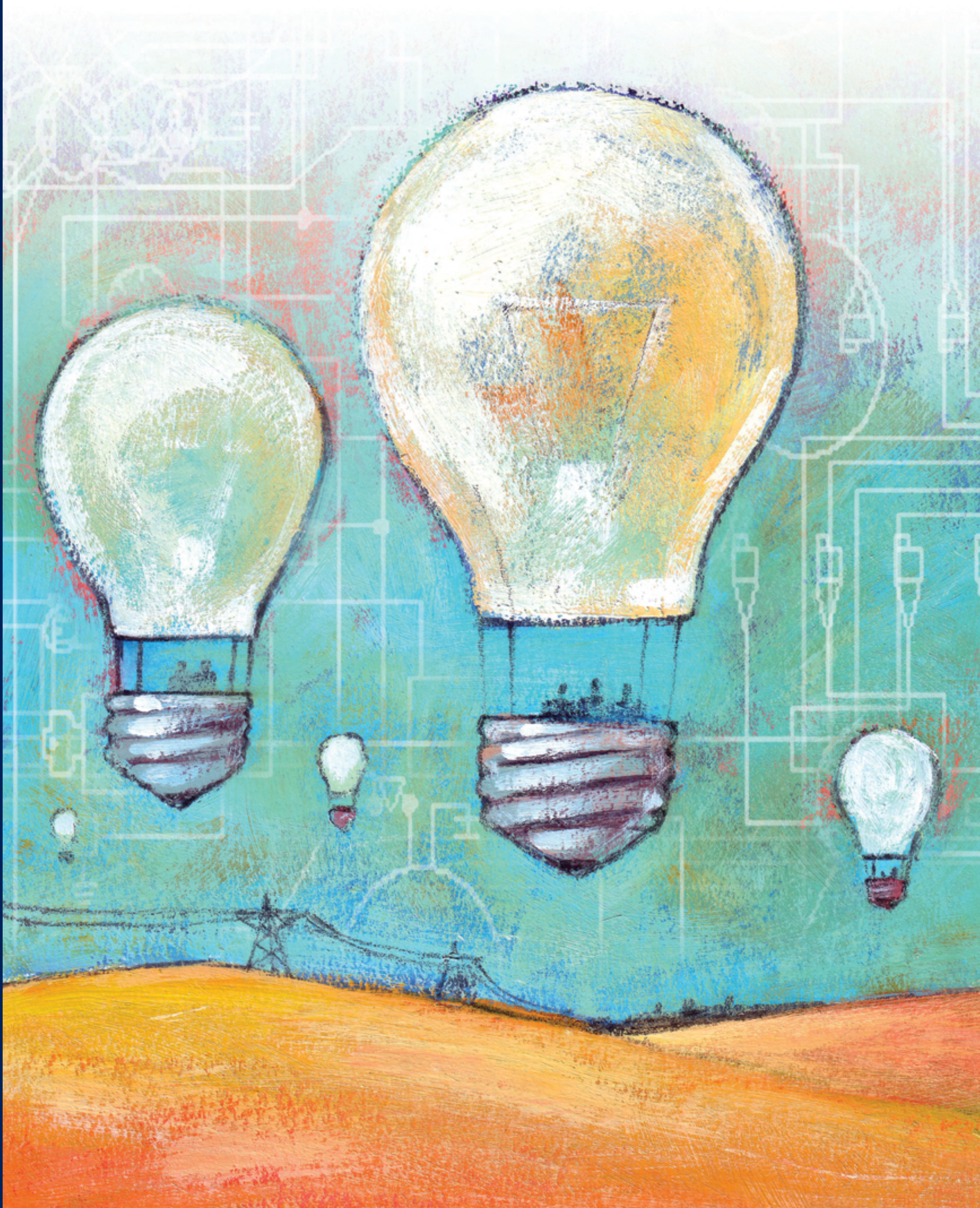
EVA NIESTEN

Regulation, Governance and Adaptation

Governance Transformations in the Dutch and French Liberalizing Electricity Industries



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Regulering, Governance en Adaptatie
Governance transformaties in de Nederlandse en Franse liberaliserende elektriciteitsindustrieën

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Eva Niesten

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1 - Introduction

For decades, the European governments have focused their economic policies on the processes of liberalizing and privatizing their formerly state-run industries. The industries that have been subject to the introduction of competition include telecommunications, railways, postal services, electricity and gas. For a long time, these industries have been excluded from the workings of the market, as they were state-owned, run by a governmental department or extensively regulated, and endowed with regional or national monopolies. The reasons for the substantial government involvement in these industries included the provision of goods and services that are in the public interest, and the presence of infrastructures that have natural monopoly characteristics. These industries, as telecommunications, electricity and gas, are referred to as network industries, because they are characterized by the presence of capital-intensive networks. These networks are natural monopolies: there is only one network in each industry, for the simple reason that supplying the service with more than one network increases costs. In the past, this natural monopoly characteristic of the networks has led to the state ownership and state operation of the industries. The networks have often been vertically integrated with the production and the supply of the goods and services as electricity, gas and telecommunications (e.g. Newbery, 1999: 134).

The current policies of the European governments are directed at the privatization of the network industries, their restructuring and opening to competition, and at their re-regulation. The European governments claimed that these policies would bring an increased level of efficiency to the industries, a higher quality of services, and a decrease in consumer prices. The introduction of competition into these industries is complicated by the presence of the natural monopolistic networks and the vertically integrated structures of the firms that provide the electricity, gas, telecom, or rail services. In order to introduce competition, the networks are being separated from the potentially competitive segments, i.e. the production and supply of these services. The restructuring of the industries thus entails a vertical unbundling of the integrated firms. It also includes ending the regional and national monopolies and thus opening the industries to new entrants. The incumbents and new entrants have to compete for the supply of the services to the customers, who are given a choice of switching between suppliers. Joskow described these changes as 'one of the most dramatic government mandated transformations in the last century of vertically integrated industrial hierarchies' (Joskow, 1996: 342).

The process of liberalization is often associated with a deregulation of industries. The liberalization of the network industries has, however, been accompanied by a substantial increase in rules (Minogue, 2002: 653). In the liberalized industries, the networks remain natural monopolies and the tariffs and conditions for accessing and connecting to the networks are regulated in order to avoid an abuse of the monopoly by the network firms. The re-regulation does not only include new rules for the monopolistic networks, but also new regulations on the vertical unbundling of the industries and on allowing the consumers a choice of supplier. The new regulatory framework gives the regulator a duty to promote competition and encourage new entry, in contrast to traditional regulatory frameworks that sought to replace competition (Littlechild, 2003: 63). An explanation for the increase in rules is the 'Europeanisation of policymaking' (Majone, 1997). Many of the rules at the national levels are implementations of European directives. The European directives for the different network industries are aimed at introducing competition and at creating one European competitive market for the services provided over the networks. These directives oblige the vertical unbundling of the industries, the independence of the network operators, and the opening of the industries to new entrants. They also prescribe that consumers be given a choice of supplier. The European rules thus influence the governance structures at the level of the firm in the liberalized network industries: they oblige a change from vertically integrated hierarchies to new forms of governance.

This focus on rule-making is changing the role of the national governments. National governments are retreating from the management and operation of the firms, and are instead focusing on regulating the network industries. As others have observed, the European governments are changing from interventionist states to regulatory states (e.g. Majone, 1996). One of the most obvious structural consequences of the shift to a regulatory state is the rise of a new type of regulator; the independent, sector-specific regulatory agency (Majone, 1997). The independent regulatory agency is taking over, and is reformulating some of the formerly state duties. In addition, in the process from monopolistic to potentially competitive industries, the competition authority is assuming its role as a regulator of the network industries. As a result of the liberalization of the network industries, both the institutional structures of regulation and the institutions of governance at the level of the firm are changing.

Several strands within the literature on liberalizing network industries have addressed these various themes of privatization, re-regulation, and restructuring. Firstly, research on privatization of network industries has focused on the issue of whether privatization increases the efficiency of firms in these industries. Several studies on privatization have reported contradictory results. In a review of these studies, Vickers and Yarrow (1988) conclude that there are no substantial differences in efficiency between publicly and privately owned firms. Others, such as Pollitt (1995), find some evidence for a greater efficiency of private firms in the electricity industry. Overall these studies conclude that other factors than privatization contribute more to the efficiency of network industries, including the degree of competition and the quality of regulation. In a more recent review on the effects of privatization, Ricketts (2002: 478-482) finds that private firms are better at generating sales, and increasing profitability, productivity and efficiency.
Secondly, different theories can be distinguished within the economics of regulation. The *public interest theory* views regulation as a means to achieve some public interest objective, also in circumstances where the market fails, as in the case of a natural monopoly (e.g. Landis, 1938). Critics of this perspective argue that there is often no agreement on what is in the public interest, and that regulators cannot be trusted on taking only public interests into account (Baldwin and Cave, 1999: 20). The *special interest theorists* argue that regulators distribute rents among various interest groups, as firms, consumers, and environmental groups, that

pursue their self-interests and compete for the regulatory rents. When there is one dominant interest group, usually the regulated firms, the regulator is often captured by these firms, which are pursuing their self-interests and which are, for instance, bargaining for entry restrictions in the industry (Stigler, 1971; Laffont and Tirole, 1991). A large part of the discussion on regulation focuses on the methods for determining tariffs (Littlechild, 1988). Some alternatives are price-cap regulation, rate-of-return regulation or yardstick regulation. These first two types of regulation set a maximum for respectively the tariffs that can be charged to consumers and the rate-of-return that can be earned by the regulated firms. In yardstick regulation, the tariffs that can be charged to consumers depend on the performance and the costs of other comparable firms in the network industries.

The *new institutional economics* also addresses the topic of regulation (e.g. Williamson, 1976). Within this theoretical framework, regulation is mainly viewed as a governance structure that can solve the contracting problem between utility firms, who have an incentive to set monopolistic prices, and their customers. The regulator takes on an agency role for the customers, and engages thereto in a collective contract with the utility firm (Goldberg, 1976). In this collective contract, the conditions and tariffs are set out under which the regulated firm can supply its service to consumers, and under which it can recover its reasonable costs of providing the service (Joskow, 1991: 68; Williamson, 1986: 121). More recently, several studies are focusing on regulatory governance structures that govern the regulatory contract between the regulators and the regulated firms, as compared to the regulated contracts between utility firms and consumers (e.g. Stern and Holder, 1999). The regulators may have an incentive to hold up the utility firms, which have sunk large investments in network or production capacity, by demanding very low prices for their utility services. The regulatory governance structures are the mechanisms that societies use to constrain regulatory discretion (Levy and Spiller, 1994). These studies also focus on the political, legal and administrative institutions that influence the regulatory governance structures, and on these institutions' ability to restrain regulatory discretion (Parker, 1999ab; Holburn and Spiller, 2002).

Recent literature on regulation refers to the importance of studying the relations between the various public authorities, as the ministries, independent regulatory agencies and competition authorities, and the allocations of power and responsibilities among these authorities (Glachant and Finon, 2000; Ogus, 2002). Knowledge of these regulatory institutions is important for understanding their influence on the regulatory outcomes (Estache and Martimort, 1999; Ruhil and Teske, 2003). There has, however, been very little research on these institutional structures of regulation, or in other words on the internal organization of the regulatory state (Böllhoff, 2001: 3).

Thirdly, the restructuring of network industries entails the vertical separation of the integrated firms to enable the introduction of competition into the services provided over the networks (Newbery, 1999: 3). The European directives and the national regulations have prohibited the vertically integrated firms in the European industries, and therefore new structures need to emerge for the governance of transactions in these industries to replace the vertical integration. The restructuring of network industries thus raises questions on the efficiency of governance structures and on the changes in forms of governance in these industries. Transaction cost economics (TCE) analyses the comparative efficiency of governance structures. Several studies within this theoretical framework of TCE have shown that the regulated vertically integrated firms are the most efficient institutional solution in these industries when considering the attributes of the transactions, as asset-specificity and uncertainty, and the presence of natural monopolies (Williamson, 1996a; Joskow, 1996; Glachant, 2002). It has also been argued that market forms of governance will not emerge in the unbundled network industries to replace the vertical integration (Crocker, 1996). Most of the TCE studies on forms of governance in unbundled industries focus on network industries in the United States. They reported the emergence of long-term contracts in the unbundled industries, because of the presence of bilateral dependencies and asset-specific investments (e.g. Joskow, 1987). In the liberalized network industries, the producers have lost their stable customer base of their regional or national monopolies, and therefore they experience an increase in uncertainty associated with investing in production capacity. These increased levels of uncertainty in liberalized industries can even explain 'the general desire to reintegrate vertically in these sectors' (Helm and Jenkinson, 1998: 11). Very few empirical studies have focused on the type of governance structures that are emerging in European unbundled industries (Yvrande-Billon and Ménard, 2005), in which the processes of liberalization are more recent and which have been driven by the regulatory framework of the European directives. Furthermore, it has been argued that transaction cost economics is a static perspective that works out of an equilibrium contracting setup (Langlois, 1992). A complementary perspective is needed to analyse the changes in governance structures from vertically integrated firms to unbundled and liberalized forms of governance.

This thesis focuses on these changes from vertically integrated firms to new forms of governance in European unbundled industries that are caused by the European directives and national regulations. The aim is to understand what new forms of governance emerge, how and why forms of governance adapt from one structure to another, and what the regulatory influence is on the transformations of the governance structures (i.e. the governance transformations). To answer these questions, a theoretical contribution to transaction cost economics is made that allows for an analysis of the adaptation process between governance structures. The network industry that is chosen to study these governance transformations is the electricity industry. The Dutch and French electricity industries are compared. This thesis thus focuses on the two topics of restructuring and re-regulation that have been introduced in this first chapter. It does not take the issue of privatization of network industries into account, because the European directives do not require a privatization of the electricity firms or an ownership separation of the networks.

1.1 Theory: transaction cost economics

The theoretical framework that is used in this thesis is that of transaction cost economics. The focus is on the transaction cost economics of Oliver Williamson. Within this transaction cost economics, the emphasis lies on explaining the comparative efficiency of governance structures, which is determined by the type of transactions that the structures coordinate. The core argument of TCE revolves around the hypothesis that transactions – that differ in their attributes - are aligned with governance structures – that differ in their cost and competence - in a transaction cost economizing way (Williamson, 1996a). The attributes of transactions may create several contracting problems between the parties to the transactions. For example, very specific transactions may lead to the contractual problem of bilateral dependency between the contracting parties, and therefore to high transaction costs. To solve this contractual problem and to minimize the transaction costs, ex post contractual safeguards are set up in the form of governance structures. The three generic forms of governance are the market, the hybrid and the hierarchy. For highly specific transactions, the hierarchy is considered to be a more efficient form of governance. For standard transactions, the market reduces transaction costs. Transaction cost economics analyses this efficient alignment of ex post governance structures with the attributes of transactions. TCE thus focuses on defining the attributes of transactions and those of governance structures, and on formulating refutable hypotheses on how transactions are efficiently aligned with governance structures.

Transaction cost economics also refers to the institutions at a higher level (the institutional environment) that influence the governance structures at the level of the firm. Williamson locates property rights, contract law and reputation in this institutional environment (Williamson, 1991). Improvements in this environment may increase the use of a particular form of governance. Within TCE, the focus has, however, been on the efficient alignment of governance structures to transactions, as opposed to the environmental influence on governance.

Several elements of transaction cost economics are adopted in this thesis, including the definitions of a governance structure and a transaction, the characterization of the different types of governance structures, and the attributes of transactions. In addition, this thesis recognizes that transaction costs exist in exchange relations between economic actors, and assumes that these economic actors aim for a minimization of transaction costs. It agrees with how governance structures are efficiently aligned with transactions, and adopts the analysis of higher-level institutions that influence the forms of governance.

The main reason for choosing transaction cost economics in this thesis is that this theoretical perspective analyses both governance structures and transactions. The focus is on governance structures in this thesis, because the main drivers of the liberalization of the European electricity industries are the EC electricity directives, and these directives prescribe changes in the governance structures. In addition, these directives, that include rules on unbundling, leave several electricity transactions (network connection, network access, and balancing transactions), that are crucial to the functioning of the electric system, without a safeguard (see figure 4.4). In the liberalized industry, consumers and generators still need a connection and an access to the electricity network, and electricity supply and demand still need to be balanced. Therefore, the focus is also on the transactions in this thesis.

1.2 Theoretical contribution: complementing transaction cost economics

On various points, however, this thesis also diverges from the transaction cost economics of Oliver Williamson. It aims for several complements to this theory of TCE to enable an understanding of the current changes in liberalizing electricity industries, and in particular the regulatory influence on changes in governance structures. As was set out in this introduction, the new European and national regulations prohibit the vertically integrated structures of the electricity firms, and encourage instead the adoption of market forms of governance; in other words, they force a process of governance change on the European electricity firms. For transaction cost economics, the analysis of this process of governance transformations and regulation poses several problems. Firstly, transaction cost economics is limited in its ability to explain governance transformations, and thus the processes of change from one form of governance to another. It is largely a comparative static perspective (e.g. Langlois, 1992). TCE does refer to adaptation as the 'central problem of economic organization' (Williamson, 1999a: 1101), but adaptation is not analyzed as a mechanism that can explain changes between different forms of governance. Within TCE, adaptation is defined as a static feature of governance structures; the market is characterized by autonomous adaptation, and the hierarchy by cooperative adaptation. Secondly, transaction cost economics ignores the fact that regulation sets the rules of the game and thereby influences the governance structures at the level of the firm, as can be observed in the case of the European liberalizing electricity industries. Transaction cost economics analyses regulation solely as a governance structure that is positioned at the same level as markets, hybrids and hierarchies (Williamson, 1999b). It does not embed regulation in the institutional environment. This complicates both an understanding of the regulatory influence on the comparative efficiency of governance structures, and on the governance changes at the level of the firm. Thirdly, the contracting problem on which transaction cost economics focuses is less relevant in liberalized electricity industries. TCE focuses on the contracting problem between consumers and utility firms, for which regulation is considered to be an efficient governance solution (Williamson, 1976). In the liberalizing electricity industries, the electricity firms have lost their monopolies for the supply of electricity, and are therefore not able to hold up the consumers with monopolistic prices. The relevant contracting problems in liberalizing electricity industries are the ones between the unbundled segments of the formerly integrated electricity firms. These are considered to be the most relevant, because the European and national regulations have required the vertical unbundling, and because new forms of governance need to be set up to replace the vertical integration and to safeguard the contractual hazards between the unbundled activities.

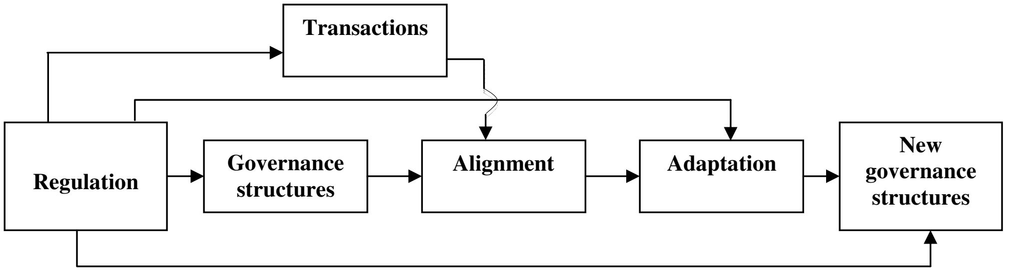
This thesis presents a different, but complementary to TCE, perspective on regulation and governance transformations that enables an understanding of the regulatory influence on changes in governance structures. Transaction cost economics is able to explain the comparative efficiency of governance structures with the attributes of transactions. When regulations prohibit the efficiently aligned governance structure, transaction cost economics only points to the adoption of a governance structure that is a second-best solution. TCE is not able to explain the transformation from the efficient governance structure to the second-best solution, or what this second-best solution will be. The complementary perspective extends the transaction cost economics framework to include a process of adaptation that enables an explanation of governance transformations and consequently of the type of new governance structures (and thus also the second-best solutions) that emerge. It locates regulation in the institutional environment. Regulation influences the structures that govern the contracting problems between the unbundled segments of the electricity value chain. This complementary perspective is different from the current transaction cost economics' treatment of concepts as regulation, relevant contracting problems and governance change, but it can still be incorporated within the larger TCE framework. These complementary elements are theoretically consistent with transaction cost economics, so that they can be introduced into the current framework of transaction cost economics. The assumptions on bounded rationality, opportunism, and the minimization of costs by the economic actors (whether these are transaction costs, or the costs of adapting to new forms of governance) are the same. The heuristic device is similar: the attributes of adaptation have an efficient alignment with governance transformations, as do the attributes of the transaction with the governance structures. In this transaction cost economics, that is extended with the analysis of governance transformations, a first step is always to study the efficiency of the governance structure with the attributes of the transactions, and when there is a misalignment (possibly due to new regulations), the process of adaptation is analysed to understand the transformation to a new governance structure.

1.3 Research questions and conceptual framework

Figure 1.1 presents the conceptual framework of this thesis. It shows the intermediate steps that have to be taken before the general research question can be answered. The general research question is formulated as follows:

What is the influence of regulation on the transformations between governance structures in the liberalizing Dutch and French electricity industries?

Figure 1.1 Conceptual framework



In the conceptual framework, regulation is opted to have a direct effect on the governance structures that existed before the liberalization of the industries; regulation prohibits the vertical integration, and thereby creates a need for the emergence of new forms of governance. Regulation refers here to the national laws and rules that implement the European directives on the creation of one European electricity market. The new governance structures need to coordinate the transactions between the various unbundled segments in the electricity value chain, and to safeguard against the contractual hazards that arise between the transacting parties. Several research questions are formulated for this first step in the conceptual framework.

1.a. What is the effect of regulation on the governance structures that existed before the liberalization of the electricity industry?

1.b. Between which segments of the electricity value chain and for what types of transactions does the need for new forms of governance arise as a result of the regulations?

1.c. What contracting problems – that are in need of new forms of governance - emerge as a result of the regulations on unbundling and consumer choice?

The new European and national regulations may also influence the attributes of the transactions in the electricity industry. This thesis defines the attributes of the relevant transactions in the industry, where relevant refers to those transactions of which the governance is affected by the new rules on unbundling and consumer choice. These transactions include the network connection, network access, balancing and switching transactions. This thesis also discusses, with the transaction cost economics framework, what the governance consequences are of the attributes of the transactions.

2.a. What are the attributes of the relevant transactions in the electricity industry?

2.b. What is the effect of regulation on the attributes of these electricity transactions?

2.c. How do these attributes limit and/or enable the emergence of particular governance structures?

Based on the findings of the regulatory effects on the governance structures of before the liberalization and on the transactions, this thesis analyses the resulting degree of misalignment (or alignment) between the emerging governance structures and the attributes of the transactions. The conclusions on the presence of a (mis)alignment are based on the TCE framework that matches particular attributes of transactions with particular forms of governance in a transaction cost economizing manner. Transaction cost economics has argued, and has empirically shown, that vertical integration in the electricity industry is an efficient form of governance when considering the attributes of the electricity transactions (e.g. Joskow, 1996). The assumption is therefore made in this thesis that the governance structures of before the liberalization were efficiently aligned with the attributes of the transactions. Taking into account the regulations on the vertical unbundling of the integrated firms, a misalignment between the emerging forms of governance and the transactions is likely to occur.

3.a. How does transaction cost economics explain the efficiency of various forms of governance?

3.b. For which transactions do the regulatory effects on governance and transactions create a misalignment between governance structures and transactions?

A misalignment between governance and transactions stimulates a process of adaptation towards new forms of governance since economic actors aim for an efficient alignment to reduce transaction costs. This thesis takes this process of adaptation into account as a variable that explains what new forms of governance will emerge. It also explains the transformation from one governance structure to another. Three attributes of adaptation (identity of the future contracting party, laterality of the adaptation, and type of adaptation response) will be defined that determine the direction of change into either the market or the hybrid form of governance.
4.a. What new forms of governance are adopted in the liberalized electricity industries for each of the four types of electricity transactions?
4.b. How do the attributes of adaptation explain the transformations from one governance structure to another, and thus the emergence of the new governance structures?

Regulation is analysed in this thesis as the ex ante rules of the game that influence the governance structures and the transactions, but two other effects of regulation will also be taken into account. In the conceptual framework in figure 1.1, the line from regulation to adaptation indicates that regulation may also have an influence on the process of adaptation. And the bottom line in the figure (from regulation to new governance structures) indicates that regulation can also become part of the new governance structures.
5.a. How does regulation influence the process of adaptation?
5.b. When does regulation become part of the new governance structures?

1.4 Case studies: the Dutch and French electricity industries

To answer these research questions, a multiple case study is done on the governance transformations in the Dutch and French electricity industries. The case study is preferred as a research strategy in this thesis, because it allows for an investigation of ‘a contemporary phenomenon within a real-life context’ (Yin, 2003: 13). In this case study, the contemporary phenomenon refers to the governance transformations in the liberalizing electricity industries.

The real-life context includes the electricity laws and regulations that stimulate governance changes, and the governance structures that characterized the industries before the liberalization.

This multiple case study predicts similar results across the two cases on how the adaptation process to new forms of governance works. The governance transformations in the Dutch and French electricity industries have been chosen as the two cases, because of their contrasting real-life contexts[1]. Although the Dutch and French governments transpose the same European electricity directives, the Dutch and French electricity legislation and regulations differ. The Dutch government has formulated electricity laws and regulations that stipulate more stringent requirements on the independence of the networks than are included in the European directives, while the French government has been very conservative in transposing the European directives into French law. Before the liberalization, the Dutch electricity industry internalized the generation and transmission of electricity, but had separate distribution companies with regional monopolies. The French electricity industry has been characterized by a vertically integrated firm (EDF) that internalized the generation, transmission and distribution of electricity and that had a national monopoly in these three activities. These two contrasting real-life contexts have been chosen to enhance the generalizability of the case results to the proposed theory on the adaptation process. Yin (2003) states that if 'under varied circumstances you can still arrive at common conclusions from both cases, they will have immeasurably expanded the external generalizability of your findings' (Yin, 2003: 53). The results of case studies are not generalized to a larger population, but to theory (analytic generalization) (Yin, 2003: 32-33). Possible differences between the new governance structures in the two industries can be explained by referring to the differences in the contexts.

In each of the two electricity industries, the four types of electricity transactions (network

[1] Other countries have not been chosen for several reasons. For example, the United Kingdom has not implemented the European directives of 1996 and 2003, but has liberalized its electricity industry before these directives were issued. A choice for the United Kingdom would complicate the analysis in this thesis, because the directives are the drivers of governance change. After the implementation of the 1996 directive, Germany relied solely on an ex post regulation by the competition authority. This would also have complicated the analysis, because regulation is here seen as the ex ante rules of the game.

connection, network access, balancing and switching transactions) are studied. For each of these electricity transactions, the case will show what new governance structure has emerged, how this new form of governance can be explained (with the attributes of adaptation, and with the attributes of the transaction only when there is also an efficient alignment in the new situation), and what the governance transformation has been. These four types of transactions are the subunits of each case. The type of case study can therefore be described as an embedded multiple case study, in which several subunits – the different transactions – are embedded in each of the two case studies (Yin, 2003: 39).

The time period for which the changes are studied in both industries range from the implementation of the first EC electricity directive of 1996 into the national laws and regulations until the end of 2008. Several data sources are used in the case studies, including literature, documents, and interviews.

1.5 Structure of the thesis

Chapter two discusses the theoretical framework of transaction cost economics. It starts with some definitions of the main elements of TCE, including the transaction, transaction costs, and governance structures (section 2.1 and 2.2). The core argument of TCE revolves around the discriminating alignment hypothesis in which transactions are matched to governance structures in a transaction cost economizing way (section 2.3). The paradigm case of transaction cost economics is that of vertical integration. This form of governance is efficiently aligned to transactions with a large degree of asset-specificity and uncertainty (section 2.4). Transaction cost economics is a theoretical framework that allows for a comparative analysis of the efficiency of governance structures, but its approach to adaptation, and specifically to changing forms of governance, is limited (section 2.5). One way in which the comparative efficiency of governance structures is explained is through the influence of the institutional environment on the governance structures (section 2.6). TCE locates property rights, reputation and contract laws in the institutional environment to the neglect of regulation. Regulation is analyzed as a governance structure (section 2.7).

Chapter three presents the particularities of the electricity industry. It introduces the various segments of the electricity value chain, including the generation, transmission, distribution and retail of electricity. The European electricity industries have for decades been characterized by a vertical integration of these segments (section 3.1). From a transaction cost economics perspective, the vertical integration in this industry is considered to be an efficient institutional solution, when looking at the attributes of the electricity transactions, the presence of externalities and the strong interrelationships between the different segments of the electricity value chain (section 3.2). The transmission and distribution of electricity are natural monopolies. TCE argues for the efficiency of regulation as a form of governance for natural monopolies (section 3.3). The European electricity directives of 1996 and 2003 require the vertical unbundling of the transmission and distribution system operators, and the possibility for consumers to choose their electricity retailer (section 3.4). The few empirical studies within TCE on unbundled industries conclude that the most common form of governance that emerges is the long-term contract, and not the market form of governance as envisaged by the European directives (section 3.5).

Chapter four presents the conceptual framework of this thesis in detail. It discusses a perspective that allows for an analysis of changing governance structures and that is complementary to transaction cost economics. Within this framework, regulation is located in the institutional environment (sections 4.1 and 4.2) and has an influence on governance structures and transactions at the level of the firm (sections 4.3 and 4.4). This regulatory influence can create a misalignment between governance structures and transactions (section 4.5) that stimulates a process of adaptation towards altered forms of governance. The adaptation process enables an explanation of governance transformations in the direction of either a market or a hybrid form (section 4.6).

Chapter five discusses the operationalization of the various concepts (section 5.1), the research design of the embedded multiple case study (section 5.2), and the data collection methods that are used in this thesis (section 5.3).

Chapters six and seven present the two cases of the Dutch and French electricity industries, respectively. These studies discuss the real-life contexts: the governance structures of before the liberalization, the regulations and regulatory institutions in each of the two industries (sections 6.1-6.3; 7.1-7.3). These two chapters analyse what new forms of governance have emerged in each of the respective industries for the network connection, network access, balancing, and switching transactions; how these forms of governance have changed with respect to the governance structures of before the liberalization; and what the influence of regulation has been on these governance transformations. These studies will indicate when the attributes of adaptation are able to explain the transformations to the new governance structures, and when there is an efficient alignment in the new situation and the attributes of the transactions are able to explain the new governance structures (sections 6.4-6.8; 7.4-7.7).
Chapter eight makes a comparison between the results of the two cases. It presents the observations on how the findings of the two cases and the comparisons match the conceptual framework. It concludes on how the multiple case study has contributed to an understanding of governance transformations and regulatory influences on changes in governance structures. This chapter also presents the policy recommendations, and draws the conclusions for the entire thesis.

2 - Transaction Cost Economics

The theory of transaction cost economics has its origins in the article that is written by Ronald Coase in 1937 on 'The nature of the firm'. In this article, Coase addressed the question: if markets are so efficient, why do firms exist? The answer was found by recognizing that there are costs involved in running the economic system (i.e. transaction costs), and that economic actors aim to minimize these positive transaction costs. The firm and the market are alternative structures for coordinating transactions, and they coexist in the economy for transaction cost economizing reasons. This analysis of Coase in 1937, and the continuing development of transaction cost economics (e.g. Williamson, 1975, 1985, 1996a), differ from the neoclassical economics' view on the firm (Williamson, 1985: 15-19). Neoclassical economics traditionally views the firm as a production function that exists in a zero transaction cost world. In this neoclassical world, efficiency is based on comparisons to the hypothetical ideal of the market. In transaction cost economics, the efficiency of the market is determined by comparisons to feasible governance alternatives. For some transactions, it is more efficient - meaning it economizes on transaction costs – to use the market. For other transactions, it is more efficient to internalize the transactions into the firm.

From the late 1930s to the beginning of the 1970s, 'The nature of the firm' (Coase, 1937) was largely neglected. In a lecture in 1970, Coase referred to his 1937 article as 'much cited and little used' (Coase, 1988: 62). After this period, among others Oliver Williamson began the operationalization of Coase's 'big idea' (Varian, 2002) by focusing on naming and explicating the attributes of transactions and the various forms of transaction costs (e.g. Williamson, 1975, 1985). A focus on transactions also made sense at the time to overcome the reputation of a 'well-deserved bad name' (Fischer, 1977: 322) of transaction costs; the use of the concept was too elastic in that almost anything could be explained by resorting to transaction costs. One of the attributes of transactions, on which most of the transaction cost analysis and its empirical work has been built, was characterized as the asset-specificity of transactions. Asset-specificity refers to ‘the degree to which an asset can be redeployed to alternative uses and by alternative users without sacrifice of productive value’ (Williamson, 1996a: 59).

By the time of the publication of Williamson’s ‘Markets and hierarchies’ (1975), the contours of transaction cost economics were clear: the comparative efficiency of governance structures, as the market and the hierarchy, needs to be determined by the attributes of the transactions. Transaction cost economics started with the analysis of the make-or-buy decision (the decision on whether to make a transaction within the firm or to buy it in the market) as it was first addressed by Coase in his 1937 article. The early empirical studies focused on this paradigm case, which is also referred to as the vertical integration decision (e.g. Klein, Crawford and Alchian, 1978). One of the main explanations that was found for vertical integration is the transaction attribute of asset-specificity.

From the late 1970s onwards, Williamson extended the transaction cost analysis beyond the market and hierarchy dichotomy to include the hybrid form and characterized the features of governance structures (Williamson, 1979; 1991)[2]. The hybrid form is a governance structure that is situated in between the market and the hierarchy in TCE’s comparative institutional analysis. The contracting parties to a hybrid form retain their autonomy, but they are dependent upon each other due to asset-specific investments into the contractual relation. Several attributes of governance structures have been defined, including incentive intensity, administrative control and contract law regimes (Williamson, 1991). The market exhibits a high incentive intensity, a low administrative control and a use of courts, while the hierarchy is characterized by a low incentive intensity, a large administrative apparatus, and the use of fiat. The hybrid form displays intermediate values on these attributes. This focus of transaction cost economics on the ex post governance of incomplete contracts distinguishes it from the ex ante, incentive alignment agency perspectives (Grossman and Hart, 1976). The ex post governance of incomplete contracts with market, hybrid or hierarchical forms serves efficiency purposes and provides safeguards for contractual hazards. An example of a contractual hazard is

[2] In 1979, Williamson does not yet use the term hybrid form of governance, but refers to bilateral and trilateral governance as the structures that are situated in between the market and internal organization.

bilateral dependency, which is the result of investments in specific assets by the parties to the contractual relation. This contractual hazard consists of the potentially opportunistic behaviour by one of the contracting parties that can hold up the other contracting party due to the asset-specific investments. The governance of these asset-specific transactions with a hybrid form that consists of a commitment to a long-term relation or with an integration of these transactions into the firm, guards against the hold-up problem and thereby solves the contractual hazard and reduces transaction costs.

Transaction cost economics is often described as a private ordering approach (Williamson, 1996a). Private ordering refers to efforts of the immediate parties to the transactions to craft governance structures that are better attuned to their exchange needs. These private parties do not rely on a regulator or legislator to construct governance structures for them. This central role for private ordering in transaction cost economics also entails, according to Williamson, that 'court ordering is better regarded as a background factor' (Williamson, 1996a: 57). Williamson has often criticized the legal centralism tradition for overemphasizing the role of the law (Williamson, 1996a). Public ordering has, however, a larger role in transaction cost economics than is admitted by Williamson. Firstly, public forms of governance have been added as structures to the comparative institutional analysis (Williamson, 1999b). Secondly, the law of contracts, which Williamson locates in the institutional environment, is analysed as having an influence on the comparative efficiency of governance structures (Williamson, 1991). And thirdly, Williamson often refers to the public policy ramifications of transaction cost economics (e.g. Williamson, 1996a: 27).

This chapter discusses the various components of TCE, as introduced above, and with an emphasis on the transaction cost economics of Oliver Williamson. It focuses first on the attributes of transactions and transaction costs (section 2.1), the characteristics of governance structures, the different types of governance and their corresponding attributes (section 2.2), and the alignment of the attributes of transactions with governance structures (section 2.3), followed by a discussion in section 2.4 on the paradigm case of vertical integration. Section 2.5 presents the analysis of dynamics within transaction cost economics, and sections 2.6 and 2.7

expand on the role of the institutional environment and regulation in transaction cost economics.

2.1 Transactions

Transaction cost economics concurs with John R. Commons, who stated that 'the ultimate unit of activity must contain in itself the three principles of conflict, mutuality and order. This unit is a transaction.' (Commons, 1932: 4). The transaction is the basic unit of analysis in transaction cost economics. A transaction occurs 'when a good or service is transferred across a technologically separable interface. One stage of activity terminates and another one begins' (Williamson, 1985: 1). Three main attributes of the transaction have been identified, including the uncertainty to which the transaction is subject, the frequency with which the transaction recurs, and the asset-specificity of the transaction.

2.1.1 Transaction attributes

Uncertainty refers to the unanticipated disturbances that affect transactions. Disturbances have different origins; transaction cost economics focuses on uncertainty that is attributable to opportunism. This type of uncertainty, referred to as behavioral uncertainty, arises as a result of 'strategic nondisclosure, disguise or distortion of information' (Williamson, 1985: 56) by the contracting parties.

Frequency plays a relatively minor role in characterizing transactions in Williamson's transaction cost economics (Rindfleish and Heide, 1997). Three frequency classes are identified for transactions: one-time, occasional and recurrent (Williamson, 1985: 72). Frequency has been argued to be relevant with respect to reputation effects and governance costs. When the frequency of transactions increases from one-time to recurrent, the reputation of contracting parties on previous transactions starts to matter. And when transactions are of a recurring kind, they allow for an easier recovery of costs for specialized governance structures (Williamson, 1985: 60).

Asset-specificity plays a central role in transaction cost economics; it is the source of many refutable hypotheses, and the focus of the majority of the empirical work (Macher and Richman, 2006: 5; David and Han, 2004: 52). Asset-specificity refers to 'the degree to which an asset can be redeployed to alternative uses and by alternative users without sacrifice of productive value' (Williamson, 1996a: 59). It ranges from generic, non-specialized assets to highly idiosyncratic assets. Generic, non-specialized assets can be easily transferred to other transactions and alternative uses without great costs. Investments into idiosyncratic assets are made specifically to enable a particular transaction. These assets, which are specific to a transaction, are put to alternative uses only at a great loss of economic value. Asset-specificity can be traced to investments that are made immediately upon signing a contract, 'but asset-specificity also evolves during contract implementation' (Williamson, 2005b: 7). In 'The economic institutions of capitalism' (1985), Williamson identifies four types of asset-specificity: (1) site-specificity, in which successive plants are located in close proximity to one another so as to economize on inventory and transportation expenses; (2) physical asset-specificity, where inputs are specialized to the production of a particular component or a product; (3) human asset-specificity that arises in a learning-by-doing fashion; and (4) dedicated assets, which represent a discrete investment in generalized (as contrasted with special purpose) production capacity that would not be made but for the prospect of selling a significant amount of product to a specific customer. In 'The mechanisms of governance' (Williamson, 1996a), (5) brand name capital (an investment in reputation (Williamson, 1988: 359)) and (6) temporal specificity have been added (Williamson, 1996a: 60, 106) to the types of asset-specificity that are mentioned in 'The economic institutions of capitalism'. Temporal specificity is 'a type of site-specificity in which timely responsiveness by on-site human assets is vital' (Williamson, 1996a: 106).

2.1.2 Transaction costs

There are costs involved in transacting, in transferring goods and services from one stage of activity to another. Transaction costs are often described as 'the costs of running the economic system' (Arrow, 1969: 48). They include the costs of bargaining, drafting, negotiating and safeguarding an agreement. These are referred to as ex ante transaction costs; they are incurred before the intended transaction takes place. In addition, transaction costs include costs of planning and monitoring task completion. And finally, there are ex post transaction costs, such as costs for enforcing and policing an agreement, and misalignment costs. Transactions can become maladapted to the structures that govern them, because of the unanticipated disturbances to which transactions are subject. This misalignment[3] creates various ex post transaction costs, including (1) the maladaptation costs; (2) the haggling costs incurred if bilateral efforts are made to correct ex post misalignments; (3) the setup and running costs associated with the governance structures to which disputes are referred; and (4) the bonding costs of effecting secure commitments (Williamson, 1985: 21).

The empirical research in transaction cost economics almost never measures transaction costs directly[4], because these costs are often difficult to quantify (Williamson, 1985: 22). Buckley and Chapman (1997) claim that these costs are often outside the domain of quantification altogether (Buckley and Chapman, 1997: 137). Williamson offered a solution to these difficulties by referring to the comparative nature of transaction cost economics: the magnitude of transaction costs does not need to be measured in an absolute sense, but can be assessed by comparing costs under different modes of governance (Williamson, 1985: 22; Williamson, 1996a: 5). However, when comparing transaction costs under different modes of governance, these costs still need to be quantified in order to allow for a comparison. One central assumption of transaction cost economics reduces the need for empirical research to focus on the measurement of transaction costs: TCE assumes that economic actors minimize transaction costs, and that they aim for such a minimization through the efficient alignment of transactions

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[3] The misalignment of transactions and governance structures is discussed in detail in section 2.3.

[4] There are some exceptions; for example, Wallis and North (1986) calculated that the amount of transaction costs in the United States had grown from 25 per cent of GNP in 1870 to 45 per cent of GNP in 1970. Transaction costs were measured by 'adding all the resources used in the transaction industries (wholesale and retail trade; and finance, insurance and real estate) and the wages paid to employees in transaction-related occupations (e.g. managers, supervisors, clerical workers) in all other industries' (Wallis and North, 1988).

with governance structures. TCE formulates hypotheses on this efficient matching of transactions with governance structures, and most empirical studies within TCE are therefore focused on testing these hypotheses.

2.2 Governance structures

Transaction cost economics assumes the presence of two behavioural attributes in economic actors: bounded rationality and opportunism. These two behavioural attributes of economic actors lead to the necessity of governing transactions.

2.2.1 Bounded rationality and opportunism

Bounded rationality refers to 'human behavior (that) is intendedly rational but only limitedly so' (Simon, 1957: xxiv). It is a condition of limited capacity to receive, store, retrieve and process information (Williamson, 1996a: 377). The limited cognitive competence of economic agents makes complete contracting impossible. A consequence of the assumption of bounded rationality is therefore that all complex contracts are unavoidably incomplete. Transaction cost economics is said to work out of a semi-strong form analysis of bounded rationality. This type of analysis 'joins bounded rationality with farsighted contracting' (Williamson, 1996a: 8). The intentionality of human agents that Simon referred to in his definition of bounded rationality is translated to farsightedness in transaction cost economics (Williamson, 1996a: 9). Farsighted economic agents have 'the capacities both to learn and to look ahead, perceive hazards, and factor these back into the contractual relation, thereafter to devise responsive institutions' (Williamson, 1996a: 9).

Opportunism is a form of self-interest seeking that is combined with dishonest behaviour in transaction cost economics. It refers to the 'incomplete or distorted disclosure of information, especially to calculated efforts to mislead, distort, disguise, obfuscate or otherwise confuse' (Williamson, 1985: 47). It is responsible for real or contrived information asymmetries, and for uncertainty in the contractual relation. Transaction cost economics does not require that every economic actor is opportunistic all of the time, but that some economic actors display opportunistic behaviour some of the time. Since it is especially costly to ascertain ex ante the level of trustworthiness of a contracting party, opportunism is assumed, and safeguards against the hazards of opportunism are set up.

These two assumptions of bounded rationality and opportunism result in the transaction cost economics' focus on the governance of incomplete contracts. The limited cognitive competence of human agents leads to incomplete contracting, and farsightedness leads these human agents to set up governance structures that guard against the hazards of opportunism and economize on bounded rationality.

2.2.2 Governance defined

Governance structures are the organizational constructions that coordinate the transactions between the parties to incomplete contracts[5]. They enable the implementation and enforcement of these contracts, and the settlement of disputes between the contracting parties. They also determine how decisions are made on matters that are not specified in the incomplete contracts, and thereby they allow for an adaptation to unanticipated disturbances. Where incomplete, complex contracts have been defined as the frameworks around which real working relations vary (Llewellyn, 1931), governance structures define and constrain how the real working relations function. In doing so, they promote the continuity of ongoing contractual relations.

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[5] Incomplete contracts are not considered to be governance structures. A clear distinction exists within TCE between incomplete contracts and governance. TCE focuses on the analysis of ex post governance structures, which are necessary to safeguard against the contractual hazards that are created by incomplete contracts and specific investments. The presence of the behavioral assumption of farsightedness within TCE leads economic actors to set up governance structures. In addition to the incomplete contracts, Williamson also refers to contracts that are simple and discrete. He states that this is 'the ideal transaction in both law and economics: sharp in by clear agreement; sharp out by clear performance' (Williamson, 2000: 603). He refers to this as an 'ideal market' (Williamson, 1998a: 38) or as an 'unassisted market' (Williamson, 2000: 602). Unassisted refers to a lack of governance, and therefore these contracts are also not considered to be governance structures. Once contractual hazards appear in his contracting schema, governance is needed to solve these hazards. The ideal markets are rare in real economic life, and markets come in various forms. In addition to this ideal, unassisted market, Williamson also refers to a market as a governance structure that he compares with the hybrid and hierarchical forms. The market is here therefore defined as a structure that governs an incomplete contract.

In terms of the ‘Commons-triple’, governance is described as ‘the means by which order is accomplished in a relation in which potential conflict threatens to undo or upset opportunities to realize mutual gains’ (e.g. Williamson, 1996a; 2005b: 3). Conflicts between contracting parties can arise due to the hazards in the contractual relation. A well-known example of a contractual hazard is bilateral dependency that is the result of the transaction-attribute of asset-specificity: when contracting parties invest in transaction-specific assets, they become dependent upon each other. Given the behavioural assumption of opportunism, this transaction-attribute of asset-specificity creates the hazard of being held up by one of the contracting parties. Governance structures mitigate this contractual hazard. An often-used definition of a governance structure is therefore ‘the institutional framework within which the integrity of a transaction, or related set of transactions, is decided’ (Williamson, 1996a: 11).

2.2.3 Attributes and generic forms of governance

The three generic forms of governance are the market, the hybrid and the hierarchy. Many varieties of governance structures can be observed among these three generic forms, such as joint ventures, strategic alliances, producer cooperatives, networks, regulation, functionally organized firms (U-form), multi-divisional firms (M-form) and public bureaus. The various forms of governance can be characterized along three attributes: incentive intensity, administrative control and contract law regime (Williamson, 1991). Firstly, incentive intensity is the degree to which changes in efforts expended by an economic actor have an immediate effect on his compensation or stream of revenues (Williamson, 1996a: 99; 1985: 132). Markets are characterized by high-powered incentives; since contracting parties to a market governance structure receive immediate, individual streams of revenue for their efforts, they have a strong incentive to reduce costs and adapt efficiently (Williamson, 1996a: 103). The incentive intensity in hierarchies is low. Employees get paid a monthly salary that is not immediately dependent upon their individual efforts. Hierarchies benefit from these low-powered incentives, because they promote cooperation among employees towards a larger goal or a greater task.

Secondly, administrative control refers to the various mechanisms that support the functioning of governance structures, such as dispute settlement machinery, monitoring and information disclosure mechanisms, auditing and accounting, career rewards and penalties (e.g. Williamson, 2000: 606). This administrative apparatus creates costs that are referred to as governance or bureaucratic costs, and that increase when moving from the market to the hybrid and to the hierarchical form of governance.

And finally, three types of contract law regime can be distinguished: classical contract law, neoclassical contract law, and forbearance law (Williamson, 1991)[6]. These three types of contract law support the market, the hybrid and the hierarchy respectively. Ménard identified several factors that explain the variability among contracts, including the degree of completeness, the duration and the enforcement procedures of contracts (Ménard, 2000: 237). These factors can be applied to Williamson's classification of the three contractual regimes.

The classical contract law regime refers to contracts that describe in great detail the terms and conditions under which exchange between contracting parties takes place. Although all contracts are unavoidably incomplete due to the bounded rationality of economic actors, classical contracts are the most complete contracts. The details of these contracts are largely focused on prices and pricing formulas. The transactions between the parties to the classical contracts are standardized, and therefore the contracting parties are not dependent upon each other and their identities are irrelevant (Williamson, 1996a: 95). The classical contracts are very short term. Once the contracts have ended, they are automatically renewed, or the economic actors can easily find a new contracting party for supplying the same good or service. The enforcement procedures are largely restricted to what is specified in the contract; the legal terms supersede informal agreements. When disputes arise, contracts are ended. Third parties do not get involved in solving the conflicts. Only the courts are reserved as a forum for ultimate appeal (Williamson, 1994: 325).

Neoclassical contract law is supportive of contracts with a greater degree of flexibility and a

[6] This distinction between the various forms of contract law is based on MacNeil (1978). It bears no relation to the distinction between classical and neoclassical economics.

longer duration. These contracts are used when the continuity of the contracting relation is valued, which is the case when the contracting parties have invested in specific assets to the contractual relation. Asset-specific investments create a dependency relation between the contracting parties to the neoclassical contract, but these parties do maintain their autonomy. Neoclassical contracts allow for adaptations to unexpected disturbances. These adaptations do not only include price adjustments as in classical contracts, but also come from special adaptive mechanisms, such as information disclosure requirements. Third-party involvement in these contracts is common, for example to observe performance, regulate the contracting relation, or to settle disputes through arbitration.

The implicit contract law of the hierarchy is described as forbearance (e.g. Williamson, 1996a). These contracts are even more elastic and long-term than the contracts under neoclassical contract law. Their capabilities for adapting to disturbances are even greater, because consent between autonomous contracting parties under a neoclassical contract takes longer to accomplish than a hierarchical decision. Hierarchies are their own court of ultimate appeal; disputes between divisions are resolved internally or resorted to the hierarchy for a solution. The underlying rationale for forbearance law is twofold: ‘parties to an internal dispute have deep knowledge - both about the circumstances surrounding a dispute as well as the efficiency properties of alternative solutions – that can be communicated to the court only at great cost, and permitting internal disputes to be appealed to the court would undermine the efficacy and integrity of hierarchy.’ (Williamson, 1996c: 33).

Table 2.1 Supporting match of governance attributes to governance forms

	Incentive intensity	**Administrative control**	**Contract law regime**
Markets	High	Low	Classical
Hybrids	Intermediate	Intermediate	Neoclassical
Hierarchies	Low	High	Forbearance

Table 2.1 summarizes the attributes of the generic forms of governance. Markets are characterized by high incentive intensity, little administrative apparatus, and dispute settlement in courts; and hierarchies feature low incentive intensity, a large degree of administrative control, and internal dispute settlement. The hybrid form displays intermediate degrees of incentive intensity and administrative apparatus, and is supported by neoclassical contract law. These attributes of the various forms of governance bear a supporting relation to one another. For example, the large administrative apparatus and internal dispute settlement of the hierarchy are internally consistent with a low incentive intensity. In chapter six of 'The economic institutions of capitalism', Williamson describes how the introduction of high-powered incentives into firms leads to several problems. He observes, for example, that assets (e.g. equipment) will not be utilized with due care. Managers aiming to maximize immediate net receipts save on labor costs by utilizing equipment intensively and deferring maintenance expenses to a successor manager (Williamson, 1985: 138).

2.3 Discriminating alignment

The core argument of transaction cost economics is the discriminating alignment hypothesis. This is the string that draws the foregoing elements – the attributes of transactions and governance - together. It is the main assertion in transaction cost economics from which it draws its predictive content[7]. The discriminating alignment hypothesis claims that 'transactions, which differ in their attributes, are aligned with governance structures, which differ in their cost and competence, so as to effect a discriminating - mainly a transaction cost-economizing – result' (Williamson, 1996a: 12).

Transaction cost economics always starts from the market, after which the hybrid form and the hierarchy can be tried to which additional bureaucratic costs accrue. The efficiency of the market and the other governance structures are not determined by comparisons to some

[7] The majority of the empirical research in transaction cost economics is based on the discriminating alignment hypothesis (Macher and Richman, 2006: 5).

hypothetical ideal of the market. Instead, transaction cost economics bases its comparisons of the efficiency (i.e. transaction cost economizing) of alternative governance structures on the remediableness criterion, which 'holds that an extant mode of organization for which no superior feasible alternative can be described and implemented with expected net gains is presumed to be efficient' (Williamson, 2000: 601). Although TCE starts from the market, there is an efficiency place for each form of governance in the comparative institutional analysis of transaction cost economics that is dependent upon the attributes of the transactions. Figure 2.1 illustrates how governance structures are aligned with attributes of transactions in an efficient manner.

Figure 2.1 Discriminating alignment of transaction attributes to governance forms (adapted from Williamson, 1985: 79)

<table>
<tr><td colspan="2"></td><td colspan="3">Asset-specificity:</td></tr>
<tr><td colspan="2"></td><td>Non-specific</td><td>Mixed</td><td>Idiosyncratic</td></tr>
<tr><td colspan="2"></td><td colspan="3">Uncertainty:</td></tr>
<tr><td colspan="2"></td><td></td><td>Intermediate</td><td>High</td></tr>
<tr><td rowspan="2">Frequency:</td><td>Occasional</td><td rowspan="2">Market governance</td><td>Trilateral governance</td><td rowspan="2">Unified governance</td></tr>
<tr><td>Recurrent</td><td>Bilateral governance</td></tr>
</table>

The market is best suited for governing standardized, non-specific transactions of a recurring and occasional kind. For recurring transactions market parties can consult their own experience with other contracting parties. For occasional transactions this is more difficult, but can be overcome by an easy access to, for example, rating agencies that compare prices of numerous market parties. The use of the hybrid form (bilateral and trilateral governance in figure 2.1) or the hierarchy (unified governance) for standardized transactions will result in larger bureaucratic costs without any benefit from such specialized governance structures.

The use of the hybrid form of governance has an economizing effect when the transactions are characterized by an intermediate or high degree of uncertainty and mixed or idiosyncratic assets. Asset-specific transactions create the contractual hazard of bilateral dependency between the contracting parties to the transactions. Ending such a contractual relation that has invested in asset-specific transactions leads to a loss of economic value. The hybrid form is therefore an efficient governance solution, because it promotes the continuity of the contractual relation and thereby guards against the hazard of opportunistic behaviour by the contracting parties. A distinction is made in the figure between trilateral governance, in which the autonomous contracting parties are assisted by a third party, and bilateral governance, in which the contracting parties set up a governance structure that is specialized to their transactions. Only for recurrent transactions can the setup costs of a specialized, bilateral governance structure be recovered.

The hierarchical form of governance is most efficient when the transactions to be governed are characterized by idiosyncratic assets and high uncertainty. The hierarchy can, through the use of fiat, make fast decisions when there is a great degree of uncertainty.

When governance structures are aligned with transactions in the manner as just described, there are no inefficiencies. For several reasons, however, governance structures can become maladapted to the transactions[8]. Firstly, contracting parties can invest in specific assets during contract implementation, and thereby alter the attributes of the transactions, and reduce the efficiency of the initially chosen form of governance. Secondly, exogenous changes can alter the comparative efficiency of governance structures[9]. The contracting parties want to minimize

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[8] In their review of empirical studies in transaction cost economics, Macher and Richman (2006) conclude that there are very few studies on the costs associated with failing to align transactions and forms of governance (Macher and Richman, 2006: 53). One exception is Masten et al. (1991) who report that a ‘mistaken integration would increase organization costs by approximately 70 percent, while subcontracting work currently performed inside the firm would, on average, generate market organization costs almost three times those incurred managing that work internally (Masten et al., 1991: 2).

[9] Section 2.6 on the institutional environment expands on these external influences.

their transaction costs and therefore aim for a more efficient alignment of transactions with governance. They can choose to adopt a new form of governance, but they can also choose to alter the attributes of their transactions. Williamson recognized the possibility of turning the matter of discriminating alignment around: ‘suppose instead that we think of governance structures as being in search of transactions for which they are well suited’ (Williamson, 2003: 933). Transaction cost analysis has, however, largely focused on adjusting the governance structures to the transactions.

2.4 The paradigm case of vertical integration

The paradigm case out of which transaction cost economics developed is that of vertical integration. TCE started its theoretical development and empirical analyses with vertical integration for two reasons. Firstly, vertical integration was analysed by Ronald Coase in his 1937 article on ‘The nature of the firm’, in the form of the make-or-buy decision. This article is considered to be the starting point for transaction cost economics, because it argues for a comparative assessment of more than one mechanism for coordinating production. Since the make-or-buy decision is central to this seminal article, empirical studies of vertical integration were an obvious place to start. Secondly, vertical integration, as compared with other candidate transactions (such as the employment relation), has the advantage of being simpler, in that a variety of complications that arise in transactions between firms and workers (such as differences of information, differential access to technical and legal expertise, differential capacity to bear risk) are of lesser importance in transactions between firms (Williamson, 2005a: 12).

A few of the first empirical studies on vertical integration within transaction cost economics are those by Monteverde and Teece (1982) and Masten (1984). These studies concluded that investments in specific assets, either in the form of physical assets or human assets, lead to a vertical integration. Williamson also argued that another form of asset specificity, site-specificity, provides a compelling reason for vertical integration (Williamson, 1985: 95).

Investments in specific assets create a relation of bilateral dependency between the contracting parties. Without sufficient safeguards, in the form of vertical integration, contractual hazards and therefore large transaction costs will result. Vertical integration is thus explained by a transaction cost economizing argument. An additional argument for preferring vertical integration, in this case over long-term contracts, is given by Klein (1988). He claims that when transactions are characterized by a substantial degree of uncertainty, vertical integration is preferred. The presence of uncertainty complicates the ability to write and use long-term contracts, and increases the transaction costs of using these long-term contracts (Klein, 1988: 212). Klein defines transaction costs as the 'rent-dissipating costs borne during the negotiation and renegotiation contracting process as transactors attempt to create, avoid, and execute the hold-ups implied by necessarily imperfect long-term contractual arrangements' (Klein, 1988: 211). To reduce the transaction costs that are due to the hold-ups under long-term contracts, Klein argues for vertical integration.

In the previous section (2.3), it was shown that Williamson identified these two attributes of transactions – high asset-specificity and high uncertainty- as those that require the hierarchy as an efficient form of governance. This is no surprise when it is considered that vertical integration is simply the extension of the hierarchy into additional stages of production. As a final comment on vertical integration in transaction cost economics, it is noted that differences between firms have been argued to be responsible for varying degrees of vertical integration (Williamson, 1985: 94-5). Larger firms will be more integrated, because they have greater cost advantages due to economies of scale. M-form firms will be more integrated than their U-form counterparts, because they have lower bureaucratic costs. Due to the lower costs of the larger firm and the multidivisional firm, vertical integration is preferred over the market for a larger range of asset-specificity for these firms.

2.5 The dynamics of TCE

Transaction cost economics has been criticized for being a static perspective that works out of an equilibrium contracting setup (e.g. Langlois, 1992). Williamson claims that dynamics enters into transaction cost economics in various ways. Firstly, he argues that intertemporal process transformations are central to TCE (Williamson, 1996a: 11; Williamson, 1999a: 1101). Secondly, transaction cost economics takes adaptation to disturbances to be the main problem of economic organization (e.g. Williamson, 1996b). And finally, dynamics enters into the analysis through the institutional environment. Changes in the environment influence the comparative costs of forms of governance and thereby increase or decrease the use of particular governance structures (e.g. Williamson, 1991).

2.5.1 Intertemporal process transformations

One of the contributions of transaction cost economics to the incomplete contract literature is its ex post perspective. In addition to the ex ante incentive alignment stage, TCE takes the contract implementation and contract renewal intervals into account. It recognizes that contracting takes place over time, and according to Williamson 'inquiries into the intertemporal transformations that contracts and organizations undergo' (Williamson, 1996a: 13). One of the intertemporal transformations to which Williamson often refers is the fundamental transformation. This is the change from large numbers bidding for a contract at the outset to small numbers bilateral dependency in the contract implementation and renewal stage. The bilateral dependency sets in as a result of asset-specific investments by the winning bidder during contract implementation. In the contract execution stage and in the ex post competition during the contract renewal stage, the winning bidder has an advantage over the non-winners. Due to the asset-specific investments, 'economic values would be sacrificed if the ongoing supply relation were to be terminated' (Williamson, 1985: 62). Large numbers competition can thus not be guaranteed in the ex post stages. Another intertemporal regularity to which Williamson refers is the observation that organization has a life of its own. Some examples are bureaucratization, tacit knowledge, informal organization and learning

(Williamson, 1996a: 11; 2003: 924).

Williamson views the uncovering of these contractual regularities as part of the transaction cost economics' exercise (Williamson, 1996a). The regularities are not the focus of attention to study the processes of change from one form of governance to another. Instead, knowledge of the regularities enables parties to a contract, and students of governance, to work out their potential hazards and contractual ramifications and fold these back into the ex ante contractual agreement (Williamson, 1996c: 20; 2000: 601). Hereby transaction cost economics takes the dynamics out of the intertemporal process transformations and returns to a comparative static institutional exercise.

2.5.2 Adaptation

The intertemporal considerations are also said to enter the transaction cost economics setup through TCE's treatment of adaptation as the central problem of economic organization (Williamson, 1999a: 1101). Since all complex contracts are incomplete, governance structures need to be devised to enable an adaptation to disturbances. Williamson distinguishes between two types of adaptation: autonomous adaptation through the market (Hayek, 1945) and cooperative adaptation through the hierarchy (Barnard, 1938). Adaptation through the market involves economic actors that respond unilaterally to disturbances. These independent economic actors do not have an ongoing relationship with contracting parties that they need to consult when adapting to disturbances. They respond unilaterally to changes in relative prices, and thereby switch continuously to other contracting parties of which the identity is irrelevant. The autonomous adaptations are also referred to as spontaneous or invisible hand adaptations, because of 'how little the individual participants need to know to be able to take the right action' (Hayek, 1945: 526-527). Cooperative adaptation refers to the opposite case that involves economic actors to an ongoing contract that are bilaterally or multilaterally dependent. These contracting parties consult each other when adapting to disturbances, or they refer the decision to the hierarchy where through fiat is decided on the type of response. The adaptation is intentional, or in Barnard's words, it is 'conscious, deliberate, and purposeful' (Barnard,

1938: 4). These two types of adaptation are believed to co-exist in the economy.
As discussed in section 2.2, governance structures are defined by their three attributes: incentive intensity, administrative control and contract law regime. Markets are characterized by high incentive intensity, little administrative apparatus, and dispute settlement in courts; the hierarchy features low incentive intensity, a large degree of administrative control, and internal dispute settlement. Different adaptive strengths and weaknesses accrue to these syndromes of internally consistent attributes (Williamson, 2003: 925). The attributes of markets give them an advantage in autonomous adaptation respects, and those of hierarchies in cooperative adaptation. The hybrid form of governance takes an intermediate position, between the market and the hierarchy, on both the attributes of governance and adaptation.
Adaptation is thus treated as a fourth attribute by which forms of governance can be distinguished (Williamson, 1998a: 37). The core argument of TCE, the discriminating alignment hypothesis, is also applied to the adaptive capacities of governance structures. Cooperative adaptation is better suited for the efficient governance of transactions characterized by a large degree of asset-specificity and uncertainty, whereas autonomous adaptation is more efficient for transactions with assets that are easily redeployable. The hierarchy has adaptive advantages over the market for transactions of a bilaterally or multilaterally dependent kind (Williamson, 1991: 279). Within the transaction cost economics of Williamson, adaptation is thus not seen as a process of change in which economic actors adapt from one governance structure to another, but as a dual feature that distinguishes among different forms of governance.
A third option of how change can be part of the transaction cost economics' exercise is through the institutional environment. While the discussion on the fundamental transformation showed the unintended consequences of endogenous changes in the attributes of transactions, the institutional environment is a source of exogenous disturbances that can affect the comparative use of governance structures.

2.6 The institutional environment in TCE

The new institutional economics has developed into two complementary parts, one that focuses on the institutions of governance, and another that is mainly concerned with institutions at a higher level, the institutional environment. Although the institutions of governance are at the core of transaction cost economics, TCE does take the institutional environment into account. The institutional environment is 'the set of fundamental political, social and legal ground rules that establishes the basis for production, exchange and distribution. Rules governing elections, property rights, and the right of contract are examples' (Davis and North, 1971: 6). It is also simply referred to as 'the rules of the game' (North, 1990: 5), to be distinguished from the play of the game: the institutions of governance. The rules define the way the game is played. This is one of the most salient differences between the institutional environment and the institutions of governance; the environment defines, and is a constraint on, the forms of governance (Williamson, 1996a: 5)[10]. The following sections (2.6.1 and 2.6.2) on Williamson's four-layer scheme and parameter changes expand on this environmental influence on the governance structures.

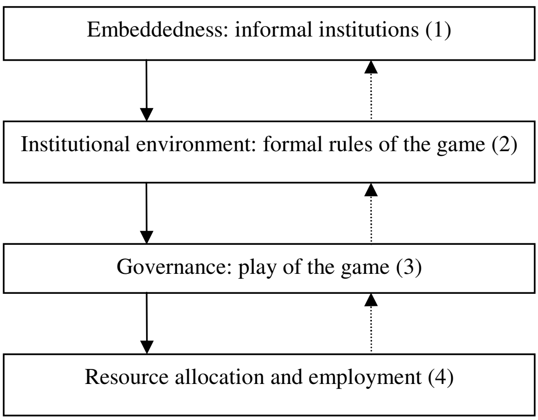
2.6.1 Four-layer scheme

In his familiar four-layer scheme (see figure 2.2), Williamson shows that there exist four levels of institutions and of economic analyses: the first level of informal institutions, such as customs, norms and traditions, is the domain of economic historians and sociologists; the fourth level of the individual is the one at which neoclassical economics works; and the second and third level of respectively the institutional environment and the governance structures are the focus of the new institutional economics and transaction cost economics. With the solid arrow from level two to three, Williamson illustrates that transaction cost economics focuses on the environmental influence on governance structures. The dashed arrow from governance

[10] Although Williamson puts the emphasis on the institutional environment as a constraint on the lower-level forms of governance, on several occasions (e.g. Williamson, 1999a) he illustrates the enabling role of the environment. For example, having the courts available for purposes of ultimate appeal is said to delimit threat positions, and thereby provides support for private ordering (Williamson, 1996a: 42).

to the institutional environment indicates that Williamson recognizes that this opposite influence exists, but that he 'mainly neglects these feedbacks' (Williamson, 2000: 596). In comparison, Douglass North analyses the institutional environment and changes in the rules of the game. The emphasis on governance structures, or what North refers to as organizations, is 'primarily on their role as agents of institutional change' (North, 1990: 5). North thus explicitly focuses on these feedbacks that Williamson ignores.

Figure 2.2 Williamson's four-layer scheme (Williamson, 1998a)



2.6.2 Parameter changes

Within transaction cost economics, level two, the institutional environment, is taken as given. It is treated as a set of parameters; changes in the institutional environment (or, if making international comparisons, differences between institutional environments (Williamson, 1996a: 18)) elicit shifts in the comparative costs of governance, and thereby change the comparative use of governance structures. Williamson identifies 'property rights, contract law, reputation and uncertainty' (Williamson, 1991) as parameters, and thereby locates these in the institutional environment. Several examples can be given of the effect of parameter changes on the comparative use of governance structures. Firstly, a change in property rights: a weaker appropriability and a consequent increased risk of leakage increases the costs of hybrids and markets. Transaction cost economics predicts an increase in the use of the hierarchy. Secondly, a change in contract law: an improvement of excuse doctrine, increases the use of the hybrid form (Williamson, 1991: 287). At some point in a contractual relation, governed by a hybrid form, one of the contracting parties may realize that continuing the relation has lower gains than a literal enforcement of the contract. Excuse doctrine can be used to relieve the other contracting party from strict enforcement of the contract, when this strict enforcement would unduly harm this contracting party, when the altered contractual relation is the result of unforeseen events, and when the enforcement is driven by opportunism of the departing contracting party. A sensible use of the excuse doctrine means that it is not too lax and not too strict. When it is too lax, contracting parties will pay less attention to constructing a good contract and setting up a well-governed contractual relation. When it is too strict, contracting parties are discouraged to use a hybrid form, and prefer internalizing their transactions, because of the possible harmful consequences of a literal enforcement of the contract. Thirdly, improvements in inter-firm and intra-firm reputation effects will respectively increase the use of hybrids and hierarchies. Finally, uncertainty is also located in the institutional environment. Two forms of greater uncertainty can be distinguished: disturbances can become more numerous or they can become more consequential due to an increase in the variance of the disturbances. When the frequency of disturbances increases, the use of the hybrid mode of governance is likely to decrease. Adaptations through the hybrid form of governance require mutual consent of the contracting parties. Since consent takes time, the market or hierarchical form of governance will be preferred in an environment characterized by numerous disturbances (Williamson, 1991).

