CPB Document

No 84

Vertical separation of the energy-distribution industry

An assessment of several options for unbundling

Machiel Mulder, Victoria Shestalova and Mark Lijesen

CPB Netherlands Bureau for Economic Policy Analysis
Van Stolkweg 14
P.O. Box 80510
2508 GM The Hague, the Netherlands

Telephone +31 70 338 33 80
Telefax +31 70 338 33 50
Internet www.cpb.nl

ISBN: 90-5833-217-9

Abstract in English

The Dutch Minister of Economic Affairs has proposed to replace the currently implemented structure of legal unbundling of the energy distribution industry by ownership unbundling. In this study we analyse costs and benefits of this proposal, compared to the current situation, and to two alternative options that strengthen legal unbundling. We identify four mutually-related categories of benefits: better performance of networks, more efficient regulation, improved effectiveness of competition, and benefits of privatisation; and three categories of costs: one-off transaction costs, loss of economies of scope and the risk of less investment in generation. The analysis highlights that the benefits depend on the future development in small-scale generation and on allocation of the management of transmission networks. Mainly because of the uncertainty about the future role of small-scale generation and the uncertainty about the magnitude of the one-off transaction costs related to cross-border leases, the net welfare effect of ownership unbundling at the distribution level is ambiguous. We identify an alternative route for achieving some of the benefits considered.

Key words: network industries, electricity, restructuring, ownership unbundling

Abstract in Dutch

Deze studie bevat een analyse van de kosten en baten van het voorstel van de Minister van Economische Zaken om de energiedistributiebedrijven volledig af te splitsen in netwerkbedrijven en bedrijven die zich op handel en/of productie richten. We vergelijken dit voorstel met de huidige juridische splitsing en met twee sterkere vormen van juridische splitsing. Volledige splitsing leidt tot betere prestaties van netwerkbedrijven, efficiëntere regulering en effectievere concurrentie in het geliberaliseerde deel van de sector. Bovendien schept het de mogelijkheid commerciële activiteiten te privatiseren. Tegenover deze baten staan kosten, zoals eenmalige transactiekosten, kosten van het verliezen van synergie en een mogelijke tijdelijke vermindering van investeringen in productie. Er blijkt dat de baten afhankelijk zijn van de toekomstige ontwikkeling van kleinschalige productie en van de vraag of het beheer van transmissienetten aan de landelijke netbeheerder wordt overgedragen. Met name vanwege onzekerheid over de toekomstige ontwikkeling van de kleinschalige productie en over de eenmalige transactiekosten is het welvaartseffect van de eigendomssplitsing van distributienetten niet eenduidig. Wij bespreken een alternatieve route om sommige baten van de eigendomsplitsing te bereiken met bestaande instrumenten.

Steekwoorden: netwerksectoren, elektriciteitssector, herstructureren, eigendomsplitsing

Een uitgebreide Nederlandse samenvatting is beschikbaar via www.cpb.nl.

Contents

Preface

The intention of the Dutch government to impose ownership unbundling on the incumbent energy distribution firms has raised a fierce debate between adherents and opponents of this proposal. Although the debate has brought forward many arguments both in favour of and against ownership unbundling, a clear picture of the net effects of this change in the ownership structure has not been achieved yet. Given the potentially far-reaching consequences of this measure radically changing the structure of the energy industry, a systematic analysis of costs and benefits is necessary according to many participants in the debate. The CPB, therefore, has started a research systematically analysing conceivable effects of several options to unbundle the energy-distribution industry.

Although this research is mainly based on desk research of economic literature on vertical organisation of industries as well as publications specifically focused on the case of the Dutch energy-distribution industry, we have also had several useful discussions with a number of participants in the debate. In particular, we thank Bart Brouwer, Sander de Jong and Jaco Stremler of the Ministry of Economic Affairs for all the information submitted on the Minister's proposal and the comments received on draft versions of this report. We thank Frans Rijkschroeff and Michiel Veersma of the energy regulator, DTe, and Daan Vrijmoet of the telecom regulator, OPTA, for the useful discussions on alternative options for unbundling and the impact of unbundling on regulation. This discussion was focused on the issues of regulatory tasks under the Electricity Law and experiences with regulating and enforcing the current unbundling requirements. Dirk Brouwer and Willem de Boer of the investment consultancy Sequoia informed us about relationships between ownership structure and value of firms, we are grateful to them. We thank Hans Huygen of Essent and Winfred Knibbeler of Freshfields Bruckhaus Deringer for the discussion on draft conclusions of our report. We are indebted to Michael Pollitt of the University of Cambridge, and Alejandro Hernandez Alva and Yanhua Zhang of the University of Toulouse for their valuable comments on a draft version of this document. Finally, we thank all other people who provided us with useful information. The responsibility for the content and the conclusions of this report is, of course, entirely ours.

Besides the authors of this report, Mark Lijesen, Victoria Shestalova and Machiel Mulder (project management), two other colleagues of the sector Competition and Regulation, notably Marcel Canoy and Gijsbert Zwart, contributed to this report by participating in the many discussions during the project.

Henk Don
Director

Summary

Scope of our research

The Dutch Minister of Economic Affairs has proposed to replace the currently implemented structure of legal unbundling in the energy distribution industry by ownership unbundling. Dutch regional utility holdings, whose ultimate owners are local authorities, are vertically integrated firms including regional distribution companies as well as commercial businesses, such as production and retail. The three largest utility holdings produce currently about 40% of electricity in the Netherlands and have a large share in retail, especially in the market for small customers. In addition to several vertically integrated regional firms, there are also other companies active in production and/or retail activities in the Dutch electricity market.

When an electricity firm is active in several vertically related businesses, including the network business, it can exploit the superior position of the network to influence the situation in the market. Therefore, the last EU Electricity Directive has strengthened unbundling requirements for distribution networks and has required legal unbundling. In the Netherlands, distribution networks are legally unbundled from the holdings. The Minister of Economic Affairs proposes to make this separation stronger, in particular, to introduce ownership unbundling.

In this study we analyse costs and benefits of this proposal, compared to the current situation. The current situation is referred to as Legal-Lean, because many networks are 'lean' companies, i.e. having no economic ownership of their assets and almost no personnel. Besides the current Legal-Lean unbundling structure and the structure of ownership unbundling, we include in the analysis two intermediate unbundling options, Legal-Fat and Legal-Fat Plus respectively. In the first alternative, networks have the economic ownership of their assets, and a proper division of the activities between the network and other companies is introduced. In the second alternative, financial ring fencing is added, implying that the financing capacities of the network firms are protected. In this option, a network firm is still part of the holding while the holding is able to influence the management of the network firm. These options are included in order to see which benefits can be achieved by less strong unbundling and at which cost.

We conduct an analysis of possible effects of these unbundling options. As each option has specific strong and weak points, we focus on describing the trade-offs between benefits and costs of each option. This analysis is of a highly qualitative nature because these types of restructuring measures are inherently hard to assess. While there are relatively many examples of the implementation of ownership unbundling for national transmission networks in different countries, the empirical evidence on such measures for distribution networks is scarce.

Benefits and costs of alternative unbundling options

When comparing the four alternative options introduced above, we identify several welfare effects, which we classify into 'costs' and 'benefits'. The benefits of unbundling relate to the improved performance of networks, more efficient regulation, and improved effectiveness of competition. Furthermore, ownership unbundling creates the possibility of privatising commercial activities, which separates the role of the government and private parties in the market segment of the industry. In addition to benefits there are also costs. We distinguish one-off transaction costs, loss of economies of scope and the risk of less investment in generation. We discuss each cost and benefit below.

Benefit: unbundling raises independence and, hence, performance of networks

Unbundling creates a more independent position of the network, which improves the network performance through a better focus on the objectives of the network and a better response to regulatory incentives. Making network companies 'fat' creates more transparency with respect to the network assets. This and a proper allocation of the strategic tasks will decrease the interference with the holdings and secure a better performance of the network. Therefore, a stronger unbundling form generates a larger improvement in this respect.

Benefit: effectiveness of regulation increases

We distinguish two effects of unbundling on regulation: effect on tariff regulation and effect on the market monitoring task of the regulator. More unbundling is beneficial for both. Therefore, stronger unbundling options deliver more of this benefit. The largest improvement is achieved under the ownership unbundling option, since this option removes last cross-subsidies and all remaining links.

Benefit: improved competition, possibly large welfare effects on wholesale market

Both improved independence of networks and increased effectiveness of regulation affect competition. In analysing this impact, we distinguish the retail segment and the wholesale segment. The effect of unbundling on the wholesale market appears to be more important.

A higher degree of unbundling of generation and *transmission* networks enhances the position of new entrants in large-scale generation and may lead to substantial welfare gains. Since the current distribution companies also operate a part of the transmission grid, ownership unbundling of such companies secures their independence, which is important for a good functioning of the wholesale market. If the management of the regional transmission grid as from 110 kV is allocated to the national TSO, as the Dutch government has proposed, the effect of unbundling distribution companies for the wholesale market is smaller. Still, unbundling of generation and *distribution* networks increases the opportunities for small-scale producers to compete in the electricity market, which is especially relevant if the concept of virtual utilities is

further developed in practice. Such a development is more likely if there is much entry in distributed generation, which is also facilitated by stronger unbundling of distribution networks. Although ownership unbundling may result in sales of generation owned by Dutch utilities to foreign firms, this is unlikely to have a large effect on competition on the North-Western European power market.

With respect to retail markets, unbundling is likely to promote entry. Even though the net welfare gains achieved in retail markets are likely to be small, unbundling may tackle a potential tight oligopoly in this market segment. The impact of ownership unbundling on further consolidation in the Dutch retail market due to possible takeovers after unbundling is probably negligible because of the currently high level of concentration. This threat of increased consolidation is likely to be dealt with by the competition authority.

Benefit: ownership unbundling enables privatisation of commercial activities

Currently, public authorities own the vertically integrated energy distribution firms. As a result, commercial activities, i.e. generation and supply, are conducted by firms in public hands. Ownership unbundling enables (public) shareholders to sell their shares in the commercial firms, while retaining their shares in the network firm. This generates a more clear division between the role of the government and activities of market parties in the liberalised part of the industry. Moreover, selling commercial activities of the energy holdings to private parties could generate an additional benefit, notably making these firms more sensitive to pressure from shareholders. Another possibility to achieve this benefit can be realised through changing corporate governance to facilitate the possibility of voluntary unbundling initiated by public owners.

Cost: risk of large one-off transaction costs

As unbundling involves a change in the structure of the industry, one-off transaction costs will occur. The improvement of legal unbundling would already give rise to some of these costs, as several alterations would have to be implemented, such as the reorganisation of the former common shared call centres. Both Legal-Fat Plus and Ownership unbundling give rise to additional one-off transaction costs, in particular costs following from changing the cross-border leases that some companies concluded in the past. There is uncertainty regarding the magnitude of these costs, due to confidential information about the current contracts and uncertainty regarding the possible reaction of American investors to unbundling.

Cost: ownership unbundling hardly results in additional loss of economies of scope

In the electricity industry, synergies between different activities occur because of economies of scope. The latter exists if integration of different types of activities reduces average costs. We distinguish operational and financial synergy. When comparing the four policy options with

respect to operational economies of scope, we conclude that the main cost of losing such economies of scope arises with introducing a proper task allocation. Additionally, ownership unbundling adds only small extra cost. The effect of financial synergy is mainly allocative and not on total welfare.

Cost: investment in generation is hardly affected

Unbundling possibly affects the financial ability of the (currently) integrated firm to invest in generation. However, this effect on investment in generation is likely to be small and temporary. More than 50% of all generation capacity is owned by other parties than the vertically integrated firms. As a result, total investment in power plants depends on far more factors than the financing capacities of the integrated firms.

Conclusion

Ownership unbundling strongly increases independence of network management, fostering the focus of network companies on their direct activities and leading to a better performance of networks. In addition, unbundling raises the efficiency of regulation. As a result, competition becomes more effective. The welfare effect of the improved competition in the retail market is probably small, while benefits of ownership unbundling are likely to be larger in the wholesale market. The magnitude of the latter benefits depends on the future development of small-scale generation and the separation of the transmission grid. Furthermore, ownership unbundling enables privatisation of commercial activities, which generates a more clear distinction between the role of the government and activities of market parties in the liberalised part of the industry.

The realisation of these results is, of course, not a free lunch. Ownership unbundling reduces economies of scope and, furthermore, creates possibly large one-off transaction costs. There is uncertainty about the size of the one-off transaction costs caused by the impact of unbundling on the current cross-border leases. Unbundling may also affect investments in generation by the currently vertically integrated Dutch utility holdings, but this is unlikely to affect overall investment in power plants.

Mainly because of the uncertainty about the future role of small-scale generation and the uncertainty about the magnitude of the one-off transaction costs related to the cross-border leases, the net welfare effect of ownership unbundling at the distribution level is ambiguous. Ownership unbundling is not the only option to realise some of the benefits mentioned above. By improving current structures, such as regulatory surveillance, competition policy, and corporate governance, both the performance of networks and competition in the market segment of the industry can be improved, while (public) shareholders can obtain the option to withdraw from risky, commercial activities. Postponing the decision on the form of unbundling would, however, result in prolonging uncertainty about the future structure of the industry.

1 Introduction

1.1 Policy debate in the Netherlands and goal of this research

The Dutch Minister of Economic Affairs has proposed to replace the currently implemented structure of legal unbundling in the energy distribution industry by ownership unbundling of networks from commercial activities. According to his letters to the House of Parliament[1], legal unbundling is unable to fully guarantee free access to the network by new entrants and adequate investment in the grid. Despite regulatory measures, legal unbundling would not completely prevent influence of the vertically integrated holdings on activities of network firms. Due to remaining links between network and other activities and the presence of asymmetric information, regulation faces difficulties in removing all ways of mutual influence. As a result of this influence, incumbent distribution firms could still hinder competition by deterring potential entrants or favouring own commercial activities.

In the view of the Minister, ownership unbundling is necessary to facilitate competition as well as efficiency of network management. In addition, ownership unbundling might enable the current ultimate shareholders – regional public authorities – to sell their shares in production and supply, raising both liquidity of regional public authorities and incentives for efficiency in these parts of the holding.

The proposal to introduce ownership unbundling has induced a fierce debate on the pros and cons of ownership unbundling. Many articles have been written and many lectures have been given, by adherents[2], opponents[3], politicians[4], lawyers[5], advisory bodies[6] as well as researchers.[7] Despite all these interactions of views, a clear picture of the consequences of the full unbundling of the energy distribution firms has not been achieved yet.

[1] The Minister of Economic Affairs, letters to the House of Parliament , Kamerstukken II, 2003 – 2004, 28982, nr.18 (March 2004) and nr. 29 (October 2004).
[2] See e.g. a letter of a former CEO of Eneco in Het Financieele Dagblad, “Energieplan Brinkhorst is goed voor economie”, May 12, 2004.
[3] See e.g. a letter of the three large incumbents (Essent, Nuon and Eneco) in Het Financiële Dagblad, “Vernieling energiesector”, November 25, 2004.
[4] See e.g. a letter of Crone, a member of the House, in Het Financieele Dagblad, “Neem locale overheden als aandeelhouders serieus”, December 12, 2004.
[5] See e.g. a letter of lawyers of Van Doorne NV in Het Financieele Dagblad, “Brinkhorst, bekijk nog eens goed noodzaak splitsing energiesector”, October 28, 2004.
[6] See e.g. the report “Net nog niet” of the Energieraad, December 2003, in which this body advises to take any decision on unbundling in a European context.
[7] See e.g. Baarsma et al., 2004 in Het Financieele Dagblad, “Stop de gedwongen splitsing van de elektriciteitsbedrijven”, December 12, 2004, concluding that the enforced separation of distribution firms should be stopped until a systematic cost-benefit analysis has been conducted, and Van Damme et al., 2004, concluding that the proposal of the Minister will hardly affect competition on the retail market while it will significantly influence ownership structure, raising questions about the proportionality of this measure.

The aim of this research is, therefore, to deliver a systematic analysis of conceivable effects of several options to unbundle the energy distribution industry. We will not only deal with the option of ownership unbundling, but also analyse options to improve legal unbundling by additional behavioural measures.

Before giving more detail about the scope of our research, we describe the issue in the remainder of this chapter. First, we present an overview of institutional choices made elsewhere in the European Union, and in particular in the Netherlands. Next, we go further into the options to structure the Dutch energy distribution industry. Finally, we describe the scope of our research and the structure of the report.

1.2 European context

The introduction of competition in the energy industry in European countries, as in other industries, has strongly been encouraged by initiatives of the European Union. The European Union has published several directives prescribing steps towards competition to be taken by member countries. These steps include restructuring of the industry, design and opening of markets as well as introduction of regulation. The issue of ownership, in particular privatisation, has not been dealt with by the EU Electricity Directives until now.

The restructuring issue refers to both vertical and horizontal organisation. Although the potentially adverse effects of concentrated markets are widely acknowledged, the EU Electricity Directives have not required horizontal separation. In addition, due to the absence of proactive regulation and control, the electricity market has shown an ongoing process of concentration, which may seriously limit effectiveness of competition (Jamasb, et al., 2005).[8]

Regarding the vertical structure of the energy industry, several countries initially introduced weak forms of unbundling in the electricity industry, notably accounting unbundling and management (organisational) unbundling, following the first EU Electricity Directive (1996). Some countries already implemented legal unbundling, although this more strict form of unbundling was formally introduced in the second EU Electricity Directive adopted in June 2003. Table 1.1 offers an overview of the currently implemented vertical unbundling models of electricity and gas distribution networks in some European countries. It follows from this table that so far, ownership unbundling of the energy distribution networks has only been implemented in one country of the European Union, i.e. the United Kingdom. The ownership unbundling in the British gas industry, is not the result of legislation, but has been implemented voluntarily. The former monopoly supplier, British Gas, has been split into production, supply

[8] In many European countries, the share of the largest three generation firms in generation is above 60%, while comparable figures exist for the retail market (Jamasb et al., 2005).

and transportation business. The National Grid Transco is currently about to sell four of their distribution business. This sale has been conditionally approved by Ofgem.

