributing responsibilities and decision making among employees for the division of work within and between firm activities (and organizational units), as well as new concepts for the structuring of activities, such as the integration of different business activities. An example of an organizational innovation in workplace organization is the first implementation of an organizational model that gives the firm's employees greater autonomy in decision making and encourages them to contribute their ideas. This may be achieved through the decentralization of group activity and management control or the establishment of formal or informal work teams in which individual workers have more flexible job responsibilities. However, organizational innovations may also involve the centralization of activity and greater accountability for decision making. An example of organizational innovation in the structuring of business activities is the introduction for the first time of build-to-order production systems (integrating sales and production) or the integration of engineering and development with production.

New organizational methods in a firm's ***external relations*** involve the implementation of new ways of organizing relations with other firms or public institutions, such as the establishment of new types of collaborations with research organizations or customers, new methods of integration with suppliers, and the outsourcing or subcontracting for the first time of business activities in production, procuring, distribution, recruiting and ancillary services.

Changes in business practices, workplace organization or external relations that are based on organizational methods already in use in the firm are *not* organizational innovations. Nor is the formulation of managerial strategies in itself an innovation. However, organizational changes that are implemented in response to a new managerial strategy are an innovation if they represent the first implementation of a new organizational method in business practices, workplace organization or external relations. For example, the introduction of a written strategy document to improve the efficient use of the firm's knowledge is not, by itself, an innovation. Innovation occurs when the strategy is implemented through the use of new software and practices for documenting information in order to encourage knowledge sharing among different divisions.
Mergers with, or the acquisition of, other firms are *not* considered organizational innovations, even if a firm merges with or acquires other firms for the first time. Mergers and acquisitions may involve organizational innovations, however, if the firm develops or adopts new organization methods in the course of the merger or acquisition.

(Source: OECD 2005, Oslo Manual, pp.:51-52)

Methods of inquiry

As regards to the methods employed to collect data, the large part of existing evidence is based on survey data and is not able to address the "single-respondent" problem. This limitation, combined with the use of "self-reported" measures, acquires particular importance if the variables considered for the analysis may suffer from the subjectivity of respondents. While this may be a minor problem for performance indicators (which are registered in internal reports and documents), it may acquire more importance for innovation variables. Indeed, a recent qualitative study on Italian firms has shown that the meaning of the term "innovation" is socially constructed, with each actor having its own perspective on what innovation is (Massa and Testa, 2008). Therefore, "self-reported" measures and "single-respondent" datasets may suffer from the differences among individuals" perceptions, and future studies should take such aspects into greater account. Another consideration concerns the adaptive action taken after the introduction of innovations. As Ansari and colleagues recently noted, existing theories say little about what happens after innovations have been adopted. Nevertheless, the new practices cannot be considered to be "*off the shelf*" solutions, and it is likely that they will require adaptation after they have been introduced if they are to have significant effects and be appropriate to a specific organizational context (Ansari et al. 2010). Such kind of adaptations highlight the process dimension of the adoption of organizational innovation and suggest to the researchers to include qualitative source of data in their research design in order to furnish deeper evidence about what really happened during the innovation implementation phases and how such phases were experienced by different organizational actors. From the above discussion, we can conclude that for new research in this area which aim to increase the knowledge about how organizational innovation take form and influence firm performance, the starting point would be to develop research designs that adopt the so-called "mixed-methods approach" (Creswell, 2004), combining quantitative and qualitative methods of inquiry.

1.4 Our methodology

The analysis of organizational innovation in Electric utilities will be conducted with a consistent strategy. First, we analyze the existing literature on innovation in Electric Utilities, with a specific focus on topics related directly or indirectly to organizational innovation. Second, we identify a sample on the basis of representing the extreme heterogeneity of companies operating in the industry. In each of them we will interview one top manager to collect qualitative information on existing and completed change initiatives. On the basis of the previous two activities, we develop an online survey that will be sent to all Electric Utilities that operate at a global level.

2 Research on electric utilities

2.1 The economic and organizational context

From the organizational strategy point of view, a lot of work has analyzed the consequences of the privatization process that affected most Electric utilities organizations. These processes have been documented in the U.S. (Baxter et al. 1997, Kilian 2008, Lyon &Mayo 2005, Reiss & White 2005, Ruff 1997), across Europe (Giulietti et al. 2005, Moral Soriano 2008), in Asia (Hafsi & Tian 2005, York 2007), in African and Middle-East countries (Al-Muhawesh & Qamber 2008, Gnansounou et al. 2007), and represents a truly global process of change. Some other researchers have analyzed implemented strategies within homogeneous geographical areas (Haber 2011, Hepbasli 2005). The focus of most research is economic, dealing with financial consequences, transition costs and potential losses following the transition from the regulated toward the competitive market (Baxter et al. 1997). Under a similar perspective, several analyses are macro-economic. For example, Kilian (2008) illustrates the consequences of energy price shocks on the U.S. economy. Further, the author tries to understand how consumer expenditures respond to the rise of energy prices, and links the oil price shocks to the US monetary policies. The analysis suggests that most oil price shocks since the 1970s have been driven by a combination of strong global demand for industrial commodities (including crude oil) and expectation shifts that increased precautionary demand for crude oil. These expectation shifts reflect the market's uncertainty about future oil supply shortfalls, which in turn reflects expectations about both future demand for crude oil and its future supplies.

Other concerns on the positive effects of the privatization process are illustrated by Kwoka (2005), who finds that publicly owned utilities in the U.S. market generally perform better in electric power distribution, whereas private ownership has cost advantages in generation. In particular, both public and private enterprises have a comparative advantage in different facets of the electric power industry. Specifically, privately owned utilities are superior in impersonal markets with more specifiable products or services – namely, power generation – whereas public ownership has advantages in the customer-oriented tasks of retail distribution. These results provide support for newer theories of public ownership, which identify possible advantages over private ownership in the provision of certain services.

According to Kwoka (2005), the long-standing debate over public vs private ownership may require some rethinking. From a research perspective, rather than searching for uniform superiority of either private or public enterprise, this study suggests the need to identify product, market and provider characteristics best suited to each ownership type. From a policy perspective it cautions that the quest for superior performance is not simply a matter of prescribing privatization. There are identifiable circumstances in which public enterprise is an appropriate, if not perfect, policy prescription. Both research and policy require a more sophisticated view of the effect of ownership on enterprise performance.

Focusing on a completely different evolutionary stage of development of the market, Gnansounou et al. (2007) describes a model of energy restructuring aimed at developing the electricity supply industry in Africa. Two strategies are compared. The first strategy, called "autarkical", is based on adequate expansion of the national power systems and the electricity exchanges among the countries in sub-zones. It aims at optimizing the management of national

electricity generation systems. The second one – the "integration" strategy – leads to a fast retirement of obsolete power plants and integration of electricity sector investments at the level of whole sub-region.
The model elaborated by Gnansounou et al. (2007) includes seven modules: strategy and scenario assumptions, electricity demand forecasting, electricity generating system configuration, evolution of electricity generation and transmission costs factors, expansion of the electricity generating system (taking into account interconnection), and profitability assessment.
The results presented demonstrate that the "integration" strategy represents a better option compared to the "autarkical" one. In fact, the integration of national power generation systems has many advantages. It allows for more efficient use of less expensive power generation facilities, a wider access to low-cost primary energy resources available in the sub-region and thus a less vulnerability in the face of oil price fluctuations in the international market.
Gnansounou et al. (2007) conclude that without a sustained economic growth supported by the increased electricity consumption, the power generation facilities to be developed will be underutilized and this fact will impose additional burden on the regional economy in Africa.
Another possible development of the energy sector liberalization is the spread of a new system of "sustainable electricity". Wohlgemuth (2000) presents the policies of the European Commission aimed at promoting renewable energy and energy efficiency activities, with a special attention given to the experience made in the United Kingdom.
Commercial and political dimensions of greening of electricity are explored also by Midttun & Koefoed (2003), whereas Finon et al. (2004) distinguish four paths of electricity market development, referring to the Nordic, European and Californian context.
In spite of the European Union's attempt at standardization, Midttun & Koefoed (2003) emphasize that there still exists a persistent variety of greening strategies. Moreover, these strategies can be anchored in a variety of political contexts, and with different commercial approaches – indicating that pluralism will continue and that the greening of European electricity is likely to move along several parallel paths. In particular, cost-based scale strategies are going to co-exist with targeted niche strategies, and industrial and innovation policies will work to push technological frontiers alongside incentives to optimize on existing technical solutions. The possibility of linking commercial and regulatory configurations into consistent ideal types, indicates that variety may consist over time as part of different paths of commercial-institutional coevolution.
Existing research has provided compelling evidence of the complex problems arising in the generalized move from State-owned Electric utilities to market-based systems. However, research has not dealt explicitly with the different strategies that individual organizations have chosen to sustain their competitive positioning. The organizational level perspective is absent from research.
In the absence of research on company-level strategies, it is quite expected that research on organizational design is not represented as well.
Bergman et al. (2006) develop a methodology for scenario planning in the industry. As intervening variables, they take into consideration the role of the external environment, emergent opportunities, organizational capabilities, and the business environment in electricity distribution systems. The aim is to obtain an instrument that can be adopted by authorities and by companies in order to stimulate strategic thinking and communication – which improves organizational flexibility of response to environmental uncertainty, leading them to better actions concerning the future. Similarly, Rufín et al. (2003) describe the evolutionary path of the role of the State in the electricity industry in the Brazilian, Chinese, and Indian context, adopting ideology, institutions, and interest groups as benchmarks in order to compare the three cases. The authors share Kwoka's (2005) skeptical view on the bene-