2.6.3 First-order economizing

As discussed in section 2.3, the core argument of transaction cost economics is the discriminating alignment hypothesis, according to which transactions are aligned with governance structures in a transaction cost economizing way. The institutional environment is, in fact, a second factor that determines the comparative efficiency of governance structures[11] (Williamson, 1999a: 1090), as the examples on property rights, contract law, reputation and uncertainty illustrate. Linking the institutional environment to the institutions of governance in this way is an additional source of refutable hypotheses and of predictive content for transaction cost economics (Williamson, 1996c: 17-18). A consequence of including the institutional environment into transaction cost economics is thus that an opportunity for an additional form of economizing is introduced. Where second-order economizing refers to getting the governance structures right, through the efficient alignment of transactions with modes of governance, first-order economizing refers to getting the institutional environment (or the formal rules of the game) right. This additional form of economizing is relevant, because the structure of the institutional environment has large consequences for the economic productivity of a country (North, 1990; Levy and Spiller, 1994). Williamson identifies the instruments for designing the institutions at the environmental level. These are said to include 'the executive, legislative, judicial, and bureaucratic functions of government as well as the distribution of powers across different levels of government (federalism)' (Williamson, 2000: 598). Williamson does not, however, analyze how to get the formal rules of the game right or how to structure the functions and powers of government. This can partly be explained by TCE's focus on governance structures, and Williamson's claim that 'cumulative change of a gradual kind (of the institutional environment) is difficult to orchestrate' (Williamson, 1998a: 27). It is much more complicated to change the institutional environment in order to enhance the efficiency of this institution (Williamson, 1996a: 5), as compared with altering governance structures. Changes in the rules of the game are believed to occur in the order of decades or centuries (e.g. Williamson, 1998a).

[11] In an empirical study on intellectual property protection and inter-firm alliances, Oxley (1999) finds that both the institutional environment and transaction attributes are important drivers of governance choice.

2.7 TCE perspective on regulation

Within transaction cost economics, regulation has been conceptualized as a governance structure, solving a contracting problem between public utility firms and their customers (Goldberg, 1976; Joskow, 1991; e.g. Williamson, 1996a), and between regulated firms and the regulator (Joskow, 1991; Levy and Spiller, 1994; Williamson, 1999b). Within the new institutional economics, regulation has also been approached as embedded in the institutional environment (Glachant, 1998; Glachant and Finon, 2000; Yvrande-Billon and Ménard, 2005).

2.7.1 Regulation as a governance structure

Williamson focuses on the regulation of natural monopolies. Specifically, he addresses the contracting problem between utility firms, which have a regional or national monopoly in supplying a utility service, and their customers. The contracting problem consists of the utility firms' incentive to set monopolistic prices. Williamson depicts regulation as a hybrid form of governance that can solve this contracting problem. Hybrid modes of governance are supported by neoclassical contract law (Williamson, 1991: 271). Parties to such contracts retain autonomy, but are mediated by an elastic contracting mechanism. Regulation is regarded as such an elastic contracting mechanism, mediating the contract between the utility firms and their customers. The regulator takes on an agency role for the customers, and engages thereto in a collective contract with the utility firm. In this collective contract, the conditions and prices under which the utility firm can supply the utility service to consumers are set out. The regulator does not only have a responsibility to protect customers from excessive prices, but also to establish rate-making rules that enable the regulated firm to recover its reasonable costs of providing the service (Joskow, 1991: 68; Williamson, 1986: 121). This collective contract, which is also referred to as an administered contract (Goldberg, 1976), governs the individual contract that firms have with their customers.

Regulation's (comparatively) efficient place in the transaction cost analysis, together with the attributes of the underlying (discriminatingly aligned) transactions, can be found in the following contracting schemes (Williamson, 1998a; 1999b) (see figures 2.4 and 2.5).

Figure 2.3 Contracting schema (e.g. Williamson, 1998a: 38)

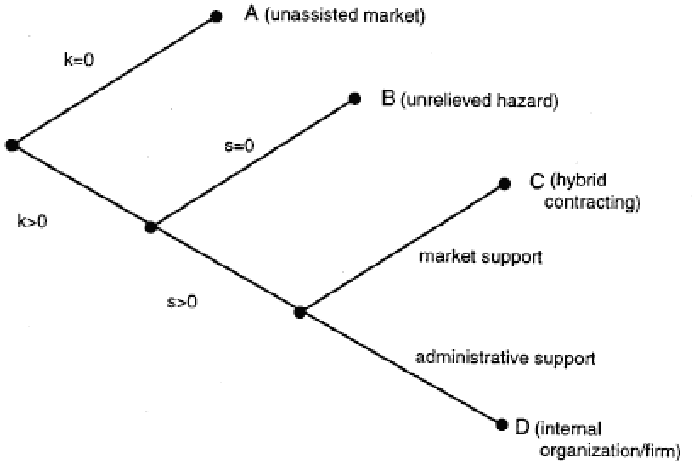
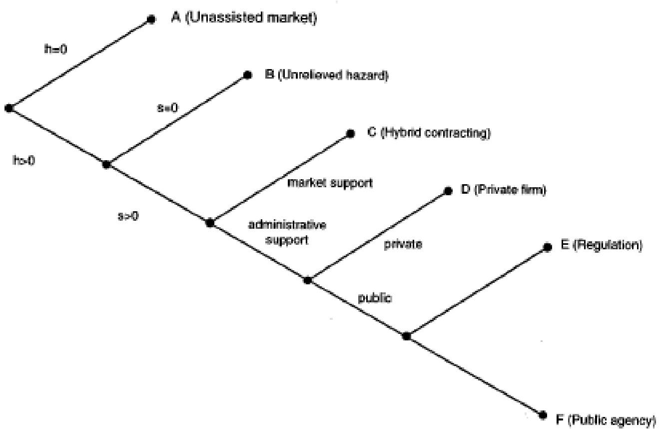


Figure 2.3 displays the perceived order between attributes of transactions and modes of governance, on the basis of the characteristics of contracts: contractual hazards and contractual safeguards. A well-known contractual hazard is bilateral dependency that increases with greater degrees of asset-specificity. In this heuristic display, Williamson illustrates how the absence of contractual hazards (k=0) combines with the (unassisted) market; how the existence of contractual hazards (k>0) and the absence of contractual safeguards (s=0) combines with a situation of persisting hazards; how the existence of contractual hazards and the existence of safeguards (s>0) can be split-up in situations of hybrid contracting, and in situations of internalizing the hazard in organizations. The choice between hybrid contracting and vertical integration is made on the basis of aligning transactions characterized by a greater degree of asset-specificity and uncertainty with the vertically integrated private firm.

In figure 2.4, Williamson has extended his heuristic display to include regulation and the public bureau. The public bureau is regarded as the 'organization form of very last resort: try markets, try hybrids, try firms, try regulation, and resort to the public bureau when all else fails (comparatively)' (Williamson, 1998a: 46-47). Regulation combines the private firm with the public regulatory agency (Williamson, 1999b: 320). It is located between the private firm and the public bureau in the comparative institutional analysis. These three forms of governance differ with respect to incentive intensity, administrative control, adaptation, and contract law regime, with the private firm having the 'strongest incentives, the least administrative control, the strongest propensity to behave autonomously and the weakest to behave cooperatively, works out of a (comparatively) legalistic dispute settlement regime, appoints its own executives, and affords the least degree of security of staff employment' (Williamson, 1999b: 336) as compared with the public bureau. Regulation takes on an intermediate position on these governance characteristics. In addition to these differences in governance attributes, the private firm, regulation and the public bureau also differ in terms of the types of transactions that each structure can most efficiently govern.

Figure 2.4 Contracting schema extended (Williamson, 1999b: 337)



Williamson argues that the hazard of probity can be a distinguishing characteristic of the contractual setting. With the hazard of probity, Williamson refers to loyalty and rectitude as attributes of transactions, or in other words to sovereign transactions (Williamson, 1998b: 77). He argues that transactions involving contractual hazards, safeguards, and the hazard of probity will lead to the public bureau. Alternatively, transactions involving contractual hazards (h>0), safeguards (s>0), but excluding the hazard of probity, will lead to the private firm or to regulation. The discriminating factor between the private firm and regulation is again asset-specificity, where even greater degrees of asset-specificity are to be organized under regulation. 'Extreme conditions of bilateral dependency and information asymmetry' require governance in the form of regulation that 'provides safeguards beyond those that can be crafted through private ordering' (Williamson, 1999b: 337).

Already in 1976, Williamson gave an asset-specificity reason for regulating natural monopoly transactions. He replied to Demsetz (1968), Stigler (1968) and Posner (1972), who opted for franchise bidding as a solution to the contracting problem of natural monopolies. Franchise bidding refers to a competitive process, in which firms bid the lowest price at which they are willing to offer the utility service. The firm that is able to provide the service at the lowest price is awarded the franchise. Williamson argued that they ignored the substantial asset-specific investments in plants and equipment that utility firms have to make before being able to serve their customers. He states that 'if the good or service is to be supplied under conditions of uncertainty and if nontrivial investments in specific assets are involved, the efficacy of franchise bidding is highly problematic' (Williamson 1996a: 85). For Williamson (1976), asset-specificity is the reason for depicting regulation as a more efficient institutional solution for natural monopoly as compared to franchise bidding[12].

Joskow (1991), on the other hand, focuses on the hold-up problem that is created by the relationship-specific investments. 'Once a public utility has made sunk investments in facilities, it is open to being held up by regulators trying to keep prices as low as possible' (Joskow, 1991: 68). The focus turns to a different contracting problem, between the regulated

[12] See also section three of chapter three for a discussion on regulating natural monopolies.

firm and the regulator. Joskow mentions several legal and economic constraints, such as constitutional restrictions, which limit the ability of regulatory agencies to engage in opportunistic behaviour. Levy and Spiller (1994) focus on this contracting problem, between the potentially opportunistic regulatory agency and the public utility firm with sunk asset-specific investments. They discuss the constraints, which Joskow made reference to, more extensively and locate them in the institutional environment. They view regulation as a governance structure that can solve the contracting problem between the regulator and the public utility firm. The regulatory governance structure is defined as 'the mechanisms that societies use to constrain regulatory discretion and to resolve conflicts that arise in relation to these constraints' (Levy and Spiller, 1994: 205). Whether these mechanisms are capable of restraining regulatory discretion is said to depend on characteristics of the institutional environment (Levy and Spiller, 1994; Parker, 1999ab; Holburn and Spiller, 2002). An independent judiciary, restraints on changing the regulatory system and strong administrative capabilities are brought forward as valuable characteristics of the institutional environment for restraining arbitrary administrative action.

Williamson has also addressed the contracting relation between the regulator and the regulated firms, focusing on the notion of regulatory capture in which the regulator has become captive of the special interests of the industry's firms or the natural monopolist. (Williamson, 1996d: 1014). Several factors that contribute to regulatory capture are the close and continuing relations between the regulated industries and the regulatory agencies, the common exchange of personnel, and the comparative disadvantage of unorganized consumers to influence outcomes (Williamson, 1996a: 206). Williamson describes regulatory capture as a contractual hazard (Williamson, 1999b: 318), and as a transformation in the regulatory contract; declared intentions of the regulatory agencies differ from realizations (Bernstein, 1955). With their feasible foresight, economic actors should be able to recognize this contractual hazard and fold it back into the ex ante design of the governance structure (Williamson, 1999b: 318).

2.7.2 Regulation in the institutional environment

Regulation is also viewed as embedded in the institutional environment and thus as establishing the rules of the game. A few studies focus on the influence of regulation on governance structures at the level of the firm in liberalizing network industries (Glachant, 1998; Glachant and Finon, 2000; Yvrande-Billon and Ménard, 2005). Yvrande-Billon and Ménard (2005) state that 'the regulatory structure is in charge of implementing a reform that involves substantial changes in the organization of the public utility' (Yvrande-Billon and Ménard, 2005: 678). They focus on the organizational misalignment that results from regulatory policies that do not take the attributes of transactions into account. Glachant (1998) researched what new modes of governance are being produced as a result of the introduction of competition into the formerly integrated English electricity industry. He concludes that the English wholesale electricity transactions are conducted within a hybrid governance structure, the English Electricity Pool, in which the price mechanism is combined with a collective agreement between wholesale electricity producers and retailers. In addition, the institutional environment exerts a powerful influence on this private hybrid institutional arrangement. "By exercising its asymmetrical rights, the public authority can obtain certain results that the Pool could never achieve in its capacity as a private arrangement between voluntary participants" (Glachant, 1998: 70). For example, the regulator has made Pool membership compulsory and has the final say on the Pool rules. Glachant and Finon (2000) claim that reforms in the electricity industries are institutional in two essential ways. Firstly, the reforms are directed at changing most of the industries' institutional arrangements, such as horizontal and vertical integration and ownership structures. Secondly, they locate the influence on these governance changes in the institutional environment. 'The instigators of these reforms are not the industries themselves, but the public institutions in the countries concerned: notably governments and public local authorities, law-making bodies, and the authorities that regulate networks and competition' (Glachant and Finon, 2000: 313). The 'allocation of powers of regulation among the public authorities' is viewed as a main criterion for characterizing the institutional environment (Glachant and Finon, 2000: 322).

This chapter presented various elements of transaction cost economics, including the attributes of transactions, and those of governance, the discriminating alignment hypothesis, and the paradigm case of vertical integration. It also discussed the perspective of TCE on dynamics, regulation and the environmental institutions. The following chapter will apply this theoretical framework of transaction cost economics to the specifics of the electricity industry. It will characterize the attributes of electricity transactions and the historical structure of vertical integration of the European electricity firms. A transaction cost justification for the vertically integrated firm and the regulation of natural monopolies in the European electricity industries will be given.

3 – The Electricity Industry

The European electricity industries have been characterized by an extensive degree of vertical integration for almost a century. Many of the activities, from the generation to the distribution of electricity, have largely been internalized within a single firm. These vertically integrated firms had a regional or national monopoly in the supply of electricity to consumers, and were heavily regulated by their national governments on among others tariffs and security of supply.

In recent years, these structures of vertically integrated monopolies are changing as a result of new European and national regulations on the introduction of competition into the European electricity industries. In 1996 and 2003, the European Parliament and Council issued two electricity directives on common rules for electricity generation, transmission, distribution and retail. These directives aim to create one European competitive electricity market. The national governments of the EU member states have implemented, or are in the process of implementing, these directives into their national legislation and regulation. The European directives and national regulations prescribe the independence of the natural monopolies of transmission and distribution from the generation and retail of electricity, and thus the vertical separation of the integrated electricity firms. The vertical unbundling of transmission and distribution enables the introduction of competition into the potentially competitive segments of the electricity value chain, such as the generation and retail of electricity. In addition, the directives prescribe that consumers should be able to choose their own electricity retailer, and therefore that the electricity industries should be opened up to new entrant electricity firms that can compete with the incumbents. By implication, the European electricity directives are influencing the governance structures in the liberalizing electricity industries; they are prohibiting the vertically integrated hierarchies and are promoting the emergence of market forms of governance.

With these requirements on vertical unbundling and consumer choice, the European directives and national regulations run counter to TCE claims on efficiency in the electricity industry.

Transaction cost economics claims that both vertical integration and regulation are efficient structures for governing the transactions in the electricity industry (Williamson, 1976; Joskow, 1996). TCE argues for coordination in the form of vertically integrated firms and regulation on the basis of the attributes of electricity transactions with a focus on asset-specificity, the strong interrelationships between the different segments of the electricity value chain, and the presence of externalities and natural monopolies in the electricity industry. Within transaction cost economics, various empirical studies have analyzed the forms of governance that are put in place in the vertically de-integrated energy industries in the United States. These studies do not report the emergence of market forms of governance, but mostly the adoption of long-term bilateral contracts (Joskow, 1987; Crocker, 1996).

This chapter presents the particularities of the electricity industry. It starts with a discussion on the various segments in the electricity value chain, and the structures of the European electricity industries of before the liberalization (section 3.1). This chapter also discusses the perspective of transaction cost economics on the electricity industry (sections 3.2 and 3.3), and in particular, the attributes of electricity transactions and the efficient governance of these transactions through vertical integration and regulation. Section 3.4 introduces the various requirements of the EC electricity directives of 1996 and 2003. It will clarify how these new rules prohibit the vertically integrated monopolies, and influence the new forms of governance. Section 3.5 discusses the various empirical studies within transaction cost economics on the governance of unbundled energy industries with long-term contracts. This chapter thus introduces the various (potential) influences on the new governance structures, such as the electricity transactions and the new electricity regulations.

3.1 The structure of the electricity industry

The electricity industry is defined as the collection of firms that are involved in the different activities of the electricity value chain; these activities include the generation, transmission, distribution, system operation and retail of electricity. This section discusses these different activities and it outlines a short history of the governance structures in the European electricity industries of before the liberalization.

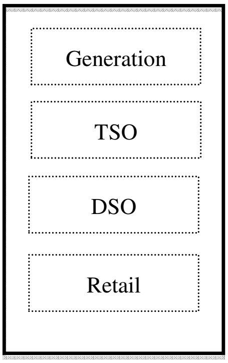
3.1.1 The electricity value chain

The various activities in the electricity value chain include the generation, transmission, distribution, system operation and retail of electricity (see figure 3.1). The generation of electricity refers to the production of electric power in plants using for example fossil fuels, nuclear fuel or falling water. The transmission and distribution of electricity are the transportation of electric power from generating plants to consumers along the electricity network. The electricity network consists of high- and low-voltage electricity lines, substations and transformers in which the electricity is converted to higher or lower voltages, and circuit breakers that protect the electrical circuit from damage caused by overload. Transmission is the transportation of electricity along the high-voltage part of the network, whereas distribution refers to the transportation along the low-voltage electricity lines. Every generator and every consumer needs a connection and an access to the network to be able to deliver and receive electricity.

The operators of the electricity network, also referred to as system operators, provide the connections and access to the network. They maintain and develop the network to ensure a safe and secure delivery of electricity. In addition, they continuously balance the demand for and supply of electricity. The supply of electricity by generators and the demand for it by consumers need to be balanced every second of the day, because electricity cannot be stored, or at least not in an economically efficient way. This continuous balancing of electricity supply and demand is necessary in order to avoid an overload, and a possible blackout, of the electric system. The operators of the network monitor the changes in load (the sum of all customers' instantaneous usage) (Hunt, 2002: 20) and call upon power plants to start or stop generating, or to deliver reserve capacity to the network. The system operators can combine their activities of providing access, maintaining a secure network, and balancing supply and demand, with transmitting or distributing electricity. These operators are then referred to as transmission system operators (TSOs) or distribution system operators (DSOs), depending on which part of the network that they operate.

The final activity in the electricity value chain is the retail of electricity to consumers. Retail is the business of advertising, making arrangements for supplies of power from generators, contract bundling, metering, and billing of electricity for final customers (Joskow, 1998; Bergman, 1999).

Figure 3.1 Electricity value chain



3.1.2 A history of vertical integration

Since the beginning of the mass utilization of electric power in the late 19th century and the beginning of the 20th century, the European electricity industries have been structured in different ways, ranging from completely decentralized systems with many small generators and separate distributors to vertically integrated structures. In the early days, production plants were small and located close to their supply area. Electricity distributors were locally organized, often under private ownership, and were usually granted concessions by municipalities. They served only a small area, because the use of direct current at low voltage made it impossible to distribute electricity over an area greater than one square mile (Kahn, 1971: 117). The large power losses of direct current led to the close positioning of generators to the distribution lines. A few early technological innovations, such as the steam turbine, the transformer, and alternating current (Mez et al., 1997: 3), increased the scale at which electricity was generated and transported. With the increase in scale, the transmission system operator assumed an increasingly larger role as a coordinating body in the electricity industry. The TSO became responsible for the balancing of electricity supply and demand for the entire electric system in a country, purchasing fuel for the production of electricity, importing and exporting electricity, and planning the construction and location of new generating facilities. The European TSOs were often, and in some cases still are, vertically integrated with the generation, distribution, and retail of electricity (Newbery, 1999: 199; Hunt, 2002: 2). For more than sixty years, Electricité de France (EDF) has internalized the entire vertical electricity chain in one firm. Another common form of vertical integration was the internalization of generation and transmission on the one hand, and distribution and retail on the other hand. In this case, 'the generation and transmission entity typically serves the distribution entity on a long-term exclusive basis' (Joskow, 1998: 27). In the United Kingdom, the Central Electricity Generating Board (CEGB) and its precursors, controlled generation and transmission, and supplied electricity to the distributors under a bulk supply tariff (Newbery and Green, 1996: 25). In the Dutch electricity industry, distribution was unbundled from generation and transmission in the late 1980s. The Dutch distributors paid the generators a uniform tariff for the electricity. This variant to the vertical integration of the entire electricity value chain is referred to by Hunt (2002) as 'vertical integration by contract or tariff, a variation, but not an exception, to the rule of vertical integration' (Hunt, 2002: 24). The European electricity industries have been characterized by varieties of vertical integration for several decades. It has been argued that there are substantial economies associated with vertical integration, and that single-firm production by a vertically integrated firm can in fact be a least-cost solution (e.g. Joskow and Schmalensee, 1983). The following section explains the efficiency of vertical integration in the electricity industry.

3.2 The efficiency of the vertically integrated structure

From a transaction cost economics perspective, the vertically integrated, hierarchical forms of governance are considered to be the most efficient institutional solution for the transactions that need to be governed in the electricity industry (e.g. Joskow, 1996). TCE gives two reasons for the efficiency of vertical integration in the electricity industry, namely the attributes of the transactions with a focus on asset-specificity, and the presence of externalities in the industry. Joskow (1996, 2002) provides another reason for vertical integration in the electricity industry, which are the operating and investment interrelationships between the different activities in the electricity value chain (see appendix A).

3.2.1 The governance of asset-specificity

Williamson has stated that 'the principal factor to which transaction cost economics appeals to explain vertical integration is asset-specificity' (Williamson, 1985: 90). Different types of asset-specificity, including site-specificity, dedicated assets, physical asset-specificity and temporal specificity, characterize the various transactions in the electricity industry.
A first type of asset-specificity that characterizes the transactions for connecting to the electricity network between the generators and the system operators is *site-specificity*. Williamson defines site-specificity 'as where successive stations are located in a cheek-by-jowl relation so as to economize on inventory and transportation expenses' (Williamson, 1996a: 59). Site-specific investments are investments in assets that are placed in close proximity to assets of the other contracting parties, and that are very costly to setup and relocate. The network connection transactions are characterized by a large degree of site-specificity: the generators need a direct connection to the electricity network to enable the transportation of their electricity. Once the generators have built their generating plants and connected them to the network, it is prohibitively costly for them to relocate and set-up their generating plants at another operator's connection point. The generators are therefore placed in a dependency relation with respect to the system operator. The system operator has a dominant position in which he can demand unreasonable network access and connection conditions and prices. The

governance, in the form of vertical integration, provides a safeguard for the generators against the possible opportunistic behaviour of the system operator. Site-specificity has been argued to provide ‘a compelling reason to integrate activities into a single firm’ (Glachant, 2002: 302). In the electricity industry, the condition of site-specificity is combined with the presence of a monopoly for the network. The generators are dependent on the electricity network, the essential facility, to an extreme degree: they have no alternative for the delivery of their electricity. This monopoly of the system operator provides an extra stimulus for a safeguard in the form of vertical integration.

Two other types of asset-specificity, *dedicated assets* and *physical asset-specificity,* provide a transaction cost economizing reason for vertically integrating the electricity supply transactions between the generators, distributors and retailers. ‘Dedicated assets are discrete investments in general purpose plant that are made at the behest of a particular customer’ (Williamson, 1996a: 105). When ‘inputs are specialized to the production of a particular component or a product’ (Williamson, 1985), the transactions are characterized by physical asset-specificity. Electricity generators invest in large, capital-intensive production plants that have very few alternative uses. They build these plants with the prospect of being able to sell the electricity to distributors and retailers. Once these investments are sunk, the distributors and/or retailers can renegotiate terms of the sales contract to their own advantage. The generators, therefore, prefer to vertically integrate into distribution and retail to avoid becoming locked into a relationship that is not profitable. They prefer to reduce the uncertainty and set up sufficient safeguards for the potentially opportunistic behaviour of their contracting parties.

A fourth type of asset-specificity, *temporal specificity*, characterizes the transactions of balancing electricity supply and demand between the system operators and the users of the network. Temporal specificity is ‘a type of site specificity in which timely responsiveness by on-site human assets is vital’ (Williamson, 1996a: 106). Glachant (2002) described temporal specific transactions as transactions in which ‘the adjustment of production to consumption requires a just-in-time synchronization’ (Glachant, 2002: 302). The inability to store electricity in an economically efficient way, and therefore the requirement to balance electricity supply and demand continuously in real time, makes this type of specificity highly relevant to the electricity industry. The transmission system operator balances electricity supply and demand every second of the day for the entire electricity network. It provides the ultimate just-in-time service to the users of the network: the generators, distributors and retailers. From a TCE perspective, 'temporal specificity may lead to vertical integration if the dependency relationships between users and suppliers are very asymmetric' (Glachant, 2002: 303). The TSO has a monopoly in supplying balancing services. Without these balancing services, the system cannot function. When too much or too little electricity is flowing through the network, breaks in the current and blackouts can occur. The users of the network are thus dependent on the TSO for the supply of electricity. They therefore prefer vertical integration to safeguard against the possible opportunistic behaviour of the TSO. The TSO could for example demand monopolistic prices for his balancing services.

3.2.2 The governance of externalities

A second argument for the efficiency of vertical integration in the electricity industry is provided by the presence of externalities in this industry. 'Externalities (or spillover effects) occur when firms and people impose costs or benefits on others outside the marketplace' (Samuelson and Nordhaus, 2001: 37). Joskow and Schmalensee (1983: 35) point out that the externality problems in modern power systems are important, because the components of electric systems are closely linked: the electricity network directly connects generators to consumers and there is no alternative for either consumer or generator to receive or deliver electricity but through this electricity network. In addition, electricity cannot be stored and generators have to respond continuously to the changing demand of consumers. Because of this direct connection and the impossibility of storing electricity, externalities are important in the electricity industry: any change at any position in the network, either in production or consumption, can affect all other places in the network. For example, a negative consumption externality is a complete break in the current or blackout of the electric system (Glachant and

Finon, 2000; Glachant, 2002). If at one point in the network a few consumers overload a line, they negatively affect many other consumers by causing a break in the current or a complete blackout. A negative externality for generators is the need to supply reserve capacity to the transmission system operator in order to balance the system, when no benefits accrue to this service that could otherwise have been obtained in the marketplace. The presence of these negative externalities, such as congestion and blackouts, has been said to 'threaten the efficiency of decentralized markets' (Newbery, 1999: 205). The externalities have been argued to create at least an economic rationale for cooperative procedures across the sector (Glachant, 2002), or maintaining central co-ordinating authorities (Glachant, 2003) such as the transmission system operator, or central dispatch (Newbery, 1999: 206) by for example this TSO, or even the vertical integration of the industry (Williamson, 1985; Joskow, 1996; Glachant and Finon, 2000).

3.3 Regulating natural monopolies

Several attributes of electricity transactions such as the various forms of asset-specificity and the externalities have been brought forward as reasons for regarding vertical integration as the most efficient institutional solution in the electricity industry. Another prominent feature of the electricity industry is the presence of a natural monopoly. Transaction cost economics argues for the governance of natural monopolies with regulation.

3.3.1 Natural monopolies defined

The transmission and distribution of electricity along the electricity network are a natural monopoly (Hunt, 2002: 37-8; Samuelson and Nordhaus, 2001: 170). Early definitions of natural monopoly seem to have been formulated with public utilities in mind. Farrer (1902, cited in Newbery, 1999: 28), for example, included in his catalogue of natural monopoly the following characteristics: (1) economies of scale, (2) capital-intensity, (3) non-storability with fluctuating demand (4) locational specificity generating location rents, (5) producing necessities essential for the community, and (6) involving direct connections to customers. Narrower definitions of natural monopoly, in which economies of scale are at the center of the issue, are accepted today (Berg and Tschirhart, 1988). Economies of scale exist when long run average costs decrease as output increases. Kahn stated that 'the critical and all-embracing characteristic of natural monopoly is an inherent tendency to decreasing unit costs over the entire extent of the market' (Kahn, 1971: 119). He added that 'this is only so when the economies achievable by a larger output are internal to the individual firm' (Kahn, 1971: 119). The many characterizations of a natural monopoly focus on the presence of economies of scale within a single firm that can satisfy the total demand for the product or service. Baumol defines 'a natural monopoly as an industry whose cost function is such that no combination of several firms can produce an industry output vector as cheaply as it can be provided by a single supplier' (Baumol et al., 1977: 350). Parkin states that 'a natural monopoly is an industry in which one firm can supply the entire market at a lower price than two or more firms can' (Parkin, 2005: 262). The principal source of these economies of scale is the large investments that have to be made before customers can be served (Kahn, 1971; Train, 1991). Once the investments have been made, every additional product or service supplied reduces the average costs. The large, capital-intensive and immobile investments in the electricity transmission and distribution network are the source of economies of scale in the electricity industry. Various empirical studies have reported evidence of scale economies in electricity transmission and distribution (see Kwoka (1997: 39) for a summary of these studies).

Kahn mentions an additional source of potential economies of scale in the electricity industry that is to be found on the demand side (Kahn, 1971: 122). Because electricity demand fluctuates and producers cannot know in advance how much will be consumed, the producers have to keep enough generating capacity running so as to serve all customers at peak demand. The variability in demand gives rise to economies of scale: the greater the number and diversity of customers and markets served, the greater is the likelihood that the variations in their separate demands will tend to cancel one another out (Kahn, 1971: 122). The costs of running generating capacity can be divided among an increasing number of customers, and the costs per served customer will therefore decrease when the size of the market increases.

3.3.2 The governance of natural monopolies

Williamson's concern with natural monopolies is focused on characterizing their efficient structure of governance. He refers to natural monopolies in line with the definitions as mentioned above; as 'where economies of scale are large in relation to the size of the market', and where 'goods or services are supplied under decreasing cost conditions' (Williamson, 1996a: 84-5). The discussion within transaction cost economics on the governance of natural monopolies started in the 1970s with a reply by Williamson (1976) to Demsetz (1968), Stigler (1968) and Posner (1972)[13]. The latter argued that a private unregulated monopoly does not necessarily lead to pricing on monopoly terms. They opted for franchise bidding; a mechanism in which the franchise is awarded to the firm that has bid to offer the utility service at the lowest price. Williamson (1976) responded by claiming that the efficacy of franchise bidding as an organizational response to the problems posed by natural monopoly (the pricing on monopoly terms) varies with the circumstances. He argued that if the transactions are subject to considerable market and technological uncertainty and involve substantial asset-specific investments, the market-oriented approach of franchise bidding is highly problematic (Williamson, 1985: 41; Williamson, 1996a: 85). The necessity of investing in specific assets transforms the large numbers bidding at the outset into a relation of bilateral dependency, between the firms and consumers, after the bidding process. The consumers are locked into the relation with the incumbent supplier, since the cost of supply from others, from unspecialized capital, is presumably great (Williamson, 1985: 62). In addition, the supplier of the service – the winning bidder – is committed to the transactions to a significant degree due to his asset-specific investments, which have much smaller economic value in alternative uses. In the contract execution stage and in the ex post competition during the contract renewal stage, the winning bidder has an advantage over the non-winners, because 'economic values would be sacrificed if the ongoing supply relation were to be terminated' (Williamson, 1985: 62), and

[13] See also section 2.7 for a discussion on franchise bidding versus regulation of natural monopolies.

competition in these ex post stages can thus not be guaranteed. When the transactions between consumers and the monopolist are characterized by a large degree of uncertainty and asset-specificity, Williamson argues for regulation 'as the 'best' mode of governance in comparison to alternative feasible forms' (Williamson, 1999b: 320). He views regulation as a hybrid form of governance, in which the parties to the transactions retain their autonomy, but are mediated by a regulatory agency (Williamson, 1996a: 96). Goldberg also argued for regulation of natural monopolies in order to protect consumers right to be served, but also to protect producers right to serve. The latter's willingness to invest in long-lived, specialized capital equipment depends on their expectations concerning the future availability of the market (Goldberg, 1976: 432). With respect to the electricity industry, Williamson states that the investments are long-lived and immobile (Williamson, 1985: 328), and he therefore questions the deregulation efforts in the electricity industries (Williamson, 1985: 328; Williamson, 2002: 187).

Transaction cost economics has thus argued for a combination of two forms of governance in the electricity industry: regulation and the vertically integrated hierarchy. The European and national authorities have apparently not taken the TCE arguments into account when formulating their recent energy policies. What Joskow referred to as the 'neoclassical public policy prescription' (Joskow, 1996: 345) has been implemented in many European countries. The European directives and national implementations require the vertical separation of the integrated firms and the opening of the industries to competition. These EC electricity directives of 1996 and 2003 will be presented in detail in the following section. The consequences of these new rules for the governance structures in the liberalized electricity industries will be discussed.

3.4 Regulating the liberalizing electricity industries

In the last few decades, the European Commission and national governments have focused their energy policies almost exclusively on the introduction of competition into the European electricity industries. To attain the goal of creating one European competitive electricity market, the European Parliament and Council issued two electricity directives, in 1996 and 2003, on common rules for electricity generation, transmission, distribution and supply. These directives require the vertical unbundling of transmission and distribution from the integrated electricity firms, to enable the introduction of competition into electricity generation and retail. They set very detailed guidelines for the independence of the transmission and distribution system operators, and the opening of the retail segment to competition. The directives furthermore stipulate several rules on how access to the electricity network should be provided by the system operators, and on the functioning and responsibilities of the public authorities. The directives also allow for some exceptions to these guidelines on the basis of public service obligations. The specifics of these directives are described below, to show how they constrain and promote the emergence of particular forms of governance in the liberalizing electricity industries.

3.4.1 Generation capacity

The 1996 directive allows member states to use two procedures for the construction of new generation capacity: a tendering procedure and an authorization procedure. When a tendering procedure is used, a competent authority within each member state has to make estimates for the required new and replacement generation capacity. In most European countries, the transmission system operator is appointed as the competent authority to make these estimates. Some national governments have these estimates approved by either an independent regulatory agency or a ministry. Details of the tendering procedure have to be published and tender specifications have to be made available to any interested electricity company. These specifications have to include among others criteria for the selection of tenderers and the award of the contract. An authority has to be appointed that organizes, monitors and controls the tendering procedure.

When member states opt for an authorization procedure, they have to publish detailed information on the requirements for the grant of an authorization to electricity companies to build new generation capacity. The 2003 directive restricts the use of the tendering procedure. Member states can opt for this procedure only for reasons of security of supply, environmental protection and the promotion of infant new technologies, when the authorization procedure cannot sufficiently achieve these objectives. The aim of the 2003 directive is thus to leave the majority of the investment decisions to the market. Under an authorization procedure, electricity companies decide where and with what technology to invest, as compared to the tendering procedure in which the transmission system operators and the public authorities make these decisions.

3.4.2 Transmission system operation

The 1996 directive requires the appointment of a transmission system operator that is responsible for the operation, maintenance and development of the transmission system. In addition, the TSO is responsible for the dispatching of generating installations (to call upon generators to produce electricity and to send the electricity along the network), whereby priority may be given to generators that use renewable energy sources, waste, and combined heat and power (chp). For reasons of security of supply, priority may be given to generating installations that use indigenous primary energy fuel sources with a maximum of 15 per cent per year of all the primary energy that is necessary to produce the total consumption of electricity in the member state.

3.4.2.1 Independence of the TSO

Under the 1996 directive, the TSO has to be independent from the generation, distribution and retail activities of the vertically integrated parent company, at least in terms of its management. The 2003 directive is more explicit on the independence of the TSO: the TSO has to make its own decisions with respect to the assets for the operation, maintenance and development of the network, and the personnel of the TSO cannot participate in generation, distribution or retail activities of the parent company. In addition, the 2003 directive extends the requirement of independence to a separation of the TSO at least in terms of its legal form. In the Dutch and

French electricity industries, this requirement on an independent legal form for the TSO has been implemented in different ways. The Dutch TSO (TenneT) is a completely independent company, which has removed all of its organizational links (including its ownership) with its former parent company (consisting of several Dutch electricity generators). The French TSO (RTE) is organized as a legally independent subsidiary that is located under the holding of its parent company, Electricité de France. This requirement on the legal independence of the TSO has large consequences for the relations between the TSO and the electricity generators and retailers and the distribution system operators. New contracts and governance structures have to be formulated and implemented between these network users and the TSO for a connection and an access to and conduct on the transmission system. The 2003 directive does not require a separation of the ownership of the TSO from that of the parent company. The owner can approve the financial plans of the TSO and set limits on the level of its indebtedness. The French transmission system operator (RTE) is managed independently from Electricité de France and is a separate legal subsidiary, but RTE has the same owner as Electricité de France, which is the French state.

3.4.2.2 Balancing by the TSO

The 2003 directive includes rules for the balancing of electricity supply and demand. Before the vertical unbundling of the European electricity industries, demand and supply for electricity were only balanced for the entire (national) electric systems. The vertically integrated national monopolies matched their generation of electricity to the demand by consumers. An example is the French electricity industry in which EDF balanced the total generation to the total consumption of electricity. In electricity industries where generation was integrated with transmission on the one hand and distribution with retail on the other hand, as was partly the case in the Dutch electricity industry, the TSO acted as a pooling system. The TSO pooled all the electricity of the generators, and sold it for a uniform tariff to the distributors. It monitored the amount of electricity taken out of the network by consumers, ordered generators to produce reserve capacity in indicated plants, and thereby balanced the entire electric system.

A consequence of the vertical separation of the TSOs from the integrated structures is that in addition to the system-wide balances, the electricity firms (both the incumbents and the new entrants) have to balance their individual positions. They have to match their production of electricity to the demand of their customers. These individual, firm-specific balances do not only have the goal of ensuring a safe and secure electric system, but also of reducing the balancing costs of each individual electricity firm. Electricity firms have several options to balance their daily individual positions of electricity supply and demand. They can increase or decrease their production, buy or sell electricity on the spot market, and contract balancing services from the TSO. Several options are thus available for governing these individual balancing transactions.

In the unbundled electricity industries, the total supply and demand for electricity still need to be balanced for the entire systems. Since the TSOs are independent from the vertically integrated firms in the new situation, a new form of coordination had to be devised for enabling the system-wide balances. This new form of coordination includes among others the program responsibility. This is the responsibility of electricity firms to send energy programs (e-programs) to the TSO on a daily basis. These e-programs contain the amount of electricity that firms expect to put on and be taken out of the network on the next day. The TSO adds all these e-programs and makes sure that these projections are balanced for the entire system. The expectations on electricity generation and consumption often differ from reality. The TSO is responsible for balancing electricity supply and demand for the entire system. It also bills the electricity firms for the amount of imbalance (the difference between their e-programs and the actual production and consumption of electricity) that they create on the network. The 2003 directive states that the TSO cannot favour any electricity firms when providing balancing services. The rules for charging the users should be non-discriminatory and cost-reflective.

The electricity firms also provide balancing services to the TSO by increasing or decreasing the amount of electricity that they supply to the network. New forms of governance are emerging for the coordination of these balancing services by the electricity firms. A bidding mechanism can be set up, in which the electricity firms bid to deliver a certain amount of reserve capacity to the TSO. Another option is bilateral contracts, in which a minimum amount of electricity is specified that the electricity firms will reserve for delivery to the TSO as balancing power. The 2003 directive requires that the TSO buys the energy from electricity firms to balance the system in a transparent and non-discriminatory way. It also states that 'as soon as the electricity market is sufficiently liquid, non-discriminatory and cost-reflective balancing should be achieved through the setting up of a transparent market-based mechanism for the supply and purchase of electricity needed in the framework of balancing requirements' (EC, 2003).

3.4.3 Distribution system operation

The first directive states that a distribution system operator shall be appointed to which many of the same guidelines apply as to the transmission system operator. The distribution system operator shall not discriminate between network users. When dispatching, it can give priority to electricity firms that generate combined heat and power or that generate electricity with renewables or waste. The 2003 directive sets the same balancing mechanism guidelines for the distribution system operator as those that apply to the transmission system operator. The distribution system operator has to be independent in terms of its legal form, organization and decision-making from the other activities of the related electricity firm.

3.4.4 Accounting unbundling

Electricity firms have to unbundle their accounts, which means that they have to keep separate accounts for their generation, transmission and distribution activities. The directives state that a competent authority has to be appointed that has a right of access to these accounts. In most countries, the independent regulatory agencies are responsible for monitoring the accounting unbundling of electricity firms. This unbundling of accounts is required in order 'to avoid cross-subsidies, discrimination and distortion of competition' (EC, 1996). Vertically integrated firms could use income of the transmission and distribution activities for expenditures in the potentially competitive segments as generation and retail. These cross-subsidies enable them to offer lower prices to consumers or better returns to investors. New entrants, which do not own transmission or distribution systems, are set at a competitive disadvantage. The 2003 directive added that electricity firms have to separate their accounts of the retail services to eligible customers (consumers that can choose their electricity retailer) from those to the non-eligible customers (consumers that are still restricted to supply from their regional or national monopolist). While the eligible customers pay a price for their electricity that is set by their electricity firm, non-eligible customers pay a regulated tariff. Electricity firms can have an incentive to use the income from the non-eligible customer segment to offer lower prices to their eligible customers, and thereby distort competition.

3.4.5 Network access

The independence of the transmission and distribution system operators from the generators and retailers necessitates the development of new forms of governance for network access to replace the vertical integration. The generators and retailers still need access to the network to be able to deliver and receive electricity. The 1996 directive states that the system operators have to provide a non-discriminatory access to the network for every network user: the electricity generators, retailers and large industrial consumers. The two directives give several options for governing these network access transactions.

Under the 1996 directive, member states could opt for a system of negotiated access to the network, a single buyer procedure, or a system of regulated access to the network. In a system of negotiated access to the network, the system operator and the network user negotiate the price and conditions of the contract for access to the network. In the case of the single buyer procedure, a single buyer is appointed for the territory that is covered by the system operator. The single buyer purchases all the electricity from competing generators and supplies all the consumers within its territory. The problem with this single buyer model is that no competition can develop in the retail part of the industry. There is only one electricity firm, the single buyer, which sells all the electricity to the consumers. In a system of regulated access to the network, the network users pay a regulated tariff to the system operator for access to the network. Most European countries chose to implement the regulated network access system. One of the exceptions was Germany, which initially chose for a system of negotiated access to the network. The 2003 directive only allows for the system of regulated access to the network. This directive adds that the tariffs, or at least the methodologies used to calculate them, need to be fixed or approved by a public authority prior to their entry into force.

3.4.6 Opening retail to potential competition

The first directive sets several thresholds and a timetable for giving consumers a choice of electricity retailer, and thereby for ending the monopolies in the retail segments of the European electricity industries. These thresholds are based on the levels of electricity consumption, ranging from consumers that buy more than 40 GWh of electricity per year to those that buy more than 20 GWh and 9 GWh per year. These thresholds determine the shares of the national industries that have to be opened up to potential competition. If consumers that use more than 40 GWh of electricity per year cover 33 per cent of the total demand in the European electricity industries, then 33 per cent of each national industry needs to be opened. This means that 33 per cent of the consumers must be able to switch from their incumbent to another electricity retailer. The first threshold is thus 40 GWh, and after three and six years of the entry into force of the directive, the thresholds are reduced to 20 GWh and 9 GWh, respectively. The 2003 directive added that by July 2004 all non-household consumers should be free to choose their electricity retailer, and by July 2007 all consumers should be able to choose their retailer.

3.4.7 Regulatory authorities

The 1996 directive states that a competent authority within each member state needs to be appointed that is responsible for settling disputes related to among others network access contracts and refusals of network access. This authority has to be independent from the parties involved in the dispute. The 2003 directive refers not only to a competent authority, but specifically to the designation of one or more regulatory authorities. These authorities have to be independent from the interests of the electricity industry. The 2003 directive specifies and extends the responsibilities and powers of the authorities. The regulatory authorities are responsible for 'ensuring non-discrimination, effective competition and efficient functioning of the market' (EC, 2003). They have to monitor the accounting unbundling, the conditions and tariffs for connecting new generators of electricity to the network, and the extent to which transmission and distribution system operators fulfil their tasks. The regulatory authorities have to publish an annual report on the outcome of their monitoring activities. In addition, they are responsible for fixing or approving the tariffs or at least the methodologies used to establish the conditions for the connection and access to the network and the provision of balancing services. This responsibility signifies an important change in the 2003 directive as compared to the first directive. Member states are not allowed anymore to make use of an authority that only operates ex post. Some member states (e.g. Germany) used to rely solely on their competition authorities to ensure the functioning of their electricity markets. This directive thus requires the appointment of a regulatory authority that approves or sets the tariffs or the methodologies for these tariffs ex ante.

3.4.8 Public service obligations

The directives specify that member states can oblige their electricity firms to take public service obligations into account. Public service obligations include such concerns as security of supply, quality and price of electricity, and environmental protection. These guidelines on public service obligations can allow member states to take exception with other guidelines in the directives. Member states may decide not to apply the provisions on the authorization and tendering procedures and network access rules if these obstruct the performance of the public service obligations. The development of trade within the European Union should thereby not be obstructed. The 2003 directive adds to these public service obligations a concern for consumer protection. All household consumers, and where appropriate small enterprises, should enjoy universal service, which is the right to be supplied with electricity of a specified quality for comparable and transparent prices. Safeguards should be offered to vulnerable consumers to help them avoid disconnection. Member states shall ensure that the eligible customer is in fact able to switch to another supplier.

Several of the requirements of these two European directives, including the requirements on the vertical unbundling of the transmission and distribution system operators, and on giving consumers a choice of electricity retailer, have a substantial influence on the governance transformations in the electricity industries. These requirements prohibit the vertically integrated structures, and necessitate the emergence of altered forms of governance in the vertical chain of transactions. A few of the guidelines in the directives are specifically aimed at promoting the adoption of market forms of governance to replace the vertical integration. These include among others the designation of regulatory authorities with a responsibility for an efficient functioning of the market, the requirements for the transmission and distribution system operators to supply and purchase electricity needed for balancing with a market-based mechanism, and the use of the tendering procedure for new generation capacity. The following section presents the results of the few empirical studies within transaction cost economics on the governance of transactions in unbundled energy industries. These studies did not report the emergence of market forms of governance, but instead the adoption of hybrid structures in the form of long-term bilateral contracts between the vertically unbundled segments of the electricity value chain.

3.5 Governance in an unbundled electricity industry

Transaction cost economics argues that the altered forms of governance in a disintegrated industry are unlikely to be anonymous spot markets (e.g. Crocker, 1996; Joskow and Schmalensee, 1983). Instead, TCE predicts and empirical studies (Joskow, 1987; Crocker and Masten, 1988) have shown that long-term contracts are the preferred institutional response. Long-term contracts are favoured because the transactions between the transmission system operators, generators, distributors and retailers are characterized by extensive relationship-specific investments. The empirical studies on the characteristics of governance structures in unbundled energy industries will be discussed in this section for the various relations in the electricity value chain. These empirical studies have mainly focused on the unbundled energy industries in the United States.

3.5.1 Generators – transmission system operators

Between the generators of electricity and the transmission system operators, Crocker (1996) observed the presence of substantial relationship-specific investments that are associated with the siting of generation facilities and the construction of transmission lines. These relationship-specific investments lead to an exchange environment in the wholesale power market that is characterized by small numbers bargaining and a high probability of opportunistic behaviour (Crocker, 1996: 90-91). The preferred institutional response for both the transmission system operators and the generators is therefore the long-term contract, as compared to market relations, in the vertically disintegrated electricity industries. See also appendix A for a discussion on the operating and investment complementarities between the transmission system operator and the electricity generators.

3.5.2 Generators – distributors/retailers

The contracts between independent generators and utilities in the electricity industry in the United States have been studied, and have been found to be characterized by extended durations (Cameron, 1992). The main reason given for the increase in the duration of these long-term contracts is asset-specificity. Cameron (1992) reported that the contracts between the independent generators and utilities were on average 2.3 decades long. Joskow (1987) found the same relation between asset-specificity and contract length: the more important the relationship-specific investments are, the longer are the commitments that buyers and sellers make to the terms of future trade (Joskow, 1987: 168). He studied 277 coal contracts between coal suppliers and electric utilities in the United States. The presence of site-specificity between mines and electric utilities led to an increase in contract duration of twelve to sixteen years. The presence of dedicated assets led to an increase in the duration of thirteen years (Joskow, 1987: 175-178). In the natural gas industry, Crocker and Masten (1988) also observed the presence of long-term contracts as a result of extensive relationship-specific investments in this industry. The long-term nature of the contracts was found to be accompanied by a large degree of flexibility in the terms of the contracts. The longer the contractual agreements are the more likely is the chance of some future external change influencing the terms of the agreement. Crocker and Masten (1988) concluded that because of these extended durations, the long-term contracts include pricing and quantity provisions that allow for future adjustments to the agreed upon price and quantity level. Joskow (1988) also reported that the majority of the contracts between coal mines and electric utilities included provisions to adapt the price of coal to the production costs of the mine.

Helm and Jenkinson (1998) explain the presence of long-term contracts between generators and retailers in the electricity industries, and even the desire of the contracting parties to re-integrate vertically, by an additional attribute of transactions, that of uncertainty. They claim that the vertical disintegration of the electricity industry will lead to the replacement of integration with long-term contracts. The introduction of competition into the retail segment will have a large impact on the vertical relations. A monopoly in the retail segment allowed for the downward allocation of risks of investing in generating capacity to the consumers. When the monopoly for the electricity consumers disappears, uncertainty increases substantially. Generators are uncertain whether they can earn a sufficient rate of return on their investments in new generating capacity. Helm and Jenkinson state that this increase in uncertainty helps to explain the general desire to reintegrate vertically in this industry (Helm and Jenkinson, 1998: 11).

3.5.3 Transmission system operators – network users

The distributors and retailers prefer long-term contracts in their relation with the transmission system operator, because the latter has a monopoly over the transmission network and therefore has the potential for displaying opportunistic behaviour and abusing its monopolistic position (Joskow and Schmalensee, 1983). If, for example, the distributors or retailers were to purchase some electric power from the TSO to meet peak demand or balancing requirements on a spot market basis, the TSO may have ‘strong incentives to curtail supplies and create shortages’ (Joskow and Schmalensee, 1983: 144) and thereby increase the price of electricity. These long-term contracts would have to specify the price at which the TSO will supply the electricity.

Joskow and Schmalensee (1983) also argued that the long-term contracts between the TSO and the users of the network are characterized by a coordinating role for the transmission system operator. The TSO has the objective of finding a way to make the decentralized decisions of distributors and generators consistent with the overall economics of the system. There are, for example, important economies associated with the combined operation and investment of transmission and generation capacity. Since the TSO cannot own electricity distribution or generation firms, the integrating function has to be performed through contracts with the distributors and generators. The TSO will require information from the distributors, including among others information on the distributors’ contractual arrangements with the generators. This information should enable the TSO to decide whether the contracts will allow for an efficient mix of plant, plant locations and total capacity of electricity for the entire system (Joskow and Schmalensee, 1983: 139-142). Not only do long-term contracts replace the vertical integration, the TSO thus also takes on a coordinating role in the governance of several of these contracts.

These various empirical studies have shown that long-term contracts have emerged in the unbundled energy industries. For reasons of asset-specificity and uncertainty, the market is not an efficient institutional solution for the vertical relations between the various unbundled segments of the energy industries. A coordinating role for the transmission system operators is reserved for several of the long-term contracts. The increased uncertainty in liberalized industries provides a reason for the vertical re-integration of electricity generators and retailers.

3.6 Conclusion

The search for new forms of governance by the European electricity firms in the unbundled, liberalized industries is constrained, both by the attributes of the electricity transactions and the institutional environment in the form of the European directives and national regulations. The presence of extensive asset-specific investments, externalities, natural monopolies and close interrelationships between the various segments of the electricity value chain constrain the emergence of market forms of governance. These transaction attributes lead to relations between the parties to the electricity transactions that are characterized by a great degree of bilateral and multilateral dependence. The transacting parties require some form of coordinated cooperation to ensure the efficient performance of the electric system. The European directives and national regulations on the unbundling of the vertical hierarchy, the independence of the system operators and the opening of the retail segment are, on the contrary, stimulating the emergence of market forms of governance. This chapter has discussed these characteristics of the electricity industries, the electricity transactions' attributes and the regulations, to analyse the drivers of governance transformations and determinants of the new forms of governance in the electricity industry. These two factors, regulation and transactions, are inputs to the conceptual framework that provides the explanation of this study on how governance structures change, and what new forms of governance emerge. This conceptual framework is presented in the following chapter.

4 – Complementing Transaction Cost Economics

The European Council and Parliament and the national regulators have formulated various rules to enable the liberalization of the European electricity industries. These rules prescribe the vertical unbundling of the integrated electricity firms and promote the development of competitive electricity markets[14]. The vertical unbundling refers to the separation of the transmission and distribution of electricity from the generation and retail of electricity. It entails the creation of independent companies for the operation of the transmission and distribution networks. These networks have natural monopoly characteristics and are therefore excluded from the introduction of competition. The vertical separation of these networks from the integrated electricity firms is prescribed to facilitate the introduction of competition in the generation and retail of electricity[15].

The new rules also prescribe that electricity consumers should be allowed to choose their electricity retailer. These rules thereby end the regional and national monopolies for the supply of electricity and allow new electricity firms to enter the electricity industries. The incumbent and new entrant electricity retailers are expected to compete for the supply of electricity to consumers, and to set competitive prices. The regulated tariffs for the supply of electricity are abandoned when consumers are able to choose their electricity retailer.

By implication, these new regulations influence the governance structures at the level of the firm in the European electricity industries; they stimulate a process of governance change away from the vertically integrated hierarchies. New forms of governance need to emerge to coordinate the transactions between the unbundled system operators, and the generators and

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[14] See section four of chapter three for a more detailed discussion on the European electricity directives.

[15] Competition could also be introduced into the electricity industries without the vertical unbundling, and the vertically integrated energy firms would compete for the supply of electricity to consumers. The European Commission advocates vertical unbundling, because a continued integration of the electricity networks into the incumbent energy firms could give these firms a competitive advantage over the new entrants. The incumbent firms would be able to cross-subsidize their electricity generation and retail with earnings from the distribution and transmission of electricity, and they could favor their own subsidiaries over the new entrants for a connection and an access to the network (EC, 2003).

retailers of electricity. These new forms of governance need to replace the vertical integration and to provide safeguards for the contractual hazards between the unbundled activities. The main contractual hazard between the system operators and the generators and retailers of electricity is bilateral dependency. This dependency is due to the extensive asset-specific investments that characterize the transactions between the operators, generators and retailers[16]. The European Commission and national regulators aim for changes to market forms of governance.

These two topics, regulation and governance structures, are addressed by transaction cost economics[17]. Transaction cost economics analyses regulation as a hybrid form of governance that solves a contracting problem between utility firms and consumers, and between utility firms and the regulator (Williamson 1996a: 96). This first contracting problem arises when the utility firm has a monopoly for the supply of its service, and has an incentive to hold up the consumers with unreasonably high prices. The regulator takes on an agency role for the consumers and signs a collective contract with the utility firms. This collective contract includes a maximum tariff for the utility service (e.g. Goldberg, 1976; Williamson, 1976). The second contracting problem consists of the regulator's incentive to hold up the utility firms with very low tariffs once the utility firms have sunk large, capital-intensive investments in the networks and in generating capacity (e.g. Joskow, 1991). In this case, a regulatory governance structure has to restrict the discretionary behavior of the regulator. Transaction cost economics has thus focused its analysis on the regulation of utility firms that have a monopoly for providing utility services and that provide these services at a regulated tariff. In the liberalizing electricity industries, this analysis is relevant only for the regulation of the transmission and distribution networks. The networks remain natural monopolies, and the system operators provide the transportation services at a regulated tariff.

Transaction cost economics has largely ignored the regulation of introducing competition into

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[16] Section 3.2 introduced the various forms of asset-specificity that characterize the transactions in the electricity industry.

[17] Section 2.7 gives a detailed discussion on the perspective of TCE on regulation as a governance structure.

the electricity industries and of maintaining competition between the various electricity generators and retailers[18]. Analyzing the regulation of the current governance changes in the liberalizing electricity industries with transaction cost economics poses several problems. Firstly, transaction cost economics ignores the fact that regulation sets the rules of the game and thereby influences the governance structures at the level of the firm, as can be observed in the case of the European liberalizing electricity industries. Transaction cost economics analyses regulation solely as a governance structure that is positioned at the same level as markets, hybrids and hierarchies. It does not embed regulation in the institutional environment[19]. This complicates an understanding of the regulatory influence on governance changes at the level of the firm. Secondly, the contracting problems on which transaction cost economics focuses (between the utility firms and the consumers, and between the utility firms and the regulator), for which regulation is claimed to be an efficient governance solution, are less relevant in liberalized electricity industries. In these industries, the electricity firms have lost their monopolies for the supply of electricity, and are therefore not able to hold up the consumers with monopolistic prices[20]. In liberalized electricity industries, the regulator cannot hold up the electricity generators or retailers with regulated tariffs, because these firms set their own prices. The relevant contracting problems in liberalizing electricity industries are the ones between the unbundled segments of the formerly integrated electricity firms. These contracting problems are relevant because the rules to liberalize the industries, and specifically the rules on vertical unbundling and consumer choice, create a need for new safeguards for these contracting problems. Thirdly, transaction cost economics is limited in its ability to explain changes from one form of governance to another[21]. Transaction cost economics is largely a comparative static perspective (e.g. Langlois, 1992). Williamson does refer to adaptation as the 'central

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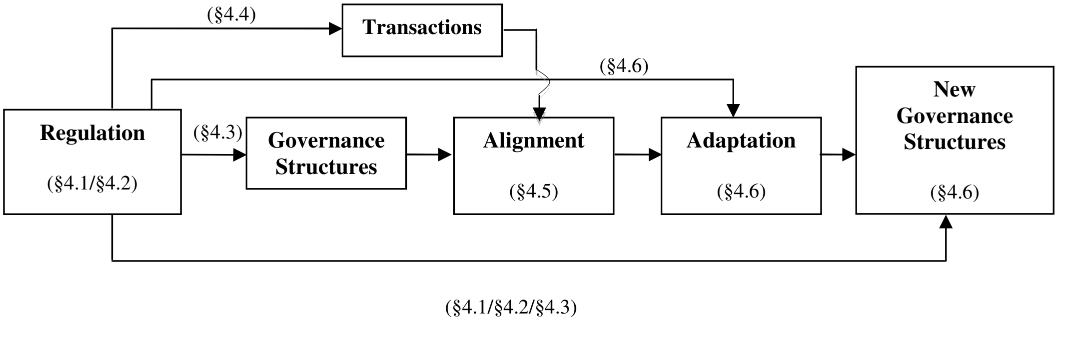
[18] Transaction cost economics has focused on competition *for* the market. The firm that wins the bidding competition earns the right to the monopoly franchise and is subject to regulation (Williamson, 1976).
[19] See section 2.7 for a discussion on the distinction between the perspective of TCE on regulation as a governance structure, and the viewpoint in which regulation is located in the institutional environment.
[20] This contracting problem only remains relevant for the transmission and distribution of electricity. These two activities retain their monopoly and are therefore still subject to regulated tariffs.
[21] Section 2.5 provides a discussion on the concept of adaptation within transaction cost economics, and why this concept is limited in its ability to explain changes between governance structures.

problem of economic organization' (Williamson, 1999a: 1101), but adaptation is not analyzed as a process that can explain changes between different forms of governance. Within transaction cost economics, adaptation is defined as a static feature of governance structures: the market is characterized by autonomous adaptation, and the hierarchy by cooperative adaptation. To understand the changes from vertically integrated electricity firms to hybrid and market forms of governance, the concept of adaptation has to be extended to enable an explanation of changes between forms of governance.

This chapter presents a complementary perspective on regulation and governance transformations that enables an understanding of the regulatory influence on governance changes. It is different from the current transaction cost economics' treatment of concepts as regulation, relevant contracting problems and adaptation, but it is a perspective that can still be incorporated within the larger TCE framework: it is thus complementing transaction cost economics. It locates regulation in the institutional environment, focuses on the contracting problems between unbundled activities, and analyses adaptation as a process of change between governance structures.

Figure 4.1 Conceptual framework



The various sections of this chapter discuss these complementary elements, and thereby follow the conceptual framework of this thesis that is illustrated here in figure 4.1. In the first two sections (section 4.1 and section 4.2), regulation is defined and located in the institutional environment. It is shown how regulation as the rules of the game differs from regulation as a governance structure. In addition, the regulatory institutional organizations (consisting of the public authorities that formulate, execute and enforce the regulations) are characterized. Section 4.3 discusses the various effects that regulation has on the governance structures at the level of the firm: firstly, it describes that regulation prohibits the vertically integrated monopolies; secondly, it discusses which electricity transactions are in need of new forms of governance as a result of the regulations on unbundling and consumer choice; thirdly, it characterizes the attributes of these electricity transactions and the contracting problems to which these attributes lead; fourthly, it discusses how these contracting problems in liberalizing electricity industries differ from Williamson's contracting problems; and finally it illustrates how regulation becomes part of the new governance structures (see the bottom line from regulation to new governance structures in figure 4.1). Section 4.4 looks at the effects of regulation on the attributes of the electricity transactions, including the asset-specificity, uncertainty and frequency of the transactions. Based on the discussion of the regulatory effects on governance and transactions, section 4.5 introduces the concept of misalignment (and alignment) between governance structures and the attributes of transactions. A misalignment may stimulate a process of adaptation towards altered forms of governance. Section 4.6 extends the transaction cost economics framework to include a process of adaptation that enables an explanation of governance transformations and consequently of the type of new governance structures that emerge. Regulation has a direct influence on this process of adaptation (see the line from regulation to adaptation in figure 4.1). Chapters six and seven apply this conceptual framework to empirical data of the Dutch and French electricity industries, respectively.

4.1 Taking regulation to a higher plane

Regulation has been defined in various ways, ranging from very broad definitions ('an alternative mode of public control' (Majone, 1996) or 'a form of public policy' (Wilks, 1996)) to more detailed ones, and to those that are specifically tailored to the regulation of liberalizing electricity industries. A more detailed, and often used[22], definition of regulation is provided by Selznick (1985). He defines regulation as 'sustained and focused control exercised by a public agency, on the basis of a legislative mandate, over activities that are generally regarded as desirable to society' (Selznick, 1985: 363-4).

This definition of regulation will here be used, but it will be adjusted to take account of a particularity of regulating liberalizing electricity (and other network) industries. In these industries, regulation's main goal is constituting markets and promoting competition. Henry et al. (2001) for example define regulation of network industries as 'involving all aspects of intervention on the part of the public authorities, aimed at establishing competition in a sector where it did not previously exist or existed only to a very limited extent, and reconciling the fair exercise of such competition with the duties in the public interest that are incumbent upon network utilities' (Henry et al., 2001: 14). Littlechild (2003) also stated that 'the modern regulatory framework gives the utility regulator a duty to promote competition and encourage new entry, in contrast to traditional regulatory frameworks that sought to replace competition' (Littlechild, 2003: 63). The inclusion of this characteristic of regulation (i.e. market-creation) results in a definition of regulation that recognizes that regulation does not only have the purpose of restricting behaviour and preventing the occurrence of certain undesirable activities, but that 'the influence of regulation may also be enabling or facilitative' (Baldwin and Cave, 1999: 2).

In addition, the definition of regulation will also have to include a specification of what these public authorities do on the basis of their legislative mandate: the public authorities exercise control by formulating, executing and enforcing laws, rules, codes of conduct and contracts. This adjustment of the definition is necessary to enable a clear distinction (in the following

[22] Studies on regulation often refer to this definition (see e.g. Majone, 1996: 9; Minogue, 2002: 651).

subsection, 4.1.1) between regulation as a governance structure and regulation as the rules of the game. The following definition of regulation will be used in this thesis:

The regulation of liberalizing electricity industries is defined as the formulation, execution and enforcement of laws, rules, codes of conduct and contracts, by public authorities, on the basis of a legislative mandate, aimed at constituting markets and promoting competition, and protecting the public interest.

4.1.1 Regulation as a governance structure versus regulation as the rules of the game

Transaction cost economics analyses regulation solely as a governance structure that is positioned at the same level as hierarchies, hybrids and markets. Although transaction cost economics does take the institutional environment into account as an influence on governance structures, it does not locate regulation at this higher level of institutions. Within transaction cost economics, the institutions at the environmental level include uncertainty, property rights, contract law regimes, and reputation (Williamson, 1996a: 112-117), but not regulation[23]. In this thesis, regulation is also located in the institutional environment. To enable a distinction between regulation as a governance structure and regulation as the rules of the game, the two definitions of a governance structure and of the institutional environment will here be applied to regulation.

Governance structures have, in chapter two, been defined as the organizational constructions that coordinate the transactions between two or more parties to incomplete contracts. Governance structures allow for an ex post implementation and enforcement of the ex ante formulated incomplete contracts. The two distinguishing features of governance structures as compared to the institutional environment are (1) the fact that they only operate *ex post* to fill in the gaps as left by incomplete contracts, and (2) that they govern contracts that are restricted in their application to the specific parties that have signed these contracts. This latter feature

[23] Section 2.6 gives a discussion on how the institutional environment is defined within transaction cost economics.

can be referred to as a distinction between *inter-individual* governance structures and collective institutions at the environmental level (Brousseau and Fares, 2000). The institutional environment is defined as the *collective*[24] 'rules of the game that exist *ex ante* (before a governance structure is built)'[25] (North, 1990; Brousseau and Fares, 2000), and that are formulated, executed and enforced by public authorities[26].

When regulation is restricted in its definition to that of governance structures, as is the case in transaction cost economics, a large part of the regulations in the liberalizing electricity industries is ignored. The European electricity directives, national laws, and many of the regulatory decisions, codes of conduct, and contracts are collective and formulated ex ante. These regulations therefore have to be defined as the rules of the game, and located in the institutional environment. They have to be taken into account when studying the regulation of governance structures and governance transformation in the liberalizing electricity industries.

Others have also argued that there exists a clear distinction between governance structures at the level of the firm and the public authorities that set the rules of the game. Scott (1995) remarked that 'all organizations are correctly viewed as governance structures, but the state is set apart' (Scott, 1995: 93). The government and its regulatory agencies are set apart, because they can 'exercise authority over other organizations' (Lindblom, 1977: 21). Lindberg et al. (1991) state that 'the important point is that the state assumes a privileged conceptual position, because it is capable of influencing governance in many complex ways, most of which are not

[24] Ménard (1995) summarizes the collective nature of institutions as follows: 'Institutions transcend individuals and organizations such as firms. They involve the implementation of an abstract set of rules which are impersonal, in that they must apply to all members of specified categories and preclude individual choices, and non-arbitrary, in that they are perceived to be the same for all members of a certain category.' (Ménard, 1995).

[25] Aoki (2000) refers to Douglass North' perspective on institutions as existing ex ante: 'North (1990) argues…that institutions should be identified with the rules of the game as distinct from the players of the game. By definition, the formal rules of the economic game…have been determined prior to the playing of the game.' (Aoki, 2000: 12).

[26] Brousseau and Fares (2000) also include the public authorities in their definition of the institutions: 'Institutions are made up, on the one hand, of rules that prescribe behaviors to agents in particular circumstances, and on the other hand, of decision-making mechanisms that are responsible for managing these rules (courts, parliament, a civil service in charge of implementing the law)' (Brousseau and Fares, 2000: 415).

available to organizations in civil society' (Lindberg et al., 1991: 31). And specifically for liberalizing network industries, Majone (1996) stated that the main function of the regulator is to ensure that economic actors play by the agreed rules of the game (Majone, 1996: 54). Similarly, Henry et al. (2001) referred to the role of the state as a designer and monitor of the rules of the competitive game (Henry et al., 2001: 14). In order to distinguish regulation as the rules of the game from regulation as a governance structure, the following two definitions apply here:

Regulation is located in the institutional environment, either when regulation refers to the rules (in the form of European directives, national legislation, regulatory decisions, codes and contracts) that are set ex ante (before the governance structures are set up that are affected by these rules) and that are collective (they are not restricted in their application to one specific economic actor or one specific contractual relation), or when it refers to the public authorities that formulate, execute and enforce these collective ex ante rules.