Table 1.1 Unbundling models of energy distribution networks in several European countries

	Accounting unbundling	Management unbundling	Legal unbundling	Ownership unbundling
Electricity	Finland Germany Norway Portugal	France Ireland Luxemburg	Austria Belgium Denmark Italy Netherlands Spain Sweden United Kingdom	
Gas	France Germany Sweden	Ireland Luxemburg	Austria Belgium Denmark Italy Netherlands Spain	United Kingdom (voluntary unbundling BG)

Source: EC (2005) Fourth benchmarking report on the implementation of the internal electricity and gas markets.
Notes: New EU members are not included here. They typically feature a somewhat lower degree of unbundling. In electricity, Norway applies legal unbundling in the case of mergers between distribution companies; Brussels region in Belgium is not yet legally unbundled.

For transmission system operators, many countries have chosen for legal or ownership unbundling, since TSOs perform the most crucial market facilitating functions and need a high degree of independence. Still there are some countries, e.g. Germany (accounting unbundling of TSO in the gas industry), lagging behind this development. The sluggishness in the restructuring processes in national energy industries may be a concern for the formation of the European energy market.

1.3 Current structure and options for unbundling in the Netherlands

The Dutch transmission system operator TenneT is fully separated from commercial electricity generators and traders. This TSO is entirely owned by the state government. TenneT currently manages 100% of the high-voltage network of 220 and 380 kV lines, of which it owns 58% and 90% respectively. In addition, TenneT owns and manages 12% of the 150 kV network. The rest of the 150kV grid and all the lower voltages are owned and managed by regional distribution

companies[9]. Table 1.2 gives more detail regarding the division of the lines beginning from 50kV across the companies.

Table 1.2 Ownership and management of Dutch electricity lines from 50kV, by voltage, 2003

	50kV	110kV	150kV	220kV	380kV
% Owned by TSO (TenneT)	0.0	0.0	12.4	58.2	90.1
% Managed by TSO (TenneT)	0.0	0.0	12.4	100.0	100.0
Ownership of lines per company, in km					
TenneT	0	0	542	379	1803
Delta	213	0	281	0	94
Eneco	638	0	278	0	0
Essent	67	1496	1432	140	105
Nuon	2020	475	1849	146	0
Total in the Netherlands	2938	1971	4328	638	2002

Source: DTe division of regions across companies of August 18, 2003 and the annual report of TenneT of 2003.

Regional distribution companies, whose ultimate owners are local authorities, are vertically integrated firms which are active in generation, network and supply.[10] There are three large electricity distribution companies: Essent, Nuon and Eneco. Together, these firms deliver to end users more than 80% of the electricity. About 10% is delivered to end users by TenneT, while a number of small distribution companies, with Delta Energy as the largest one, distribute the remaining part.[11] The three largest electricity distributors generate approximately 40% of the electricity. In addition, they have a large share in the supply, especially in the market for small customers, where their share is about 90%.

At present, network management and commercial activities of the regional companies are legally unbundled. However, the network firms are ‘lean’, i.e., they do not have economic ownership of their assets. Also the tasks of the network firm and the other firms within the holdings are not fully separated. As the regulator faces difficulties in guaranteeing full independence of network management from other parts of the holding, the Minister of Economic Affairs has proposed to introduce ownership unbundling, which structurally eliminates any influence of holdings on distribution companies.

The current form of legal unbundling and the ownership unbundling option do not exhaust all options for unbundling the energy distribution industry. In addition to these options, intermediate options can be distinguished in which a more clear division of tasks and

[9] According to the proposal of the Minister, in the near future, the complete network of 110 and more kV will be managed by TenneT.

[10] In chapter 3, more detail information is given on the current industrial structure of the Dutch energy industry.

[11] The term ‘distribution’ refers to the transport of energy to end users, while the term ‘supply’ refers to retail sales of energy to end users.

responsibilities is specified for the network manager. Following suggestions from DTe (2004b), we define two intermediate options between the current situation and ownership unbundling. Consequently, we have four alternative options for unbundling:

a) Legal-Lean: legal unbundling with lean network managers, which is the current structure of most energy-distribution firms;
b) Legal-Fat: legal unbundling with fat network managers, i.e. network firms with a proper allocation of tasks and the economic ownership of their assets, without independent financing capabilities;
c) Legal-Fat Plus: legal unbundling with fat network managers and a financial ring fence between the network and commercial activities;
d) Ownership: Full ownership unbundling of the network and commercial activities.

The new options b) and c) feature 'legal unbundling with a fat network manager', i.e. network firms with economic ownership of their assets. We assume that these intermediate options implement a proper division of tasks between the network and other businesses, allocating strategic tasks to the network manager.

The difference between the Legal-Fat option and the Legal-Lean option is that in the Legal-Fat option the network firm executes all strategic activities while it also has the network assets on its balance sheet. The Legal-Fat Plus option differs from the Legal-Fat option as in the former financial ring-fence of the network firm is added. The measure secures sufficient financing for network activities. In the Ownership option, there is full independence. The holdings lose ownership rights with respect to the network. For example, this option also prevents the holdings from having informal powers that may affect the choice of the board of directors of network companies. We will go deeper in detail of each option in chapter 3.

In addition to ownership unbundling between network and commercial activities, the Minister has proposed to reallocate the management of all networks at and above 110 kV (hereafter 'regional transmission networks') to TenneT. This part of the proposal represents another dimension of unbundling (between two network activities) and can be implemented independently from the four policy options that we discussed above. However, costs and benefits of each of the four policy options depend on the implementation of this part of the proposal. Therefore, when analysing the four policy options, we will discuss possible effects of this part of the proposal.

1.4 Scope of research and structure of the document

In this document, we analyse the effects of several options for vertical separation of the distribution network from commercial activities. As each option has specific strong and weak points, it is hardly possible to define the optimal structure. Therefore, we focus on describing the trade-offs between benefits and costs of each option for restructuring, instead of looking for the optimal option. The trade-offs between different effects of separation deserve careful attention as changing the institutional structure causes several costs.

Our analysis is of a highly qualitative nature as empirical data on effects of separation are very scarce. Instead of a quantitative analysis, our research is mainly based on desk research of economic literature on unbundling in network industries in general and studies directed at the Dutch case in particular. In addition, we have used discussions with several participants in the Dutch debate to collect information and check tentative findings.

The focus of the analysis is on national welfare effects, meaning that we have looked for the net effect of unbundling on costs and benefits in the Dutch economy. Distributional effects, however, will also be mentioned as far as it is possible. Given the focus on welfare effects, this analysis does not include other aspects relevant for the decision on unbundling, such as legal aspects and political aspects. Moreover, although the debate holds for both electricity and natural gas networks, here we focus on the electricity industry.

Theoretically-based insights on effects of vertical separation are given in chapter 2. This chapter starts by sketching the fundamental characteristics of network industries and their consequences for policy. It will appear that introduction of competition in contestable segments of network industries such as energy and telecommunications, requires regulation of access of producers and traders to that part of the industry that has a natural monopoly, i.e. the network. Unbundling is a means to improve allocative and technical efficiency in these industries, but also gives rise to several costs. In this chapter, we also give an overview of some international experiences with the introduction of competition in the electricity industry.

Chapter 3 describes the four options for unbundling in more detail. In addition, this chapter presents the framework for analysing the costs and benefits of unbundling. The analysis of the several benefits is the subject of chapter 4, while chapter 5 deals with the costs. The overall assessment of all costs and benefits is given in chapter 6. Chapter 7 ends this document by summarising the main findings and giving some concluding remarks.

2 Liberalisation, regulation and restructuring of the electricity industry

2.1 Introduction

This chapter offers a general introduction of issues coming to fore when introducing competition in the electricity industry. Section 2.2 concisely describes the fundamental characteristics of the electricity industry as a network industry and the consequences for competition, regulation and industry structure. This section, which also describes several options to unbundle vertically integrated network firms, ends with the rationale behind splitting integrated utilities, paying attention to the debate on separation in other network industries, such as telecommunication and railways. Section 2.3 explores international experiences with introducing competition in the electricity industry, looking both outside and inside the European Union. Section 2.4 presents the concluding remarks.

2.2 Competition in network industries

2.2.1 Characteristics of network industries and liberalisation

Network industries, such as energy, communications and railways, have three fundamental, mutually-related characteristics which make them different from other sectors (CPB, 2004). These characteristics are a) the presence of network infrastructures b) which form essential links in the related chain of activities and c) which coincide with substantial economies of scale. Below, we concisely elaborate on each of these characteristics.

- Presence of network infrastructure

  A consequence of the presence of network infrastructure, such as pipelines in the gas industry and tracks in railways, is the existence of network externalities. From the perspective of consumers, network externalities occur if “one person’s utility for a good depends on the *number* of other people who consume this good” (Varian, 2003). This holds in particular for the communications industry where each new consumer raises the value of the system to consumers already present. These network externalities follow directly from individual behaviour. Indirect network externalities result from increasing returns to scale in production: “a greater number of complementary products can be supplied – and at a lower price – when the network grows.” (Tirole, 1988). The more developed a network is, the cheaper extending the network generally is. In a well-developed railway system for instance, or an electricity grid or natural gas network, extending the system to more locations within the same area gives rise to relatively low costs due to the small distances which have to be covered. The existence of network externalities leads to two potential inefficiencies: excess inertia, i.e. users waiting to adopt a new technology, and excess momentum, i.e. consumers rush to an inferior technology (Tirole, 1988).

- Essential facility

  The network infrastructure forms an essential facility in the industry meaning that the infrastructure is a necessary input for the production of sectors using the infrastructure. Train operators absolutely need tracks to offer their transport services, just as electricity producers need wires to transport power. Strongly related to this is the high level of interdependence between users of the infrastructure. Consequently, the use of the infrastructure requires much coordination in order to prevent accidents or black outs. Moreover, the close links between infrastructure activities and operational activities could cause economies of scope, i.e. integrating these activities in one firm could be more efficient than conducting these activities in separate firms.
- Economies of scale

  Network industries exhibit significant economies of scale due to the high level of fixed costs. If investment in a network infrastructure has been made, this cost is mainly sunk. The huge fixed cost and the scale effects related to it make it uneconomical to double networks in most countries. As a consequence, networks are often natural monopolies.

  For example, in the electricity sector, natural monopolies exist on both the national level and the regional level. On the national level, electricity is transported by a high-voltage grid called the transmission network. On the regional level, low-voltage grids constitute distribution networks. The transmission network plays a crucial role in coordinating generation in order to achieve equilibrium between supply and demand at the most efficient way at every moment of time. It transports electricity over large distances, from a relatively small number of central generators to a few large customers and to regional distribution networks, which further transport it to smaller customers. Distribution networks are less important for realising system stability but are essential in delivering electricity to end-users. The distinction between national and regional grids is also relevant for the natural gas sector. On the national level, natural gas is transported by the high-pressure grid and on the regional level by low-pressure grids.

  Due to these fundamental characteristics of network industries, introduction of competition requires policy measures in several domains (see table 2.1). These domains include restructuring, design and opening of markets, regulation and ownership measures.[12] Below, we deal with some regulatory and restructuring measures. Because of the wide range and complexity of these measures, these sections are necessarily very concise. The main purpose of paying attention to the whole spectrum of competition measures is clarifying the role of unbundling as one structural measure amidst many other measures directed at introducing competition in a network industry.

[12] Joskow (2003a) mentions also horizontal integration of transmission and network operation as a key component for creating competitive markets.

Table 2.1 Main domains of electricity reforms	
Category	Description
Restructuring	Vertical unbundling of generation, transmission, distribution and supply activities
	Horizontal splitting of generation and supply
Competition and markets	Wholesale markets and retail competition
	Allowing new entry intro generation and supply
Regulation	Establishing an independent regulator
	Provision of third-party network access
	Incentive regulation of transmission and distribution networks
Ownership	Allowing new private actors
	Privatising the existing publicly owned business

Source: Jamasb et al., 2005.

2.2.2 Liberalisation and regulation

From the characteristics of network industries follow several potential market failures. The most important of these market failures is the existence of market power. Market power following from the characteristics of the infrastructure enables an unregulated network firm to demand monopoly prices, i.e. prices which maximise its profits. Such prices generate allocative inefficiencies as these prices exceed marginal costs. In case of a vertically integrated firm, this firm could use the market power resulting from the infrastructure to acquire market power in the downstream market and, consequently, also demand monopoly prices in this market.

Network firms can be prevented from using their market power following from the network characteristics by public management or regulation. The former solution, which was the common choice in many countries in the past, enables state-owned firms to set prices at marginal-cost levels if the government gives lump-sum subsidies to cover the fixed costs. Although this option theoretically solves the issue of allocative efficiency, it generally scores lower on the issue of technical efficiency because of the lack of incentives for management to improve productivity. The latter solution mentioned above, regulation, enables private parties to operate the network firm and consequently improve technical efficiency. If, however, these firms should operate without government subsidy, regulated prices should be set at the average-cost level. In that case, network firms are able to cover all their costs, although their production will be below the efficient level which is an allocative inefficiency. If access prices were set at a level below the average costs, the network firm does not have an incentive to invest in the infrastructure. The determination of the access tariffs belongs, therefore, to the key issues of regulating network industries.

If the network firm is integrated with a downstream firm, regulation is also needed to guarantee access of other downstream firms to the infrastructure. As both parts of the vertically integrated firm usually are closely interwoven and the firm has strong incentives to hinder downstream

competitors, regulators usually face magnificent difficulties to guarantee a level playing field for the latter. This problem can be solved by unbundling both parts of the vertically integrated firm. After all, proper third-party access to networks can only be realised if network activities are conducted independently from competitive activities.

Regulation of networks also has to deal with the hold-up problem as investments in infrastructure are characterised by asset specificity and sunk costs. Ex ante, i.e. before any investment in networks has been made, both retailers and users fully depend on the network firm's decision whether or not to invest in the essential facility. Ex post, i.e. when the investment in the network infrastructure has been made, the network firm fully depends on operators and retailers, as well as on the regulator, who may have an ex-post incentive to set a low access price.[13] The existence of this potential hold-up problem has been an incentive for vertical integration of both activities into one firm. After all, the hold-up problem does then not exist as all effects could be internalised. In a case of vertically separated firms, proper regulation of access fees for the infrastructure is needed to give the network firm adequate investment incentives.

Summarising, regulation (in the broad sense) has to ensure that the network operators do not abuse market power resulting from the natural monopoly of the network. Key issues in the regulation of networks are the accessibility to the network of upstream or downstream commercial firms, the tariffs network firms may demand for the use of the network and the investment by network owners in maintaining and extending the network.

2.2.3 Regulation and restructuring

In order to achieve proper results on the above-mentioned issues of accessibility, network tariffs and investments, two types of measures can be used: structural measures and behavioural measures. The former affect the legal and ownership structure of the industry, while the latter focuses at changing the incentives of players in the industry. Behavioural measures include access regulation (notably negotiated or regulated third-party access), price regulation (e.g. price caps) and quality regulation.

As unbundling can be established in different degrees, the question is which form is the most efficient. The following major forms of unbundling can be distinguished:

[13] The importance of the hold-up problem in these industries follows from the sunk character of investments in infrastructure. Otherwise, the investor would not fully depend on the users of the infrastructure, as he could also recover his costs by selling the infrastructure to somebody else. This is why the hold-up problem does not emerge in other economic transactions, such as the sale of goods in a shop.

- Accounting unbundling: unbundling of accounts and cash flows;
- Organisational unbundling: split into different departments with separated management, accounts and cash flows within the same company;
- Legal unbundling: split into different legal entities (companies) belonging to the same owners;
- Ownership unbundling: split into different legal entities which do not belong to the same group.[14]

The degree of unbundling determines the need for behavioural measures. For instance, in the three forms of legal unbundling considered in this report, incentives for strategic behaviour on the holding level remain, therefore, additional behavioural measures by the regulator are necessary. The analysis of each form of vertical unbundling, therefore, will include the trade-offs between structural measures and behavioural measures.

Unbundling issues play an important role in restructuring many network industries. Such industries often have both competitive and non-competitive segments, as shown in table 2.2.

Table 2.2 Competitive and non-competitive segments in network industries

Industry	Activity which is usually non-competitive	Activities which are potentially competitive
Electricity	High-voltage transmission and local electricity distribution	Electricity generation and supply
Gas	High-pressure transmission of gas	Gas production, supply, storage
Water	Distribution of water and wastewater	Water collection and treatment
Railways	Track and signalling infrastructure	Operation of trains and maintenance facilities
Telecommunications	Local residential telephony or local loop	Long-distance telephony, mobile telecommunications, and value added services
Air services	Airport services	Aircraft operations, maintenance facilities, and catering services

Source OECD, ECO/WKP(2000)24.

Deregulating the industry and introduction of competition in the competitive segment can deliver large welfare gains in many cases. This implies the need for the introduction of some form of unbundling. The choice of the degree of unbundling, however, is not the same across industries and may also depend on characteristics of the country. “As experience mounts with

[14] While the companies cannot belong to the same mother company they still can have the same ultimate owners. For example, a local authority can hold shares of both an electricity distribution company and the respective incumbent supply company from the same region.

weaker forms of separation, a movement can be discerned, especially in certain sectors, towards stronger and more effective forms of separation." (OECD, 2001.)

In the railway industry, net welfare effects of vertical separation are highly debated (see e.g. OECD, 2004). Vertical separation would only generate a positive net benefit if it has a strong impact on competition. If competition is hardly possible - due to, for instance, a low traffic density - the benefits of vertical separation are negligible. Costs of this policy option, however, appear to be significant (see e.g. BTRE, 2003). Separation likely gives rise to significant costs due to loss of economies of density (fewer travellers per operator) and increased coordination costs (the complexity of interaction between the infrastructure manager and train operators increases disproportionately). Moreover, costs of utilisation of infrastructure capacity rise if new operators use trains with different characteristics - speeds, lengths, axle loads, etc., making it difficult to use the infrastructure intensively. In addition, in the case of separation, incentives to invest in rail infrastructure depend on the tariffs the manager may charge to operators, creating the risk of suboptimal investments. On the other side, investment of operators - in e.g. longer trains - depends on investments of infrastructure owners - in e.g. longer platforms. This mutual dependency may hamper investments. Finally, separation in railways may lead to inadequate incentives for the wheel-rail interface, negatively affecting investments in reliability as this strongly depends on this interface.