fits of the privatization process, arguing that markets are not necessarily a better resource allocation in order to reduce transaction costs. In fact, from the analysis of the restructuring of the electricity industry in the countries taken into consideration, it emerges that critical aspects such as ideological past, current institutions, and power and organization of interest groups play an enormous influence on the institutional outcomes in such circumstances. According to Rufín et al. (2003), these variable have necessarily to be considered when dealing with such kind of reform elsewhere, in the sense that when it comes to dispensing policy advice, economists would do well to take into account also the impact of ideology, institutions, and interest groups in design the organizational structure.

2.2 The actors

Arrowsmith (2003) makes a comparison between two case studies of firms in the rail and electricity sector to show how privatization had differential impacts due to a combination of sectorial context and strategic choice factors. In railways, the fragmentation of the industry intensified trade unions' potential disruptive capacity, so that sophisticated pattern of bargaining and the use of ballots on industrial action led to substantive improvements for workers. Arguably, the unions also became more responsive to local membership compared to the times of national bargaining. Furthermore, declining subsidies mean that the rail companies will likely become even more cost-conscious. Given that the only major variable cost that companies hold are respectively staff, employee numbers, pay and conditions, and labour "flexibility", they will continue to be major issues in the future. At the same time, the unions have their own demands, notably over pay and working hours.
In electricity, the unions have been more reactive, but have managed to maintain relatively high pay settlements and generous terms for displaced workers. Equal pay for women was also achieved through the harmonization process in the electricity firms. Increased competition and tighter regulation, together with the prospect of further mergers and acquisitions, means that the present context in the energy sector is much less favorable than it was in the past. The diversification of the generators continues to pose a challenge to unions with a traditional servicing role based on production workers. As in the railways, local organizations will be the key to maintaining union relevance.

2.3 Human resource management

From the view point of the human resources involved instead, three articles deal with their management in this specific sector. Mueller & Carter (2007) study the ways in which a managerial approach was promoted, embraced and subsequently came to challenge and ultimately displace the extant mode and logic of organization prior to the privatization process – that is the one of professional engineering. They analyzed a sample of twelve regional electricity companies in the UK, where in the space of seven years, professional engineers went from being the dominant group in the organization to almost being removed. In particular, Mueller & Carter (2007) illustrate the ways in which senior engineers embraced managerialism, shedding in this way their professional identity as engineers, and starting to internalize the managerial one. They find out that at the organizational level that the environment generated a package of changes that were translated in terms of a move of the engineers' mentality towards a managerial approach; at the same time, the ones that did not embrace the new identity – who represented the majority – left the company.
Lastly, Brunelle & Polèse (2008) examine spatial functional specialization over a 30-year period within a largely publicly owned and regulated vertically integrated industry in Canada. The aim is to understand the logics that lie behind the location of different organizational functions (i.e. management, scientific, etc.), and in particular their spatial distribution re-

ferring to a centre-periphery model. Employment in management and in scientific occupations is found to be highly concentrated in major metropolitan areas, both in absolute and in relative terms, whereas workers in production and maintenance function were relatively more concentrated in peripheral locations near power generation facilities.

From an historical point of view, spatial functional specialization sharpened markedly within the industry between 1971 and 2001, suggesting that functional specialization is not solely driven by market forces and by competition, but also by considerations of technical and managerial efficiency internal to organizations. This trend, it is reasonable to assume, is in part driven by new information technologies, which make it less costly for organizations to separate production facilities from scientific and management facilities. In fact, technological change does appear to have facilitated functional specialization and, correspondingly, the centralization of knowledge-rich functions.

In the present study we briefly described how the energy sector has been investigated by the literature. In particular, we focused on the elaboration of the business strategies and the potential future trends that interests these companies. Further, we tried to illustrate the policies of organizational design that have been implemented in the sector, as well as the role that some relevant actors played in the management of the energy companies.

In Table 1 we classify the articles we analyzed, according to several relevant criteria.

TABLE 1 – Classifying literature

	Energy	Green Energy
Strategy	Burt G., (2010), *Towards the integration of system modelling with scenario planning to support strategy: the case of the UK energy industry* in "Journal of the Operational Research Society".	Finon D., Johnsen T.A., Midttun A., (2004), *Challenges when Electricity Markets Face the Investment Phase* in "Energy Policy", 32, pp. 1355-1362.
	Al-Muhawesh T.A., Qamber I.S., (2008), *The Prerequisite for Competition in the Restructured Wholesale Saudi Electricity Market* in Energy Policy, vol. 36, pp. 477-484.	Menegaki, AN A social marketing mix for renewable energy in Europe based on consumer stated preference surveys, in "Renewable Energy".
	Baxter L. et al., (1997), *Strategies to Address Transition Costs* in a Restructuring Electricity Industry.	Midttun A., Koefoed A.L. (2003), Greening of Electricity in Europe. Challenges and Developments, in "Energy Policy", vol. 31, pp. 677-687.
	Chick M., Nelles H.V., (2007), *Nationalization and Privatization: Ownership, Markets and the Scope for Introducing Competition into the Electricity Supply Industry* in "Revue économique", vol. 58, n. 1, pp. 277-293.	Wohlgemuth N. (2000), Renewable Energy and Energy Efficiency in Liberalized European Electricity Markets, in "European Environment", vol. 10, pp. 1-11.
	Gnansounou E., Bayem H., Bednyagin D., Dong J., (2007), *Strategies for Regional Integration of Electricity Supply in West Africa* in "Energy Policy", 35, pp. 4142-4153.	
	Lyon T.P., Mayo J.W., (2005), *Regulatory Opportunism and Investment Behavior: Evidence from the U.S. Electric Utility Industry* in "The RAND Journal of Economics", vol. 36, n. 3, pp. 628-644.	
	Provance M. Donnelly, R.G. Carayannis, *EGTI Institutional influences on business model choice by new ventures in the microgenerated energy industry*, ENERGY POLICY.	
	Moral Soriano L., (2008), *New Modes of Governance in the Spanish Electricity and Gas Sectors* in "Journal of Public Policy", vol. 28, n. 1, pp. 93-111.	