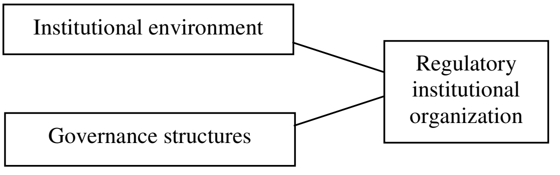
Regulation becomes part of a governance structure when the public authorities get involved in the execution and/or enforcement of a specific contract between transacting parties, or in settling the disputes that arise between the parties to the contract.

4.2 Regulatory institutional organizations

These two definitions of regulation, in which regulation is either located in the institutional environment or is part of a governance structure, refer to the public authorities that formulate, execute and enforce the regulations. Over time, the public authorities that regulated the electricity industries, and the role of these public authorities, have changed. Before the liberalization of the European electricity industries, most utilities with national monopolies were owned and operated by the central governments, as was the case in France and Italy. In several other European countries, such as the Netherlands, Sweden and Norway, the regional or local governments owned and operated the utilities and were subject to regulation by the central government, usually by the ministries of economic affairs and finances. The introduction of competition into the European electricity industries is altering the role of the national governments in these industries. This role is changing from being a provider of utility services to one of developing and implementing a regulatory framework for the stimulation of competition among energy companies that provide the utility services to consumers. As others have observed (e.g. Majone, 1996), the interventionist state in Europe is gradually evolving into a regulatory state. There is thus a switch from a state that does to a state that tells how things are to be done. One of the most obvious structural consequences of the shift to a regulatory state is the creation of a new type of regulator: the independent sector-specific regulatory agency (Majone, 1997). The independent regulatory agency is taking over, and is reformulating, some of the formerly state duties. In addition, in the process from monopolistic to potentially competitive industries, the competition authority is assuming its role as a regulator of the electricity industries.

A new institutional organization for the regulation of the electricity industries is thus emerging in which the central governments, and in particular the ministries of economic affairs, have to share their responsibilities for regulating the electricity industries with independent sector-specific regulatory agencies and competition authorities. This section defines such a *regulatory institutional organization* by (1) the various public authorities that are involved in regulating the liberalizing electricity industries (ministries, independent sector-specific agencies, competition authorities); (2) the allocation of regulatory responsibilities among these authorities; and (3) the coordination mechanisms that structure the authorities' mutual relations (Niesten, 2006). This regulatory institutional organization is located in between the institutional environment and the governance structures (see figure 4.2), because the public authorities both formulate, execute, and enforce the collective ex ante rules, and execute and enforce the specific contracts between transacting parties.

Figure 4.2 Regulatory institutional organization



4.2.1 Public authorities and the allocation of regulatory responsibilities and powers

The three main public authorities involved in regulating the liberalizing electricity industries are the ministry of economic affairs, the independent sector-specific regulatory agency and the competition authority. The ministry is responsible for formulating sector-specific and competition legislation. The independent sector-specific regulatory agency and the competition authority implement the sector-specific and competition laws, respectively.

Despite these generalities, countries have attributed regulatory responsibilities and powers to each of these authorities in different ways. Important regulatory responsibilities and powers in liberalizing electricity industries include responsibilities for formulating, executing, and/or enforcing rules on network connection, network access, unbundling of accounts, independence of the transmission and distribution system operators, balancing of electricity supply and demand, electricity supply, consumer choice, and the transfer of information on switching consumers. The responsibilities for these rules are studied in this thesis, firstly because they make up the largest part of the requirements in the European electricity directives, and secondly because it will become evident that these are the rules that influence the governance transformations (see section 4.3).

4.2.2 Coordination mechanisms between the competition authority and the sector-specific agency

Coordination mechanisms between the various public authorities exist in order to coordinate the formulation, execution and enforcement of the regulations[27]. These mechanisms include various means of control and/or influence of one public authority over another. The coordination mechanisms between the competition authority and the sector-specific regulatory agency are necessary for at least two reasons. Firstly, the two authorities have to be able to cope with an overlap of regulatory responsibilities. An example of such an overlap concerns the responsibility for network access rules. When the sector-specific regulatory agency has the responsibility for network access rules and tariffs to allow each new entrant a non-discriminatory access to the natural monopoly of transmission and distribution, it in fact has a responsibility to avoid an abuse of dominant position by the incumbent (the owner of the network). Avoiding abuses of dominant position is generally the responsibility of the competition authority. Secondly, it has to be avoided that the sector-specific regulatory agency can interpret terms under the sector-specific legislation in a way that is inconsistent with competition legislation. Countries have found different institutional solutions to cope with the overlap of responsibilities and inconsistencies in the interpretation of terms. They have set up different mechanisms to coordinate the relation between the competition authority and the sector-specific regulatory agency. At least four coordination mechanisms can be distinguished. Within the sector-specific agency's area of responsibility, the agency can ask the competition authority for *advice*. The competition authority may also *coordinate* the decisions of the sector-

[27] To identify the coordination mechanisms, various data sources have been used, including reports of the OECD (1999) and of the International Energy Agency (2001) on regulatory institutions in liberalized electricity markets. This IEA report summarizes the authorities that are involved in regulating the various European electricity industries. On the basis of this report, several EU countries, including Germany, France, the Netherlands, the United Kingdom, Sweden and Finland, were selected to study their regulatory institutional organizations more in depth. From this analysis, the various coordination mechanisms were identified. The websites of the public authorities were used as a data source: www.bmwi.de, www.bundeskartellamt.de, www.cre.fr, www.industrie.gouv.fr/energie/, www.finances.gouv.fr/DGCCRF/, www.dte.nl, www.nmanet.nl, www.ez.nl, www.ofgem.gov.uk, www.stem.se, www.energiamarkkinavirasto.fi.

specific regulatory agency. This means that the competition authority is involved in the regulatory decisions of the sector-specific regulatory agency and that it consults with the agency on its regulatory decisions, but no formal approval of the competition authority is necessary for the decisions of the sector-specific regulatory agency. Co-ordination does not rule out conflicting decisions between the sector-specific agency and the competition authority (OECD, 1999: 196, 208). If advice or coordination are not sufficient, the sector-specific agency can be required to ask for the *approval* of the competition authority. These three coordination mechanisms indicate that an increasing influence of the competition authority over the decisions by the sector-specific agency can be observed, and thus an increasing precedence is given to competition legislation. In the fourth coordination mechanism, no further influence is attributed to the competition authority over the sector-specific agency. It is the sector-specific agency itself that gives precedence to competition legislation over the sector-specific acts. The sector-specific regulatory agency has *concurrent* powers under competition legislation.

4.2.3 Coordination mechanisms between the ministry and the sector-specific agency

Multiple reasons have been brought forward to justify the independence of the sector-specific regulatory agencies. It has been claimed that they are better able at hiring more experienced and capable personnel (Cushman, 1941), because they are not restricted to civil servants' salaries. Independent agencies have been attributed a longer-term focus (Landis, 1938); a change in government should not influence the agencies' objectives. A complete independence of these agencies is not desired by the central government either. The central government should be able to hold these independent agencies accountable for their actions, because they provide goods and services that are in the public interest. Majone (1997) remarks in this respect that 'indirect government involves not only a structure of responsibilities, but also new forms of control and accountability' (Majone, 1997: 147). Various mechanisms have been set up through which the ministry can exert an influence on the independent sector-specific regulatory agencies. Firstly, the ministry can exert a direct influence on the independent regulatory agency through financing its *budget*. The budget of the regulatory agency can also be financed by license fees that are paid by the industry. Secondly, the ministry can *appoint* the director of the regulatory agency or the different members in case of a commission. To increase the independence of the agency and reduce the direct control of the ministry over the agency, different branches of government can appoint the members of a commission. Thirdly, the *security of tenure* of the members of a commission or the head of the regulatory body is usually protected. They cannot be removed from office for arbitrary or political reasons. The ministry may be allowed to intervene in cases of incompetence or misbehavior or other restrictively defined cases. Finally, the ministry can have the power to give individual *instructions* to the regulatory agency. This allows the ministry to exert a large influence on the sector-specific regulatory agency. In most European electricity industries, the ministry is only allowed to control the agency through its decisions on energy policy that are formulated in electricity laws and ministerial regulations. The independent regulatory agencies implement these laws and ministerial regulations into more specific rules for the industry.

4.2.4 Relevance of defining a regulatory institutional organization

Various authors have recognized the importance of specifying who the rule-makers are, and the allocation of different regulatory tasks and powers among the different authorities (Lodge, 2002; Minogue, 2002: 650; Ogus, 2002: 638)[28]. Glachant and Finon (2000) argued for characterizing the European differences in the allocation of powers of regulation among the public authorities in order to determine the feasibility of converging national electricity reforms to one European model. In this thesis, a regulatory institutional organization is characterized in order to understand which public authorities formulate, execute and enforce the different regulations within a particular national electricity industry. This enables an understanding of when the authorities set the rules of the game and thereby influence the governance structures, and when the authorities are part of the governance structures. In addition, a regulatory

[28] Ogus (2002) claimed that an appropriate allocation of power among public authorities is important for the legitimacy of the regulatory institutional structure, and the protection of public interest regulatory objectives as transparency and accountability. Minogue (2002) pointed to an enhanced understanding of the strengths and weaknesses of regulatory practice.

institutional organization is characterized in order to highlight the differences in the regulatory institutional organizations across the European electricity industries. These differences can explain the differences in regulations across these industries, and consequently the differences in the governance structures at the level of the firm (see figure 4.3).

Figure 4.3 Influence of the regulatory institutional organization

Diverse regulatory institutional organizations in the EU → Differences in regulation across European electricity industries → Differences in governance structures across European electricity industries

Although each European electricity industry is subject to the same electricity directives that are issued by the European Council and Parliament, the transposition of these directives into national legislation and regulation by the public authorities differs among the European countries, resulting in diverse regulatory frameworks across the European electricity industries. These transpositions of the EU directives into national regulations differ across the European electricity industries, because each country allocates the regulatory responsibilities and powers to each of the public authorities in a different way, and because these public authorities (the ministries, independent sector-specific agencies, and competition authorities) take different regulatory decisions based on their diverse objectives. While the objective of the competition authority is ‘to maintain and encourage the process of competition in order to promote an efficient use of resources while protecting the freedom of economic action of various market participants’ (OECD, 2003: 2), the ministry takes considerations of industrial policy and social policy into account, which ‘more often than not, can inject market distortions which impede the competitive process’ (OECD, 2003: 3). The sector-specific regulatory agency is given the task of introducing competition into the electricity industries. The difference between the objectives of the sector-specific regulatory agency and the competition authority can be summarized as promoting versus protecting competition, respectively. This has also been described as the difference between an ex ante versus ex post perspective to competition; ‘Sector-specific

regulators generally apply an ex ante prescriptive approach while competition offices, except in the area of merger review, apply an ex post enforcement approach' (OECD, 1999: 9).
Lodge (2002) identified the allocation of regulatory authority and the objectives of the regulatory authorities as crucial factors for defining regulatory reforms (Lodge, 2002: 5). A regulatory institutional organization that is characterized by a large regulatory responsibility for the ministry will thus lead to different regulatory decisions as compared to an organization with a greater role for the competition authority and the independent sector-specific regulatory agency. Each European country allocates the regulatory responsibilities and powers in the electricity industry to each of the three authorities in different ways. These differences in regulatory institutional organizations result in different regulations across the European electricity industries. The differences between these national regulations serve as an explanation for the differences between the new governance structures that are emerging in each of the European electricity industries (see figure 4.3 for the influence of the regulatory institutional organization).

4.3 Regulatory influence on governance structures

The European directives and national regulations on the introduction of competition in the European electricity industries influence the governance structures at the level of the firm in these industries in several ways. Firstly, the rules on unbundling the system operators from electricity generation and retail, and the rules on giving consumers a choice of electricity retailer, prohibit the vertically integrated monopolies that characterized the European electricity industries for decades (section 4.3.1). Secondly, by prohibiting the existing governance structures, these rules also create a need for new forms of governance, and thereby stimulate a process of governance change. The rules on unbundling and consumer choice create a need for new governance structures for several electricity transactions: the network connection transactions, the network access transactions, the balancing transactions, and the switching transactions. The attributes of these electricity transactions create various contracting problems. The new forms of governance need to emerge to replace the vertical integration, and to provide safeguards for these contracting problems (section 4.3.2). These contracting problems, which are relevant in liberalizing and vertically disintegrating industries, differ from transaction cost economics' analysis of contracting problems in network industries, and more specifically from Williamson's contracting problems between integrated utility firms and consumers (section 4.3.3). Thirdly, the new rules for the liberalizing electricity industries (e.g. rules on network connection, network access, balancing, and switching) influence the characteristics of the new governance structures, and regulation also becomes part of these new forms of governance (section 4.3.4).

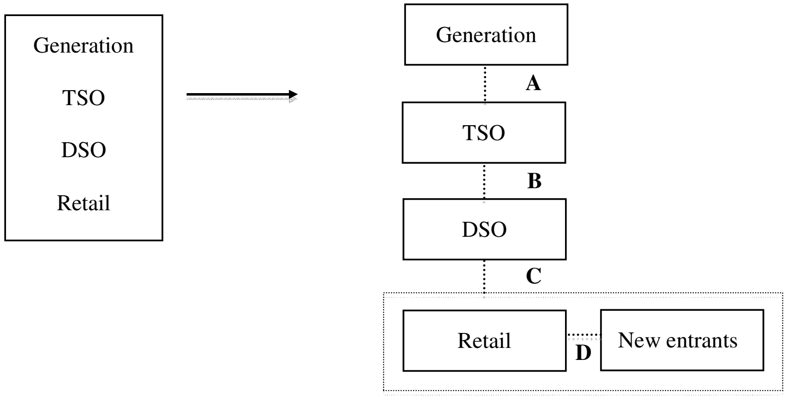
4.3.1 Regulation prohibits the vertically integrated monopolies

The European electricity directives and the national regulations for the electricity industries prescribe the unbundling of the distribution and transmission system operators from the generation and retail of electricity, and the possibility for consumers to choose their electricity retailer. These European rules influence the governance structures at the level of the firm in the European electricity industries; they prohibit the vertically integrated hierarchies and the regional and national monopolies. The unbundling of the distribution and transmission system operators from the generation and retail of electricity entails the creation of legally independent companies for the (formerly integrated) system operators[29]. Figure 4.4 illustrates how the governance structures in the electricity industries are affected by these rules on vertical unbundling: the four activities in the electricity value chain, the generation, transmission, distribution and retail, have to be separated where they were previously internalized within one firm. The European directives prescribe the independence of the distribution and transmission system operators to facilitate the introduction of competition in the generation and retail of

[29] The 2003 directive prescribes the legal unbundling of the system operators. Other forms of unbundling were obliged by the 1996 directive, such as accounting, financial and management unbundling. These preceded the implementation of the legal unbundling by the energy firms. Some European governments, such as the Dutch government, prescribe the implementation of ownership unbundling (the owners of the system operators have to be unbundled from the owners of the electricity generators and retailers). Rules on ownership unbundling are not yet included in the European directives.

electricity. An additional requirement for competition to emerge is giving consumers a choice of electricity retailer[30]. The European directives specify the details on how and when the consumers must be given a choice[31]. When consumers are able to choose their electricity retailer, new electricity firms are expected to enter the European electricity industries and to compete with the incumbents for the supply of electricity to consumers (see the new entrants in figure 4.4). These European rules on consumer choice thereby lead to the end of the regional and national monopolies in which consumers were restricted to supply from one electricity firm at regulated tariffs.

Figure 4.4 Unbundling of the hierarchy and a need for new governance



[30] Competition is also introduced into the generation of electricity. This is not explicitly taken into account here with respect to the rules on consumer choice. Most consumers only choose an electricity retailer, and this retailer then contracts with electricity generators for the supply of electricity to the consumers. Only very large industrial consumers contract directly with electricity generators.
[31] See section four of chapter three.

4.3.2 Regulation necessitates new governance for the electricity transactions

By prohibiting the vertically integrated monopolies, the rules on vertical unbundling and consumer choice create a need for new governance structures for several electricity transactions. These electricity transactions include the network connection transactions, network access transactions, electricity supply and demand balancing transactions, and switching transactions. Figure 4.4 indicates the linkages (A-D) between the various segments in the electricity value chain in which these electricity transactions are in need of new forms of governance.

Within the transaction cost economics framework, these four types of transactions can be characterized along three attributes: asset-specificity, behavioral uncertainty, and frequency[32]. Two of these attributes, asset-specificity and behavioral uncertainty, determine whether a contracting problem is present between the transacting parties. Frequency plays a negligible role in this respect. This third attribute of transactions is relevant when making a choice between bilateral and trilateral governance. When the transactions occur only occasionally, trilateral governance reduces transaction costs. When the frequency of the transactions increases, the efficiency of bilateral governance increases.

The focus is here on the contracting problem of bilateral dependency[33]. When transactions are characterized by specific assets and by behavioral uncertainty, this leads to the contracting problem of bilateral dependency between the contracting parties. A contracting party that has sunk investments in specific assets is dependent upon the other contracting party for buying the goods or services that are produced with these specific assets. This dependent contracting party is subject to a potential holdup by its opportunistic contracting party that purchases the goods or services. The new forms of governance have to provide a solution for this contacting problem, and they have to replace the vertical integration (Jolink and Niesten, 2008).

This section introduces the four types of electricity transactions, and it discusses the attributes

[32] See section one of chapter two for a discussion on the three attributes of transactions.

[33] TCE is mainly concerned with the analysis of this type of contracting problem, the bilateral dependency. It does identify other types of contractual hazards, including hazards that accrue to weak property rights, measurement hazards, intertemporal hazards such as disequilibrium contracting, and hazards that accrue to weaknesses in the institutional environment (Williamson, 1996a: 14).

of these transactions and the contracting problem of bilateral dependency between the parties to these transactions[34]. The four electricity transactions are the focus of this thesis, because the new regulations on the liberalization of the European electricity industries affect the governance of these transactions.

4.3.2.1 Network connection transactions

The network connection transactions involve connecting the generating plants and the equipment of electricity consumers to the distribution and transmission network, and of connecting the distribution network to the transmission network. These transactions are located in the linkages A, B, and C in figure 4.4. They are characterized by a particular type of asset-specificity, the so-called site-specificity, and by behavioral uncertainty. Site-specificity characterizes a transaction when a contracting party invests in assets that are located close to the plants and equipment of the other contracting party to reduce costs. The generators and consumers of electricity (the network users) are located close to the transmission and distribution network to reduce their connection costs. Once the network users have built their plants and equipment, and have connected it to the network, they are placed in a dependency relation with respect to the system operator. The network users have sunk their site-specific investments that have far less economic value in other uses. It would be prohibitively costly for them to relocate and set up their plants and equipment at another connection point. This creates a contracting problem in which the system operator has a dominant position and can hold-up the network users by demanding unreasonable network connection prices. This possibility for opportunistic behavior on the part of the distribution and transmission system operators characterizes another attribute of the network connection transactions, namely the behavioral uncertainty. The two attributes, asset-specificity and behavioral uncertainty, together lead to the presence of the contracting problem in which the generators and retailers are dependent on

[34] The preliminary characterization of the transactions in this chapter only serves the purpose of illustrating how the attributes of the transactions lead to the contracting problem of bilateral dependency. In the case studies, in chapters six and seven, the transactions will be characterized more specifically, and for each case. Chapter five provides the operationalization of the attributes of the transactions and the governance structures.

the system operators. Site-specificity has been argued to provide ‘a compelling reason to integrate activities into a single firm’ (Glachant, 2002: 302). The vertically integrated firm provided a safeguard for the generators and retailers against the opportunistic behavior of the system operators. In the electricity industry, the condition of asset-specificity is combined with the presence of a monopoly for the network. The network users are dependent on the electricity network to an extreme degree; they have no alternative for the delivery of their electricity. This monopoly of the system operator provided an extra stimulus for governance through internal organization. In the current situation, in which the vertically integrated firms are prohibited, the contracting parties to these network connection transactions, including the new entrants, need to find other forms of governance to solve this contracting problem.

4.3.2.2 Network access transactions

The network access transactions involve the exchange of information between the system operators and the generators and retailers of electricity on the amount of electricity that these network users expect to take out and put on the network on the next day for each network connection (the so-called transportation programs). The system operators need this information to resolve any transportation restrictions, which may occur when too much electricity is transported along a particular part of the network. The network access transactions also involve the supply of reserve power from the electricity generators to the network to resolve transportation restrictions in real time. These transactions are located in the linkages A, B, and C in figure 4.4. They are characterized by temporal specificity. This type of asset-specificity characterizes a transaction when investments in assets are made that enable a transaction to take place within a short period of time. The network users have made investments to enable a continuous exchange of information with the system operators, and to increase or decrease their production and consumption within a very short period of time. The transmission system operator is dependent upon the electricity generators for an increase or decrease in production to resolve the transportation restrictions. When the generators can earn a higher income on their electricity on, for example, the electricity spot market, they may have an incentive to disguise information on their available capacity from the transmission system operator. These network access transactions are thus also characterized by asset-specificity and behavioral uncertainty, leading to a bilateral dependency among the contracting parties for which new forms of governance need to provide a safeguard.

4.3.2.3 Balancing transactions

In these same linkages in the electricity value chain (A, B and C in figure 4.4), the generators, retailers, the distribution system operators and the transmission system operator transact to keep the balance of electricity supply and demand. These balancing transactions include an exchange of information between the generators, retailers, and the system operators on the amount of electricity that the generators and retailers expect to put on and take out of the network on the next day (the energy programs). The transmission system operator has to balance electricity supply and demand for the entire electricity system in real time. The balancing transactions also include the supply of balancing power from the generators to the transmission system operator. These transactions are characterized by temporal specificity: the network users need to inform the system operators continuously about their energy programs, and the generators need to respond within a few minutes to a call of the system operator for an increase or decrease in production. The generators may have an incentive to disguise information on their reserve capacity for these balancing transactions to earn a higher income elsewhere. The balancing transactions are thus also characterized by a behavioral uncertainty, which combined with the temporal specificity, leads to the contractual hazard of bilateral dependency between the parties to the transactions. Before the unbundling of the electricity industries, supply and demand were balanced internally; the transmission system operator ordered the vertically integrated generators to produce more or less electricity to keep the total supply and demand for electricity in balance. In the unbundled situation, new governance structures need to coordinate the exchange of information between the system operators, generators and retailers of electricity on their expected electricity production and consumption on the next day; and the supply of balancing power to the transmission system operator.

4.3.2.4 Switching transactions

The European directives and national rules prescribe that the European electricity consumers should be able to choose their electricity retailer, and that they should thus be able to switch from their incumbent to another energy firm. When consumers switch to another retailer, metering data and consumer-specific information as names, addresses, and electricity use have to be transferred to the new retailer. This information can come from different sources, including the consumers' previous retailer, the distribution system operators, and possibly the metering companies. The switching transactions thus involve the transfer of information on the switching consumers between these various contracting parties. They are located in linkages C and D in figure 4.4.

The switching transactions are characterized by behavioral uncertainty; the (incumbent) retailers and the distribution system operators have an incentive to obstruct transferring customer information to the new retailers, or at least they have no incentive to aid in the process of transferring the information to competitor firms. Although the distribution system operators are structured as separate legal entities (thereby complying with the new EU rules on vertical unbundling), they are often still operating under the same holding and owner as the incumbent retailers. These integrated distribution system operators therefore have an incentive to discriminate between the different retailers in their supply of information on consumers' electricity use and meter readings. They have an incentive to obstruct or delay the information transfer to the new electricity retailers. Since the distribution system operators often have a quasi-monopoly on the information of metering readings, the new retailers are dependent on the distribution system operators for this information. The incumbent retailers have an information advantage with respect to the switching transactions over the new retailers. Because of their organizational link to the distribution system operators, they have an easier access to the consumer information than do the independent retailers. The potentially opportunistic behavior of the distribution system operators and their quasi-monopoly create the contracting problem of a dependence of the new retailers on the system operators.

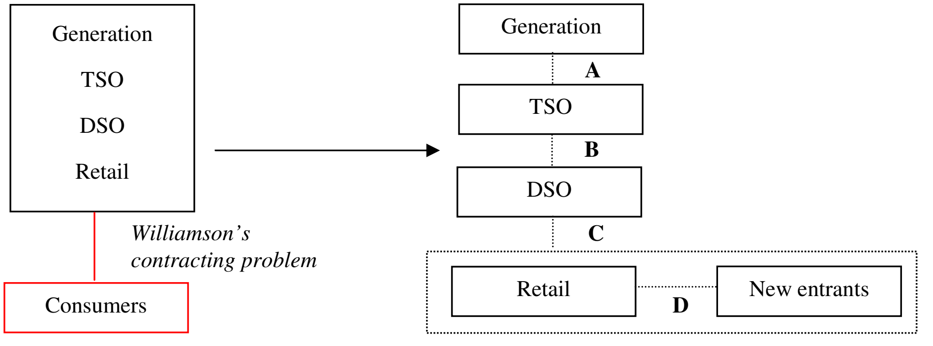
Before the liberalization, these switching transactions occurred only when consumers relocated to a different address that was either served by the same or a different distribution system operator with a monopoly for the region. After the introduction of competition into the industries, other contracting parties became involved in these transactions, such as the new entrant retailers and the independent metering companies. New forms of governance need to be set up that can provide a safeguard for the potentially opportunistic behavior of the incumbent retailers and distribution system operators.

4.3.3 Regulation alters the location of the relevant contracting problems

The attributes of the electricity transactions, such as the behavioral uncertainty and the asset-specificities, create the contracting problems of bilateral dependencies between the parties to each of the transactions. These contracting problems are the relevant ones to study in liberalizing electricity industries, because as a result of the EU rules on the liberalization these contracting problems are in need of new governance structures.

Figure 4.5 compares the contracting problems in the liberalized electricity industries (on the right hand side) with the contracting problem as addressed by Williamson (on the left hand side). The contracting problems between the parties to the network connection, network access, balancing, and switching transactions in the liberalized electricity industries, are located in the linkages A to D in the figure 4.5. Williamson analyses the contracting problem between the (integrated) utility firms and their customers (e.g. Williamson, 1996a). These utility firms have a regional or national monopoly in supplying a utility service, and an incentive to hold up consumers with monopolistic prices. This contracting problem is less relevant in an industry in which the monopoly is restricted to the network, and consumers can choose between competing electricity firms. The relevant contracting problems are the ones that appear as a result of the rules on the liberalization of the electricity industry, and in particular as a result of the rules on vertical unbundling and consumer choice. Although the focus is here on a different set of contracting problems as compared to the one addressed by Williamson, the contracting problems in the liberalized electricity industries can still be analyzed within the transaction cost economics framework. The previous section has shown that the attributes, as asset-specificity and behavioral uncertainty that lead to bilateral dependencies between the contracting parties, can be identified for the electricity transactions in the liberalized industries.

Figure 4.5 Change in the positions of contracting problems



4.3.4 Regulation becomes part of the new governance structures

The four types of transactions, and the contracting problems between the transacting parties, in the unbundled electricity industries are in need of altered forms of governance. When the vertically integrated hierarchy is excluded, these transactions will be governed - within the transaction cost economics framework - either by hybrid or market forms of governance. The EU directives and the national regulations influence the attributes of these emerging forms of governance. For example, the directive of 2003 obliges the use of a system of regulated access to the network. In such a system, the public authorities determine the conditions and tariffs for access to the network. These conditions are usually stipulated in codes of conduct (e.g. the grid code and the tariff code) that specify how the system operators and the network users have to behave with respect to the transportation of electricity over the network, and with respect to connecting to and using the network. The specific contracts between a system operator and a network user for the connection and access to the network are based on these codes of conduct.

Similar codes of conduct have been formulated by the public authorities for the balancing of electricity supply and demand and for the switching between retailers (the system code and the information code respectively). These codes influence how governance for the four types of electricity transactions will be structured.

In addition to this regulatory influence on the governance structures, regulation can also become part of the new forms of governance. The definitions of regulation as the rules of the game and regulation as a governance structure, which were introduced in section 4.1, are applied here in making the distinction. When the public authorities execute and/or enforce the implementation of the specific contracts between the users and operators of the network and when they settle disputes between the users and operators of the network, regulation becomes part of the new governance structures. For example, the Dutch regulator for the electricity industry has interfered in the contracts between energy firms and system operators. The Dutch regulator has demanded a change in connection tariffs and in transportation tariffs for specific contracts, after a complaint by one of the contracting parties[35]. It has also enforced a contract between an energy firm and a system operator on the payment for system services by the energy firm to the operator[36]. In the illustration of the conceptual framework in figure 4.1, this is shown by the direct, bottom line from regulation to new governance structures.

Figure 4.6 compares the current location of regulation as a governance structure in unbundled industries (right hand side) with the analyses of regulation as a governance structure by Williamson, and by Levy and Spiller (left hand side). Williamson views regulation as a structure that governs the contracting problem between consumers and utility firms, who have an incentive to set monopolistic prices (Williamson, 1976). Levy and Spiller (1994) address the contracting problem between the regulated firm and the regulator, who has an incentive to

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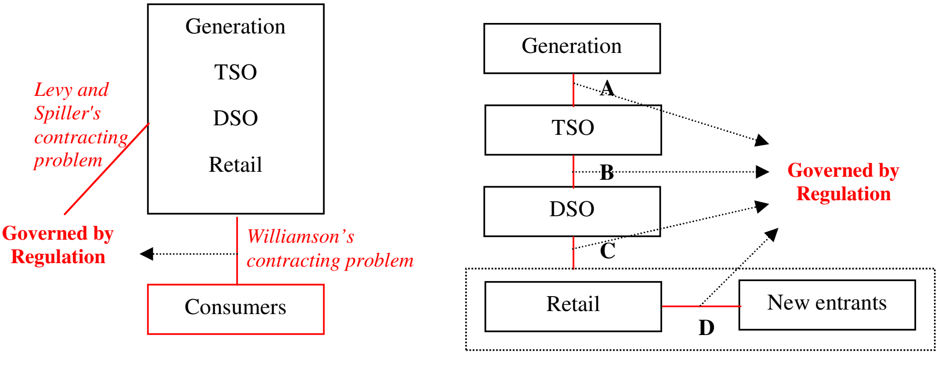
[35] Besluit van de NMa op het bezwaar van Eneco Netbeheer B.V. tegen het besluit van de NMa van 21 maart 2007 inzake de aanvraag van Europees Massagoed-Overslagbedrijf B.V. tot beslechting van een geschil tussen EMO en Eneco Netbeheer B.V. Besluitnummer: 102392/49.
Bindende aanwijzing voor Essent Netwerk Brabant B.V., press release December 11, 2002.

[36] Besluit op de aanvragen van Elsta B.V. & Co en Delta Netwerkbedrijf B.V. om een bindende aanwijzing te geven. Besluitnummer: 101855-11.

keep prices as low as possible[37]. Schwartz (2002) has summarized various discussions on regulation. This summary is useful to highlight the differences between these three perspectives on regulation. He stated that ‘a regulation discussion may ask what terms a regulated firm can include in its contracts with customers’ or ‘what terms the state should supply to firms to use in transaction with each other’ and ‘in recent years, scholars have begun to add to the question how the state should regulate contracts between business firms’ (Schwartz, 2002: 116). The first discussion on regulating the contractual relation between consumers and firms represents the perspective as adopted by Williamson. The second refers to the discussion on regulatory structures that govern the relation between the regulator and the regulated firms, as focused on by among others Levy and Spiller (1994). The current discussion revolves around the latter type of regulation, meaning regulation of contracts between two or more business firms.

Figure 4.6 Change in location of regulation as a governance structure



[37] See section seven of chapter two for a discussion on the various perspectives on regulation as a governance structure.

This section has proposed the various ways in which regulation influences the governance structures in the European electricity industries. The European directives and national regulations for the electricity industries prohibit the vertically integrated monopolies, and they thereby create a need for new forms of governance. These new forms of governance need to replace the vertical integration, and to provide safeguards for the contracting problems between the parties to the various electricity transactions. The European rules also influence the characteristics of the new forms of governance, and they also become part of these new governance structures.

4.4 The relatively inert nature of electricity transactions

The European rules on the introduction of competition in the European electricity industries have a profound effect on the governance structures in these industries and on the transformations to altered forms of governance. The European directives aim for the adoption of market forms of governance to replace the vertical integration. The European Commission describes one of the key objectives of the EU as follows: 'To create a genuine internal market for energy is one of the European Union's priority objectives' [38]. Article 3 of the 1996 directive states that 'Member States shall ensure that…electricity undertakings are operated in accordance with the principles of this Directive, with a view to achieving a competitive market in electricity'. The question remains whether these markets will in fact emerge. Within the transaction cost economics framework, this depends on the attributes of the transactions, and not necessarily on the implementation of a new regulatory framework. For a market to be an efficient governance structure, the transactions will have to be characterized by non-specific assets. The transactions in the electricity industry have traditionally been characterized by a great degree of asset-specificity and by behavioral uncertainty. The new regulations are not likely to alter these attributes of the transactions in the electricity industry for several reasons. Firstly, there is still only one network to which the users need a connection and an access, and

[38] europa.eu/scadplus/leg/en/s14002.htm (last accessed December 6, 2008).

the system operators retain their monopoly for the network. Secondly, electricity can still not be stored in the unbundled industry, or at least not in an economically efficient way. For these reasons, the network connection transactions will continue to be characterized by behavioral uncertainty, as the system operators may still have an incentive to hold up the network users with high connection tariffs. And the network access transactions and the balancing transactions will still be characterized by temporal specificity. The network users have to continuously send their projections on their electricity consumption and production to the system operators, so that the latter can ensure that there are no restrictions on the transportation of electricity and that supply and demand of electricity are balanced. The generators have to be able to supply electricity to the transmission system operator within very short periods of time. Glachant and Finon (2000) argued that 'the present introduction of competitive forms into the electricity industry has not overcome any of the transactional difficulties particular to that industry: those of site or temporal specificities, those of natural monopolies, those of externalities and measurement' (Glachant and Finon, 2000: 317).

The new regulations are thus not likely to alter the attributes of the electricity transactions in the direction into which markets are an efficient institutional solution for the network connection, the network access, and the balancing transactions. Changes of the transactions into that direction can possibly be found in technological innovations. For example, innovations that enable electricity to be stored efficiently reduce the degree of temporal specificity of the balancing transactions. But chapters six and seven will have to illustrate whether regulation has altered the attributes of the transactions in the Dutch and French electricity industries.

4.5 A regulated misalignment between governance and transactions

The electricity industry is characterized by transactions with a great degree of asset-specificity and behavioral uncertainty. Transaction cost economics has argued and empirically shown that vertical integration is an efficient institutional solution for these transactions in the electricity industry. It is therefore assumed on the basis of transaction cost economics that the governance structures, and in particular the vertically integrated hierarchies, and the electricity transactions were aligned before the liberalization of the electricity industries. This core argument of transaction cost economics is referred to as the discriminating alignment hypothesis[39]. It claims that 'transactions, which differ in their attributes, are aligned with governance structures, which differ in their cost and competence, so as to effect a discriminating - mainly a transaction cost-economizing – result' (Williamson, 1996c: 12). The European regulations on the unbundling of the system operators from the integrated electricity firms are altering this efficient alignment. The vertical integration is being prohibited in the electricity industries, and the European regulators are stimulating the emergence of market forms of governance. The regulators may have assumed that the transactions would adapt to the governance structures, and thus that the discriminating alignment would also work the other way around[40]. In this case, the attributes of the transactions would have to change in the direction of lower asset-specificity to fit the market forms of governance. As the previous section has illustrated, the attributes of the electricity transactions are not likely to change in this direction. The new European regulations are thus ending the situation of alignment between the electricity transactions and governance structures, and thereby create a situation of *misalignment*. A misalignment creates large transaction costs[41] and therefore an incentive for contracting parties to adapt to more efficiently aligned situations. The following section discusses the process of adaptation of the governance structures to new forms.

[39] See section three of chapter two for a discussion on the discriminating alignment hypothesis.
[40] Williamson allows for the option of turning the matter of discriminating alignment around, in which the transactions adjust to the governance structures (Williamson, 2003).
[41] In their review of empirical studies in transaction cost economics, Macher and Richman (2006) conclude that there are several studies on the costs associated with failing to align transactions and forms of governance (Macher and Richman, 2006: 53). They state that the 'relatively few studies that explore the performance implications of organizational choice, notably Silverman et al. (1997), Nickerson and Silverman (2003) and Masten et al. (1991), find that the effects of misalignment can be substantial, entailing lower profitability and higher failure rates (Macher and Richman, 2006: 54).

4.6 Adapting to new forms of governance

Williamson has argued that adaptation is the central problem of economic organization (Williamson, 1994: 323). Within his transaction cost economics, two types of adaptation are distinguished: autonomous or Hayekian adaptation and cooperative or Barnardian adaptation[42]. In autonomous adaptation, economic actors adapt unilaterally to changes in relative prices, and thereby switch continuously to other contracting parties of which the identity is irrelevant. In cooperative adaptation, the bilaterally or multilaterally dependent parties to ongoing contracts consult each other when adapting to disturbances, or they refer the decision to the hierarchy where through fiat is decided on the type of response. Williamson defines these two types of adaptation as attributes of governance structures; the market is characterized by autonomous adaptation, and the hierarchy by cooperative adaptation (Williamson, 1991: 279). Adaptation thus takes place *within* a particular form of governance. Williamson does not analyze the adaptation *between* forms of governance, or in other words, the adaptation from one governance structure to another. His transaction cost economics has often been described as ‘a comparative static perspective’ (Groenewegen and Vromen, 1997: 33), which is ‘incapable, by itself, of explaining the dynamics of institutional change’ (Dietrich, 1994: 5). Langlois has also criticized transaction cost economics for being a static perspective. He introduced the concept of dynamic transaction costs - the costs of persuading, negotiating, coordinating and teaching outside suppliers (Langlois, 1992: 113) - to allow for a longer time frame in the study of governance structures and thereby to enable a better explanation of why the market or the hierarchy is used. With this perspective, Langlois aims to integrate capabilities theory and transaction cost economics. The dynamic transaction costs have also been referred to as the costs of not having the capabilities you need when you need them (Langlois, 1992: 99).

Analyzing the process of adaptation *between* forms of governance is necessary to understand the transformations of governance structures and the emergence of particular forms of governance, in particular when the latter cannot be explained by the attributes of the

[42] Section five of chapter two discusses the concept of adaptation within transaction cost economics in more detail.

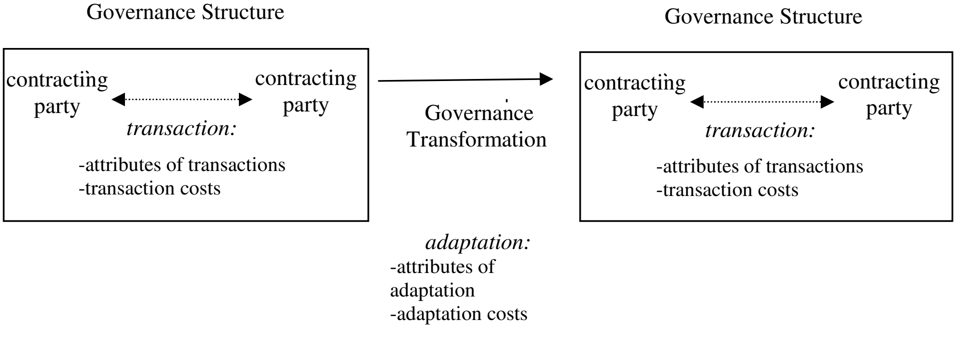
transactions. Such an analysis of the adaptation process will be proposed in this section. Since most of the terminology within transaction cost economics has not been tailored to the description and explanation of adaptations from one governance structure to another, this implies that part of the problem of explaining governance transformations is of a conceptual nature. However, several concepts that are already present within transaction cost economics will be used in this complementary perspective. The definitions of these concepts will be extended to enable their application to the analysis of governance transformations. In this sense, this is an exercise in how transaction cost economics can be extended to address the analysis of changes in governance structures. Such an approach is preferred to ensure that the complementary elements are theoretically and conceptually consistent with the current transaction cost economics. This is also the reason why no other theoretical perspectives, such as the capabilities approach, are introduced to address the analysis of governance change.

4.6.1. Governance transformations

A governance transformation is a change from one governance structure to another (see figure 4.7). The three generic forms of governance have been defined as the hierarchy, the hybrid and the market (e.g. Williamson, 1996a). Using this categorization, three types of governance transformations are distinguished: a change towards the hierarchy, a change towards the hybrid, and a change towards the market. A change towards the hierarchy is excluded from the analysis, because the vertically integrated hierarchy has been prohibited by EU regulation for a large number of electricity transactions. Governance transformations thus include the changes from the hierarchy to the hybrid, from the hybrid to the market, and from the market to the hybrid. The attributes of these types of governance transformations will be defined using the characteristics of governance structures. Within Williamson's transaction cost economics, governance structures have been characterized by incentive intensity, administrative control and contract law regime. A governance transformation towards the market is characterized by an increase in incentive intensity, a decrease in administrative control, and an increase in the use of courts. A governance transformation from the market to the hybrid is characterized by a decrease in incentive intensity, an increase in administrative control, and an increase in the use of arbitrage to solve disputes; and a governance transformation from the hierarchy to the hybrid is characterized by changes in the opposite direction.

The question that needs to be answered is: how can a governance transformation be explained, or in other words, when does a transformation to the market occur and when does a transformation to the hybrid occur? In transaction cost economics, the unit of analysis is the transaction. The attributes of the transactions explain the efficiency of the various forms of governance. When explaining the efficiency of the governance transformations, adaptation is taken to be the unit of analysis (see figure 4.7). The attributes of adaptation explain the efficiency of the various governance transformations. It is assumed that the economic actors to the adaptation process economize on adaptation costs, just as the economic actors to a transaction economize on transaction costs. This similar heuristic device and the similar assumptions on economic actors contribute to the integration of this complementary perspective on governance transformations into TCE.

Figure 4.7 Transformation between governance structures



4.6.2 Adaptation

An adaptation is an adjustment of a governance structure to an exogenous or endogenous disturbance. An example of an exogenous disturbance is the EU regulation that prescribes a governance change away from the hierarchy. An example of an endogenous disturbance is an investment in specific assets by the parties to a contractual relation that alters the governance needs of these contracting parties. The exogenous and endogenous disturbances result in a misalignment of the governance structure to the attributes of the transaction, and thereby increase the transaction costs. An adaptation to another form of governance is assumed to move into the direction where it economizes on these costs of misalignment. In the process of adaptation, economic actors search for another governance structure to coordinate the transaction, they search for a contracting party, and they negotiate the specifics of the contract and the governance structure with the contracting party.

Several attributes of adaptation are distinguished: the identity of the contracting party[43], the laterality of the adaptation, and the type of response[44]. Firstly, the *identity of the contracting party* refers to the extent to which the identity of the (potential) contracting party is relevant to the economic actor that is searching for a contracting party and a new form of governance. The extent to which an identity is relevant is defined only for the relation between the parties to the (potential) transaction, and for that particular transaction only. It is thus not an absolute quality, but it is relative to the transaction and to the economic actors involved. This quality (that what determines the relevance of an identity) can refer to an almost infinite number of things, such as the location of the (potential) contracting party, the reputation of the (potential) contracting party, the name of the brand of the product or service, the quality of the product or service, the combination of products or services that is provided by the (potential) contracting party, and all those other qualities that are valued by the economic actor that is searching for a contracting party and a new governance structure. When the identity of the contracting party is relevant,

[43] Ben Porath (1980) has referred to the identity of contracting parties as a determinant of institutional modes, in addition to the impersonal dimensions such as asset-specificity.
[44] The choice of these attributes is based on the definitions of autonomous versus cooperative adaptation of Hayek and Barnard as introduced in the beginning of this section 4.6.

the economic actor is restricted in its search for a contracting party. In the extreme case, there is only one contracting party with which the economic actor is able to transact. This happens when the economic actor needs to transact with a contracting party that has a particular quality that no other economic actor has. When the identity of the contracting party is irrelevant, the economic actor can choose among numerous alternative contracting parties, and the search is therefore less complicated. Secondly, the *laterality of the adaptation* refers to how the economic actor adapts to the disturbance and adjusts towards a new form of governance. The economic actor can adjust unilaterally, meaning that it responds on its own, without consulting with another economic actor. A bilateral or multilateral response, on the other hand, refers to economic actors that are cooperating in their response to the disturbance and their adaptation to a new form of governance. Thirdly, a diverse set of *responses* exists on the basis of which economic actors react to a disturbance. An adaptation on the basis of the price of a good or service is a common response across industries. Specific responses for the electricity industry are those to the system requirements; economic actors need access to the electricity network to be able to supply or receive electricity, and they need to balance electricity supply and demand in order to avoid blackouts. Economic actors thus need to take other factors than just the price of a good or service into account, such as the safety of the system and their dependence on a network, when adjusting to a new form of governance. Figure 4.8 displays the consequences of these attributes of adaptation for the governance transformations.

Figure 4.8 Attributes of adaptation and governance transformations

Identity of the parties:	Irrelevant	Relevant
Laterality of the adaptation:	Unilateral	Bilateral/multilateral
Type of response:	Price	System requirements

governance transformation towards the market

governance transformation towards the hybrid

When the identity of the contracting party is relevant, it is more costly for the economic actor to search for a contracting party, as compared to the situation where the identity is irrelevant and numerous potential transacting parties are available. A transformation to an ongoing relation in a hybrid form is preferred when the identity is relevant. A hybrid governance structure is preferred, because of the limited availability of suitable contracting parties, and the longer-term nature of the hybrid form reduces the need of searching for a new contracting party. In addition, a hybrid form of governance enables the contracting parties to recover the current search costs and to reduce the future search costs, also as a result of the longer-term contractual relation of the hybrid form. When only one or a few potential contracting parties are available for the desired transaction, the bargaining and negotiation costs for the contractual relation are likely to be much higher than when there are numerous potential contracting parties. The contracting party with the preferred identity has an incentive to take advantage of his preferential qualities in the contract negotiations, and it thereby increases the bargaining and negotiation costs. A transformation to the hybrid form is also preferred to recover these costs. When the identity is irrelevant, the search costs are low, and the economic actor has the option to easily switch to other contracting parties. The economic actor does not have an incentive to engage in a long-term contractual relation, and to increase the administrative control and costs of the governance structure. A transformation to the market is preferred.

Starting from the governance structure that is influenced by a disturbance, the contracting parties to the governance structure can react unilaterally to the disturbance; they can react bilaterally or multilaterally with the same contracting parties as those to the governance structure of before the disturbance; or they can react bilaterally or multilaterally with economic actors that were not parties to this governance structure. When an economic actor prefers to adapt to a new form of governance on its own, it will most likely adapt to a market form of governance in which cooperation with others is also reduced to a minimum. Economic actors may prefer to adapt bilaterally or multilaterally, in order to share and thus reduce the costs of searching for a new form of governance. These economic actors will consequently set up a hybrid form of governance with the economic actors involved in the adaptation process.

When an economic actor selects a contracting party on the basis of the price (of the good or service), it prefers a short-term contract. A short-term contract allows the economic actor to easily switch to another contracting party in order to react to changes in prices. These responses to prices and the short-term contracts are accompanied by an increase in the incentive intensity of the economic actor. A transformation to the market form of governance is thus observed. When an economic actor takes other factors, such as the safety of the system or the dependence on a network, into account, it prefers a transformation to a hybrid form of governance. Certain characteristics of an industry (e.g. the presence of a network) will not change quickly, and will thus allow for longer-term structures to govern the transactions that need to take these characteristics into account. In addition, many actors in the industry are affected by the same characteristics of the industry, and may thus prefer to cooperate to reduce the costs of searching for the most efficient form of governance.

In short, when the identity of the (potential) contracting party is relevant, the economic actors cooperate in their adjustment to disturbances, and take other considerations than just the price of a good or service into account; a transformation to a hybrid form of governance will occur. When the identity of the contracting party is irrelevant, and the economic actors adapt unilaterally to the prices of goods and services; a transformation to a market form of governance will occur.

With the electricity directives of 1996 and 2003 on common rules for the European electricity industries, the EC aims to stimulate the emergence of market forms of governance in these industries. The EC should not restrict its directives and regulations to structural measures, such as the unbundling of the vertically integrated firms and the creation of independent system operators. Considering these attributes of adaptation, the EC should also aim to alter the behavior of the economic actors in the direction of unilateral responses to changes in prices, in order to stimulate the emergence of markets.

4.6.3 Adaptation costs and the transaction cost differential

When adapting from one form of governance to another, various costs are incurred. These costs include search costs, and the costs of bargaining, drafting, negotiating and safeguarding an agreement. Search costs have been defined as 'the costs of locating information about opportunities for exchange' (North and Thomas, 1973: 93), and as 'the costs of gathering information to identify and evaluate potential trading partners' (Dyer, 1997). These costs thus involve the costs of searching for information on the different ways in which the transactions can be governed, and information on the various potential contracting parties. When economic actors have decided on the type of governance structure and on the contracting party, they need to negotiate the specifics of the contract and governance structure with the contracting party. These costs include costs of bargaining, drafting, negotiating and safeguarding the agreement. Williamson (1985) refers to the latter costs as ex ante transaction costs, but he does not take the search costs into account.

Since these various costs are incurred in the adaptation process from one governance structure to another, and thus before the intended transactions take place, they are here referred to as *adaptation costs*. By taking these search, bargaining, drafting, negotiating and safeguarding costs as a category of costs related to adaptation between governance structures, they are to be distinguished from the transaction costs, such as monitoring costs, enforcement costs or policing costs. The latter costs are typically costs which will emerge once transactions have materialized and have been aligned with a governance structure. As such, the conceptual stance is taken in which transaction costs are considered in cases of executed transactions, as opposed to those costs, the adaptation costs, which are involved in the process prior to the executed transactions.

These adaptation costs influence whether adaptation from one governance structure to another is, or is not, a feasible option for the economic actor involved. An economic actor will want to adapt to another form of governance when its current form of governance is misaligned with the transactions. Misalignment implies that the transaction costs are not optimized to the prevailing governance structure. The difference between the actual transaction costs and the optimal transaction costs may be called the *transaction cost differential*[45]. When the actual transaction costs are higher than the optimal transaction costs, a misalignment is observed. This transaction cost differential could therefore also be referred to as the misalignment costs. In order to overcome this suboptimal situation an adaptation process is feasible, yet at least two venues emerge: the economic actors may adjust the attributes of their transactions, or they may adapt to a (new) form of governance and re-align the transactions with this new form of governance. In the first case, economic actors will reassess the attributes of their transactions, and adjust in order to reduce the transaction cost differential. This adjustment of the transactions is closely related to Williamson's transaction cost economics, although in this case his discriminating alignment hypothesis is turned around; not the governance structures are aligned to the transactions, but the transactions are matched to the governance structures (Williamson, 2003)[46]. Since most of the electricity transactions are relatively inert, and therefore unlikely to adjust to the governance structures, the focus will be on the second case. In this second case, economic actors will reassess the governance structures and will opt for an adaptation of the form of governance as long as the adaptation costs are smaller than the transaction cost differential. Through this adaptation process a new governance structure may be attained and a new alignment may take place. Alternatively, if the adaptation costs are higher than the transaction cost differential, an adaptation of the governance structures is obstructed and the economic actor may remain locked into a situation of misalignment, when no further adjustments are envisaged. Economic actors are assumed to economize on the adaptation costs when adapting their forms of governance. When the search, bargaining, negotiation and safeguarding costs are relatively high, a transformation to a hybrid governance structure will be more efficient. As the previous section has shown, a hybrid form of governance allows for a longer period to recover these adaptation costs, and the possibility of

[45] This term has also been used by Masten et al. (1991), to refer to the positive difference between market and internal organization costs when governing transactions that are characterized by asset-specificity and uncertainty.
[46] Although Williamson allows for the option of turning the matter of discriminating alignment around (Williamson, 2003), his analysis has only focused on matching the governance structures to the attributes of the transactions.

sharing these costs with the contracting parties. A transformation to a market form of governance will be more efficient when the search, bargaining, negotiation and safeguarding costs are low.

4.6.4 The effects of regulation on adaptation

The processes of adaptation are ongoing, and a starting point is therefore hard to determine. The case of the regulation of the liberalizing European electricity industries is an interesting exception, as there is a deliberate incision of this ongoing process where one form of governance, the hierarchy, is restricted ex ante as an option in favor of, and in anticipation of, the market. Furthermore, the EU legislation promotes and voluntarily causes a misalignment between existing transactions and future form of governance. Thus, by law, adaptation is enforced on the vertically integrated firms, in order to promote more competition.

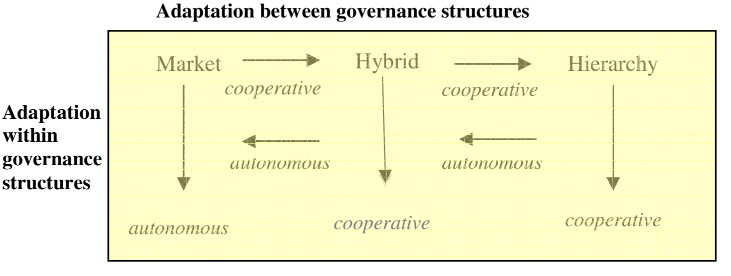
The European and national regulations on the liberalization of the electricity industries influence the attributes of adaptation between forms of governance and the adaptation costs. For several electricity transactions, such as the network connection, the network access and the balancing transactions, regulation prescribes that the economic actors should take the system requirements into account when adapting to a new form of governance. The national regulators for the electricity industries have formulated various codes of conduct that specify how the system operators and the network users have to behave with respect to a connection to the network, the transportation of electricity and the balancing of electricity supply and demand. These codes aim for a non-discriminatory and transparent connection and access to the network, and the safety of the system by providing procedures for balancing electricity supply and demand. The economic actors use these codes of conduct to formulate their contracts and governance structures. These codes also specify various procedures that the system operators and network users have to follow when making changes to the codes, and which economic actors to involve in these procedures. Regulation therefore also prescribes that for several transactions the economic actors have to adapt in a bilateral and multilateral way to a (new) form of governance. Regulation can also influence the relevance of the identity of the contracting parties to the new forms of governance. For the balancing transactions, the national regulators often prescribe that the energy firms should supply balancing power to the electricity network. The energy firms are therefore restricted in their choice of a contracting party to the transmission system operator for the supply of a particular amount of power.

In addition to its influence on the attributes of adaptation, regulation may also affect the adaptation costs. For example, without the involvement of regulation, the bargaining, negotiation and safeguarding costs of adapting to a new form of governance for the network connection transactions would remain high. The transmission system operator has the opportunity to increase these costs for the energy firms, since it is the only contracting party to which the energy firms can turn for a connection to the network. By determining the procedures on how and when a (potential) network user is to be connected to the network, regulation reduces the bargaining, negotiation and safeguarding costs between the energy firms and the system operator for these transactions. With the codes, the regulators may also reduce the search costs of the economic actors for both the search for a governance structure and the contracting parties for several electricity transactions. When the regulators reduce the adaptation costs for the economic actors, they stimulate the process of adaptation to other forms of governance.

4.6.5 Co-adaptation

Two different forms of adaptation have been identified: adaptation *within* governance structures and adaptation *between* governance structures. Transaction cost economics has analyzed adaptation as an attribute of governance structures, and has thus focused on adaptation within governance structures. Williamson has distinguished between two types of adaptation: autonomous adaptation and cooperative adaptation (e.g. Williamson, 1996a). The market is characterized by autonomous adaptation, and the hierarchy and the hybrid by cooperative adaptation. In this chapter, the focus has been on adaptations between forms of governance. Williamson's terminology is applied to these adaptations between forms of governance. The adaptation that explains the governance transformation to the market is referred to as an autonomous adaptation, and the adaptation that explains the governance transformation to the hybrid as a cooperative adaptation. These two forms of adaptation (within forms of governance and between forms of governance) do not exclude each other and may, in fact, operate simultaneously in an industry. In this case one may refer to a process of *co-adaptation.* Figure 4.9 illustrates the various adaptation processes. The horizontal arrows illustrate the adaptations between forms of governance, and the vertical arrows the adaptation within forms of governance.

Figure 4.9 Co-adaptation



In terms of the figure 4.9, the EU regulation restrains the full possibilities of adaptation within the hierarchy, and adaptation towards the hierarchy. The transactions to which the distribution and transmission system operators on the one hand and the generators and retailers of electricity on the other hand are contracting parties, cannot be governed by a vertically integrated hierarchy in the liberalized electricity industries. These transactions include the network connection and network access transactions, the balancing transactions, and the switching transactions. The governance structures for these transactions will transform into the direction of hybrid or market forms of governance. An autonomous adaptation between forms of governance will then be observed. An example of co-adaptation can be given. The Dutch regulators for the electricity industry have, in the past, set up a market for trading balancing power. They have thus enforced an autonomous adaptation between forms of governance (from the hierarchy to the market) on the Dutch energy firms. The Dutch regulators have caused a misalignment between the transactions and the newly enforced market form of governance. The contracting parties to this form of governance may be driven, due to the misalignment, to adjust within the form of governance. They may adjust the attributes of the transactions to more efficiently align with the market form of governance. This example of co-adaptation that combines an autonomous adaptation between and within forms of governance, can illustrate the role of the adaptation costs and the transaction cost differential in the process of adaptation. Since the regulator determines how this market will be structured, which contracting parties will be involved, and how the contracting parties will have to behave on this market, it reduces the adaptation costs for the energy firms, and thereby stimulates the adaptation. Regulation increases the transaction cost differential due to the misalignment of the market with the unchanged transactions. The attributes of the transactions were efficiently aligned with a hierarchy, and not with a market form of governance; regulation thus increases the actual transaction costs above the optimal transaction costs. The energy firms will have a further incentive to reduce the transaction cost differential by adapting the attributes of the transactions to the market form of governance.

4.7 Conclusion

This chapter has proposed several ways in which regulation influences the governance transformations in the European electricity industries. Regulation sets the rules of the game, and thereby prohibits the governance structures that characterized the electricity industries for decades, and influences which new forms of governance emerge in the industries. By prohibiting the vertically integrated monopolies, regulation creates a misalignment for several electricity transactions, and stimulates a process of adaptation to other forms of governance. It reduces the adaptation costs for the energy firms, and influences the direction of governance change through its impact on the attributes of adaptation. Regulation also becomes part of the new forms of governance when it implements and enforces the specific contracts between the parties to several electricity transactions.

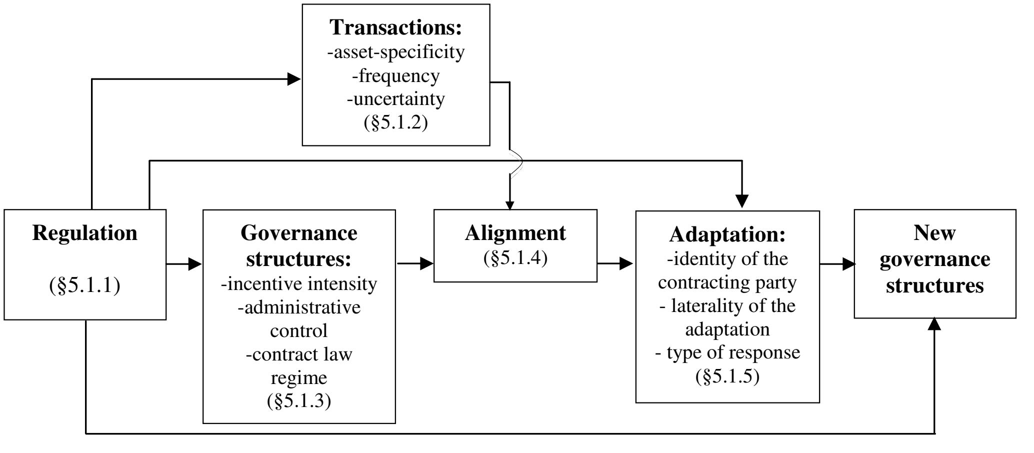
This chapter has provided several complementary elements to transaction cost economics that allow for an understanding of the emergence of specific forms of governance when the attributes of transactions cannot provide an explanation, and in particular these elements allow for an understanding of governance transformations. These elements include recognizing that regulation also sets the rules of the game and thereby influences governance structures at the level of the firm, identifying the relevant contracting problems in liberalizing electricity industries, and specifying a process of adaptation between forms of governance. Regulation and the adaptation process are taken into account to explain the emergence of particular governance structures.

The following chapter will operationalize the various concepts that have been introduced in this chapter, such as regulation, the attributes of transactions and governance, misalignment, and the attributes of adaptation and the adaptation process. It will present the research design and data collection methods of this thesis. Chapters six and seven will apply the conceptual framework that was proposed in this chapter to the Dutch and French electricity industries.

5 – Research Design

The conceptual framework of this thesis on the regulatory influence on governance transformations, that was discussed in the previous chapter and is summarized here in the illustration (in figure 5.1), needs to be further operationalized and tested with empirical data. The various concepts in the conceptual framework, and the attributes along which these different concepts vary, will be defined in this chapter (section 5.1). The research strategy that is chosen to study the relationships between the various concepts is the case study (section 5.2). A multiple case study on the Dutch and French liberalising electricity industries is presented in chapters six and seven respectively. The data collection methods and the data sources that are used for each of the concepts for both the Dutch and French cases will be introduced in this chapter (section 5.3).

Figure 5.1 Conceptual framework



5.1 Operationalization of concepts

Each concept and its attributes will be defined in this section, following the conceptual framework (in figure 5.1) from left to right; from regulation to the new governance structures.

5.1.1 Regulation

The regulation of liberalizing electricity industries is defined as the formulation, execution and enforcement of laws, rules, codes of conduct and contracts, by public authorities, on the basis of a legislative mandate, aimed at constituting markets and promoting competition, and protecting the public interest. The regulation of liberalizing electricity industries takes place at the national level. The national electricity laws are themselves implementations of the European electricity directives. The three main public authorities that regulate the liberalising electricity industries are the ministries of economic affairs and energy, independent sector-specific regulatory agencies, and competition authorities. The analysis of regulation is restricted to the laws, rules, codes of conduct, and contracts that are formulated, executed and enforced by these three authorities, and that affect the four types of electricity transactions that are studied in this thesis.

5.1.2 Transactions

A transaction occurs when a good or service is transferred from one stage of activity to another. The four types of electricity transactions that are studied in this thesis are the network connection, network access, balancing of electricity supply and demand, and switching transactions. The *network connection transaction* involves the connection of the generating plants and the equipment of the electricity consumers to the distribution network or the transmission network; the connection of the distribution network to the transmission network; and the maintenance of the connection. Two *network access transactions* are distinguished. Firstly, the network users and system operators exchange information on the daily transportation of electricity over each network connection, in the form of so-called programs, which allows the network users an access to the network and enables the system operators to check whether there is enough transportation capacity for the intended electricity flows and to predict whether and where transportation problems may occur. Secondly, the network users supply reserve power to the system operators so that the latter can resolve the restrictions on the transportation of electricity over the network in real time. Two *balancing transactions* are distinguished. Firstly, the network users and the transmission system operator exchange information on the amount of electricity that the network users expect to put on and take out of the network on the next day, also in the form of programs. Since these projections of the network users often differ from their actual generation and consumption of electricity, the transmission system operator calls upon the network users to decrease or increase their consumption or production of electricity to balance supply and demand in real time. The second balancing transaction therefore consists of the supply of balancing power from the network users to the transmission system operator. The *switching transaction* involves the transfer of information on the switching consumers, such as their names, addresses, monthly electricity use, and meter readings, between the consumers, old retailers, distribution system operators, metering companies and the new retailers.

These different types of transactions will be characterized along three attributes: frequency, asset-specificity and uncertainty.

The *frequency*[47] with which a transaction occurs can be one-time, occasional, or recurrent. When a transaction occurs only once over the entire contractual period, the frequency of the transaction is characterized as one-time. An occasional transaction is one that does not occur very often, and only on an irregular basis. A recurrent transaction occurs more often and follows a fixed pattern of exchange between the transacting parties.

Five types of asset-specificity will be considered, including site-specificity, human asset-

[47] Williamson identifies three types of frequency (one-time, occasional and recurrent). Several researchers consider frequency as a dichotomous phenomena (one-time versus recurring transactions) and control for transaction frequency by examining only recurring exchanges (e.g. John and Weitz, 1988; Klein et al., 1990; Rindfleisch and Heide, 1997: 31).

specificity, physical asset-specificity, temporal specificity, and dedicated assets[48]. A transaction is characterized by *site-specificity* when investments in assets to the contractual relation have lower costs when they are made close to the plants, facilities or equipment of the other contracting party. A transaction is characterized by *human asset-specificity* when investments in human capital are made that can only be used for that particular transaction, and when without these investments the transaction cannot take place. A transaction is characterized by *physical asset-specificity* when investments in physical assets are made that can only be used for that particular transaction, and when without these investments the transaction cannot take place. *Temporal specificity* is present in a transaction when investments are made in assets that allow the transaction to take place within a short time period. *Dedicated assets* characterize a transaction when the investments in assets are only made for the transactions with a specific contracting party. These assets are thus not specific to the transaction, as is the case in the physical, human and temporal asset-specificity, but to the contracting party. The various types of asset-specificity are considered to characterize an electricity transaction when investments in such assets (in specific sites, time periods, human or physical capital, or dedicated to a contracting party) are made; and when these investments are not made, the transaction is considered not to be characterized by the particular type of asset-specificity.

Behavioural uncertainty is defined as uncertainty that may arise within the transaction itself due to the opportunistic inclinations of the transacting parties (John and Weitz, 1988), and thus as a result of the possibility for the 'strategic nondisclosure, disguise or distortion of information' by the transacting parties (Williamson, 1985: 56). Very few operationalizations of behavioural uncertainty exist in the literature on transaction cost economics (Macher and

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[48] Williamson has distinguished between six types of asset-specificity, including site-specificity, human and physical asset-specificity, temporal specificity, dedicated assets, and brand name capital (Williamson 1996a: 105-106). This last one is an investment in reputation and is often present in franchise relations. It is less relevant for the governance structures studied in the case studies in chapters six and seven, and is therefore excluded from the current analysis. The focus is on the first five types of specificity. Some examples of empirical studies that have operationalized these types of asset-specificity are Joskow (1987) and Masten et al. (1989).

Richman, 2008: 6). One measure of behavioural uncertainty is performance ambiguity, which refers to the difficulty of ascertaining the actual performance or adherence to contractual agreements by the parties to the transaction. It is difficult to ascertain performance when responsibility for performance is shared between the contracting parties, when there are no readily observable indicators of what is meant by performance (Anderson, 1985: 239), when there is a lack of performance standards, when performance evaluation is subjective (Stump and Heide, 1996: 436, 440), or when the activities of the contracting parties are separated by relatively longer periods of time (John and Weitz, 1988: 346). Williamson (1981) remarked in this last respect that when individual productivity cannot be assessed by measuring output, an assessment of input is needed. Inputs may be inferred by, for example, observing the intensity with which an individual works. This can be measured only over long observation intervals (Williamson, 1981: 564). One problem with this operationalization is that these indicators of performance ambiguity often depend on features of the governance structure. The administrative apparatus of the governance structure may include objective performance standards and ways of monitoring and evaluating the performance of the contracting parties. The behavioural uncertainty is then hard to identify independent from the attributes of the governance structure, and accordingly the efficient alignment of governance with the attributes of the transactions cannot be determined when the transactions are defined by characteristics of the governance structure. In this case study, a different operationalization of behavioural uncertainty is therefore used. A transaction will be characterized by either the absence of behavioural uncertainty or the presence of behavioural uncertainty. No degrees of uncertainty are defined. When the parties to a contractual relation, which are assumed to be opportunistic, have been able to align their incentives, the transaction is not characterized by behavioural uncertainty. Incentives are aligned when the parties to the contractual relation will provide the other party with accurate information in order to increase their own income. From a transaction cost economics perspective, such transactions will not require any protective governance structures. The case studies will illustrate that the parties to the transaction benefit from an accurate information exchange to be able to conclude on the absence of behavioural uncertainty. When incentives between the contracting parties have not been aligned, and the behavioural attribute of opportunism is assumed to be present, this will lead to a transaction that is characterized by behavioural uncertainty; the contracting parties have an incentive to distort and disguise information to increase their own income. The case studies will identify and describe situations in which a party to a transaction has distorted or disguised information to increase its own income at the expense of the other party before the attribute of behavioural uncertainty is ascribed to a transaction. There is thus not solely an assumption of behavioural uncertainty, as in Williamson (1985: 79)[49], but it will be empirically proven that an act of opportunistic behaviour has occurred between parties that have not aligned their incentives. This operationalization of behavioural uncertainty may include situations in which the contracting parties break the rules and/or do not abide by the contractual agreements. Performance ambiguity is not able to include these situations as an indicator of behavioural uncertainty; what is meant by performance can be very clear, but the contracting parties may just decide not to live up to the performance standards.