Similarly to railways, in telecommunication separation of the local loop from competitive services appears problematic, because it undermines incentives for efficient investment in the local loop, as it is difficult to contractually arrange that the owner of local loop appropriates returns on his investment. Because of the alleged high economies of scope between network management and retail, local loop unbundling is usually carried out in a form of access regulation, such that the incumbent retains ownership and responsibility for maintenance of the lines which are then leased to the rival operator. In a cost-benefit analysis of structural separation in telecommunication, OECD (2003) concludes that structural separation in this industry is "risky with benefits that seem limited, uncertain, indeed, conjectural, with on the other hand, potentially significant costs including potentially adverse effects on network development. Certainly, there is insufficient evidence that benefits would be convincingly in excess of costs". In other words, the OECD (2003) strongly doubts whether ownership unbundling in telecommunication would strengthen competition and, hence, reduce prices, while it views the costs of full separation significantly high, in particular due to increased problems with coordination of investments between network firm and retail firms. Given the growing competition among alternative techniques for telecommunication, i.e. copper lines, cable and wireless techniques, the networks in this industry cease to be bottlenecks, reducing the need for unbundling (De Bijl, 2004).

Although for both railways and telecommunications full separation of network and (potentially) commercial parts is doubtful from an economic perspective, the reasons leading to this conclusion are different. In railways, costs of separation seem to be significant due to close relationships between network management and operation. In telecommunication, these costs are not negligible either; but in addition to that, technological developments are reducing the essential-facility character of the networks. These different stories illustrate that industries should be considered separately in order to determine the likely effects of separation. Each sector has its own specific characteristics affecting the appropriate design of industry structure and markets.

The electricity industry has a number of physical and economic attributes complicating transformation of the vertically integrated power industry into competition-based markets. Joskow (2003a) mentions the following key characteristics of the electricity industry:

- As electricity cannot be stored economically, production must meet demand at each moment of time;
- Economic management of use of network by producers and consumers is highly challenged by physical laws governing flows of electrons, and voltage and stability of the network;
- Given the above characteristics and the low short-run elasticity of demand, spot electricity prices are very volatile creating opportunities for suppliers to exercise market power;
- Congestion of networks may seriously hinder competition;
- The non-storability of electricity added to the large variety of demand between day and night, between weekdays and weekends, between seasons and due to weather conditions, results in a significant share of total generation capacity which is hardly used during the year. In a liberalised environment, investments in this peak capacity strongly depend on prices during peak hours.
- The regulation of the transmission network, in terms of access tariffs and allocation of scarce capacity, determines the possible outcomes of the competitive markets for generation and supply.

Because of these specific characteristics, the electricity industry consisted of vertically integrated utilities in the past. According to Joskow (2003a), “replacing these hierarchical governance arrangements with well functioning decentralised market mechanisms is a very significant technical challenge, about which even the best experts have disagreements”. The key challenge in electricity liberalisation is dealing with the tension between the desire for efficient markets on the one hand and for long-term investment on the other (Newbery, 2002b). In decentralised competitive electricity markets, investments in (peak) generation plants are very risky due to highly uncertain prices during periods of peak demand, possibly leading to inefficient levels of investments. In less competitive (oligopoly or monopoly) markets, control

over prices reduces this uncertainty but results in allocative inefficiencies and also in inefficient levels of investment. As a result, the most appropriate structure of the electricity industry is still an inconclusive issue, also because models which work well in some circumstances perform less in other places. (Newbery, 2002a.)

On some issues, however, theoretical and empirical evidence is quite straightforward. Practice shows that ownership unbundling works well for separation of the transmission system operation from competitive activities. The net benefits of ownership unbundling in this part of the electricity industry are widely acknowledged (see e.g. Joskow, 2003a, and Jamasb et al., 2005). In the distribution industry, we observe examples of both enforced and voluntary ownership unbundling from competitive activities in their service areas (i.e. in New Zealand and in the United Kingdom, respectively). However, the latter examples of ownership unbundling are quite unique. The last EU Directive on electricity requires only legal unbundling, as was mentioned in chapter 1. In the next section we will go deeper into international experiences with reforms in the electricity industry.

2.3 International experiences in the electricity industry

2.3.1 Introduction

In this section, we review some international experiences with unbundling energy distribution from commercial activities. While not aiming to provide a full review of international experiences, we include the few relevant experiences that we have been able to find that highlight the role of unbundling in market reforms. First, we look at developments outside Europe, in particular at those countries heading the world-wide process on introduction of competition in the electricity industry. Next, we sketch experiences of members of the European Union with this process of structural change in this industry. The final section analyses the main lessons of the experiences from abroad for the Dutch case.

2.3.2 Outside Europe

The United States and several countries at the Southern Hemisphere, i.e. New Zealand, Argentina and Chile, have introduced competition and related structural changes in the electricity industry in the past decades. Below, we mention the main measures taken and their impact in each of these countries.

United States

Unlike the situation in European countries, electricity reforms and privatisation in the United States have occurred at both the national level and the state level. An implication has been that there was a different degree of restructuring observed across the states, which allowed some states to go much further with their reforms than others. However, a different focus of national

and local regulation offices and conflicting policies have in some cases contributed to creating a crisis situation. The well-known example of this inconsistency of regulation is California's electricity crisis , in which the Federal Energy Regulatory Commission (FERC) promoted competitive pricing at the wholesale market, while the state government of California was maintaining price caps for final consumers.

In his assessment of experiences with introducing competition in electricity markets in the United States, Joskow (2003a) concludes that this process "has encountered more problems and proceeded less quickly than some had anticipated when the first restructuring and competition programs were first being implemented in the late 1990s". The author mentions the following problems:

- The boom in investment in generation capacity, caused by a financial bubble giving access to cheap capital, and the growth in wholesale power trade turned into a bust resulting in many electricity firms being in financial trouble.
- Liquidity and, hence, the efficiency of the market has fallen dramatically due to withdrawal of trading companies. Efficiency of wholesale power markets has been reduced because of market power problems and other market imperfections.
- The performance of competition on the retail market has been disappointing. In California, for instance, retail prices increased by 30 to 40% due to market design imperfections, market power problems and poor responses of federal and state authorities.
- The capacity of the transmission grid has hardly been extended in spite of a congested network, which caused several local market power problems. This bad performance of the network part is likely due to the institutional structure in which, contrary to many other countries, a large part of the transmission network is still owned and operated by vertically integrated companies.

The introduction of competition in electricity markets in the United States has also produced successes. Joskow (2003a) mentions the following achievements:

- Substantial investments in new generating plants by merchant generating companies;
- A shift of responsibility of construction costs, operating performance and market risks from consumers (under regulation) to suppliers;
- A substantial growth in the magnitude of electricity supplied through competitive wholesale markets;
- Lower electricity prices for the largest customers.

Because of the disappointing results of electricity restructuring in states in the Northeast, California and some others, several other states "have either taken a cautious wait and see attitude or have simply rejected restructuring and competition initiatives. These states tend to

have relatively low regulated retail prices, do not face looming supply shortages or reliability problems and face little consumer pressure for change. Why take the risk that a California-like crisis will come home to roost?" (Joskow, 2003a). The states that were at the forefront of electricity restructuring, however, have proceeded in order to overcome the above problems by improving the design of markets and regulation. These actions include measures directed at increasing investments in transmission capacity and reducing market power by encouraging divesture of transmission assets by the vertically integrated firms in order to form independent transmission companies.

Generally, the actions to be taken in order to improve performance of liberalised electricity markets follow from lessons produced by events such as the California experiences. One of those lessons is, according to Newbery (2002a), that risks following from unbundling generation from supply require long-term contracts or hedging instruments to insure against dramatic chances in spot prices.

Argentina and Chile

Among developing countries, only Argentina and Chile had successful comprehensive reforms of their electricity industries. The reforms had a number of features that are similar to those in reforms in Europe, such as restructuring (some degree of disintegration), introduction of competition in competitive segments and regulation of network charges. Also privatisation played a large role in improving efficiency in the electricity sectors of Argentina and Chile.

Although the reforms have generally led to positive changes in the electricity sectors of these two countries, there were still several drawbacks that slugged the development. We refer the readers to Pollitt (2004ab) for the general discussion of the lessons from the reforms in Chile and Argentine, mentioning here only those experiences that are relevant in the context of our report.

In particular, one of the problems mentioned in Pollitt (2004a) for Chile is little competition between the generators for customers embedded in the distribution networks, because of too much vertical integration of incumbents. This effect arises because in Chile there is no regulation of the combined network and retail charges of distribution companies. Incumbent distribution companies integrated with generators offer very low prices to large users, preventing both physical and financial bypass by competing generators who are denied a contract market. Pollitt concludes:
"In general generators should be allowed to merge with retailers but not with retailers and distribution wire businesses as this potentially creates the same access problems as arise when generation and transmission are merged." (Pollitt, 2004a, p.15.)

In contrast, this particular problem did not occur in Argentina, where distribution and generation were unbundled and there was no incentive for distribution companies to prevent efficient financial bypass. (Pollitt, 2004b, p.18.)

New Zealand

In New Zealand, separation of network activities from retail and generation was followed by an increase in competition. The Electricity Industry Reform Act of 1998 mandated that the network businesses should be owned separately from retail and generation businesses. According to the New Zealand Ministry of Economic Development:[15] *"The rationale behind separation of competitive retailing from natural monopoly lines is that integrated electricity supply companies have incentives and the ability to restrict a competitor's use of their lines, cross subsidise between distribution, retail and any generation business; and charge monopoly prices in distribution and retail markets."*

Electricity companies complied with the separation requirement faster than the Act required, completing the ownership separation by April 1, 1999. In most cases the formerly integrated electricity companies retained network activities and sold their retail businesses. Currently there are about 10 retailers, 31 distribution businesses and one state-owned TSO, Transpower.

Competition in electricity retail was very limited prior to separation and much improved after that. Many customers switched provider in response to market signals. However, not only ownership separation contributed to this improvement. Prior to separation, in order to switch to a new entrant, customers had to install a time-of-use meter, unless the incumbent and the entrant agreed otherwise. Since the meters are costly, this was only reasonable for large users. On April 1, 1999, new arrangements were introduced, such as load profiling, to ensure that small customers could also switch supplier. Also the national generation company ECNZ that used to dominate the market was split into three state-owned generators on 1 April 1999.

The measures implemented in New Zealand, i.e. ownership unbundling, improved switching possibilities and splitting of the incumbent led to a decrease in wholesale prices. While during the one-year period before April 1, 1999, wholesale price averaged 3.74 c/kWh, in the next year it fell to 2.64 c/kWh. However, as the three measures were undertaken at the same time, the positive effect on market functioning should not be ascribed to ownership unbundling alone. Also, we observe that currently the government of New Zealand allows some generation to be owned by line businesses.

[15] Source: http://www.med.govt.nz/ers/electric/sector/sector-02.html.

On the other hand, the example of New Zealand, where companies complied with ownership unbundling (as introduced by the Electricity Act in New Zealand in 1998) within a year, shows that the transaction cost of introducing this form of unbundling is unlikely to be too large.

2.3.3 European Union

Within the European Union, the United Kingdom has been at the forefront in liberalising markets, including the electricity market. This country features some examples of voluntary unbundling of energy companies. Also the experience of Denmark is interesting, because it is one of few countries that have a restriction regarding ownership shares of generators in network companies. Finally we include an example of Germany, a country which features relatively high vertical integration.

United Kingdom

Within Europe, the United Kingdom was the first country completely liberalising the electricity market. During the restructuring processes, a trade-off was made between vertical and horizontal concentration. The major generators (Powergen and National Power) were not allowed to vertically integrate unless they divested themselves of some generation assets. For example, the government approved the merger of Powergen with a regional distribution company, East Midlands Electricity, in return for further divestiture of generating plant by Powergen. (Pollitt, 1999.)

Since 2000, the UK applies separate licensing of distribution companies (i.e. legal unbundling). There are 12 distribution companies in England and 2 in Scotland. Although no ownership unbundling of network from other businesses was required by law, it happened voluntarily in several cases. Currently, a half of (formerly) integrated incumbent companies feature different ownership of the network and supply. Van Damme et al. (2004) provide information regarding the ownership structure, which we present in Table 2.3 below. We observe that there are five main parties that are active in supply: E.On, EdF, RWE, Scottish and Southern Energy and Scottish Power. Apart from RWE, each of these large utilities also operates some regional network in the UK. There is one large entrant into the UK residential electricity market without wires - British Gas, i.e. the dominant incumbent supplier of gas to the same customers. This company is the most successful entrant. According to the estimates by Waddams and Prandini, the share of the other entrants in the UK residential market remains very low (about 1%)[16], which confirms that it may be difficult to entry such a market.

The increase in competition has led to improved efficiency and lower end-user prices, especially for larger customers. For residential customers, however, the effect of competition on

[16] Waddams and Prandiny 'Vertical separation and competition in energy markets', presentation at the CIEP Energy Market Seminar, February 9, 2005, The Hague.

prices is far less clear. (See Giulietti et al, 2006.) This seems to be consistent with the development observed in other countries. For example, Steiner (2000) reports that the reforms generally induced a decline in the industrial price and an increase in the price-differential between industrial customers and residential customers. Hence, industrial customers generally benefit from the reforms in the electricity industry.

Table 2.3 The ownership of distribution and supply in the United Kingdom

	Supply	Network
Same owners of supply and retail		
East Midlands Electricity	E.On	
London Electricity	EdF	
Manweb	EdF	
Scottish Power	Scottish Power	
Scottish Hydro Electric	Scottish and Southern Power	
Seeboard	EdF	
Southern Electric	Scottish and Southern Power	
Different owners of supply and retail		
Eastern Electricity	E.On	EdF
Midlands Electricity	RWE	Aquila/First Energy
Northern Electric	RWE	Mid American Holding Company
Norweb	E.On	United Utilities
South Wales Electricity	Scottish and Southern Power	PPL
South Western Electricity	EdF	PPL
Yorkshire Electricity	RWE	Mid American Holding Company

Source: Van Damme et al. (2004)

Also the British gas industry has an impressive example of a voluntary split of a formerly integrated energy company, the British Gas, into three companies - Centrica (supply), Transco[17] (network), and British Gas (production).We see two reasons for this voluntary split, which took place several years after the debate on vertical organisation in the United Kingdom had started.

- The old structure did not quite fit into the new market environment. By 1993, there were already several inquiries (by the Competition Commission) into the gas market, and it was recognised more and more clearly that strict legal unbundling and strict regulatory power do not make competition work under joint ownership.
- The second reason is internal: different goals and a lack of synergy among the three companies hindered efficient operations. The structure was not sufficiently transparent. There was a lack of synergy, while it was costly to facilitate independent operation, which made it difficult and costly to manage such an integrated company.

[17] The National Grid Transco is currently about to sell four of their distribution business, which has been conditionally approved by Ofgem. See the website of Ofgem.

By providing the experience of several examples of voluntary unbundling, the British energy industry gives us some information about the magnitude of the economies of scope after the introduction of competition in the energy market. Although ownership unbundling of the network and the incumbent suppliers was not imposed by law, it happened in many cases voluntary, implying that the remaining operational synergies after legal unbundling are unlikely to be too large. For example, in the case of ownership separation of British Gas, major costs of the separation of supply from the network lied in changing information systems; and two years were sufficient to get the companies on the right track. The shareholder value for all three companies increased as well as the size of operation of Centrica (supply) did. Unbundling also improved the relations between the company and the regulator.

Concluding, let us compare the situation in the electricity industry in the United Kingdom to that in the Netherlands. We notice that the number of large players in the United Kingdom is larger than in the Netherlands, where the market is dominated by three large players, two of which also control a large share of central generation (see Chapter 1 and Chapter 4). Having too few suppliers may be a potentially large problem in the residential market, as price transparency, needed to enable residential consumers to choose between suppliers, may lead to joint dominance by these suppliers in the market. Therefore, it is important to evaluate the effect of the unbundling decision on the number of suppliers. Furthermore, the experience of the United Kingdom suggests that reducing market share of market players (by means of vertical or horizontal ownership unbundling) may be beneficial for market functioning.

Denmark

In Denmark, the number of suppliers has increased after the introduction of liberalisation in January 2003. There are now about 40 obligation-to-supply companies, which are the former regional distribution companies, and about 25 suppliers who can access network (under regulated TPA) and freely compete in the market. The latter are called trading companies. According to the law, supply and network companies should be organised as separate legal entities but can belong to the same group (common ownership), which is often the case. In particular, the obligation-to-supply companies are often owned by network companies, and organised as their subsidiaries. Also some of the free trading companies belong to groups. However, there is a restriction that not more than 15% of network assets can be in hands of supply companies and/or producers (as reported by van Damme and Kanning (2004) with a reference to Deloitte en Touche[18]).

When customers choose another supplier than their original licensed supply company, the network company is responsible for the transfer of such customers to the new supplier (in particular for the necessary exchange of information between the old and the new supplier). The

[18] 'Internationale benchmark privatisering en unbundling regionale energiebedrijven', July 23, 2003.

law prohibits the distributor to give a preferential treatment of its affiliated supply company: all transactions must be on market conditions, be based on written agreements, etc. Still, in practice, some distributors seem to be very slow in allowing external sales companies, referring for example to computer system difficulties.

In Denmark, prices charged by the incumbent obligation-to-supply companies (who used to supply to captive customers before liberalisation) are still regulated in order to protect customers in their areas who are non-active in the market. Since retail prices in Denmark are partly regulated, it is difficult to use the example of Denmark to see how much benefits of increased competition may be achieved.