	Reiss P.C., White M.W., (2005), *Household Electricity Demand, Revisited* in "The Review of Economic Studies", vol. 72, n. 3, pp. 853-883. Ruff L.E., (1997), *An Efficient, Competitive Electricity Industry. Can the Vision Become Reality?* in "The Electricity Journal", vol. 10, n. 1, pp. 8-16. Saez L., (2007), *U.S. Policy and Energy Security in South Asia. Economic Prospects and Strategic Implications*. Tonn B.E., Schweitzer M., (1997), *Institutional and Programmatic Suggestions for Satisfying Public Policy Responsibilities in a Retail Competitive Electric Industry* in "Energy Policy", vol. 25, n. 1, pp. 29-42. York R. (2007), *Structural Influences on Energy Production in South and East Asia, 1971-2002* in "Sociological Forum", vol. 22, n. 4, pp. 532-554.	
Organizational design	Bergman J. et al., (2006), *Managing the Exploration of New Operational and Strategic Activities Using the Scenario Method – Assessing Future Capabilities in the Field of Electricity Distribution Industry* in "International Journal of Production Economics", vol. 104, pp. 46-61. Mansur E.T., (2007), *Upstream Competition and Vertical Integration in Electricity Markets* in "Journal of Law and Economics", vol. 50, n. 1, pp. 125-156. Rennie C.G., (2006), *Governance Structure Changes and Product Market Competition: Evidence from U.S. Electric Utility Deregulation* in "The Journal of Business", vol. 79, n. 4, pp. 1989-2017. Roux-Dufort C., Metais E., (1999), *Building Core Competencies in Crisis Management Through Organizational Learning. The Case of French Nuclear Power Producer* in "Technological Forecasting and Social Change", pp. 113-127. Rufín C., Rangan U.S., Kumar R., (2003), *The Changing Role of the State in the Electricity Industry in Brazil, China, and India. Difference and Explanations* in "American Journal of Economics and Sociology", vol. 62, n. 4, pp.649-675. Tsai C.M., (2011), *The Reform Paradox and Regulatory Dilemma in China's Electricity Industry* in "Asian Survey", vol. 51, n. 3, pp. 520-539.	
Human resource management	Arrowsmith J., (2003), *Post-Privatisation Industrial Relations in the UK Rail and Electricity Industries* in "Industrial Relations Journal", vol. 34:2, pp. 150-163. Brunelle C., Polèse M., (2008), *Functional Specialization across Space. A Case Study of the Canadian Electricity Industry, 1971–2001* in "The Canadian Geographer/Le Géographe Canadien", 52, n. 4, pp. 486-504.	
Roles, Jobs, and professions	Bryan S., Hwang L.S., Lilien S., (2005), *CEO Compensation after Deregulation: The Case of Electric Utilities* in "Journal of Business", vol. 78, n.5, pp. 1709-1752. Brunelle C., Polèse M., (2008), *Functional Specialization across Space. A Case Study of the Canadian Electricity Industry, 1971–2001* in "The Canadian Geographer/Le Géographe Canadien", 52, n. 4, pp. 486-504. Tezel T., (1999), *Changing the Face of the Sales Force in the Deregulated Electric Industry* in "The Electricity Journal", vol. 12, n. 7, pp. 28-31.	

Competencies	Min, B. Lee, M. Nam, K.Y. Jeong, K., *Nuclear Human Resource Projection up to 2030 in Korea so Nuclear Engineering and Technology*. Mueller F., Carter C., (2007), *"We Are All Managers Now": Managerialism and Professional Engineering in UK Electricity Utilities* in "Accounting, Organizations and Society", vol. 32, pp. 181-195.	
Future trends	Giulietti M., Waddams Price C., Waterson M., (2005), *Consumer Choice and Competition Policy: A Study of UK Energy Markets* in "The Economic Journal", vol. 115, n. 506, pp. 949-968. Haber H. (2011), *Regulating-for-a Welfare. A Comparative Study of "Regulatory Welfare Regimes" in the Israeli, British, and Swedish electricity sectors* in "Law & Policy", vol. 33, n.1, pp. 116-148. Hafsi T., Tian Z., (2005), *Towards a Theory of Large Scale Institutional Change. The Transformation of the Chinese Electricity Industry* in "Long Range Planning", vol. 38, pp. 555-577. Hepbasli A., (2005), *Development and Restructuring of Turkey's Electricity Sector. A review* in "Renewable and Sustainable Energy Reviews", vol. 9, pp. 311-343. Kilian L., (2008), *The Economic Effects of Energy Price Shocks* in "Journal of Economic Literature", vol. 46, n. 4, pp. 871-909. Kwoka J.E., (2005), *The Comparative Advantage of Public Ownership: Evidence from U.S. Electric Utilities* in "The Canadian Journal of Economics/Revue Canadienne d'Economique", vol. 38, n. 2, pp. 622-640. Yeager K.E., (2004), *Electricity for the 21st century. Digital electricity for a digital economy* in "Technology in Society", 26,pp. 209–221.	Borenstein S., (2012), *The Private and Public Economies of Renewable Electricity Generation* in "Journal of Economic Perspectives", vol. 26, n. 1, pp. 67-92.

Source: Own elaboration

3 The energy industry. An overview

The energy industry includes the totality of all of the industries involved in the production and sale of energy, as well as the fuel extraction, manufacturing, refining and distribution. In particular, it comprises:

- the ***petroleum*** industry, including oil companies, petroleum refiners, fuel transport and end-user sales at gas stations;
- the ***gas*** industry, including natural gas extraction, and coal gas manufacture, as well as distribution and sales;
- the ***electrical*** power industry, including electricity generation, electric power distribution and sales;
- the ***coal*** industry;

TABLE 2 – Platts Top 250 - Electric Utilities (2012)

Platts Rank	Company Name	Region	Industry
32	Exelon Corp	Americas	Electric Utilities
37	Enel SpA	EMEA	Electric Utilities
39	Iberdrola SA	EMEA	Electric Utilities
40	Electricite de France SA	EMEA	Electric Utilities
47	Southern Co	Americas	Electric Utilities
53	NextEra Energy, Inc	Americas	Electric Utilities
54	ČEZ, a.s.	EMEA	Electric Utilities
59	American Electric Power Co, Inc	Americas	Electric Utilities
60	Fortum Oyj	EMEA	Electric Utilities
66	Entergy Corp	Americas	Electric Utilities
67	Duke Energy Corp	Americas	Electric Utilities
69	PPL Corp	Americas	Electric Utilities
71	EDP-Energias de Portugal, SA	EMEA	Electric Utilities
75	Centrais Eletricas Brasileiras SA - Eletrobras	Americas	Electric Utilities
76	Polska Grupa Energetyczna SA	EMEA	Electric Utilities
84	CLP Holdings Ltd	Asia/Pacific Rim	Electric Utilities
88	Cia Energetica de Minas Gerais	Americas	Electric Utilities
95	OJSC RusHydro	EMEA	Electric Utilities
97	FirstEnergy Corp	Americas	Electric Utilities
99	Xcel Energy Inc	Americas	Electric Utilities

Source: http://top250.platts.com/Top250Rankings/2012/Region/ElectricUtilities

- the ***nuclear*** power industry;
- the ***renewable*** energy industry, comprising alternative energy and sustainable energy companies, including those involved in hydroelectric power, wind power, and solar power generation, and the manufacture, distribution and sale of alternative fuels;
- ***traditional energy*** industry based on the collection and distribution of firewood, the use of which, for cooking and heating, is particularly common in poorer countries.

In order to identify the population of Electric utilities we first used use the renowned **Platts Top 250 Global Energy Company Rankings**, that recognizes outstanding accomplishments of the top performing energy companies around the world. We considered both the Electric utilities (Table 2) and Multi-utilities sub-sector (Table 3).
However, we should specify that the Platts ranking is not the unique classification of energy companies. In fact, several other rankings have been developed by other agencies.

TABLE 3 – Platts Top 250 – Multi–utilities (2012)

Platts Rank	Company Name	Region	Industry
33	RWE AG	EMEA	Multi-Utilities
35	National Grid plc	EMEA	Multi-Utilities
42	GDF Suez SA	EMEA	Multi-Utilities
65	Public Service Enterprise Group Inc	Americas	Multi-Utilities
72	Dominion Resources, Inc	Americas	Multi-Utilities
73	Sempra Energy	Americas	Multi-Utilities
77	Centrica plc	EMEA	Multi-Utilities
80	Consolidated Edison Inc	Americas	Multi-Utilities
94	PG&E Corp	Americas	Multi-Utilities
102	CenterPoint Energy, Inc	Americas	Multi-Utilities

Source: http://top250.platts.com/Top250Rankings/2012/Region/MultiUtilities

Among them, **Economy Watch** groups the energy organizations by taking into consideration the geographical area. In particular, from their ranking it emerges that the five leading electricity companies control 21% of the worldwide generation capacity. Among these, the contribution of Russia's RAO-UES is the highest, at 6.5%. Observing separately each region, Economy Watch deploys a region-wise list of the prominent companies that are involved in the supply and generation of electricity.
As obvious, there is some overlap between the two rankings, but the Economy Watch (Table 4) allows to observe the geographical distribution of the leading players in this industry.