5.1.3 Attributes of governance structures

The three generic governance structures are the market, the hybrid and the hierarchy[50]. Vertical integration is the extension of the hierarchy into additional stages of activity[51]. The governance structures will be characterized along three attributes: incentive intensity, administrative control, and contract law regime.

Incentive intensity is the degree to which changes in efforts expended by an economic actor have an immediate effect on his compensation or stream of revenues (Williamson, 1996a: 99; 1985: 132). Markets are characterized by a high incentive intensity; hierarchies by a low

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[49] ‘The third dimension, uncertainty, is assumed to be present in sufficient degree to pose an adaptive, sequential decision problem’ (Williamson, 1985: 79).

[50] ‘The most common empirical approach is to conceptualize organizational form as one of the three broad discrete types: market, hierarchy, or various hybrid and intermediate modes’ (Macher and Richman, 2006: 5).

[51] Vertical integration can be measured as the percentage of the company’s component needs produced under the governance of the firm (Masten et al., 1989: 269).

incentive intensity; and hybrids display intermediate values. The incentive intensity is considered to be high when the efforts of an economic actor will immediately translate into a higher income for this actor. The incentive intensity is low when the efforts of an economic actor do not directly affect his income, but will only translate into a higher income after a long period of time or the income has to be shared with a group of economic actors that have together contributed to the higher income. An intermediate incentive intensity characterizes a governance structure when a part of the income to be earned cannot be influenced by the economic actor; or when the transaction itself may not directly earn an income, but is a prerequisite for earning an income with a consecutive transaction. For example, when tariffs are regulated, economic actors in a regional monopoly cannot influence their total revenues, but by decreasing costs they can influence their profits. To establish an intermediate value of incentive intensity in the case studies, it will be illustrated how the economic actor can directly influence his income and how this influence is reduced by a factor that is outside of the economic actor's control.

Administrative control refers to the various mechanisms that support the functioning of governance structures. In hierarchies, this administrative apparatus is the most extensive, and includes career rewards and penalties, monitoring, accounting, auditing, and transfer pricing, as well as the supports of informal organization (Williamson 1996a: 104; Williamson, 2000: 606). Hybrids display intermediate values of administrative control. The administrative control mechanisms of hybrids include information disclosure and information verification mechanisms, specialized dispute settlement procedures, and penalties for premature termination. When regulation is a governance structure, and thus when the public authorities execute and/or enforce an agreement between two contracting parties or the public authorities settle disputes between these contracting parties, it is characterized as a hybrid form of governance (Williamson, 1996a: 96). Administrative control mechanisms that can be used by regulators include a binding instruction or a fine that will be given when contracting parties are not living up to their contractual agreements. Markets are characterized by very few administrative control mechanisms. These may include rating services to compare and evaluate standard products of various suppliers, and the organisation that surrounds a bidding mechanism.

Three types of *contract law regime* can be distinguished: classical contract law, neoclassical contract law, and forbearance law (Williamson, 1991). These three types of contract law support respectively the market, the hybrid and the hierarchy. Ménard identified several factors that characterize the variability among contracts, including the degree of incompleteness, the duration, and the enforcement procedures of contracts (Ménard, 2000: 237). These factors are used to characterize the different contract law regimes. The classical contracts of the market forms of governance are the least incomplete contracts and they are short term. When enforcing these contracts and settling disputes, legal terms are always given priority over informal agreements. Courts are used to resolve disputes. Neoclassical contracts of the hybrid forms are more open ended and flexible; they have a longer duration; and disputes are resolved through third party involvement such as arbitration. Forbearance law of the hierarchies is even more elastic and long term. Disputes are resolved internally, possibly through the use of fiat.

The duration of a contract will be characterized as either long term or short term, with long term referring to contracts with a duration of one year and longer[52], and short term to contracts with a duration of less than one year.

In transaction cost economics, contracts are always incomplete and thus the 'complete-contract benchmark is unattainable' (Saussier, 2000: 388). A distinction will therefore by made between contracts that are close to a complete contract and contracts that are flexible. Saussier refers to 'feasible completeness: one contract is less incomplete than another if it gives a more precise definition of the transaction and of the means to carry it out' (Saussier, 2000: 388). When a disturbance affects such a contract that is close to a complete contract and that includes precise definitions of the transaction, the contract will not be adjusted, but will be ended, and a new contract may be set up to take account of the altered circumstances. A flexible contract allows for changes to be made to the prices and conditions that are included in the contract. A

[52] For example, Joskow (1987: 168) has referred to contracts with a duration of one year or longer as longer-term contractual relationships.

disturbance does not necessarily lead to the end of the contract, but may lead to changes in the flexible contract.
With respect to the enforcement procedures and dispute settlement mechanisms, a distinction will be made between reliance on courts, third parties (arbitration), and fiat.

5.1.4 Alignment

The core argument of TCE is the discriminating alignment hypothesis that claims that transactions, which differ in their attributes, are aligned with governance structures, which differ in their cost and competence, in a transaction cost economizing way. As was shown in figure 2.1, the market more efficiently governs non-specific transactions of an occasional and recurrent kind, and the hybrid is better suited for transactions characterized by uncertainty and asset-specificity. Governance structures can become misaligned with transactions when the attributes of the transactions change while the governance structures remain unaltered, or when some exogenous disturbance (e.g. regulation) forces the governance structures to change while the attributes of the transactions remain the same. The resulting misalignment between transactions and governance structures creates inefficiencies in the form of increasing transaction costs. An alignment is observed when the transactions and governance structures are matched in the manner as analysed by TCE to be the most efficient. When this is not the case, possibly due to an endogenous or exogenous disturbance, a misalignment is observed. It is assumed that before the liberalization, the electricity transactions were aligned with their governance structures. This assumption is based on the previous empirical studies on the efficiency of the vertically integrated structure in the electricity industry (see section 3.2).

5.1.5 Governance transformation and adaptation

A governance transformation occurs when there is a change in governance structure from either the market, the hybrid, or the hierarchy, into one of these modes of governance. The governance transformation to the hierarchy is excluded for most electricity transactions by the EU regulation on vertical unbundling. A governance transformation to the market is characterized by an increase in incentive intensity, a decrease in administrative control, a decrease in the duration of the contracts, a decrease in the degree of incompleteness of the contracts, and an increase in the use of courts. A governance transformation from the market to the hybrid is characterized by a decrease in incentive intensity, an increase in administrative control, an increase in the duration of the contract, an increase in the degree of incompleteness of the contract, and an increase in the use of arbitrage. A governance transformation from the hierarchy to the hybrid is defined by changes in the opposite direction.

Three attributes of adaptation between forms of governance are characterized that enable an explanation of the direction of the governance transformations, either to the market or to the hybrid. These attributes are the identity of the contracting party, the laterality of the adaptation, and the type of response. The *identity of the contracting party* is defined as relevant or irrelevant to the economic actor that is searching for a contracting party. When the identity of the (potential) contracting party is relevant, there are only one or a few economic actors that are able to provide the particular good or service to the searching economic actor. When the identity is irrelevant, numerous economic actors exist in the industry that are able to provide the good or service. The *laterality of the adaptation* can be characterized as unilateral, bilateral or multilateral. In a unilateral adaptation, the economic actor adapts to a new form of governance on its own. In a bilateral or multilateral adaptation, the economic actor that is searching for a new form of governance and contracting party adapts in cooperation with other economic actors. The *type of response* can be characterized as either a response to the requirements of the industry, such as the safety of the electric system or the dependence on a network, or as a response to the price of the good or service. When economic actors, in their choice for another contracting party and governance structure, do not only consider the price of a good or service, but also take into account their dependence on a network and the need to balance supply and demand in real time, their response will be characterized as a response to system requirements. In contrast, economic actors may consider only the price of the good or service in their choice for another contracting party and governance structure.

An adaptation within the market has been defined as an autonomous adaptation and an adaptation within the hybrid or the hierarchy has been defined as a cooperative adaptation (e.g. Williamson, 1996a). This terminology will be applied to adaptations between governance structures[53]. When an adaptation from the hierarchy to the hybrid or the market occurs, this is referred to as an *autonomous adaptation*. When an adaptation from the market to the hybrid or the hierarchy occurs, this is referred to as a *cooperative adaptation*.

5.2 Research strategy: the case study

The research strategy that is used in this thesis is the case study. A case study is 'an empirical inquiry that investigates a contemporary phenomenon within its real-life context' (Yin, 2003: 13). The contemporary phenomenon refers here to the governance transformations in liberalizing European electricity industries, and the real-life context includes the electricity laws and regulations, and the governance structures from which the economic actors adjust to new forms. A case study is preferred over other research strategies when the boundaries between phenomenon and context are not clearly evident, and when the contextual conditions are believed to be highly pertinent to the case (Yin, 2003: 13). As was discussed in chapter four, the electricity laws and regulations are believed to influence the governance transformations in various ways; they are believed to influence the direction of governance change, to stimulate the adaptation process, and to set the attributes of the new forms of governance. The electricity laws and regulations are thus intertwined with the governance transformations. An understanding of the governance transformations benefits from including the laws and regulations in the analysis. In addition, the governance structures that characterized the electricity industries before the liberalization influence the governance

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[53] The aim of this thesis is to introduce *adaptation between governance structures* into the framework of transaction cost economics. The concepts that are chosen, such as adaptation as the unit of analysis, the adaptation costs, the attributes of adaptation that explain the efficiency of governance transformations, are aimed to be theoretically consistent with transaction cost economics (see also sections 1.2 and 4.6.1). The attributes of adaptation are based on the definitions of autonomous adaptation of Hayek, and cooperative adaptation of Barnard (see also section 4.6). The adaptations between governance structures are therefore also referred to as autonomous and cooperative adaptation.

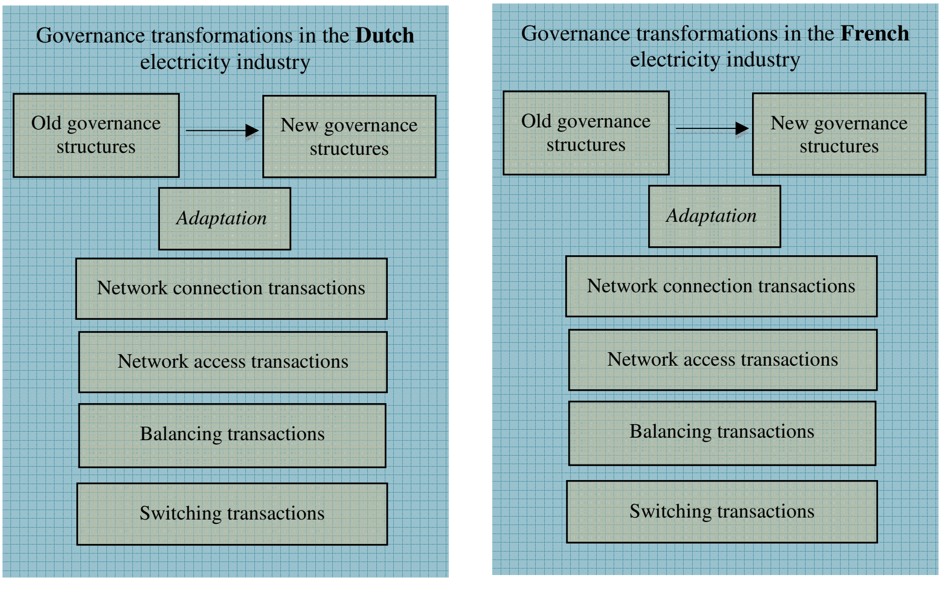
transformations, as starting points of the process of adaptation. A case study allows for taking this real-life context into account.

5.2.1 An embedded multiple case study

Different types of case studies exist. In this thesis an embedded multiple case study is done. The two cases are the governance transformations in the Dutch electricity industry and the governance transformations in the French electricity industry. A multiple case study is preferred over a single case study, because it increases the external validity of the study, and thus the generalizability of the study beyond the two cases, and because it guards against observer bias (Leonard-Barton, 1990). An embedded design is preferred over a holistic design[54] to give focus to the two cases. In an embedded design, a case includes more than one unit of analysis, and each of the subunits to the case is studied separately before returning to the analysis of the entire case. The advantage of such an embedded design is that it enables to focus the case study through the use of these subunits. The embedded units of analysis in this case study are the transaction and the adaptation. The choice for this first unit of analysis is guided by the use of the theoretical framework of transaction cost economics in this thesis. The attributes of the electricity transactions may be able to explain the new forms of governance (when these forms are aligned with the attributes of the transactions). As argued in chapter four, the attributes of the transactions cannot explain the transformations to new governance structures and in particular the transformations to the second-best solutions (e.g. when regulation has created a misalignment), and therefore a second unit of analysis is proposed. This second unit of analysis is adaptation. The attributes of adaptation may be able to explain the governance transformations, and therefore the emergence of the new forms of governance. Figure 5.2 illustrates how these two types of subunits – the transaction and the adaptation - are embedded in the two cases.

[54] A holistic design is used if the case study examines only the global nature of an organization, and is advantageous when no logical subunits can be identified (Yin, 2003: 43-45).

Figure 5.2 Embedded multiple case study



In both the Dutch and French case, each of the four electricity transactions is studied separately. For each of these subunits, the analysis starts with a characterization of the attributes of the transaction, and of the new structure that governs the transaction. The analysis of each subunit will then indicate if, and how, transaction cost economics is able to explain the efficiency of the new governance structure. The analysis will continue by characterizing the adaptation towards the new structure, and how the attributes of adaptation are able to explain the new form of governance and the governance transformation. The governance transformation can only be characterized by identifying the governance structure of before the liberalization, and thus from which the adaptation process started. Finally, the analysis elaborates on the various roles of regulation in the governance transformation. This is repeated eight times; each of the two cases discusses the four types of transactions. The time period for which the governance transformations are studied range from the implementation of the first EC electricity directive of 1996 into the national laws and regulations until the end of 2008.

5.2.2 Pattern matching

The conceptual framework in figure 5.1 illustrates which concepts are believed to be relevant to an understanding of governance transformations, and it proposes what the relations are among these various concepts. Whether this conceptual framework is able to explain the governance transformations in the Dutch and French electricity industries is determined by matching the empirical observations to the patterns as proposed by the framework. For example, when a governance structure transformed from a vertically integrated hierarchy to a hybrid form of governance, and the adaptation is characterized by a search for a contracting party with a relevant identity, cooperation among multiple economic actors, and a response to the requirements of the electric system, the empirical pattern matches the expected relations in the conceptual framework. This adaptation process would only take place if regulation had an influence on the old governance structure, and created a misalignment between the governance structure and the attributes of the transaction. Yin (2003) argues that inferences about causality can be made with pattern matching. He states that 'if the initially predicted values have been found, and at the same time alternative patterns of predicted values have not been found, strong causal inferences can be made' (Yin, 2003: 116).

5.2.3 A literal and theoretical replication of the case study results

The expectation for the multiple case study is that the results will be similar across the two cases with respect to how the adaptation process to new forms of governance works, and how the attributes of adaptation explain the governance transformations. Similar results are also expected across the two cases with respect to how the attributes of the transactions explain the efficiency of the new forms of governance. The latter is based on transaction cost economics' discriminating alignment of governance structures to transactions. When the attributes of the transaction are characterized by asset-specificity and by behavioural uncertainty, and when the contracting parties adapt multilaterally, respond to the system requirements, and the identity of the contracting party is relevant, it is thus expected that a hybrid form of governance will emerge in both the Dutch and French cases. An expectation of similar results across the various cases in a multiple case study is referred to as a literal replication (Yin, 2003).

In this multiple case study, a literal replication is complicated by the fact that the French and Dutch cases differ in terms of their real-life contexts. Firstly, the French and Dutch governments and energy firms have implemented the European electricity directives of 1996 and 2003 in different ways. The French government has been very conservative in transposing the European directives into French law, and the French energy firms have been very slow in implementing the new regulatory requirements. The Dutch government, on the other hand, has formulated electricity laws and regulations that stipulate more stringent requirements on the independence of the networks than are included in the European directives. It has also demanded a fast implementation of the European directives and national regulations by the Dutch energy firms. Secondly, the French and Dutch electricity industries have been characterized by different governance structures before the liberalization. The French electricity industry was characterized by a more extensive vertical integration as compared to the Dutch electricity industry. The governance transformations in the French and Dutch electricity industries may differ, because of these different laws and regulations in the two industries, and because of the different governance structures from which the changes to new forms are taking place. These two concepts - the regulation and the pre-liberalization governance structures - are taken into account in the conceptual framework of this thesis (see figure 5.1). They are included in the analysis in order to better understand how the adaptation process to new forms of governance works, but not for the purpose of highlighting these differences. A literal replication is thus combined with a theoretical replication in this thesis. A theoretical replication ‘predicts contrasting results but for predictable reasons’ (Yin, 2003: 47). These two types of replication illustrate that a case study relies extensively on a theoretical framework that supports the case and that enables the case researcher to determine when results are contrasting for predictable reasons and under which conditions the results are similar. It has been claimed that there is an advantage to choosing two (or more) cases with contrasting contexts. Bryman and Bell (2007) state that 'we can understand social phenomena better when they are compared in relation to two or more meaningfully contrasting cases or situations' (Bryman and Bell, 2007: 66). The governance transformations can thus be better understood when the differences in regulation and in the pre-liberalization governance structures between the French and the Dutch case are considered. For example, French regulations may prohibit the emergence of a market for a particular transaction, while the Dutch regulations for this transaction may not include such a restriction. A governance transformation to the market is thus excluded for the French energy firms. The French energy firms often depart from a hierarchical governance structure, and may therefore first transform to a hybrid. These differences in the real-life contexts lead to differences in the governance transformations between the two cases. Taking the contextual conditions into account should not only result in a better understanding of the particularities of each case and of the differences between the two cases, but it should enhance an understanding of the process of adaptation as such.

5.2.4 The use of theory and analytic generalization

A theoretical framework plays a central role in a case study. It is used from the very beginning of conducting a case study; the research questions and conceptual framework are based on previously developed theory, on a review of the relevant literature, and on an expansion of the theory into underdeveloped areas of research. The theoretical framework influences what type of data will be gathered. Transaction cost economics has introduced the attributes of transactions as the explanatory variables for the efficiency of governance structures. In the two cases, information is collected on the attributes of transactions, and thus on the specific investments that are made in human and physical capital, in assets to position the plants close to the other contracting party, and to allow the transaction to take place within a short period of time, on the perceived opportunistic behaviour of the other contracting party, and on the frequency of the transaction. To extend the theory of transaction cost economics, information is also gathered, in each of the two cases, on the attributes of adaptation to understand the governance transformations.

In addition to the role of theory in the formulation of research questions and the data collection, a theoretical framework serves two other purposes in a case study. Firstly, the case study allows for testing the existing theory, and for testing the expansion to this theory, with the empirical data of the cases (Yin, 2003). Secondly, the case study method enables the development of theory based on new findings in the case studies that differ from the expectations on the basis of the earlier proposed expansion to the theory (Eisenhardt, 1989). The multiple case study of this thesis serves mainly the first purpose. The two cases on the governance transformations in the Dutch and French electricity industries illustrate when transaction cost economics is able to explain the efficiency of a new form of governance, and when the theoretical extension to transaction cost economics on the adaptation process explains the governance transformations.

The multiple case study is preferred over a single case study for both these purposes of theory testing and theory building. With respect to theory testing, Yin (2003) argues that two cases are better able at testing theory than a single case is, and more specifically, are better able to expand the external generalizability of the case studies' findings. He states that 'the contexts of the two cases are likely to differ to some extent. If under these varied circumstances you still can arrive at common conclusions from both cases, they will have immeasurably expanded the external generalizability of your findings' (Yin, 2003: 53). This points to a specific characteristic of the case study as a research strategy. The results of the case studies are not generalized to a larger population, as in experiments or surveys, but they are generalized to theory. This is referred to as analytic generalization (Yin, 2003: 32-33). With respect to theory building and multiple case studies, Bryman and Bell state that 'by comparing two or more cases, the researcher is in a better position to establish the circumstances in which a theory will or will not hold, and the comparison may itself suggest concepts that are relevant to an emerging theory' (Bryman and Bell, 2007: 68). The aim of this multiple case study is to confirm the theoretical framework on the transformation of governance structures with the results of the two cases.

5.3 Data collection

The data for the two cases are collected from multiple sources, including documents and archival records, literature[55], and interviews. This section will present the specific data sources that were used for collecting information on the various concepts, including regulation, the public authorities, the pre-liberalization governance structures, the attributes of transactions, the attributes of adaptation, and the new governance structures.

5.3.1 Regulation

Various documents and archival records were studied to discuss those regulations that affect the governance transformations, the new forms of governance and the attributes of transactions in the two cases on the liberalizing Dutch and French electricity industries. These documents and records include the national electricity laws and amendments to these laws, ministerial regulations, regulatory decisions, and guidelines of the independent regulatory agencies, and various codes (the grid code, system code, tariff code, measurement code, and information code). The decisions of the sector-specific regulators and the competition authorities on dispute resolutions were used. The websites and press releases of the ministries of economic affairs and energy, the independent sector-specific regulatory agencies, and the competition authorities were used for information on legislation and regulatory decisions, and for information on the introduction of new regulations. In addition, letters of the ministry of economic affairs to parliament, reports by the ministry of economic affairs on a proposal for changes to the electricity law, monitors of the regulatory agencies of the energy market,

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[55] Secondary data collection techniques include the use of published data from diverse sources such as industry trade publications (Lieberman, 1991), government data (Levy, 1985), newspapers and journals (Osborn and Vaughn, 1990), or archival data (Anderson and Coughlan, 1987), or non-published data such as contracts between exchange partners (Macher and Richman, 2006: 9).

activity reports of the sector-specific regulatory agencies, and minutes of a hearing on the regulation of the transmission system operator were studied. Interviews with the ministries of economic affairs, independent regulatory agencies and energy companies were conducted.

5.3.2 Public authorities

The websites and press releases of the ministries of economic affairs and energy, the independent sector-specific regulatory agencies and the competition authorities were used for information on the regulatory responsibilities and objectives of the public authorities. The competition law and amendments to this law, and the annual reports of the competition authority were studied to understand the objectives of the competition authority, its organizational structure and its relation to the independent sector-specific regulator. Literature on independent regulators and on the organizational structure of competition authorities was studied for this same purpose. A public service contract between an incumbent energy firm and a ministry gave information on the objectives of the ministry. A statute of relation between the competition authority and the ministry of economic affairs gave information on the coordination mechanisms between these two authorities. Interviews with independent sector-specific regulators, energy firms, and the ministries of economic affairs were conducted. These interviews provided information on the separation of regulatory powers between the public authorities, and within the independent sector-specific regulator; the coordination mechanisms between the ministry of economic affairs, the competition authorities, and the sector-specific regulators; and the differences between the regulatory objectives of these public authorities.

5.3.3 Pre-liberalization governance structures

To understand how governance before the liberalization of the electricity industries was structured, literature on the French and Dutch electricity industries and on the recent reforms in these industries was used. The annual reports and websites of energy incumbents were studied. In interviews with the energy firms, and with an association of energy producers, retailers and traders (Energiened), questions were included on the situation before liberalization, and in particular, on which activities in the electricity value chain were vertically integrated.

5.3.4 Attributes of transactions

The documents and archival records that were used to determine the attributes of the electricity transactions include the electricity laws, ministerial regulations, regulatory decisions of the competition authority, regulatory decisions on a binding instruction, dispute resolution, and on tariffs by the regulatory agency, the tariff, grid and information codes, rules for the program and balancing responsibility and the adjustment orders, activity reports of the sector-specific regulator, monitors of the energy market by the regulatory agency, and press releases of the regulatory agencies. The websites of the transmission system operator, Energie Data Services Nederland (EDSN), the APX Group, and Energiegids are used. Various publications are studied, including an EDSN reference model on what information has to be exchanged when switching retailer; publications of the transmission system operator on how it executes the system and grid codes and its procedures for resolving transportation restrictions; documents of the regulatory agency and the transmission system operator on the balance system; annual reports of the transmission system operator; letters of the transmission system operator to parliament; reports of the Brattle Group; a manual on bidding for reserve power; and reports of the Dutch energy centre ECN. Minutes of a hearing on the design of a regulatory decision, and a response of an energy firm to the competition authority on a consultation of the energy market are also used to establish the attributes of the electricity transactions. And finally, literature on the efficiency of the balancing mechanism is studied.

5.3.5 Attributes of adaptation

The electricity laws, ministerial regulations, regulatory decisions of the sector-specific regulator, the grid and system codes, the rules on program and balancing responsibility and adjustment orders, the minutes of a hearing on the design of a regulatory decision, the activity reports of the sector-specific regulator, and communications of the sector-specific regulator on consultations with the parties in the electricity industry were used for determining the attributes of adaptation. The website of the transmission system operator, the website of an association of energy firms (Energiened), the annual reports of the transmission system operators and a distribution system operator were also used. An interview with the sector-specific regulator (Energiekamer) also provided information on the attributes of adaptation.

5.3.6 New governance structures

The documents and archival records that were used to determine the characteristics of the new governance structures include the electricity laws, ministerial regulations, the grid, system and tariff codes, rules on program and balancing responsibility and adjustment orders, and regulatory decisions on a penal sum, on a binding instruction and on the resolution of disputes by the regulator. An advice of the competition authority to the ministry of economic affairs, a document of the regulatory agency and the transmission system operator on the balance system, a monitor by the regulator on the energy markets, and activity reports of the sector-specific regulator were also used. The network connection and network access contracts and the general conditions to these contracts of the distribution and the transmission system operators; and publications by the transmission system operator on how it executes the system and grid codes, its procedures for resolving transportation restrictions, and several technical guidelines of the transmission system operator were studied. The websites of the transmission system operator and of Energie Data Services Nederland (EDSN); annual reports of the transmission system operator and publications by EDSN; and literature on an evaluation of electricity policies were studied to establish the characteristics of the new forms of governance. Interviews with the energy firms provided information on what new forms of governance are emerging in the unbundled industries; how these governance structures were influenced by the new regulations on an independent network operation; and which governance structures were prohibited by these new regulations.

The following chapters six and seven will present the multiple case study on the governance transformations in the Dutch and French electricity industries. These chapters provide the detailed references of these different data sources. In chapter eight a cross-case analysis is performed that discusses the similarities and the differences across the two cases and their impact on the theoretical extension to transaction cost economics.

6 – The Dutch Electricity Industry

In this chapter, the conceptual framework will be applied to the Dutch electricity industry. This first case of the multiple case study presents the governance transformations in the Dutch electricity industry for the four types of electricity transactions. Section 6.1 discusses the governance structures that characterized the Dutch electricity industry before the liberalization, in order to understand from which governance structures the adaptation to new forms of governance takes place. Section 6.2 presents the Dutch regulations that implement the EC electricity directives on the introduction of competition and consumer choice, and on the vertical unbundling of the system operators. Section 6.3 introduces the three public authorities that formulate, implement and enforce these new regulations in the Dutch electricity industry; the allocation of regulatory powers and responsibilities among these authorities; and the coordination mechanisms that structure the authorities' mutual relations. These regulations and public authorities influence the governance transformations. Sections 6.4 until 6.8 introduce the four types of electricity transactions: the network connection transactions, the network access transactions, two types of balancing transactions, and the switching transactions, respectively. These sections discuss the attributes of these transactions, the attributes of the new forms of governance that coordinate the transactions, and the governance transformations. They illustrate whether transaction cost economics is able to explain the efficiency of these new forms of governance on the basis of the attributes of the transactions. These sections also characterize the attributes of adaptation, and analyze how the process of adaptation explains the emergence of the new forms of governance and the governance transformations. It becomes apparent that the attributes of the transactions are able to explain the efficiency of a new governance structure for one transaction only. This illustrates the need for a perspective that is complementary to the standard transaction cost analysis, and that takes the process of adaptation into account. These sections also discuss the various roles of regulation for each of the four types of electricity transactions, and which of the three public authorities takes on these roles. Regulation sets the ex ante rules of the game, and thereby influences the attributes of the transactions, and those of the governance structures. Regulation also influences the attributes of adaptation, and becomes part of the new forms of governance.

6.1 Governance before liberalization

Before the liberalization of the Dutch electricity industry, the governance of the electricity transactions was structured as a centralized pooling system that internalized the transmission and generation of electricity. A large part of the electricity distributors were vertically integrated with the generation of electricity. At the end of the 1980s, a first attempt was made to an operational separation of the distributors from the vertically integrated structures, but the generators and distributors of electricity retained the same owners. This section discusses the characteristics of the governance structures in the Dutch electricity industry before the implementation of the EC electricity directive of 1996 in more detail.

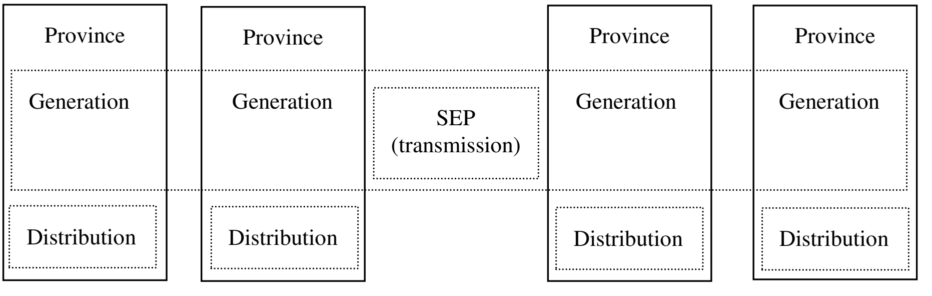
6.1.1 Vertical integration by the local and provincial authorities

At the end of the 19th century, when electricity was invented, private firms were the first to generate and distribute electricity in the Netherlands. Within a few years, the local authorities (municipalities) had taken over the generation and distribution of electricity. Until 1912 only these local authorities were involved in the supply of electricity to the Dutch consumers (Veraart, 2007: 172). As the scale of electricity generation increased and the distance over which electricity could be transported grew, various provincial authorities started to take over the management and ownership of the electric utilities[56]. The electric utilities of the different provinces remained relatively isolated from each other for close to thirty years, both in terms of their generation and their distribution of electricity. In 1949, the SEP (Samenwerkende Elektriciteits-Productiebedrijven), an organization of co-operating electricity producers, was

[56] In several cities, such as Amsterdam and Rotterdam, the local authorities remained the owners of the electric utilities (see Köper (2003) for an overview of the shareholders of the Dutch distributors in the beginning of the 1990s).

established for the construction of a high-voltage electricity network, and to connect the various networks of the provinces. The SEP was made responsible for operating the transmission network, purchasing fuel on behalf of the producers, coordinating decisions on the location of new production plants, importing and exporting electricity, system dispatch, and balancing electricity supply and demand (Cross, 1996: 171). The owners of the SEP were the co-operating electricity producers. Since the provincial authorities owned the electric utilities that both generated and distributed electricity, these provincial authorities also owned the SEP (see figure 6.1). The generation, transmission and distribution of electricity were therefore vertically integrated, in terms of their ownership, by the provincial authorities[57]. This governance structure of vertical integration of generation, transmission and distribution of electricity characterized the Dutch electricity industry until the late 1980s (Arentsen et al., 1997: 176; Van Damme, 2005: 156).

Figure 6.1 Ownership of generation, transmission and distribution by the provinces



[57] These vertically integrated electricity generators were the largest distributors in the Dutch electricity industry (Arentsen et al., 1997: 176). In addition to these large electric utilities, many smaller and separate distributors operated in the industry (Interview Anne Sypkens Smit, Energiened, November 29, 2005).

6.1.2 Operational separation of the electric utilities in the early 1990s

In 1989, the Dutch government issued a new electricity law. This law was aimed at introducing a limited amount of competition in the generation of electricity, and it prescribed the operational separation of distribution from generation. The ownership of these two activities did not have to be separated and could remain with the provincial authorities. Competition had to be introduced into the generation of electricity by giving the distributors the option to buy electricity from a different generator than the one with which they were vertically integrated.

This so-called horizontal shopping of the distributors did not occur for two reasons. It would constitute lost sales for the integrated producers (Cross, 1996: 181), and the distributors only had a limited choice; there were only four producers that charged a uniform tariff. This uniform tariff was set by the SEP. The SEP operated as a pooling system; it bought all the electricity from the producers at different prices, depending on the producer's fuel use, and then sold the electricity back to the producers for a national basic tariff. The producers sold the electricity to the distributors for this national basic tariff plus a regional surcharge (Koster, 1998: 663). This idea of horizontal shopping in the 1989 law did not lead to competition in generation, because of this uniform tariff and the fact that the distributors still shared their ownership with the generators.

An omission in the 1989 law unintentionally led to the dominance of the distributors in the electricity industry by the first half of the 1990s (Arentsen et al., 1997: 182). This omission follows from a distinction in the law between centrally coordinated generation of electricity by the SEP and decentralized generation. The law allowed for the decentralized generation of electricity by industrial consumers, but also by the distributors. A subsidy program for the generation of electricity with environmentally friendly techniques encouraged the distributors to invest in decentralized combined heat and power (chp) plants. When the distributors wanted to invest in generation units of over 25 MW, they needed the approval of the SEP. The law did not require the approval of the SEP for the construction of chp plants of over 25 MW by other producers, such as the industrial consumers. The distributors set up joint ventures with these decentralized producers to avoid the approval of the SEP. This omission in the 1989 law led to a great increase in decentralized generation. As a result of favorable prices for electricity produced by chp units, 'the decentralized production capacity doubled between 1990 and 1995 from 2100 MW to 4200 MW, equal to 23 per cent of total capacity' (Van Damme, 2005: 158). Combined with the centrally coordinated generation of electricity by the SEP, the Dutch electricity industry was confronted with a large overcapacity of generation. This situation in the Dutch electricity industry, as created by the 1989 law, proved to be untenable. 'SEP announced, in early 1995, that it was making payments totalling Nfl 85 million to several large consumers in exchange for their cancellation of plans to complete chp projects' (Cross, 1996: 169). A new structure for the Dutch electricity industry and a new regulatory framework was needed in order to overcome these inefficiencies.

6.1.3 Past governance of the electricity transactions

When looking specifically at the four electricity transactions (the network connection, network access, balancing, and switching transactions), it can be concluded that these were mainly governed by vertically integrated hierarchies and by regulation. Firstly, the connection and access of the generators to the transmission network were internalized in the SEP, and the consumers were given a connection and an access to the network with a regulated tariff and contract. Before the 1989 law, there was a vertical integration of generation, transmission, and distribution. In the late 1980s, the electric utilities began separating the generation and transmission of electricity from the distribution and the supply of electricity[58]. The distributors had to have a long-term contract with the transmission system operator for a connection to the high-voltage grid[59]. Secondly, the balancing transactions were internalized within the SEP. The SEP was responsible for balancing electricity supply and demand for the entire national electric

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[58] Before the introduction of competition into the electricity industries, the function of the supply of electricity to the consumers (or the electricity retail) was very limited. There was hardly any product differentiation in electricity, and electricity did not need to be marketed to the consumer. At that time, the electricity consumers were not referred to as customers of the electric utilities, but they were simply viewed as connections to the network (Veraart, 2007: 180). The supply function consisted mainly of sending bills and collecting monthly payments.

[59] Interview Hendrik Bosch, Managing Director Delta Netwerkbedrijf B.V., October 28, 2005.

system. It monitored the amount of electricity taken out of the network by consumers, ordered generators to produce reserve capacity in indicated plants, and thereby balanced electricity supply and demand. Thirdly, before the liberalization, the switching transactions occurred only when consumers moved to a different address. When consumers moved to a region that was served by a different electric utility, the consumers had to contact this utility themselves. When a consumer moved to an address that was served by the same electric utility, information on the switching was performed internally, and the switching transactions were thus governed by vertically integrated hierarchies.

6.2 Electricity regulations

The liberalization of the Dutch electricity industry started with the *electricity law of 1998*. This law transposed the EC electricity directive of 1996 (96/92/EC). It was amended several times, by the law of July 2004 and the law of November 2006. The law of July 2004 implemented the EC electricity directive of 2003 (2003/54/EC) and increased the supervision of the electricity networks. The law of November 2006 obliged an independence of the system operators that extends beyond the European requirement of legal unbundling. It prohibits the electricity generators, traders and retailers to be part of the same holding as those companies that distribute and transmit electricity. The electricity law of 1998 appointed TenneT as the transmission system operator for the Dutch high-voltage network, thereby replacing the SEP. In December 2000, an additional law for the Dutch electricity industry was issued. This law (Overgangswet elektriciteitsproductiesector) arranged for the discontinuation of the SEP and the transfer of its shares to the Dutch government.

In addition to the 1998 electricity law, other regulations for the Dutch electricity sector have been formulated. The Ministry of Economic Affairs formulates more detailed rules for the electricity industry on the basis of the 1998 law in so-called *ministerial regulations*. The regulatory agency for the Dutch electricity industry, the Energiekamer, explains in *policy rules* and *guidelines* how it implements the electricity law of 1998 and the ministerial regulations. In cooperation with the system operators and the energy firms, the regulatory agency has formulated five *codes* that provide detailed descriptions of the behavior that is required of the various parties in the electricity industry. More specifically, these codes prescribe how the system operators and the network users have to behave with respect to network connection and the transportation of electricity, system services, tariffs, measurement of electricity, and the exchange of information on switching consumers. Firstly, the grid code specifies these requirements for a connection to the network, the operation of the network, and the transportation of electricity. Secondly, the system code applies to the behavior of the transmission system operator on the one hand and the distribution system operators and those connected to the network on the other hand with respect to the system services that the transmission system operator provides for the safe and efficient transportation of electricity, the maintenance of the balance between electricity supply and demand, the solutions to large disturbances in the transportation of electricity, and the program responsibility. Thirdly, the measurement code contains conditions for the design and management of measurement devices, the measurement of electricity transportation and supply, and the exchange of measured data. Fourthly, the tariff code describes the methods of calculation of the tariffs for a connection to the network, the transportation of electricity, and the system services. Finally, the information code specifies how the system operators, electricity retailers, and the parties that are responsible for the energy programs and the measurement of electricity have to behave with respect to the administrative processes and the exchange of information in the electricity industry. This exchange of information mainly concerns information on the switching of consumers to a different retailer, and the switching to a different program responsible party. The Ministry of Economic Affairs and the regulatory agency can also take specific *regulatory decisions*. These include, for example, decisions on the tariffs for a connection and an access to the network for a particular period. These tariffs are determined on the basis of the procedures as specified in the codes, ministerial regulations and the electricity law.

The largest part of the electricity law and most of the other regulations concern rules for the monopolistic transmission and distribution networks. Several rules also exist for the potentially competitive activities in the electricity industry, such as the generation and retail of electricity. The 1998 electricity law and the various regulations will be discussed here with respect to these four activities. The discussion is also limited to the rules that affect the four types of electricity transactions and their governance.

6.2.1 Generation and electricity retail

Before the liberalization, the SEP formulated electricity plans that included information on the investments to be made in new generation capacity. These electricity plans needed to be approved by the Minister of Economic Affairs. Currently, the construction of new generation capacity is not regulated in the Dutch electricity industry. The government does not decide where and when new electricity plants will be build. If, however, the Minister of Economic Affairs believes that too little new generation capacity is constructed in order to ensure the security of supply, he can start a procedure as described in article 7 of the 2003 EC directive. This article refers to the possibility of tendering for new generation capacity (see section 3.4.1). When energy firms vertically integrate the generation and the retail of electricity, article 86 of the 1998 electricity law states that these energy firms have to unbundle their accounts, which means that they should keep separate accounts for the generation of electricity and for the retail of electricity.

6.2.2 Transmission and distribution

The 1998 electricity law and several other regulations give detailed descriptions of the responsibilities of the transmission and distribution system operators, and stipulate the requirements with respect to the vertical separation of these system operators from the potentially competitive activities, such as the generation, trade, and retail of electricity.

6.2.2.1 Responsibilities of the transmission and distribution system operators

According to article 16 of the electricity law of 1998, the distribution and transmission system operators are responsible for the operation and maintenance of their networks. They have to construct, repair, renew and expand the networks, and while doing so they have to take account of measures directed at energy saving, sustainable electricity, and decentralized generation of electricity through which the necessity of investing in new generation capacity is reduced. The system operators need to provide connections to their network, and if requested, supply those connected with a meter. They are responsible for the transportation of electricity, for keeping enough reserve capacity on the network, and for metering the amount of electricity that is produced by chp plants and by installations that produce sustainable electricity. When an electricity retailer goes bankrupt and is unable to supply electricity to its consumers, the system operators are obliged to take certain provisions for these consumers.

The transmission system operator has to provide system services to the users of the network. These services include balancing electricity supply and demand and resolving disruptions in the transmission of electricity.

The law of November 2006 prescribes that the distribution and transmission system operators have to be so-called 'fat' operators. A fat operator is one that performs most of the activities related to the operation of the network itself. The law restricts the activities that the operators can contract out to other firms, and it thereby enlarges the number of activities that the operators have to perform under their direct management. A guideline of the Dutch regulator (Energiekamer) defines the activities that are under the direct management of the system operator as those activities for which the operator uses its own employees and resources, over which it has full control, and for which it does not need the approval of others (NMa/DTe, 2008). These activities include the planning for new distribution and transmission capacity; designing, constructing and maintaining the network; resolving disturbances on the network; dispatching the system; and purchasing energy for balancing and for compensating grid losses on the network. Other activities can be contracted out, such as the administrative processes of the operators and the metering of electricity use. The operators have to take efficiency considerations and the principle of non-discrimination into account when contracting out to other firms (NMa/DTe, 2008).

6.2.2.2 Independence of the transmission and distribution system operators

Article 10a of the electricity law of 1998 requires that the distribution system operators have the economic ownership of their network. This means that the operators are entitled to the value of use of their network; they have all the rights and duties with respect to the network and bear the full risk of a change in value of the network. This economic ownership is distinguished from the legal ownership of the networks. The legal owner has sold the value of use of the network to the economic owner, but can still forbid the economic owner to use the network as collateral for a loan, or to sell the economic ownership to someone else (Kanning et al., 2004: 8).

The system operators are allowed to be located within a larger holding structure in which other firms are present. Until the law on an independent network operation has been implemented, these other firms can also be generators, retailers, and traders of electricity. The system operators have to be separated from the generators, retailers and traders of electricity in several ways. First of all, the generators, retailers and traders cannot be appointed as operators of a network[60]. Secondly, the members of the management team and the majority of the members of the supervisory board of the system operators cannot have any connections with a generator, trader, retailer or a shareholder of the system operators. Thirdly, the generators, retailers, traders and other firms connected to a system operator through the holding structure, cannot interfere with the implementation of the tasks of the system operator that are attributed to it by the 1998 law[61]. Fourthly, the system operator is not allowed to discriminate between those firms that are located under its holding structure and those that are not. In other words, it cannot confer any advantages on those firms to which it is related[62]. These advantages include providing information on consumers to the related firms, providing goods or services to the related firms at a price that is lower than the costs that can be attributed to the goods or services, and allowing the related firm to use the name of the system operator[63]. Fifthly, a

[60] Article 11.1 of the electricity law of 1998.
[61] Article 16.4 of the electricity law of 1998.
[62] Article 11b.1 of the electricity law of 1998.
[63] Article 18 of the electricity law of 1998.

system operator has to keep separate accounts for the activities related to the operation of the network. Sixthly, a network cannot be used to raise funds, except insofar as these funds are used for the operation of the network[64].

The law on an independent network operation requires some changes in the holding structures of the electricity firms. It prohibits that the system operators are located under the same holding as the generators, retailers and traders of electricity. This type of unbundling of the electricity firms thus increases the independence of the network operation beyond what is required by the EC electricity directive of 2003. It is often referred to as ownership unbundling, but the law does not require that the owners of the electricity firms sell their shares, either in the network part or in the commercial parts (the generation, retail, and trade) (Ministerie van Economische Zaken, 2007a). This unbundling requirement of the law on an independent network operation has entered into force in July 2008, and will have to be implemented for existing system operators by January 2011 (Ministerie van Economische Zaken, 2008).

The 1998 law restricts the possibilities of the system operators to enter into competition with other firms. The operators cannot supply any goods or services when they compete with other firms for the supply of these goods or services, unless these involve activities that the operators have to perform on the basis of their responsibilities as specified in the 1998 law, and specifically in article 16.

6.2.3 Network connection and network access

The system operators are obliged to provide a connection to their network for those who request to be connected. They are not allowed to discriminate between these requests[65]. When the capacity of the connection is larger than 10 MW, other companies than the system operators are allowed to build the connection to the network. In this case, the purchaser of the connection can invite tenders for the construction of the connection[66].

With respect to access to the network, the system operators are obliged to transport electricity

[64] Article 93b of the electricity law of 1998.
[65] Article 23 of the electricity law of 1998.
[66] Article 16c of the electricity law of 1998.

along their network for those who request the transportation of electricity, in a non-discriminatory way[67]. The electricity law also includes rules for the quality of the transportation service, and the registration of the quality by the system operators[68]. In addition, it obliges the system operators to have enough reserve capacity available to resolve any transportation problems in their network[69].

The tariffs for which the system operators provide a connection to the network and transport electricity along the network are regulated. On the basis of a proposal made by the system operators and the representatives of different parties in the electricity industry, the Dutch regulator for the electricity industry (Energiekamer) sets these tariffs. The efficiency of the system operators is stimulated by including an x-factor in the tariffs. This x-factor is calculated on the basis of the average increase in productivity (the increase in output per unit of costs) of the operators. Each year, the tariffs are increased with a measure of inflation (CPI) and decreased with the x-factor. The transportation tariff for those who receive electricity does not depend on the place where the electricity is produced or through which connection the electricity is put on the network. It only depends on the voltage level of the network from which the electricity is subtracted. Similarly for the producers, the transportation tariff does not depend on where the electricity is received, but on the voltage level at which the electricity is put on the network.

6.2.4 Balancing of electricity supply and demand

With respect to the balancing of electricity supply and demand, the 1998 law only states that the transmission system operator has the obligation to provide system services. When the transmission system operator purchases energy to implement the duties that are attributed to it by the 1998 law (which thus includes providing system services), it has to use a transparent and non-discriminatory procedure, and one that is in accordance with other energy purchases in

[67] Article 24 of the electricity law of 1998.
[68] Articles 19a, 21, and 39 of the electricity law of 1998.
[69] Article 16.1.d of the electricity law of 1998.

the industry[70]. The tariff that the transmission system operator charges for maintaining the balance should reflect the costs, be transparent and non-discriminatory[71]. The tariff for the system services is charged to anyone who has a connection to the network and receives electricity[72]. The system code and the grid code specify the responsibilities of the transmission system operator and the network users with respect to the system services. Articles 31 to 37 of the electricity law specify how the conditions in the system code and grid code, and changes to these codes, should be formulated and by whom.

6.2.5 Retail, customer choice and switching

Since July 2001, the Dutch consumers are able to switch from their incumbent to another electricity retailer. For the first three years, this choice was restricted to the purchase of green electricity. Since July 2004, the Dutch consumers can also choose another retailer for grey electricity. Electricity retailers need a license to sell electricity to consumers[73]. To obtain such a license, the firms have to demonstrate that they are technically, financially and organizationally capable of selling electricity to consumers, and that they will include reasonable and transparent terms in their contracts with customers. The prices for the supply of electricity to consumers are not regulated, but the electricity firms do have to inform the Dutch regulator of the prices that they charge to the consumers. The Dutch regulator can set a maximum tariff when it considers the prices to be unreasonable, meaning that the effects of an efficient management do not sufficiently lead to lower costs[74]. When a consumer switches to a different electricity retailer, the system operator is obliged to execute the switch in accordance with rules as specified in ministerial regulations[75]. The specifics on how information on the switches is to be exchanged between the system operators, parties responsible for the energy programs and the metering of electricity, and the electricity retailers are given in the

[70] Article 16 of the electricity law of 1998.
[71] Article 27.3 of the electricity law of 1998.
[72] Article 30 of the electricity law of 1998.
[73] Article 95a of the electricity law of 1998.
[74] Article 95b of the electricity law of 1998.
[75] Article 24a of the electricity law of 1998.

information code. The information that is exchanged includes information on the electricity use of the consumer and meter readings.

The metering of electricity has always been done by the system operators. Since 2000, Dutch consumers are able to choose a metering firm. In 2006, the regulatory agency concluded that the prices for metering electricity have risen by 99 per cent (NMa, 2006). Because there have not been any substantial cost increases in metering electricity, the regulatory agency concluded that 'this free metering market does not work as expected' (NMa, 2006). Hardly any new metering firms entered the Dutch market (NMa, 2006). In 2007, the Ministry of Economic Affairs decided to regulate the tariffs for metering electricity, because this market does not work properly, and to protect the consumers from paying unreasonable prices (Ministerie van Economische Zaken, 2007b). As of January 2008, the tariff for the metering of electricity is set by the regulatory agency (NMa, 2007a). This tariff is applicable to those activities of metering as defined in the article 30a of the electricity law of 1998, including the use of a meter, determining the amount of electricity that is taken out of the network and that is put on the network, and sharing the metering data with the system operator and the consumer of metering services. This tariff is only applicable to the meters that are managed by the system operators, which is more than ninety per cent of all the electricity meters in the Dutch electricity industry (NMa, 2007b).

6.3 Regulatory institutional organization

In chapter four, a regulatory institutional organization in liberalizing industries has been defined as consisting of the public authorities that regulate these industries, the allocation of regulatory responsibilities and powers among the authorities, and the coordination mechanisms that structure the authorities' mutual relations. Such a characterization provides an understanding of which authority formulates, implements and enforces the regulations, and thus of when the authority sets the rules of the game and when it is part of the new governance structure. This characterization can also explain why particular regulations are introduced in the Dutch electricity industry, and why these differ from the regulations in other European countries. A larger allocation of regulatory responsibilities to the independent regulatory agency leads to different regulations than when the ministry assumes a large responsibility, because these two authorities have different regulatory objectives. This section characterizes the regulatory institutional organization of the Dutch electricity industry, starting with a discussion on the public authorities (6.3.1), the regulatory responsibilities and powers (6.3.2), followed by the coordination mechanisms (6.3.3), and finally a discussion on the regulatory objectives (6.3.4).

6.3.1 Public authorities

In the Dutch liberalizing electricity industry, three public authorities regulate the energy firms and the system operators: the Ministry of Economic Affairs, the sector-specific regulatory agency (Energiekamer), and the competition authority (Nederlandse Mededingingsautoriteit, NMa). The Energiekamer[76] is structured as a chamber within the competition authority.

Before July 2005, the Energiekamer (as a chamber of the NMa) was a separate governmental agency. It was responsible for the implementation of the electricity law and had the power to take regulatory decisions for the electricity industry within the boundaries of the electricity law and the ministerial regulations. The NMa could give general and individual instructions to the Energiekamer with respect to sector-specific cases. In 2005, the NMa and the Energiekamer experienced several changes in their organizational structure and position within the government. These changes were meant to increase the independence of the two authorities from the Ministry of Economic Affairs. Firstly, the board of directors of the NMa was changed from a directorate within the Ministry of Economic Affairs to a so-called Zelfstandig Bestuursorgaan (ZBO) (NMa/DTe, 2005). A ZBO is an independent administrative authority,

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[76] The Dutch regulatory agency is referred to as the Energiekamer since the 1st of June 2008. Before this date the regulatory agency was called the Dienst Toezicht energie (DTe), and sometimes it was referred to as the NMa/DTe to indicate that the sector-specific regulatory agency is part of the competition authority. Several references in this thesis still mention the DTe or the NMa/DTe, because the documents or regulatory decisions were published before June 2008. When this chapter refers to the regulator, it refers to both the competition authority and the Energiekamer, as they are part of the same organization.

outside of the ministerial hierarchy. Secondly, the competences and powers of the director of the Energiekamer for the implementation of the electricity law were transferred to the board of directors of the NMa, who now takes all the regulatory decisions for the electricity industry. Thirdly, a mandate from the NMa to the deputy director and department managers of the Energiekamer authorizes the regulatory agency to implement the electricity law, but the final decision-making powers rest with the board of directors of the NMa.

6.3.2 Regulatory responsibilities and powers

No clear differences exist between the three public authorities with respect to their regulatory powers: the Ministry of Economic Affairs and the independent regulators formulate, execute and enforce regulations in the Dutch electricity industry.

6.3.2.1 Formulating rules

In 2004, a new law was passed that changed the 1998 electricity law. This law of 2004 had among others as its goal to deliver a better separation of powers between the Ministry of Economic Affairs and the Energiekamer. The Ministry is responsible for formulating energy policy, legislation and regulations. The intention of this law was to restrict the task of the Energiekamer to executing the electricity law and the ministerial regulations. However, when implementing the electricity law, the Energiekamer formulates rules. It develops regulations that specify the more general rules of the electricity law. For example, the Energiekamer formulates codes that specify how the system operators and those connected to the network have to behave with respect to the transportation of electricity, connection to the network, tariffs, system balancing, measurement of electricity transportation, and consumer switching. The basic principles of these codes are formulated by the Ministry of Economic Affairs in ministerial regulations. In cooperation with the energy firms, the Energiekamer determines the particularities in the codes. This power of the Energiekamer to set rules with respect to the behavior of the system operators and those connected to the network is in part justified by the lack of expertise at the Ministry of Economic Affairs[77]. The Dutch energy firms claim to experience an increase in the amount of rules that are formulated by the Energiekamer. 'The Dutch cabinet can formally say that there is less legislation and regulation, but in fact there are more rules set by the sector-specific regulatory agencies'[78]. In addition, the NMa has some freedom in developing policy. It has the power to determine the priority of complaints and its own investigations (Algera, 2002: 121).

6.3.2.2 Executing rules

The Energiekamer shares its power to execute the electricity law with the Ministry of Economic Affairs[79]. For example, the Minister issues licenses for the supply of electricity. He has to approve the assignment of the system operators, the appointment of the supervisory board of the TSO, and the annual report and budget of the TSO. Article 78 of the 1998 law states that the Minister can demand information from an electricity generator, supplier, trader or system operator to enable him to execute the electricity law. In an interview with the Energiekamer, it was mentioned that the Minister keeps the responsibility for these decisions, because he wants to retain an influence over the activities of, for example, the TSO. The Energiekamer is, however, attributed an increasingly larger role with respect to the execution and preparation of these decisions. For example, the Energiekamer prepares the decisions on requests for assignments of system operators and the licenses for the supply of electricity[80].

6.3.2.3 Enforcing rules

The three public authorities have enforcement powers. When energy firms do not abide by the rules, the Minister can withdraw their license[81]. He can take the necessary actions to ensure

[77] Interview Mr. M. Veersma, Energiekamer, January 5, 2006.
[78] Interview Mr. F. van den Heuvel, Delta, October 25, 2005.
[79] In an interview with mr. R. Dantuma of the Ministry of Economic Affairs on October 28, 2005, it was mentioned that the Ministry of Economic Affairs still has responsibilities for executing the rules for the electricity industry.
[80] Interview Mr. M. Veersma, Energiekamer, June 23, 2006.
[81] Interview Mr. R. Dantuma, Ministry of Economic Affairs, October 28, 2005.

compliance to the rules at the costs of the energy firms. He can assign another firm to manage the network if the current firm is not abiding by the rules[82]. In addition, he can appoint a person from outside the system operator to manage the network. In case of non-compliance with the electricity law, the Energiekamer can give an energy firm a binding instruction, in which it obliges the firm to abide by the rules. A more severe enforcement method is an obligation to abide by the rules combined with a penal sum. In certain cases of non-compliance, the Energiekamer can oblige firms to pay a fine. The NMa can settle cases informally, by threatening with sanctions, naming and shaming, or come to a solution in consultation with the parties to the complaints (Algera, 2002: 121).

6.3.2.4 Dispute resolution

Disputes between system operators and those connected to the network on how the system operators execute their tasks, for example, on how they set the tariffs for network connection or how they provide information to third parties[83], can be settled by the NMa. Another result of the newly acquired ZBO-status of the NMa (see section 6.3.1), is that the dispute resolution powers are transferred from the director of the Energiekamer to the board of directors of the NMa. The legal department of the NMa, in cooperation with the Energiekamer, prepares the decisions. There exists no mandate to the Energiekamer for dispute resolution[84]. In its decisions on these disputes, the NMa explains how the electricity law should be understood and interpreted. The electricity law prescribes that those who settle the disputes should not be involved in setting the rules for connection to the network, electricity transport and the tariff structures[85]. This is partly settled by allocating the responsibility for dispute resolution to the legal department of the NMa, but as De Rijke (2002: 65) observes, it is the board of the NMa who takes the final decisions and is thus both a regulator and a dispute resolution mechanism.

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[82] Interview Mr. R. Dantuma, Ministry of Economic Affairs, October 28, 2005.
[83] Articles 51.1 and 51.2 of the electricity law of 1998.
[84] Interview Mr. M. Veersma, Energiekamer, June 23, 2006.
[85] Article 5, chapter 4 paragraphs 4-6 of the electricity law of 1998.

6.3.2.5 A fourth branch of governance

The Energiekamer and the NMa have thus been allocated three powers that are normally exercised by, and explicitly separated into, three branches of government. They formulate, execute and enforce the rules. Since the establishment of one of the first independent regulatory agencies in the United States, the Interstate Commerce Commission, there has been a debate about the democratic accountability of these agencies. McCraw states that 'controversy became attached to regulation like a Siamese twin' (McCraw, 1984: 301-2). Majone referred to accusations of 'constituting a politically irresponsible fourth branch of governance' (Majone, 1996: 17). One of the Dutch energy firms mentioned that 'there is no clear democratic legitimacy for the rules set by the DTe'[86]. In an interview with the Energiekamer, it was recognized that there exists no separation of powers. In October 2005, the Energiekamer changed its internal structure. With this new organizational structure, the Energiekamer aims to contribute to a separation of powers[87]. The departments that set the rules are separated from the departments that monitor the electricity industry and enforce the rules. However, the board of directors of the NMa has the final decision-making powers.

6.3.3 Regulatory coordination mechanisms

6.3.3.1 NMa – Energiekamer

In section 4.2.2, the coordination mechanisms between the competition authority and the sector-specific regulator have been characterized. These mechanisms are necessary to avoid an overlap of regulatory responsibilities between the two authorities, and to ensure that the sector-specific regulator does not interpret terms under the sector-specific legislation in a way that is inconsistent with competition legislation. In the Dutch electricity industry, these potential problems have been solved by structuring the sector-specific regulator for the electricity industry, the Energiekamer, as a chamber within the Dutch competition authority (NMa). A mandate has been given to the Energiekamer by the NMa that authorizes the sector-specific

[86] Interview Mr. F. van den Heuvel, Delta, October 25, 2005.
[87] Interview Mr. M. Veersma, Energiekamer, January 5, 2006.

regulator to implement the electricity law, but the final decision-making powers rest with the board of directors of the NMa.

6.3.3.2 Ministry of Economic Affairs – Energiekamer

Although the independence of the NMa has been increased in 2005, the authority does not have a separate legal status. It is part of the Ministry of Economic Affairs for its finances, personnel and organizational aspects. The *budget* of the NMa (and thus of the Energiekamer) is part of the budget of the Ministry (Algera, 2002: 105)[88]. As a result, the competition authority is subject to a certain degree of influence by the Ministry of Economic Affairs. Every year, the NMa sends a report to the Ministry with an estimate of the necessary financing for the coming year[89], but it is the Minister who determines the budget of the NMa[90]. In addition, the NMa has to account for its expenditures. It sends its annual report, in which it justifies on what activities it has spent the budget, to the Ministry[91]. A small part of the budget of the Energiekamer is paid by the industry. The energy firms are obliged to have a license for the supply of electricity. They pay a fee for this license, of which a part goes to the Energiekamer [92].

The Minister of Economic Affairs *appoints* the three members of the board of directors of the NMa (Braal-Verhoog, 2002: 31)[93]. He has to approve the rules that specify the division of responsibilities among the members of the board (Braal-Verhoog, 2002: 31; Algera, 2002:

[88] Artikel 2:1 Relatiestatuut EZ-NMa.

[89] Artikel 5i:1 Wet van 9 december 2004, houdende wijziging van de mededingingswet in verband met het omvormen van het bestuursorgaan van de Nederlandse mededingingsautoriteit tot zelfstandig bestuursorgaan.

[90] Interview Mr. R. Dantuma, Ministry of Economic Affairs, October 28, 2005.
Interview Mr. M. Veersma, Energiekamer, January 5, 2006.

[91] Artikel 5g Wet van 9 december 2004, houdende wijziging van de mededingingswet in verband met het omvormen van het bestuursorgaan van de Nederlandse mededingingsautoriteit tot zelfstandig bestuursorgaan.

[92] Interview Mr. M. Veersma, Energiekamer, January 5, 2006.

[93] Interview Mr. R. Dantuma, Ministry of Economic Affairs, October 28, 2005; Article 3 Wet van 9 december 2004, houdende wijziging van de mededingingswet in verband met het omvormen van het bestuursorgaan van de Nederlandse mededingingsautoriteit tot zelfstandig bestuursorgaan.

104)[94]. Since the NMa is not a separate legal entity, it cannot hire its own employees. The personnel of the NMa is employed by the Ministry. This difference between the board and the employees of the NMa is also due to the fact that the status of an independent administrative authority (ZBO) is only attributed to the board and not to the entire NMa[95]. To ensure the independence of the employees, the law states that they fall under the authority and are accountable to the board of the NMa. The board sets up a mandate that specifies the powers of its personnel with respect to the implementation of the electricity law. The rules of this mandate require the approval of the Minister[96].

The Minister of Economic Affairs has an influence on the *security of tenure* of the members of the board of directors of the NMa[97]. If the Minister is of the opinion that the board of directors of the NMa neglects to perform its tasks, he has the power to propose the suspension or the resignation of the members of the board[98]. These powers offer the minister the opportunity to influence the board of the NMa by the mere threat of using these measures (Algera, 2002: 104). The transformation of the NMa into an independent administrative authority (ZBO) reduced the ministerial responsibility for the electricity legislation (Kummeling, 2002: 1). The Minister retains responsibility for energy policy, the functioning of the regulatory agencies in general terms, and the organization of the monitoring and enforcement system (Braal-Verhoog, 2002: 21, 29). This latter responsibility includes the allocation of tasks and competences to the regulatory agencies. The Minister lost his ability to give individual *instructions* to the NMa and Energiekamer. He can only give general directions in the form of policy rules to the board of

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[94] Artikel 4b Wet van 9 december 2004, houdende wijziging van de mededingingswet in verband met het omvormen van het bestuursorgaan van de Nederlandse mededingingsautoriteit tot zelfstandig bestuursorgaan.

[95] Interview Mr. M. Veersma, Energiekamer, January 5, 2005.

[96] Artikel 5a Wet van 9 december 2004, houdende wijziging van de mededingingswet in verband met het omvormen van het bestuursorgaan van de Nederlandse mededingingsautoriteit tot zelfstandig bestuursorgaan.

[97] Artikel 17 Relatiestatuut EZ-NMa; Artikel 5f:1 Wet van 9 december 2004, houdende wijziging van de mededingingswet in verband met het omvormen van het bestuursorgaan van de Nederlandse mededingingsautoriteit tot zelfstandig bestuursorgaan.

[98] Artikel 3.2 Wet van 9 december 2004, houdende wijziging van de mededingingswet in verband met het omvormen van het bestuursorgaan van de Nederlandse mededingingsautoriteit tot zelfstandig bestuursorgaan.

directors of the NMa, and thus indirectly to the Energiekamer. This should stimulate an independent judgment, based on economic and legal analysis, in sector-specific cases, and reduce the possibility of introducing political issues into the decision-making. The policy rules describe among others the way in which the NMa and the Energiekamer have to interpret legislation and regulation, or how they have to balance different interests when applying the electricity law. These rules are binding for the NMa and the Energiekamer.

6.3.4 Regulatory objectives

6.3.4.1 Energiekamer

The mission of the Energiekamer is to ensure the effective functioning of the electricity markets[99]. Article 5.2 of the 1998 electricity law states that the Energiekamer, when executing the tasks attributed to it in the law, takes into account the importance of promoting an electricity market that is non-discriminatory and transparent, and that is characterized by competition and an effective functioning of the market. In addition, the Energiekamer protects consumers against potential abuses of power by the energy firms. It guards the consumers' interests in this transition phase to a competitive electricity market. The Energiekamer monitors the administrative processes of the energy firms to make sure that consumers receive correct and clear bills in time. The Energiekamer does not view its role as restricted to the implementation of the law. It is a mission-oriented and proactive regulatory agency[100]. It sets up investigations and advises the Ministry of Economic Affairs on its own initiative.

6.3.4.2 The Ministry of Economic Affairs

The main objective of the Ministry of Economic Affairs for the electricity industry is the protection of the interests of consumers. These public interests have been specified as the availability of energy at acceptable prices for all consumers, the protection of consumers against a potential abuse of power by the monopolistic system operators, security of supply

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[99] www.energiekamer.nl (last accessed December 29, 2008).
[100] Interview Mr. M. Veersma, Energiekamer, January 5, 2006.

through sufficient investments in generation, transmission and distribution capacity, and quality and safety of electricity generation and supply (Ministerie van Economische Zaken, 2004). The Ministry aims to achieve these objectives through the introduction of competition into the electricity industry. The effective functioning of the market is thus not a goal in itself, but a means to protect the interests of consumers. The Ministry ignored the advice of the General Energy Board (Algemene Energieraad), a Dutch advisory board for the Ministry, to create a national energy champion. The Ministry reasoned that reducing competition through the creation of one Dutch energy firm is not in the interests of Dutch consumers.

6.3.4.3 The competition authority

The main tasks of the Dutch competition authority are to enforce a fair competition in all sectors of the Dutch economy, to take action against parties who participate in a cartel, and who abuse a dominant position. The NMa states that its objectives extend beyond the implementation of the competition law: 'our main objective is to ensure that competition rules continue to play a role in business considerations, and we aim for spontaneous compliance'[101].

The previous two sections (6.2 and 6.3) have presented the regulations for the liberalization of the Dutch electricity industry and the public authorities that formulate, execute and enforce these regulations. These rules of the game and the public authorities influence what altered forms of governance emerge in the Dutch electricity industry, and how the transformation to these altered forms of governance takes place. The following sections will discuss the governance transformations for the network connection transactions (section 6.4), the network access transactions (section 6.5), the two types of balancing transactions (sections 6.6 and 6.7) and the switching transactions (section 6.8). Each of these sections will first discuss the attributes of the transaction and the attributes of the new governance structure. Secondly, these sections will analyze whether the attributes of the new form of governance can be explained

[101] www.nmanet.nl/engels/home/About_the_NMa/Objectives/objectives.asp (last accessed August 8, 2008).

with the attributes of the transaction, and thus whether TCE is able to explain the comparative efficiency of the new form of governance. Thirdly, these sections will discuss the attributes of adaptation, and how the adaptation process is able to explain the emergence of the new form of governance, and the governance transformation. Finally, these sections will analyze the role of regulation in each of the transactions.

6.4 Network connection transactions

The Dutch electricity network is divided into a low-voltage grid (≤ 50 kV), a high-voltage grid (110 and 150 kV), and an extra high-voltage grid (220 and 380 kV). The Dutch transmission system operator, TenneT, operates the high- and extra high-voltage grid from 110 to 380 kV, and has a national monopoly for this part of the electricity network. There are eight regional distributors in the Netherlands that operate the low-voltage grid. Each of these regional distributors has a monopoly for the grid in its particular region. TenneT connects the regional distributors, the large generators of electricity, and the large industrial consumers of electricity to the high-voltage part of the network. The regional distributors connect the smaller generators of electricity, such as those that produce electricity with wind turbines and with combined heat and power plants, to their network. The Dutch households and businesses are also connected to the low-voltage grid. The network connection transactions thus consist of connecting the generating plants and the equipment of electricity consumers to the distribution and transmission network, connecting the distribution network to the transmission network, and of maintaining these connections.