Germany

Germany is one of the European countries seriously lagging behind in implementing steps needed to obtain effective competition in the electricity industry. The German energy market is dominated by four vertically integrated private energy companies: RWE, E.ON, EnBW and Vattenfall, which also own transmission networks. Also tens of little regional supply companies in Germany are vertically integrated with regional networks. Only since recent, distribution companies have been obliged to have accounting unbundling, but it is still not fully implemented (Energie Nederland, May 2004). Of all EU-15 countries, only Germany, Finland and Portugal have still only accounting unbundling in distribution (EC, 2005). Only recently Germany's parliament passed a new law that is meant to increase competition within the country's energy market. Since electricity networks tariffs were not regulated in Germany, German network charges exceed network charges in other EU countries. (EC, 2005, p.11.)

Large Dutch energy concerns, such as Nuon and Essent, own several regional energy companies in Germany, including the respective distribution networks. Also large German energy companies own energy businesses in other countries (e.g., E.ON owns a generator in the Netherlands).

2.4 Concluding remarks

Unbundling of networks from potentially competitive parts of network industries encourages competition in the latter. As several options exist to unbundle this industry, from accounting to ownership unbundling, the appropriate option depends on the costs and benefits from an economic point of view. Evidence from other network industries, i.e. railways and telecommunications, suggests that ownership unbundling can raise significant costs, in particular due to loss of economies of scope, while the impact on competition can be modest. However, its application for energy is limited as each industry has its unique features.

International experiences with restructuring the electricity industry do not produce clear answers on the impact of unbundling. With respect to negative sides of insufficient unbundling, we can mention entry barriers due to the superior position of incumbents. It is difficult to monitor that the superior information position of networks is not misused (e.g. it is impossible to prove if delays of sending bill information or slow customer transfer to entrants are indeed due to ICT problems). Furthermore, there is evidence that high degree of vertical integration may amplify problems of high degree of horizontal integration, as well as evidence that the integration of generation supply and distribution in the absence of efficient third party tariffs discourages new entry in generation (Chile).

While there is international evidence that more competition in the market leads to lower price margins and hence to lower prices, and that a lower degree of both vertical and horizontal integration contributes to better market conditions, there is hardly evidence that would allow us to *quantify* this contribution. In most cases, when competition improved after introducing (a stronger form of) unbundling, the events were accompanied by other regulatory changes. The fact that we observe some examples of voluntary unbundling suggests that costs of such an operation need not to be high in comparison to the benefits.

3 Cost-benefit analysis of several options for unbundling

3.1 Introduction

The fundamental characteristics of network industries as well as the reasons behind restructuring the industry, both described in the former chapter, form the basis for assessing several options for unbundling. In this chapter, we describe the framework for analysing costs and benefits of such a measure changing the structure of an industry. This chapter consists of two sections. Section 3.2 describes several options for unbundling, while section 3.3 depicts an overview of all cost and benefit categories which will be used in our assessment.

3.2 Options for unbundling

3.2.1 Four options

In chapter 1, we have introduced four options to restructure the energy distribution sector in the Netherlands. These options are:

- Legal-Lean: the currently present structure of legal unbundling with lean network managers;
- Legal-Fat: a structure of legal unbundling with fat network managers without financing capabilities;
- Legal-Fat Plus: a structure with fat network managers being financially independent;
- Ownership: ownership unbundling resulting in fully independent network firms.[19]

The first option represents the current situation, the last one corresponds to the proposal of the Minister, and the other two are intermediate options between them.

3.2.2 Legal-Lean

Currently, the energy distribution firms in the Netherlands are legally unbundled. However, the network firms belong to groups ('holdings'), which share their operational, managerial, and financial responsibilities. For example, some strategic and operational tasks of network companies are now done in collaboration with other parts of the holdings, or outsourced to them (e.g. shared service centres). Most network firms are lean, i.e. do not have economic ownership of their assets. They are organised as a BV[20] with no assets and only a few employees, while the network assets are typically owned and financed by the holdings. In the recent revision of the Electricity law 1998 (also referred to as the I&I-law) there is an article regarding shifting economic ownership to network companies, but this article has not come into force yet.

[19] In our definition of ownership unbundling, the network firm is able to integrate with other non-energy, commercial activities, giving rise to other sources of cross subsidies. A stronger form of ownership unbundling could, therefore, include limitation on integration with activities outside the energy industry.

[20] BV='Besloten vennootschap'.

Although the network firms do not possess the infrastructure assets, the regulator (DTe) assumes that these assets belong to the network firms, i.e. it assumes a so-called regulatory asset base.

3.2.3 Legal-Fat

In this option for structuring the industry, the network firms are still part of the groups. They are legally and operationally unbundled from commercial activities and have the economic ownership of the assets. As a result, no difference exists between the formal and actual treatment of the assets of network firms by the regulator, as is the case in the Legal-Lean structure.

Operational unbundling means that all the strategic network activities are assigned to the network firm. The strategic activities affect competition in the energy market, hence, it is desirable that no market parties are involved in performing them.

DTe (2004b) lists strategic functions:

- Investment decisions regarding the extension and maintenance of the network;
- Operational management (e.g., dispatch, negotiations on contracts over the access to the network, responsibility about information systems);
- Contracting of the parties that perform outsourced activities;
- Financial policy (setting up the annual reports, billing, contact with clients);
- Supervision of the design of new and maintained networks;
- Management of information systems.

The three last functions were formally classified as operational functions (Electricity Act, 1998), however, according to DTe, they should also belong to strategic functions. In such a case, only few operational functions could be contracted out to commercial firms, such as:

- Field work, i.e. physical constructions and maintenance of the grid;
- Inspection tasks for safety;
- R&D with respect to network techniques.

To prevent cross-subsidisation in the case of contracting certain tasks among the companies within the same holding, the arms' length principle should be applied. This means that companies should charge each other on the same basis as they would charge external companies. Given informational asymmetry existing between the firms and the regulator, it may however be challenging to control for the application of the arms' length principle in this situation.

3.2.4 Legal-Fat Plus

The Legal-Fat Plus option is different from the previous options in that it strengthens the existing financial rules by giving the network more financial capabilities.

In the previous options, financing issues are to a large extent dealt with at the level of the holding. There is no formal restriction preventing that cash flow of networks can be used by the holdings (e.g. it may flow out in the form of dividends or through transactions, especially with respect to the old financial contracts of the holdings where the network assets provide guaranties, such as cross-border leases which are still in place[21]). Since commercial activities are generally more risky than network activities, this imposes the risks on the network companies that there may be insufficient cash flow to maintain the network or insufficient funds to finance network investment. In order to protect the networks from such problems, a further step is taken: the introduction of extra rules that would provide the networks with more financial independence. Such rules are called financial ring fencing.

The term ring fencing can be defined as "a process undertaken to determine the total asset and resource base and liabilities and obligations of a particular functional unit and the revenue and operational costs associated with the unit as if it were to operate independently." (See, e.g., PWC, 2004.) Any form of unbundling can also be seen as some form of a ring fence. A financial ring fence secures that the networks do not run into financial difficulties due to financial losses in other parts of holdings. This can be done by setting a threshold on the credit rating of the group, after which the regulator have to approve all financial transactions of the network company with other companies in the group to which it belongs. This secures the ability of the network company to get enough financing for its operation and investment and prevents creditors of the holding (or other subsidiaries) from having recourse on the assets of the network owner in case the company defaults on its debts.

A comparable measure was recently proposed by the British regulator (Ofgem, 2004a,b). The box below summarises typical features of financial ring-fencing as discussed in the Ofgem proposal for independent gas transportation companies. In another document, for British electricity distribution network companies, Ofgem suggests a financial ring-fence of the networks in the case of 'a trigger event', i.e. an event that signals a deterioration of the financial strength of the parent company, for instance, a downgrade of its credit rating. Such an event activates a 'cash lock up mechanism'. This means that an approval of the authority becomes necessary for certain transactions, such as paying dividends, certain transfers of money, payment of principal and interest on certain loans, fair value payments for goods, services and tax losses, and acquisitions of certain investments. Such a measure reduces the risk of underinvestment in network.

[21] There is an article in the I&I-law that prevents using network assets as a collateral for new contracts.

Unfortunately, by itself, the group credit rating may not guarantee that each company in the holding, in particular the network company, has enough cash flow for operational needs. Therefore, the above measure can be complemented by some restriction on the cash-outflow (e.g. in the form of dividends or money transfers) from the network company.

By implementing a financial ring fence, not all links between the network firm and commercial firms are cut through. The holdings still have certain shareholder powers, e.g., through personal links with the network firm. Although, the holdings' formal shareholder powers are restricted (especially for larger network companies that are subject to the 'structuurregime'), informal powers may still play a role, affecting the choice of the management board members.

Financial ring-fencing arrangements

According to Ofgem, there are two major advantages of financial ring-fencing arrangements of licensed energy network companies. They are the following:

'They provide protection from certain events that might otherwise lead to the insolvency of the licensee, thereby protecting consumers from the associated uncertainty and disruption.'
'They allow the licensee to retain access to financial markets on reasonable terms, thereby facilitating the funding of future investment programmes.'

Financial ring-fencing requires a licensee:

♦'To procure an undertaking from its ultimate controller that it will refrain from taking any action which would be likely to cause the licensee to breach its obligations under the Gas/Electricity Act or its GT licence;
♦ Not to incur any indebtedness nor create any security, nor guarantee any liability of another person, other than on certain specified terms and for a permitted purpose, or otherwise with consent of the Authority;
♦ Not to conduct any business other than its core business, subject to certain exceptions and specific limitations on the turnover and investment of permitted non-core activities;
♦ To ensure that the licensee has sufficient resources to carry on its licensed business and to submit a report to the Authority each year confirming availability of financial resources;
♦ To maintain an investment grade credit rating; and
♦ Not to enter into an agreement incorporating a cross-default obligation without consent of the Authority.'

Source: Ofgem, 12 November 2004, Financial ring-fencing for new and existing independent gas transporters. Initial proposals. Section 4.

3.2.5 Ownership unbundling

This policy option results in the strongest form of unbundling. It completely removes all financial and operational links between network firms and commercial firms, such as carrying the same name, combining commercial and network information in one mail to a customer, etc. In this option, networks are fully split from the original holdings, so that the holdings have no shareholders' rights. For example, a holding (a current owner of a network company) cannot even informally affect the choice of the board members for the network company, financial

decisions or decisions on network investment. Ownership separation means that there will be no common financing of the network and commercial activities. The old contracts of the holdings regarding financing, such as cross-border leases, may need to be broken or altered, in order to implement the full separation.

Ownership unbundling can be implemented in several ways, as the Minister of Economic Affairs has pointed out in his letter to the House of Parliament[22]:

- The network firm is directly owned by the shareholders;
- The network firm is owned by the current holding while the commercial activities are conducted in a newly established firm;
- The network firm is owned by a newly established holding while the commercial activities are conducted by the current holding.

As the network firm is fully independent in all these cases, we can ignore the form the ownership unbundling has been organised in our analysis. What is important here is that the proposal does not allow for direct ownership of the network and commercial activities by the same group, while allowing for indirect ownership of the network and commercial activities by the same ultimate shareholders (cities and provinces in this case).

3.3 Categories of costs and benefits

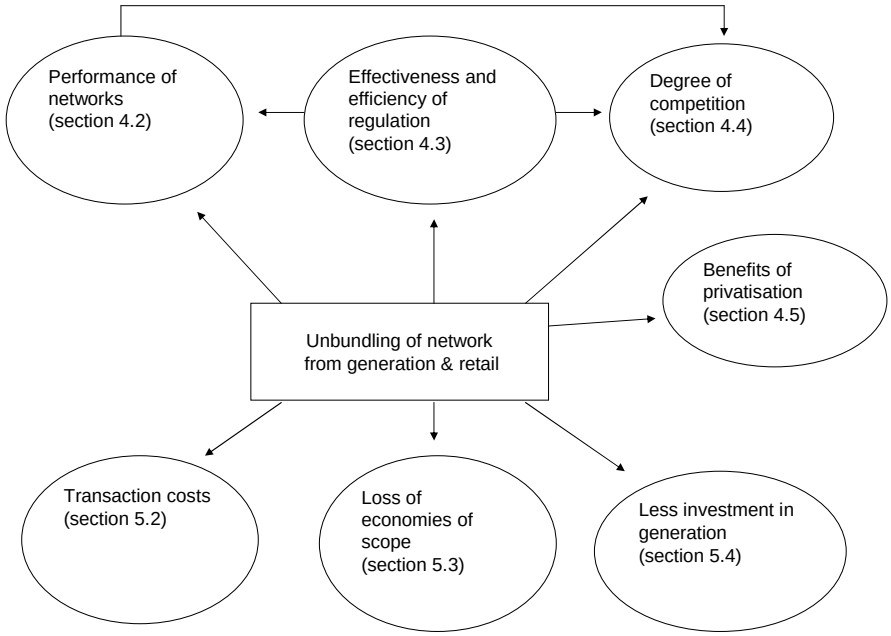
In order to compare several options for structural separation, we use the welfare-economic approach. In this approach, the key question is whether a policy measure, i.e. an option for unbundling, affects allocative efficiency, technical efficiency or distribution of effects on efficiency. Allocative efficiency refers to welfare effects of the allocation of goods and technical efficiency to the costs of supplying goods. If a good is not priced according marginal costs of supplying it, an allocative inefficiency exists. So, allocative efficiency is related to the way goods are priced and allocated. Technical efficiency is related to the incentives firms have to improve productivity, both in the short term (i.e. static efficiency) and in the longer term (i.e. dynamic efficiency). These efficiency concepts determine our cost-benefit analysis. In other words, we analyse whether unbundling affects the functioning of markets and the allocation of goods, the incentives for firms to improve productivity and raise quality of their products, and finally, the distribution of the results of production and allocation (i.e. welfare) among consumers and firms.

[22] The Minister of Economic Affairs, letter to the House of Parliament of October 11, 2004 (Kamerstukken II, 2003 – 2004, 28982, nr.18).

As unbundling potentially impacts many components of the industry, we have distinguished several categories of costs and benefits (see figure 3.1).[23]

Unbundling immediately affects independence of network management. Depending on the degree of unbundling, it raises transparency of costs and returns of the network firm and reduces incentives for cross subsidies and distorting actions, provided a proper allocation of tasks between network firm and commercial firms, and, furthermore, it increases financial security for the network firm. Moreover, unbundling of network firms may open options to realise economies of scale in network management. As a result, the performance of the network firm rises. Section 4.2 analyses this benefit.

Figure 3.1 Benefits and costs of unbundling and structure of chapters 4 and 5



Unbundling also directly impacts effectiveness and efficiency of regulation. The increased transparency enables the regulator to set appropriately access tariffs and other incentives for the network firm. This also increases performance of networks. In addition, the increased transparency improves regulator's ability to monitor the market. Due to the reduction in incentives for strategic behaviour, regulation becomes less complicated and, hence, more efficient. Section 4.3 is directed to the benefits on regulation.

[23] These categories are more or less comparable to those used in OECD (2003). In that report, the benefit categories include facilitation of competition, transparency about costs of the non-competitive activity, and innovation in the infrastructure. The cost categories in that study include loss of economies of scope, investments in relation-specific assets and one-off transaction costs.

Both improved network performance and more effective regulation affect competition. The improved network performance leads to less allocative distortion caused by high network tariffs[24] as well as to better options for new entrants for dispatching to the grid or for supplying. Regulation directly affects competition by improved market surveillance. Competition is also directly affected by unbundling through the impact on cross subsidies and distorting actions by vertically integrated firms. Section 4.4 deals with all these effects on competition.

A final, side-benefit of unbundling is related to its impact on privatisation of commercial activities. If public shareholders are enabled to sell their shares in these activities, several benefits follow. Firstly, privatisation enables public authorities withdraw public capital from commercial activities and to use the proceeds for financing other socially preferable investments. Secondly, unbundling and privatisation could raise the value of the commercial firms by reducing corporate inefficiencies, optimising the financial structure and increasing the pressure of private shareholders to increase efficiency. Section 4.5 is directed at these benefits.

As there is no free lunch, unbundling also introduces costs. We distinguish transitional cost (section 5.2), loss of economies of scope (section 5.3) and a risk of reduced investment in generation (section 5.4).

Transaction costs are costs which are directly related to the implementation of the measure to unbundle. This cost item mainly consists of costs of restructuring the industry, such as breaking existing links between network and commercial parts of the holding and changing (financial) contracts. Other transaction costs include costs of changing legislation by the public authorities.

Loss of economies of scope is a potentially significant cost of unbundling as network and other parts of the chain (i.e. generation and retail) are closely related to each other, as is described in chapter 2.

A final cost item which deserves specific attention is the risk of less investment in generation. Unbundling likely results in higher capital costs for the (currently) vertically integrated generation firms, as a result of which investments in new power plants by these firms could reduce.

Combining the four options for unbundling and the above categories of benefits and costs, we are able construct a table with the list of benefits and costs as captions of the rows, and the four

[24] If network costs are not priced according to the marginal costs, allocative inefficiency exists. Pure marginal cost-pricing is a convenient theoretical idea, however, infeasible in practice due to fixed costs. However, other pricing structures based on this idea may be still feasible (e.g. two-part tariffs, with variable charges reflecting marginal cost).

policy options as captions of the columns (see table 6.1). In chapters 4 and 5, we look horizontally, focusing on each individual category of benefits and costs, and compare the relative performance for this category across the four policy options. In chapter 6, we look vertically, analysing the trade-offs between benefits and costs for each option.

4 Benefits of unbundling

4.1 Introduction

In this chapter we analyse the benefits of four options for unbundling using the categories described in chapter 3. Section 4.2 analyses the impact of unbundling on the performance of the network, section 4.3 focuses on effectiveness and efficiency of regulation, section 4.4 deals with the overall impact on competition, and section 4.5 goes into the benefits of privatisation after unbundling has been realised.

4.2 Performance of networks

4.2.1 Introduction

Unbundling breaks links between the network company and commercial activities. The stronger the unbundling, the more links are broken. This provides more independence to the network, which affects performance of the network company itself, as well as performance in the other parts of the electricity supply chain. In this section we discuss the benefits for the network that arise from a more independent position of the network company. These benefits include less risk of underinvestment in the network, which stems from more secured financing and an improved focus of the network company on its own objectives. Hence, an independent network company better responds to regulatory incentives. Such a company is likely to operate more efficiently and to provide a better price-to-quality ratio. A second benefit is associated with the possibility to achieve economies of scale by merging networks. Before we discuss these two benefits (in sections 4.2.3 and 4.2.4, respectively), let us first explain why in the current situation the network may be insufficiently independent.