A third ranking is provided by Statista Dow Jones that ranks Electric utilities according to their market values.

TABLE 4 – The Economy Watch ranking

Region	Electric Company
European Union	Electricité De France (EDF)
	Enel
	ENI
	RWE AG
	Vattenfall
	Iberdrola
Asia Pacific	Huaneng Power International
	CLP Power Hong Kong Limited
	Tenaga Nasional Berhad
	Korea Electric
USA	Dominion Resources
	American Electric Power
	Northeast Utilities
	PG&E Enersis
	Comphania Sanea ADS
	E.ON
	ONEOk
Australia	AGL Energy
Russia	RAO UES

Source: Own elaboration

According to the ranking in Table 5, the European market holds a prominent position inside the industry, with a large number of companies among the largest, followed by the US.

3.1 Sample selection

All companies selected in the different rankings will be part of the universe of our observation, together with smaller ones at local level. However, given our research purposes we collected additional information on a sub-sample. A subset of this sample will be interviewed to collect more fine-grained information on how they are responding to the present challenge in terms of organizational innovation.

The subset was not selected on the basis of statistical representativeness, but on the basis of research convenience.

The energy companies we chose are:

- ČEZ, a.s.
- E.On. AG
- EDF
- EdP SA
- Eletrobras
- EnBW

- Exelon Corp.
- Fortum OYJ
- Gas Natural Fenosa
- GDF Suez
- Iberdrola SA
- NextEra
- RWE
- Scottish&Southern
- Southern Company
- Vattenfall AB.

The more detailed reasons for our choice are summarized hereafter.

First of all, these are energy companies that have a leadership position in the areas in which they operate. Moreover, they allow us to compare the innovation practices in place within both the American (both US and South American) and the European market. In this way, we'll be able to make some considerations on the types of practices and policies in place within such contexts.
In order to better depict the scenario we are going to deal with, in the next sections we briefly describe the characteristics of each company, trying to develop a general framework for our investigation.

TABLE 5 – Statista Dow Jones Energy Companies Financial Ranking

Financial Rank Position	Company Name	Market Value (in billion US dollars)
1	GDF (France)	58.30
2	E.ON (Germany)	49.10
3	EDF (France)	45.70
4	Southern Co (U.S.)	38.40
5	Iberdrola (Spain)	36.00
6	ENEL (Italy)	35.40
7	Exelon (U.S.)	33.10
8	RWE Group (Germany)	29.90
9	Dominion Resources (U.S.)	28.70
10	NTPC (India)	28.40
11	Duke Energy (U.S.)	28.10
12	NextEra Energy (U.S.)	25.00
13	CEZ Group (Czech Republic)	23.20
14	Fortum (Finland)	21.80
15	CLP Holdings (Hong Kong – China)	21.00
16	SSE (UK)	19.60
17	American Electric (U.S.)	18.70
18	First Energy (U.S.)	18.60
19	PG&E (U.S.)	17.90
20	China Yangtze Power (China)	17.50

Source: Own elaboration

ČEZ, a.s.

CEZ Group is an established, integrated electricity conglomerate with operations in a number of countries in Central and Southeastern Europe and Turkey, headquartered in the Czech Republic. The company is part of the ČEZ, a.s., the largest electricity producer in the Czech Republic, founded in 1992.
The Group was created in 2003, when ČEZ, a.s. merged with several regional distribution companies. Today, CEZ Group belongs among ten of the largest energy companies in Europe, both in terms of installed capacity and number of customers. As of December 31, 2011, the Czech Republic remained the company's largest shareholder with a nearly 70% stake in the stated capital.
Its principal businesses encompass generation, trading, and distribution of power and heat, as well as coal mining. It is the responsible of the production of nearly three-quarters of the total electric energy manufactured in the Czech Republic, and it operates 2 nuclear power plants, 15 coal-fired power plants in the Czech Republic, 3 coal-fired power plants abroad, 35 hydropower plants, including 3 pumped storage plants, 2 locations with wind power plants, 13 photovoltaic (solar) power plants and 1 biogas station. This diverse portfolio of plants enables the group to respond flexibly to changing demand and provide all the services necessary for generating a reliable supply. Apart from the production and sale of electricity, CEZ Group also deals in telecommunications, informatics, nuclear research, planning, construction and maintenance of energy facilities, mining raw materials, and processing energy by-products, in that becoming one of the currently three largest heat suppliers in the CzechRepublic.
Moreover, in its recent-year history, the parent company of CEZ Group invested a total of over 7 billion euro into development and ecological measures. CEZ Group's largest investment into the environment was an extensive program aimed at the desulphurization of its coal-fired power plants. Between 1992 and 1998, the group invested a total of 1.58 billion euro into the project, as a result of which the levels of SO_2 were reduced by 92%, ash particles by 95%, nitrogen oxides by 50%, and carbon dioxide by 77% from values in the early 1990s.Since the end of 1998, all of these plants have been fitted with equipment reducing pollutant emissions.
People employed in 2012: 31,420.

E.ON. AG

E.ON was formed in June 2000 by the merger of VEBA and VIAG, two of Germany's largest industrial groups, each with an impressive history in its own right. Currently, it is one of the world's largest investor-owned power and gas companies.
At facilities across Europe, Russia, and North America, with more than 72,000 employees E.ON. generates approx. EUR132 billion in sales in 2012. In addition, there are businesses in Brazil and Turkey we manage jointly with partners.
E.ON's diversified business consists of renewables, conventional and decentralized power generation, natural gas, energy trading, retail and distribution. With its broad energy mix, E.ON owns almost 68 GW generation capacity and it is one of the world's leading renewables companies.
The E.ON Group is segmented into global units (by function) and regional units (by country), with the headquarters placed in Düsseldorf. Five global units manage the generation portfolio, renewables business, optimization and trading, new-build projects and innovative technology, and exploration and production business. Eleven regional units manage the retail operations, regional energy networks, and distributed-generation activities in Europe.
Finally, the Group is also engaged in power generation and wholesale power marketing in Russia, a special-focus country.

EDF

Électricité de France S.A. (EDF; Electricity of France) is the largest electric utility company in the world.

Headquartered in Paris, France, with €65.2 billion in revenues in 2010, EDF operates a diverse portfolio of 120,000+ megawatts of generation capacity in Europe, South America, North America, Asia, the Middle East and Africa.
It was founded on 8 April 1946, as a result of the nationalization of around 1,700 smaller energy producers, transporters and distributors by the Minister of Industrial Production Marcel Paul. It became the main electricity generation and distribution company in France, enjoying a monopoly in electricity generation, although some small local distributors were retained by the nationalization. This monopoly ended in 1999, when EDF was forced by a European Directive to open up 20% of its business to competitors. The French government partially floated shares of the company on the Paris Stock Exchange in November 2005, although it retained almost 85% ownership as of the end of 2008.
EDF is the world's largest producer of electricity. In 2011, it produced 22% of the European Union's electricity, primarily from nuclear power:

- Nuclear: 84.7%
- Renewable energy: 8.3% (among which 4.6% from hydroelectric plants)
- Gas: 2.7%
- Charcoal: 2.7%
- Fuel: 1.2%
- Other: 0.4%

Its 58 active nuclear reactors (in France) are spread out over 20 sites (nuclear power plants). They comprise 34 reactors of 900 MWe, 20 reactors of 1300 MWe, and 4 reactors of 1450 MWe, all PWRs.
From the activities point of view, the company specializes in electricity, from engineering to distribution. EDF's operations include: electricity generation and distribution; power plant design, construction and dismantling; energy trading; and transport. It is active in such power generation technologies as nuclear power, hydropower, marine energies, wind power, solar energy, biomass, geothermal energy and fossile-fired energy.
People employed in 2012: 156,168.