6.4.1 The attributes of the transaction

The electricity law of 1998 states that the network connection services that the system operators provide to the network users include the following: firstly, making a cut in the network where the network user needs to be connected; secondly, installing various facilities that will protect the network; and thirdly, making a connection from the network to the equipments of the network user and preserving the connection and the safety measures[102]. The network connection transaction is considered to consist of these services. This subsection will characterize the network connection transaction along the three attributes of transactions: the frequency, asset-specificity and behavioral uncertainty.

The *frequency* of this network connection transaction is occasional[103]. The system operators need to provide a connection for a network user only once, and some network users may over time want to change the capacity at which they are connected. To preserve the connection, the system operators may have to do some maintenance works, and replace some of the components of the connection. They may also have to restore a connection when there has been a disturbance in the network. These activities do not occur very often and not on a regular basis as disturbances cannot be predicted; TenneT indicates that it does maintenance works only three weeks per year, and has to respond to one disturbance in a year[104].

The network connection transaction is characterized by *site-specificity*. The generators have to construct their plants (and the larger consumers their equipment) close to the grid if they want to economize on the connection costs. The network user has to pay for each additional meter of electricity line that the system operators use to make the connection. These payments for the additional meters have to be made every year, because they are included in the annual connection tariff[105]. The network users also pay a one-time fee for the construction of the connection, which can be as high as 250,000 euro for a connection to the regional grid[106], and several million euro for a connection to the transmission grid[107]. These investments of the network users are also characterized by *physical asset-specificity*; the invested assets in electricity lines, transformers, and safety measures among others, can only be used for a

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[102] The tariff code (article 2.1.2) describes the connection services that the system operators provide to the network users as those activities that are stated in article 28 of the electricity law.
[103] See section 5.1 for the definitions of the attributes of the transactions.
[104] www.tennet.org (last accessed December 29, 2008).
[105]www.dte.nl/nederlands/elektriciteit/transport/tariefregulering/Vaststelling_transport_aansluit_en_systeemdienstentarief_elektriciteit_2007.asp (last accessed August 6, 2008).
[106]www.dte.nl/nederlands/elektriciteit/transport/tariefregulering/Vaststelling_transport_aansluit_en_systeemdienstentarief_elektriciteit_2007.asp (last accessed August 6, 2008).
[107] www.tennet.org (last accessed December 29, 2008).

connection of their plants and equipment to the electricity network. In addition, the network users *dedicate the investments* to one contracting party: either to the transmission system operator or to one of the regional system operators.

The network connection transaction is characterized by *behavioral uncertainty*. For the largest part of the (potential) network users, which are those that request a network connection with a capacity of less than or equal to 10 MW, the system operators have a monopoly on providing the connection. These system operators can act opportunistically and set very high prices and unreasonable conditions for a connection to the network. They have the information on what it costs to provide a connection to the network, what the necessary conditions are, and how much connection capacity is available. The (potential) network users do not have access to this information. There is thus an asymmetrical dependence of the (potential) network users on the system operators. This is not entirely the case when the potential network users request a connection to the network that is larger than 10 MW. These network users can tender for the construction of the connection, and the system operator has to compete with other firms. The system operator still has a large role when another firm constructs the connection. For example, the system operator needs to agree with the construction of the connection by the other firm[108]. The electricity law states that the operator may only refuse its agreement when the construction by the other firm will harm the reliability of the network. The system operator may be able to distort information on when the reliability of the electric system is harmed, and thereby obstruct the network user from choosing another firm to construct the connection.

Several examples can be given of system operators that have disguised information or have portrayed opportunistic behavior with respect to the network connection transactions. Firstly, the transmission system operator, TenneT, has refused to provide a connection to its network for an electricity generator. TenneT claimed that there was not enough capacity available on the network. The electricity law of 1998 states that the transmission system operator is obliged to demonstrate this lack of capacity to the party requesting a connection, and to propose measures that may resolve the restrictions on the network. The transmission system operator

[108] Article 16c of the electricity law of 1998.

did not provide such proof of absence of capacity, and did not suggest any measures to resolve the restriction[109]. A second example concerns the distribution system operator, NRE, which charged monthly network connection tariffs that were higher than the maximum tariffs set by the regulator[110]. Thirdly, the distribution system operator, Essent Netwerk Brabant B.V., has charged higher connection tariffs to some network users, depending on the other services that the users contracted with the distribution system operator. The law requires that the system operators act non-discriminatively with respect to the network connection tariffs. Those network users that installed a transformer themselves were charged a higher connection tariff than those network users that contracted for the installation of a transformer with Essent Netwerk Brabant B.V.. The distribution system operator has made it impossible for other firms to compete with the operator for the installation of this part of the network connection[111]. Fourthly, this same distribution system operator has been in conflict with an electricity generator on the additional length of electricity lines that was needed for the construction of a connection, and that thus had to be paid for by the generator. The distribution system operator has calculated a connection tariff on the basis of an additional length of electricity lines that was three times as large as the calculation by the network user. The regulator has argued that the distribution system operator has not calculated the tariff according to the agreements that are made between the regulator and the system operator[112].

6.4.2 Misalignment

The governance structures of the network connection transactions of before the liberalization have been assumed to be aligned with the attributes of the transactions. The generators and the transmission system operator integrated the network connection transactions, and the

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[109] Besluit Geschil Essent vs TenneT, Zaaknummer: 102743-49, 22 november 2007.
[110] Openbaar Besluit van de Raad van Bestuur van de Nederlandse Mededingingsautoriteit als bedoeld in artikel 77n van de Elektriciteitswet 1998. Nummer 102676/13 Betreft zaak: 102676 NRE Netwerk B.V..
[111] Bindende aanwijzing voor Essent Netwerk Brabant B.V., press release 02-19, December 11, 2002.
[112] Besluit naar aanleiding van de aanvraag van REMU Power Plus B.V. voor het geven van een bindende aanwijzing, op grond van artikel 5, zesde lid van de Elektriciteitswet 1998, aan Essent Netwerk Brabant B.V. Nummer: 100793/5.

transactions with the consumers were governed by a regulated contract and tariff. In the liberalized industry, the attributes of the network connection transactions (the asset-specificity and the behavioral uncertainty), would still, within transaction cost economics reasoning, be efficiently aligned with a vertically integrated form[113]. The regulations have, however, prohibited this governance structure for the network connection transactions. A *misalignment* is thus observed for the governance structure between the generators and the transmission system operator, stimulating an adaptation process towards altered forms of governance. In addition, the regulated contracts with the consumers will have to change from contracts for the integrated service of electricity connection, transportation and supply to unbundled contracts for the connection services.

6.4.3 The governance structure

The governance structure for the network connection transactions will be characterized along three attributes: administrative apparatus, incentive intensity and contract law regime.

The competition authority and the Energiekamer have in the past interfered with the network connection contracts between a system operator and a network user. These two regulators have three *administrative control instruments* at their disposal to enforce the network connection contracts, and to stimulate the contracting parties to live up to the contractual agreements. They can give a contracting party a binding instruction, or an instruction combined with a penal sum, or they can oblige a contracting party to pay a fine. In July 2007, the regulators imposed a fine on a system operator for including monthly connection tariffs that were too high in its contracts with network users[114]. The regulators also gave a binding instruction to a system operator for charging higher connection tariffs to network users that contracted out the connection services to another firm[115]. These instruments thus belong to the administrative apparatus of the

[113] See appendix B for a discussion on network connection problems in disintegrated governance structures.

[114] NMa legt NRE Netwerk een boete op. 18-7-2007, Zaaknummer 102676/13. www.dte.nl (last accessed August 7, 2008).

[115] Bindende aanwijzing directeur DTe aan Essent Netwerk Brabant, 10-12-2002, www.dte.nl (last accessed August 7, 2008).

governance structure for the network connection transactions, and regulation is thus part of this new governance structure. Regulation has been defined as being part of a governance structure when the public authorities get involved in the execution and/or enforcement of a specific contract between transacting parties.

The *incentive intensity* of the system operators is of an intermediate level. An intermediate incentive intensity has been defined in chapter five as characterizing a governance structure when a part of the income to be earned cannot be influenced by the economic actor. The system operators cannot influence their revenues, because they receive a regulated tariff for their connection services. They do, however, have some influence on their profits: by increasing their efficiency and thus decreasing their costs, they can earn a higher profit. Their increase in efficiency will, however, affect the regulated tariffs in the future. In each new regulation period, a new x-factor is determined that is based on the average performance of the system operators[116]. An efficient performance in a previous period will increase the x-factor, and thus decrease the tariffs. The efficiency of the system operators will, in the long run, lead to a lower income. They are therefore stimulated to continuously outperform the other system operators in terms of efficiency.

The network connection *contracts* are signed for an indefinite period[117] and at least for twelve months[118], and can therefore be characterized as *long term*.[119] The electricity generators and consumers will always need a connection to the network to be able to deliver and receive electricity. The regulatory decisions on the connection tariffs are made for three-year periods.

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[116] See section 6.2.3 for a discussion on the x-factor.

[117] Advies van de Raad van Bestuur van de Nederlandse Mededingingsautoriteit aan het Ministerie van Economische Zaken, inzake de beoordeling van het huidige aansluitbeleid van TenneT. Betreft zaaknr. 102488_3 / Signalen Grootschalige productieaansluitingen TenneT. 18 december 2007.

[118] For example, the contracts and the general conditions for the connection and transportation of electricity of Continuon, a distribution system operator, refer to this contract duration. www.continuon.nl/informatieopmaat/mkb/products/algemenevoorwaarden/index.jsp (last accessed January 4, 2009). Another Dutch distribution system operator, Delta, refers to the same contract duration in its general conditions. www.deltanetwerkbedrijf.nl/web/show/id=94000 (last accessed January 4, 2009).

[119] In an interview with Hendrik Bosch, Managing Director of Delta Netwerkbedrijf B.V. on October 28, 2005, it was mentioned that these network connection contracts between the distribution activities of Delta and TenneT are long-term.

The general conditions to the connection contract of TenneT refer to these tariff decisions. They state that a change in these tariffs will apply to the existing connection contracts, and therefore no new contracts need to be signed when the regulator formulates new tariffs for the connection services. The network connection contracts are therefore *flexible*. In addition, articles 32 to 34 of the electricity law describe how the conditions for connecting users to the network can be changed. The grid code[120] allows for the possibility that changes are made to the connected equipment of the network users, which may necessitate changes to the connection. In this case, the network connection contract has to be adjusted, for example, the voltage level or the connection capacity may have to be changed. The transmission system operator can change the general conditions to its connection contracts[121]. The board of directors of the NMa settles the *disputes* on the connection to the network that arise between a system operator and a network user. On several occasions the competition authority has had to settle such disputes. These disputes concerned among others the refusal by the transmission system operator to provide a connection to the network[122], exceeding the time period within which the connection had to be provided[123], and the calculation of the connection tariffs[124].

In summary, the governance structure of the network connection transactions can be characterized as a hybrid form, in which there are two contracting parties – a system operator and a network user – that retain their autonomy. The network users are dependent upon the system operator to an extreme degree; they have no alternative for a connection to the electricity network (except when they need a connection larger than 10 MW). The system operators have a monopoly on providing the connection services, and they have an incentive to behave opportunistically and to set high prices and unreasonable conditions. The long-term

[120] Articles 2.2.4.13 and 2.2.4.14 of the grid code.
[121] Article 18 of the general conditions, www.tennet.org (last accessed August 9, 2008).
[122] Besluit Geschil Essent vs TenneT, Zaaknummer: 102743-49, 22 november 2007.
[123] Besluit tot geschilbeslechting inzake het niet tijdig realiseren van aansluitingen (aanvrager vs. Eneco Netbeheer B.V.), Zaaknummer 102704.
[124] Geschilbeslechting inzake de aansluiting van een windpark door netbeheerder, 14-9-2005, zaaknummer: 102073/14.

connection contract is governed by regulation. Regulation enforces the contract with binding instructions and fines, and settles the disputes between the contracting parties.

Williamson described regulation as a hybrid governance structure that solves the contracting problem between public utility firms and consumers, in which the public utility firms provide the vertically integrated service of connecting the consumers to the network, and of transporting and supplying electricity (Williamson, 1996a: 96). In the liberalized industry, this form of governance is still present for the relation between the consumers and the system operators, but it is restricted to the network connection (and is not applied to the integrated service). In addition, whereas Williamson has mainly focused on the contractual relation with consumers, in this case the structure also governs the network connection transactions between two firms (the system operators and electricity generators). *Transaction cost economics* argues for the efficiency of vertical integration for these transactions. TCE has not yet been applied to the new situation of unbundled services, and of involving other contracting parties than the consumers. The adaptation process enables an explanation to this hybrid form of governance.

6.4.4 Adaptation

The electricity law of 1998 has guided the adaptation process to this hybrid form of governance, and in particular to the regulated long-term contractual relations for the network connection transactions. It has obliged a *multilateral adaptation* to the new governance structure. The law prescribes how the tariff structures and the conditions for connecting to the network should be determined, and which parties in the industry should be involved in this adaptation process. The system operators had to consult with the representatives of various parties in the electricity industry on the conditions and tariff structures. They had to formulate a proposal for these conditions and tariffs, and to send this proposal to the competition authority[125]. The competition authority made the final decision, but in this process to the

[125] In an interview with mr. M. Veersma of the Energiekamer on January 5, 2006, it was mentioned that the energy firms and the system operators consult with the DTe, and send proposals to the DTe, on the specific rules that are to be included in the codes.

decision on the tariffs and conditions, the parties in the electricity industry had a chance to again formulate their opinion on the competition authority's first drafts of the decision. By stipulating which parties had to be involved in the process of adaptation to the new form of governance, regulation reduced the search costs for the transacting parties involved. The economic actors involved in this adaptation process are also the parties to the hybrid form of governance.

The *identity of the contracting party* is highly relevant for the network users. For a connection to the electricity network, there are only a few contracting parties: the system operators that have a monopoly for their particular parts of the network. This would give the system operators a large bargaining and negotiation advantage, if the public authorities did not coordinate the adaptation process. The public authorities oblige the system operators to provide a non-discriminatory connection to the network for a regulated tariff. These authorities thereby reduce the bargaining and negotiation costs in the process of adaptation to a new network connection contract and governance structure. Or as Williamson has stated, regulation can introduce changes "without the costly haggling that attends such changes when parties to the contract enjoy greater autonomy" (Williamson, 1985: 347). The network users prefer a long-term contractual agreement with the system operator, because of the limited availability of contracting parties.

This network connection transaction exists because the generators and consumers of electricity have to consider the *electric system*, and in particular their dependence on the electricity network and the safety and reliability of this network. They need a connection to the network to be able to supply and receive electricity. There is hardly any selection of a contracting party or a governance structure on the basis of price for the network connection transaction, because the tariffs for a connection to the network are regulated. When potential network users that are requesting a connection that is larger than 10 MW, tender for the construction of the connection, they need the approval of the system operator. The operator has to take the safety and reliability of the network into account as obliged by the electricity law and the grid code. The dependence of the network users on the electricity network will not change in the near future, and therefore they prefer a long-term agreement with the system operator.

This combination of a multilateral adaptation in which the identity of the contracting party is relevant, and the requirements of the electric system are important, has led in accordance with the expectations, to a transformation to a hybrid form of governance. For the network connection transactions between the large electricity generators and the system operators, the adaptation process can be described as one of *autonomous adaptation*, from the vertically integrated structure to the hybrid form.

6.4.5 The role of regulation

Regulation has set the ex ante rules of the game, and has influenced the attributes of the transactions, the governance structure, and adaptation. Firstly, the rules have created the site-specificity by increasing the tariffs for connections that are located farther away from the network. Secondly, regulation has reduced the incentive intensity of the system operators by rewarding their connection services with a regulated tariff. Thirdly, the electricity law has required a multilateral adaptation to the new form of governance, and has reduced the search costs for the contracting parties, and the bargaining and negotiation costs for the network users. Finally, regulation is also a part of the new form of governance. With their binding instructions and fines, the competition authority and the sector-specific regulator enforce the contracts between the system operators and the network users. The competition authority has settled various disputes between the contracting parties.

6.5 Network access transactions

The distribution and transmission system operators have to provide a non-discriminatory access to their network for those that are connected to their network. The network access service is the transportation of electricity for network users from one connection point to another, which includes compensating for grid losses, maintaining the voltage levels and reactive power supplies, and resolving restrictions on transportation[126]. The system operators provide this network access service to the network users, and these users aid the operators in providing the service. For example, several network users supply reserve power to the electricity network to enable the system operators to resolve the transportation restrictions.

The contracting parties to the transactions of the network access service are the transmission and distribution system operators, and the generators, retailers and consumers of electricity. The large generators of electricity need an access to the transmission network to enable the transportation of their electricity, whereas the decentralized generators, which produce smaller amounts of electricity, access the distribution network. The electricity consumers need an access to either the transmission network or the distribution network, depending on the amount of electricity that they consume. The electricity retailers may act on behalf of the electricity consumers, and contract with the transmission and distribution system operators for access to the network. The network users and the system operators sign a network access contract, which is usually combined with the network connection contract that was discussed in the previous section[127].

Appendices C and D discuss the governance structures that coordinate the transactions of the grid losses, and of the voltage levels and reactive power supplies. The focus in this section will be on the transactions for resolving transportation restrictions. These transactions involve an exchange of information between the system operators and the network users, in the form of so-called transportation programs (or t-programs), which allows the system operators to make projections of the possible transportation restrictions on the next day, and a supply of reserve power by the network users to the electricity network, which allows the system operators to resolve the restrictions in real time.

A t-program includes information on the amount of electricity that a network user will put on the network, or the amount of electricity that it will take out of the network for one network

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[126] TenneT includes these three elements in its definition of the transportation services that it provides to the network users, www.tennet.org/transport_en_systeemdiensten/transportdienst/index.aspx (last accessed August 23, 2008). The tariff code also refers to these three elements (article 3.2.1).

[127] Some parties in the electricity industry, such as the electricity traders, only need an access to the network and not a physical connection. They will thus only have a network access contract.

connection and for every hour of the next day. The electricity law states that every network user has the responsibility for sending these programs[128]. The electricity retailers take over this program responsibility for the small electricity consumers, as is stated in the network connection and network access contracts. Every energy firm can contract out the program responsibility to another firm. These program responsible parties then send the t-programs to the system operators. The distribution system operators add all the t-programs that they have received from the program responsible parties for the connections within their network area, and send these to TenneT. The system operators, and in particular TenneT, need this information to calculate whether transportation problems can be expected.

A restriction on the transportation of electricity means that the system operators cannot transport the electricity from one connection point to another as requested by the energy firms and the electricity consumers. Every distribution system operator and the transmission system operator are responsible for signalling and solving the restrictions in their own part of the electricity network (TenneT, 2002: 6). The distribution system operators can, however, ask TenneT to partly or completely solve the restrictions in their distribution network. The system operators can solve the transportation restrictions in several ways; by changing the schedules for maintenance of the electricity network, by redispatching the production of electricity, and by calling on reserve capacity of the electricity generators. The grid code states that every network user with a contracted capacity that is larger than 60 MW has the obligation to supply reserve capacity to the transmission system operator, in the form of either a decrease or an increase of the production of electricity. This reserve capacity is made available to TenneT through a bidding mechanism, of which the procedures are determined by the transmission system operator. The network users specify in their bids for what price and with which amount they can either decrease or increase their production of electricity[129]. The network users with a contracted capacity that is less than 60 MW can voluntarily bid for the supply of reserve

[128] Article 1.o. and 31.2 of the electricity law of 1998; Article 12 of the Regeling van het Ministerie van Economische Zaken van 9 januari 2005 inzake tariefstructuren en voorwaarden voor elektriciteit.
[129] Article 5.1.1.1.a.1 of the grid code.

capacity to TenneT[130].

Two transactions can thus be distinguished that make up a large part of the network access transactions; these are the transaction of the exchange of the t-programs between the system operators and the program responsible parties, and the transaction of the supply of reserve power to the transmission system operator. In the following subsections, the attributes of this first transaction, its new form of governance, and the adaptation to this new form of governance will be discussed in detail. The transaction of the supply of reserve power will be discussed in section 6.7, on the balancing transactions, because energy firms also bid for the supply of reserve power to the transmission system operator to balance electricity supply and demand.

6.5.1 The attributes of the transaction

The *frequency* of this first network access transaction is recurrent. The program responsible parties have to send t-programs to the system operators on a daily basis and for every hour of the day. After TenneT has given its approval of the t-programs on the day before the t-programs are implemented, the program responsible parties may adjust the t-programs until one hour before their implementation. The parties to this transaction are thus continuously exchanging information.

Several forms of *asset-specificity* characterize this transaction, including human asset-specificity, temporal specificity, and dedicated assets. The program responsible parties have to deliver the t-programs to the system operators in an electronic format that must conform to certain electronic message standards. These electronic messages are referred to as EDINE, which stands for Electronic Data Interchange in the Netherlands Energy Sector[131]. The Dutch regulator has made the testing of EDINE-messages by the program responsible parties compulsory. The energy firms that wish to exchange these messages must be in the possession of a certificate for each type of message. This certificate is distributed by the transmission

[130] Article 5.1.1.1.a.2 of the grid code.
[131] www.tennet.org, www.edsn.nl (last accessed December 29, 2008).

system operator. It shows that the energy firm is capable of exchanging the particular type of message. The program responsibility thus requires the availability of employees who are able to work with EDINE-messages. The energy firms will need to invest in specific human capital. It also requires the presence of these employees 365 days a year; the transportation programs have to be sent every day, they have to comply with a strict schedule of delivery[132], and adjustments to these programs can be made for every hour of the day (Wenting, 2002: 7). These network access transactions of exchanging transportation programs are thus characterized by human asset-specificity, and by temporal specificity. The program responsible parties have dedicated the investments in facilities and employees to one contracting party: the system operator.

The *behavioral uncertainty* in this transaction is absent; the contracting parties do not have an incentive to strategically disguise or distort information. The distribution system operators and the program responsible parties have an incentive to provide TenneT with accurate t-programs, as compared to disguising any information. The distribution system operators have this incentive, because any transportation problem that might arise in real time in their network (possibly due to inaccurate t-programs) has to be solved and paid for by these distribution system operators. The program responsible parties do not pay for not abiding by their transportation programs, but they do pay a penalty when their actual consumption and production of electricity differs from the sum of these t-programs. The sum of the t-programs is referred to as an energy program (or e-program) that describes the amount of electricity that a program responsible party expects to put on and take out of the network. An e-program is not specific for one network connection as are the t-programs. The transmission system operator needs the e-programs to balance electricity supply and demand[133]. The program responsible

[132] T-programs have to be sent to the system operators on the day before the implementation of the T-programs before 14h00. The distribution system operators send the total of the T-programs of their network area to TenneT before 14h45. Between 14h45 and 15h15 TenneT checks the total of these T-programs and whether they will lead to transportation problems. Until 17h30, the system operators can solve the transportation restrictions, and before that time TenneT has to approve the T-programs and communicate to the system operators and program responsible parties (TenneT, 2002: 15; TenneT, 2007: 14).

[133] See the following section (6.6) for a more elaborate discussion on these e-programs.

parties have an incentive to supply accurate e-programs and behave according to these programs, because otherwise they pay for the imbalance between the e-programs and the actual supply and demand of electricity to the network. They therefore also have an incentive to provide accurate t-programs, because the e-programs are the sum of the t-programs. The incentives between the distribution system operators, the program responsible parties and the transmission system operator have thus been aligned; the transmission system operator needs accurate t-programs, and the distribution system operators and program responsible parties have a financial incentive to provide such accurate programs.

6.5.2 Misalignment

Before the liberalization, the information exchange on the expected transportation was internalized in the SEP, and in the vertically integrated firms. This form of governance is assumed to have been aligned with the attributes of the transactions. The regulations on the unbundling of the system operators are now creating a *misalignment*. The regulators have, however, also influenced the attributes of the network access transactions in the unbundled industry. Article 3.9 of the system code specifies how the imbalance price should be determined. This imbalance price has to be paid by the energy firms when the e-programs, and thus the sum of the t-programs, are not in conformity with the actual electricity production and consumption of the energy firms. The energy firms are thus given a stimulus to provide the system operator with accurate t-programs. The regulator has aligned the incentives of the energy firms with those of the system operators, and it has thus eliminated the behavioral uncertainty in the transaction. From a *transaction cost economics perspective*, the absence of behavioral uncertainty means that there is no governance problem (Williamson, 1985: 31). Williamson states that 'uncertainty is assumed to be present in sufficient degree to pose an adaptive, sequential decision problem' (Williamson, 1985: 79). When uncertainty is present, it is 'imperative that the parties devise a machinery to work things out' (Williamson, 1985: 60). For this transaction, and seen from a TCE perspective, this contractual relation for the t-programs would not require such a machinery. But, as the following section will show, an elaborate form of governance has been set up for this transaction of exchanging t-programs.

6.5.3 The governance structure

The new form of governance for the t-program transactions can be characterized as a hybrid form, in which the contracting parties retain their autonomy, but are dependent upon each other to a substantial degree. The system operators need the t-programs from the program responsible parties to be able to predict the transportation restrictions, and the program responsible parties depend on the system operators for making sure that these transportation problems do not occur.

The transmission system operator has an authoritative role in this hybrid form. Firstly, TenneT decides whether an energy firm is capable of being responsible for sending the programs. Those energy firms that want to have the program responsibility over their connections, and that want to take over the program responsibility from other energy firms and electricity consumers, must have permission from the transmission system operator to act as a program responsible party. Permission is granted when the transmission system operator has made sure that the firm has the expertise and the technical, administrative and organizational facilities that are required for the program responsibility, and when the firm has signed an agreement with the transmission system operator that sets out various conditions for the implementation of the program responsibility, including a financial guarantee[134]. Secondly, TenneT manages the electronic postbox to which the messages are sent that contain the programs. Together with the distribution system operators, TenneT determines the procedures for using the postbox, the communication protocols for the daily information exchange, the rules on what information should be included in the messages, and the time schedule for sending the programs to the postbox[135]. Thirdly, TenneT has to approve the t-programs that are submitted by the program responsible parties and distribution system operators (TenneT, 2007: 15). And finally, TenneT can impose restrictions on the network users. When TenneT has approved the t-programs, it

[134] Article 3.2.11 of the system code.
[135] Article 5.1.1.4 and 5.1.1.5 of the grid code state that the system operators determine these procedures and protocols for the data exchange.

can place a restriction on a particular part of the network. This means that additional transport along these restricted lines should be avoided, and energy firms cannot alter their t-programs in such a way that they make use of these restricted lines[136].

The *incentive intensity* is of an intermediate degree. An intermediate incentive intensity characterizes a governance structure among others when the transaction itself may not directly earn an income, but is a prerequisite for earning an income with a consecutive transaction. The program responsible parties have an incentive to send the t-programs, because it is a requirement for receiving or delivering electricity. But it is only a first step: the generators, traders and retailers of electricity do not earn an income from sending these t-programs. They still need to produce or sell electricity. The network users also have an intermediate incentive intensity with respect to behaving according to the t-programs. A larger or smaller transportation of electricity over a connection may influence the imbalance with respect to the e-programs, and the program responsible parties have to pay for this imbalance, but there is no sanction on not adhering to the t-programs. TenneT may preclude certain changes to the t-programs in the area of the restricted part of the network. When network users ignore this restriction in real time, and transport additional electricity along the restricted area, there is no direct sanction on this behavior.

The *administrative apparatus* of this governance structure includes an information disclosure mechanism. When network users expect to alter their consumption or production of electricity, and when these changes will affect more than five percent of the total capacity on a particular part of the network, they have to inform the system operators of these changes and send them altered t-programs (TenneT, 2002: 14). The administrative apparatus also includes a form of monitoring of the contracting parties and a penalty. The amount of electricity that is transported over each network connection is measured by the system operators, and can be used to check whether the network users followed their t-programs. A penalty, in the form of the imbalance price, exists for not abiding by the e-programs, and thus for the sum of the t-programs of a program responsible party. In addition, a monitoring system exists that checks

[136] Article 5.1.1.8.a of the grid code.

the quality of the transportation service of the system operators[137]. The electricity law of 1998 states that each system operator is responsible for registering its quality level[138]. A ministerial regulation has defined the quality of the transportation service according to three criteria: the yearly duration of blackouts of the electric system, the average duration of a blackout, and the frequency of the blackouts[139]. These are largely based on a system of quality registration that was in place before the liberalization, and that was developed by the system operators. The system operators have to send their registrations to the competition authority every year. The competition authority may start an investigation to check the reliability of the registration of a system operator, and may take measurements in the network of the system operator[140]. This latter regulatory power of the competition authority and therefore also of the sector-specific regulator (Energiekamer) means that regulation becomes part of the governance structure. In the contractual agreement between the network users and the system operators, the network users have agreed to send the t-programs and the system operators to aim for a particular quality level of their transportation service. The regulator now intervenes by monitoring this quality level.

The *contracts* between the system operators and the network users on the transportation of electricity, which include the conditions on the exchange of the t-programs and the quality of the transportation service, are *long term*. These contracts state that they are signed for an indefinite period, and at least for twelve months[141]. Changes can be made to these contracts,

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[137] The grid code includes a table that specifies the desired quality level of the transportation service (article 3.2). Article 3.3.5 of this code states that the system operators may propose adjustments to this table.

[138] Article 19a of the electricity law of 1998.

[139] Regeling van de Minister van Economische Zaken van 20 december 2004, nr. WJZ 4082582, houdende nadere regels ten aanzien van de kwaliteitsaspecten van het netbeheer op het terrein van elektriciteit en gas (Regeling kwaliteitsaspecten netbeheer elektriciteit en gas), page 1.

[140] Article 19a.4 of the electricity law of 1998; Regeling van de Minister van Economische Zaken van 20 december 2004, nr. WJZ 4082582, houdende nadere regels ten aanzien van de kwaliteitsaspecten van het netbeheer op het terrein van elektriciteit en gas (Regeling kwaliteitsaspecten netbeheer elektriciteit en gas), page 5.

[141] For example, the contracts and the general conditions for the connection and transportation of electricity of Continuon, a distribution system operator, refer to this contract duration. www.continuon.nl/informatieopmaat/mkb/products/algemenevoorwaarden/index.jsp (last accessed

and they are therefore *flexible*. Articles 32 to 34 of the electricity law of 1998 allow for changes to be made to the conditions on the transportation of electricity over the network, the program responsibility, the quality of the transportation service, and the measurement of the transportation of electricity[142]. These changes will necessitate changes to the contractual agreements between the system operators and the network users. The general conditions to the contracts on the transportation of electricity also state that the system operators can make changes to these conditions. In addition, changes in the tariffs for transportation alter the contractual agreements[143]. The *dispute resolution* for this network access transaction is done by a third party. Conflicts between system operators and network users on the program responsibility and the transportation restrictions have been resolved by the competition authority. Firstly, the authority has made a decision in a conflict between a distribution system operator and an operator of a private network on whether the distribution system operator should supply those connected to the private network with a connection number that is needed for the program responsibility[144]. Secondly, it decided on a conflict between a network user and a distribution system operator on the duration of a blackout, and whether the system operator had to pay the network user as compensation for the loss of electricity during the blackout[145]. However, these disputes did not concern the exchange of t-programs between the system operators and the program responsible parties, as can be expected from the ex ante incentive alignment between these parties, and thus the conclusion on the absence of behavioral uncertainty.

In summary, the governance structure for the t-program transactions is characterized by an intermediate degree of incentive intensity, an administrative apparatus of information

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January 4, 2009). Another Dutch distribution system operator, Delta, refers to the same contract duration in its general conditions. www.deltanetwerkbedrijf.nl/web/show/id=94000 (last accessed January 4, 2009).

[142] Article 31 of the electricity law of 1998 specifies these activities to which articles 32 to 34 apply.

[143] Article 24 of the general conditions (note 141) refers to changes that can be made to these conditions.

[144] Besluitnummer: 102454/25. Betreft zaak: Besluit inzake geschil zaak 102454; geschil ECW Netwerk B.V. vs. N.V. Continuon Netbeheer.

[145] Besluitnummer: 102487/21. Betreft zaak: Besluit tot geschilbeslechting inzake aanvrager versus Eneco Netbeheer B.V..

disclosure mechanisms and penalties, and long-term flexible contracts. These three attributes have been defined as those of a hybrid form of governance. This hybrid form is characterized by an authoritative role for the transmission system operator and by the involvement of a third party, the regulator, which monitors the implementation of the contractual agreements and that settles the disputes between parties to these contracts. Within the framework of transaction cost economics, a hybrid form would not have been adopted when considering the attributes of the transactions, and in particular the absence of behavioral uncertainty. The process of adaptation is able to explain the emergence of this hybrid form.

6.5.4 Adaptation

To the network users and program responsible parties, the *identity of the contracting party* for the t-program transactions is highly relevant. There is in fact only one contracting party with which they can transact for the t-programs. This is the distribution system operator that operates the regional network to which the network users are connected, or TenneT when the network users are connected to the transmission network. Because there is only one relevant contracting party, the network users and program responsible parties prefer to set up a long-term contract. Without this contractual relation, they do not have access to the network and cannot receive or deliver electricity. For the system operators, the identity of the contracting party is less relevant, or at least it is not restricted to one contracting party. Currently, TenneT registers 55 energy firms that act as program responsible parties in the Dutch electricity industry.

The system operators have, however, another reason to want to set up a long–term contractual relation with the network users and program responsible parties. When economic actors are connected to their network, the system operators will always need information on how much electricity will be put on the network and how much will be taken out of the network in which location. The system operators will always need these t-programs to be able to predict and thereafter resolve transportation problems in their network, and thus to ensure the reliability of the electric system. The sole function of these t-programs is to ensure the safety and reliability of the system. When adapting to a new form of governance for these t-program transactions, the contracting parties will thus only focus on the *system requirements*, while considerations of price are less relevant. The electricity law of 1998 also states that when the contracting parties and the regulator are formulating the conditions for the program responsibility[146], the importance of a good quality of the service of the system operators, and the importance of a reliable functioning of the electricity supply[147], should be taken into account.

The electricity law also specifies which parties have to be involved in the adaptation to a new form of governance for the t-program transactions. It requires a *multilateral adaptation*. Article 31 states that the system operators should send a proposal for the conditions on the program responsibility, on the quality criteria for the transportation service of the system operators, and on the measurement of the transportation of electricity, to the regulator. The system operators should consult with parties in the electricity industry, including the energy firms, on these conditions[148]. On the basis of the proposal of the system operators, the regulator formulates a first draft of the regulatory decision on the conditions for program responsibility etcetera[149]. The system operators and parties in the electricity industry can express their views on this first draft, but it is the regulator that finally decides on the conditions[150]. These conditions are formulated in the various codes, including the grid, system, measurement and tariff codes. The contractual relations between the system operators and the network users are based on these codes. The various parties, including the system operators, network users and the regulator, which were involved in the adaptation process, are also parties to the new form of governance for the t-program transactions.

This multilateral adaptation in which the identity of the contracting party is relevant and the economic actors have to consider the requirements of the electric system in the adaptation process, explains the emergence of the hybrid form of governance for these network access transactions. Since these transactions used to be internalized in the SEP before the

[146] Article 31.2 of the electricity law of 1998.
[147] Articles 36.1.b and 36.1.e of the electricity law of 1998.
[148] Article 33.1 of the electricity law of 1998.
[149] Article 32.2 of the electricity law of 1998.
[150] Articles 34.2 and 36.1 of the electricity law of 1998.

liberalization of the industry, the governance transformation can be summarized as one from the vertically integrated hierarchy to the hybrid form. The adaptation can therefore be characterized as an *autonomous adaptation*.

6.5.5 The role of regulation

Regulation affects this governance transformation for the network access transactions in several ways: it influences the attributes of the t-program transactions, the attributes of the new governance structure, the adaptation process, and it becomes part of the new form of governance. Firstly, the grid code obliges the program responsible parties to send the t-programs according to the strict time schedule, and in the particular electronic format (EDINE)[151]. Regulation thus influences that the transactions are characterized by human asset-specificity and by temporal specificity. It has also eliminated the behavioral uncertainty of the transaction. Secondly, several ex ante rules of the game influence the form of governance. The measurement code states that the economic actor that is responsible for measuring the electricity use, should measure this use for each network connection and for every fifteen minutes, and should send this data to the system operator. The system operator may use this data to monitor whether the network users are abiding by their t-programs[152]. Regulation thus determines that the governance structure is characterized by monitoring. The system code has introduced a penalty as a form of administrative control to the governance structure for the t-program transactions. This penalty, in the form of the imbalance price, only has to be paid for the difference between the actual production and consumption and the sum of the t-programs. The electricity law states that each system operator is responsible for registering the quality level of its transportation service, and a ministerial regulation and the grid code define the quality of the transportation service. Article 19a of the electricity law states that the system operators have to publish the registration of their transportation quality. The electricity law thus requires that the form of governance is characterized by an information disclosure

[151] Articles 5.1.13 until 5.1.1.5 of the grid code.
[152] Articles 2.3.4.1, 3.1.1 and 3.1.3 of the measurement code.

mechanism. Thirdly, regulation also influences the process of adaptation. It obliges a multilateral adaptation that takes the system requirements into account. Finally, regulation also becomes part of the governance structure. The regulator monitors the reliability of the quality registration of the system operator and may take measurements in the network to check the registration. The regulator also resolves disputes.

6.6 Balancing transactions: exchange of energy programs

Two types of balancing transactions have been distinguished in chapter five[153]. The first balancing transaction concerns the exchange of information between the transmission system operator and the network users (generators, retailers, traders and consumers of electricity) on the amount of electricity that these network users expect to put on and take out of the network on the next day, in the form of so-called energy programs or e-programs. The network users send these e-programs to the transmission system operator on a daily basis. The transmission system operator needs this information in order to balance electricity supply and demand on the day before the operational day. Since these projections often differ from the actual generation and consumption of electricity, the transmission system operator purchases electricity to balance supply and demand in real time. The supply of balancing power by the network users to the transmission system operator is the second balancing transaction. The transmission system operator pays the network users that reduce or increase their offtake from, or input into, the network to resolve an imbalance of supply and demand, and bills the network users that cause an imbalance by an additional offtake from, or input into, the network. In the liberalized Dutch electricity industry, the Dutch transmission system operator, TenneT,

[153] The Dutch transmission system operator, TenneT, identifies three pillars for achieving and maintaining the system-wide balance. These include the program responsibility, which refers to the responsibility of network users to send information on their electricity production and consumption (the energy programs) to TenneT; the supply of balancing power to TenneT; and the financial settlement with the program responsible parties for their contribution to the (im)balance (www.tennet.org, last accessed January 2, 2009). These three pillars are in conformity with the balancing transactions that are discussed in this and the following section.

balances electricity supply and demand for the entire electric system, and the network users have to balance their own electricity supply and demand. This section will discuss the first balancing transaction on the exchange of energy programs, and the following section (6.7) will discuss the supply of balancing power to the transmission system operator.

6.6.1 The attributes of the transaction

The electricity law of 1998 states that licensed energy firms and everyone who has a connection to the electricity network have the responsibility to formulate e-programs, to send them to the transmission system operator, and to behave according to these programs[154]. The program responsible parties include the generators, consumers, retailers and traders of electricity. The electricity consumers with a small connection to the network, such as the households and small businesses, transfer their program responsibility to the electricity retailer that also supplies their electricity. Energy firms with a license to retail electricity can also transfer their responsibility for the e-programs to other energy firms. The majority of the new entrant retailers in the Dutch electricity industry have transferred their program responsibility to a Dutch energy incumbent[155]. Some reasons for contracting out this program responsibility are a lack of technical expertise or of organizational capabilities. The energy programs also have to be delivered to the transmission system operator in the EDINE-format, as do the transportation programs[156]. The program responsibility requires the availability of employees who are able to work with the EDINE-messages. It also requires the presence of these employees 365 days a year; the energy programs have to be sent every day, they have to comply with a strict schedule of delivery, and adjustments to these programs can be made for

[154] Article 1.1.o of the electricity law of 1998.
[155] The incumbents profit from a larger amount of customers for which they act as program responsible party. The total imbalance of a larger number of customers is likely to be smaller than when there are less customers for which program responsibility is provided, because these various (im)balances cancel one another out. This reduces the imbalance costs for the incumbents. Kahn has referred to a similar and related feature in the electricity industry, that of economies of scale of demand: the greater the number and diversity of customers and markets served, the greater is the likelihood that the variations in their separate demands will tend to cancel one another out (Kahn, 1971: 122), see also section 3.1 of chapter three.
[156] See also section 6.5 for a more extensive discussion on the EDINE-messages.

every fifteen minutes of the day (Wenting, 2002: 7). These balancing transactions of exchanging energy programs are thus characterized by a *human asset-specificity* and a *temporal specificity*. The energy firms have also *dedicated the investments* in facilities and employees to one contracting party: the transmission system operator.

The *frequency* of these balancing transactions is recurrent, because the e-programs are sent to the transmission system operator on a daily basis, and adjustments to the e-programs can occur multiple times during a day. This transfer of the e-programs by the network users to the transmission system operator follows a strict schedule of delivery.

The *behavioral uncertainty* in the transactions is absent; the transactions do not allow for increased opportunities to behave opportunistically, and thus to strategically disguise or distort information. As was illustrated for the transaction of the t-programs, the program responsible parties have an incentive to provide the transmission system operator with accurate e-programs, because otherwise they will have to pay the imbalance price. The transmission system operator wishes to receive accurate e-programs, because it enables him to better balance electricity supply and demand. The incentives between these contracting parties have thus been aligned ex ante.

6.6.2 Misaligment

Before the liberalization of the Dutch electricity industry, the transactions for balancing electricity supply and demand were internalized in the SEP. The SEP was an organization of cooperating electricity generators that operated as a pooling system. It pooled all the produced electricity and sold it back to the generators for a uniform tariff. The generators transferred the electricity for this uniform tariff plus a regional surcharge to the distributors. Until the end of the 1980s, the generation, transmission and distribution of electricity were vertically integrated. The energy programs did not exist as they do in their current form. Since the SEP was an organization of cooperating generators, and it pooled all the produced electricity, and monitored the amount of electricity that was taken out of the network by consumers, it had its own and immediate access to information on electricity supply and demand. The unbundling of the transmission and distribution system operators from the generation and retail of electricity ended the pooling system. The independent transmission system operator, TenneT, replaced the SEP. Since the governance structure of before the liberalization (the vertical integration) is assumed to have been aligned with the balancing transactions, the rules on vertical unbundling have created a *misalignment*. When considering the attributes of the energy program transactions, *transaction cost economics* does not predict the comparative efficiency of a new form of governance. The absence of behavioral uncertainty means that there is no need for ex post governance structures. A contractual agreement may suffice to structure the relation between the transacting parties. The following subsection 6.6.3 does, however, show that a new governance structure for these balancing transactions has emerged.

6.6.3 The governance structure

The governance structure that has emerged for the energy program transactions is a hybrid form. The contracting parties to this governance structure retain their autonomy, but are dependent upon each other to a substantial degree. The energy firms depend on TenneT's approval of the energy programs, because otherwise they will not be able to supply and receive electricity. TenneT needs the information from the energy firms to be able to balance electricity supply and demand. As comparable to the governance of the t-program transactions, the transmission system operator has an authoritative role in this hybrid governance structure for the e-programs. Firstly, TenneT must give the energy firms permission to act as program responsible parties. Secondly, TenneT manages the electronic postbox to which the messages are sent that contain the energy programs. Together with the distribution system operators, TenneT determines the procedures for using the postbox, the communication protocols for the daily information exchange, and the rules on what information should be included in the messages. Thirdly, TenneT either approves, asks for adjustments, or rejects the energy programs. Once the transmission system operator has received the energy programs, it checks both their internal and their external consistency[157]. Energy programs that are internally consistent, balance the (expected) amount of electricity that is to be taken out of the network (by consumption, sale and export of electricity) to the amount of electricity that is to be put on the network (by production, purchase and import of electricity). Energy programs that are externally consistent match the information on an energy transaction that is mentioned in one energy program to the information on this same energy transaction in a different energy program. The transmission system operator will withhold its approval of an energy program if it does not meet the requirements of the internal and external consistency. The program responsible parties can adjust their e-programs to meet these requirements. If the program responsible parties are not able to resolve an external inconsistency of an e-program before the start of this program, the transmission system operator will charge the parties the price of an imbalance for this inconsistency. The transmission system operator can also withhold its approval of an energy program when problems with the transportation of electricity are expected[158]. The system operator can request a change in location of the electricity production in order to resolve the transportation problems. In this case, the program responsible party has to send a revised energy program (Wenting, 2002: 7).

The *administrative apparatus* of this governance structure thus includes information disclosure and information verification mechanisms (the system operator collects information on whether the contracting party is capable of sending the e-programs, and whether these e-programs meet the requirements of consistency), and a financial penalty (the imbalance price) that is charged when the requirements of consistency are not met. In addition, the system operators also monitor the program responsible parties by taking measurements in the network, and by comparing these amounts of electricity that are put on and taken out of the network to the energy programs. The program responsible parties pay the difference between these two, multiplied by the imbalance price, to the system operator.

The governance structure is characterized by an intermediate degree of *incentive intensity*. In

[157] See articles 3.6.12 and 3.6.13 of the system code for a description of the internal and external consistency of the energy programs.

[158] Article 3.6.14 of the system code.

chapter five, an intermediate incentive intensity has been defined as characterizing a governance structure when the transaction itself may not directly earn an income, but is a prerequisite for earning an income with a consecutive transaction; or when a part of the income to be earned cannot be influenced by the economic actor. The energy firms do have an incentive to send energy programs to the transmission system operator, because otherwise they are not able to deliver or receive electricity. The exchange of energy programs is thus a requisite for earning an income, but it is not a sufficient one: the electricity still has to be produced or bought and delivered and retailed to the consumers before earning an income. In addition, the energy firms have an incentive to deliver externally consistent programs, or else TenneT charges the energy firms the imbalance price. The energy firms also have an incentive to deliver good energy programs, meaning energy programs that are close to the actual production and consumption of electricity on the next day, and to behave according to these energy programs. These good energy programs reduce the amount that has to be paid to the transmission system operator for the imbalance between the energy programs and the actual production and consumption. However, the actual production and consumption also depend on factors that are not under the control of the energy firms, such as the weather on a particular day. Energy programs can be adjusted until one hour before operation of the programs. For these one-hour periods, energy firms cannot adjust their programs to changing conditions, and they can therefore not influence the amount of imbalance that they have to pay to TenneT. These real-life conditions and the time restrictions on the energy programs complicate the formulation of good energy programs, and reduce the incentive intensity.

The *contracts* between the transmission system operator and the network users for the exchange of the energy programs are based on the conditions for program responsibility that are set out in the system code. These contracts are *flexible*; the articles 32 to 34 of the electricity law of 1998 specify the procedures for making changes to the conditions in the system code. The contracts are *long term*. When energy firms want to supply or receive electricity, they will always have to send the energy programs to the transmission system operator, and they therefore have an incentive to retain their relation with the transmission system operator for the exchange of the energy programs. The energy firms do not have an incentive to contract out the activity of formulating and sending the energy programs to another firm. A disadvantage of contracting out the program responsibility to another firm is that detailed information is transferred to this firm on energy transactions, including information on contracts with other parties for the supply of electricity (Wenting, 2002: 7). *Disputes* between the transmission system operator and the program responsible parties with respect to the energy programs will be resolved by a third party: the board of directors of the competition authority.

In summary, the new form of governance is characterized by information disclosure and verification mechanisms, monitoring and penalties, an intermediate degree of incentive intensity and long-term flexible contracts. This hybrid form is heavily influenced by regulation: the contracts between the transmission system operator and the program responsible parties are based on the system code. The authoritative role of TenneT in this governance structure is determined by the public authorities, and formulated in the system code.

6.6.4 Adaptation

Within the transaction cost economics framework, the attributes of the energy program transactions (i.e. the absence of behavioral uncertainty) cannot explain the emergence of this hybrid form of governance. The attributes of adaptation (the identity of the contracting party, the type of response in the adaptation process, and the laterality of the adaptation) are able to illustrate the transformation to the hybrid governance structure.

The *identity of the contracting party* is highly relevant to the program responsible parties, because there is only one contracting party with which they can exchange the energy programs. Without their contractual relation with the transmission system operator, the program responsible parties are not able to deliver and receive electricity. In the absence of another suitable contracting party, the program responsible parties prefer a long-term relation with the transmission system operator to a short-term market relation.

The energy program transactions are necessary in order to retain a balance on the network, and thus to ensure the safety of the electric system. Because the energy firms and the operators engage in this transaction and develop a structure to coordinate the transaction, they take the *system requirements* into account. A dependence on a balance for the safety of the system will remain for a long time, and therefore the economic actors prefer a long-term, hybrid form.
This type of response and also the *laterality of the adaptation* are largely determined by the legislation in the electricity industry. Articles 31 to 37 of the 1998 electricity law require a multilateral adaptation that considers, among others, the reliable, sustainable and efficient functioning of the supply of electricity, a good quality of the services provided by the system operators, and the importance of maintaining the balance between electricity supply and demand in a non-discriminatory and transparent way. The law thus requires that, when adapting to another form of governance, the transacting parties consider the requirements of the electric system, such as the importance of a balanced supply and demand and a reliable network. The parties to the energy program transactions have therefore preferred the long-term nature of the hybrid form of governance and the cooperation between the contracting parties in this governance structure. These requirements of the electric system will not change quickly, and many of the economic actors in the electricity industry are affected by these requirements.
The multilateral adaptation to another form of governance for the energy program transactions involves the system operators, the energy firms and the regulator. In July 1999, the system operators sent a proposition to the Dutch regulator (Energiekamer) for the conditions that they aim to include in their contracts with network users on the system services, the maintenance of the energy balance, and the program responsibility, and thus for the formulation of a system code[159]. Both the regulator and the system operators have consulted with the energy firms on these conditions. The Dutch regulator makes the final decision on what conditions to include in the system code. With respect to making changes to the system code, the transmission system

[159] Articles 31.1.c, 31.1.i, and 31.2 of the electricity law of 1998 specify the procedure for developing a code. The decision of the DTe, with reference number 99-005, and title Besluit tot vaststellen van de voorwaarden bedoeld in artikel 26e van de Elektriciteitswet 1998, refers to the decision-making process with respect to the system code, grid code and measurement code.

operator or at least one third of the distribution system operators can make a request to all the system operators for formulating a proposal for changes to the conditions as set out in the code[160]. The system operators consult with the organizations that represent the various parties in the electricity industry, including the energy firms, on the proposals for changes to the system code[161]. The system operators have to send such proposals to the competition authority, and they must indicate how they took into account the views of the organizations in the electricity industry[162]. Currently, it is the competition authority that decides on changes that are to be made to the conditions in the system code. The competition authority takes the proposal of the system operators into account when making the decision. Both the system operators and the organizations in the electricity industry can send their views to the competition authority on the latter's proposal for changes to the system code[163]. The parties to this multilateral adaptation are also the parties to the hybrid form of governance for the energy program transactions.

This multilateral adaptation in which the identity of the contracting party and the requirements of the electric system are important, explains the transformation to the hybrid form of governance. Before the liberalization of the Dutch electricity industry, the centrally coordinated pooling system of the SEP internalized the balancing transactions. The governance transformation for this balancing transaction of exchanging energy programs can thus be summarized as a transformation from the vertically integrated hierarchy to a hybrid form of governance. The incentive intensity of the energy firms has increased in the liberalized environment. The energy firms now have a financial incentive to match their electricity supply to their demand, whereas in the pooling system, electricity supply and demand were only balanced for the entire electric system. Fiat is replaced by information disclosure and information verification mechanisms, and by dispute resolution by the board of directors of the

[160] Article 32.1 of the electricity law of 1998.
[161] Article 33.1 of the electricity law of 1998.
[162] Article 33.2 of the electricity law of 1998.
[163] Article 34.2 of the electricity law of 1998.

competition authority. The type of adaptation can be described as an *autonomous adaptation* between forms of governance.

6.6.5 The role of regulation

Regulation influences the attributes of this balancing transaction, the new form of governance, and the attributes of adaptation. Regulation is also part of the new governance structure. Firstly, the system code specifies that an imbalance price must be paid for not abiding by the energy programs. This code thereby stimulates the program responsible parties to send accurate energy programs to the transmission system operator, and aligns the incentives between these two contracting parties. Regulation has therefore eliminated the attribute of behavioral uncertainty in the transaction, and has reduced the need for a new form of governance. Regulation has also influenced the human asset-specificity and temporal specificity of this balancing transaction, as was the case for the t-program transaction. Secondly, the system code introduced several administrative control instruments into the governance structure, including the monitoring of electricity input and offtake from the network, a penalty in the form of the imbalance price, and a mechanism that verifies whether the program responsible parties have submitted internally and externally consistent energy programs. Articles 32 to 34 of the electricity law of 1998 have led to flexible contracts between the transacting parties. Thirdly, the public authorities influence the attributes of adaptation; they have specified in the electricity law how the energy firms and the system operators have to formulate and make changes to the system code. These parties to the energy program transaction have to adapt multilaterally and consider the system requirements. The authorities have reduced the search costs by setting several requirements for the governance structure of the energy program transaction in the system code. Finally, the competition authority is part of the governance structure, as it settles the disputes between the contracting parties.

6.7 Balancing and network access transactions: supply of reserve power

The energy programs of the first balancing transaction inform the transmission system operator of the expected input of electricity into the network and the expected offtake of electricity from the network for the next day. The actual production and consumption of electricity often differ from these energy programs. The transmission system operator therefore needs the availability of power to balance electricity supply and demand in real time. The second balancing transaction thus concerns the supply of reserve power by the network users to the transmission system operator. The transmission system operator also needs this power to resolve the transportation restrictions on the network. The first three subsections (6.7.1-6.7.3) introduce this second balancing transaction, after which the attributes of the transaction, the governance structure, the misalignment, the adaptation, and the role of regulation are discussed in subsections 6.7.4 until 6.7.8 respectively.

6.7.1 Regulating power and reserve power on the single buyer market

The transmission system operator has set up a single buyer market to coordinate this second type of balancing transaction. On this market, energy firms bid for the supply of regulating power and reserve power to TenneT. Regulating power and reserve power is power that the energy firms are able to produce more, to produce less, or to consume less, as compared to their energy programs. The grid code obliges energy firms to supply reserve power. Article 5.1 of this code states that those connected to the network with a contracted capacity of over 60 MW are obliged to bid for the supply of reserve power to TenneT. Network users with a capacity that does not exceed 60 MW can bid for the supply of reserve power to TenneT on a voluntary basis. In addition to the compulsory contracts for the supply of reserve power, TenneT has also contracted with energy firms for the supply of 250 MW of regulating power. These energy firms are obliged to bid regulating power to the single buyer market up to their contracted amount. Other energy firms, which do not have such a contract with TenneT, can bid for the supply of regulating power on a voluntary basis. When there is an imbalance, TenneT first calls on the bids for regulating power. Regulating power must be made available to the transmission system operator within fifteen minutes, and is used to maintain the balance on the network for the fifteen-minute periods[164]. Reserve power is used when TenneT decides that the regulating power is used for too long and too extensively, and when TenneT has to resolve transportation problems in the network. The bids for reserve power are for one-hour periods, and the energy firms can indicate within which period they are able to supply or withdraw the power to or from the network. This period cannot extend beyond three days (DTe and TenneT, 2004: 7). When TenneT calls on the bids for the supply of reserve power for an increase of the production, the energy firms supply the total amount of electricity that was included in the bid. When TenneT calls on the bids for reserve power for decreasing the production, it can call upon parts of the bids, which is necessary to resolve a transportation problem on the network. When TenneT has signaled a transportation problem, it asks the energy firms to supply a specific bid with a particular amount of electricity that can be increased or decreased and the location in the network where the power has to be supplied. TenneT selects the energy firm that has bid to supply this power at the lowest price. This bidding and TenneT's selection takes place by phone.

This is different in the case of the regulating power. TenneT automatically sends messages, the so-called delta signals, to the energy firms, which specify how much regulating power the energy firms must supply to (or withdraw from) the network. The delta signals thus indicate which parts of the bid the system operator calls upon. The delta signals change the energy programs that have been submitted by the energy firms. This gives the energy firms an incentive to respond to the delta signals; if they do not respond to the delta signals, they will have to pay TenneT for the imbalance between their changed energy programs and their actual production and consumption of electricity. These delta signals are sent by TenneT to the energy firms via a system for frequency control (Frequentie Vermogens Regeling (FVR)). This system checks every two seconds if there is an imbalance between electricity supply and

[164] The energy programs are also based on these fifteen-minute periods; for each fifteen minutes, the energy firms specify how much electricity they expect to put and take out of the network. For each day, the energy firms thus supply information on electricity generation and consumption for 96 fifteen-minute intervals to TenneT.

demand. When there is an imbalance, this system selects the most suitable bids for resolving the imbalance, and sends the delta signals to the energy firms. Every energy firm that wants to submit bids to TenneT needs a connection to this FVR-system.

6.7.2 Regulating prices and imbalance prices

The energy firms send their bids for the supply of regulating power and reserve power to TenneT on the day before the operational day. They send bids for increasing the amount of electricity that is put on the network (through an increased production or a decreased consumption) and for decreasing the input into the network (through a decreased production). They can change their bids for a particular period up until one hour before the start of this period. The energy firms include a price in their bids for which they are willing to supply the regulating power or reserve power. They give two different prices: one for increasing their input into the network, and one for decreasing their input. TenneT puts the bids in increasing order of price, and calls first on the bids with the lowest price, and then proceeds to the higher prices. All the energy firms that have supplied regulating or reserve power in a particular period are paid the price of the highest bid that TenneT had to use in that particular period (DTe and TenneT, 2004: 9). There are two bid price ladders, one for regulating power and one for reserve power. TenneT pays the energy firms for regulating power or reserve power that has increased the input into the network. And TenneT either pays the energy firms for decreasing their input into the network, or the energy firms pay TenneT for decreasing their input. This depends on the bid price ladder of a particular period. When looking at previous ladders on TenneT's website, TenneT often pays the energy firms for decreasing the input into the network when smaller amounts of electricity (100-300 MW) need to be reduced, and the energy firms pay TenneT when the decrease in volume is around 600 MW.

TenneT transfers the costs for the regulating power to the energy firms that have caused the imbalance[165]. The energy firms that had a larger offtake from (or smaller input into) the

[165] The costs that were made to resolve the transportation restrictions with reserve power are not included in the calculation of the imbalance prices. The system operators pay for the reserve power that was needed within their part of the electricity network.

network than was specified in their energy programs pay an imbalance price to TenneT. And those firms that had a larger input into (or smaller offtake from) the network receive (or pay) the imbalance price. These imbalance prices that are paid or received by the energy firms are based on the regulating prices. They also depend on the system imbalance, and thus on whether TenneT had to increase or decrease the input into the network. When TenneT had to increase the input into the network, and the energy firm decreased (increased) its input, the firm had to pay to (receive from) TenneT the imbalance price that is based on the regulating price for increasing the input. When TenneT had to decrease the input into the network, and the energy firm decreased (increased) its input, the firm had to pay to (receive from) TenneT the imbalance price that is based on the regulating price for decreasing the input. When in one fifteen-minute period, TenneT had to both increase and decrease its input into the network, the imbalance prices that the energy firms pay (or receive) cannot depend on the conditions of increase or decrease into the network. In this case, when energy firms decrease (increase) their input as compared to their energy programs they pay to (receive from) TenneT the price for increasing (decreasing) the input (TenneT, 2005: 10). The imbalance prices are thus very unpredictable, because they differ for situations when TenneT has either dispatched bi-directional or when TenneT has dispatched in one direction only (Beune and Nobel, 2001: 49). The result for TenneT will always be zero; the system operator does not make a profit on this single buyer market.

The delta signal gives the energy firms information on the price for the regulating power in a particular fifteen-minute period. When the transmission system operator has called on an energy firm's bid by sending a delta signal, the regulating price is at least equal to the bid price of the energy firm. This gives the energy firms an incentive to spread their bids, in other words, to send bids for the same fifteen-minute period to the transmission system operator with different prices. This gives them a better picture of the height of the regulating price.

6.7.3 APX intraday market

Until September 2006, the single buyer market for regulating and reserve power was the only market in which a real time price for electricity was determined. TenneT is the only party that can purchase electricity on this market. The energy firms therefore had no access to a market in which they could trade electricity for the next fifteen-minute period. The APX offered only a forward market in which electricity could be traded up until one hour before operation. Bilateral contracts between energy firms are also forward contracts. In September 2006, APX introduced the intraday market for Dutch power after renewed interest in such a market by energy firms[166]. The APX made a first attempt to such a market in 2001, but due to a lack of liquidity on this market, it was closed within a short period of time (Huisman and Huurman, 2004). On this new APX intraday market, energy firms can trade electricity for the fifteen-minute periods. This allows them to better balance their individual positions. For example, when an energy firm expects to have a larger input into (or offtake from) the network during the next fifteen minutes as compared to its energy program, it can sell (or purchase) electricity on this market. By doing so, the energy firm is not completely dependent on the imbalance system of TenneT, in which it is not entirely clear beforehand what the imbalance price will be. Previously, the energy firms could only manage their individual positions up until one hour before operation. For the one hour in between, they depended entirely on the imbalance system of TenneT. Traders thus use the intraday market to reduce the risks associated with unexpected imbalance prices charged by TenneT[167]. All contracts on this market are traded anonymously and are settled by the APX Group. The owner of TenneT (TenneT Holding B.V.) owns 72 per cent of the shares of the APX Group.

6.7.4 The attributes of the transaction

The *frequency* of these transactions is recurrent. Those energy firms that have a contract with TenneT for the supply of regulating power, and those energy firms that are obliged by the grid

[166] www.apxgroup.com (last accessed January 3, 2009).
[167] www.apxgroup.com (last accessed January 3, 2009).

code to supply reserve power, bid to supply power to TenneT on a daily basis. These energy firms can send bids for 96 periods per day, and can alter these bids during the day up until one hour before operation of a particular fifteen-minute period.

Several *investments in physical and human assets* have to be made before energy firms can bid for the supply of regulating power to TenneT. Firstly, when energy firms want to send bids to TenneT for the supply of regulating power, they need a connection to the FVR-system. To enable such a connection, the energy firms have to invest in technical facilities[168]. Secondly, the messages that include the bids for the supply of regulating and reserve power can be transferred to TenneT in the same format as is used for the energy program transactions (the EDINE-format). As was shown in the previous section on the first balancing transaction, these EDINE-messages require specific investments in human capital[169]. The specific investments in the connection to the FVR-system and in the EDINE-format are also *dedicated assets*. These investments only serve the contractual relation and the transactions with one contracting party: the transmission system operator. The transactions between TenneT and those energy firms that have a contract with TenneT for the supply of regulating power, and those firms that are obliged to supply reserve power, are characterized by *temporal specificity*. When sending the bids to TenneT, these energy firms have to comply with strict time schedules (TenneT, 2003: 10). And when receiving a delta signal on the basis of the bids for regulating power, the energy firms have to adjust their production or consumption within a few minutes. For those energy firms that bid for the supply of regulating power and reserve power to TenneT on a voluntary basis, the temporal specificity is less relevant. They can decide themselves for what day or for what particular fifteen-minute periods they want to send bids. If these firms have sent bids for the supply of regulating power, they will have to be able to increase or decrease their production or consumption within a few minutes, and then these transactions are also characterized by a substantial temporal specificity.

The transaction of supplying regulating power and reserve power to TenneT is characterized by

[168] Reactie Essent N.V. op NMa Consultatie Concentratie Energiemarkten. www.nmanet.nl, p. 4.
[169] www.slea.nl/Downloads/Load%20Management.pdf (last accessed July 20, 2008).

behavioral uncertainty. The energy firms are not always willing to supply their reserve capacity to TenneT[170], and they therefore have an incentive to disguise information about their available capacity. They may want to use the reserve capacity to balance their individual positions, or to sell it to other energy firms, instead of reserving it for TenneT. When energy firms reserve capacity for TenneT, they are not sure if TenneT will call upon this capacity, and therefore they are not sure whether they will earn an income on this reserve capacity[171]. The energy firms thus have an incentive to withhold information on their available capacity from TenneT. They may also want to use their private information on their available capacity in setting their prices. In the summer of 2003, there was a shortage of electricity supply, and TenneT had no information on the available reserve capacity, other than information from the very short bid ladder. After calls to the energy firms, it became obvious that some of them were only willing to supply their power at very high prices[172]. There is thus a behavioral uncertainty in the relation with respect to the energy firms' decisions on whether to send bids to TenneT.

6.7.5 Misalignment

Before the liberalization of the Dutch electricity industry, the balancing transactions of the supply of reserve power were internalized in the SEP. The SEP monitored the amount of electricity that was taken out of the network, and ordered generators to produce electricity in particular generating plants, and thereby the SEP balanced electricity supply and demand in real time. This vertical integration is assumed to have been aligned with the attributes of the

[170] 'Not every party bid for supplying all of its reserve capacity to TenneT' (annual report TenneT 2001: 19). 'Apparently program responsible parties control resources that are not made available either to the APX or to TenneT's market for regulating and reserve power' (Brattle Group, 2001: 27).

[171] Section 2.3 of chapter three referred to a negative externality for generators as the need to supply reserve capacity to the transmission system operator, when they could have earned a (higher) income on this electricity in a marketplace. This negative externality is seen as a reason for the comparative efficiency of vertical integration in the electricity industry.

[172] From a hearing on the design of a regulatory decision with respect to the publication of information on the availability of production capacity for resolving imbalances by the energy firms, it became obvious that the energy firms are not willing to display this information. Verslag van de hoorzitting, 23 september 2003, 13.45 – 16.00 uur. Zaaknummer: 101595. Inzake: Ontwerpbesluit TenneT. www.cogen.nl (last accessed January 3, 2009).

balancing transactions. The current balancing transactions are characterized by several types of asset-specificity and by behavioral uncertainty. From a *transaction cost economics perspective*, the vertically integrated hierarchy can still be considered as an efficient form of governance for these transactions. The rules on vertical unbundling have, however, prohibited this structure for the balancing transactions, and have thus created a *misalignment* for these transactions. An adaptation to a new form of governance had to take place.

6.7.6 The governance structure

The structure that governs this second balancing transaction is a hybrid form, in which a bidding mechanism is combined with long-term contracts between the energy firms and TenneT for the supply of regulating power and reserve power. The contracting parties retain their autonomy, but their relation is characterized by bilateral dependency. TenneT depends on the energy firms for the supply of power, and the energy firms depend on TenneT for maintaining the balance. To govern this bilateral dependency, TenneT contracts with energy firms for the supply of 250 MW of regulating power. Every year, TenneT invites energy firms to tender for these contracts. In addition, the grid code obliges the energy firms with a capacity larger than 60 MW to contract with TenneT for the supply of reserve power. On the basis of these contracts, the energy firms bid for the supply of regulating power and reserve power. Other energy firms that do not have long-term supply contracts with TenneT and that do not fall under the requirements of the grid code, can voluntarily bid for the supply of regulating power and reserve power to TenneT on this market.

The *incentive intensity* of the energy firms with respect to this second balancing transaction is characterized as an intermediate degree of incentive intensity. The incentive intensity will be described with respect to the decision to participate in the bidding mechanism, the bidding for reserve power, and the response to the delta signals. Firstly, in the transition period to the new balancing system[173], the Dutch regulator (Energiekamer) and the transmission system operator

[173] This period is referred to as the reference period. It was introduced to allow the energy firms to get acquainted with the new system of imbalance prices. During this period, from the 1st of July 1999 until the 31st of December 2000, the imbalance price was set at 0.

aimed at first to rely solely on a bidding mechanism and on voluntary tenders for the supply of power to TenneT. 'But by mid 2000, there was an unsuccessful tender for regulation and reserve power' (Beune and Nobel, 2001: 48). At that time, the regulator concluded that a market for reserve power was not likely to emerge in the Dutch electricity industry, because the electricity generators were not willing to contract with the transmission system operator for the supply of the necessary reserve capacity[174]. The grid code was thereafter extended with the obligation to all energy firms with a capacity of more than 60 MW to offer reserve power to TenneT. One reason for this lack of interest is that the energy firms have to reserve a particular amount of capacity, while they are not sure if TenneT will call upon this capacity. The energy firms are thus not sure if they get paid for their reserve capacity. On the APX or in bilateral contracts, the energy firms could have been sure to sell their electricity and earn an income. The energy firms that have contracts with TenneT for the supply of regulating power do receive a fixed fee for signing these contracts. Another reason is that on the APX, the energy firms can ask almost any price they want for their electricity. On the single buyer market, the energy firms normally have an incentive not to set their prices too high, because the imbalance prices are based on the prices for regulating power (Beune and Nobel, 2001: 52). If an energy firm, by some unexpected event, deviates from its energy program and creates an imbalance, it has to pay this imbalance price that is based on the regulating price.