4.2.2 Current situation

In the case of legal unbundling, independence of management is regulated but not fully realised. There are still personal links, as well as financial links between network and commercial activities.

The Dutch Electricity Law 1998 makes certain provisions that are meant to secure independent decision making of network companies. In particular, Article 11(2) stipulates that network companies should necessarily establish a supervisory board. The management board of a network company as well as the majority of the supervisory board cannot be tied directly or indirectly with a producer, a supplier or a shareholder of the network company.

The supervisory board has to approve a certain range of strategic decisions of the management board, while the shareholders should not interfere with the core network activities.[25] Still, especially if network companies are not subject to the 'structuurregime', the holdings (which are their shareholders) can appoint members of the network companies' boards. If a network company is a 'vennootschap met een verplicht structuurregime' this power is limited. For example, the members of the supervisory board are appointed by cooptation. Still, the holdings (as a network company's shareholder) may have informal 'advisory' powers.[26] Therefore, in both cases personal links exist between network firm and the holding.

Although the independence of the decisions of network companies from their shareholders (the utility holdings) has been formally arranged already in the Electricity Law 1998, there has been some freedom left to the holdings to decide regarding how 'fat' to make their networks. Hence, holdings could choose for a lean structure for their network companies, as well as use the network assets as a collateral in financial contracts of the holding. This means that holdings can still informally affect actions of network companies. The latest revision in the Dutch Electricity Law, also referred to as the 'I&I'-law of July 2004, includes provisions that make the network companies more 'fat'. It arranges the economic ownership of the network assets by network companies (article 10a), as well as prohibits the use of network assets as a collateral in new financial contracts of the utility holdings (article 93b). The requirement of no financing of commercial activities with the network as collateral has already been imposed with respect to the future financial contracts of the holdings. However, the law does not specify yet the date on which the transfer of economic ownership comes into force. The Minister has communicated that he will bring this article into force in coordination with the planned moment of the full unbundling.

4.2.3 Improved focus of network companies

A direct consequence of unbundling is a more independent management and financing of the network. Unbundling increases focus of network management on the network without the need for compromising with other needs of an integrated holding. (OECD, 2003.) In particular, when network is fully unbundled from generation and supply it focuses on its own profit and not on

[25] The authors' summary of Article 11(2) of the Dutch Electricity Law 1998:
"De statuten van de netbeheerder, niet zijnde de netbeheerder van het landelijk hoogspanningsnet, bevatten in ieder geval:
a. de instelling van een raad van commissarissen;
b. de bepaling dat de leden van het bestuur en de meerderheid van de leden van de raad van commissarissen direct noch indirect binding hebben met een producent, een leverancier of een aandeelhouder van de netbeheerder;
c. de bepaling dat aan de goedkeuring van de raad van commissarissen ten minste zijn onderworpen de besluiten van het bestuur van de rechtspersoon, bedoeld in artikel 164, eerste lid, of 274, eerste lid, van Boek 2 van het Burgerlijk Wetboek, en
d. de bepaling dat de aandeelhouders van de netbeheerder zich onthouden van iedere bemoeiing met de uitvoering van de werkzaamheden die op grond van artikel 16, eerste of tweede lid, aan een netbeheerder zijn opgedragen."
[26] Only in the case of the national TSO TenneT the Minister has to approve the members of the supervisory board (see article 11a(7) of the Electricity Law).

the profit of the group. As a result, it better responds to regulatory incentives and it is more likely to do investments that are good for facilitating competition (e.g. in technology that reduces switching costs).

Also with respect to financing, especially full ownership unbundling secures that the cash flow generated by the network is not diverted to other activities, but spent in the best interests of the network company. Also financial ring fencing helps to prevent the risk that network may have insufficient financial means. In this respect options Legal-Fat Plus and Ownership Unbundling are better than Legal-Fat. The option of ownership unbundling is the best with respect to this benefit as it fully secures operational and financial independence.

Notice, that cash flow is perfectly secured only if networks are kept separately and not allowed to merge with *any* other businesses, which may be also an undesirable obstacle to the movement of capital. In case of merging with low-risk businesses, such as other network firms (see the box "Economies of scope of multi-utilities"), the cash flow of the network is less at risk than in the case of merging with high-risk businesses.

Economies of scope of multi-utilities

Ownership unbundling of electricity network firms enables them to merge with other network firms, for instance in natural, gas, water or telecom. Recently there was a tendency towards creating multi-utilities providing many network services, which was caused partly by liberalisation processes in many industries, where the incumbent monopolist had to withdraw from competitive businesses in the same industry, and partly by the desire to diversify. However, how desirable is this development?

Fraquelli et al. (2004) show that relatively small specialised firms would benefit from economies of scale and scope by extending the activities to other network industries. Large firms, however, do not obtain these benefits from diversification. The authors draw a straightforward policy implication from their finding. Since small-scale local utilities providing such network services as gas, electricity and water can gain from forming a multi-utility, it makes sense to encourage such efforts. At the same time, "keeping into account the fact that local public services have not yet been fully privatise, one has at best to be cautious in expecting large welfare gains from diversification moves involving large players" (p.2057).

While highlighting the positive side of a more independent position of network companies for their performance, we also have to discuss two main arguments that may be used against this claim and explain why possible negative consequences of the increased independence of the networks are minor in the current context.

First, there is a theoretical argument regarding the possibility of 'hold up' of network investment if the network is not vertically integrated with commercial activities: as a separated network firm has to share gains from their investments with other parties in the chain, it invests less than an integrated firm would. Therefore, separation may theoretically reduce network

investment. For instance, an integrated network firm has a better incentive to invest in network extension than a separated network firm as this improves its opportunities for commercial activities. This incentive is still present in the case of legal unbundling, but may be less in the case of ownership unbundling. In other words, the latter may induce some network firms to hold up investment. In practice, however, tariff regulation serves to mitigate this problem. Under stronger unbundling forms, network companies better respond to regulatory incentives, in particular towards more efficiency and a more optimal reliability, which leads to a more optimal price-to-quality ratio and enhances welfare.

A second argument relates to substitution between investment in the network and investment in generation. In some situations reinforcing the network may be more efficient than building new production capacity, but a non-integrated network firm may be less keen to take that decision. This issue is in particular important for the transmission level, but may also play a role at the distribution level. The management of regional transmission lines is currently done by distribution companies, but will, in accordance with the proposal of the Minister, be transferred to TenneT. As a result, unbundling does not affect this issue. Only if the proposal of the Minister on transmission is not implemented then vertically integrated companies may have better incentives to take into account the substitution between transmission and generation in investment decisions. However, there is a trade off between this and the effect of such integration on competition. The gains of more vertical integration between large-scale generation and transmission are likely to be offset by competition gains. As the role of distributed generation increases, the same argument holds also for the distribution level. See section 4.4 for more detail on competition issues.

4.2.4 Economies of scale in network management

Another theoretical advantage of ownership unbundling of regional distribution networks is the option to achieve positive scale effects in the network management by consolidation of these networks. However, this goes at the expense of loosing the possibility to apply benchmarking in regulation of regional distribution networks. Therefore it is important to evaluate how large the scale economies actually are.

It appears from the economic literature that scale economies are large in transmission, but negligible in distribution. In particular, KEMA (2004)[27] presents numerous arguments in favour of merging regional and national transmission together. According to their report, cost savings due to more economic design of the network, better communication, and cheaper operation could reach up to tens of millions euros annually (the total revenue of TenneT being around 350

[27] This report by KEMA has been commissioned by TenneT. In KEMA(2004), transmission is defined from 50kV. However, in our analysis, we refer to the lines of 110kV+ as transmission, since this was conventional terminology historically. In any case, the lines of 110kV+ represent the bulk of transmission in the Netherlands.

mln[28]). Furthermore, an integrated network would be more reliable. Transfer of the management of transmission network of 110/150 kV to TenneT is a part of the proposal of the Minister of Economic Affairs on unbundling. This would improve the synergy between regional transmission networks and the national TSO. The proposal allows for the possibility of (voluntary) sale of the respective transmission networks to TenneT.

For the distribution level, there is some evidence supporting the assumption of constant returns to scale. See, e.g., Pollitt (1995) and Kittelsen (2003). For Norway Kittelsen finds that "even for the very smallest sizes the VRS [variable returns to scale] frontier is very near CRS [constant returns to scale]", implying negligible positive scale economies in distribution.

Therefore, if the proposal of the Minister with respect to regional transmission is implemented then economies of scale in transmission are realised. Horizontally integrating distribution networks after this is unlikely to be beneficial. Firstly, economies of scale in this network hardly exist. Secondly, the regulator would lose the option of benchmarking if networks were integrated in one firm. Hence, the four options will be equivalent for this benefit.

In contrast, if the part of the Minister's proposal regarding transferring the management of transmission networks to TenneT is not implemented, then ownership unbundling may create larger benefits than any other option, because it increases the prospect of consolidation of transmission networks in the future. If regional networks are not fully unbundled from commercial activities, then the chance that the transmission can be merged in the future is smaller, because vertically integrated companies are less likely to sell their shares in transmission, or voluntary to transfer the management of transmission lines to TenneT.

4.2.5 Conclusion

Unbundling creates a more independent position of the network, which provides benefits for the network performance through a better focus on the objectives of the network and a better response to regulatory incentives. Furthermore, unbundling may have a positive effect if it leads to achieving scale economies in network management. Here we compare the four alternative options with respect to these two effects.

As explained, more independence is beneficial for the performance of the network. In the Legal-Lean situation, which is our benchmark, networks are the least independent, as they even do not have economic ownership of their assets. In tariff regulation, DTe already treats the networks as if they were economic owners, assuming a regulatory asset base. Making networks 'fat' would be a logical step that creates more transparency with respect to the network firms' assets. This and a proper allocation of the strategic tasks will decrease the interference with the

[28] According to the annual report of TenneT (2003, p.3), in 2002 the revenue of TenneT was 358.1 mln euros.

holdings and secure a better performance of the network. From this perspective, the option Legal-Fat is better than Legal-Lean; and the option Legal-Fat Plus is even better as it decreases the risk of insufficient financing. The option of ownership unbundling improves on Legal-Fat Plus by removing the last distortions and focuses the performance of network companies on their objectives the best.

Regarding the possibility to realise economies of scale, we conclude that this possibility is mainly important for transmission. Therefore, the four options are equivalent with respect to this benefit, as long as the proposal of the Minister on merging the management of transmission lines goes through. Otherwise, the ownership unbundling option may have a larger benefit than the other options, as it increases the chance of merging regional transmission networks with TenneT in the future.

4.3 Effectiveness and efficiency of regulation

4.3.1 Introduction

Introduction of unbundling implies that the role of the regulator alters. In particular strong structural measures, such as ownership unbundling, contribute to the efficiency and effectiveness of regulation.

Economic literature acknowledges three main regulatory constraints: informational, transactional, and administrative and political, which in practice prevent regulators from implementing their preferable policy. (See e.g., Laffont and Tirole, 1993.) The literature mostly focuses on informational and transactional constraints. An important consequence of these two constraints is that contracts are inherently incomplete, and contingencies left out of incomplete contracts have to be filled in. In such a case, the pattern of ownership matters.

Structural separation creates more transparency and leave less incentives for network companies for cross subsidies and other distortions, which looses both informational and transactional constraints, and hence contributes to more efficient and effective regulation. More transparency improves the informational position of the regulator, enabling setting tariffs and incentives more appropriately. Since the network company has less incentives to favour the former sister companies after unbundling, the surveillance task of the regulator becomes easier and more effective.

4.3.2 Effect on incentive regulation

In the Netherlands, distribution networks are already legally unbundled and subject to regulated third-party access. Network tariffs are set by the regulator (DTe) based on benchmarking of the companies' standardised costs, which includes the regulatory return on capital. The regulator

also creates incentives for quality by introducing financial compensations for changes in quality indicators. Although the tariff setting procedure is the same under all four options, unbundling still may have effect on its outcome through increasing the adequacy of the regulator's information.

As DTe argues in their advice to the Minister of Economic Affairs (DTe, April 15, 2004), regulation is more difficult and less effective if there is no proper division of tasks between the network and the respective commercial companies. The internal transactions between the companies within the same group are difficult to control, therefore, some freedom remains with respect to the (operational) cost allocation, which may affect the network tariffs.

Under stronger unbundling forms, the network operator loses the possibility to strategically reallocate its internal costs. A vertically integrated firm would have the incentive to shift costs of commercial activities to the network firm and to shift resources of the latter to the commercial part of the group. By unbundling, the regulator obtains a better insight in the costs of network management. As a consequence, the regulator is able to implement more appropriate rules, such as efficiency targets, on network firms.

Comparing across the four options, the situation already improves under Legal-Fat as compared to Legal-Lean, because the implementation of a proper task allocation reduces opportunity for shifting costs between the companies within the same group. Adding financial ring-fencing – as described in the option Legal-Fat Plus, i.e. adding rules restricting cash outflow – seems not to add much to what can be already achieved in Legal-Fat. The reason is that under the current legislation there is already a provision that the network assets cannot be used as a collateral in new contracts of the holdings. Therefore, the financial cross subsidy with respect to future contracts has already been eliminated, while such a cross-subsidy is still present with respect to the old contracts. Ownership unbundling removes last cross-subsidies and distorting actions that could be present under vertical integration. In addition to the improvement of information position of regulator, ownership unbundling also improves focus of network companies on regulatory incentives, increasing the effectiveness of regulation. However, it is hardly possible to assess the magnitude of this effect.

4.3.3 Effect for market monitoring

Unbundling makes the market-monitoring task of the regulator simpler and more effective because it reduces the incentives of the network operator to favour its subsidiary in the competitive segment. The information stream within the group is also difficult to control. Therefore, the closer the relationship between the companies in the group, the higher the risk of preferential treatment of the affiliated company by the network. Since interference between the network company and commercial divisions of the holding reduces after implementing a proper

allocation of activities between the two, Legal-Fat (and also stronger options) make an improvement on Legal-Lean.

Still, legal unbundling cannot fully remove the incentive of the network firm to give a better treatment to their subsidiaries. Even with extra measures with respect to customer systems, billing information, etc., there will always be a risk of preferential treatment and it would be extremely difficult to prove when sensitive information would 'leak' from the network to other holding members. Here we refer to the textbox from section 4.4. called "Some examples regarding risks of too little unbundling" illustrating this point. Only ownership unbundling eliminates this risk and creates the most effective "Chinese walls" between the network and commercial activities, as it fully removes such incentives.

Conclusion

We have distinguished two effects of unbundling on regulation: effect on incentive regulation and effect on the market surveillance task of the regulator. More unbundling is beneficial for both. The Legal-Fat as well as the Legal-Fat Plus options have higher benefits than the Legal-Lean option, because they introduce a proper task allocation, and hence eliminate a great deal of possible cross-subsidies and interference between the network and commercial divisions of the holding. Still, the largest improvement will be achieved only in the Ownership option, since it removes last cross-subsidies and personal links. The surveillance task of the regulator becomes much easier, as networks have no incentives to favour or disadvantage any competing company.

4.4 Degree of competition

4.4.1 Introduction

One of the main arguments in favour of more unbundling of distribution networks relates to improved competition in commercial segments, which will increase welfare. An integrated network company has both incentive and possibility to affect competition in the competitive segment. This can be done either via cross subsidies to competitive activities from the network or through distorting actions of the network firm. As has been said in chapter 3, unbundling affects competition via several routes. The improved network performance leads to less allocative distortion caused by high network tariffs as well as better options for new entrants for dispatching to the grid or for supplying. Regulation directly affects competition by insuring non-discriminative third-party access. Competition is also directly affected by unbundling through the impact of the latter on cross subsidies and distorting actions by vertically integrated firms. Unbundling can, however, also have a negative impact on competition: stand-alone commercial companies may become more prone to the risk of takeovers, which may reduce the number of market players.

It is useful to distinguish between the retail segment and the production segment when discussing competition in the electricity market. Competition in retail directly relates to links between retailers and low-voltage network owners. For competition in production, the relation is slightly more complicated and the magnitude of benefits depends on the realisation of the proposal of the Minister of Economic Affairs with respect to allocation of the management of high voltage networks to TenneT. Before going to each of these markets in sections 4.4.3 and 4.4.4 respectively, we first discuss sources and effects of cross subsidies and other distortions.

4.4.2 Cross subsidies, information advantages, distorting actions and risk of consolidation

If management of the network is conducted independently from commercial activities, competition between commercial activities, upstream as well as downstream, could improve. Without independent network management, cross-subsidies and strategic investment behaviour of the network firm could distort competition. Unbundling could remove these distortions, although the former incumbent would preserve some competitive advantages, such as initial relationships with customers.

We distinguish several forms of market distortions:

- Direct cross subsidies by cash-flows between network part and commercial parts;
- Indirect cross subsidies by financing advantages;
- Information advantages due to the close relationship between network activity and commercial activities;
- By firms' actions.

Cross subsidies

Direct flows of cash between network and commercial parts are an evident example of cross-subsidy. If an integrated firm can use cash generated by the network part for commercial activities, this subsidy distorts competition in the commercial markets. It is in the interest of the integrated firm to raise the access fee above its optimal level, for instance by strategically reallocating costs and benefits within the holding. Given an information advantage of the integrated firm over the regulator, the most likely outcome is a network access fee which is 'too high' from a welfare point of view. Theoretically, this problem is curbed by unbundling of accounts. However, in practice, there is no possibility to control for all internal transactions as long as the firm remains integrated. Therefore, prices of network services may be distorted.