EdP SA

EdP – Energias de Portugal (formerly Electricidade de Portugal) ranks among Europe's major electricity operators, as well as being one of Portugal's largest business groups.
The Group became the first Iberian company to own significant generating and distribution assets in both sides of the border, with a controlling position in the Spanish company HC Energía, and it is also present in the electricity sectors of Latin America – with a major presence in the United States, Brazil, Africa and Macau, in the generation, distribution and trading businesses.
The EDP Group's activities are centred on the generation and distribution of electric power, as well as the information technologies areas. In addition, the group's business includes complementary and related areas, such as water, gas, engineering, laboratory testing, vocational training and real estate management. It once had businesses in the IT consulting (Edinfor) and telecommunications (ONI Telecom) sectors, but these were sold, respectively, to Logica and the private equity group The Riverside Company.
In 2006 35% of the energy produced by EDP was from renewable energy sources, and, as of the end of 2007, the company announced that 39% of its energy was already emissions-free and that it was aiming for a 75% renewable energy production by 2013. In March 2007 the group made a US$3 billion takeover of Horizon Wind Energy, the Texan-based wind power producer. This is the largest renewable energy deal to date and made EDP the fourth largest wind power producer in the world. The firm's renewables operations are now contained within its majority-owned subsidiary EDP Renováveis, 25% of which was floated on the Lisbon Stock Exchange in 2008.
People employed in 2012: 12,292.

Eletrobras

Eletrobras (full name: Centrais Elétricas Brasileiras S.A.) is a major Brazilian electric utilities company. It is also Latin America's biggest power utility com-

pany, tenth largest in the world and is also the fourth largest clean energy company.
Eletrobras holds stakes in a number of Brazilian electric companies, so that it generates about 40% and transmits 69% of Brazil's electric supply. The company's generating capacity is about 43,000 MW, mostly in hydroelectric plants.
It is a mixed economy and open capital stock corporation, with shares traded at São Paulo (Bovespa), Madrid and New York Stock Exchange. Federal government holds 52% of the ordinary shares of the company and, thus, it is the majority stockholder.
The Eletrobras companies operate in an integrated way, with policies and guidelines defined by the High Council of Eletrobras System (Consise), consisting of the presidents of the companies, who meet on a regular basis.
Eletrobras supports government strategic programs, such as the program that fosters alternative electric power sources (Proinfa), the National Program for Universal Access To and Use of Electric Power (Luz para Todos) and the National Program for Electric Power Conservation (Procel).

EnBW

EnBW Energie Baden-Württemberg AG, or simply EnBW, is a publicly traded electric utilities company headquartered in Karlsruhe, Germany.
It was formed on 1 January 1997 from the merger of two utilities companies from Baden-Württemberg, Badenwerk AG and Energieversorgung Schwaben AG (EVS).
With revenue in excess of €18 billion in 2011 and some 20,000 employees, EnBW is one of the largest energy companies in Germany and Europe.
The company generate, trade in, transport and sell energy and operate in the fields of electricity and gas as well as energy and environmental services, with the aim of achieving sustainable and profitable growth with a balanced business portfolio and smart energy.
The home market is Baden-Württemberg and Germany, but it also operates in other European markets.
In addition to the use of conventional energies, the increase in energy efficiency and expansion of renewable energies plays an important role.

Excelon Corp.

Headquartered in Chicago, Exelon has operations and business activities in 47 states, the District of Columbia and Canada. The company is one of the largest competitive U.S. power generators, with approximately 34,700 megawatts of owned capacity comprising one of the nation's cleanest and lowest-cost power generation fleets. Its Constellation business unit provides energy products and services to approximately 100,000 business and public sector customers and approximately 1 million residential customers. Exelon's utilities deliver electricity and natural gas to more than 6.6 million customers in central Maryland (BGE), northern Illinois (ComEd) and southeastern Pennsylvania (PECO).
It is the nation's leading competitive energy provider, with approximately $23.5 billion in annual revenues.
The Exelon family of companies participates in every stage of the energy business, from generation to competitive energy sales to transmission to delivery.
Exelon has one of the nation's cleanest and lowest-cost power generation portfolios, with 55 percent nuclear, 28 percent natural gas and 10 percent hydro, wind, solar and other clean generation. In addition, Constellation provides customers with clean energy solutions including natural gas supply, solar energy solutions, energy efficiency services, load response and real-time energy management.
People employed in 2012: 27,000.

Fortum OYJ

Fortum Oyj is a Finnish energy company, which focuses on the Nordic and Baltic countries, Poland and Russia.

It operates and maintains power plants and provides other energy related services. The company's main product is the production and distribution of electricity, heat and steam.
Fortum Corporation was founded in 1998. It was created from the merging of the Finnish state owned power and heat company IVO (Imatran Voima Oy), founded in 1921, and Neste Oy, the Finnish national oil company. The Neste assets were divested into separate stock-listed company in 2005.
Fortum is listed on NASDAQ OMX Helsinki stock exchange and is currently the only Nordic energy company registered on the Dow Jones Sustainability Index. (DJSI).
Hydro power has always been Fortum's core activity. The company currently owns and runs about 260 hydro power plants, mainly in Finland and Sweden, for a 4,683MW production capacity. Hydro power amounts to 48% of the power produced by Fortum in Nordic countries, and 1/3 of the total power produced by Fortum each year.
It has also been producing nuclear power since 1977. The company owns the nuclear plant in Loviisa, Finland, which covers around 10% of the country's energy production. Its nuclear assets also cover Sweden with share ownership in the nuclear plants in Forsmark and Oskarshamn.
Fortum produces and sells heat in Nordic countries and Baltic countries, Russia and Poland, with 31 plants combining production of heat (district heating) and electric power.
It holds also the biggest market share of ecolabeled electricity in Finland. With three hydropower plants, seven biomass plants and four wind parks the company has also more EKOenergy certified power stations than any other company in Finland.
People employed: 10,400.

Gas Natural Fenosa

Gas Natural Fenosa is one of the leading multinational companies in the gas and electricity sector. It is present in more than 25 countries, has almost 20 million customers and an installed capacity of 15.4 gigawatts.
Following the acquisition of the electricity company Unión Fenosa, the third largest in the Spanish market, Gas Natural Fenosa has achieved its objective of integrating the gas and electricity businesses in a single company with extensive experience in the energy sector, capable of competing efficiently in markets subject to a process of increasing integration, globalization and levels of competition.
It is the largest integrated gas and electricity company in Spain and Latin America, leading the natural gas sales market in the Iberian Peninsula, and it is the biggest distributor of natural gas in Latin America.
Gas Natural have approximately 10,000,000 clients and 6,700 employees, of which around 50% work in Spain. The firm is headquartered in Barcelona.
The group's largest shareholders include the Spanish bank La Caixa and oil major Repsol YPF.
Gas Natural acquired utility company Unión Fenosa for around €16.8 billion in 2009.

GDF Suez

GDF Suez S.A. is a French multinational electric utility company, headquartered in Paris; which operates in the fields of electricity generation and distribution, natural gas and renewable energy.
The company, formed on 22 July 2008 by the merger of Gaz de France and Suez, traces its origins to the Universal Suez Canal Company founded in 1858 to construct the Suez Canal. The firm also holds a 35% stake in Suez Environnement, the water treatment and waste management company spun off from Suez at the time of the merger.
GDF SUEZ bought 70% of Britain's International Power in August 2010, creating the world's largest independent utility company. The purchase of the remaining 30% was announced by GDF SUEZ in April 2012, and the transaction completed in July 2012.
As of 2010 GDF SUEZ employs 236,000 people

worldwide, including 1,200 researchers and experts at 9 R&D centers, with revenues of €84.5 billion. GDF SUEZ is listed on the Euronext exchanges in Paris and Brussels and is a constituent of the CAC 40 and BEL20 indices.
GDF SUEZ is organized in six business lines:

- Energy France, comprising a unit that supplies natural gas and electricity to private customers, professionals and businesses throughout France;
- Energy Europe and International, engaged in the production of electricity and distribution and supplying of gas out through five divisions in Benelux and Germany, the rest of European countries, North and Latin America, Middle East, Asia and Africa;
- Global Gas and Liquid Natural Gas (LNG), which includes exploration-production, supply, sales and liquid natural gas (LNG) project-related activities;
- Infrastructures, which operates the transport, supply and storage of natural gas and the regasification of LNG;
- Energy Services, providing consulting services for the design and construction of electrical, nuclear, gas and industrial facilities; and Environment, specialized in the provision of water, waste treatment and recovery.