Secondly, when energy firms are bidding for the supply of power to TenneT, their incentive intensity is not very high either. The real-time regulating prices are not known to the energy firms. The bid price ladder and the delta signals can be used to provide some information on these prices, but this information is very limited in its ability to predict the level of the regulating prices[175]. The energy firms can thus hardly alter their future behavior - in terms of future bids to TenneT or in terms of buying or selling electricity on the APX intraday market to

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[174] Besluit van de directeur van de Dienst uitvoering en toezicht Energie op de bezwaren ingebracht tegen zijn besluit van 21 december 2000, nr. 00-124 tot wijziging van de voorwaarden als bedoeld in artikel 31, eerste lid, onder a en onder c van de Elektriciteitswet 1998 (wijziging van de Netcode, Systeemcode en Begrippenlijst). Nummer: 100264/6.

[175] www.tennet.org/bedrijfsvoering/Systeemgegevens_voorbereiding/Aangeboden_regel_en_reservevermogen/Biedprijsladder.aspx (last accessed July 20, 2008).

settle their individual balance positions - to earn an income (in the form of paying a reduced amount for the imbalance that was caused by the energy firm, or of sending better informed bids to TenneT).

Thirdly, the energy firms do have a high incentive to react to the delta signals. If they do not respond to these signals, they have to pay TenneT for the imbalance that they have caused. The imbalance prices are very unpredictable, and therefore the energy firms will prefer to react to the delta signal, to reduce the risk of being confronted with very high imbalance prices.

To conclude, only when the energy firms have bid for the supply of regulating power, they have a high incentive to respond to the delta signals. The incentive of energy firms to engage in this second balancing transaction with TenneT has not been very high. When obliged to transact, the incentive intensity of bidding for the supply of power to TenneT is not very high either.

The *administrative apparatus* of governance structures are the mechanisms that support the functioning of these structures. It includes mechanisms to check whether the other contracting party is living up to the contractual agreements. For this second balancing transaction, these mechanisms include a monitoring of the network users by taking measurements of the input and offtake of electricity from the network. Whether energy firms have not responded to the delta signals is determined by taking these measurements. The administrative apparatus also includes a penalty (in the form of paying the imbalance price) for energy firms that do not react to the delta signal. The administrative apparatus of this governance structure also includes various information disclosure mechanisms. The system code states that TenneT should have access to up to date information of the energy producers with a connected capacity of more than 60 MW[176]. In addition, after the shortage of electricity supply in the summer of 2003, the system code was altered to include the following information disclosure mechanisms. Firstly, every production firm with a capacity of more than 5 MW has to inform the transmission system operator every three months of the capacity of its different electricity production plants for each day for the next twelve months. Secondly, when there is a change to the available

[176] Article 2.2.7 of the system code.

production capacity, the production firms have to send this information to TenneT within 24 hours. Thirdly, the energy firms with a capacity of more than 5 MW have to send information to TenneT on a daily basis on their available capacity that can be used for regulating the balance[177]. TenneT publishes this information on the same day[178].

The *contracts* between TenneT and the energy firms for the supply of reserve power and regulating power are *long-term*. The energy firms with a capacity of more than 60 MW are obliged to supply reserve power to TenneT. They will have this obligation as long as they are connected to the network, and therefore they have a long-term relation with TenneT for the supply of reserve power. The contracts for the supply of regulating power have a duration of one year. TenneT invites tenders for these contracts on an annual basis. Those energy firms that contract with TenneT for regulating power receive a fixed income that is financed out of the system tariff (in addition to the regulating price when TenneT calls upon the energy firms' bids) (Wals et al., 2003: 26). A maximum and a minimum price for which the energy firms can bid for the supply of regulating power are specified in these contracts. These prices are linked to the APX price (DTe and TenneT, 2004: 7). The system code specifies the procedures for determining the regulating prices. These procedures can be changed by altering the system code. Section 6.6.3 has discussed how changes can be made to the system code. The contracts for the supply of regulating power and reserve power are therefore *flexible*; they do allow for changes to their contents. The board of directors of the competition authority settles the *disputes* between the transmission system operator and the energy firms on how the transmission system operator executes its tasks.

In summary, the new governance structure for the supply of regulating power and reserve power to TenneT that allows the transmission system operator to balance electricity supply and demand and to resolve transportation restrictions in real time is a hybrid form. It combines a bidding mechanism with long-term contracts and regulation. It is characterized by an

[177] Article 2.4 of the system code.
[178] Article 2.5.3 of the system code.

intermediate degree of incentive intensity, a monitoring of network users, penalties and information disclosure mechanisms, and by long-term, flexible contracts and dispute resolution by the competition authority.

6.7.7 Adaptation

In the transition period from an internal balancing by the SEP to the new governance structure for the second type of balancing transaction, the Dutch sector-specific regulator and the transmission system operator aimed at first to set up a single buyer market on which the energy firms would voluntarily bid for the supply of regulating power and reserve power. The energy firms would also have to voluntarily tender for the contracts with TenneT for the supply of this power[179]. Within the proposed framework of adaptation, to achieve such a market, TenneT would have to adapt unilaterally, respond to price signals, and not care for the identity of the contracting parties. However, TenneT did not adapt unilaterally to the new form of governance. 'Various firms in the Dutch electricity industry and the distribution system operators were closely involved in the introduction of the new system for balancing' (TenneT, 2001: 19). The Dutch sector-specific agency regulated the contracting for the supply of reserve power. In this regulated search for a governance structure for the reserve power transactions, the regulator involved the energy firms, the transmission and distribution system operators[180]. The adaptation to the new form of governance was thus a *multilateral* adaptation. TenneT did not adjust to the new form of governance by taking into account only the price that it had to pay for the regulating power and reserve power. If this were the case, the transmission system operator could have only set up a single buyer market and call on the bids with the lowest price. In order to ensure the safety of the electric system and thus the balance of supply and

[179] Besluit tot wijziging van de voorwaarden als bedoeld in artikel 31, eerste lid a een onder c van de Elektriciteitswet 1998 (wijziging van de Netcode, Systeemcode en Begrippenlijst). Number 00-124, date: 21st of December, 2000, page 4.

[180] Besluit van de directeur van de Dienst uitvoering en toezicht Energie op de bezwaren ingebracht tegen zijn besluit van 21 december 2000, nr. 00-124 tot wijziging van de voorwaarden als bedoeld in artikel 31, eerste lid, onder a en onder c van de Elektriciteitswet 1998 (wijziging van de Netcode, Systeemcode en Begrippenlijst). Number: 100264/6, date: December 14, 2001.

demand, TenneT contracted with generators for the supply of regulating power, and it submitted the proposal to the regulator for changing the grid code to include the obligation for energy firms of supplying reserve power. TenneT also proposed to the regulator to include additional information disclosure mechanisms in the system code. Since these changes to the system code took effect, the energy firms are obliged to supply TenneT on a daily basis with information on their available capacity. TenneT has indicated that it needs this information to ensure the security of supply for the short and long term[181]. The transmission system operator and the regulator did consider the requirements of the *electric system* in their adaptation to the new form of governance. In certain cases, the transmission system operator cannot solely rely on the bid ladder for information on the available capacity. The regulator consulted with various parties on this regulatory decision, including the energy firms, APX, industrial consumers of electricity, and EnergieNed (the association of energy producers, traders and retailers in the Netherlands)[182]. The *identity of the contracting parties* was relevant. They had to be large electricity generators that could supply electricity to the Dutch network and that had the organizational and technical capabilities to alter their input and offtake from the network automatically. At that time, there were only four large electricity generators in the Dutch electricity industry that were obliged to have these technical facilities[183].

The process of adaptation was thus characterized by a multilateral response to system requirements in which the identity of the contracting parties was relevant. This adaptation process can explain the governance transformation to the hybrid form. The type of adaptation can be summarized as one of *autonomous adaptation* between governance structures, because a transformation from the vertically integrated hierarchy of the SEP to a hybrid form took place.

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[181] Verslag van de hoorzitting, 23 september 2003, 13.45 – 16.00 uur. Zaaknummer: 101595. Inzake: Ontwerpbesluit TenneT. www.cogen.nl, (last accessed January 3, 2009), page 2.

[182] These parties displayed different opinions on the proposed change to the system code. The energy firms were not in favor of supplying detailed information to TenneT, whereas the participants of the APX preferred the transparency of the information.

[183] Besluit van de directeur van de Dienst uitvoering en toezicht Energie op de bezwaren ingebracht tegen zijn besluit van 21 december 2000, nr. 00-124 tot wijziging van de voorwaarden als bedoeld in artikel 31, eerste lid, onder a en onder c van de Elektriciteitswet 1998 (wijziging van de Netcode, Systeemcode en Begrippenlijst). Number: 100264/6, date: 14 December 2001, page 2.

6.7.8 The role of regulation

Regulation influences this governance structure between the energy firms and TenneT in several ways. Firstly, the regulator has set several ex ante rules for the governance structure. The system code specifies the procedures for determining the regulating prices and the imbalance prices[184]. The imbalance price is based on the regulating price, and therefore the incentive intensity of the energy firms in the bidding process is reduced. The energy firms cannot entirely increase their income by transferring higher bids for the supply of regulating power, because if by some unexpected event they deviate from their energy programs, they have to pay the imbalance price that is based on the regulating price. Regulation thus gives the energy firms an incentive to minimize their bid prices. The system code also requires that the energy firms inform TenneT of their available production capacity[185]. In addition to this information disclosure mechanism, other administrative control instruments, such as the monitoring and the penalty of the imbalance price, are determined by regulation. Regulation also determines the long-term nature of the contracts for the supply of reserve power, and the flexibility of the contracts for the supply of regulating power and reserve power. Secondly, regulation has reduced the adaptation costs for the transmission system operator and the energy firms. By obliging the supply of reserve power, the regulator has reduced the search, bargaining and negotiation costs for adapting towards the hybrid form of governance for both the energy firms and TenneT. The regulator has also reduced the search costs for TenneT, and in particular the costs of searching for contracting parties that can supply reserve power to the transmission system operator. Thirdly, the regulator has also stimulated the contracting between TenneT and the energy firms for the supply of 250 MW of regulating power by imposing a regulatory threat on the energy firms. The obligation of supplying power for energy firms with a capacity larger than 60 MW would at first also apply to regulating power, and not only to reserve power. The energy firms responded by voluntarily contracting with TenneT for this regulating power, and therefore only the obligation to supply reserve power was included

[184] Article 3.9 of the system code.
[185] Article 2.4 of the system code.

in the grid code. Fourthly, the regulator also influenced the attributes of adaptation. When taking the regulatory decision on the obligatory supply of reserve power, it enforced a multilateral response to the new governance structure, by involving the transmission and distribution system operators and the energy firms in the decision. This same regulatory decision led to a governance structure in which not only the price, but mainly the security of supply is taken into account. Finally, regulation is part of the governance structure, because it settles the disputes between the transmission system operator and the network users.

6.8 Switching transactions

The governance transformations that have been discussed in the previous sections (6.4 until 6.7) were mainly influenced by the regulations on the vertical unbundling of the integrated energy firms. New forms of governance had to emerge to coordinate the unbundled relations between the system operators and the network users for a connection and an access to the network, and a balancing of electricity supply and demand. Before the liberalization, these network connection, network access and balancing transactions were internalized in the vertically integrated firm. The transactions that will be discussed in this section, the switching transactions, and their governance, are mainly influenced by the regulations on the introduction of consumer choice into the industry. The 2003 EC electricity directive demanded that by July 2004 all non-household consumers are free to choose their electricity retailer, and that by July 2007 every consumer is free to choose its retailer in the European Union. In the Dutch electricity industry, the electricity consumers can choose their retailer for green electricity since July 2001, and for grey electricity since July 2004. The Dutch regulations have thus demanded a faster implementation of consumer choice than was required by the EC directives. The rules on consumer choice are included in the directives to introduce competition into the supply of electricity, with the result that the incumbent electricity firms loose their monopoly in their particular region. These rules aim to stimulate the entry of new electricity retailers into the European electricity industries. Currently, the Energiekamer grants 41 licences to various energy firms to retail electricity in the Dutch electricity industry[186]. The distribution system operators retain their monopoly for their part of the electricity network. When consumers are given a choice, and may thus switch to a different retailer, information has to be exchanged between the consumer, the old and the new retailer, and the distribution system operator. This exchange of information on the switching consumer and its meter readings is the *switching transaction*.

Article 24a of the electricity law of 1998 states that the system operator is responsible for implementing the switch, and that additional rules should be set on the term within which the system operator implements the switch. These additional rules have been formulated in the information code. This code defines the responsibilities of the various parties in the electricity industry with respect to the exchange of information between the parties. It specifies what information has to be exchanged and within which time periods, and it describes the switching process that has to be followed when switching consumers to a different retailer. This switching process consists of several steps. Firstly, the consumer authorizes its (potentially) new electricity retailer to start the switching process, after which this retailer sends information on the switch to the system operator, including the network connection number of the switching consumer (EAN-code), the intended switch date, and the name of the program responsible party after the switch[187]. Secondly, the system operator checks among others whether this notification of the switch is complete, whether the connection number is correct and if there are no other switch requests for the same connection. When the system operator intends to execute the switch, it informs the old and new retailer the day after it has received the notification of the switch. Thirdly, the system operator executes the switch by making changes in the so-called connection register on the indicated switch date. Every system operator in the Dutch electricity industry manages a connection register for all the connections in its part of the network. For each EAN-code, the registers include information on the name of the electricity consumer, the address of the connection, the current electricity retailer, the

[186] www.energiekamer.nl (last accessed January 3, 2009).
[187] Section 2.7 of the information code of April 2008 prescribes the switching process.

program responsible party, the transportation capacity on the connection, how electricity is measured on the connection, and the name of the firm that is responsible for measuring the electricity use[188]. Finally, maximum fifteen days after the switch date, the new retailer has to send the meter readings of the switch date to the system operator. When the consumer has not sent the meter readings to the electricity retailer, the system operator can take the meter reading or make an estimate. This has to be done before the 21st day after the switch date. Before the 30th day, the system operator has to communicate the meter readings to the old and new retailer.

6.8.1 The attributes of the transaction

The *frequency* of the switching transaction is recurrent. The organization that facilitates the exchange of switching information between the retailers and the system operators is EDSN (Energie Data Services Nederland). This organization reports to process 62,000 switch requests per month[189], and to exchange more than 100 billion messages per year[190]. In June 2007, 23 independent electricity retailers[191] operated in the Dutch electricity industry (NMa/DTe, 2007: 6). This means that, on average, each of these retailers processed 270 switch requests per day[192]. However, the three largest Dutch energy firms supply electricity to around eighty per cent of the industry, which means that the largest amount of the switch requests affect these companies, and they will thus process a number of switches that is much higher than the 270. For the system operators, that are responsible for implementing the switch, the amount of switches per day is also higher than the 270, simply because there are fewer system operators than there are retailers. The frequency of these transactions may therefore be characterized as recurrent.

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[188] Articles 2.1.2 and 2.1.3 of the information code state what is included in the connection registers.
[189] www.edsn.nl/default.asp?id=200 (last accessed September 6, 2008).
[190] www.energiegids.nl (last accessed September 3, 2008).
[191] In January 2009, the Energiekamer grants 41 licenses to various energy firms to retail electricity. A holding company may include more than one retailer, and may therefore have more than one license to retail, which explains the lower number (of 23) for the independent retailers.
[192] 62,000 divided by 23 is 2695, divided by twenty working days per month is 135, and this has to be multiplied by two, because there are always two retailers involved in one switch request.

The information on the switch of retailer can be exchanged between the various parties in the same electronic format as the messages on the t-programs and e-programs, which is the so-called EDINE-format. As sections 6.5.1 and 6.6.1 have shown, the use of this EDINE-format requires *specific investments in human capital*. In addition to these EDINE-messages and the exchange through the central postbox that is managed by TenneT, another format and way of exchanging messages has been developed in the Dutch electricity industry. In July 2001, two incumbent energy firms, Eneco and Essent, set up the Energie Clearinghouse (ECH)[193] to simplify the information exchange between parties in the electricity industry. The focus of ECH was on the information exchange to enable the consumers to switch retailer. At that time, the EDINE-format already existed. The first messages that were exchanged through the ECH were comparable to the EDINE-format, but later they were altered to meet the requirements of the energy firms, and more information was added to the messages. In October 2007, the organization that managed the EDINE-standard merged with the Energie Clearinghouse, and together they currently operate under the name of EDSN. The system operators are the shareholders of EDSN, and the representatives of the electricity retailers, program responsible parties, measurement responsible parties, and system operators, sit on the board of directors of EDSN (ECN, 2006: 5). EDSN takes over some of the responsibilities of the electricity retailers and the system operators in the switching process; it receives the messages from the retailers and sends them to the system operators. The retailers do not need to communicate directly with the different system operators. EDSN also checks the correctness of the switch requests, which would otherwise have been done by the system operators. The energy firms that contract with EDSN pay for its services, while the exchange of information through the central postbox of TenneT is for free. A large share of the messages (around 98 per cent) for switching retailer is exchanged through EDSN[194], as opposed to the central postbox of TenneT. Messages in the EDINE–format can also be exchanged through EDSN. Of all the energy firms that retail electricity, 43 per cent use the EDINE-format and 57 per cent use the EDSN (former ECH)

[193] www.energiegids.nl (last accessed September 5, 2008).
[194] www.energiegids.nl (last accessed September 5, 2008).

standard[195]. The program responsible parties, system operators, and electricity retailers need to meet certain requirements before they are allowed to make use of the EDSN switching services (EDSN, 2005). They need to show that they are familiar with the various services of EDSN, the codes of the regulator, the switching process, the messages that need to be sent in this process, EDSN contact information, and EDSN support services. Their information technology, the security of this technology, and the interface of this technology with EDSN have to conform to certain standards that are set by EDSN. They also have to be trained on how to send messages to EDSN and how to receive messages. As comparable to the EDINE-messages that are exchanged through the central postbox of TenneT, these switching messages that are send through the EDSN system need substantial *investments in human capital*. Employees have to be trained so that the energy firms can meet the above requirements. The investments in human capital are also *dedicated assets*; they are dedicated to one contracting party, which is EDSN.

The information code describes what information the parties to the switching transaction have to exchange, and within which time periods. The energy firms have implemented the requirements of this code into a more detailed description of the switching process. This thousand-page document, which is referred to as the Reference Model, defines and names the various messages that are involved in the switching process, and describes which of these messages have to be exchanged between which parties. In addition, EDSN has published a description of the services that it provides to the retailers and system operators[196], which also includes detailed information on the switching process. These documents are all very explicit on what is expected from each transacting party, and within which time period. The Dutch regulator has, however, reported that it received signals that the switching process is not taking place as it should[197].

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[195] www.edsn.nl/default.asp?id=338 (last accessed September 5, 2008).

[196] www.edsn.nl/docs/Dienstbeschrijving/ech_dienstbeschrijving_uitvoeren_leverancierswitch_electriciteit_v9.0.pdf (last accessed September 9, 2008).

[197] Bindende aanwijzing voor drie netbeheerders, press release December 2nd 2002. www.dte.nl (last accessed September 7, 2008).

In the Dutch electricity industry, the distribution system operators are legally unbundled from the retailers and the generators of electricity, but they are still located under the same holding. In 2011, the ownership unbundling has to be implemented, and the distribution system operators are not allowed anymore to be located under the same holding as the generators and retailers. In the current structure, the distribution system operators may still have an incentive to favor the electricity retailers with which they have an organizational relation. With respect to the switching transaction, this would mean that the system operators do not have an incentive to switch consumers from the related electricity retailer to another energy firm. The Dutch regulator has observed that the distribution system operators have indeed displayed behavior with which they aim to obstruct or complicate the switching of consumers to independent retailers in several ways[198]. Firstly, the regulator observed that three distribution system operators did not implement switches of an independent retailer while there was no reason for not executing these switches according to the regulations. Secondly, the system operators did not implement switches and provided reasons for the refusals that were not mentioned in the regulations. Thirdly, the system operators did not execute switches within the set time periods. This indicates that the system operators do indeed display opportunistic behavior in the switching transaction. In a recent monitor of the Dutch electricity industry by the regulator, several retailers have also indicated to experience problems with the slow supply of measurement data by the system operators. When the retailers do not receive this data, they are not able to send electricity bills to their new consumers, and this leads to liquidity problems, especially for the new entrants (NMa/DTe, 2007: 21). In this monitor, the new entrants also claim that mistakes are made in the switching process, and that this creates high costs, and reduces their ability to acquire new customers. When integrated electricity retailers experience problems with switching, they can solve these problems relatively quick and with less costs as compared to the new entrants, because these incumbents have personal contacts with the employees of the system operators (NMa/DTe, 2007: 21-22). The switching transaction is thus

[198] Bindende aanwijzing voor drie netbeheerders, press release December 2nd 2002. www.dte.nl (last accessed September 7, 2008).

characterized by a *behavioral uncertainty*; the new entrant retailers may be disadvantaged by the opportunistic behavior of the distribution system operators.

6.8.2 Misalignment

Before the liberalization, the switching transactions did not occur very often. The integrated electric utilities only performed a switch when electricity consumers moved to a different region. These consumers switched to a different integrated electric utility. The behavioral uncertainty in these transactions was very low; the regional electric utilities were not in competition with each other, and did not have to display opportunistic behavior to retain a consumer, and to obstruct the switching process. These transactions are somewhat different from the current switch of retailer in the liberalized industry. The latter transactions only involve a switch of retailer, and the electricity consumers retain the same regional system operator. The system operator, who is responsible for making the switch and for gathering the meter readings, facilitates the exchange of information on the switching consumer between the old and the new retailer. This switching transaction is vital to an industry in which new energy firms must be able to enter, and in which these new energy firms must be enabled to compete with the incumbents. The new rules on the introduction of consumer choice that have stimulated the competition, have led to an increase in behavioral uncertainty in the switching transactions, and have thereby created a *misalignment*.

6.8.3 The governance structure

The governance structure that has emerged for the switching transactions is a hybrid form. The retailers and system operators need to exchange information on the switching consumer, and a third party, EDSN, facilitates this exchange. The energy firms have agreed that before they send a switch request to EDSN, they will first check whether the electricity consumer, that is willing to switch, does not have any other electricity supply contracts with another retailer that cannot be cancelled in the short term. A database was set up with information on these electricity supply contracts that includes the date at which the contract can be cancelled, the period of notice of termination of the contract, and whether the contract has already been cancelled. EDSN also manages this database (Contract Controle Protocol), and thus facilitates the exchange of information on the electricity supply contracts. The energy firms transfer data on their contracts with consumers to EDSN on a weekly basis. An information disclosure mechanism thus characterizes the *administrative apparatus* of this governance structure. The administrative apparatus is also characterized by monitoring. EDSN monitors the quality of the switching transaction, and in particular how fast the response was to switch requests, how fast the measurement data were supplied, and how fast the switches were completed[199]. The energy firms can check their own performance and how it compares to the industry average. The regulator also monitors the quality of the switching transaction (NMa, 2006: 18), which means that regulation is also part of this governance structure. The regulator enforces the contracts between EDSN and the system operators: it has given three system operators a binding instruction, because they were not implementing switches that were requested by an independent retailer, and they were not performing switches on time[200].

The *incentive intensity* of the electricity retailers is of an intermediate degree. The electricity retailers have an incentive to participate in the governance structure for switching transactions, because it may increase their number of electricity consumers. The retailers will earn a higher income when more consumers switch to their firm. A governance structure that enables a coordination of the switching process may also reduce the costs of switching consumers. The incentive intensity is, however, reduced, because the electricity retailers also need to contribute in this governance structure to the switching of their customers to competitor firms.

In 2007, a new association was set up, referred to as NEDU, that serves as a platform in which the electricity retailers, system operators, and program responsible parties may propose adjustments to the switching process and the switching messages to improve the exchange of

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[199] www.edsn.nl/docs/Specificatie/bfi_bedrijfsspecifieke_gegevens_switches_v1.0.pdf (last accessed September 7, 2008).

[200] Bindende aanwijzing voor drie netbeheerders, press release December 2nd 2002. www.dte.nl (last accessed September 7, 2008).

information among the parties. This association is a client of EDSN, and purchases the switching services from EDSN. NEDU and EDSN have signed a l*ong-term contract* for the supply of the switching services to the members of NEDU, which include the electricity retailers, system operators, program responsible parties, and measurement responsible parties. This long-term contract is a so-called framework agreement in which the terms and prices for the orders that NEDU places with EDSN can be set when the services are demanded. The agreement is signed for a period that extends beyond five years[201]. The orders may include defining new messages, describing the processes for the exchange of information, and designing changes to the EDSN system that supports the exchange of the switching messages[202]. The agreement is thus highly flexible. The association and the framework agreement with EDSN have been set up, with the express intention, to facilitate making changes to the current agreements between the parties to the switching transaction. When a system operator is a party to a conflict on a switching transaction, the board of directors of the competition authority may resolve the *dispute*.

In summary, the new form of governance for the switching transactions is a hybrid. It is characterized by an intermediate incentive intensity, information disclosure mechanisms, monitoring, and long-term, flexible contracts. The regulator is part of this governance structure: it monitors the quality of the switching transactions, and enforces the agreements with binding instructions.

6.8.4 Adaptation

The *identity of the contracting party* is highly relevant; the majority of the economic actors in the electricity industry have chosen to contract with EDSN for the switching services (98 per cent of the switching messages is exchanged through EDSN). The electricity retailers that want to request a switch, will send this request to EDSN. The system operators that have a

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[201] www.edsn.nl/docs/Algemeen/communicatiedocument_-_v2_1.pdf (last accessed September 9, 2008). Page 25.
[202] www.edsn.nl/docs/Algemeen/communicatiedocument_-_v2_1.pdf (last accessed September 9, 2008). Page 6.

responsibility for executing the switch, and for establishing the meter readings, communicate their approval of the switch and the meter readings to EDSN.

The search for this current contracting party (EDSN), and for this form of governance, in which information is exchanged through EDSN, has involved many of the economic actors in the industry. In June 2000, the Ministry of Economic Affairs installed a platform for facilitating the changes towards a liberalized energy industry (Platform Versnelling Energieliberalisering, PVE). Participants in this platform were the transmission system operator, employers' organizations, the Ministry of Economic Affairs, and various associations to which the energy firms are connected. One of these associations for retailers, traders and generators in the Dutch electricity industry (EnergieNed) set up a support program that facilitated the implementation of the rules, as developed within PVE, for a liberalized industry. This support program, (Support Programma Opening Energiemarkt Derde fase, Spoed!), formulated an industry-wide planning for the changes that had to be made before the introduction of consumer choice; it translated the codes into the Reference Model; and it enabled the energy firms to practice with the administrative processes of switching. In July 2004, when every consumer was able to choose its retailer, the activities of the platform and the support program were ended. Some of the activities were continued in B'con, which was an organization that monitored the information exchange between the energy firms to improve the quality of this exchange. It implemented the changes in legislation and the codes into the Reference Model, and organized industry-wide tests for changes to the model. B'con merged with ECH and the organization that implemented the EDINE-standard into EDSN. The adaptation towards the new form of governance can thus be characterized as a *multilateral adaptation*; the Ministry of Economic Affairs facilitated the start to the new structure; the various energy firms were involved, including the retailers, system operators, and new entrants, through their associations; and the regulator formulated the codes that had to be implemented into the firm-level agreements. The actors involved in the adaptation process are also the parties to the hybrid form of governance, including the system operators, old and new retailers, and the regulator that monitors the switching process.

The adaptation to the hybrid form of governance occurred, because the economic actors have to take the *electric system* into account. The switching to another retailer is more complicated in the electricity industry than in other industries, because the parties to this transaction have to consider the presence of the electricity network. The electricity consumers cannot, as in a market, change to a new firm every day without exposing the details of their previous retailer and use of the service. The electricity meters have to be read on the switching day in order to allow the old and new retailers to send correct bills to the consumers. Every meter is located near the network connection. In most cases, the system operators own the meters and are responsible for the meter readings. The system operators are therefore involved in the exchange of switching information between the old and the new retailers. The switching is also more complicated in the electricity industry, because the electricity network has natural monopoly characteristics and the distribution system operators retain their regional monopolies. The switching consumer retains its connection and transportation agreement with the system operator, but signs a new supply contract with the new retailer. The system operator needs to register this change of retailer in the connection, because it needs to know to which retailer to send the future meter readings. Since 2007, EDSN has taken over some of the activities of the system operators.

This adaptation process, characterized by a search for a relevant contracting party, and a multilateral adaptation that takes the system requirements into account, explains the emergence of the hybrid form of governance. Before the liberalization, switching transactions occurred only when electricity consumers moved to a different region. The integrated energy firms exchanged information on the consumers bilaterally. These transactions have thus always been governed by a hybrid form, but a *governance transformation* from the bilateral to the trilateral form occurred. In the current governance structure for the switching transactions, the third party, EDSN, facilitates the exchange of switching information between the retailers. With transaction cost economics, the emergence of the trilateral form is difficult to explain with an increase in the frequency of the transactions (see figure 2.2 in chapter two). When considering the economic actors that are involved in the multilateral adaption and that have to take the system requirements into account, the emergence of the trilateral form can be understood.

6.8.5 The role of regulation

The role of regulation, in terms of the ex ante rules of the game, is more limited when compared to the previous transactions. The 1998 electricity law obliges the system operators to execute the switch, and the information code describes the responsibilities of the various parties in the switching process. Articles 31 to 34 of the 1998 law also describe how the rules for the exchange of measurement data have to be formulated, and which economic actors have to be involved in the formulation of these rules. The economic actors must include the system operators, representative organizations of the parties in the electricity industry, and the regulator. Regulation is part of the governance structure; it monitors the quality of the exchange of information on the switching consumer, and it has given the system operators a binding instruction.

6.9 Conclusion

When considering all these governance transformations, it must be concluded that regulation still plays a large role in this Dutch electricity industry that policymakers, at the European and national levels, have aimed to liberalize. Regulation sets the ex ante rules of the game for the governance structures, it becomes part of the new forms of governance, it influences the attributes of the transactions, and it has guided the adaptation process to the new forms of governance. It has been illustrated that for several transactions, TCE has not been able to explain the emergence of the particular form of governance. Only when looking at the process of adaptation can the transformations to the governance structures be understood.

Before the liberalization of the Dutch electricity industry, the network connection transactions between the generators of electricity and the transmission system operator were vertically integrated. The rules on vertical unbundling have, however, created a misalignment between these transactions and their governance. The transacting parties were led to search for another governance structure for transactions that were still characterized by behavioral uncertainty and asset-specificity, and for which the hierarchy is thus considered to be an efficient structure. The regulator has further stimulated this misalignment through its influence on the attributes of the transactions. It encourages the network users to make site-specific investments through its regulation of the network connection tariffs. These tariffs increase when plants are located farther away from the network. The new structure that has emerged is a long-term connection contract that is governed by regulation. The regulator enforces the individual network connection contracts, and resolves the disputes between the contracting parties. The adaptation process is able to explain the emergence of this hybrid form of governance: the economic actors have adapted multilaterally, and took the requirements of the electric system into account, and searched for a contracting party with an identity that was highly relevant. This contracting party had to be able to provide a connection to the electricity network. The difference with transaction cost economics is that in this case the analysis has also focused on the regulation of an unbundled connection transaction between firms as compared to the regulation of the vertically integrated utility that is providing a bundled service to consumers.

The rules on vertical unbundling have also created a misalignment for the transactions that exchange the transportation programs to access the network, and for those transactions that exchange the energy programs to balance electricity supply and demand. But for these transactions, the regulators have ex ante aligned the incentives of the system operators and the network users, and thereby they have removed the behavioral uncertainty in the transactions. Transaction cost economics argues that there is no need for a governance structure when behavioral uncertainty is absent. However, hybrid forms of governance did emerge for these network access and balancing transactions. The regulator has become part of these governance structures; it monitors the implementation of the contractual agreements and resolves the disputes. In contrast to TCE, the adaptation process is able to explain these governance transformations to a hybrid form. The regulator has determined that the adaptations should take place multilaterally, and that the economic actors should take the requirements of the system into account when adapting to the new forms.

The transactions for the supply of reserve power to the transmission system operator used to be internalized in the SEP. In the unbundled environment, the regulator and the transmission system operator tried to set up a market form of governance for these transactions, in which they wanted to rely solely on a bidding mechanism and on voluntary tenders. The generators were, however, not willing to contract with the system operator for the supply of reserve power, and the regulator had to oblige these contracts. The adaptation process did not predict a transformation to the market, but instead the emergence of a hybrid form of governance. The economic actors adapted multilaterally, took the system requirements into account, and recognized the relevance of the contracting party. A hybrid form, that combines long-term contracts with a bidding mechanism, did in fact emerge for these transactions. Regulation is also part of this governance structure; the regulator resolves the disputes. Since these transactions used to be aligned in a vertically integrated hierarchy, and they are still characterized by behavioral uncertainty and asset-specificity, the current hybrid form may be regarded as a second best solution.

The regulator has increased the behavioral uncertainty in the switching transactions. By introducing consumer choice into the electricity industry, the contracting parties to the switching transactions have an incentive to obstruct the transfer of information in order to retain their customers. The ex ante regulations thus create a misalignment, because before the introduction of competition the parties to the switching transaction did not have such incentives. A trilateral form of governance has emerged, in which the regulator monitors whether the contracting parties live up to their contractual agreements, and enforces the agreements. The adaptation process is able to explain the transformation to this hybrid form.

7 – The French Electricity Industry

Since the nationalization law of 1946, the French electricity industry is characterized by an extensive vertical integration. The incumbent energy firm, Electricité de France (EDF), has a national monopoly in the transmission of electricity. It distributes electricity to more than ninety per cent of the French consumers, and is by far the largest generator and supplier of electricity in the French electricity industry. Even in the annual report of 2007, more than ten years after the first EC electricity directive, EDF writes that it is an integrated energy firm that is active in generation, transportation, distribution, supply and trade of electricity (EDF, 2007: 12). In France, the vertically integrated structure of EDF is regarded as economically efficient. Neither the government, the interest groups, nor the public favors the liberalization of the electricity industry (Finon, 2003: 259). This is illustrated by the late transposition of the first European electricity directive of 1996 into French legislation in February 2000. It has been argued that 'the aim of the French reformer is not to favour the development of competition per se, but to respect the Directive a minima' (Finon, 2003: 260). In 2007, EDF implemented the requirements of the 2003 EC directive, and legally unbundled its transmission and distribution system operators from electricity generation and retail. These system operators are currently subsidiaries of EDF, and are therefore still located under EDF's holding structure.

The following section discusses the governance structures that characterized the French electricity industry before the liberalization in more detail (section 7.1). Section 7.2 introduces the French regulations that implement the European directives of 1996 and 2003. Section 7.3 characterizes the French institutional organization of regulation, and thus the French public authorities that formulate, execute and enforce the electricity regulations, the regulatory responsibilities and objectives of these public authorities, and the coordination mechanisms that structure the relations between the authorities. Sections 7.4 until 7.7 discuss the governance transformations of the network connection, network access, balancing and switching transactions. The characteristics of each new governance structure and the governance transformation are discussed, and these are explained by respectively the attributes of the transactions and the attributes of adaptation. The role of the new regulations in each of the governance transformations is analyzed.

7.1 Governance before liberalization

7.1.1 The vertical integration of EDF

The nationalization law of 1946 created Electricité de France. EDF was given control over almost all of the generation and distribution of electricity, and over the entire transmission network, and the export and import of electricity.

Several small electricity firms that generated less than twelve million kWh of electricity per year were excluded from nationalization, as were the Compagnie Nationale du Rhône (hydroelectricity), Charbonnages de France (coalmines) and SNCF (railways). These independent firms have always been responsible for a very small part of total electricity generation. The annual report of EDF of 1996, just before the liberalization of the industry, mentioned that EDF produced 93 per cent of electricity in France in that year. Furthermore, EDF owned parts of the independent electricity generators. It owned seventeen per cent of the Compagnie Nationale du Rhône[203], and it still has a nineteen per cent share of a former subsidiary of Charbonnages de France[204], called Société Nationale d'Electricité Thermique. The Compagnie Nationale du Rhône (CNR) mandated EDF to operate and sell its hydro production (Finon, 2003: 262). The decree of 20 May 1955 obliged EDF to purchase and transport electricity of these independent generators. EDF had to offer a contract to autonomous producers for the purchase of their surplus electricity for a period at least equal to the term of the depreciation period applicable to the installations (Cross, 1996: 35). This period had to last for a minimum of five years (Poppe and Cauret, 1997: 202). EDF had to purchase at the long-term avoided cost (Audigier, 1999: 7), which is the cost that EDF had incurred if it

[203] The energy firm Electrabel, part of the Suez Group, bought a 49.9 percent share in the Compagnie Nationale du Rhône.

[204] Charbonnages de France was closed at the end of 2007.

were to build the generation capacity itself. A decree in 1994 suspended EDF's purchase obligation for diesel- and fossil fuel-fired production of electricity, but not for chp and renewables-based production.

The low-voltage part of the electricity network is operated by the distributors under a concession regime. Before the 1946 nationalization law, concessions to build and operate a distribution line were granted either by municipalities, groups of municipalities (syndicats), counties (départements) or the state. Private companies that wanted to build a distribution line over public land needed a concession. Whenever a distribution line crossed private land only, no concession was necessary. In 1946, the nationalization law expropriated the private power firms and concessions were granted to EDF. EDF uses the distribution system and pays rentals to the municipalities in return. It controls around 95 per cent of the distribution of electricity (Laffont, 1996: 420). Some 200 small distribution firms were not nationalized. These include municipal utilities that did not give concessions to private firms to operate their distribution system, but that operated the distribution system themselves.

The transmission system is also operated under a concession regime. The concessions are granted to EDF by the French state and the municipalities. Article 1 of the nationalization law required the nationalization of the import and export of electricity, and gave EDF a monopoly for these activities in the French electricity industry (Cross, 1996: 44).

Because EDF has integrated around 93 percent of generation, 95 percent of the distribution and supply of electricity, and the entire transmission system for more than fifty years, many of the electricity transactions have been governed by vertical integration. EDF has had an almost complete national monopoly for these various activities in the French electricity industry.

7.1.2 The governance of the electricity transactions before liberalization

The contracting parties to the network connection and network access transactions include the generators, the transmission and distribution system operators, and the consumers of electricity. EDF has vertically integrated the network connection and network access transactions between the generators of electricity and the distribution and transmission system

operators. There were, however, some exceptions. Several independent generators of electricity have been excluded from the nationalization, and they were therefore not internalized within EDF. These firms had to develop other forms of governance, than the vertical integration, with EDF for the network connection and network access transactions. These forms of governance can be characterized as regulated long-term agreements; the decree of 1955 obliged EDF to purchase electricity from these independent generators and to transport the electricity along its network, which gave the generators access to EDF's electricity network. EDF signed long-term supply agreements with Charbonnages de France and the Société Nationale d'Electricité Thermique, which stated that these two independent generators supplied the electricity to EDF[205]. The contractual relation between EDF and the Compagnie Nationale du Rhône came close to a vertical integration of CNR into EDF. Employees of EDF operated the power plants of CNR, and produced the hydroelectricity[206]. The electricity consumers have contracted for the supply of electricity with the distributors and suppliers of electricity for a regulated tariff, and thereby obtained a connection and an access to the network.
Because EDF has a national monopoly on the transmission system and integrates the largest part of electricity generation, the balancing transactions have also been vertically integrated. The switching transactions occurred only when consumers moved to a different address. Most of these switching transactions were internalized within EDF, because EDF distributed electricity to around 95 per cent of the consumers[207].

The French electricity industry also has to implement the European directives on the creation of an internal competitive electricity market for the European Union, and thus has to move away from the vertically integrated monopoly that has governed the electricity transactions in

[205] Avis de la Commission des participations et des transferts n° 2004-AC-3 du 26 juillet 2004 relatif au transfert au secteur privé de la SNET par Charbonnages de France.
[206] Présence Energie, no. 857, juin 2007, page 28.
[207] A few exceptions existed for the consumers that lived in an area with a different incumbent distributor than EDF (e.g. Electricité de Strasbourg or Gaz Electricité de Grenoble), and that moved to the EDF region. In 1954, EDF purchased the majority of the shares of Electricité de Strasbourg. www.electricite-strasbourg.fr/internet/promotion.nsf/wContenu/U1D10T30Q0.htm (last accessed November 16, 2008).

this industry for over fifty years. The following section presents the new French regulations for the electricity industry.

7.2 Electricity regulations

The EC electricity directive of 1996 has been implemented into the French electricity law of February 2000 on the modernization and development of the public service of electricity. This law has been altered by the law of August 2004 and the law of December 2006. The 2004 law, on the public service of electricity and gas and the electricity and gas enterprises, mainly addresses the independent organization of the distribution and transmission system operators. The 2006 law, on the energy sector, focuses on the legal independence of the distributors and the opening of the energy industry to competition and consumer choice. In addition to these electricity laws, the ministry responsible for energy policy has formulated various decrees (décrets) and orders (arrêtes) for the electricity industry. Decrees are formulated to give a more specific implementation of a law, or they can be autonomous rules without reference to a law. They can be general rules, or be applicable only to a particular individual. Orders are inferior to the decrees, and may serve to implement a law or a decree. The ministry has formulated decrees and orders on network connection, network access, electricity prices, and quality levels of the transmission and distribution services. The independent regulatory agency for the electricity industry, the *Commission de régulation de l'energie* (CRE), may also formulate orders. It has done so in the past on among others investments of the transmission system operator, balancing, and accounting unbundling. In the following sections, this regulatory framework for the French electricity industry will be introduced for the various activities in the industry: generation, transmission and distribution system operation, network connection and network access, balancing of electricity supply and demand, and electricity retail, consumer choice and switching[208].

[208] The data used for this and the following section has been taken from official documents published by the relevant authorities including among others press releases and activity reports (www.cre.fr, www.rte-france.com, www.industrie.gouv.fr/energie/sommaire, www.finances.gouv.fr/DGCCRF), electricity laws

7.2.1 Generation

The EC directives of 1996 and 2003 include requirements for the construction of new generation capacity, but they do not refer to a regulation of existing capacity. These requirements on the construction of new capacity have been implemented into the French regulations for the electricity industry. The French minister responsible for energy policy formulates a multi-year plan for investments in generation capacity (la programmation pluriannuelle des investissements de production) that includes objectives on where the capacity should be built, and on the type of technologies and primary energy sources that should be used to produce the electricity. This multi-year plan has to allow for the generation of electricity with new technologies, decentralized plants and cogeneration. It also has to take into account the long-term projections, made by the transmission system operator, on the future demand for electricity, and on the capacity of the distribution and transmission system. To make these projections the transmission system operator has access to all the necessary information of the distribution system operators, the generators, retailers and consumers of electricity.

New generation capacity is built through an authorization procedure and through a tendering procedure[209]. The minister responsible for energy policy must authorize the energy firms to build generation capacity. When the generation capacity that is being built under the authorization procedure is not sufficient, given the objectives of the multi-year investment plan, the minister can write a call for tenders. This call will include several requirements for the capacity to be built, including the region where the plant should be constructed, and various technical and economic characteristics of the plant. EDF and the non-nationalized distributors

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(loi no 2000-108 du 10 février 2000 relative à la modernisation et au développement du service public de l'électricité, loi no 2003-8 du 3 janvier 2003 relative aux marchés du gaz et de l'électricité et au service public de l'énergie, loi no 2004-803 du 9 août 2004 relative au service public de l'électricité et du gaz et aux entreprises électriques et gazières, loi n° 2006-1537 du 7 décembre 2006 relative au secteur de l'énergie), OECD reports on French competition and regulatory policies (Daffe/Comp(99)8, Daffe/Comp(2004)7), International Energy Agency (2000) Energy Policies of IEA Countries – France 2000 Review, and interviews with the Ministry of Economy, Finance and Industry and the Commission de régulation de l'énergie.

[209] The articles 6 through 11 of the law of February 2000 specify these requirements for electricity generation.

are obliged to purchase the electricity produced by the energy firm that has responded to the call for tender. They also have a purchase obligation for electricity that is produced with renewable energy sources.
The incumbent, independent generators, such as CNR and SNET, were always obliged to sell their surplus electricity to EDF or to the non-nationalized distributors. This obligation does not exist anymore since the implementation of the electricity law of 2000. This law of February 2000 has introduced the possibility for other generators to enter the French electricity industry, and thus to compete with EDF and the smaller incumbent generators of electricity. The Belgian energy firm Electrabel and the Spanish energy firm Endesa have entered the French electricity industry.

7.2.2 Transmission and distribution

The transmission system of the French electricity network is the high-voltage part of the network that is equal to and above 50 kV[210]. The distribution system is the low-voltage part of the network, and thus below 50 kV. The *réseau de transport d'electricité* (RTE), also referred to as RTE EDF Transport, is the French transmission system operator. It has a national monopoly for the operation of the transmission system. The distribution system is operated by Electricité de France and by the non-nationalized distributors[211], each within their regional monopolies.

7.2.2.1 Responsibilities of the transmission and distribution system operators

RTE EDF Transport is responsible for the operation, maintenance, and development of the transmission system, in order to allow for the connection of the distribution system, the electricity generators and the consumers to the transmission system. It has to provide a non-discriminatory access to its network. Within their regional monopolies, the distribution system operators have the same responsibilities as RTE EDF Transport, but for their low-voltage part

[210] Article 12 of the law of February 2000.
[211] Article 18 of the law of February 2000.

of the network. The distribution system operators also have a responsibility to provide a transparent and non-discriminatory access to their network. They have to perform metering activities for the network users, such as the supply and maintenance of the metering equipment and the management of the metering data[212]. In addition, the transmission and distribution system operators have to ensure the balance between electricity supply and demand on their respective parts of the network for every second of the day[213]. The tariffs that the system operators receive for operating the network, and for providing a connection and an access to the network are regulated, and are set by the ministries of energy and of economy. A decree determines the quality levels that the transmission and distribution system operators have to achieve[214].

7.2.2.2 Independence of the transmission and distribution system operators

The law of August 2004 states that the transmission system should be managed by an organization that is different from the organizations that manage the activities of electricity generation and retail[215]. The transmission system operator should develop, maintain and operate the transmission network in a way that is independent from the interests of the activities of electricity generation and retail that are undertaken by the organizations that are located under the same holding. In addition, the managing directors of the transmission system operator may not have any responsibilities for the activities of electricity generation and retail[216]. The minister of energy appoints the director of the transmission system operator after an advice by the independent regulatory agency for the electricity industry (CRE)[217]. This director of RTE cannot sit on the board of directors of EDF, and accounts for the system operators' activities to the regulatory agency. The employees of RTE report only to the director of RTE. The transmission system operator has its own budget and publishes accounts that are

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[212] Article 13 of the law of August 2004.
[213] Articles 14, 18 and 19 of the law of February 2000.
[214] Article 21 of the law of February 2000.
[215] Article 5 of the law of August 2004.
[216] Article 6 of the law of August 2004.
[217] www.industry.gouv.fr (last accessed September 28, 2008), article 7 of the law of August 2004.

separate from those of the holding, and that report only on the transmission activities[218]. Article 9 of the law of August 2004 states that EDF has to transfer all of its assets, obligations and contracts that belong to the operation of the transmission system to RTE. The contracts or specific clauses in the contracts may not be changed while they are being transferred to RTE. This transfer occurred on the first of January 2005[219]. In addition, article 10 states that parts of the transmission system that at the time of the publication of the law do not belong to EDF, and parts of the distribution system with a voltage level that is equal to or higher than 50 kV, must also be transferred to RTE. The transmission system operator thus obtains every part of the network in the French electricity industry with a voltage level of 50 kV and higher, and a clear separation between the distribution and transmission system results. As of the first of January of 2005, the transmission system operator is a separate subsidiary within the larger holding structure of EDF, and operates under the name of RTE EDF Transport (EDF, 2007: 21).

The law of December 2006 has obliged the legal unbundling of the distribution system operators. The distribution system operators that transport electricity to more than 100,000 clients have to be separated in terms of their legal form from those organizations that generate and/or retail electricity[220]. The legal separation of the distribution system operators involves the transfer of the assets, rights and obligations that relate to the activity of distributing electricity to these operators. This transfer should not lead to the modification of contracts or clauses in these contracts. Before the legal separation, the relations between the distribution system operators and the other activities within EDF were formalized into protocols. Once the distribution system operators were legally unbundled, these protocols got contractual value[221]. EDF has implemented this law of 2006 through the creation of a subsidiary referred to as *Electricité Réseau Distribution France (ERDF)*. On the 31st of December 2007, the distribution activities of EDF were transferred to this subsidiary that is located under the EDF holding

[218] www.industry.gouv.fr (last accessed September 28, 2008).
[219] www.rte-france.com/htm/fr/mediatheque/telecharge/Base_Prospectus_2006.pdf (last accessed January 22, 2009).
[220] Article 13 of the law of August 2004, which has been modified by article 23 of the law of December 2006.
[221] Article 14 of the law of August 2004.

(EDF, 2007: 37). The distribution system operators may not have any responsibilities for electricity generation or retail. They have to develop the distribution network in a way that is independent from the interests of the electricity generation and retail activities. The majority of the members of the board of directors or of the supervisory board of the distribution system operators are elected by parliament. This board may exert a control over the budget, financing, and investments of the distribution system operator. The French state should hold the majority of the distribution system operator's capital[222].

7.2.3 Network connection and network access

The large generators and consumers of electricity, and the distribution system operators need a connection and an access to the high-voltage grid. These network users have to engage in a contractual relation with the transmission system operator. The decentralized electricity generators and the consumers of smaller amounts of electricity need a connection to the distribution grid. The installations that connect these network users to the electricity network have to meet several technical requirements. The electricity law of February 2000 states that these technical requirements are determined by decree. The regulated tariff for the use of the network, paid by every network user, covers a part of the costs of connecting the generators, consumers and distributors to the network. The remainder of these costs is paid for by either the system operators, or by the generators and consumers that are requesting a connection. Generators of electricity may also choose another firm to connect them to the network, but only when the system operator[223] has agreed to this, and when this other firm takes into account the various requirements for the connection installations.

The distribution and transmission system operators have to guarantee a right of access to the electricity network. The law of August 2004 states that the transmission system operator and the distribution system operators have to formulate, in a code of good conduct, the measures

[222] Article 15 of the law of August 2004.

[223] The law of February 2000 does not directly refer to a distribution system operator but to a 'maître d'ouvrage', which is usually a system operator, but can also be a 'collectivité territoriale, un établissement public de coopération intercommunale ou un syndicat mixte' (article 4).

that the operators take to ensure a non-discriminatory access for third parties to the network. The independent regulator for the electricity industry monitors the implementation of these codes of good conduct, and each year it publishes a report on these monitors[224] (CRE, 2007: 2). Network access contracts have to be signed between the network users and the system operators that stipulate the conditions under which an access to the network is provided and the network can be used. The distribution system operators also have to sign a network access contract with electricity retailers that supply electricity to eligible consumers. The electricity consumers do not need to sign a separate network access contract with the distribution system operator, when their electricity retailer has such a contract[225].

7.2.4 Balancing of electricity supply and demand

The network users formulate two types of programs on a daily basis: the 'programmes d'appel' and the 'programmes d'approvisionnement'[226]. The electricity generators and the energy firms that import electricity formulate 'programmes d'appel'. These programs specify the amount of electricity that these network users expect to supply to the network on the next day, and the propositions for adjustments to these programs. The authorities that organize the public distribution of electricity[227] and the electricity retailers formulate 'programmes d'approvisionnement', which indicate the amount of electricity that they expect to supply, and be supplied to them on the next day. These programs are sent to the transmission system operator, who makes sure that they match its expectations of the national electricity consumption on the next day. These programs are a necessity for the network users to access the network, and for the transmission system operator to balance electricity supply and demand and to resolve the restrictions on the transportation of electricity. The transmission system operator may change the 'programmes d'appel', when they do not respect the rules on the

[224] Article 6 of the law of August 2004.
[225] Article 23 of the law of February 2000.
[226] Article 15 of the law of February 2000.
[227] These are authorities that supply electricity to consumers that benefit from regulated tariffs or from special tariffs (for consumers that are not able to pay the regulated tariffs or the prices of electricity), as is defined in article 2 of the law of February 2000.

connection of the French network to other national transmission systems[228].

The transmission system operator has to ensure the availability and the use of reserve capacity in order to allow for the functioning of the electric system. The operator negotiates with electricity generators and retailers for the supply of reserve capacity, following competitive, non-discriminatory and transparent procedures. For the short term, the operator may call upon the network users to adjust their programmes d'appel. The costs for this reserve capacity that is needed to balance supply and demand are divided among the network users and the balancing responsible parties (firms that take over the responsibility to balance the input and offtake of electricity from the network for other network users). All the electricity that is not used, but that is technically available in the generating plants that are connected to the network, should be made available to the transmission system operator through the balancing mechanism.

The generators and consumers of electricity, which are connected to the distribution or to the transmission system, are responsible for the difference between the amount of electricity that they put on and take out of the network. The programs that these network users transfer to the system operators are always balanced, which means that the expected generation of electricity is equal to the expected consumption of electricity. The transmission system operator may ask those network users that are responsible for creating a difference between their actual production and consumption on the one hand and their submitted programs on the other hand to pay for these imbalances, and thus for the costs of adjustments by the system operator. The network users can choose how they want to pay for these differences, through a contract with the transmission system operator or with a balancing responsible firm, or they can ask an electricity retailer to contract with a balancing responsible firm for them.

7.2.5. Retail, customer choice and switching

Since the first of July of 2007, every consumer in the French electricity industry is eligible, and may thus choose its own electricity retailer. The consumers may switch from EDF to another energy firm. In the third quarter of 2008, close to 212,000 consumers switched to another

[228] Article 15 of the law of February 2000.

retailer (CRE, 2008b: 16). The electricity retailers and the non-nationalized distributors are also regarded as eligible clients. The electricity retailers are recognized as eligible for the electricity that they buy for resale to final consumers. The distributors are eligible for the supply of electricity to eligible consumers only in the area of their regional monopolies, and for the loss of electricity on their own networks[229]. The French electricity consumers may still choose to be supplied for a regulated tariff (le tarif réglementé transitoire d'ajustement du marché) until July 2010.

7.3 Regulatory institutional organization

The regulatory institutional organization for the French electricity industry characterizes the public authorities that formulate, execute and enforce the regulations for this industry, the allocation of regulatory responsibilities and powers among these authorities, the coordination mechanisms that structure the authorities' mutual relations, and the objectives of the public authorities.

7.3.1 Public authorities

In June 2007, a new French ministry was created that is responsible for formulating policy on ecology, energy and sustainable development. It is referred to as the *Ministère de l'écologie, de l'énergie, du développement durable et de l'aménagement du territoire* (MEEDDAT). One of the departments within this ministry is the department of energy (*direction de l'énergie),* which formulates and implements energy and electricity policy. This department supervises the proper implementation of the missions for the public services of energy and electricity. It aims to ensure the security of supply of energy in France, and the proper functioning of the energy markets. It is also competent to address statutory problems with the electricity and gas enterprises[230]. This department is comprised of several divisions, including one for the energy

[229] Article 22 of the law of February 2000.
[230] Décret n° 2008-680 du 9 juillet 2008 portant organisation de l'administration centrale du ministère de l'écologie, de l'énergie, du développement durable et de l'aménagement du territoire.

market and one for the electric system. The division for the energy market formulates and implements the tariffs for the electricity industry, the policies for electricity retail, and it monitors the electricity prices. The division that is responsible for the electric system develops and implements the policies on the generation, transmission and distribution of electricity. It negotiates the contracts between the French state and EDF on the public services, and it monitors the implementation of these contracts[231]. These public services that EDF has to provide to the energy consumers include the safety of its generating plants and the network, the protection of the environment, the balance between electricity supply and demand at the national and regional levels, and the quality of electricity. In the public service contract of 2005, it is mentioned that EDF provides an indispensable contribution to the objectives of French energy policy, such as the French energy independence, the conservation of the environment, the security of supply, and the social cohesion[232]. This last objective includes aid to families that have difficulties with paying their energy bills.

The department of energy within the ministry shares the responsibility for implementing electricity legislation with the *Commission de régulation de l'energie* (CRE). The CRE was created in March 2000 as an independent regulatory agency for the electricity and gas industries.

In May 2007, the French ministry of economic affairs, finance and industry[233] was split into two separate ministries: the *Ministère de l'économie, de l'industrie et de l'emploi* (MINEIE) and the *Ministère du budget, des comptes publics et de la fonction publique*. One of the departments that is located within this first ministry, is the *Direction générale de la concurrence, de la consommation et de la répression des fraudes* (DGCCRF). The DGCCRF prepares and implements competition legislation. It shares this responsibility with the French

[231] Arrêté du 9 juillet 2008 portant organisation de l'administration centrale du ministère de l'écologie, de l'énergie, du développement durable et de l'aménagement du territoire.

[232] service-public.edf.com/accueil-com-fr/edf-service-public-101001.html (last accessed November 16, 2008).

[233] This ministry of economic affairs, finance and industry (MINEFI), which ceased to exist in May 2007, used to include the department of energy that is currently located in the ministry of ecology, energy and sustainable development.

competition authority: the *Conseil de la concurrence.* The competition authority was created by the 'ordonnance' of the 1st of December 1986, which transferred decision-making powers on anti-competitive agreements, abuse of dominant position and economic dependence from the minister to the competition authority. The minister retains responsibility for merger control. The Conseil de la concurrence has the status of an independent administrative authority.

There are two judicial orders in France. 'The administrative order has jurisdiction over decisions taken by the government and the judicial order deals with litigation between private individuals. Competition law is part of the judicial order, decrees, which are issued by the government, fall under the administrative order' (Audigier, 1999: 5). The *Conseil d'etat* (council of state) heads the administrative jurisdiction, while appeals from decisions by the Conseil de la concurrence and the CRE are taken by the court of appeal of Paris.

7.3.2 Regulatory responsibilities and powers

There exists no clear division of regulatory powers among the ministries and the CRE, in which for example, the ministries formulate the rules and the independent agency executes the rules. In fact, the CRE formulates, implements and enforces regulations, and settles disputes between the parties in the electricity industry. The distinction between the public authorities is mainly related to the area of regulation for which they exert their regulatory powers. The responsibilities of the CRE include regulating the connection and access to the network, the balancing of electricity supply and demand, and the unbundling of accounts. The ministries retain the regulatory responsibilities for investments in generation and transmission capacity, and decide on the legal form of the transmission system operator, appoint the director of the transmission system operator, and set the network access and end-user tariffs. The Conseil de la concurrence has an advisory role with respect to these regulatory responsibilities.

7.3.2.1 Formulating rules

The CRE has the responsibility for making regulatory decisions on connection and access to and usage of the electricity network. It aims for transparent and non-discriminatory network access rules. In cooperation with the transmission system operator (RTE), the CRE formulates the contract for access to the transmission network. Each contract that is signed between a network user and RTE is send to the CRE. The ministers of energy and economy set the network access tariffs and the evolution of these tariffs, after a proposal by the CRE. The ministers usually follow the proposals of the CRE, but are not obliged to do so. The first proposal on network access tariffs of the CRE was not rejected, but it had to be reformulated. When a proposal of the CRE is not followed, the ministers cannot determine the tariff. The CRE has to formulate a new proposal.

The CRE determines the accounting unbundling principles[234]. It exercises this power in co-operation with the Conseil de la concurrence, who gives its opinion prior to putting any new principles of accountancy into application, and which may be referred to by the president of the CRE at any time. The government has the sole responsibility for determining the legal form of the transmission system operator. In January 2005, RTE was changed from an integrated department within EDF with accounting and management independence to a separate legal entity in the form of a subsidiary within EDF. The CRE takes the regulatory decisions on the missions of the system operators.

The CRE determines the presentation of the balancing programs (the programmes d'appel and the programmes d'approvisionnement), the proposals for adjustments to these programs, and the criteria for the transmission system operator on the basis of which the operator chooses between these proposals for adjustments. The CRE also determines the methods for calculating the difference between the actual production and consumption of electricity on the one hand and the submitted programs on the other hand, as well as the methods for financial compensation for these imbalances.

In article 22 of the law of 2000, which was modified by article 2 of the law of 2006, the then minister of economy, finances and industry prescribed that every consumer is eligible, and may thus choose his own electricity retailer. Various decrees that have been formulated by the Minister of economy, finances and industry, have stipulated which consumers are eligible at

[234] See also article 37 of the law of February 2000.

which date. For example, the decree of 2000[235] refers to those consumers that consume more than 16 GWh, and the decree of 2004[236] refers to all non-residential consumers.

7.3.2.2 Executing rules

The CRE and the Ministry of ecology, energy and sustainable development execute the electricity regulations through their involvement in the planning for new generating capacity, the approval of investments in transmission capacity, and the appointment of the director of the transmission system operator among others. The ministry formulates a long-term investment plan for electricity generation (programmation pluriannuelle des investissements de production d'électricité (PPI)). New electricity generating plants can be build through an authorization procedure or through tender offers. The minister authorizes energy firms to construct new generating capacity, and he can deny permits in case of overcapacity. The minister will launch tender offers if insufficient capacity of a particular technology is being built. The CRE has to implement the tenders for the construction of new generating capacity. It issues a call for tenders, draws up the specifications, opens the tenders and makes a recommendation on the candidates. The minister selects the firm that wins the tender. The CRE organizes these tender offers for renewable sources of energy, like wind power and biomass, which is only a small part of total electricity generation.

RTE develops an annual investment program for the electricity transmission network, which needs to be approved by the CRE. In addition, RTE formulates a multi-year network development plan, which requires the approval of the minister. The CRE gives its opinion on the multi-year plan. The minister appoints the director of RTE. He chooses among three candidates that are proposed by EDF.

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[235] Décret n°2000-456 du 29 mai 2000 relatif à l'éligibilité des consommateurs d'électricité et portant application de l'article 22 de la loi n° 2000-108 du 10 février 2000 relative à la modernisation et au développement du service public de l'électricité.

[236] Décret n°2004-597 du 23 juin 2004 relatif à l'éligibilité des consommateurs d'électricité et modifiant le décret n° 2000-456 du 29 mai 2000.

7.3.2.3 Enforcing rules

The CRE has to ensure that the energy firms act in accordance with the accounting unbundling criteria, in order to avoid cross-subsidies and an abuse of dominant position. It has the right to monitor the firms, and it can use its sanctioning powers in the case that the criteria are not met. The CRE can use two types of penalties when energy firms violate a regulation on the principles of accounting unbundling: a prohibition on accessing the electricity network for at most a year, and a financial penalty with a maximum of five percent of the energy firm's revenues. These penalties may also be used when energy firms do not comply with the regulations on making their accounts available, and on access and use of the electricity network.

The minister of energy may also impose a financial penalty on a network user, and he may demand that an installation of a network user is temporarily put out of service. The minister may impose these sanctions when a network user does not pay the public service charges, or when the user does not abide by regulations on the generation of electricity, the eligibility of consumers, the supply of last resort, the activity of purchasing electricity for resale to consumers, and the obligation of the supply of information[237]. The minister may also prohibit a retailer to purchase electricity for resale to consumers, when this retailer has not paid for an access to the network or for the imbalances on the network that were created by the electricity retailer[238].

The CRE and the minister of energy have a right of access to all the information of the system operators and energy firms that the authorities need for the execution of their tasks that are attributed to them in the electricity law, and thus also for enforcing the rules.

7.3.2.4 Dispute resolution

Whenever a system operator refuses to sign a network access contract with a potential network user, the CRE has to receive a notification of this refusal. The CRE has the power to settle

[237] Article 41 of the law of February 2000.
[238] Article 22 of the law of February 2000.

disputes between (potential) network users and the transmission and distribution system operators in the event of such a refusal, and when there is a disagreement on the performance or interpretation of the contract or on the use of the network. Whenever the CRE observes a threat to the security of the electric system due to such a dispute, it has the right to request the minister in charge of energy to take restraining measures. When the parties to the dispute do not comply with the regulatory agency's decision on the settlement of the dispute, the CRE can use the two types of penalties (the ban on accessing the network and the financial penalty). The Paris Appeal Court has the power to set aside or overturn decisions on the settlement of disputes that are pronounced by the sector-specific regulator. Within CRE a separate committee settles the disputes between network users and system operators. The members of this committee cannot be members of the commission of the CRE[239].

7.3.3 Regulatory coordination mechanisms

7.3.3.1 CRE – Conseil de la Concurrence

The CRE has the right to monitor firms within the electricity industry. If the CRE encounters a possible situation of economic dependence, abuse of dominant position or a restrictive agreement, it notifies the Conseil de la concurrence. The CRE has no concurrent powers under the 'Code de Commerce' (competition legislation). The Conseil de la concurrence refers disputes in the energy sector to the CRE whenever these disputes do not violate competition legislation. 'In order to ensure the consistency of decisions made by the competition authorities and the sectoral regulators, the same Court of Appeal is used' (Bureau and Curien, 2001: 146).

The relationship between the CRE and the competition authority is mainly characterized as one of giving each other *advice*. For example, the Conseil de la concurrence has to give its opinion to the CRE on new principles of accountancy. In an interview with the CRE it was mentioned that: 'the Conseil de la concurrence has to give its opinion to the CRE, but in fact, before, we work together. We were never surprised by their opinion. It was only on general principles of

[239] Article 28 of the law of February 2000.

accountancy and not for slight modifications'. 'On the general principles we always agree'[240]. Their relationship is thus characterized as an informal, cooperative one.

7.3.3.2 CRE – Ministry

The CRE makes recommendations to the minister of energy on the amount of funds that it requires, but it is the minister that decides on the commission's *budget*. A member of the commission stated that the independence of the CRE has nothing to gain, but that the setting of the budget by the government is certainly a limitation[241]. In an interview with the CRE it was said that: 'the fact that our budget is given to us by the government is not completely satisfactory. It would be better if we were funded by the contributions of the gas and electricity consumers. It will give us more independence from the government'[242]. The CRE is made up of seven members as of March 31, 2004. The *appointment* of the members of the commission does not give a large influence to the ministry of energy over the commission, as the various members are appointed by different organizations. Two members (including the chairman) are appointed by decree by the President, two members by the President of the Parliament, two members by the President of the Senate and one member by the President of the Social and Economic Council. The *security of tenure* of the members of the commission is protected to a certain extent. 'The Commission members cannot be removed from office, except in the event of resignation as a matter of course. This may only occur when there has been a breach of very strict rules relating to conflicts of interest, and is noted by the minister for energy after recommendation from the Commission'[243]. The ministry cannot give any *individual instructions* to members of the commission. Article 35 of the law of February 2000 prohibits any orders to be given by the government or any third parties to the CRE.

[240] Interview with Ms. Bodiguel and Mr. Lecaille of the CRE on December 10, 2004.
[241] R. Hadas-Lebel: 'L'indépendance de l'institution n'aurait rien à y gagner. La fixation de notre budget par le gouvernement est certes une limitation'.
[242] Interview with Ms. Bodiguel and Mr. Lecaille of the CRE on December 10, 2004.
[243] www.cre.fr (last accessed January 16, 2009).

7.3.4 Regulatory objectives

A regulatory objective of the *Commission de régulation de l'énergie* is the proper functioning of the markets for electricity and gas, which should benefit the final consumers of these two commodities. In particular, the commission aims for conditions on access to the distribution and transmission system that do not interfere with the development of competition in the French electricity industry[244].

The objectives of the *Ministry of energy (MEEDDAT)* can be summarized by looking at the aims of French energy policy. This policy does not only aim for the proper functioning of the French energy markets, but also for an energy independence, a security of supply, a social cohesion, and a conservation of the environment[245].

The *Conseil de la concurrence* has the objective of ensuring the functioning of competition in French markets. Consumers must have access to a large variety of goods and services at competitive prices that are the result of a free market[246]. The difference between the objectives of the CRE and the Conseil de la concurrence is that the sector-specific regulator has to stimulate the development of a market and competition in an industry that consisted until recently of a national monopoly and a large involvement of the government in the operation of the monopoly, whereas the Conseil de la concurrence must ensure that economic actors do not harm the competition in markets that are already in place.

The two previous sections (7.2 and 7.3) have presented the regulations and the regulatory institutions in the French electricity industry. The regulations on the legal unbundling of the transmission and distribution system operators, and the introduction of consumer choice are changing the governance structures in the French electricity industry. These governance transformations from the vertically integrated monopoly to new forms of governance will be discussed in the following sections (7.4 until 7.7) for the four types of electricity transactions:

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[244] Article 28 of the law of February 2000.