One form of cross subsidy is a direct flow of cash to commercial parts which may arise when the network owner charges his subsidiary a lower price than it does the competitors. But even if prices are non-discriminatory, access pricing above marginal costs leaves the integrated firm in an advantageous position, whereas above marginal cost pricing is required to finance the fixed

costs of the network (see e.g. Baumol *et al.*, 1997, Laffont and Tirole, 1994 and Armstrong *et al.*, 1996). The argument that the network access fee may be above its socially optimal level is however not exclusively linked to vertical integration. A non-integrated network monopolist also has the incentive and ability to raise its price above the socially optimal level. However, the marginal costs of the downstream product of an integrated firm are not affected by the higher access fee, whereas the costs of non-integrated firms are. Therefore, the incumbent vertically integrated firm may foreclose the market for new entrants.

Cross-subsidies could also arise with respect to financing: bundling networks with competitive activities leads to a credit rating below the pure credit rating for the network and above that for competitive activities. Although any other large firm with capital-intensive, low-risk activities in other parts of the economy (e.g. a company with real-estate activities) would also be able to obtain low-cost financing, this type of cross-subsidisation would still have to follow market rules, whereas cross-subsidies from monopoly activities would not. If this form of cross subsidy hinders entrants and leads to market power in the competitive segment, complete unbundling may be an effective way to eliminate it.

Information advantages

Information advantages can also be a form of cross-subsidy bringing new entrants in a disadvantage. The owner of the network has a superior information position. A vertically integrated firm may have the incentive to use the superior information position of the network to create an unlevel playing field in favour of companies that belong to the same group, and to disadvantage new, potentially more efficient entrants.

Distorting actions

In addition to cross-subsidies, competition between commercial activities can also be affected by actions of the network firm. Given that there is always an incentive for an integrated firm to maximise joint profit with their sister companies, there is a risk of soft discrimination of other companies by the network. Recent economic literature on third party access issues has focused on non-price discrimination or sabotage (see e.g. Economides, 1998, Beard *et al.*, 2001 and Mandy, 2000). Sabotage is defined as discriminatory provision of the input that raises rivals' marginal costs, and is also referred to as '3D-practices' ('3D' standing for Deny, Delay, Detail). The literature reveals that the more efficient price regulation is, the greater the incentive for sabotage. We give examples of the latter in the Box called "Some examples regarding risks of too little unbundling".

Concluding, cross subsidies, informational advantages and distorting actions of network firms negatively affect competition. Unbundling reduces these distortions, in particular by improving incentives of the network firms, enabling better regulation and market monitoring, and

facilitating better competition in the contestable segment of the market. As a result, theoretically, unbundling raises allocative efficiency. Moreover, improved competition conditions could induce entry and lead to supply firms operating more cheaply and efficiently.[29]

Some examples regarding risks of too little unbundling

Recent history shows some evidence on risks of vertical integration in liberalised energy markets.

A KPMG report (KPMG, 2004), commissioned by DTe after a signal from Greenchoice (an entrant in the Dutch electricity market) about the unfair situation in the market, provides some evidence of preventing entry by cross-subsidies. According to this document, the use of the network assets when financing supply activities ('100% garantiestelling') may create barriers to entry. Furthermore, they conclude that the unfair allocation of payments for the tasks that the network company delegates to supply companies in order to facilitate administration, which may also affect the level-playing field in the market.

Events following the bankruptcy of Energy XS raised suspicion regarding 'non-price discrimination'. After this bankruptcy, all network companies having responsibility to appoint last-resort supplier for the customers of Energy XS in their areas, have appointed their sister-company. Since the sister-companies of network companies used to supply the respective customers in the past, it was impossible to distinguish if these companies consequently contracted the majority of those customers based on their old information or based on new information that they received for emergency supply. DTe could not tell if the client information was used by supply companies purely for emergency supply or also for commercial purposes.[a]

Furthermore, there were signals from new entrants regarding the sluggishness in information exchange, because of which they cannot send bills on time. Also, many customers complained to DTe about missing bills, or bills being sent very late. Therefore, DTe has been investigating the reasons why the information is delivered to new entrants too late. (See the press release of DTe of November 10, 2004.)

It is difficult to assess the magnitude of the effect of these problems on entry. We can only look at the number of those suppliers who have actually entered the market, and not at the number of those who considered entry but did not enter because of possible 'non-price' discrimination. The retailers that supply to small customers are obliged to get a licence, therefore, we can get insight in the number of entrants in this segment of the market. The most successful entrant in this market is Energiebedrijf.com (now operating under the name Oxxio) who has currently about 0.5 mln connections in the Netherlands. This company entered the market when the green energy market was liberalised and there were large subsidies for green energy, while incumbents did not reduce green energy prices below they grey energy prices. (See van Damme and Zwart, 2003.) In addition to Energiebefrijf.com (Oxxio), there are about ten other new licence holders, however, they are smaller. Some of them are under the same mother company. We have already witnessed several mergers and takeovers of new electricity retailers (e.g., a recent takeover of Echte Energie by ONS; Evolta and Durion by Energiebedrijf.com.) See section 4.4.3 for more discussion regarding the current situation in the retail market and the effects of entry on welfare.

[a] According tot the press release of DTe of October 15, 2003.

[29] Contrary to the theoretically founded relationship between competition and allocative efficiency, the impact of competition on technical efficiency is less clear as firms are assumed always to strive for cost minimisation regardless of the degree of competition. Nevertheless, evidence on a positive impact of competition on productivity exists. Markiewicz et al (2004), for instance, found a positive relationship between liberalising energy markets and technical efficiency of power producers.

Consolidation

Unfortunately, unbundled commercial firms may become less strong financially and, hence, more prone to the risk of mergers and takeovers. As a consequence, the number of competitors may reduce.

It is often emphasised that the Dutch companies may be taken over by foreign utilities. By itself, a takeover by a foreign company is not necessarily bad: there are many utilities in the world owned by foreign companies. Also some Dutch energy holdings own energy companies abroad (e.g. Essent and Nuon own firms in Germany), and the other way around: some Dutch generators are owned by foreigners (e.g. by Electrabel). The share of foreign-owned suppliers in the electricity market is substantial in the countries which have liberalised their energy markets most strongly: United Kingdom and Sweden (see table 4.1). The degree of foreign ownership does not indicate anything about the degree of competition in the market. Far more important is how takeovers will impact the number of competitors and the market shares of the largest firms. Therefore, we have to analyse a trade-off between competition-enhancing effects of more entrants on the one hand and competition-hindering effects of more consolidation.

4.4.3 Retail competition

The above theoretical analysis suggests that further unbundling improves the market situation and facilitates stronger competition between incumbents and entrants. Currently, the position of entrants is less strong than that of vertically integrated incumbents. The textbox “Some examples regarding risks of too little unbundling” gives some evidence. With an improved allocation of tasks and respective formal procedures put in place, the network activities become better separated from retail activities, reducing incentives and opportunities for cross-subsidies and soft-discrimination. Compared to Legal-Lean, the situation improves under both Legal-Fat and Legal-Fat Plus options, approximately to the same degree, and under ownership unbundling to a higher degree, as only ownership unbundling is able to fully remove these incentives and possibilities.

New entrants

As said, unbundling is likely to improve the possibilities of entry in retail. However, whether and to what extent entry actually will take place, depends on several factors. Entry is more likely in a growing market than in a market in decline. The Dutch electricity market will continue to grow in the coming decades (see e.g. ECN/RIVM, 2005), stimulating entry. Given the low or absent economies of scale in retail, no significant barriers to entry are expected. However, there may be imperfections on both the consumer side and the firms’ side that may reduce or deter entry.

On the consumer side, switching costs may play role. Such costs may be especially important in the market for small residential customers.[30] In addition to financial switching costs (e.g. switching fees), also other switching costs exist, for instance costs associated with uncertainty about the market or psychological hurdles. High (perceived) switching costs make it harder on entrants to gain market share after entry. On the other hand, high switching costs leave room for higher profit margins, thus rendering entry more profitable. The net effect of switching costs on entry is ambiguous.

Although it is not clear how much entry will actually occur after unbundling, we can get an impression of the welfare effects of entry in retail. Let us first note that retailers compete in two-part tariffs and that it is clear from economic theory that it is optimal to realise price-cost margins in the standing charge rather than in the per unit price. This implies that an increase in competition (e.g. through entry) will reduce the standing charge rather than the per unit price, which has no effects on consumption volumes. Therefore, static effects coming from entry are distributive. Still, in the case if retailers are foreign companies, the allocation of surplus between retailers and their customers affects national welfare. Turning to dynamic effects, obviously, efficiency gains from increased competitive pressure may increase welfare in the longer run, although the relationship between the degree of competition and dynamic efficiency is not straightforward. An increase in retail competition may also positively affect competition in generation, as retailers are pressed to minimise costs.

Splitting up the network from other activities and liberalisation of the market could lead to an increase in the number of players active in the commercial activities, which may result in higher costs of coordination. These costs could consist of for instance slackening the pace of decision making. In addition, an increase in the number of players could make it difficult to identify which company is responsible for a failure (e.g. why the customer switch has not been performed on time, why bills are delayed). Moreover, it could make it difficult and/or costly to write enforceable contracts on this, because collection of information and conflict resolution are costly. This may affect both costs and quality of service in energy supply. However, such an effect is more attributed to the introduction of competition (i.e. to access of several market players to the network and the need for the duplication of information stream in the liberalised market), than to unbundling.

Both the distributive effects and the efficiency gains in retail are unlikely to be very large. From a recent study by Lijesen (2002), it can be deduced that increasing the number of retailers from

[30] Such markets are in general characterised by the low activity of customers. According to the EC (2004, p.9), " based on experience of those member states which have already had a competitive market for some time one might expect a well functioning market share to have around 15-20% of business changing suppliers every year with most, if not all, seeking to renegotiate tariffs with their current supplier every year. For households, an annual level of switching of perhaps 10% would be seen a reasonable benchmark."

3 to 4 leads to a decrease of the standing charge of approximately 14%, boiling down to 1% of total electricity expenditure for an average household. Likewise, dynamic efficiency gains will be limited, simply because retail costs form only a small part of total electricity costs.[31] On top of the dynamic effects, the disappearance of cost-increasing non-price discrimination will enhance welfare, but again, the order of magnitude is probably fairly small for the same reasons mentioned above.

Regarding the small-customers segment, a countervailing effect of retail competition is brought forward by Joskow and Tirole (2004). They address the consequences of 'load profiling', finding that a better outcome[32] can be achieved by a (regulated) monopoly retailer that uses two-part tariffs than by retail competition. This is because under retail competition with no real-time metering, retailers cannot face the real-time wholesale price for the aggregate consumption of their customers, but an average price. In contrast, a monopoly retailer in an area would be able to observe the total load in real-time and to face the real-time wholesale price, thus increasing the efficiency of its electricity purchases by time of day. This argument may loose significance in the near future because of technical developments, such as real-time metering or the development of a real-time spot market. Newbery (2002a) mentions another argument against retail competition for small customers. In his view, a monopoly for small customers (up to 50-100 kW) is likely more able to act as a viable counterparty for medium and long term contracts compared to independent retailers. However, the net benefits of such a development are not straightforward, as they depend on the respective regulatory costs and effectiveness.

Consolidation in the retail market

As said in the former section, unbundling possibly increases the risk of consolidation. What can we expect for the retail market? Table 4.1 below illustrates the ownership situation in the retail market in other countries, as presented in the latest benchmarking report of the European Commission. The retail markets in several European countries including the Netherlands were characterised by high concentration, with a high share of the 'Top 3' and a small number of suppliers with market share larger than 5%. Notice, the United Kingdom and Norway that are somewhat ahead of other countries with competition have a lower concentration. For the Netherlands, the figure for the share of 'Top 3' reflects the situation in the household market[33], however, the market for larger customers is also characterised by high concentration. The 'Top 3' suppliers – Essent, Eneco and Nuon – were created in the consolidation processes that took place over the last few years.

[31] Even in the extreme case where retail profits are absent, total expenditures on electricity decrease by less than 5 percent.
[32] In economic terms, in a world with homogeneous consumers and on traditional meters, a monopoly retailer can achieve a second best outcome provided that it charges two-part tariffs, while retail competition achieves a third best outcome.
[33] Source: DTe (Marktconcentratie op de kleinverbruikersmarkt voor elektriciteit en gas per 1 juli 2004).

Table 4.1 Market shares retail electricity supply

	Number of active licensed suppliers	Number of suppliers independent on distribution	Number with market share >5%	Top 3 suppliers' share (all consumers) (in %)	Market share of foreign owned suppliers (in %)
Austria	144	19	4	67	2
Belgium	41	17[a)]	2	c.90	<10
Denmark	69	23	5	67	n.k.
Finland	70	8	6	30	25
France	20-25	15	1	88	9
Germany	1050	100	3	50	c.20
Ireland	9	7	4	88	12
Italy	305	270	6	35	n.k.
Luxemburg	12	1	2	100	0
Netherlands	37	16	3	88 [b)]	18
Norway	130	70	4	44	2
Portugal	4	3	3	99	33
Spain	70	62	5	85	8
Sweden	127	127	4	70	39
UK	80	66	6	60	50

Source: EC (2005) Fourth benchmarking report on the implementation of the internal electricity and gas markets, Technical Annexes, p.23. We do not include new member states, as there the reforms began later. Here n.k.= not known, c.=circa.
Notes: [a)] Although independent, the two most important suppliers have strong ownership links with DSO's. [b)] For household customers.

The second column in Table 4.1 shows the number of independent supply companies, who do not own distribution networks in the respective countries.[34] The number of such suppliers is relatively large in some countries. Also, in the Netherlands, in the period of survey, there were about 16 supply companies who do not possess networks. (Notice, not all of them belonged to different mother companies.) Among the entrants into the Dutch energy market there are many large foreign utility companies. Some of them were already active in the Dutch energy market before (e.g., Electrabel and E.ON who have shares in Dutch generators), while some began to penetrate the market only recently (e.g. Greenchoice and Energiebedrijf.com, now under the name of Oxxio). Furthermore, there are companies that are expanding their activities in the Netherlands from one energy product to both gas and electricity (e.g., RWE Obragas and RWE Haarlemmermeergas). Still the concentration in the Dutch market is relatively high, as most customers are still supplied by the three large incumbent energy companies. Given such a high concentration and no full integration in the electricity market, it is unlikely that further mergers of the 'Top3'commercial companies can be allowed by NMa, irrespectively of unbundling, although competition policy regarding the electricity industry is highly complex (Newbery, 2002b).[35]

[34] It is likely that data for some countries, such as Belgium and Sweden, reflect legal or organisational independence, rather than ownership independence.

[35] One of the problems to be dealt with is cross-border ownership which requires competitive measures on international (European) level.

Several characteristics of the retail electricity market make this market to be prone to the risk of formation of a tight oligopoly, i.e. a structure that can enable the incumbents to realise supranormal profits for a substantial period of time (Canoy et al., 2003). These characteristics include the limited number of suppliers, the relatively high switching costs, the low elasticity of demand, the rather stable level of demand (on annual basis) and hurdles for entry. Because of these characteristics, the incumbents are able to (implicitly) coordinate their activities. A conceivable example of such coordinated activities is the way the incumbents deal with administrative restructuring and the problems following from it. Unbundling the incumbents likely reduces the risk of formation of a tight oligopoly to some extent as it improves conditions for entrants.

Conclusion

Concluding on the effect of unbundling on retail competition, unbundling is likely to promote entry in retail, but the net welfare effects are limited. However, unbundling may tackle a potential tight oligopoly to some extent. Because of the pricing structure in retail, price decreases are likely to be distributive rather than total welfare effects. Moreover, retail costs and margins form a relatively small part of total electricity costs and finally, there may be welfare losses in the market segment that requires load profiling. The impact of unbundling on consolidation in the Dutch retail market is probably negligible because of the current high level of concentration. This threat of increased consolidation is likely to be dealt with by the competition authority. Although direct welfare effects of increased competition in retail are likely to be small, indirectly welfare may increase due to the impact of retail competition on the wholesale market.

4.4.4 Wholesale competition

Improved performance of networks, more effective regulation and fewer opportunities for cross subsidisation and other distortions also affect wholesale competition. The magnitude of the effect of unbundling on wholesale competition depends on three factors: ownership of the transmission grid by the distribution companies, future development of small-scale generation, and development of the North-Western European power market.

Ownership of transmission lines

When both regional transmission and the main generation in the respective area belong to the same direct owner, the scope for gaming in generation exists. Such a network has both incentives and opportunities to strategically affect competition in production. Competition between producers may be harmed in three ways.

- Vertically integrated generation incumbents may hinder entry or harm entrants' operations by 'non-price discrimination' (similarly to the examples in the textbox in section 4.4.2).

Unbundling transmission and generation is therefore likely to facilitate entry in electricity production, which leads to an increase in welfare as well as induce improvements in productive efficiency and raise the level of supply security. The higher level of supply security comes from the mechanism that producers realise their profit margins by offering lower levels of capacity. An increase in the number of competitors will lower profit margins through an increased level of capacity supplied to the market (also see Lijesen and Vollaard, 2004). We can obtain an impression of the order of magnitude of the welfare effects by looking at the price effects from entry. Simulations with CPB's model for the electricity market (Ten Cate and Lijesen, 2004) show that an extra entrant in generation would bring average per unit prices down by 9 %. Other than in the case of retail, per unit prices are affected, so that not only distributional effects arise, but welfare effects as well.

- A vertically integrated firm has a strong incentive to adjust its capacity choice in order to have its generator gain locational market power (Joskow, 2004).

- A third threat if transmission lines are vertically integrated with electricity producers is a very specific one, in which the only generator in a region is vertically integrated with the transmission network in a neighbouring region. It can then influence the ability of its neighbouring transmission lines operator to resolve congestion, thus creating a very favourable position for its own generator.

At least two options exist to deal with these threats for wholesale competition: reallocation of transmission lines to the TSO (TenneT) and unbundling of the distribution firms. Given the importance of regional transmission lines for wholesale competition, their unbundling from production is especially important. Therefore, if the proposal of the Minister regarding transferring the management of the regional transmission lines to TenneT does not take place and distribution companies continue to manage these lines, unbundling of distribution companies from production will bring very large benefits.