It is the second-largest generator of electricity in France behind EDF.
64% of the group's production comes from renewable sources, principally hydroelectricity (through CNR and SHEM) and wind power, the latter of which both Gaz de France and Suez moved aggressively into in 2007 and 2008.
The company also operates a natural gas-fired combined cycle power plant (DK6) in Dunkirk. With the stated aim of reaching a total production capacity of 10GW by 2013, three gas-fired thermal power plants at Fos-sur-Mer, Montoir-de-Bretagne and Saint-Brieuc are currently in various stages of development, as is a solar panel project in Curbans.
The GDF SUEZ group also generates electricity in a number of countries outside France. Most notably, the company is the leading producer in both Belgium and the Netherlands through Electrabel (and the fifth-largest generator in Europe overall), as well as the largest non-state owned generator in both Brazil and Thailand.
GDF SUEZ also holds a 50% stake in NuGeneration (NuGen), a company planning to build a new nuclear power station of up to 3.6GW capacity at Sellafield in the United Kingdom. The other 50% of NuGen is held by Iberdrola.
The company also operates in North and Latin America through its Suez Energy International unit, as well as in other European and Asian countries. The company generates electricity through various types of plants, including thermal power, nuclear power, combined heat and power, wind farms, hydroelectric and biomass.
People employed in 2012: 236,120.

Iberdrola

Iberdrola is a Spanish private multinational electric utility company based in Bilbao, Basque Country.
It has a workforce of around 31,330 employees in dozens of countries on four continents serving around 31,67 million customers. Subsidiaries include Scottish Power (Scotland), Iberdrola USA (United States) and Elektro (Brazil), among others.
Since embarking on its growth and international expansion plan in 2001, Iberdrola has become Spain's largest energy group by market capitalization, the global leader in wind energy and one of the world's largest utilities by market capitalization.
Iberdrola was created on November 1, 1992 as a result of the merge between Hidroeléctrica Española and Iberduero. As of 2011 and with the integration of Scottish Power and Energy East, now renamed Iberdrola USA, the company has become a major multinational group.
With Scottish Power and Iberdrola formed in Europe, in 1998 Energy East Corporation came into being in the US following New York State Electric & Gas's

acquisition of Central Maine Power, Southern Connecticut Gas Company, Connecticut Natural Gas Company, Berkshire Gas Company and RGS Energy Group (the parent of Rochester Gas & Electric).
In 2001 Iberdrola began focusing on renewable energy, and in 2007, the company continued its international expansion, increasing its presence in the UK and the US via the integration of Scottish Powerand Energy East.
Iberdrola's liberalized business combines power generation, and gas and electricity supply. The company had assets with combined installed capacity of 46,039 MW at the end of 2012. Iberdrola manages its production assets, comprising hydroelectric, combined-cycle gas, nuclear and co-generation plants located in 40 countries, mainly in Europe, North America and Latin America. Output in Spain: 57,127 GWh in 2012, of which 9,039 GWh were produced at hydroelectric plants. As a result, 83% of Iberdrola's production in Spain was CO_2 emission free.
People employed in 2012: 31,338.

NextEra Energy

NextEra Energy, Inc. is a publicly traded electricity generation, transmission, and distribution company headquartered in Juno Beach, Florida.
NextEra Energy Resources employs about 15,000 and operates 43,000 megawatts of generating capacity in 28 US states and three Canadian provinces. The company had 2010 revenues of $15.3 billion and net income of $2.0 billion.
NextEra Energy Resources has three subsidiaries: NextEra Energy Resources (NER), Florida Power & Light (FPL), and FPL FiberNet.
It is the largest North American producer of wind and solar energy.
NextEra Energy Resources operates Solar Electric Generating Systems (SEGS), the world's largest solar power generating facility.
In addition to wind and solar, NextEra Energy Resources owns and operates generating plants powered by natural gas, nuclear fuel, and oil. The largest of its hydro plants is Harris Station Dam in northern Maine, impounding the Kennebec River to produce about 86 megawatts.
NextEra Energy Resources is primarily a competitive wholesale power generator. The company is not a public utility. It sells the output to companies and businesses with an interest in clean energy, including utilities, retail electricity providers, power cooperatives, municipal electric providers and large industrial customers.
NextEra Energy Resources leads the power industry through its focus on clean and renewable energy.
Approximately 96 percent of the electricity comes from clean or renewable sources, including wind, solar, nuclear, gas and hydro.

RWE AG

RWE AG (until 1990: Rheinisch-Westfälisches Elektrizitätswerk AG), is a German electric utilities company based in Essen, North Rhine-Westphalia.
Through its various subsidiaries, the energy company supplies electricity and gas to more than 20 million electricity customers and 10 million gas customers, principally in Europe.
RWE is the second largest electricity producer in Germany. RWE previously owned American Water, the United States' largest investor-owned water utility, but this was divested in 2008. Subsidiary RWE Dea produces some of the oil and gas its parent sells (annual production is around 2 million m^3 of crude oil (about 365,000 boe) and 3 billion m^3 of natural gas (about 18 million boe, 49,300 boe a day).
It's the largest German investor in Egypt (RWE Dea and RWE Power do business in Egypt).
Also RWE has begun building more wind farms, a renewable energy business.
Around 70,000 employees supply over 16 million electricity customers and nearly eight million gas customers with energy, both reliably and at fair prices.
In fiscal 2012, the company recorded approximately €53 billion in revenue.

SSE plc

SSE plc (formerly Scottish and Southern Energy plc) is an electric utility company headquartered in Perth, United Kingdom.
It is listed on the London Stock Exchange.
SSE is one of the leading energy companies in Ireland and the United Kingdom, and is the UK's second largest energy supplier.
It is involved in the generation and supply of electricity, the supply of gas, the operation of gas and telecoms networks and other energy-related services such as gas storage, contracting, connections and metering.
SSE is the UK's largest generator from renewable sources.
The company has its origins in two public sector electricity supply authorities: North of Scotland Hydro-Electric Board and Southern Electricity in 1998.
The company is the second largest supplier of electricity and natural gas in the United Kingdom, and the UK's largest generator of renewable energy. It incorporates the brands SWALEC, Southern Electric, Scottish Hydro Electric and Atlantic Electric and Gas.
It also owns Southern Electric Power Distribution, Scottish Hydro Electric Power Distribution, Scottish Hydro Electric Transmission and 50% of Scotia Gas Networks.
Its subsidiaries are organized into the main businesses of generation, transmission, distribution and supply of electricity; storage and supply of gas; electrical and utility contracting, and domestic appliance retailing and telecoms. They also own Airtricity.
Its contracting business has five main areas of activity: industrial, commercial and domestic, mechanical and electrical contracting; data communications; high-voltage design and maintenance; electrical and instrumentation engineering, and public and highway lighting.
People employed in 2012: Around 20,000.

Southern Company

Southern Company is an American electric utilities holding company based in southern United States. It is headquartered in Atlanta, Georgia with executive offices also located in Birmingham, Alabama.
The company is currently the 16th largest utility company in the world and the fourth largest in the U.S.
Through its subsidiaries it owns and operates more than 42,000 megawatts of generation capacity and serves 4.3 million customers in Alabama, Georgia, Florida, and Mississippi. Southern Company's regulated regional electric utilities serve a 120,000-square-mile (310,000 km^2) territory with 27,000 miles (43,000 km) of distribution lines.
Southern Company subsidiaries operate hydroelectric, gas, coal, and nuclear generation sources to generate approximately 200 terawatt-hours of electricity. In 2009, coal represented 57 percent of the company's output, followed by nuclear (23%) and natural gas (16%). Renewable hydroelectric power represented 4 percent of Southern's generation. Coal-based generation dropped significantly in 2009 from an average of 70% between 2005 and 2008.
As a coal-burning energy company, greenhouse gas emissions are a primary environmental concern. According to a 2007 study conducted by the Center for Global Development, the Southern Company is the largest greenhouse gas emitter in the U.S. utility industry, with an annual tally of 172 million tonnes of carbon dioxide equivalent gases.
In response to growing public and financial community interest the company has enacted both corrective and palliative environmental measures.
Southern Company is building one of the largest all-biomass plants in the nation. The company expects the 100-megawatt Nacogdoches Generating Facility to serve the city of Austin for 20 years.
In partnership with Turner Renewable Energy, the company is building one of the largest solar photovoltaic plants in the U.S. near Cimarron, New Mexico. The 30-megawatt project will supply power to approximately 9,000 homes.
The company manages and operates the National Carbon Capture Center, a focal point of U.S. Department of Energy's efforts to develop carbon capture and greenhouse gas reduction technolo-

gies, under which various projects to test geologic sequestration are in progress at Plant Gorgas in Alabama, Plant Daniel in Mississippi and other company sites.
People employed in 2012: approx. 25,000.