[245] service-public.edf.com/accueil-com-fr/edf-service-public-101001.html (last accessed November 16, 2008).

[246] www.conseil-concurrence.fr (last accessed December 12, 2008).

the network connection transactions, the network access transactions, the balancing transactions, and the switching transactions. The governance transformations and the new forms of governance will be explained by respectively the attributes of adaptation and the attributes of the transactions. These sections will also illustrate the influence of regulation and the public authorities on the attributes of the transactions, their role in the adaptation processes, and their effect on the new forms of governance. The following section (7.4) will start with an analysis of the governance transformation of the network connection transactions.

7.4 Network connection transactions

The network connection transactions have been defined, in chapter five, as consisting of connecting the generating plants and the equipment of electricity consumers to the electricity network, connecting the distribution network to the transmission network, and of maintaining these connections. The contracting parties to these transactions include the system operators, and the generators and consumers of electricity. The large generators and consumers of electricity engage in a contractual relation for a connection to the electricity network with the transmission system operator, while the smaller generators and consumers contract with the distribution system operators. The electricity retailers may also engage in a contractual relation with the system operators on behalf of the consumers. Three contractual agreements need to be signed between a system operator and a potential network user (a generator or a consumer) before the user can be connected to the electricity network. These include a connection agreement (convention de raccordement), an operating agreement (convention d'exploitation), and a network access contract.

The connection agreement specifies the technical requirements that the system operators and network users have to meet before a connection can be put into service. These requirements include those for the installations of the generators and consumers, the changes to the network, the protection of the connection, and for the equipment that measures the electricity use and the quality of electricity. The connection agreement also describes which part of the connection the

network user owns, which part belongs to the system operator[247], and how much the network user has to pay the system operator for the connection. After the connection agreement has been signed, the construction of the connection can start. The connection is only put into service when the operating agreement and the network access contract have been signed.
The operating agreement specifies the rules for the relation between the network users and the system operators that must ensure a coherent operation of the connected installations with the electricity network and its connections[248]. This agreement is a supplement to the network access contract. In this section, the focus is on the connection agreement. The other two agreements are necessary for putting the connection into operation, but describe the rules on the use of the network for the network users and the system operators. They are thus only relevant when the connections have already been constructed. These agreements will be referred to in section 7.5 on the network access transactions.

7.4.1 The attributes of the transaction

The network connection transactions are characterized by an occasional *frequency*. When a generator or a consumer signs a network connection contract with a distribution system operator or with the transmission system operator, the activity of connecting the generator or the consumer to the network occurs only once. The network users may change the capacity that they subtract from (or supply to) the network, and the capacity at which they are connected to the network. When altering these capacities, the network users may retain the same network connection contract, and the changes to these capacities are formulated in a supplement to the network connection contract. Because the network connection transactions include these capacity changes, the frequency of these transactions is characterized as occasional[249].

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[247] Convention de raccordement au réseau public de distribution HTA d'une installation de production et/ou de consommation d'énergie électrique (conditions générales). www.edfdistribution.fr (last accessed October 17, 2008). Référentiel technique de RTE. www.rte-france.com (last accessed October 17, 2008).
[248] Convention de raccordement au réseau public de distribution HTA d'une installation de production et/ou de consommation d'énergie électrique (conditions générales) (page 43). www.edfdistribution.fr (last accessed October 17, 2008). Référentiel technique de RTE – Trame type convention d'exploitation (page 7). www.rte-france.com (last accessed October 17, 2008).
[249] Contrat d'Accès au Réseau de Distribution d'électricité (CARD) Soutirage BT Puissances supérieures

The network connection transactions are characterized by *site-specificity*. A part of the costs for connecting users to the electricity network is covered by the tariffs for using the network. The rest of the connection costs has to be paid for by either the system operator or the network user. When the costs are incurred for the reinforcement of the network, the system operator pays, but when they are incurred for the connection of a network user, the user pays for these costs. The general principles for calculating the contribution of the network users are determined by the ministries of economic affairs and of energy, after an advice by the CRE[250]. The contribution of the network user for a connection to the distribution network increases with an increase in the length of the electricity lines[251]. The costs for connecting the large generating plants to the transmission network also increase when the distance from the plants to the network increases[252]. The French ministries thus create the site-specificity for these connection transactions; for electricity generators and consumers it is cheaper to locate their installation and equipment close to the network.

The investments of the network users in the connection to the electricity network are also characterized by a *physical asset specificity* and by *dedicated assets*. The investments are only made for connecting installations and equipment to the electricity network, and when these connection assets are put to a different use they hardly have any economic value. The generators and consumers dedicate these investments to one contracting party: the system operator.

à 36 kVA, Conditions générales Version 2.1, article 2.2.2 Demande d'augmentation de Puissance Souscrite conduisant à dépasser la Puissance Limite.

[250] Décision de la Commission de régulation de l'énergie du 27 mars 2008 relative à l'approbation du barème d'Électricité Réseau de Distribution France (ERDF) pour la facturation des opérations de raccordement des utilisateurs aux réseaux publics de distribution d'électricité qui lui sont concedes. www.cre.fr (last accessed October 18, 2008). Articles 4 and 18 of the law of February 2008.

[251] Arrêté du 28 août 2007 fixant les principes de calcul de la contribution mentionnée aux articles 4 et 18 de la loi no 2000-108 du 10 février 2000 relative à la modernisation et au développement du service public de l'électricité (article 6). Décision de la Commission de régulation de l'énergie du 27 mars 2008 relative à l'approbation du barème d'Électricité Réseau de Distribution France (ERDF) pour la facturation des opérations de raccordement des utilisateurs aux réseaux publics de distribution d'électricité qui lui sont concedes. www.cre.fr (last accessed October 18, 2008).

[252] Letter from André Merlin (RTE) to Nicole Fontaine (Minister of Industry) on 24 April 2003. www.cre.fr/fr/content/download/2568/42612/file/3.pdf (last accessed November 2, 2008).

As will be illustrated here by several examples of CRE's dispute resolutions, the system operators have displayed opportunistic behavior with respect to connecting users to the electricity network. They have disguised information that should have been made available to the network users. The incentives between the two contracting parties (the network users and the system operators) have not been aligned: the system operators have a monopoly for their network and for providing connections to their network, and therefore they have an incentive to set high prices and unreasonable conditions at the expense of the network users. The connection transactions are therefore characterized by *behavioral uncertainty*. A first example of a dispute resolution concerns the energy firm, SITOM, which has requested EDF for information on a possible connection of its generating plants to the electricity network. This energy firm also consumes part of the electricity that it produces, and it is therefore unclear at which capacity the plants should be connected to the network. EDF has been unwilling to provide the energy firm with information on its connection. If the energy firm had to be connected to the high-voltage part of the network, EDF would have expenses for investigating the possibilities for this connection, but would not earn an income on the construction of the connection and on the distribution of electricity to this user. CRE ruled that EDF has not abided by the regulations and should have provided the energy firm with information on the possibilities for its connection[253]. In another dispute, CRE ruled that EDF did not provide the network user with transparent information on why the connection charges were raised from 21,300 euro to more than 300,000 euro, and what costs were included in this last amount[254]. A third example of a dispute resolution concerns EDF's refusal to investigate the possibility of connecting the Société Pouchon Cogen to the existing distribution network. EDF has instead proposed to build a new distribution line, and thereby increasing the connection costs and time

[253] Décision de la Commission de régulation de l'énergie en date du 1[er] octobre 2003 se prononçant sur un différend qui oppose le Syndicat intercommunal de traitement des ordures ménagères Nord Isère (SITOM Nord Isère) à Électricité de France (EDF) relatif au refus d'instruire une demande de raccordement d'une installation de production d'électricité. www.cre.fr (last accessed October 19, 2008).
[254] Décision de la Commission de régulation de l'énergie en date du 30 octobre 2003 se prononçant sur un différend qui oppose la SARL Cogé de Kerverzet à Electricité de France concernant le prix du raccordement d'une installation de production d'électricité. www.cre.fr (last accessed October 19, 2008).

for the energy firm. CRE concluded that by not investigating the possibility of connecting the firm to the existing distribution network, EDF has not abided by the decree of March 2003. In addition, EDF has not provided sufficiently transparent information to justify its conclusion that, due to constraints of voltage levels, a new electricity line needs to be build for connecting the energy firm. It has not demonstrated that this solution is the one with the least costs, and it has delayed the connection of the production plants of this energy firm by at least eight months. CRE ruled that if, after a sufficient investigation of the different technical possibilities, the conclusion is that a new electricity line needs to be built, the costs for reinforcing the network should be paid by EDF[255]. EDF has thus not provided sufficient information, and the information that was provided was not transparent, and EDF has aimed to increase the costs for the energy firm that according to CRE's ruling should be paid by EDF.

7.4.2 Misalignment

The network connection transactions between the electricity generators and the system operators have for more than fifty years been governed by a vertically integrated hierarchy. Since 1946, EDF has integrated the generation, transmission and distribution of electricity. The network connection contracts between the consumers and the system operators have been governed by regulation. These governance structures of before the liberalization of the French electricity industry are assumed to have been efficiently aligned with the transactions. Very few empirical studies within transaction cost economics have analyzed the regulation as a governance structure between the various unbundled activities of the electricity value chain in a liberalized environment (see section 3.5) TCE has mainly addressed the regulation of contracts between consumers and utility firms, and the governance of transactions between the regulator and the utility firms. Since various types of asset-specificity, a behavioral uncertainty, and a monopoly for providing a connection to the network, characterize the network

[255] Décision de la Commission de régulation de l'énergie en date du 3 juin 2004 se prononçant sur un différend qui oppose la Société Pouchon Cogen à Electricité de France (EDF) relatif aux conditions de raccordement d'une installation de cogénération au réseau public de distribution. www.cre.fr (last accessed October 19, 2008).

connection transactions in the liberalized industry, *transaction cost economics* predicts that the vertically integrated hierarchy and regulation are still the most efficient governance structures for respectively the network connection transactions between the generators and the system operators, and between the consumers and the system operators. The new rules on the vertical unbundling therefore create a *misalignment* of the governance structures to the transactions between the generators and the system operators, and are thereby stimulating a process of adaptation to a new form of governance.

7.4.3 The governance structure

This new form of governance for the network connection transactions will be characterized along the attributes of incentive intensity, administrative apparatus and contract law regime.

The *incentive intensity* of the system operators for the network connection transactions is characterized as being of an intermediate degree. An intermediate incentive intensity characterizes a governance structure when a part of the income to be earned cannot be influenced by the economic actor (see section 5.1). The system operators are limited in influencing their returns from connecting users to the network, because the tariffs for the use of the network are regulated, and the additional connection charges also have to be approved by the CRE[256]. The system operators may be able to increase their profits by reducing their costs of constructing and maintaining the connections. Ulset (1996) has measured incentive intensity by price formats[257]. He argues that fixed price contracts increase the incentive to reduce costs. When a client pays most of the suppliers' expenses before a project is finished, the client carries most of the risk, thereby lowering the incentive intensity among the suppliers (Ulset, 1996: 67). In the connection agreement, the network users and system operators have agreed on a price for the connection, and therefore the agreement increases the incentive of the system operators to reduce costs. In addition, the network users pay only up until forty per cent of total

[256] Arrêté du 28 août 2007 fixant les principes de calcul de la contribution mentionnée aux articles 4 et 18 de la loi no 2000-108 du 10 février 2000 relative à la modernisation et au développement du service public de l'électricité, article 2.

[257] Ulset (1996) has applied this measure to transactions for R&D projects.

costs before the construction is finished. A quarter of this forty per cent is paid when the network user has signed the proposal of the system operator for the technical and financial conditions of the connection, and the rest of this forty per cent is paid when the network user signs the connection agreement[258]. The network user does not pay the total amount of the connection charges before the project is finished, and therefore the incentive intensity of the system operator is increased. In summary, the incentive intensity can be characterized as intermediate: due to the regulated tariffs the system operators cannot entirely influence their income, but they can reduce their costs.

Various *administrative control instruments* characterize the governance structure of the network connection transactions. These include information disclosure mechanisms, information verification mechanisms, and penalties. Firstly, a network user has to disclose information to the distribution system operator about the changes that it intends to make to its connected installations. The distribution system operator has to approve these changes[259]. The distribution system operator also informs the network user of the changes that it intends to make to the connection when these changes affect the clauses and conditions of the connection agreement[260]. In addition, the distribution system operator informs the network users of its plans to make adjustments to the network at least two weeks in advance. These changes to the network can include maintenance works, a renewal of the network or an expansion of the network. The network users may not have access to electricity for the duration of these changes to the network[261]. Furthermore, the consumers and generators have to connect equipment to their installations that allows them to exchange information with the transmission system operator, in order to ensure among others the proper integration of their installations in the

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[258] Référentiel Technique: Chapitre 1 – Instruction des demandes de raccordement, Article 1.1 – Processus de raccordement, page 10. www.rte-france.com (last accessed November 15, 2008).

[259] Article 2.3 Contrat d'Accès au Réseau de Distribution d'électricité (CARD) Soutirage – HTA www.erdfdistribution.fr (last accessed November 20, 2008).

[260] Convention de raccordement au réseau public de distribution HTA d'une installation de production et/ou de consommation d'énergie électrique (conditions générales) (Article 13.4, page 50). www.erdfdistribution.fr (last accessed November 20, 2008).

[261] Convention de raccordement au réseau public de distribution HTA d'une installation de production et/ou de consommation d'énergie électrique (conditions générales) (Article 8.3.2.1.2, page 34). www.erdfdistribution.fr (last accessed November 20, 2008).

electric system. This requirement also holds for some generators that are connected to the distribution network, and that are sufficiently large to be able to have a substantial influence on the operation of the distribution network[262]. At the request of the transmission system operator, the consumers and generators (with a connected capacity that is larger than 120 MW) may have to install a communication system that allows them to communicate instantaneously with the system operator. Such a communication system enables the generators and consumers to react to signals of the TSO for an increase or decrease in the production or consumption of electricity. These communication systems have to meet the specifications that are determined by the TSO. The connection agreement has to mention what information needs to be exchanged, and the specifications for the communication equipment[263].

Secondly, several mechanisms are in place to verify the safety of the installations of the network users. The network users have to take various tests to prove that their installations can safely be connected to the electricity network. An independent organization, 'le Comité national pour la securité des usagers d'électricité' (Consuel), verifies whether the installations meet the safety regulations, as set out in the decree of March 2001. The network users send a proof of conformity to these regulations that is signed by Consuel to the distribution system operators[264]. The distribution system operators may also access the electrical equipment of the network users to verify whether it meets the quality standards as set out in the connection agreement. This equipment connects the network users' installations to the network, and is located at the point where electricity is delivered to the network. The verification may only be

[262] Arrêté du 17 mars 2003 relatif aux prescriptions techniques de conception et de fonctionnement pour le raccordement à un réseau public de distribution d'une installation de production d'énergie électrique (article 14).

[263] Arrêté du 4 juillet 2003 relatif aux prescriptions techniques de conception et de fonctionnement pour le raccordement direct au réseau public de transport d'une installation de consommation d'énergie électrique (article 13). Arrêté du 4 juillet 2003 relatif aux prescriptions techniques de conception et de fonctionnement pour le raccordement au réseau public de transport d'une installation de production d'énergie électrique (articles 18 and 26).

[264] Convention de raccordement au réseau public de distribution HTA d'une installation de production et/ou de consommation d'énergie électrique (conditions générales) (Article 8.5.1, page 37). www.erdfdistribution.fr (last accessed November 20, 2008).

performed to ensure the safety of the electric system[265].

Thirdly, if the network users do not pay for their connection, the distribution system operator may suspend the connection agreement[266]. The distribution system operators and network users may be held accountable for the responsibilities that are attributed to them in the connection agreement; when they inflict damage on another party, they have to financially compensate this other party for the damages. For example, the distribution system operator may be held accountable for delays in the construction of the connection to the network[267].

The connection agreements between the system operators and the network users are signed for an indefinite period, and they last for as long as the installations are connected to the electricity network[268]. The network connections are usually in place for multiple decades[269]. During this period, the system operator has the obligation to keep the connection available for the network user, and the user has the responsibility to maintain its installations as stated in the connection agreement. These agreements can therefore be characterized as *long term*.

They are also *flexible contracts*, because adjustments can be made to their clauses. The agreement for a connection to the distribution network states that if the system operator or the network user wishes to alter the connection or the connected installation respectively, these contracting parties should consult each other, and they may alter the terms included in the

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[265] Article 2.3.3 Contrat d'Accès au Réseau de Distribution d'électricité (CARD) Soutirage – HTA www.erdfdistribution.fr (last accessed November 20, 2008). Article 2.4.3 Modèle de Contrat d'accès en injection pour un site de production raccordé au Réseau Public de Distribution HTA. Conditions générales. www.erdfdistribution.fr (last accessed November 20, 2008). See also article 8 of Décret n° 2008-386 du 23 avril 2008 relatif aux prescriptions techniques générales de conception et de fonctionnement pour le raccordement d'installations de production aux réseaux publics d'électricité.

[266] Convention de raccordement au réseau public de distribution HTA d'une installation de production et/ou de consommation d'énergie électrique (conditions générales) (Article 9.2.4.2, page 42). www.erdfdistribution.fr (last accessed November 20, 2008).

[267] Convention de raccordement au réseau public de distribution HTA d'une installation de production et/ou de consommation d'énergie électrique (conditions générales) (Article 11.1, page 44). www.erdfdistribution.fr (last accessed November 20, 2008).

[268] Référentiel technique de RTE – Trame type convention de raccordement (article 4.2). www.rte-france.com (last accessed October 17, 2008). Convention de raccordement au réseau public de distribution HTA d'une installation de production et/ou de consommation d'énergie électrique (conditions générales) (page 9). www.edfdistribution.fr (last accessed October 17, 2008).

[269] www.rte-france.com/htm/fr/accueil/pop/intervention_08-11-2001.jsp (last accessed October 17, 2008).

connection agreement by including a supplement to this agreement[270]. Articles 2.2.3 and 3.5 of the connection agreement for the transmission grid state that modifications to the agreement may be made when the network users or the system operators wish to make changes to their installations or the connection respectively[271].

Article 4.7 of the connection agreement[272] states that the contracting parties should aim to settle the *disputes* amicably, and otherwise they may ask the CRE to settle the disputes. The CRE has settled many disputes on the connection of energy firms and consumers to the electricity network[273]. These were concerned with delays in the construction of the connection, the connection costs, and with the technical solutions for the connection. In many of these cases, the network users claimed that the system operators had not provided them with sufficient and transparent information on the connection.

This governance structure can, in sum, be characterized as a hybrid form, in which the two parties – the system operators and the network users – retain their autonomy. The network users depend on the system operators for a connection to the network. The system operators have a regional or national monopoly for the network, while the network users do not possess such a monopoly position. The system operators have some authority over the network users in this governance structure. They may, for example, disconnect the network users to avoid a collapse of parts or the entire network. They also instruct the network users to develop a system of protection for their installations, mainly to avoid a disturbance in the network that may harm the quality of electricity. The system operators determine the features of these protection systems, the way in which they should be operated and coordinated with the

[270] Convention de raccordement au réseau public de distribution HTA d'une installation de production et/ou de consommation d'énergie électrique (conditions générales). www.edfdistribution.fr (last accessed October 17, 2008).

[271] Référentiel technique de RTE – Trame type convention de raccordement (articles 2.2.3 and 3.5). www.rte-france.com (last accessed October 17, 2008).

[272] Référentiel technique de RTE – Trame type convention de raccordement (article 4.7). www.rte-france.com (last accessed October 17, 2008).

[273] On CRE's website, the regulatory decisions on each of these disputes are published: www.cre.fr/fr/documents/deliberations (last accessed October 17, 2008).

network, and the level of quality that these systems have to meet[274]. They have to approve the changes that the network users intend to make to their installations.
Regulation is also part of the governance structure, because the sector-specific regulator (CRE) settles the disputes between the system operators and the network users on network connection. The hybrid form can more specifically be characterized as a trilateral governance structure: a third party, the regulator, governs the transactions between the two contracting parties. In this trilateral structure, the system operators have an intermediate incentive intensity, and use several administrative instruments to check the safety of the network users' installations, and the contracts are long-term and flexible.
The next subsection will consider the attributes of adaptation to understand the emergence of and the transformation to this hybrid form, by looking at the search for a contracting party, the laterality of the adaption, and the response in the adaptation process to either the price or to the system requirements.

7.4.4 Adaptation

The network users' search for a contracting party to engage in the network connection transactions is restricted: they can only transact with the monopolistic system operators. The transmission system operator (RTE) has a monopoly for the connection to the high-voltage part of the electricity network. *Electricité Reseau Distribution France* (ERDF), a distribution system operator and subsidiary of EDF, controls around 95 per cent of the distribution activities in the French electricity industry (ERDF, 2007: 3). The other five per cent is distributed by the non-nationalized distributors. When network users want to connect to the transmission system, they have no other choice than to contract with RTE. When the network users want to connect to the distribution system, the relevance of *the identity of the contacting party* is also very high. In 95 per cent of their connection requests, the network users are

[274] Arrêté du 4 juillet 2003 relatif aux prescriptions techniques de conception et de fonctionnement pour le raccordement direct au réseau public de transport d'une installation de consommation d'énergie électrique (article 7). Arrêté du 4 juillet 2003 relatif aux prescriptions techniques de conception et de fonctionnement pour le raccordement au réseau public de transport d'une installation de production d'énergie électrique (article 6).

restricted to contracting with ERDF.

The system operators have formulated technical guidelines (référentiels techniques) that include among others information on the process of connection, on the technical requirements for the installations that are to be connected to the network, and on the systems of protection and communication. The system operators must take into account the relevant legislation, decrees and orders, and the regulatory decisions of the CRE in their formulation of the technical guidelines. These guidelines are not contractual agreements between the network users and the system operators, but elements from the guidelines are included in the connection agreements. The guidelines have influenced the new form of governance in several ways. They specify the duration and the flexibility of the agreement. The incentive intensity is increased by determining a fixed price before the construction of the connection starts, and by specifying the forty per cent down payment. In 2004, the CRE obliged the system operators to publish their technical guidelines. With the publication of these guidelines, the CRE aims to approach the situation of the network users in other European Union countries that have access to information on the technical, regulatory and contractual conditions for network connection through the grid codes[275]. The CRE described what should be included at minimum in the guidelines. The CRE also ruled that before the publication of the guidelines, the system operators should consult with the network users or their representative organizations. The network users should also be consulted when the system operators intend to modify the technical guidelines. The system operators have to communicate the results of these consultations and the expressed opinions to the CRE and to the minister of energy[276]. Since 2004, the adaptation to the new form of governance has thus allowed for a *multilateral adaptation*; the system operators are obliged to consult with the network users.

From several communications of the CRE, it is obvious that the network users have complaints about the current process of consultation, and that these users suggest alterations to the

[275] Décision de la Commission de régulation de l'énergie du 7 avril 2004 sur la mise en place des référentiels techniques des gestionnaires de réseaux publics d'électricité.
[276] Article 35 of the Decree n° 2006-1731 of December 23, 2006.

process[277]. Both RTE and EDF Réseau Distribution have published incomplete guidelines[278]. The network users claim that the system operators treat the guidelines as having a prescriptive character, while only the contractual agreements between the system operators and network users are binding. They suggest that, since the CRE can settle disputes ex post on these matters, it may even be better that the CRE intervenes ex ante and obliges the system operators to take into account the remarks of the network users, and that the network users may propose changes to the guidelines through a procedure of arbitrage or through a unilateral imposition of modifications. The CRE could not react to these suggestions, as it does not have the power to intervene ex ante in these matters. It can be concluded that the network users believe that their influence on the content of these guidelines can be improved.

In addition to the technical guidelines, the regulatory decisions of the CRE also have an influence on the new form of governance for the network connection transaction (see also the next subsection, 7.4.5). When making regulatory decisions on network connection, the CRE consults with other parties in the electricity industry. For example, when determining the additional connection charges for the distribution network in 2008, the CRE organized two round tables and invited among others the distribution system operators, the generators, retailers and consumers of electricity, and the ministry of energy[279].

A large part of the regulations for network connection that affect the governance structure (such as those for information disclosure and information verification mechanisms, and the tariffs for the use of the network) are, however, determined by decree or order, and thus set by the ministry. For these regulations, no such consultative mechanisms exist as mentioned in the two previous cases.

[277] Communication de la Commission de régulation de l'énergie du 22 mars 2007 sur les enseignements à tirer de la consultation publique relative à la mise en place de la documentation technique de référence (référentiels techniques) des gestionnaires de réseaux publics d'électricité.
[278] Communication de la Commission de régulation de l'énergie du 26 octobre 2005 sur l'application de sa décision du 7 avril 2004, relative à la mise en place des référentiels techniques des gestionnaires de réseaux publics d'électricité.
[279] Décision de la Commission de régulation de l'énergie du 27 mars 2008 relative à l'approbation du barème d'Électricité Réseau de Distribution France (ERDF) pour la facturation des opérations de raccordement des utilisateurs aux réseaux publics de distribution d'électricité qui lui sont concedes.

The adaptation to the new form of governance has been driven by the *requirements of the electric system*. The network connection transactions would not even exist if there were no dependence on a network for the supply and consumption of electricity. The dependence on the network will most likely continue for a long period of time, which can explain the preference for a long-term hybrid form. The dependence on the electric system can also explain the involvement of the public authorities, the presence of the information disclosure and verification mechanisms, and the role of authority for the system operator in this governance structure. Since the electricity networks remain natural monopolies in the liberalized electricity industry, the public authorities have continued to regulate the activities of distribution and transmission. Their regulatory objectives include ensuring the security of supply and the security of the network. In the decree of 2003 they attributed a responsibility for the security of the network to the system operators. This decree states that the system operator has to verify that the new installation, which is to be connected to the network, must not endanger the quality and the safety of the electricity network[280]. The decree of 2008 states that only those installations can be connected to the network that have a protection system, and the equipment that allows the network user and the system operator to exchange information[281]. This information disclosure mechanism, in which the system operator and the network user put in place equipment to communicate, is included in the governance structure to ensure the safety of the electric system. This equipment allows the system operator to send information to the generators to immediately increase or decrease their production to avoid an overload (of parts) of the network. The information verification mechanism, in which the user has to supply the operator with a proof of conformity to the technical standards, is also included in the governance structure to ensure the safety of the electric system. The system operators are given authority over the network users to ensure the safety of the electric system and to avoid a

[280] Décret n° 2003-588 du 27 juin 2003 relatif aux prescriptions techniques générales de conception et de fonctionnement auxquelles doivent satisfaire les installations en vue de leur raccordement au réseau public de transport de l'électricité (article 6).

[281] Décret n° 2008-386 du 23 avril 2008 relatif aux prescriptions techniques générales de conception et de fonctionnement pour le raccordement d'installations de production aux réseaux publics d'électricité. (article 5).

disturbance in the network. They may, for example, disconnect the network users, and oblige the network users to set up a protection system for their installation.
Network users could not select the contracting party and the governance structure on the basis of price, because of the regulated tariffs for a connection to the network. The price for the connection services does play another role in the selection of the governance structure, because it explains the involvement of the third parties: the public authorities set the tariffs to ensure that the system operators, with their monopoly position, do not demand unreasonably high prices.

The relevance of the contracting party, the multilateral adaptation, and the fact that the parties to the governance structure take the requirements of the electric system into account in the process of adaptation, can explain the *transformation* to the hybrid form of governance. For the relation between the electricity generators and the system operators, the adaptation can be described as an *autonomous adaptation*, because the governance structure transformed from a vertically integrated hierarchy to a hybrid form of governance.

7.4.5 The role of regulation

Regulation sets the ex ante rules of the game. The law of February 2000 states that the distribution and transmission system operators should provide a non-discriminatory connection to the electricity network. This law also states that the ministers of energy and of economic affairs determine the tariffs for the use of the network, and, in an order, they set the general principles for calculating the additional connection charges. CRE approves the additional connection charges that are proposed by the system operators. Several decrees and orders set the technical conditions for the network users' installations that are to be connected to the electricity network. CRE has to approve the procedures for processing connection requests by the system operators[282].

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[282] Décret n° 2006-1731 du 23 décembre 2006 approuvant le cahier des charges type de concession du réseau public de transport d'électricité.

These ex ante rules have an influence on the governance structure. By determining the tariffs for the use of the network and approving the connection charges, the public authorities reduce the incentive intensity of the system operators. The decrees and orders require the creation of various information disclosure and information verification mechanisms, including the communication facilities between the network users and system operators, and the proof of conformity to the safety regulations. Regulation is also part of the new governance structure: the CRE settles the disputes over network connection. In addition, regulation influences the attributes of the transaction. By making the network connection costs dependent upon the size of the electricity lines, the ministers create the attribute of site-specificity for the network connection transactions. Finally, regulation has had an influence on the process of adaptation. The CRE has determined that the system operators should publish their technical reference guides and that they should consult with the network users when they aim to alter these guides. The CRE has thereby stimulated a multilateral adaptation to the new governance structures.

7.5 Network access and balancing transactions: exchange of programs

In order to ensure their access to the electricity network, the network users have to send either a 'programme d'appel' or a 'programme d'approvisionnement' to the transmission system operator[283]. The electricity generators formulate the programmes d'appel, which include information on the amount of electricity that they expect to supply to the network on the next day, and proposals for adjusting these programs. The electricity retailers and the authorities that organize the public distribution of electricity formulate the programmes d'approvisionnement, which include information on the amount of electricity that they expect to be supplied to them on the next day, and that they expect to supply to their customers. These programs are sent to the transmission system operator, who makes sure that they match its expectations of the national electricity consumption on the next day. The transmission system

[283] Article 15 of the law of February 2000.

operator needs these programs to identify the transportation restrictions on the network[284], and to ensure the balance between electricity supply and demand[285].

Not every network user (the generators, consumers, and authorities that organize the pubic distribution of electricity) has to send these programs to RTE. The network users that do not wish to send these programs, may sign a so-called agreement on attachment (accord de rattachement) in which they transfer their program responsibility to another network user. The network user that takes on the responsibility for sending programs to RTE is referred to as a program responsible party. Every network user has to sign a network access contract with the system operator. The network access contracts specify the level of capacity (in kW) at which the users access the network, the responsibilities of the system operator with respect to the quality of the electricity transportation, the agreements on the measurement of electricity use, and the network access tariffs. In these network access contracts, the network users indicate the name of their program responsible party, and the name of the party that takes over their responsibility for balancing electricity supply and demand (the balancing responsible party). Those network users that send the programs to RTE have to sign a participation agreement (accord de participation) with RTE in addition to the network access contract. In this participation agreement, these program responsible parties agree to abide by the rules on the program responsibility, which include rules on how the programs need to be sent to RTE, within which time frame, and which changes can be made to the programs[286]. The balancing responsible parties also have to sign a participation agreement with RTE, in which they declare to abide by the rules on the balancing responsibility[287]. The CRE has to approve these rules.

A difference can be noted with respect to the exchange of the programs between the Dutch and

[284] Article C.3.1 of the Regles relative a la programmation, mecanisme d'ajustement et au dispositifs de responsable d'equilibre. www.rte-france.com (last accessed December 7, 2008).
[285] Article 15 of the law of February 2000.
[286] Règles relatives à la Programmation, au Mécanisme d'Ajustement et au dispositif de Responsible d'Equilibre - Section 1 Règles relatives à la Programmation, au Mécanisme d'Ajustement, au Recouvrement des charges d'ajustement.
[287] Règles relative à la Programmation, au Mécanisme d'Ajustement et au dispositif de Responsable d'Equilibre, section 2 relative à la reconstitution des Flux et au calcul des écarts des Responsables d'équilibre.

French electricity industries. The Dutch network users have to send two separate programs to the transmission system operator for two purposes: restricting transportations on the network and balancing electricity supply and demand. In the Netherlands, these two types of programs are referred to as the transportation programs and the energy programs, respectively. In the French electricity industry, only one program is exchanged to serve these two purposes, which is either the programme d'appel or the programme d'approvisionnement, depending on the type of network user.

Because only one type of program is used in the French electricity industry for both the signaling of transportation restrictions and the balancing of electricity supply and demand, these two purposes are discussed together in this section. The network access transaction and the balancing transaction that are studied in this section thus concern the exchange of information between the transmission system operator and the program responsible parties, in the form of the programs, which allow the network users an access to the network, and RTE to signal the transportation restrictions and to ensure a balance of electricity supply and demand on the day before the operational day. The network users have to behave according to these programs.

7.5.1 The attributes of the transactions

The programmes d'appel[288] include information on the amount of electricity that the generators expect to put on the network on the next day, and on their participation in keeping reserves for frequency control. The program responsible parties send this information to RTE for half-hour periods, and they thus formulate 48 programs for each day. After submitting these programs on day t-1, the program responsible parties may adjust these programs until two hours before their implementation. Since these transactions occur multiple times during a day, and take place every day, the *frequency* of these transactions is characterized as recurrent.

The program responsible parties have to follow a strict time schedule for the delivery of the

[288] The focus will be on the programmes d'appel in the rest of this section, because the rules on the exchange of the programs focus on these programmes d'appel (Règles relatives à la Programmation, au Mécanisme d'Ajustement et au dispositif de Responsible d'Equilibre).

programs before an access to the network can be guaranteed. These transactions are therefore characterized by *temporal specificity*. On the day before the operational day, and not later than 12h30, the program responsible parties send information to RTE on their expected production for the next day for half-hour periods and for each EDP (entité de programmation). An EDP corresponds to one or several generating plants for which a program responsible party formulates a programme d'appel. Before 12h30 on the day before the operational day, the program responsible parties also send information to RTE on the technical constraints of the generating plants for which they assume program responsibility. When a program responsible party has signed a contract with RTE to participate in the system services (e.g. frequency control), it also has to transmit information on the generation of electricity to abide by these contracts. RTE uses this information to prescribe the capacity that the program responsible party has to reserve for frequency control, and that the party has to indicate in its programmes d'appel. RTE sends these instructions to the program responsible parties before 1 pm. Before 14h30, the program responsible parties resend the information on their expected generation to RTE. This information is still on a provisional basis. Before 4 pm, the program responsible parties send their programmes d'appel and information on their contribution to the reserves for every EDP[289]. When these programmes d'appel are not consistent with for example the technical constraints, RTE informs the program responsible party. This party has to adjust its programs within fifteen minutes, or RTE may alter the programs[290]. Before 8 pm, RTE translates the programmes d'appel into so-called running programs (programmes de marche) that indicate for each EDP how they have to produce for each half hour on the next day. For the first time at 10 pm on the day before the operational day, the program responsible party may alter its programmes d'appel, which also alters the running programs. These alterations may not be contrary to the agreements made in the adjustment mechanism. The adjustment mechanism allows RTE to balance electricity supply and demand and to resolve transportation

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[289] Règles relatives à la Programmation, au Mécanisme d'Ajustement et au dispositif de Responsible d'Equilibre - C.3.1.3 Transmissions anticipées de certaines données.
[290] Règles relatives à la Programmation, au Mécanisme d'Ajustement et au dispositif de Responsible d'Equilibre - C.3.1.4 Transmission à RTE du Programme d'Appel et du Programme Prévisionnel à l'Heure Limite d'Accès au Réseau.

restrictions in real time[291]. The running programs include the agreements that are made by RTE in the adjustment mechanism. The program responsible party has to follow the running programs of the EDP[292].

In addition to this temporal specificity, these network access and balancing transactions are also characterized by *human asset-specificity*. Before a program responsible party can send the programs to RTE, it has to be able to access the information system of RTE and to use several of RTE's applications for exchanging messages on the programs and adjustments to the programs. A set of rules has been formulated on how to access this information system and the use of the applications (règles d'accès au system d'information et d'utilisation des applications de RTE) to which the program responsible parties have to conform. RTE defines the messages that have to be exchanged in order to transfer information on the programs between RTE and the program responsible parties[293]. Before the program responsible parties and RTE sign a participation agreement, the program responsible parties have to take several tests to ensure that they are able to access the information system and exchange the messages. When changes in the regulations on the programmes d'appel result in changes in the messages, RTE organizes additional tests for the program responsible parties[294]. The program responsible parties have to pay for the investments in assets that are needed to access the information system of RTE[295]. They have to invest in specific human assets to be able to access the information system, use the applications of RTE and send the various messages on the programs to RTE. These human assets are specific, because the applications of RTE (e.g. Diapason, Eode) are only suited for exchanging messages on the system services, such as the exchange of programs for the transportation restrictions and the balancing of electricity supply and demand. In the

[291] The following section (7.6) will focus on this adjustment mechanism.

[292] Règles relatives à la Programmation, au Mécanisme d'Ajustement et au dispositif de Responsible d'Equilibre - C.3.8 Respect du programme de marche par le responsable de programmation.

[293] Article 6.1 of the Règles d'accès au system d'information et d'utilisation des applications de RTE. www.rte-france.com (last accessed December 7, 2008).

[294] Article B.4.1 Tests relatifs au systeme d'information du participant of the Regles relative a la programmation, mecanisme d'ajustement et au dispositifs de responsable d'equilibre. www.rte-france.com (last accessed December 7, 2008).

[295] Article 3.3 of the Règles d'accès au system d'information et d'utilisation des applications de RTE. www.rte-france.com (last accessed December 7, 2008).

participation agreements, the program (and balancing) responsible parties indicate the names of their employees that are responsible for using the applications and for abiding by the rules on access to the information system and the applications[296]. The specific human assets are also *dedicated assets*, because the program responsible parties have only invested in these assets for their transactions on the programmes d'appel with the transmission system operator.

Whether these network access and balancing transactions are characterized by *behavioral uncertainty* is influenced by the fact that the transacting parties have to pay for deviating from their programs. Every generator and every consumer of electricity is responsible for the difference between the amount of electricity that they put on the network and the amount of electricity that they take out of the network (i.e. the imbalance), and thus for abiding by their programs[297]. They may transfer this responsibility to another party, the balancing responsible party, which can be the same as the program responsible party. When the imbalance is negative, and thus more electricity is taken out of the network than is put on the network, the balancing responsible party has to pay RTE for this difference. When the imbalance is positive, RTE remunerates the balancing responsible party for the difference. The value of these imbalances is based on the spot price for electricity that is determined on Powernext (the French day-ahead and futures market for electricity and gas), and on the prices that are established by the adjustment mechanism[298]. In this adjustment mechanism, network users offer reserve capacity to RTE for balancing electricity supply and demand and for resolving transportation restrictions in real time. Whether RTE or the balancing responsible party have to pay the spot price or the price of the adjustment mechanism for the imbalance is based on the direction of balancing, and thus on whether RTE had to increase or decrease the amount of electricity on the network in a particular thirty minute-period. Four different options are the result (see also table 7.1). Firstly, when RTE had to increase the amount of electricity on the

[296] Article B.4. of the Regles relative a la programmation, mecanisme d'ajustement et au dispositifs de responsable d'equilibre. www.rte-france.com (last accessed December 7, 2008).
[297] Article 15 of the law of February 2000.
[298] Règles relative à la Programmation, au Mécanisme d'Ajustement et au dispositif de Responsable d'Equilibre, section 2 relative à la reconstitution des Flux et au calcul des écarts des Responsables d'équilibre. Chapitre B, page 4.

network (i.e. the balancing trend was upward), and the imbalance of the balancing responsible party is positive, RTE pays the balancing responsible party the Powernext spot price. Secondly, when the balancing trend was downward, and the imbalance of the balancing responsible party is positive, RTE pays the average weighted price for the downward balancing of the adjustment mechanism to the balancing responsible party. This price is divided by a factor 1+K, where K is 0,05. The upper limit of this price is fixed at the Powernext spot price[299]. This factor K is a penalty for the balancing responsible party, because this party has supplied too much electricity to the network in a period where RTE had to decrease the amount of electricity. The height of K may be adjusted over time, and it has to be approved by the CRE. When the balancing responsible party is, for example, also an electricity generator, this factor reduces the party's incentive to supply too much electricity, and to deviate from its programs, because the party could have earned a higher return for this electricity on the spot market. Thirdly, when the balancing trend is downward, and the imbalance of the balancing responsible party is negative, the balancing responsible party pays the Powernext spot price to RTE. Fourthly, when the balancing trend is upward, and the imbalance of the balancing responsible party is negative, the latter pays the average weighted price for the upward balancing of the adjustment mechanism to RTE. This price is multiplied by the factor 1+K, and may not be lower than the Powernext spot price. This factor again serves as a penalty for the balancing responsible parties.

Table 7.1 Imbalance prices[300]

	Case where the balancing trend is upward	Case where the balancing trend is downward
Positive imbalances	Powernext spot price	AWPb / (1+K)
Negative imbalances	AWPh x (1+K)	Powernext spot price

299 www.rte-france.com (last accessed December 20, 2008).
300 Règles relative à la Programmation, au Mécanisme d'Ajustement et au dispositif de Responsable d'Equilibre, section 1 relative à la Programmation, au Mécanisme d'Ajustement et au Recouvrement des charges d'ajustement, Chapitre E, page 83, and www.rte-france.com (last accessed December 7, 2008).

Because the balancing responsible parties have to pay for their imbalances and these payments are subject to penalties, they have an incentive to reduce their imbalances. When these balancing responsible parties are also responsible for exchanging programs, they have an incentive to provide accurate programs to RTE. If these programs are close to the actual consumption and generation of electricity, the balancing responsible parties reduce their imbalances. RTE wants to receive accurate programs, because it enables the operator to make more accurate predictions of the imbalances and transportation restrictions in real time. Since the balancing responsible parties do not have an incentive to disguise or distort information in their programs, and thus do not have an incentive to behave opportunistically, these network access and balancing transactions are not characterized by *behavioral uncertainty*. The CRE has not resolved any disputes on the exchange of programs, which also alludes to the absence of behavioral uncertainty in the transaction[301].

7.5.2 Misalignment

The network access and balancing transactions between the generators, transmission and distribution system operators used to be internalized within EDF. This vertically integrated hierarchy is assumed to have been aligned with the transactions, and therefore the rules on the vertical unbundling create a *misalignment*. The attributes of the transactions have, however, changed into a direction in which transaction cost economics would not predict an ex post governance structure. There is no behavioral uncertainty in these transactions. The incentives between the two contracting parties (RTE and the balancing responsible party) are aligned ex ante, and therefore a contractual agreement between the contracting parties would suffice

[301] The Société nationale d'électricité et de thermique (SNET) has asked the CRE to resolve a dispute with RTE on the balancing mechanism. The SNET argued that this mechanism was not well adapted to SNET’s situation with a few generating plants that had an increased risk of breakdown and substantially increased the imbalance costs. The CRE rejected the demands of the SNET, and argued that it could have transferred its program responsibility to another firm to reduce its imbalance risks. This dispute did not revolve around the exchange of programs, but around an energy firm that demanded an exemption from paying the high imbalance costs. Décision du 6 février 2003 sur un différend qui oppose la Société nationale d'électricité et de thermique (SNET) à Réseau de transport d'électricité (RTE), gestionnaire du réseau public de transport d'électricité, relatif aux modalités d'exécution du contrat de responsable d'équilibre de la SNET.

according to the predictions of *transaction cost economics*. The following subsection (7.5.3) will, however, demonstrate that an elaborate hybrid governance structure has emerged. In the absence of behavioral uncertainty, transaction cost economics does not predict the comparative efficiency of a hybrid form of governance.

7.5.3 The governance structure

The governance structure will be characterized along three attributes: the incentive intensity, the administrative control, and the contract law regime. Incentive intensity has been defined in chapter five as the degree to which changes in efforts expended by an economic actor have an immediate effect on his compensation or stream of revenues. The governance of the network access and balancing transactions is characterized by an intermediate degree of *incentive intensity*. A governance structure is characterized by an intermediate incentive intensity when a part of the income to be earned cannot be influenced by the economic actor; or when the transaction itself may not directly earn an income, but is a prerequisite for earning an income with a consecutive transaction. The contracting parties to the network access and balancing transactions do not directly earn an income from exchanging the programs, but these transactions are a requisite for access to the network, and thus for enabling the contracting parties to earn an income in other transactions, such as the sale of electricity to consumers. The balancing and program responsible parties have an incentive to abide by their programs in order to reduce their imbalance costs, but several factors that are outside of the balancing and program responsible parties' control influence these costs. Firstly, the parties cannot exactly predict how much electricity will be consumed or produced on the next day by the network users for which they have taken over responsibility, due to for instance the weather or unexpected problems with generating facilities. Secondly, the price that a balancing responsible party pays or receives in the imbalance settlement depends upon the balancing trend (see figure 7.1), and thus on the behavior of the other network users in the industry, which is outside of the control of a balancing responsible party.

The *administrative apparatus* of the governance structure consists first of all of a monitoring of the network users. RTE measures the electricity that the network users put on (and take out of) the network for each half hour[302]. On the basis of these measurements, RTE determines the imbalances and the amounts that the balancing responsible parties have to pay or receive[303]. Secondly, RTE discloses the information on the amount of electricity that was put on and taken out of the network to the balancing responsible parties[304]. The latter verify whether the information that was transferred by RTE is correct[305]. Thirdly, RTE may impose several penalties on the program and balancing responsible parties and the network users. When the rules on the programs, the balancing responsibility, and the adjustment mechanism are changed, they alter the participation agreements. When the program or balancing responsible party does not sign the new supplement to the participation agreement within twenty days, RTE may end the participation agreement with this party[306]. Furthermore, the network access contracts state that RTE may suspend access to the network, or end the network access contract, when a network user does not pay the tariffs as stipulated in the contract[307].

In the network access contracts with the transmission system operator, it is stated that they are signed for an indefinite period[308]. The duration of these contracts will in most cases extend beyond a year, and they are therefore characterized as *long term*. The period for cancelling

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[302] Règles relative à la Programmation, au Mécanisme d'Ajustement et au dispositif de Responsable d'Equilibre, section 1 relative à la Programmation, au Mécanisme d'Ajustement et au Recouvrement des charges d'ajustement, article D10.1.2.1, page 71.
[303] Règles relative à la Programmation, au Mécanisme d'Ajustement et au dispositif de Responsable d'Equilibre, section 2 relative à la reconstitution des Flux et au calcul des écarts des Responsables d'équilibre. Article C12.1, page 17.
[304] Règles relative à la Programmation, au Mécanisme d'Ajustement et au dispositif de Responsable d'Equilibre, section 2 relative à la reconstitution des Flux et au calcul des écarts des Responsables d'équilibre. Article C12.4, page 19.
[305] Règles relative à la Programmation, au Mécanisme d'Ajustement et au dispositif de Responsable d'Equilibre, section 2 relative à la reconstitution des Flux et au calcul des écarts des Responsables d'équilibre. Article C14.2, page 26.
[306] Règles relative à la Programmation, au Mécanisme d'Ajustement et au dispositif de Responsable d'Equilibre, section 1 relative à la Programmation, au Mécanisme d'Ajustement et au Recouvrement des charges d'ajustement, article B3, page 24.
[307] Article 10.5 Pénalités prévues en cas de non-paiement of the network access contract between generators and RTE.
[308] Network access contract between generators and RTE (article 14.8, page 49), network access contract between consumers and RTE (article 12.8, page 50), network access contract between distributors and RTE (article 12.8, page 55).

these network access contracts may already exceed a year. When a network user informs the system operator of its intention to end its contractual relation for access to the network after the 31st of August in year t, the contract will be cancelled in January of year t+2. The network access contracts with the distribution system operator (ERDF) are signed for a period of three years[309], and can therefore also be characterized as long term.

The contracts between the system operators and the program and balancing responsible parties and the network users are *flexible*. When changes to the rules on the programs, the adjustment mechanism, and the balancing responsibility are made, the existing participation agreements are altered[310]. The network access contracts are altered when regulations are changed or new regulations are formulated that affect the clauses in these contracts[311].

The rules on the program and balancing responsibility and the network access contracts state that the contracting parties should aim to resolve their *disputes* amicably, before turning to the CRE[312]. The CRE has resolved several disputes with respect to network access. These disputes were never concerned with the exchange of the programmes d'appel between the system operator and a network user, but with for example network access tariffs[313] and with the

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[309] Network access contract between generators and distribution system operator (ERDF) (article 11.3, page 43). Network access contract between consumers and distribution system operator (ERDF) (article 11.3, page 37).

[310] Règles relative a la programmation, mécanisme d'ajustement et au dispositifs de responsable d'équilibre, section 1 relative à la Programmation, au Mécanisme d'Ajustement et au Recouvrement des charges d'ajustement, article B.3 Modalités de révision des règles, page 24. Section 2 relative à la reconstitution des Flux et au calcul des écarts des Responsables d'équilibre, article B6 Modalités de révision de la section 2 des règles, page 8.

[311] Network access contract between generators and RTE, article 14.1, page 47. Network access contract between consumers and RTE, article 12.1, page 49.

[312] Règles relative a la programmation, mécanisme d'ajustement et au dispositifs de responsable d'équilibre. B.16 règlement des différends. Conditions générales relatives à l'accès au réseau public de transport d'électricité – Producteurs (article 14.6). Conditions générales relatives à l'accès au réseau public de transport d'électricité – Consommateur (article 12.6).

[313] Décision de la Commission de Régulation de l'Electricité (CRE) en date du 12 décembre 2002 sur un différend qui oppose la société Pem Abrasif Refractaires (PEMAR) à Réseau de transport d'électricité (RTE), en tant que gestionnaire du réseau public de transport d'électricité, relatif à la tarification d'utilisation des réseaux publics applicable aux consommateurs raccordés en tension 42 kV.

Décision de la Commission de régulation de l'énergie du 25 mai 2004 se prononçant sur un différend qui oppose Réseau de transport d'électricité (RTE) à la société Cerestar France relatif à la tarification de l'accès au réseau public de transport et à la signature d'un contrat d'accès au réseau.

number of network access contracts that are needed for multiple connection points[314].

The governance structure can thus be characterized as a hybrid form, in which the contracting parties (the program and balancing responsible parties and the system operators) retain their autonomy, but are dependent upon each other for the exchange of the programs. This hybrid form is characterized by an intermediate incentive intensity, an administrative apparatus of information disclosure mechanisms, monitoring and penalties, and long-term, flexible contracts, and dispute resolution by the regulator. Given the absence of behavioral uncertainty, transaction cost economics would not predict such a hybrid form. In the following subsection, the attributes of adaptation enable an explanation of a transformation to this hybrid form.

7.5.4 Adaptation

The attributes of adaptation include the identity of the contracting party, the laterality of the adaptation, and the type of response in the process of adaptation. To the program responsible parties, the *identity of the contracting party* in these network access and balancing transactions is highly relevant. The program responsible parties are limited in their search for a contracting party; they can only transact with the transmission system operator for the exchange of the programs, and therefore, they prefer to engage in a long-term contractual relation, as they have no alternative within the French electricity industry.

With respect to the laterality, it can be concluded that various parties are involved in the process of adaptation to the new forms of governance. The program responsible parties and the transmission system operator must sign a participation agreement before the program responsible party may exchange the programs. In this participation agreement, the program

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Décision de la Commission de régulation de l'énergie du 10 février 2005 se prononçant sur un différend qui oppose Réseau de Transport d'Electricité (RTE) à la Compagnie Parisienne de Chauffage Urbain (CPCU) relatif à l'application du tarif d'utilisation du réseau public de transport.

[314] Décision de la Commission de Régulation de l'Electricité (CRE) en date du 27 juin 2002 sur un différend, qui oppose la société Semmaris à EDF, en tant que gestionnaire du réseau public de distribution d'électricité, relatif aux conditions de prise en compte de la multiplicité des points de livraison dans le dispositif contractuel d'accès au réseau électrique.

responsible party declares to adhere to the rules on the programs and the adjustment mechanism. These rules are therefore an integral part of the contractual relation and the governance structure between the program responsible party and the transmission system operator. These rules also describe the procedures for adjusting the rules. RTE, the network users that have signed a participation agreement with RTE (the participants), and the members of the 'Commission de Fonctionnement du Mécanisme d'Ajustement' (CFMA) can propose changes to the rules. The CFMA is a group within the 'Comité d'Utilisateurs du Réseau de Transport d'Électricité' (CURTE). When RTE puts forward a proposal for changes to the rules, the participants and the members of the CFMA may react to this proposal or may make a counterproposition on how the rules have to be altered. The adaptation to new governance structures is thus *multilateral*, as it involves the various parties in the electricity industry. RTE does, however, have a large role in changing the rules; it may decide not to pursue a proposal for changes in the rules with an explanation for this refusal to the CFMA, and RTE formulates the final proposition for changes to the rules. This final proposition is send to the CRE for approval[315]. A similar procedure is used for changing the rules on the balancing responsibility. A governance commission has been established that brings together RTE, the distribution system operators, and the representatives of the balancing responsible parties. The members of this commission may propose changes to the rules on the balancing responsibility[316]. In addition, the network access contracts between the generators and RTE, and between the consumers and RTE state that any changes to the general conditions of these contracts should be subject to a consultation with the distribution system operators and the representatives of the network users. These multilateral adaptations may reduce the search costs for a governance structure: the involvement of the different actors in the adaptation process stimulates a communication on which features of a potential future governance structure enable or inhibit a

[315] Règles relative a la programmation, mécanisme d'ajustement et au dispositifs de responsable d'équilibre, section 1 relative à la Programmation, au Mécanisme d'Ajustement et au Recouvrement des charges d'ajustement, article B.3 Modalités de révision des règles, page 24.

[316] Règles relative a la programmation, mécanisme d'ajustement et au dispositifs de responsable d'équilibre, section 2 règles relatives au dispositif de responsable d'équilibre, article B6 Modalités de révision de la section 2 des règles, page 8.

proper execution of the program transactions.

The program and balancing responsible parties and the transmission system operator engage in these network access and balancing transactions, because they have to take the *electric system* into account. These transactions are necessary to resolve restrictions on the transportation of electricity and to balance electricity supply and demand, and thus to ensure the security and safety of electricity supply. Because these requirements of the electric system will not change in the near future, the parties prefer to engage in a long-term relation. While these system requirements are the reason for engaging in these transactions and for developing a governance structure for the transactions, the economic actors did consider the price of the imbalances when adapting to the new form of governance. In the current governance structure, the balancing responsible parties are responsible for their own imbalances, and a penalty is included for creating an imbalance in the opposite direction of the total imbalance. The parties thus have an incentive to abide by their programs, and to reduce their imbalance costs.

This multilateral adaptation, in which the identity of the contracting party is relevant, and the requirements of the system are considered, explains the transformation to the hybrid form of governance. Because this new governance structure transformed from a vertically integrated hierarchy, the type of adaptation is characterized as an *autonomous adaptation*.

7.5.5 The role of regulation

Regulation has influenced the attributes of the transaction, the governance structure and the process of adaptation. Firstly, article 15 of the electricity law of 2000 requires this transaction of exchanging the programs. The rules on the programs stipulate the time schedule within which the programs have to be exchanged, and thereby formalize the temporal specificity that is inherent in the transaction. The rules have transferred the responsibility for the imbalances, and for abiding by the programs to the balancing and program responsible parties, and they have given these parties a financial incentive to abide by their programs. The program responsible parties therefore have a reason to provide RTE with accurate programs, and thereby regulation has ex ante aligned the incentives between the contracting parties and eliminated the behavioral uncertainty in the transactions. The need for ex post governance structures is reduced. Secondly, in the participation agreements, the parties declare to adhere to the rules on the programs, adjustment mechanism and balancing. These rules that are approved by the CRE are therefore an integral part of the governance structure that coordinates the program transactions. These rules also create the contract flexibility: they stipulate the possibility for adjusting the rules and the participation agreements. They also specify that RTE monitors the electricity use of the network users, and discloses this information to the program responsible parties. Thirdly, the rules formulate which parties in the electricity industry should be involved in the process of adaptation. Finally, the CRE is appointed as the authority that settles the disputes and is thus part of the governance structure. The CRE has not yet settled any disputes on the exchange of the programs so far.

7.6 Network access and balancing transactions: supply of reserve power

The transaction of exchanging programs enables the transmission system operator to resolve transportation restrictions and to balance electricity supply and demand on the day before the operational day. The transmission system operator also needs to resolve the restrictions on the network and to balance supply and demand in real time. For this purpose, a mechanism has been set up in which network users bid for the supply of reserve power to RTE. The transaction that will be discussed in this section concerns this bidding mechanism.

Several types of reserves exist in the French electricity system, including primary and secondary reserves and rapid tertiary reserves. The primary and secondary reserves are the reserves of the large electricity generators that participate in the primary and secondary frequency and power regulation. The primary frequency regulation is an automatic function at the level of the generators that responds to changes in frequency. The secondary frequency regulation is an automatic function, at the national dispatching level of RTE, which is intended to adjust the generation of electricity to the exchange programs on the interconnections and to the normal frequency[317]. The generators communicate these primary and secondary reserves to RTE in their programmes d'appel. RTE concludes bilateral contracts with the generators for the supply of these reserves. The aim of the rapid tertiary reserves is to complete the contributions to the secondary frequency regulation service, in the event that (one of) the large generators connected to the transmission network should fail[318]. This tertiary reserve is offered to RTE through the bidding mechanism. In addition, RTE has contracted 1500 MW of tertiary reserves (CRE, 2007: 55).

There are two types of bids in this bidding mechanism: implicit and explicit bids. The implicit bids are made by so-called adjustment parties (acteurs d'ajustement) for an increase (or decrease) in the input into the electricity network. These bids are made for an entité d'ajustement (EDA), which consists of one or several EDPs (entités de programmation). An EDP corresponds to one or several generating plants for which a program responsible party formulates a programme d'appel. An adjustment party has to be the program responsible party for the EDPs that are included in the EDA, and must thus have signed a participation agreement with RTE. An EDA consists of EDPs that are able to respond to a call by RTE for increasing (or decreasing) their supply into the network within a particular period of time. These implicit bids alter the programmes d'appel of the EDPs that are included in the EDA. Explicit bids are bids that are not associated with a program, and that consist among others of bids for decreasing the offtake of electricity from the network[319].

For the purpose of balancing electricity supply and demand, RTE classifies the bids of the adjustment parties in increasing order of price for the bids that increase the supply of electricity into the network, and in decreasing order of price for the bids that decrease the supply of

[317] Règles relative a la programmation, mécanisme d'ajustement et au dispositifs de responsable d'équilibre, section 1 relative à la Programmation, au Mécanisme d'Ajustement et au Recouvrement des charges d'ajustement, page 18-20.

[318] Règles relative a la programmation, mécanisme d'ajustement et au dispositifs de responsable d'équilibre, section 1 relative à la Programmation, au Mécanisme d'Ajustement et au Recouvrement des charges d'ajustement, page 19.

[319] Règles relative a la programmation, mécanisme d'ajustement et au dispositifs de responsable d'équilibre, section 1 relative à la Programmation, au Mécanisme d'Ajustement et au Recouvrement des charges d'ajustement, article D3: typologie des offres, page 51.

electricity. RTE calls upon the bids on the basis of their price, their technical constraints and the conditions for using the bids. These conditions, which are specified by the adjustment parties when submitting the bids, include among others the maximum and minimum amount of electricity that can be supplied to the network, the duration of the supply of reserve power, and the time period within which the EDA can supply the reserve power to the network[320]. For the purpose of resolving the restrictions on the transportation of electricity, RTE also classifies the bids by merit order, but only those bids of EDAs that are able to resolve the transportation restrictions[321]. In order to ensure the safety of the network, RTE may temporarily remove bids from the bid price ladder when these bids create or aggravate restrictions on the transportation of electricity, or RTE may reserve this electricity for responding to transportation restrictions[322].

When RTE calls upon (or cancels) a bid, it transfers a so-called adjustment order to the adjustment party, at the earliest one hour before the period that the EDA can increase or decrease its supply into the network. In this adjustment order, RTE specifies the amount of electricity that needs to be increased or decreased, when the electricity should be supplied, and when the EDA should stop supplying the electricity. The adjustment parties have to execute their bids that are called upon by RTE[323]. RTE remunerates the adjustment parties for their supply of reserve power on the basis of the bid price and the amount of electricity that is

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[320] Règles relative a la programmation, mécanisme d'ajustement et au dispositifs de responsable d'équilibre, section 1 relative à la Programmation, au Mécanisme d'Ajustement et au Recouvrement des charges d'ajustement, article D.5.1: classement des offres, page 58.

[321] Règles relative a la programmation, mécanisme d'ajustement et au dispositifs de responsable d'équilibre, section 1 relative à la Programmation, au Mécanisme d'Ajustement et au Recouvrement des charges d'ajustement, article D.5.1.3 Préséance économique sur un nombre restreint d'offres, page 60.

[322] Règles relative a la programmation, mécanisme d'ajustement et au dispositifs de responsable d'équilibre, section 1 relative à la Programmation, au Mécanisme d'Ajustement et au Recouvrement des charges d'ajustement, article D.5.1.3.2 Offres générant et aggravant des congestions, article D.5.1.4 Contraintes du Système, page 60.

[323] Règles relative a la programmation, mécanisme d'ajustement et au dispositifs de responsable d'équilibre, section 1 relative à la Programmation, au Mécanisme d'Ajustement et au Recouvrement des charges d'ajustement, article D.6 Exécution des ordres d'ajustement par l'acteur d'ajustement, page 63.

requested by RTE when calling upon a bid[324].

This transaction for resolving transportation restrictions and balancing supply and demand in real time thus concerns the supply of reserve power to RTE, in which the adjustment parties bid for the supply of reserve power, RTE calls upon these bids, and the EDAs supply the electricity.

7.6.1 The attributes of the transactions

The adjustment parties have to submit their bids for the supply of reserve power before a gate closure. Each adjustment period of 24 hours consists of 25 gate closures. The first gate closure is 16h00 on the day before the operational day, which means that before 16h00 the adjustment parties have to submit their bids. The other 24 gate closures are at each whole hour starting at 22h00 on the day before the operational day, and the last one is at 21h00 on the operational day[325]. The *frequency* of this transaction is therefore characterized as recurrent. The adjustment parties send their bids to RTE every day, and they have to follow the strict schedule of the gate closures for transferring the bids. When RTE calls upon a bid, the adjustment party has to respond to this call and the EDA has to increase or decrease its supply of electricity into the network at the exact time as indicated by RTE in the adjustment order.

This transaction is therefore also characterized by *temporal specificity.* The adjustment parties have to invest in facilities and human assets that allow them to send bids 365 days a year, and 24 hours a day. These bids have to be sent within the strict time schedule of the gate closures. The EDAs have to be able to respond to the adjustment orders of RTE within a particular short period of time. If they are not able to respond in the short periods of time, RTE will charge the EDAs for not supplying the reserve power.

The adjustment parties need to have access to the information system and applications of RTE

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324 Règles relative a la programmation, mécanisme d'ajustement et au dispositifs de responsable d'équilibre, section 1 relative à la Programmation, au Mécanisme d'Ajustement et au Recouvrement des charges d'ajustement, article D.8.1 Offres activées, page 67.

325 Règles relative a la programmation, mécanisme d'ajustement et au dispositifs de responsable d'équilibre, section 1 relative à la Programmation, au Mécanisme d'Ajustement et au Recouvrement des charges d'ajustement, article D.4.1 Mécanisme des guichets, page 56.

to be able to send bids to RTE. The application for transferring bids for the supply of reserve power to RTE is referred to as SyGA (Système de Gestion des Ajustements). The rules on the programs, the adjustment mechanism and the balancing responsibility require that the adjustment parties take various tests of sending messages with the SyGA application. The adjustment parties have to illustrate that they are able to exchange messages with RTE that include bids for the supply of reserve power before they may sign a participation agreement with RTE[326]. More than two hundred of these messages are specified in the rules on the information system[327]. The employees of the adjustment parties need to have specific knowledge on sending these messages with the SyGA application, which can only be used for transferring bids to RTE. The adjustment parties have to invest in these specific human assets, and the transaction is therefore also characterized by *human asset-specificity*. These *assets* are *dedicated* to one contracting party: the transmission system operator.

Competition on this bidding mechanism for the supply of reserve power to RTE is very weak (CRE, 2004: 56). The bidding mechanism started in 2003, and even after five years, 84 per cent of all the electricity that is called upon by RTE is supplied by EDF (CRE, 2008a: 79)[328]. There have been no observations of a distortion or a disguise of information between these two parties for this transaction; the CRE did not resolve any disputes on the supply of reserve power. Therefore, no *behavioral uncertainty* can be observed for this transaction on the supply of reserve power between these transacting parties. This French bidding mechanism is not confronted to the same extent by the problems of the participants to the Dutch bidding mechanism. The Dutch participants are more numerous, and they are subject to a greater risk on whether the transmission system operator will call upon their bids. They have an incentive

[326] Règles relative a la programmation, mécanisme d'ajustement et au dispositifs de responsable d'équilibre, section 1 relative à la Programmation, au Mécanisme d'Ajustement et au Recouvrement des charges d'ajustement, article D.1 Conditions préalables, page 48; article, D.3.2.1 Caractéristiques de base d'une offre d'ajustement, page 51.
[327] Règles d'accès au Système d'information et applications de RTE : Programmation et Mécanisme d'ajustement, annexe SI application SyGA, pages 5-17.
[328] Several other French adjustment parties exist. In total these parties supply between three and four per cent of reserve power to RTE (CRE, 2006: 99). There are also adjustment parties of the United Kingdom that have a participation agreement with RTE, but RTE has never called upon bids of these parties (CRE, 2008a: 79).

to disguise information on their available reserve capacity, because they may use this electricity for another purpose for which they are more certain to receive an income. When EDF bids for the supply of reserve power to RTE, it is certain that, on average, 84 per cent of all its reserve power is called upon. This does not create an incentive for EDF to disguise information.

7.6.2 Misalignment

Before the liberalization of the French electricity industry, the transactions for the balancing of electricity supply and demand in real time were internalized in the vertically integrated hierarchy. EDF had a monopoly on the transmission of electricity, and it generated around 93 per cent of electricity. It was responsible for balancing electricity supply and demand for the entire electric system. This vertically integrated hierarchy is assumed to have been aligned with the attributes of the transactions. The rules on the vertical unbundling would therefore create a *misalignment*. Currently, the transactions are characterized by an absence of behavioral uncertainty. From a *transaction cost economics* perspective, an ex post governance structure would therefore not be an efficient institutional solution. When the incentives are aligned ex ante between two transacting parties, a contractual agreement is sufficient. A hybrid governance structure did however emerge for these transactions.

7.6.3 The governance structure

The *incentive intensity* is characterized as being of an intermediate degree. EDF can influence its income by increasing its bid prices. If RTE needs to call upon bids for an increase (or decrease) in the supply of electricity into the network, EDF is sure for more than eighty per cent on average that RTE calls upon EDF’s bids, and EDF thus earns an income. There are, however, some factors that are outside of EDF’s control that reduce its incentive intensity. Firstly, EDF will reserve larger amounts of electricity than are called upon by RTE due to small imbalances. The amount of imbalance also depends on factors that are outside of EDF’s control. Secondly, there is some competition on this bidding mechanism, mainly from Swiss energy firms and only when the prices are high (CRE, 2004: 56). EDF may thus reserve electricity for the bidding mechanism, and may not earn an income on this reserve power, because RTE calls on the bids of the Swiss energy firms.

The governance structure is characterized by several *administrative control instruments,* including monitoring and penalties and information disclosure mechanisms. RTE measures the electricity that was put on and taken out of the network by each EDA, and compares these measurements to the total of the program, the adjustments to the program, the participation in the secondary frequency regulation, and the adjustment bids that were called upon by RTE for each EDA. This difference is always considered to be a faulty execution of the adjustment order, and a penalty is attached to such a faulty execution. This penalty is calculated by multiplying the volume of the incorrect execution by 35 per cent and by either the bid price or the Powernext spot price[329]. When an EDA is repeatedly executing the adjustment orders in an incorrect way, RTE may exclude this EDA from the adjustment mechanism or cancel the participation agreement. RTE transfers information on the value of the adjustment orders to the adjustment parties on a daily basis. The adjustment parties may contest this information. RTE also transfers the final information to the adjustment parties for each month, on the basis of which the adjustment parties send a bill to RTE for the supply of reserve power[330]. When RTE has not abided by the conditions for using the bids, it has to compensate the adjustment parties financially.

When the adjustment parties sign a participation agreement with RTE, they promise in this agreement to adhere to the rules on the programs and the adjustment mechanism, and to the rules on accessing the information system of RTE. These rules indicate that they can be modified, and the modifications to these rules are added as supplements to the existing participation agreements. The contracts between RTE and the adjustment parties for

[329] Règles relative a la programmation, mécanisme d'ajustement et au dispositifs de responsable d'équilibre, section 1 relative à la Programmation, au Mécanisme d'Ajustement et au Recouvrement des charges d'ajustement, article D10: controle de l'execution des orders d'ajustement et penalites, page 71.