Future of small-scale generation

The Netherlands has quite some small-scale generation capacity, amounting to approximately 17 percent of total generation capacity (Timpe and Scheepers, 2003). Future predictions range from a stable share to an increase to 27 percent (*op. cit.*, p. 16). Most small producers generate electricity primarily to cater for their own needs and sell the surplus to the market. It is not their main activity to sell electricity, but merely a side effect. However, technical developments may change this. As distributed regulation becomes more and more important, regulators begin to pay more attention to creating right incentives for regulated network companies to facilitate such generation. See, e.g. the recent decision documents of Ofgem (2005) and DTe (2004c)

covering this issue. Especially if virtual utilities are created by coordinating small producers, they may form a substantial competitive fringe.[36]

One important aspect in virtual utilities competing with large scale generators is the level at which they deliver their production to the network. Small-scale generators feed into the distribution network, whereas regular power plants feed into the transmission network. This difference may be important because, as Ackermann et al. (2001) point out, distribution networks are often designed for a different purpose than transmission networks. This causes differences in costs that are unfavourable for small-scale generators.

If incumbent producers are vertically integrated with owners of distribution networks, they have an incentive to exaggerate the cost difference between transmission a distribution networks, as this enhances the competitive position of their power plants vis-à-vis virtual utilities. Wals *et al.* (2003) and Connor and Mitchell (2002) report complaints from small scale producers over high connection costs charged by distribution network operators. High fees for delivering to the local network as well as non-price discrimination are likely to dampen the success of small producers in the market place. Even if the regulator will be able to perfectly regulate feed-in tariffs, the network owner may hinder downstream competitors through non-price discrimination. This may for instance take the form of delaying decisions to connect, delaying needed repairs, giving incomplete, untimely or incorrect information on balancing needs and so on.

Both Legal-Fat options increase the possibilities for regulators to act against practices as described above. The incentive for the integrated firm is not affected, however. Hindering virtual utilities, either through access fees or through non-price discrimination, is in the interest of the group or holding to which they belong. Ownership unbundling would eliminate these incentives. Therefore, ownership unbundling is a more effective cure than the Legal-Fat options.

Ownership unbundling prohibits distribution network owners to invest in local generation capacity, possibly disabling them to gain economies of scope from this combination. These economies of scope may arise because of the use of the network owner's own production capacity to resolve congestion. Note, however, that restoring balance can be contracted perfectly (as is the case with transmission in many countries), and does not require shared ownership. Investment decisions may be altered, since an integrated producer is likely to consider network solutions and capacity solutions jointly. Possible efficiency gains from this integrated decision will be lost in the case of ownership unbundling.

[36] Virtual utilities, also referred to as distributed generation, consists of coordinated small plants, often combined heat and power plants or renewable sources. See Künneke (2003) and Awerbuch and Preston (1996) for a more extensive discussion.

North-Western European power market

Let us now look on the issue of consolidation in the context of the North-Western European market. Given that consolidation processes also take place at the European level, will there be enough market players in the future European market? Table 4.2 shows the presence of the largest utilities in several European countries. If the Dutch production firms are to be taken over after ownership unbundling, then the main potential buyers may belong to this list. We observe that at the moment seven companies exits that are both large as well as internationally active, notably RWE, EON, EDF, Electrabel (E-BEL), CENTRICA, Vattenfall (VF) and ENDESA. Six of these players are already active on the North-Western European market and a takeover of a Dutch generator by one of them may therefore increase market concentration. Not from the table, however, that the number of suppliers will still be substantial in this case.

In addition, a number of smaller companies that are of local significance in certain European countries can be viewed as potential buyers as they might still develop the ambition to explore their activities across borders. Moreover, the existence of quite a large number of Independent Power Producers (IPPs) world-wide suggests that the operation of power plants without a network is an economically viable activity.[37] Some of these IPPs are already active in several European countries (Germany, UK, Portugal, Spain, Italy, Netherlands). Several large IPPs are known to have expanded either by acquisitions of individual plants (e.g. Intergen, International Power) or by acquiring small producer companies (e.g.TECO). Firms like these may be interested in increasing their European operations further in a similar manner. According to EIA (1996, p14), "Among U.S. companies, independent power producers have been among the most active in seeking overseas energy project investments.". Furthermore, the indication that power generation is by itself a viable activity implies that, after implementation of ownership unbundling, the generation firms can be taken-over by a firm from outside the electricity-utility industry. Recently, IPP Intergen was sold to corporate investors American International Group and the Ontario Teachers' Pension Plan. (NRC, 2005.)

[37] IPP's obviously operate in a different manner than traditional utilities. Woolf and Halpern (2001) discuss market structures and trading arrangements aimed at reaping the full benefits of IPP's for wholesale competition.

Table 4.2 Presence of largest utilities in the electricity industry in selected individual member states

	Largest	Other significant
Austria	VERBUND	RWE, EON, EDF
Belgium	E-BEL	EDF, ESSENT, NUON, CENTRICA
Denmark	ELSAM	E2, VF, EON
Finland	FORTUM GASUM	VF, EON
France	EDF	E-BEL, ENDESA
Germany	RWE	EON, VF, EDF
Ireland	ESB	NIE (Viridian)
Italy	ENEL	E-BEL, ENDESA, EDISON, VERBUND
Netherlands	E-BEL[a)]	ESSENT, NUON, EON
Portugal	EDP GDP	ENDESA
Spain	ENDESA	IBERDROLA, EDP, ENEL, UNION FENOSA
Sweden	VF	EON, FORTUM
UK		EDF , EON, RWE, CENTRICA

Source: EC (2005) Fourth benchmarking report on the implementation of the internal electricity and gas markets, Technical Annexes, p.8. As before, we do not include new member states.
Notes: [a)] Our own estimates for the Netherlands presented in Table 5.1 of this report show that the share of Essent and Electrabel in production are roughly the same.

Conclusion

Concluding on the effect of unbundling on competition in electricity production, we find that a higher degree of unbundling of generation and *transmission* networks enhances the position of new entrants and may lead to substantial welfare gains. Unbundling of generation and *distribution* networks increases the opportunities for small-scale producers to compete in the electricity market, which is especially relevant if the concept of virtual utilities is further developed in practice. Such a development is more likely if there is much entry in distributed generation, which is also facilitated by stronger unbundling of distribution networks. Finally, ownership unbundling may result in sales of generation owned by Dutch utility holdings to foreign firms, however, this is unlikely to have a large effect on competition on the North-Western European power market.

4.5 Benefits of privatisation

4.5.1 Introduction

Unbundling network activities from commercial activities enables public shareholders to sell one of these activities separately. More specifically, it enables public authorities to privatise the commercial part of the currently publicly-owned integrated firms. Complete unbundling would give public shareholders who do not want to run risky businesses a way out, while at the same time, keeping the essential facility, notably the network, in public hands.

In this analysis, we only go into the effects of privatisation of commercial parts of the holding without giving attention to the effects of privatisation of networks. Our point is that in the current situation in the Netherlands, with privatisation of networks have been delayed at least until 2007, creating the possibility to privatise commercial activities becomes a benefit. The textbox "Privatisation experiences in distribution networks" included in this section touches upon literature on privatisation of distribution networks.

Section 4.5.2 discusses the effect of unbundling on the possibility to privatise commercial parts of the distribution companies. Section 4.5.3 analyses the impact of unbundling and privatisation of commercial parts on efficiency and value of these firms.

Privatisation experiences in distribution networks

The benefits of privatisation depend on the contractibility of network management as well as the direction of managers incentives (see Hart et al. (1997) on the role of contractibility in the choice between public and private ownership). The larger the uncertainty about the performance of networks in private hands, the more societies will value public ownership. We refer to CPB et al. (2004) that addresses general issues that arise with respect to privatisation of networks, in particular those related to reliability.

In particular for transmission networks, contractibility is a large issue and may affect reliability. These networks are often in hands of states. For distribution networks the problem of contractibility is smaller. We observe cases of privatisation of such networks in other countries. There exists also empirical literature regarding the effects of privatisation of electricity networks. For example, Domah and Pollitt (2000) find that privatisation has brought benefits to customers in the UK. In contrast, Mota (2004), who addresses the effect of privatisation on the performance of Brazilian utilities, reports a negative and statistically significant result of privatisation in Brazil in several models that focus on total cost efficiency. Only when focusing on operational efficiency (i.e. excluding capital cost), a positive (but insignificant) effect of privatisation is found. However, Mota (2004) suggests that the results should be taken with caution, not only because of difficulties with construction capital cost figures, but also because of low investment in Brazil in pre-privatisation time and a fast rate of substitution of capital for labour.

4.5.2 Withdrawal of public capital from commercial activities

Dutch incumbent energy companies are historically in public hands. They belong to local authorities and the current law prevents sales of the networks to private shareholders, as 50% of the network assets should remain with the current owners. At the same time, since the energy market in the Netherlands has been liberalised, the energy holdings already perform a number of commercial activities and get involved in financially risky businesses, such as acquiring companies abroad. Theoretically, as there is no prohibition to sell commercial activities, these can be sold by holdings already. There is an example of such an intention in the Dutch energy market – a combined sale of the retail businesses of NRE and Intergas.[38]

[38] Also, before the condition of 50% public ownership was introduced with respect networks, two integrated incumbent gas companies, Obragas and Haarlemmermeer, were sold to RWE.

Several of the public shareholders of distribution companies prefer to sell the commercial parts of these companies as these shareholders do not want to be active in risky, entrepreneurial activities. In the case of legal unbundling, the management of the holding is able to sell parts, such as generation plants or retail firms, but this does not imply that the shareholders would always benefit from such transactions. In the current structure, the holding can decide to use the revenues from the transaction for other activities, for instance abroad, instead of transferring it to the shareholders. In the prevailing Dutch governance system (called 'structuurregime'), the ultimate shareholders, such as regional and local authorities in the energy sector, are not able to effectively influence companies' decisions with respect to both divestiture and destination of the proceeds of the divesture.

Changing the governance structure so as to increase the power of public shareholders in this respect would be one option to deal with this issue. Another option is ownership separation. Given the uncertainty regarding the Parliamentary decision on privatisation of the network companies, ownership unbundling would provide public shareholders, who may not want to hold risky commercial businesses, with a way out. Under the current corporate governance, this is realised only under the option of ownership unbundling, and not under the other options.

4.5.3 Unbundling, privatisation and the value of commercial firms

Unbundling a firm in separated companies may raise the total value because of increased transparency about future cash flows and the feasibility of a financial structure which make commercial parts operate more efficiently. Many utility holdings are conglomerates with multiple goals. Literature provides several reasons why a conglomerate structure may be inferior to having separate owners.

- Unbundling of conglomerates could induce better investment opportunities. For instance, a pension fund may not be interested to buy a conglomerate with risky businesses, while it may be interested to invest in a low risk network business. By bundling these activities together, these investors will be excluded from the list of potential buyers.

- A split structure is more transparent and hence better manageable. In a separated structure, managers of each firm can strongly focus on their own business, while in an integrated setting interests of a particular division, say the network division, can be compromised by the needs of other divisions (OECD, 2003). This argument, of course, only holds if economies of scope do not compensate for the costs of managing a conglomerate. Moreover, corporate separation possibly increases transparency on inefficiencies of the corporate.

A large stream of related literature exists on the issue of the optimal financing structure, predominantly based on principal-agent theory and agency costs theory. Recent examples

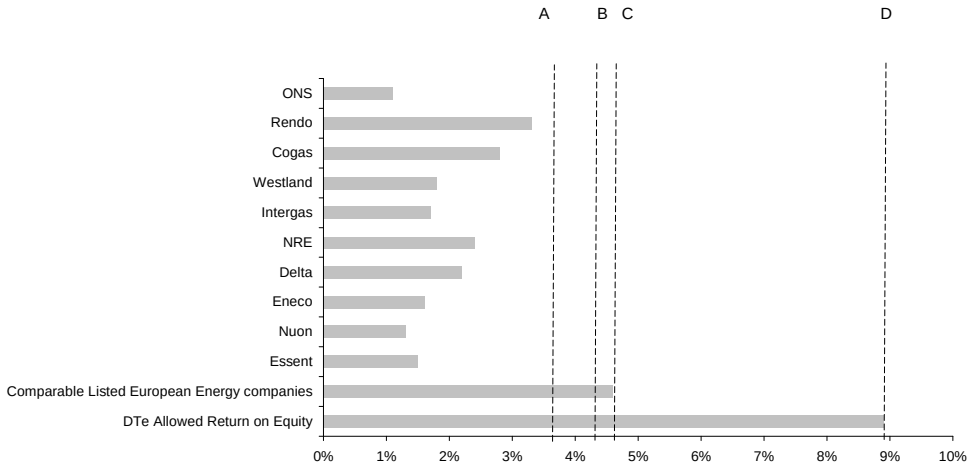
include Denis *et al.*, 1997 and Burkart *et al.*, 1997. Unbundling may improve options to choose the optimal financial structure. According to corporate finance literature (e.g. Jensen and Meckling, 1976), a large share of equity financing implies that managers have limited incentives to earn a profit, whereas a large share of debt financing urges managers to invest in high-risk projects. The trade-off between these costs implies the existence of an optimal capital structure, which is probably different for a network firm and a generation firm or a retail firm. If this difference is large, the effect of bundling these activities is that they can not reach their optimal debt-equity ratio.

Agency costs are thought to be higher in diversified firms because individual shareholders do not have the ability to monitor and discipline managers adequately. This implies that shareholders are likely to prefer equity in focused firms, thus raising the value of those firms. Recent empirical work, though, overviewed in Matsusaka (2001) is not conclusive on the effect of diversification of firm activities on the firm value.

- Some economists argue that private shareholders do a better job in monitoring managers than do public shareholders (e.g. Karpoff, 2001). As the commercial parts of energy companies are more likely to have private shareholders after unbundling, this would imply that unbundling increases the efficiency of these firms.

  The vertically integrated distribution companies in the Netherlands have realised relatively low returns on investments. In 2003, their dividend yield was approximately 1.5% for the largest companies, while the regulator guarantees a much higher return to the network assets (see figure 4.1). However, this information has to be interpreted with caution, because the rate of dividends does not fully reflect return on capital: companies may use the returns in other ways, e.g. to do efficient investment.

Figure 4.1 Dividend yield of energy firms, 2003



(A) Dutch Government Bond with 5 years maturity as per 30 January 2005 (risk free rate)
(B) Yield Fixed Bond (Single A) is assumed as risk free rate plus 70 basis points
(C) Dividend Yield comparable listed European energy companies
(D) DTe Allowed Return on Equity. Source: Dte, nominal and after tax

Source: Annual Reports 2003, Calculated as paid divident divided by estimated market value

Source: Sequoia (2004).

According to Sequoia (2004), complete unbundling would improve performance of the commercial firms and, hence, their value. Others believe, however, that in the Dutch situation buyers will exercise their market power and, hence, offer a lower price, since splitting does not only allow for sales of competitive businesses, but also forces such sales while the number of potential buyers is limited (Van Damme et al., 2004).

Interestingly, two Dutch companies have voluntarily announced their decision to unbundle fully their competitive activities from the network.[39] From this we can conclude that these companies do not expect a decrease of their value after unbundling. Note, however, that these companies are much smaller than the three large incumbents. International experiences with voluntary unbundling (see Chapter 2) also support the view that ownership unbundling may be good for a company value.[40]

4.5.4 Conclusion

Under the current corporate governance, public authorities have very limited options to impose privatisation of commercial parts. Ownership unbundling strongly improves possibilities of public shareholders to privatise commercial firms. The other forms of unbundling do not affect

[39] See transaction-cost literature for more detail regarding the choice of the organisation form by a firm, e.g. Joskow (2003b).
[40] The energy industry has shown several voluntary separation initiatives, such as by British Gas. In the telecom industry several vertically integrated firms have considered voluntary separation, such as Rochester Telephone and British Telecom, but they eventually concluded that the costs incurred would be higher than the benefits (OECD, 2003).

these possibilities. Another option to the withdrawal of public capital from commercial activities is a further improvement of the corporate governance.

Regarding the impact of unbundling on value of the separate firms, we conclude that the theoretical and empirical literature is inconclusive. By itself, an increase of efficiency and a positive effect on the value of a company may provide a reason for voluntary unbundling but do not necessarily justify enforced unbundling. Conversely, if these arguments for unbundling hold, they are reason for voluntary unbundling. Note however that the private decision not to unbundle does not imply that the benefits discussed here are smaller than the costs of unbundling, as that decision may be biased by private benefits, such as market power, that are not in the public interest.

5 Costs of unbundling

5.1 Introduction

Unbundling a vertically integrated firm involves several types of costs. In section 3, we have distinguished the following categories: transitional costs, loss of economies of scope, and increased risk of hold-up of investment in generation. Here we address each of these costs in more detail.

5.2 Transitional costs

5.2.1 Introduction

Unbundling results in costs of restructuring companies' offices and rearranging contracts of integrated companies with other parties. Here we speak about one-off transaction costs[41] associated with these processes. In the context of restructuring Dutch energy distribution companies, a special issue arises with respect to one type of financial contracts: cross-border leases. Therefore we present this issue separately in section 5.2.2, and analyse the effect of other transitional costs separately in section 5.2.3, ending the analysis with conclusions in section 5.2.4.

5.2.2 Cross-border leases

The existing cross-border leases of the network and power generation assets possibly generate large one-off transaction costs. Such costs may arise in the last two options. The textbox below elaborates on the issue of cross-border leases. Due to confidential information on these contracts, it is not possible to adequately predict the magnitude of these transaction costs. We only mention that, according to some experts, the current cross-border lease contracts may not need to be broken in the case of the ownership unbundling of the networks from the holdings. In some cases – when no substantial assets are to be unbundled – the respective transaction costs seems minor. However there is uncertainty for the cases in which substantial assets need to be unbundled. According to these experts, the issue might be solved by providing cross-guarantees between the current holdings (which are the parties that concluded the current cross-border lease contracts) and the companies/new holdings who will become the owners of the assets after the split. Notice that such a compromise implies no full financial ring fence.

Also the transfer of the management of regional transmission networks, proposed by the Minister, does not necessarily require breaking of the cross-border lease contracts. However,

[41] In economic literature, the concept of transaction cost has a much broader meaning than the one-off cost of reorganisation addressed in this section. This concept refers to the trade off between contractual relationships and internal organisation. (See e.g. Joskow, 2003b.)

here too, there is uncertainty regarding transaction costs in the case of voluntary sales of transmission assets to TenneT.