Vattenfall

Vattenfall is a Swedish power company, wholly owned by the Swedish government. Beyond Sweden, the company generates power in Denmark, Finland, Germany, the Netherlands, Poland, and he United Kingdom.
It was founded in 1909 as a state-owned enterprise in Sweden.
From its founding until the mid-1970s, Vattenfall's business was largely restricted to Sweden, with a focus on hydroelectric power generation. Only in 1974 did the company begin to build nuclear reactors in Sweden, eventually owning seven of Sweden's 12 reactors. In 1992, Vattenfall was reformed as the limited liability company Vattenfall AB.
In the years 1990 through 2009, Vattenfall expanded considerably (especially into Germany and Poland), acquiring stakes in Hämeen Sähkö (1996), HEW (1999, 25.1% stake from the city of Hamburg), the Polish heat production company EW (2000, 55% stake), Elsam A/S (2005, 35.3% stake), and Nuon (2009, 49% stake).
In 2002 Vattenfall AB and its acquisitions were incorporated as Vattenfall Europe AG, making it the third-largest electricity producer in Germany.
Vattenfall has power generation branches in Sweden, Germany, Poland, Netherlands, United Kingdom, Denmark, Finland; in Germany, Vattenfall is the electric utility for the states of Hamburg, Mecklenburg-Vorpommern, Brandenburg, Berlin, Saxony-Anhalt, Thuringia, and Saxony.
As of 2009, Vattenfall generates electricity from fossil fuels (52%), nuclear power (25%), hydropower (21%), and "other sources" (wind power, biomass, waste) (2%). Vattenfall also owns a number of coal-fired power stations, and operates biomass, coal-fired, and other power plants in Poland, Germany, the Netherlands and Denmark.
Vattenfall's vision is to create a strong and diversified European energy portfolio with sustainable and increased profits, significant growth options and will be among the leaders in developing environmentally sustainable energy production.
People employed in 2012: 34,685.

4 The survey

On the basis of the analysis of the existing literature on organizational innovation, integrated with the results of our analysis of the Electric utilities industry, we developed a questionnaire that is consistent with previous measures of most variable to allow for a comparison. The questionnaire is detailed in Appendix 1 of this working paper.

The questionnaire covers different aspects that are represented by separate sections:

1. General information: companies will be asked to illustrate the market in which they operate, and some general characteristics – such as the number of employees and the turnover rate – of the last two years.
2. Innovation: several sections are dedicated to the study of innovation from different perspectives – service, process, organizational, environmental benefits and innovation objectives during 2010-2012.
3. Human resource management and work practices: human resource management and work organization practices, together with knowledge management policies, will be investigated in the last section of our survey.

The questionnaire will be distributed online, through direct mailing to Senior HR managers & External relations managers. Alongside we will establish partnerships with national energy associations to facilitate its completion. The questionnaire will be launched during the summer of 2013, and will remain open until the end of September. Our team of researchers will be following through the phases of recall to increase the response rate.

Bibliography

1 Adams C.P., (2002), *Selection of High Performance Work Systems in US Manufacturing*, Federal Trade Commission, 29 march.
2 Al-Muhawesh T.A., Qamber I.S., (2008), *The Prerequisite for Competition in the Restructured Wholesale Saudi Electricity Market*, in Energy Policy, vol. 36, pp. 477-484.
3 Ansari S.M., Fiss P.C., Zajac E.J., (2010), *Made to Fit: How Practices Vary As They Diffuse*, Academy of Management Review, 35, 67-92.
4 Batt R., (2004), *Who Benefits from Teams? Comparing Workers, Supervisors and Managers*, in Industrial Relations, 43, 183-212.
5 Baxter L. et al. (1997), *Strategies to Address Transition Costs in a Restructuring Electricity Industry* in Energy Policy, vol. 25, n. 5, pp. 481-490.
6 Becker B.E., Huselid M.A., Pickus P.S., Spratt M.F., (1997), *HR as a Source of Shareholder Value: Research and Reccomendations*, Human Resource Management Journal, 31(1): 25-41.
7 Bélanger P.R., Lapointe P.A., Lévesque B., (2002), *Workplace Innovations and the Role of Institutions* in Murray G.J., Bélanger A., Giles P., Lapointe A. (eds.), Work and Employment Relations in the High-Performance Workplace, London: Continuum, 150-180.
8 Bergman J. et al. (2006), *Managing the Exploration of New Operational and Strategic Activities Using the Scenario Method – Assessing Future Capabilities in the Field of Electricity Distribution Industry* in "International Journal Production Economics", vol. 104, pp. 46-61.
9 Black S.E., Lynch L.M., (2001), *How to Compete: The Impact of Workplace Practices and Information Technology on Productivity*, Review of Economics and Statistics, 83(3): 434-445.
10 Black S.E., Lynch L.M., (2004), *What's Driving the New Economy? The Benefits of Workplace Innovation*, Economic Journal, 114(2): 97-116.
11 Brown C., Reich S., Stern D., (1992), *Becoming a High Performance Work Organization: The Role of Security, Employee Involvement, and Training*, University of California, paper iirwps04592, mimeo.
12 Borenstein S., (2012), T*he Private and Public Economies of Renewable Electricity Generation* in "Journal of Economic Perspectives", vol. 26, n. 1, pp. 67-92.
13 Brunelle C., Polèse M., (2008), *Functional Specialization across Space. A Case Study of the Canadian Electricity Industry, 1971–2001* in "The Canadian Geographer/Le Géographe Canadien", 52, n. 4, pp. 486-504.
14 Bryan S., Hwang L.S., Lilien S., (2005), *CEO Compensation after Deregulation: The Case of Electric Utilities* in "Journal of Business", vol. 78, n.5, pp. 1709-1752.
15 Chick M., Nelles H.V., (2007), *Nationalization and Privatization: Ownership, Markets and the Scope for Introducing Competition into the Electricity Supply Industry* in "Revue économique", vol. 58, n. 1, pp. 277-293.