[330] Règles relative a la programmation, mécanisme d'ajustement et au dispositifs de responsable d'équilibre, section 1 relative à la Programmation, au Mécanisme d'Ajustement et au Recouvrement des charges d'ajustement, article D9: information de l'acteur d'ajustment, page 69-70.

participation in the adjustment mechanism are therefore *flexible contracts*.

These participation agreements are signed for an indefinite period. In 2003, the adjustment mechanism was set up, and RTE signed agreements with 16 adjustment parties for a participation in this mechanism. The parties that signed such a participation agreement with RTE increased to 18 in 2004, 29 in 2005, 32 in 2006, and 35 in 2007[331]. Because these agreements are flexible and therefore no new agreements have to be signed when the rules change, the parties that have signed a participation agreement with RTE from 2003 until 2007 have a *long-term agreement* (exceeding one year) with RTE.

When the parties to the participation agreement for the adjustment mechanism are in a conflict with respect to this agreement or the rules on the programs and the adjustment mechanism, they should aim to resolve these conflicts amicably. The CRE is the public authority that is authorized to *settle disputes* between the parties to the participation agreement for the adjustment mechanism. The CRE has not yet had to resolve any disputes with respect to the bidding for the supply of reserve power.

In summary, this governance structure is characterized as a hybrid form, in which contractual agreements for the supply of secondary and tertiary reserves between energy firms and the transmission system operator are combined with a bidding mechanism for tertiary reserves, and a regulator that may resolve disputes. The attributes of this governance structure include an intermediate incentive intensity, penalties, monitoring, an information disclosure mechanism, and flexible, long-term contracts.

7.6.4 Adaptation

The *identity of the contracting party* is highly relevant. The bidding mechanism is a single buyer market, and the transmission system operator, RTE, is the single buyer. The energy firms can only bid for the supply of reserve power to RTE, and they can only engage in the contractual agreements for the supply of secondary and tertiary reserves with RTE.

Various parties in the French electricity industry are involved in the process of adaptation to

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[331] Annual report RTE 2007, page 12; annual report RTE 2006, page 11; annual report RTE 2005, page 10; annual report RTE 2004, page 8.

the new form of governance for these transactions on the supply of reserve power. This *multilaterality* of the adaptation is required by the rules on the programs and the adjustment mechanism. The adjustment parties and the transmission system operator must sign a participation agreement before the adjustment party may bid for the supply of reserve power. In this participation agreement, the adjustment party declares to adhere to the rules on the programs and the adjustment mechanism, and therefore these rules are an integral part of the contractual relation and the governance structure between the adjustment party and the transmission system operator. These rules prescribe the procedures for making changes to the rules, and the parties that are to be involved in these procedures. These parties include RTE, the adjustment parties, and the members of the 'Commission de Fonctionnement du Mécanisme d'Ajustement' (CFMA). These procedures for making changes to the rules are the same as for the transactions on the exchange of programs, as discussed in the previous section 7.5. The CRE has to approve the changes to the rules[332].

In this adaptation process to the new governance structure, the parties to the adaptation process have aimed to increase the flexibility for the parties that are bidding for the supply of reserve power. One way of increasing the flexibility for the adjustment parties is through adding more gate closures, which allows the parties to alter their bids or submit new bids more often. These changes to the rules on the adjustment mechanism have allowed for an increase in the flexibility, but only within the constraint of ensuring the safety of the *electric system* (CRE, 2006: 97). In addition, this transaction for the supply of reserve power exists, because the parties in the electricity industry have to consider the fact that electricity cannot be stored, at least not in an economically efficient way, and that they therefore have to devise a governance structure that ensures the safety of the electricity supply.

This multilateral adaptation that considers the requirements of the electric system and the relevance of the identity of the contracting party, explains the transformation to the hybrid form of governance. The adaptation is characterized as an *autonomous adaptation*, because the

[332] Règles relative a la programmation, mécanisme d'ajustement et au dispositifs de responsable d'équilibre, section 1 relative à la Programmation, au Mécanisme d'Ajustement et au Recouvrement des charges d'ajustement, article B.3 Modalités de révision des règles, page 24.

parties to the adaptation process transformed from the vertically integrated hierarchy before the liberalization to this hybrid form of governance.

7.6.5 The role of regulation

The CRE has to approve the rules on the presentation of the proposals for adjustments by the adjustment parties to RTE, and the criteria for choosing between these proposals by RTE. The CRE has to approve these rules before they are implemented, and it thereby sets the ex ante rules of the game for RTE and the adjustment parties[333]. The CRE also has to approve any changes to the rules on the programs and the adjustment mechanism[334]. The law of February 2000 obliges the electricity generators that are connected to the transmission network to bid all of their reserve capacity that is technically available to RTE through the adjustment mechanism. The minister of energy may demand a justification from electricity generators on why a generating plant is not technically available[335]. The rules determine that the adjustment parties have to pay a penalty when they do not execute an adjustment order of RTE. They lead to the flexibility of the contracts, and require the multilaterality of the adaptation process. Regulation is also part of the governance structure through the dispute settlement.

7.7 Switching transactions

When a French consumer wishes to switch to another electricity retailer, the newly chosen retailer contacts the distribution system operator with a request for a switch. In around 95 per cent of the switches, this distribution system operator is Electricité Réseau Distribution France (ERDF), the subsidiary of EDF[336]. The distribution system operator performs the switch.

[333] Article 15 of the law of February 2000.
[334] Règles relative a la programmation, mécanisme d'ajustement et au dispositifs de responsable d'équilibre, section 1 relative à la Programmation, au Mécanisme d'Ajustement et au Recouvrement des charges d'ajustement, article B3: Modalités de révision des règles, page 24.
[335] Article 15 of the law of February 2000.
[336] This section focuses on the switching transactions that are performed by ERDF, because ERDF operates 95 per cent of the distribution network. The 200 small distributors that were not nationalized distribute only to around five per cent of the French consumers.

Before the new electricity retailer can request such a switch and offer the consumer a contract, it must gather some information about the consumer, such as the number of the consumer's connection point, the capacity for which the consumer has access to the network, the electricity consumption, and information about the contract that the consumer currently has with the other retailer[337]. The new electricity retailer may collect this information from the consumer or from ERDF. ERDF will transfer all the technical information and the information on the electricity use of this consumer to the new retailer, only when this retailer has an authorization of the consumer to access this information. The retailer can access this information through the secure internet portal of ERDF, which is referred to as the système de gestion des échanges (SGE).

When the new retailer requests ERDF to perform a switch, it sends information to ERDF, via the SGE, on the date of the switch, the new balancing responsible party, the tariffs, and the capacity at which the consumer accesses the network. ERDF checks within three days whether this switch can be performed, which means that it checks the switch date and whether there are no other switch requests for this connection. When a request for a switch is received before the 10th of the month, the switch date can be set on the first of the next month, but when the request is received after the 10th of the month, the switch can only performed on the first day of the second month after the switch request[338]. ERDF communicates the switch date to both the old and the new retailer. The actual switch consists of attaching the connection number of the consumer to the perimeter of the new retailer. This switch is performed by ERDF.

The old and new retailer must be able to send correct bills to the consumer, and therefore the meter readings have to be determined on the switch date. Information on the meter readings on the switch date is estimated by ERDF[339]. The switching transaction thus concerns the transfer

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[337] Référentiel clientèle, C3.d. changement de fournisseur, www.erdfdistribution.fr (last accessed January 20, 2009).

[338] Modèle de contrat ERDF /Fournisseur relatif à l'accès au Réseau Public de Distribution, à son utilisation et à l'échange de données pour les Points de Connexion pour lesquels a été souscrit un Contrat Unique, ERDF-FOR-CF_02^{E}, version 5.1, article 1.5.3.5 Changement de fournisseur à un point de livraison.

[339] Référentiel clientèle. Procédure de changement de fournisseur pour les clients professionnels ou résidentiels BT≤ 36 KVA (page 3) www.erdfdistribution.fr (last accessed January 20, 2009).

of information on the switch between the new retailer and the distribution system operator. The distribution system operator communicates with the old retailer, and the new retailer communicates with the consumer on the switch.

7.7.1 The attributes of the transactions

Every month, ERDF sends information to the CRE on the amount of consumers that have switched to another retailer (ERDF, 2007: 27). The CRE publishes this information every three months in an 'Observatoire des marchés de l'électricité et du gaz'. From the 1st of July of 2007 until October 2008, the CRE reports 497,000 switches. This means that ERDF performs close to 1,600 switches per day[340]. The *frequency* of the switching transaction can therefore be characterized as recurrent.

The electricity retailers and the distribution system operator have to exchange information on the meter readings, and thus on the electricity use of the consumers, to be able to send correct bills. The distribution system operator is responsible for measuring the electricity use (or making estimates of this use). The information on the meter readings is accessible for the electricity retailers via the so-called 'Plate-forme d'échanges' of ERDF. The electricity retailers need to invest in *specific human capital*, in order to be able to use this platform. The employees need to be able to send the messages with the platform. A supplement to the GRD-F contract states that ERDF organizes training sessions to teach the employees of the retailers to work with the platform[341]. The investments that the electricity retailers make to access and use this platform are for their own costs[342]. Each retailer appoints a few employees that are allowed, and thus capable, of exchanging messages on the platform. The retailers communicate the name and contact details of these employees to ERDF[343]. These specific human assets are

[340] 497,000 divided by 15 months and divided by 20 (for the amount of working days per month) is 1657, multiplied by 95 per cent (for the percentage of consumers to which ERDF distributes electricity) is 1574.
[341] Article 4.2 of annexe 8: Règles d'accès et d'utilisation de la plate-forme d'échanges d'ERDF.
[342] Article 3.3 of annexe 8: Règles d'accès et d'utilisation de la plate-forme d'échanges d'ERDF.
[343] Modèle de contrat ERDF /Fournisseur relatif à l'accès au Réseau Public de Distribution, à son utilisation et à l'échange de données pour les Points de Connexion pour lesquels a été souscrit un Contrat Unique, ERDF-FOR-CF_02[E], version 5.1, article 1.6 Modalités des échanges de données entre le fournisseur et ERDF relativement au périmètre de facturation.

also *dedicated assets*, as they can only be used for exchanging information with the distribution system operator via this platform.

Two examples will be given that illustrate the presence of *behavioral uncertainty* in the switching transactions. These examples concern the opportunistic behavior of the distribution system operator (ERDF) and of the incumbent energy firm (EDF). The first example involves the four electricity retailers, Direct Energie, Gaz de France, Electrabel France and Poweo, which have demanded the CRE to resolve a dispute with ERDF. This dispute concerned the contract between the retailers and ERDF (the GRD-F contract) on access to the distribution network, the use of the distribution network, and the exchange of information on the connection points for which consumers have signed a unique contract. A unique contract is a contract between consumers and electricity retailers for which the consumers receive electricity, and a connection and an access to the network. The retailers arrange for a connection and an access to the network for the consumers with the distribution system operator, and therefore the consumers do not need to sign a separate contract with the distribution system operator. When consumers are switching to a different retailer, they may choose to sign such a unique contract with the retailer, or they may sign two separate contracts: one with the distribution system operator for access to the network and one with the new retailer for the supply of electricity. The system operator ERDF is a subsidiary of EDF, and is still located under the EDF holding. Therefore, ERDF does not have an incentive to aid other retailers in the switching process and to stimulate the customers of EDF to choose another retailer. The regulatory decision on the resolution of this dispute refers to an allegation of the retailers to ERDF: these retailers believe in the presence of such a privileged relation between ERDF and EDF. The retailers accuse ERDF of not providing clear information for the electricity consumers and the retailers, which also inhibits the retailers to provide their (potential) customers with clear information. The unwillingness of ERDF to provide clear information (on among others its responsibilities with respect to the consumers) may complicate the consumers' decisions on switching to another retailer. The retailers demand that ERDF clarifies the information in the annexes to the contracts, that it simplifies the information for the consumers that is published on its website (le référentiel clientèle), and that it indicates the contractual nature of this reference work for the consumers. ERDF should improve the readability of the documents that indicate the rights and obligations of the consumers. The retailers argue that the consumers that have signed a separate contract with ERDF should not have an advantage over the consumers with a unique contract. This advantage would include a better access to information of ERDF for those consumers with a separate contract, a distribution system operator that assumes its responsibilities with respect to its clients, and better consumer complaint facilities. ERDF has contested the demands of the retailers. The CRE has ruled that ERDF should alter article 1.3 of the GRD-F contract to allow for a simple and complete consultation of this contract in the annexes to the unique contracts of the electricity consumers. The CRE has also argued that the presentation of the reference work should be improved, and that these improvements should be made in consultation with the various parties in the electricity industry.[344].

The second example concerns the statement of objections that the European Commission sent to EDF at the end of December 2008. A statement of objections is a formal step in the antitrust investigations of the European Commission, in which the Commission informs a firm of the objections that are raised against this firm on, for example, an abuse of dominant position. In the case of EDF, the objections relate to contracts that are signed by EDF with industrial customers in France. The European Commission is concerned that these contracts may prevent customers from switching to other energy firms, and thereby reduce competition in the industry. The European Commission has stated that in particular the exclusive nature and the long duration of these contracts and the large share of the market that is covered by these contracts may decrease the competition in the French energy industry[345].

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[344] Décision du comité de règlement des différends et des sanctions de la Commission de regulation de l'énergie en date du 7 avril 2008 sur les différends qui opposent respectivement les sociétés Direct Energie, Gaz de France, Electrabel France et Poweo, à la société Electricité Réseau Distribution France (ERDF), relatifs à la signature d'un contrat GRD-F.

[345] Press release of the European Commission on December 29, 2008: Antitrust: Commission confirms sending Statement of Objections to EdF on French electricity market. MEMO/08/809. europe.eu (last accessed January 19, 2009).

7.7.2 Misalignment

The liberalization has altered the attributes of the switching transactions, and has in this way created a *misalignment* of these transactions with their governance structures. Before the introduction of competition, switching transactions occurred only when consumers moved to a different address. In around 95 per cent of the switches, the consumers moved to a region that was also served by EDF. Information on the switching consumers was therefore processed in the integrated firm. When consumers are given a choice of electricity retailer, the frequency of the switching transactions increases substantially. In addition, the behavioral uncertainty in these transactions increases when competition is introduced into the industry. The distribution system operator, that is located under the holding structure of the incumbent energy firm, has an incentive to disguise information to keep consumers from switching to another energy firm. The electricity retailers do not have an incentive to aid the consumers and the other retailers in switching the consumers to a competing firm. A new form of governance needs to emerge that coordinates the switching transactions between the distribution system operator and the independent electricity retailers. *Transaction cost economics* predicts, on the basis of these transaction attributes, that the bilateral governance structure is (comparatively) the most efficient. The following section does, however, illustrate that a trilateral form of governance has emerged for these transactions.

7.7.3 The governance structure

The *incentive intensity* of the switching transactions is characterized as being of an intermediate level. The electricity retailers only have an incentive to perform a switch when a consumer is switching to their firm. This new consumer will generate an income for the electricity retailer. The electricity retailers do not have an incentive to aid in switching a consumer to another retailer. They work to prevent their customers from switching to another firm, as is illustrated by the long-term contracts that EDF signed with the industrial consumers.

ERDF does not have an incentive to switch consumers from EDF to another retailer, as is illustrated by the example on the dispute resolution by the CRE.

The *administrative control instruments* of this governance structure include an information disclosure mechanism and an information verification mechanism. When a consumer has expressed an interest in switching to a new retailer, but has not yet signed a contract with this retailer, ERDF must disclose some information about this consumer to the retailer. This information includes the number of the consumer's connection point, the capacity for which the consumer has access to the network, the electricity consumption, and information about the contract that the consumer currently has with the other retailer. When ERDF receives a request for a switch, it verifies whether this switch can take place. ERDF checks whether there are no other switch requests for the connection point, and whether there haven't been any unauthorized interventions in the measuring equipment or the network connection of the consumer that is requesting the switch[346]. ERDF may prohibit a retailer an access to the platform when the behavior of this retailer is a risk to the proper functioning of the platform[347].

The contracts between ERDF and the electricity retailers are *flexible*. Article 10.1 of these contracts states that, in case of substantial changes to the legal and regulatory environment, the parties must revise the clauses in the contracts so that they conform to the new regulations. When changes of an economic or commercial nature affect the contracts, the parties must together aim for a solution and they may change the contract. ERDF is authorized to alter several of the supplements to the contracts without consulting with the other party, such as the supplement on the exchange of messages between ERDF and the retailers[348]. The contracts between ERDF and the electricity retailers are signed for a period of three years, and are

[346] Modèle de contrat ERDF /Fournisseur relatif à l'accès au Réseau Public de Distribution, à son utilisation et à l'échange de données pour les Points de Connexion pour lesquels a été souscrit un Contrat Unique, ERDF-FOR-CF_02^E, version 5.1, article 1.5.3.5 Changement de fournisseur à un point de livraison.

[347] Article 10.2 of annexe 8: Règles d'accès et d'utilisation de la plate-forme d'échanges d'ERDF.

[348] Modèle de contrat ERDF /Fournisseur relatif à l'accès au Réseau Public de Distribution, à son utilisation et à l'échange de données pour les Points de Connexion pour lesquels a été souscrit un Contrat Unique, ERDF-FOR-CF_02^E, version 5.1, article 10.1 adaptation.

therefore *long–term* contracts[349]. The CRE is authorized to settle *disputes* between ERDF and the electricity retailers. It has settled a dispute between ERDF and various electricity retailers on the translation of the regulations into the contracts between the parties and ERDF (the GRD-F contracts)[350].

In summary, the governance structure is a hybrid form in which the retailers and the distribution system operator are parties to the transaction. These parties are autonomous, but the retailers depend on the system operator for performing the switch. The governance structure is characterized by an intermediate incentive intensity, information disclosure and verification mechanisms, and a long-term, flexible contract. Regulation is part of this governance structure, because the CRE settles the disputes between the parties to this switching transaction.

7.7.4 Adaptation

The *identity of the contracting party* is highly relevant to the electricity retailers. For the consumers that are connected to the distribution network, the retailers can only transact for the switches with the distribution system operators, which is ERDF in around 95 per cent of the switches. The other five per cent are the non-nationalized distributors. For a very small part of the switches, the electricity retailers have to transact with the transmission system operator. This is only the case for the large industrial consumers that are connected to the transmission network and that wish to switch to a new retailer. But for the large majority of the switches, the electricity retailers are thus restricted in their search for a contracting party and a new governance structure to ERDF.

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[349] Modèle de contrat ERDF /Fournisseur relatif à l'accès au Réseau Public de Distribution, à son utilisation et à l'échange de données pour les Points de Connexion pour lesquels a été souscrit un Contrat Unique, ERDF-FOR-CF_02[E], version 5.1, article 10.5 date d'effet et durée du contrat.

[350] Décision du comité de règlement des différends et des sanctions de la Commission de regulation de l'énergie en date du 7 avril 2008 sur les différends qui opposent respectivement les sociétés Direct Energie, Gaz de France, Electrabel France et Poweo, à la société Electricité Réseau Distribution France (ERDF), relatifs à la signature d'un contrat GRD-F.

The CRE has created the 'Groupe de Travail Electricité 2007' (GTE 2007), in which the various parties in the electricity industry consult on the introduction of consumer choice into the industry by the first of July 2007. The GTE 2007 has aimed to put several measures in place for the protection of the electricity consumers, such as clear contractual information, transparency, and a mechanism to handle consumer complaints. A GTE 2004 existed to prepare the non-residential consumers for an electricity industry in which they can choose their own retailer. The work of the GTE 2004 is continued in the 'Comité des Utilisateurs du Réseau de Distribution d'Electricité' (CURDE) and in the 'Comité des Utilisateurs des Réseaux de Transport d'Electricité' (CURTE).

Two committees have been created within the GTE 2007: one of these committees (le comité consommateurs) is concerned with the relations between the consumers, the retailers and the distribution system operator, and the other committee (le comité systèmes d'information et processus) studies the impact of consumer choice on the information systems in the industry. In addition, various working groups exist within the GTE 2007 that focus on different themes relevant within the industry at different points in time. The GTE 2007, and thus also the committees and working groups, are composed of various parties in the electricity industry, such as the electricity consumers, the distribution system operators, the transmission system operator, the retailers, the balancing responsible parties, the CRE and the DGCCRF. The presence of these representatives in the GTE 2007 may evolve over time, and new parties may enter the GTE 2007 after a confirmation by the CRE. The working groups present their accomplishments before the GTE 2007. These groups communicate the decisions that were taken, the contributions of the various participants, and also the points on which the participants could not reach an agreement, to the GTE 2007. These points may then be discussed at the level of the committees or the plenary sessions of the GTE 2007[351]. The contract between the electricity retailers and the distribution system operators (the GRD-F contract) is also discussed within the GTE 2007. The adaptation towards this contract and the new governance structure has therefore been a *multilateral adaptation*, as it involved the

[351] www.gte2007.com (last accessed January 22, 2009).

various parties in the electricity industry, including the distribution system operator, the retailers and the CRE. This has not been an adaptation in which the parties have agreed on the contents of the GRD-F contract, and it has therefore involved a dispute resolution by the CRE. In 2004, a third version of the contract was signed between the retailers and ERDF. Four retailers, Direct Energie, Gaz de France, Electrabel France and Poweo, have demanded the adaptation of this contract within the GTE. ERDF presented the retailers with a fourth version of the contract despite the fact that the disagreements were not resolved. In August 2007, the retailers again asked ERDF to adjust the contract. After a refusal by ERDF, the retailers have demanded the CRE to resolve this dispute, and to adjust the contract in a way that clarifies the responsibilities of ERDF[352]. The CRE has ruled in favor of the retailers.

This transaction and the hybrid governance structure exist, because the retailers have to take the *electric system* into account. The customers, and the potential customers, of the electricity retailers need a connection and an access to the electricity network to be able to purchase electricity from the retailers. The system operators own the networks, the connections to these networks and often also the metering equipment. The retailers depend on these system operators for information on the electricity use and the meter readings. This is why the switching transaction (i.e. the exchange of information between the retailers and the distribution system operator on the switching consumer) exists. Because the dependence of the consumers on the electricity network will continue in the near future, the parties to the transactions prefer to set up a long-term governance structure.

This multilateral adaptation, in which the identity of the contracting party is relevant and the dependence on the electric system is taken into account, explains the transformation to a hybrid governance structure, and the adaptation can therefore be characterized as an autonomous adaptation.

[352] Décision du comité de règlement des différends et des sanctions de la Commission de regulation de l'énergie en date du 7 avril 2008 sur les différends qui opposent respectivement les sociétés Direct Energie, Gaz de France, Electrabel France et Poweo, à la société Electricité Réseau Distribution France (ERDF), relatifs à la signature d'un contrat GRD-F, page 8.

7.7.5 The role of regulation

The electricity law of 2000, which was modified by the law of 2006, states that every electricity consumer is free to choose an electricity retailer. The non-nationalized distributors are also treated as eligible consumers by this law for the supply of electricity to their customers within their region, and for the electricity that they purchase for losses on their network. The electricity retailers are also eligible for the electricity that they purchase and resell to their customers[353]. Several decrees have over time determined which consumers are allowed to choose their electricity retailer. A first decree in May 2000 set the threshold at 16 GWh: those consumers that consumed 16 GWh of electricity or more in 1999, were free to choose their retailer[354]. The decree of 2003 reduced the threshold to 7 GWh, and the decree of 2004 expanded the eligibility to all non-residential consumers[355]. Since July 2007, every French consumer is free to choose an electricity retailer. Regulation has stimulated the multilateral adaptation to the new governance structure. Regulation is also part of this new governance structure: the CRE has settled a dispute on the GRD-F contract between ERDF and the electricity retailers.

7.8 Conclusion

The governance structures of the network connection transactions between the generators and the system operators, the network access transactions, the balancing transactions, and the switching transactions were transformed from the vertically integrated hierarchy to the hybrid form of governance. Autonomous adaptations have thus taken place for these transactions. The

[353] Article 22 of the law of February 2000.

[354] Décret no 2000-456 du 29 mai 2000 relatif à l'éligibilité des consommateurs d'électricité et portant application de l'article 22 de la loi no 2000-108 du 10 février 2000 relative à la modernisation et au développement du service public de l'électricité (articles 1 and 3).

[355] Décret n°2003-100 du 5 février 2003 portant modification du décret n° 2000-456 du 29 mai 2000 relatif à l'éligibilité des consommateurs d'électricité et portant application de l'article 22 de la loi n° 2000-108 du 10 février 2000 relative à la modernisation et au développement du service public de l'électricité. Décret n° 2004-597 du 23 juin 2004 relatif à l'éligibilité des consommateurs d'électricité et modifiant le décret n° 2000-456 du 29 mai 2000 (article 1).

network connection transactions between the consumers and the system operators used to be governed by regulation, and in the liberalized industry, these transactions are still governed by regulation. Regulation is part of each of the new governance structures. Regulation has also had an extensive influence on the transactions, the new governance structures and the adaptation processes. For example, regulation reduced the behavioral uncertainty in the network access and balancing transactions on the exchange of the programs. It reduced the incentive intensity for the network connection transactions; it requested the presence of information disclosure and information verification mechanisms for these same transactions; it created the flexibility of the contracts for the transactions on the exchange of the programs and the supply of reserve power; and it demanded a penalty for the transactions on the supply of reserve power. Regulation has also required the multilateral adaptations for several transactions, including the network access and balancing transactions.

The attributes of the transactions are only able to explain the efficiency of the governance structure of the network connection transactions between the electricity consumers and the system operators. For these transactions, no misalignment was created by the European directives and the national regulations. Transaction cost economics regards the regulation of the network connection transactions between the generators and the system operators as second-best solutions, and it cannot explain the efficiency of the hybrid forms of governance for the transactions on the exchange of the programs and the supply of reserve power. The absence of behavioral uncertainty in these transactions would not require an ex post safeguard. Transaction cost economics predicts a bilateral structure, instead of the current trilateral structure, for the switching transactions, because of the recurrent frequency of these transactions in the liberalized electricity industry. The attributes of adaptation have been able to explain the governance transformations to the hybrid forms of governance.

The following chapter presents a comparison between the governance transformations in the Dutch and French electricity industries, and it provides a conclusion for the entire thesis.

Chapter 8 - Conclusions

This final chapter presents the conclusions of this thesis. It summarizes the main findings of the multiple case study, and in particular the findings on the transformations to new governance structures and the influence of regulation on these governance transformations. It indicates how the transformations to the new governance structures are explained by the attributes of the adaptations, and when the attributes of the transactions explain the efficiency of the new governance structures (section 8.1). This chapter thereby summarizes the answer to the general research question: *What is the influence of regulation on the transformations between governance structures in the liberalizing Dutch and French electricity industries?* The table in appendix E repeats the research questions 1a until 5b that were posed in chapter one, and indicates which sections of this thesis answer these research questions. This chapter also presents the theoretical contribution, the policy recommendations, and the limitations of this thesis (sections 8.2, 8.4 and 8.5). It also reports on the differences between the real-life contexts of the Dutch and French electricity industries, and indicates how these contexts have affected the governance transformations (section 8.3).

8.1 Main findings

8.1.1 Governance transformations and new governance structures

The case study in chapters six and seven has analyzed the governance transformations for the network connection, network access, balancing, and switching transactions in the Dutch and French electricity industry. In total, nine transactions have been discussed (see table 8.1)[356].

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[356] The network access and balancing transactions consist of the exchange of transportation and energy programs, and the supply of reserve power to resolve transportation restrictions and to balance electricity supply and demand in real time. In the Dutch electricity industry the exchange of transportation programs for network access and the exchange of energy programs for balancing supply and demand are two separate transactions, whereas in the French electricity industry this information for network access and balancing is exchanged in one transaction only.

Table 8.1 Nine transactions of the multiple case study

Dutch electricity industry	French electricity industry
1. Network connection transaction (§6.4)	6. Network connection transaction (§7.4)
2. Network access transaction: exchange of transportation programs (§6.5)	7. Network access and balancing transactions: exchange of programs (§7.5)
3. Balancing transaction: exchange of energy programs (§6.6)	
4. Network access and balancing transactions: supply of reserve power (§6.7)	8. Network access and balancing transactions: supply of reserve power (§7.6)
5. Switching transaction (§6.8)	9. Switching transaction (§7.7)

Every new governance structure for each of these transactions is a hybrid form and regulation is part of each of these governance structures. For each of the nine transactions, the governance transformations were from the vertically integrated hierarchy to the hybrid form of governance.

8.1.2 The influence of regulation

The influence of regulation on these governance transformations can be summarized as being of four types. Regulation sets the ex ante rules of the game and thereby influences the attributes of the transactions, the attributes of the governance structures, and the attributes of adaptation and the adaptation costs. Regulation has also become part of the new governance structures. These four types of regulatory influences are summarized here, and in table 8.2.

Firstly, regulation influences the attributes of the transactions. It creates the site-specificity of the network connection transactions in both the Dutch and French electricity industry: the regulated connection tariffs are lower when the generators and consumers of electricity locate their plants and equipment closer to the network. In both industries, regulation sets strict time schedules for exchanging the messages on the programs and the bids for reserve power, and thereby formalizes the temporal specificity that is inherent in these transactions. Regulation leads to investments in human capital to enable the exchange of these messages, and thereby creates a human asset-specificity for the network access and balancing transactions. These investments in human capital and the investments that enable a compliance with the strict time schedules are also dedicated assets: they are only made to transact with the transmission system operator. Regulation eliminates the behavioral uncertainty in the transactions of exchanging the programs in both the Dutch and French electricity industry. Regulation determines that program responsible parties have to pay an imbalance price when they do not abide by their programs. This gives these parties an incentive to provide the transmission system operator with accurate programs, and eliminates the parties' incentive to disguise or distort information. These rules on imbalance pricing thus align the incentives between the program responsible parties and the transmission system operator and reduce the need for ex post governance structures.

Secondly, regulation has also had an influence on the attributes of the governance structures, and in particular on the incentive intensity, the administrative control instruments and the contract flexibility. In the Dutch and French electricity industries, the public authorities determine the network connection tariffs. These regulated tariffs reduce the incentive intensity of the system operators, as the tariffs limit the operators' ability to influence their income. In the Dutch electricity industry, regulation also influences the incentive intensity for the supply of reserve power. In this industry, the imbalance price is based on the regulating price. The energy firms pay the imbalance price when they do not abide by their programs, and they receive the regulating price for the supply of reserve power to the transmission system operator. If the energy firms increase their bid prices (which increases the regulating price), they may have to pay this higher price themselves when an unexpected event creates an imbalance. This link between the two prices, which is formulated in the system code, therefore reduces the incentive intensity of the energy firms in the bidding process. Dutch and French regulations have determined that the administrative apparatus of the program transactions includes a monitoring of the electricity use and a penalty, in the form of the imbalance price. In the Dutch electricity industry, the transaction on the exchange of the transportation programs is governed by an information disclosure mechanism: the transmission system operator must publish information on the quality of its transportation service. The Dutch transaction on exchanging energy programs is governed by an information verification mechanism: the transmission system operator must verify whether the program responsible parties have delivered internally and externally consistent programs. In the French electricity industry, the transmission system operator must disclose information on the measurements of the electricity use to the network users for the program transactions. The French transactions for the supply of reserve power are governed by a penalty: the rules state that the transmission system operator may impose a penalty when the energy firms do not respond to an adjustment order. The Dutch transactions for the supply of reserve power are governed by an information disclosure mechanism: the energy firms must disclose information on their available production capacity to the system operator. In both industries, the rules determine that the contracts for the transactions of exchanging programs are flexible.

Thirdly, regulation has also influenced the attributes of adaptation, mainly by determining which economic actors have to be involved in the adaptation process. The Dutch and French public authorities have demanded a multilateral adaptation for the network connection transactions, the transactions for exchanging the programs, and for the supply of reserve power. The Dutch regulations state that the economic actors have to consider the requirements of the electric system, such as the safety and reliability of the network and of the electricity supply, in their adaptation to a new governance structure for the network connection, network access and balancing transactions. Through regulation's large influence on the particularities of each governance structure, as discussed above, the public authorities reduce the search costs for the economic actors in the adaptation process. The authorities reduce the costs for searching a contracting party, and a new governance structure. Regulation has also reduced the bargaining and negotiation costs for the network users by, for example, demanding non-discriminatory behavior from the system operators for a connection to the network, and by setting the connection tariffs.

Finally, regulation is also part of the new governance structures. In the French electricity industry, the sector-specific regulator resolves the disputes between the contracting parties to the transactions. In the Dutch electricity industry, the competition authority resolves the disputes for the electricity transactions to which a system operator is a contracting party. The Dutch public authorities have also intervened in the contractual agreements of the parties to the network connection and switching transactions with binding instructions and fines. These authorities also monitor the quality of the transportation service, and the quality of the switching transactions.

Table 8.2 Four types of regulatory influences

	Type of transaction	**Dutch electricity industry**	**French electricity industry**
On the attributes of transactions:	Network connection:	Regulation creates site-specificity	Regulation creates site-specificity
	Exchange of programs and supply of reserve power:	Regulation formalizes temporal and human-asset specificity and dedicated assets	Regulation formalizes temporal and human-asset specificity and dedicated assets
	Exchange of programs:	Regulation eliminates behavioral uncertainty	Regulation eliminates behavioral uncertainty
On the attributes of governance:	Network connection:	Regulation reduces incentive intensity	Regulation reduces incentive intensity
	Exchange of programs:	Regulation creates information disclosure and verification mechanisms, monitoring, a penalty, and contract flexibility	Regulation creates an information disclosure mechanism, monitoring, a penalty, and contract flexibility
	Supply of reserve power:	Regulation reduces incentive intensity, and creates an information disclosure mechanism	Regulation creates a penalty
On the attributes of adaptation & adaptation costs:	Network connection:	Regulation creates multilateral adaptation to system requirements, and reduces search, bargaining and negotiation costs	Regulation creates multilateral adaptation, and reduces search, bargaining and negotiation costs
	Exchange of programs and supply of reserve power:	Regulation creates multilateral adaptation to system requirements, and reduces search costs	Regulation creates multilateral adaptation, and reduces search costs
	Switching:	Regulation reduces search costs	
Part of governance:	Network connection, access, balancing and switching:	Competition authority resolves disputes	Sector-specific authority resolves disputes
	Network connection and switching:	Public authority enforces contracts	

8.1.3 Explanation with transactions

Chapter two has introduced the discriminating alignment hypothesis of transaction cost economics, according to which 'transactions, which differ in their attributes, are aligned with governance structures, which differ in their cost and competence, so as to effect a discriminating - mainly a transaction cost-economizing – result' (Williamson, 1996a: 12). Chapters six and seven have characterized the attributes of the various electricity transactions and those of the governance structures, and have indicated if transaction cost economics considers these governance structures to be efficiently aligned with the transactions. This subsection summarizes when transaction cost economics has been able to explain the efficiency of the new governance structures for the electricity transactions.

Transaction cost economics has analyzed regulation as a hybrid form of governance that solves the contractual hazard between consumers and the integrated electric utility. This utility has a monopoly on supplying electricity and has an incentive to set high prices. The regulator and the utility engage in a collective contract, in which the price and the conditions are determined for which the utility has to supply electricity to the consumers. Regulation enjoys a comparative efficiency advantage as a governance structure for the contractual hazard between the consumers and the electric utility with a monopoly on the supply of electricity. Chapters six and seven have illustrated that this analysis of regulation can also be applied to the network connection transactions between the system operators and the consumers in a liberalized and unbundled industry. Because of the monopoly position of the system operators for a connection to the network and the asymmetrical dependence of the network users on these system operators for a connection, the network connection contracts between the system operators and the consumers can most efficiently be governed by regulation. The attributes of these network connection transactions can thus explain the comparative efficiency of the new governance structure.

Williamson states that economic actors should 'try markets, try hybrids, try firms, try regulation, and resort to the public bureau when all else fails (comparatively)' (Williamson, 1998a: 47). Transaction cost economics thus regards regulation as one of the organization forms of last resort (see also figure 2.4). Before the liberalization of the electricity industries, the network connection transactions between the electricity generators and the system operators were governed by vertically integrated firms. From a transaction cost economics perspective, the current regulation of the network connection transactions between the generators and the system operators is therefore a second-best solution.

The transactions of the exchange of programs for a network access and a balancing of electricity supply and demand, and the French transactions of the supply of reserve power, are characterized by an absence of behavioral uncertainty. Williamson states that when uncertainty is present in a transaction, it is 'imperative that the parties devise a machinery to work things out' (Williamson, 1985: 60). But when uncertainty is absent, transaction cost economics does not predict the efficiency of an ex post governance structure (Williamson 1985: 31)[357]. Transaction cost economics is therefore not able to explain the efficiency of a hybrid form of governance for these transactions in both the Dutch and French electricity industry.

Before the liberalization of the electricity industries, the transactions of the supply of reserve power were internalized in the vertically integrated firm. In the liberalized Dutch electricity industry, these transactions are characterized by a recurrent frequency, various types of asset-specificity and a behavioral uncertainty, and they are governed by regulation. From a transaction cost economics perspective, these transactions could still be efficiently internalized in the hierarchy, and regulation is therefore again considered to be a second-best solution. The recurrent frequency of these transactions would justify the integration into the firm to recover the governance costs, as opposed to a trilateral form of governance that is more efficient for occasional transactions (see figure 2.1).

The switching transactions were governed by vertically integrated hierarchies before the introduction of competition into the electricity industries. The consumers arranged their switching themselves only when they moved to a region served by a different utility. The frequency of these transactions increased substantially in the liberalized industries in which consumers are given a choice of electricity retailer. The switching transactions are currently

[357] 'Contract reduces to a world of promise. Strategic behavior is thereby denied' (Williamson, 1985: 31).

governed by regulation, and thus by a trilateral form of governance. Transaction cost economics is not able to explain the efficiency of the trilateral structures when the frequency of the transactions increases. Parties to a bilateral governance structure are only able to recover the governance costs of such a structure when the frequency is recurrent, but when the frequency is lower a trilateral governance structure is proposed by transaction cost economics to be more efficient.

In summary, transaction cost economics is able to explain the efficiency of regulation for the network connection transactions between the consumers and the system operators. The fact that a market did not emerge for the electricity transactions confirms the predictions of transaction cost economics (see also section 3.5). From a TCE perspective, the new governance structures for the supply of reserve power and the network connection transactions between the generators and the system operators are second-best solutions. Transaction cost economics is not able to explain the efficiency of the hybrid governance structures for the transactions of exchanging the programs to access the network and to balance supply and demand: the absence of behavioral uncertainty in these transactions does not lead to ex post governance structures, and ex ante contractual agreements are considered to be more efficient. One reason for this inability of TCE to explain the emergence of these hybrid forms is that TCE does not explicitly take into account the dependence of contracting parties on a secure network. The program transactions are governed by an information verification mechanism, that is characteristic of hybrid structures, to ensure the safety of the electric system. TCE is also not able to explain the efficiency of the trilateral form of governance for the switching transactions, because the recurrent frequency would allow for a bilateral structure. TCE does not consider the specifics of these switching transactions, and in particular the dependence of the transacting parties on a network. It is less costly to centralize the information on the connections of consumers in a third party. This allows the retailers to contact only one party when they need to gather information on switching consumers, as opposed to numerous bilateral information exchanges with previous retailers and regional distributors.

8.1.4 Explanation with adaptation

This thesis has introduced the concept of adaptation as an explanatory variable for the emergence of the new governance structures and the governance transformations. Economic actors adapt to a new governance structure when they find themselves in a situation of misalignment, and when the adaptation costs are lower than the transaction cost differential, being the difference between the actual transaction costs and the optimal transaction costs. It is assumed that economic actors economize on adaptation costs when they adapt to new forms of governance. Since adaptation costs are very difficult, or maybe even impossible, to quantify, attributes of adaptation have been characterized. A parallel with standard transaction cost economics is sought in order to enable the introduction of this concept of adaptation into the TCE framework. In this TCE framework, economic actors are assumed to economize on transaction costs, the unit of analysis is the transaction, and attributes of transactions are identified that should explain the efficiency of governance structures. In this complementary perspective that takes adaptation into account, adaptation is the unit of analysis, and the attributes of adaptation aim to explain the efficiency of the governance transformations. The attributes of adaptation are the identity of the contracting party, the laterality of the adaptation and the type of response (to either the system requirements or the price) in the adaptation process. These attributes are based on the definitions of adaptation of Hayek (1945) and Barnard (1938). Chapters six and seven have illustrated that for each of the transactions, the economic actors searched for a contracting party of which the identity was highly relevant, these economic actors adapted multilaterally, and they considered the requirements of the electric system in the adaptation process. As was proposed in chapter four, these attributes of adaptation explain the transformations to the hybrid forms of governance. For example, when the identity of the contracting party is highly relevant and therefore only one or a few potential contracting parties are available, the economic actors prefer to engage in a long-term relation once they have started negotiations with a (potential) contracting party, simply because the contracting parties with the preferential quality are limited, and the economic actors aim to reduce their future search costs for new contracting parties. A long-term hybrid form is then preferred over short-term market relations. The identity of the contracting party is highly relevant to the network users; for each of the electricity transactions they need to engage in a contractual relation with a system operator. There are only a few distribution system operators and one transmission system operator in each electricity industry. The economic actors have considered the requirements of the electric system when adapting to the new governance structures for each of the transactions. The economic actors prefer a long-term hybrid form, because the dependence on a network and the importance of the security and safety of the electricity supply are not likely to change in the near future. The parties to the multilateral adaptation have also been the parties to the new governance structure for each of the electricity transactions.

8.1.5. Conclusion

As a conclusion of this thesis, an answer to the general research question can be given. This question was formulated as follows: *What is the influence of regulation on the transformations between governance structures in the liberalizing Dutch and French electricity industries?* For each of the electricity transactions, a transformation to a hybrid form of governance occurred. The attributes of adaptation have been able to explain these governance transformations. The attributes of the transactions could only explain the efficiency of the governance structure for the network connection transactions between the consumers and the system operators. In the liberalizing Dutch and French electricity industries, regulation still plays a large role. Regulation has had a profound effect on these governance transformations: it prescribed that the economic actors adopt several of the characteristics of a hybrid form of governance, such as the elaborate administrative control instruments, the intermediate incentive intensity, and the contract flexibility. It prescribed a multilateral adaptation in which the economic actors have to consider the safety of the electric system. Regulation also governs the contractual relation between the parties to the electricity transactions.

8.2 Theoretical contribution of complementary elements

Three theoretical contributions of this thesis are summarized in this section. Firstly, the introduction of the concept of adaptation into the transaction cost economics framework has provided an explanation for the new governance structures and for the transformations to these new structures. The attributes of adaptation have been able to explain the emergence of the hybrid forms of governance, also where the attributes of the transactions have not been able to explain the comparative efficiency of the new governance structures. This is especially evident in the case of the program transactions, for which transaction cost economics does not predict the efficiency of an ex post governance structure due to the absence of behavioral uncertainty. Hybrid governance structures did emerge for these transactions, because the parties to these transactions have to consider their dependence on an electricity network and the fact that electricity cannot be stored, and that the identity of the contracting parties is highly relevant. These transacting parties adapted multilaterally to the new hybrid forms. The attributes of adaptation have also been able to explain the transformation to the hybrid forms of governance for the network connection transactions and the transactions of the supply of reserve power. TCE refers to these governance structures as second-best solutions, and is not able to predict what second-best solutions will emerge, once an industry has been affected by ex ante regulations that exclude the most efficient solution.

A second theoretical contribution of this thesis is that it formulates and analyzes the various roles of regulation in unbundled and liberalized industries. In Williamson's transaction cost economics, the concept of regulation is mainly defined as a governance structure for the integrated electric utilities with a monopoly on the supply of electricity to consumers. This thesis has located regulation in the institutional environment, from where regulation sets the ex ante rules of the game and influences the attributes of the transactions, the governance structures and adaptation, as summarized in the subsection 8.1.2. Such a perspective on regulation can be internalized in the existing transaction cost economics framework, because this framework already refers to the existence of an institutional environment that affects the governance structures. It locates concepts such as property rights and contract law in this institutional environment, but not regulation.

Finally, transaction cost economics has focused on the contractual hazards between consumers and the integrated electric utilities (Williamson, 1976; Goldberg, 1976), between the regulator and the integrated electric utilities (Levy and Spiller, 1994), and between the coalmines and the electricity generators (Joskow and Schmalensee, 1983) (see also section 3.5). The study of the contractual hazards between the various unbundled activities in the liberalized electricity industries has been underemphasized. This thesis has focused on these contractual hazards, as it has addressed the network connection, network access, balancing and switching transactions that all concern the relation between the unbundled system operators and the network users.

8.3 Differences between the Dutch and French electricity industries

The main purpose of the multiple case study has been to draw similar conclusions from the adaptation process for the governance transformations in the Dutch and French electricity industries. Several differences have also been observed between these two industries. They differ in terms of the independence of their system operators. The Dutch transmission system operator is unbundled in terms of its ownership, and the law of November 2006 prohibits the distribution system operators to be part of the same holding structure as electricity generation and retail. In France, the transmission system operator, RTE, is located under the EDF holding, and the distribution system operators are also subsidiaries of EDF. In both industries, however, the distribution and transmission system operators are separate legal entities. They have both implemented the requirement of legal unbundling as formulated in the EC electricity directive of 2003. The Dutch public authorities have demanded a greater independence of the system operators than is proposed in this directive. A consequence of this requirement on legal unbundling is that these differences between the Dutch and French electricity industries in terms of the system operators' independence do not result in large differences in the governance structures. Each system operator is a separate legal entity with respect to the network users, and therefore engages in a hybrid form with these network users (instead of internalizing the transactions). The greater independence of the Dutch operators does therefore not show up in the governance structures. This is of course also due to the fact that transaction cost economics does not focus on the ownership of the transacting parties when defining the governance structures.

One example can, however, be given of a difference between the governance structures in the Dutch and French electricity industries that illustrates that the French transmission system operator retains a central role in coordinating the network users. This example concerns the transaction on the supply of reserve power to the system operator. Different types of regulating and reserve power exist, including primary, secondary and tertiary reserves. The primary frequency regulation is an automatic function at the level of the generators that responds to changes in frequency. In the Dutch electricity industry, both the secondary and tertiary reserves are offered to TenneT through a bidding mechanism. In the French electricity industry, the energy firms only bid for the supply of tertiary reserves to RTE. The secondary frequency regulation is still organized at the national dispatching level by RTE. The Dutch electricity industry has thus applied this market mechanism of bidding to a larger part of the reserves, whereas the French electricity industry stays closer to its structure of before the liberalization, of integrating activities, such as the dispatching for reserves, in a vertically integrated firm.

This difference in the governance of the supply of reserve power and the differences in the independence of the system operators can be explained by the real-life contexts in the two industries. The Dutch and French electricity industries differ in terms of the governance structures from which they started the liberalization process. The French electricity industry had a more extensive vertical integration before the implementation of the 1996 EC directive: since 1946, EDF had a national monopoly on the transmission network, it generated 93 per cent of total electricity, and distributed to 95 per cent of the French consumers. In the Dutch electricity industry, many electric utilities distributed electricity in their regional monopolies. The largest of these distributors were integrated with the generation of electricity, and several independent distributors existed. The transmission system was organized at the national level, as a cooperation of the large electricity generators. The French electricity industry thus started from a situation with a greater degree of vertical integration, and its adjustment to independent system operators may therefore take a longer time as compared to the Dutch industry.

An additional explanation is the different objectives of the ministries of energy and economy in the Dutch and French electricity industries, and in particular their means towards achieving these objectives. The Dutch ministry of economic affairs aims to protect the electricity consumers through an effective functioning of the market, and thus through the introduction of competition into the electricity industry (see section 6.3.4). The ministry has not only pursued a greater independence of the system operators, but it has also demanded a faster introduction of consumer choice into the Dutch electricity industry than was required by the directives. Every Dutch consumer is free to choose a retailer for green electricity since July 2001 and for grey electricity since July 2004. The ministry's desire to create a competitive electricity market is also illustrated by the large allocation of regulatory responsibilities to the sector-specific regulator, and the location of this regulator under the authority of the competition authority (Niesten, 2006). The mission of the sector-specific regulator is to ensure the effective functioning of the electricity market. The system operators are unbundled in terms of their ownership in order to stimulate competition in the Dutch electricity industry. The objectives of the French ministries of energy and economy have been entirely different. It has been said that 'the aim of the French reformer is not to favour the development of competition per se, but to respect the Directive a minima' (Finon, 2003: 260). The French consumers were only given the option to choose their retailer by July 2007, and they may still choose to be supplied for a regulated tariff. The ministries retain the regulatory responsibility for determining these tariffs (Niesten, 2006). One objective of the ministry of energy is the energy independence of France (see section 7.3.4). The ministry aims to protect the interests of the French consumers through the protection of the national champion EDF, and it therefore does not have an incentive to increase the independence of the system operators.

8.4 Limitations

The choice for the theoretical perspective of transaction cost economics confronts this thesis with several limitations. These limitations of transaction cost economics have often been addressed. For example, De Jong and Nooteboom have argued that 'transaction cost economics considers many things such as preferences, capabilities, perceptions and knowledge to be stable and given exogenously. It implicitly assumes unchanging competencies and a constant state of technology' (De Jong en Nooteboom, 2000: 13). Dietrich states that transaction cost economics 'forecloses investigation of many important facets of the firm involving in particular idiosyncratic organisational capabilities and issues of economic power' (Dietrich, 1994: 4). These capabilities, knowledge, changes in technology, and economic power are alternative explanations for governance structures, as compared to the attributes of transactions within transaction cost economics. Another critique on transaction cost economics is that it is 'not path-dependent and a-historical' (De Jong en Nooteboom, 2000: 13). Initial conditions may play a role in the evolution of liberalising industries, as was shown by Kahn (1998) for the Spanish electricity industry.

This thesis has illustrated that the attributes of the transactions are severely limited as explanations for the new forms of governance in the liberalizing electricity industries. The aim of this thesis has not been to look at other theoretical perspectives to resolve this limited explanatory power of transactions in a liberalizing environment. The focus is instead on the concept of adaptation as an explanatory variable for governance changes and on incorporating this concept into the existing transaction cost economics framework, to address another critique on transaction cost economics. TCE has often been viewed as a 'comparative static perspective' (Groenewegen and Vromen, 1997: 33), which is 'incapable, by itself, of explaining the dynamics of institutional change' (Dietrich, 1994: 5). This thesis analyses the process of adaptation by economic actors from one governance structure to another, and in particular the identity of the future contracting party, the laterality of the adaptation and the type of response in the adaptation process. With these attributes of adaptation, this thesis is able to explain the governance transformations. Dietrich mentions an advantage of the attempts to develop transaction cost economics, instead of suggesting alternative or substitutive frameworks. These developments of TCE avoid the marginalising of the critiques on transaction cost economics. He states that 'a major problem with suggesting substitutive frameworks is that their substantive importance is marginalised, because most economists view the world through the eyes of the dominant school of thought' (Dietrich, 1994: 8).

8.5 Policy recommendations

The European Commission aims to develop a competitive electricity market in the European Union. The two directives of 1996 and 2003 include common rules for the creation of such an internal competitive market. When considering the results of this thesis, it becomes clear that such a market has not yet emerged in the Dutch and the French electricity industries.

It has been argued that if policy makers were to use a transaction cost economics framework, they would be better able to identify the contractual hazards in the electricity industry and therefore the difficulties with creating markets in this industry. Joskow (2000) stated that 'many policy makers and fellow travelers have been surprised by how difficult it has been to create wholesale electricity markets…Had policy makers viewed the restructuring challenge using a TCE framework, these potential problems are more likely to have been identified and mechanisms adopted ex ante to fix them' (Joskow, 2000: 51, quoted in Williamson, 2002: 187). The policies of the European Commission have instead emphasized the vertical unbundling of the electricity industries. This separation of the natural monopolies from the competitive segments has been described as the 'standard neoclassical public policy prescription' (Joskow, 1996: 345).

This thesis illustrates that the electricity transactions are characterized by various types of asset-specificity and by bilateral dependencies of the transacting parties. The coordination of these transactions with a market is therefore difficult. If the European Commission aims to introduce a market, it should not restrict its policies and directives to structural measures such as the legal unbundling of the system operators. The policies should also aim to reduce the specificity of the transactions, and they should accommodate for the behaviour of the economic actors in the electricity industry. Regulations that stimulate economic actors to adapt from a misaligned situation with a unilateral response and to changes in prices, may facilitate the emergence of market forms of governance.

Appendices

A - The governance of interrelationships

In addition to the four asset-specificity reasons for vertical integration, Joskow (1996, 2002) provides another argument for the efficiency of vertical integration in the electricity industry. He argues that vertical integration internalizes the investment and operating interrelationships between generation and transmission (Joskow, 2002: 509). Investment interrelationships between generation and transmission follow from the fact that 'investments in transmission capacity to remove network constraints can affect the costs of generating electricity and the value of power produced at various locations on the network' (Joskow, 1996: 350). In addition, the location of generating capacity involves trade-offs between generating and transmission costs. The integration of these two segments of the electricity value chain enables the reduction of the combined costs of generating and transmitting electricity. In this respect, Hunt (2002) remarked that 'the long-term planning of investments in transmission and generation benefited from their vertical integration' (Hunt, 2002: 26).

Operating interrelationships between transmission and generation are important in the balancing of electricity supply and demand. The transmission system operator is responsible for balancing electricity supply and demand for the entire electric system. The TSO needs to call upon generators on a continuous basis to balance the system. Generators provide so-called ancillary services to the TSO, including reactive power, spinning reserves, standby reserves, blackstart capability and frequency regulation (Joskow, 1996: 349). This continuous balancing of the system requires such a complex coordination between generation and transmission that vertical integration is believed to be the more efficient governance structure (Joskow, 1996). Hunt (2002) stated that the 'technical challenges of coordinating the generation with the transmission demanded such complex integration of generation and transmission (via the system operator) that it was considered impossible to separate them' (Hunt, 2002: 25).

B - Network connection problems in disintegrated governance structures

The integration of generation and transmission of electricity has been argued to be more efficient than governance through disintegrated structures (Joskow, 1996). The vertical integration of these two activities internalizes the investment complementarities between generation and transmission. When decisions on investments in generation and transmission are combined, and are thus made in a vertically integrated structure, the costs of these investments may be reduced[358]. In the Dutch electricity industry, there have been some problems with connecting new generating plants to the network as a result of the disintegrated decision-making on investments in generation and transmission. The Dutch transmission system operator announced that in 2007 it could not connect every new generating plant to the network, because there was not enough transmission capacity (TenneT, 2007: 22)[359]. This problem of too little connection and transmission capacity will very likely persist in the current unbundled industry structure, as generating plants take three to five years to build, and transmission lines eight to ten years. The transmission system operator has no advance information on when new generating plants will be built in the unbundled industry. It receives this information when the electricity firms announce their plans to build, and request a connection to the network. The transmission system operator always follows the investments in generation, and thus always lacks behind these investments in generating capacity. A solution to this problem is an increased coordination between the system operators and the generators of electricity on their investment plans. A market form of governance is therefore not likely to emerge, and has not emerged, for the network connection transactions.

[358] See also appendix A for a discussion on the investment and operating complementarities between transmission and generation.

[359] This also meant that several green generating plants could not be connected, because TenneT has to provide connections to the network on a first come, first served basis. The Dutch Ministry of Economic Affairs has proposed to formulate a new law for the electricity industry that gives green generating plants priority over other plants for connections to the network.

C- Governance of grid losses

A grid loss is defined as the difference between the amount of electricity that is put on a network and the amount of electricity that can be taken out of this network. The electricity that can be consumed is always less than the electricity that is produced; when electricity is transported a small part of the amount of electricity that is put on the network is lost. Every system operator is responsible for purchasing electricity to cover these losses on their own network. The Dutch transmission system operator, TenneT, needs around 500 GWh of electricity per year for the grid losses on the transmission network. TenneT invites tenders for the supply of electricity to cover these grid losses. The costs that the system operators make for the grid losses are transferred to the electricity consumers, and covered by the regulated transportation tariff. Before the liberalization of the Dutch electricity industry, the transactions for the grid losses were internalized in the pooling system of the SEP. The SEP pooled all the produced electricity, transported the electricity along the transmission network, and set a uniform tariff for the electricity. The compensation for the grid losses is currently governed by a market: through tenders, TenneT may choose the energy firm that offers to supply the electricity at the lowest cost. The system operators can thus influence the costs for the grid losses[360].

[360] There has been a discussion between the regulator and the system operators on whether the costs for the grid losses can be influenced by the system operators, which would have consequences for how these costs are included in the calculation of the regulated tariff. The fact that these costs have to be incurred may be difficult to influence. The system operators can also hardly influence these costs by making technical adjustments to the network. But the costs for purchasing electricity to cover these grid losses can be influenced by the system operators.

D - Governance of voltage levels and reactive power supplies

There are two types of energy that may be referred to as active power and reactive power. Active power is the component of electric power that produces light and heat among others. Reactive power is the component that is needed to keep the electricity network at the right voltage levels. The grid code states that every system operator is responsible for managing the voltage levels and the reactive power in their own networks[361]. TenneT allows the distribution system operators to use small amounts of its reactive power. When the distribution system operators want to use additional reactive power of TenneT, outside of this free range, they may contract with TenneT for the supply of reactive power. Every year the transmission and distribution system operators must come to an agreement on the range within which the distribution system operators are allowed to use TenneT's reactive power. TenneT contracts with electricity generators that are connected to the high-voltage network for the supply of reactive power (TenneT, 2002: 36). TenneT pays these generators of electricity, as is stated in the contracts, and the distribution system operators pay TenneT when they use reactive power outside of the free range. The distribution system operators also contract with generators for the supply of reactive power. These costs for the reactive power are included in the regulated transportation tariff, and are thus paid for by the final consumers of electricity.

The grid code states that the electricity generators should be able to supply reactive power to the networks when the voltage levels are low[362]. When there are problems with the transportation of electricity, or when these are likely to occur, TenneT has access to all the available reactive power of the generators, even when TenneT has not contracted for this reactive power (TenneT, 2002: 36). The electricity generators are therefore not free in their decision to supply reactive power[363]. This regulatory decision has been made, because a national market for reactive power is not likely to emerge. Reactive power cannot be

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[361] Article 5.5.4.1 of the grid code.

[362] Article 2.5.4.6 of the grid code.

[363] Besluitnummer: 100264/6. Betreft: Besluit van de directeur van de Dienst uitvoering en toezicht Energie op de bezwaren ingebracht tegen zijn besluit van 21 december 2000, nr. 00-124 tot wijziging van de voorwaarden als bedoeld in artikel 31, eerste lid, onder a en onder c van de Elektriciteitswet 1998, page 2. www.dte.nl (last accessed August 24, 2008).

transported over large distances, and thus has to be used close to where it is put on the network. The price for reactive power is not regulated, and the electricity generators can thus freely determine the price at which they are willing to supply.

For the large generators connected to the high-voltage network and the transmission system operator, the reactive power transactions have in the past been internalized in the SEP. Currently, these transactions are governed by a hybrid form in which the generators and system operators retain their autonomy, but are dependent upon each other for the supply of reactive power and the transportation of electricity. These contracting parties are engaged in a long-term agreement; as long as the generators are connected to the networks, they have the obligation to be able to supply reactive power. The generators are limited in terms of the contracting parties to which they can supply reactive power. This contracting party is the system operator of the network to which the generators are connected. The generators can thus not, as in a market form, engage in short-term contracts whereby they continuously switch to another contracting party.

E - Recap to research questions

1.a. What is the effect of regulation on the governance structures that existed before the liberalization of the electricity industry?	§4.3.1, §4.3.2
1.b. Between which segments of the electricity value chain and for what types of transactions does the need for new forms of governance arise as a result of the regulations?	§4.3.2
1.c. What contracting problems – that are in need of new forms of governance - emerge as a result of the regulations on unbundling and consumer choice?	§4.3.2, §4.3.3
2.a. What are the attributes of the relevant transactions in the electricity industry?	§3.2.1, §4.3.2, §4.4, §6.4.1, §6.5.1, §6.6.1, §6.7.4, §6.8.1, §7.4.1, §7.5.1, §7.6.1, §7.7.1.
2.b. What is the effect of regulation on the attributes of these electricity transactions?	§4.4, §6.4.5, §6.5.5, §6.6.5, §6.7.8, §6.8.5, §7.4.5, §7.5.5, §7.6.5, §7.7.5.
2.c. How do these attributes limit and/or enable the emergence of particular governance structures?	§2.3, §6.4.2, §6.5.2, §6.6.2, §6.7.5, §6.8.4, §7.4.2, §7.5.1, §7.6.2, §7.7.2.
3.a. How does transaction cost economics explain the efficiency of various forms of governance?	§2.3
3.b. For which transactions do the regulatory effects on governance and transactions create a misalignment between governance structures and transactions?	§6.4.2, §6.5.2, §6.6.2, §6.7.5, §6.8.2, §7.4.2, §7.5.2, §7.6.2, §7.7.2.
4.a. What new forms of governance are adopted in the liberalized electricity industries for each of the four types of electricity transactions?	§6.4.3, §6.5.3, §6.6.3, §6.7.6, §6.8.3, §7.4.3, §7.5.3, §7.6.3, §7.7.3.
4.b. How do the attributes of adaptation explain the transformations from one governance structure to another, and thus the emergence of the new governance structures?	§6.4.4, §6.5.4, §6.6.4, §6.7.7, §6.8.4, §7.4.4, §7.5.4, §7.6.4, §7.7.4.
5.a. How does regulation influence the process of adaptation?	§6.4.5, §6.5.5, §6.6.5, §6.7.8, §6.8.5, §7.4.5, §7.5.5, §7.6.5, §7.7.5.
5.b. When does regulation become part of the new governance structures?	§6.4.5, §6.5.5, §6.6.5, §6.7.8, §6.8.5, §7.4.5, §7.5.5, §7.6.5, §7.7.5.

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Dutch Summary

De Europese overheden en energiebedrijven zijn meer dan tien jaar geleden begonnen met het liberaliseren van de elektriciteitsindustrieën. Twee richtlijnen van het Europese Parlement en de Europese Raad, uit 1996 en 2003, voor een interne elektriciteitsmarkt stellen de regels voor deze liberalisering. Deze regels schrijven de verticale splitsing van de geïntegreerde energiebedrijven voor en de mogelijkheid voor consumenten om zelf hun energiebedrijf te kiezen. De overheden in de Europese lidstaten implementeren deze richtlijnen in hun nationale wet- en regelgeving. Deze Europese en nationale regels hebben een grote invloed op de governance structuren in de elektriciteitsindustrieën: de verticaal geïntegreerde bedrijven met een regionaal of nationaal monopolie moeten veranderen in nieuwe vormen van governance. In de geliberaliseerde industrieën zijn de beheerders van het distributie- en het transmissienetwerk onafhankelijk van de productie en retail van elektriciteit en moeten de gevestigde bedrijven concurreren met nieuwe toetreders.

Dit proefschrift karakteriseert deze nieuwe vormen van governance en de transformaties naar de nieuwe vormen van governance voor vier typen transacties: aansluiting op het netwerk, toegang tot het netwerk, het balanceren van vraag en aanbod van elektriciteit, en het switchen door consumenten. In een meervoudige case studie zijn deze transformaties geanalyseerd voor de Nederlandse en Franse elektriciteitsindustrieën. De nieuwe vormen van governance die voor elk van deze transacties zijn ontstaan in de Nederlandse en Franse industrie zijn hybride vormen van governance, die sterk gereguleerd worden en waarin de netbeheerders een coördinerende rol hebben.

Het theoretische perspectief van waaruit deze governance structuren zijn bestudeerd is transactiekosteneconomie. Op basis van de eigenschappen van de transacties analyseert transactiekosteneconomie de efficiëntie van de governance structuren. Deze theorie voorspelt de efficiëntie van verticale integratie voor de transacties in de elektriciteitsindustrie. Binnen dit theoretische kader worden de nieuwe hybride vormen van governance dan ook gezien als de op een na beste governance oplossingen. Transactiekosteneconomie is een comparatief statische benadering die niet in staat is om veranderingen in governance structuren te analyseren. Wanneer regulering leidt tot een inefficiënte match tussen de transacties en de governance structuren, kan transactiekosteneconomie niet aantonen welke nieuwe vormen van governance (de op een na beste oplossingen) er verschijnen en hoe de governance transformaties plaatsvinden.

In dit proefschrift ligt daarom de nadruk op een theoretische uitbreiding van transactiekosteneconomie waarin de adaptatie van governance centraal staat. The efficiëntie van governance transformaties wordt geanalyseerd met het concept adaptatie. Adaptatie is het proces van aanpassing door actoren in een industrie naar een nieuwe vorm van governance. De drie eigenschappen van adaptatie zijn gedefinieerd als de identiteit van de toekomstige contractpartij, de lateraliteit van het aanpassingsproces, en het type van respons in het aanpassingsproces (naar de prijs van het product of de dienst, of naar de vereisten van het elektrische systeem). Actoren passen zich aan wanneer hun governance structuren niet meer efficiënt matchen met de transacties (door bijvoorbeeld regulering), en wanneer de adaptatiekosten lager zijn dan het verschil tussen de werkelijke en de optimale transactiekosten. Met de eigenschappen van adaptatie kunnen de transformaties naar de hybride vormen van governance in de Nederlandse en Franse elektriciteitsindustrieën verklaard worden.

Dit proefschrift analyseert ook de invloed van regulering op de governance transformaties. Regulering bepaalt de regels van het spel, en beïnvloedt daarmee de eigenschappen van de transacties, van governance en van adaptatie. Regulering is ook onderdeel van de nieuwe vormen van governance, doordat de regulator de uitvoering van de contracten afdwingt en geschillen tussen de contractpartijen beslecht.

De Europese markt voor elektriciteit, die door de richtlijnen als doel werd gesteld, is nog steeds niet ontstaan. Verklaringen hiervoor zijn de grote mate van specificiteit en onzekerheid van de elektriciteitstransacties en de adaptatie naar de hybride vormen van governance.

Curriculum Vitae

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Eva Niesten was born on August 14, 1978 in Breda. She finished secondary school in Maastricht in 1996, and studied international business and psychology at the Maastricht University. In 1999, she transferred to the University of Tilburg, and graduated in economics in the summer of 2002. In 2000, she studied political economy at the Université Paris 1-Panthéon Sorbonne. Eva started as a PhD candidate at the Rotterdam School of Management, Erasmus University in November 2002. She spent a few months as a visiting scholar at the Groupe Réseaux - Jean Monnet and studied at the École Supérieure d'Électricité in Gif-sur-Yvette.

Her research interests include the liberalization of network industries, the role of the government in liberalization processes, regulation and the institutions of regulation, the adaptation of governance structures, innovation and sustainable development, the energy industry, and new institutional economics and transaction cost economics.

Her research has been published in Annals of Public and Cooperative Economics and in the International Review of Applied Economics. She is a member of the council and secretariat of the European Association for Evolutionary and Political Economy. Since 2006, she has been working as an editor for the Dutch journal Economisch Statistische Berichten. Currently, she works as a researcher at the Netherlands Bureau for Economic Policy Analysis (CPB). From September 2009, she will work at the European University Institute in Florence as a Jean Monnet fellow.

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REGULATION, GOVERNANCE AND ADAPTATION
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What new forms of governance emerge in the liberalizing electricity industries? What is the influence of regulation on the governance transformations? In 1996 and 2003, the European Council and Parliament issued two directives on the creation of one European competitive electricity market. These directives prescribe the unbundling of the electricity networks from the integrated energy firms, and the option for consumers to choose their own electricity retailer. The European governments have implemented these directives into their national regulations. This thesis analyses which new governance structures emerged in the Dutch and French electricity industries as a result of these regulations for four types of electricity transactions: the network connection, network access, balancing and switching transactions. The parties in these electricity industries did not adopt a market, but hybrid forms of governance that remained extensively regulated. The efficiency of these new governance structures cannot be explained with the attributes of the transactions, as is proposed by transaction cost economics. This thesis therefore introduces the concept of adaptation into transaction cost economics. Adaptation is the adjustment by economic actors from one governance structure to another, and is characterized by three attributes: the identity of the future contracting party, the laterality of the adaption, and the type of response in the adaptation process. These attributes explain the governance transformations and the new governance structures in the two industries. Regulation continues to play a pervasive role in the liberalized electricity industries. It influences the attributes of the transactions, the new governance structures and the adaptation process.

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