16 Della Torre E., (2009) *High Performance Work Practices e caratteristiche delle imprese innovative* in "Economia Politica". Journal of Analytical and Institutional Economics, 2, 299-336.
17 Eberlein B., (2008), *The Making of the European Energy Market: The Interplay of Governance and Government* in "Journal of Public Policy", vol. 28, n. 1, pp. 73-92.
18 European Commission, (2002), *New Form of Work Organization: The Obstacles to a Wider Diffusion*. Final Report, Business Decision Limited, October.
19 European Work Organization Network, (2001), *New Forms of Work Organization. The benefits and Impact on Performance*, Thematic Paper Presented to DG Employment and Social Affairs, April.
20 Evangelista R., Vezzani A., (2010), *The economic impact of technological and organisational innovations: A firm-level analysis*, Research Policy, 39(10): 1253–1263.
21 Finon D., Johnsen T.A., Midttun A., (2004), *Challenges when Electricity Markets Face the Investment Phase* in "Energy Policy", 32, pp. 1355-1362.
22 Giulietti M., Waddams Price C., Waterson M., (2005), *Consumer Choice and Competition Policy: A Study of UK Energy Markets* in "The Economic Journal", vol. 115, n. 506, pp. 949-968.
23 Gittell J.H., von Nordenflycht A., Kochan T.A., (2004), *Mutual Gain or Zero Sum? Labor Relations and Firm Performance in the Airline Industry*, Industrial and Labor Relations Review, 57 (2), pp. 163-180.
24 Godard J., (2001), *Beyond the High Performance Paradigm? An Analysis of Variation in Canadian Managerial Perceptions of Reform Programme Effectiveness*, British Journal of Industrial Relations, 39:1, pp. 25-52.
25 Haber H., (2011), *Regulating-for-a Welfare. A Comparative Study of "Regulatory Welfare Regimes" in the Israeli, British, and Swedish electricity sectors* in "Law & Policy", vol. 33, n.1, pp. 116-148.
26 Hafsi T., Tian Z., (2005), *Towards a Theory of Large Scale Institutional Change. The Transformation of the Chinese Electricity Industry* in "Long Range Planning", vol. 38, pp. 555-577.
27 Hepbasli A., (2005), *Development and Restructuring of Turkey's Electricity Sector. A review* in "Renewable and Sustainable Energy Reviews", vol. 9, pp. 311-343.
28 Ichniowski C., Shaw K., Prennushi G., (1997), *The Effects of Human Resource Management Practices on Productivity: A Study of Steel Finishing Lines* in The American Economic Review, 87, 291-313.
29 Joskow P., Tirole J., (2007), *Reliability and Competitive Electricity Markets* in "The RAND Journal of Economics", vol. 38, n. 1, pp. 60-84.
30 Kennedy M.T., Fiss P.C., (2009), *Institutionalization, Framing, and Diffusion: The Logic of TQM Adoption and Implementation Decisions Among U.S. Ospitals*, Academy of Management Journal, 52, 897-918.

31 Kilian L., (2008), *The Economic Effects of Energy Price Shocks* in "Journal of Economic Literature", vol. 46, n. 4, pp. 871-909.
32 Kwoka J.E., (2005), *The Comparative Advantage of Public Ownership: Evidence from the U.S. Electric Utilities* in "Canadian Journal of Economics/Revue Canadienne d'Economique", vol. 38, n.2, pp. 622-640.
33 Lackner K.S., Sachs J.D., (2005), *A Robust Strategy for Sustainable Energy* in "Brooking Papers on Economic Activity", vol. 2005, n. 2, pp. 215-269.
34 Laursen K., Foss J., (2003), *New human resource management practices, complementarities and the impact on innovation performance*, Cambridge Journal of Economics, 27(2): 243-263.
35 Lyon T.P., Mayo J.W., (2005), *Regulatory Opportunism and Investment Behavior: Evidence from the U.S. Electric Utility Industry* in "The RAND Journal of Economics", vol. 36, n. 3, pp. 628-644.
36 MacDuffie J.P., (1995), *Human Resource Bundles and Manufacturing Performance: Organizational Logic and Flexible Production Systems in The World Auto Industry*, Industrial and Labor Relations Review, 48(2): 197-221.
37 Mansur E.T., (2007), *Upstream Competition and Vertical Integration in the Electricity Markets* in "Journal of Law and Economics", vol. 50, n. 1, pp. 125-156.
38 Massa S., Testa S., (2008), *Innovation and SMEs: Misaligned perspectives and goals among entrepreneurs, academics, and policy makers*. Technovation, 28(7): 393-407.
39 Midttun A., Koefoed A.L., (2003), *Greening of Electricity in Europe. Challenges and Developments* in "Energy Policy", vol. 31, pp. 677-687.
40 Milgrom P., Roberts J., (1990), *The Economics of Modern Manufacturing: Technology, Strategy and Organization*, American Economic Review, 80(3): 511-528.
41 Milgrom P., Roberts J., (1995), *Complementarities and Fit Strategies, Structure, and Organizational Change in Manufacturing*, Journal of Accounting Economics, 19(2-3): 179-208.
42 Mirvis P.H., (1997), *Human Resource Management: Leaders, Laggards, and Followers*, Academy of Management Executive, 11, 43-56.
43 Mohnen P., Röller L.H., (2005), *Complementarities in innovation policy*, European Economic Review, 49(6): 1431-1450.
44 Moral Soriano L., (2008), *New Modes of Governance in the Spanish Electricity and Gas Sectors* in "Journal of Public Policy", vol. 28, n. 1, pp. 93-111.
45 Mueller F., Carter C. (2007), *"We Are All Managers Now": Managerialism and Professional Engineering in UK Electricity Utilities* in "Accounting, Organizations and Society, vol. 32, pp. 181-195.
46 OECD (2005), *Oslo Manual: Guidelines for Collecting and Interpreting Innovation Data* (3rd edn). Paris: OECD.

47 Paauwe J., Boselie P., (2003), *Challenging "Strategic HRM" and the Relevance of Institutional Setting*, Human Resource Management Journal, 13, 56-70.
48 Paauwe J., Boselie P., (2005), *"Best practices... in spite of performance": just a matter of imitation?*, International Journal of Human Resource Management, 16, 987-1003.
49 Reiss P.C., White M.W., (2005), *Household Electricity Demand, Revisited* in "The Review of Economic Studies", vol. 72, n. 3, pp. 853-883.
50 Rennie C.G., (2006), *Governance Structure Changes and Product Market Competition: Evidence from U.S. Electric Utility Deregulation* in "The Journal of Business", vol. 79, n. 4, pp. 1989-2017.
51 Robinson A.M., Wilson N., (2006), *Employee Financial Participation and Productivity: An Empirical Reappraisal*, British Journal of Industrial Relations, 44:1, pp. 31-50.
52 Rogers E.M., (1985), *Diffusion of Innovations*, 4th edn., New York: The Free Press.
53 Roux-Dufort C., Metais E., (1999), *Building Core Competencies in Crisis Management Through Organizational Learning. The Case of French Nuclear Power Producer* in "Technological Forecasting and Social Change", pp. 113-127.
54 Ruff L.E., (1997), *An Efficient, Competitive Electricity Industry. Can the Vision Become Reality?* in "The Electricity Journal", vol. 10, n. 1, pp. 8-16.
55 Rufín C., Rangan U.S., Kumar R., (2003), *The Changing Role of the State in the Electricity Industry in Brazil, China, and India. Difference and Explanations* in "American Journal of Economics and Sociology", vol. 62, n. 4, pp.649-675.
56 Sàez L., (2007), *U.S. Policy and Energy Security in South Asia: Economic Prospects and Strategic Implications* in "Asian Survey", vol. 47, pp. 657-678.
57 Strang D., Macy M.W., (2001), *In Search of Excellence: Fads, Success Stories, and Adaptive Emulation*, American Journal of Sociology, 107, 147-182.
58 Thompson M., Heron P., (2005), *Management Capability and High Performance Work Organization*, International Journal of Human Resource Management, 16(6):1029-1048.
59 Tolbert P.S., Zuckler L.G., (1983), *Institutional Sources of Change in The Formal Structure of Organizations: The Diffusion of Civil Service Reform*, Administrative Science Quarterly, 28, 22-39.
60 Tonn B.E., Schweitzer M., (1997), *Institutional and Programmatic Suggestions for Satisfying Public Policy Responsibilities in a Retail Competitive Electric Industry* in "Energy Policy", vol. 25, n. 1, pp. 29-42.
61 Totterdill P., (2002), *Developing New Forms of work Organization: The Role of Main Actors*, Nottingham: The Work Institute.
62 Tyner W., Taheripour F., (2007), *Renewable Energy Policy Alternatives for the Future*, in "American Agricolture Economy", vol. 89, n. 5, pp. 1303-1310.
63 Wohlgemuth N., (2000), *Renewable Energy and Energy Efficiency in Liberalized European Electricity Markets* in "European Environment", vol. 10, pp. 1-11.

64 Yeager K.E., (2004), *Electricity for the 21st Century: Digital Electricity for a Digital Economy* in "Technology in Society", vol. 26, pp. 209-221.
65 York R., (2007), *Structural Influences on Energy Production in South and East Asia, 1971-2002* in "Sociological Forum", vol. 22, n. 4, pp. 532-554.

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Concept and editorial design
Aleteia Communication

February 2014

Publication not for sale
Edited by
Enel External Relations Department
Enel SpA
00198 Rome, Viale Regina Margherita 137 – Italy

WP n. 6 of EF Working Paper Series