Cross-border leases

By means of cross-border leases (CBLs), assets can be leased to a foreign investor for an extensive period of time (the headlease) and leased back, for a lesser but still substantial period (the lease of sublease). There are mainly two types of CBLs to distinguish: a 'lease-in-lease-out', also called a Lilo, and a 'sales-lease-back'. A Lilo has a relatively shorter headlease period of for example 50 years whereas a 'sale-and-lease-back' has a headlease period of 100 years or more. The lease back period is in both cases usually around 25 years. Because of such contracts, Lessors obtain a form of ownership of the assets as basis for fiscal depreciation reducing their taxable income. Lessees remain in full control of the assets during the lease-back period, obtain a realistic purchase-back option of the Lessors' rights under the headlease once the lease-back period has ended, and immediately share in the financial tax benefits of the Lessor which can be used for other profitable investments.

The first CBLs in the Dutch network industries date back to 1993, when Schiphol's and the railway company's assets were leased. In 1994, there was the first CBL on a power plant. In 1997, a gas distribution network was leased for the first time. Being the most complex network assets, electricity networks went the last. By that time, almost all less complex assets were already CB-leased. The first deal on electricity networks was done in 1999, i.e. after the first Electricity Act of 1998. Now the majority of electricity networks are leased, but not all of them. Most of the CBL contracts on network assets of electricity firms seem to be so-called 'sale-lease back' contracts. All these CBLs were implemented with U.S.A. investors (Lessors) because of fiscal advantages provided by the American tax law. In 2001 in the Netherlands, the Department of Internal Affairs requested public authorities to refrain from further approval of new CBLs in public companies, mainly because it did not want to stimulate this kind of fiscal arbitrage. Since October 2004 new CBL contracts have been made unattractive by the new fiscal regulation of the American Jobs Creation Act.

As the CBL-contracts of the energy industry are private contracts, information about the contents of these contracts is incomplete. Therefore, it is not possible to determine what the impact would be of changing the ownership structure of the industry on the contracts, and, hence, on costs for participants. We can only speculate on the size of the effects.

It is not clear whether unbundling of distribution from supply necessarily means that the old CBL-contracts have to be broken. American investors seem not have strong incentives to break such contracts because of the fiscal advantages they derive from it. Otherwise, as the American tax law has changed recently, new CBLs have become little attractive. In principle, if the old contracts are broken, then new contracts are not attractive, as no profit is to be made anymore.

In cases where a CBL is formally concluded by a network company itself, there should be no problem whatsoever. If the deal has been done by the holding and no substantial assets are unbundled (which holds for most companies), then also, no additional cost may occur. However, there is uncertainty regarding transaction costs in the case if substantial assets are to be unbundled.

5.2.3 Other transitional costs

In addition to the possible need for rearranging financial contracts, which in particular may be caused by the necessity to break the existing CBL contracts that we discussed above, there are also other transitional costs. These costs include the cost of the introduction of new ICT processes and program management, costs related to changes in personnel and housing, legal costs associated with implementing of a higher degree of unbundling, as well as costs associated with rearranging the other contracts of the companies with third parties.

Especially introduction of new ICT systems and restructuring the working process in the company may be costly. This is however one of the unavoidable costs associated with introduction of competition, since changes in technology are needed to accommodate more players in the energy market and to secure informational streams (we will discuss this also in the next section, when we address economies of scope). This means that substantial transitional cost arises already under the Legal-Fat option.

Little evidence is available regarding the magnitude of these one-off costs. For example, according to OECD (2003) one-off transaction costs of breaking-up the integrated firm are significant in the telecommunications industry. However, there may be substantial differences in such costs across industries. As there is little international experience with ownership unbundling in electricity, it is difficult to evaluate these costs, although we observe a couple of voluntary unbundlings (in the United Kingdom). The latter suggests that the one-off costs associated with breaking the last link is may not be large. However, this does not include the effect of CBLs. Also, since ownership unbundling is a new development, which companies have not experienced before, it may be that it will increase uncertainty in the market during the transition period.

5.2.4 Conclusion

Except from the current situation, which is the status quo, each of the other three policy options imposes some transition cost. Especially introduction of new ICT systems and restructuring the working process in the company may be costly. Therefore, changing the allocation of tasks when shifting to the option Legal-Fat introduces a large reorganisation cost. Shifting to Legal-Fat Plus may give rise to only little extra transaction costs compared to Legal-Fat, while the cost of shifting to ownership unbundling is larger. Both, legal and financial costs may arise in this option. In particular, there is uncertainty about the cost associated with cross-border leases.

5.3 Loss of economies of scope

5.3.1 Introduction

In the electricity industry synergies between different activities could occur because of economies of scope. The latter exists if integration of different types of activities reduces average costs. We distinguish operational and financial synergy. Unbundling of network management from commercial activities and allocation of all strategic activities of the network to the network will reduce the options for combined activities and lead to losses of economies of scope.

5.3.2 Operational synergy

Let us first address the loss of economies of scope between the network and generation. Such scope economies exist where a company's generation is located at the own network area, however, their positive effect is countervailed by possible negative effects of vertical integration on competition. In the Netherlands, main production units feed into the transmission level (i.e., at and above 110 kV). If, in accordance with the proposal of the Minister, the management of all the high-voltage grids will be transferred to TenneT, ownership unbundling will not yield further loss of economies of scope between network and such generation units. Small generation units feed into the distribution level. Many of such units are not co-owned by utility holdings. Therefore, in many cases, economies of scope that may arise from common ownership of such units and distribution networks have not been explored anyway.

Economies of scope arise also between the network and supply activities. Common facilities such as call centres and billing machines are often mentioned as an example where synergies may arise. However, these are exactly the activities where exchange of commercially sensitive information may take place. Hence, also in the case of legal unbundling, 'Chinese walls' have to be established to separate the information stream of the network from that of commercial companies. Notice that maintaining 'Chinese walls' in not fully unbundled network and supply companies active in the same region whose profit-maximising incentives work in the same direction (as both want to maximise the overall profit) may be costly and ineffective, because of large information asymmetry between the company and the regulator.

Even in the US-case, without these Chinese walls, Gilsdorf (1995) finds only insignificant economies of scope. After implementing legal unbundling and a proper division of tasks between the network and competitive activities, the additional losses of scope economies between the network and supply activities by introducing ownership unbundling are unlikely to be large in practice.

In their advice to the Ministry of Economic Affairs of December 16, 2004, DTe lists the strategic activities that are desirable to be performed by a network operator itself, i.e. activities that should not be outsourced to commercial parties. The strategic activities are the following:

- Investment decisions regarding the extension and maintenance of the network;
- Operational management (e.g., dispatch, negotiations on contracts over the access to the network, and responsibility about information systems);
- Contracting of the parties that perform outsourced activities;
- Financial policy (setting up the annual reports, billing, contact with clients);
- Supervision of the design of new and maintained networks;
- Management of information systems.

This list contains all the activities that have to do with processing customer information. Such a division of tasks is implemented under all policy options defined in Chapter 1, except the current one, called Legal-Lean. Therefore, any of the three options implementing the proper allocation of the tasks of companies gives rise to the respective cost. If such rules are implemented, ownership unbundling leads to some additional loss of economies of scope. These additional costs follow from the removal of all remaining shared facilities, such as a common name, and shared activities, such as shared purchase of non-strategic products and shared contracts with, for instance, lawyers. After all, in the ownership option, all relationships between network firm and holding are removed.

We conclude that the loss of operational synergies occurs mainly between the central generation and transmission and between the network and retail. However, the choice for liberalisation of the electricity market exactly implies removing these economies of scope to a large degree, also under legal unbundling. Therefore, when comparing the four policy options, the main cost of losing economies of scope arises with introducing a proper task allocation when moving from Legal-Lean to Legal-Fat. The cost stays almost the same if we go further to Legal-Fat Plus. Additionally, ownership unbundling adds only small extra cost.

5.3.3 Financial synergy

Financial synergies (which is just another term for financial cross-subsidies) may be also sometimes seen as a form of economies of scope. An integrated firm has an advantage as it benefits from lower interest rates compared to the competitors. One may, however, wonder how these benefits of lower interest rates of an integrated firm come about. Using network assets as a base for non-network debts implies that shareholders of the network pay for the higher credit rating of the holding, by bearing higher risks on their future dividends from the network.

Lower interest rates on debts are unlikely to be passed on to customers for two reasons. First, as shareholders of the company pay for these lower rates through increased risk on their dividends, they are likely to demand a higher return on capital, thus offsetting the initial advantage. Secondly, the cost advantage is not available to all players in the market, as it is linked to owning a network. Firms without a network do not have access to the advantage, and can not gain access to this advantage either. It is a general feature of oligopoly markets that firms with exclusive cost advantages will not pass these advantages on to consumers, but transfer them into rents. From these considerations, we conclude that economies of scope that are associated with financial synergies are unlikely to be welfare improving.

5.3.4 Conclusion

We conclude that there are some economies of scope between the network and commercial businesses exploring which may be welfare improving. This positive effect on welfare is mainly

due to the production technology in the electricity sector, which exhibits economies of scope, and the need for coordination of the actions of market participants, rather than due to financial synergies. When comparing the four policy options with respect to operational economies of scope, the main loss of such economies of scope arises after introducing a proper task allocation when moving from Legal-Lean to Legal-Fat. The cost stays almost the same if we go further to Legal-Fat Plus. Additionally, ownership unbundling adds only small extra cost.

As we have noticed above, the effect of financial synergy is mainly allocative and not on total welfare. There is however one related issue: eliminating financial synergies may increase the risk of insufficient investment in generation, which we discuss in the next section.

5.4 Increased risk of insufficient investments in generation

5.4.1 Introduction

Theoretically, unbundling could affect risks for commercial parts of holdings in two ways. The first one is higher costs of capital. Unbundling could weaken the financial base of Dutch utilities, which may adversely impact their investment in generation. The second one is the reduced role of long-term contracts, also negatively affecting investment in generation. Both arguments relate to financing capabilities, namely to the possibility to use the network as a collateral. The current law already prohibits this for new financial contracts of the holdings. In this respect all three options that feature legal unbundling are equivalent. The Ownership option separates financing fully. Therefore, the risks are higher in this option. How serious are these risks? To which extent does the argument hold that unbundling financially weakens Dutch energy companies and, hence, reduces investments in generation capacity?

5.4.2 Cost of capital and investments

In a vertically integrated firm, the combined risk of all activities could be lower than the risk of some specific activities, notably commercial activities, due to the relatively low risks associated with network management. Firms active in generation and/or supply who do not have a network face a larger probability of bankruptcy. Hence, such companies have, *ceteris paribus*, a higher cost of capital than integrated firms. In other words, unbundling would reduce the financing capabilities of commercial firms and, hence, reduce investments.

On the other side, if this significantly affects profitability, electricity-producing companies or supply companies may (and will) solve it by merging with other companies, in particular those active in less risky sectors or having network assets in other countries. For example, they may acquire a distribution company in another country or industry. If the market is sufficiently competitive, the companies will converge to the optimal structure in the long run.

The upstream level has already shown a process of consolidation of generating firms on the European level for several years. This process could be enhanced if firms were split from network firms. As a result, the number of players on the upstream level could reduce after splitting. Whether this would negatively affect competition is an issue subject to competition policy. Over and above, the question is whether the existence of vertically integrated firms would effectively countervail the on-going consolidation in the European power industry which may form a threat for achieving allocative efficiency in the electricity market. Such risks are always present. Competition policy measures, such as European merger control, seem to be far more appropriate to deal with these risks.

5.4.3 Long-term contracts and investments

In electricity, there is a concern that when supply activities compete with each other, risks on the upstream side, i.e. on the side of generation, may increase. The source of this additional risk is the reduced role of long-term contracts in the retail market. With less long-term contracting, generators facing higher risks would invest less, possibly resulting in underinvestment in production capacity.

Green (2003) argues that retail competition might lead to less long-term contracting and to higher prices. If electricity retailers face competition, then companies signing long-term contracts are exposed to the risk that a fall in short-term prices would allow their rivals to buy on the spot market and undercut them. This will result in less contracting. This argument holds for both separate and integrated companies, and relates to the introduction of retail competition rather than unbundling. In practice, both integrated and non-integrated companies have only relatively short-term contracts.

5.4.4 Investments in power plants

As said, the ability of Dutch utilities to invest in generation may reduce after ownership unbundling. However, the reduction in investment of these particular companies may be temporary, as they can improve their investment position by merging with other companies who may have investment capabilities. Furthermore, it is not obvious why such investment should necessarily be financed from the Dutch networks, as Dutch regional utilities are not the only investors in this market.

Table 5.1 provides some insight in the ownership of the top five producers in the Netherlands, who own 78% of total capacity, including all the large plants (with a very minor exception: as AES, an American corporation, partly owns one of the large plants).[42] Three of the five largest producers are vertically integrated Dutch utilities. They cover about 45% of the Dutch production. The other two, with the respective share of about 30%, are large foreign utilities.

[42] Unfortunately, the picture is incomplete, as we do not have information on other companies.

They have electricity networks in other countries. The remainder of the capacity consists of small generation units. Investment in such units is mainly done by industrial players (such as, paper producers or oil refineries), i.e. by companies without network assets. Therefore, not only the Dutch regional utility holdings invest in production in the Netherlands.

The amount of generation investment is determined by the future price for energy and the average costs of producing electricity. If access to the grid is guaranteed, new firms may enter the generation market if investment becomes economically attractive. This implies that the network does not and should not play an important role in financing generation investments. Higher levels of investments due to network-based lower capital costs may even be labelled overinvestment, as it is partly financed from other sources than the investment itself.

Related to this, we would like to touch upon the argument that is often mentioned, which is often put forward by the Dutch companies regarding the possible loss of work opportunities in the Netherlands after unbundling because of the closed head offices, no need for electricity production in the Netherlands, and smaller supply offices. See, e.g., the recent article by several leaders of the Dutch unions in 'Het Financieele Dagblad', where they argue that ownership unbundling will result in the loss of 14,000 -21,000 jobs in the industry.[43] This argument seems to boil down to 'no need to produce electricity in the Netherlands'. Although there indeed exists a 'home-bias' phenomenon for investment (it is often easier to invest in your home-country than abroad), the main motivation for investment in generation is not the location of the head-office, but the expected return on such an investment. Hence, investment in generation in the Netherlands will occur when the return on such investment is sufficient.

Table 5.1 Market shares of the five largest producers

	Production capacity including decentralised production	Share of production capacity of the five large producers in the total capacity in the Netherlands
	(in MW)	(in %)
Essent	4700	22,8
Electrabel	4692	22,8
Nuon	4296	20,9
E.ON Benelux	1770	8,6
Delta	715	3,5
Total	16173	78,5

Source: Energie Nederland Special (April 2003) and own computation. The percentage 78,5% in the last row is computed based on the data from Statline (CBS, 2002), according to which the total production capacity in the Netherlands is about 20601MW.

[43] FD, 08-04-2005: "Voorzichtig met energiebedrijven!" by L. de Waal, D. Terpstra, A. Verhoeven and J. de Jong.

5.4.5 Conclusion

We conclude, except for ownership unbundling the other three options are equivalent with respect to the effect on generation investment. The Ownership option may indeed reduce investment in generation by the currently integrated Dutch utility holdings. However, other parties will still be willing to invest as long as the expected returns are sufficiently high. In such a case, the risk of insufficient generation investment does not increase much.

6 Assessing the trade-offs between costs and benefits

6.1 Introduction

As said in the introductory chapter, we focus on describing the trade-offs of different effects of several options to unbundle the energy distribution industry. In chapters 4 and 5 we have analysed benefits and costs of unbundling, respectively. Unbundling network activities from commercial activities contributes to a clear division between them. It increases the independence of network companies as well as the effectiveness of regulation, and may be an effective measure to increase competition. Furthermore, it opens opportunities to privatise commercial activities. Besides these benefits, we have distinguished the following costs: transaction costs, loss of economies of scope, and the risk of insufficient investments in generation. Table 6.1 gives an overview of the results. In this chapter we compare the four policy options with each other, beginning with the current structure of the energy distribution industry. In the final section of this chapter, we pay attention to the relationship between unbundling and reliability of the supply of electricity.

6.2 Current structure

The trade-offs related to the current structure (Legal-Lean) are not depicted in table 6.1, as this structure is used as benchmark to assess the effects of the other three options. According to the proposal of the Minister, the current structure delivers insufficient competition between suppliers, insufficient independence of network management and insufficient transparency regarding the activities of the integrated firms. Given the political ambition to liberalise energy markets, further unbundling seems to be appropriate. There is evidence that unbundling contributes to better competition in the market and that more competition leads to lower prices. As there is no *quantitative* information regarding the exact relationship between the degree of unbundling and the degree of competition in the market, the question remains to which extent network activities and commercial activities should be separated.

6.3 Legal-Lean versus Legal-Fat

One difference between the Legal-Lean structure and the Legal-Fat structure, is that the step towards the latter increases independency of network managers and raises transparency of all the different activities of the integrated firm, thus increasing both the effectiveness and efficiency of network regulation. These are clear benefits of this option for structuring the energy distribution industry.

Note that in price regulation, DTe already treats network companies as economic owners of their assets, and takes the corresponding capital cost into account when setting prices for network services. Moving the economic ownership of the assets to the network companies – i.e., a shift from 'lean' to 'fat' – seems to be a logic step, formalising this and giving the regulator a better view on the network companies' costs.

Table 6.1 Costs and benefits of unbundling: improvement/decrease in total welfare under the alternative policy options as compared to Legal-Lean

	Legal-Fat (Legal unbundling with 'Fat' networks+ task allocation)	Legal-Fat Plus (Legal unbundling with 'Fat' networks+ task allocation+ extra rules on financing)	Ownership (Full ownership unbundling as proposed by the Ministry of Economic Affairs)
Benefits			
a. Performance of networks:			
Better focus and more secure financing	Improvement	Larger Improvement	Even larger improvement
Economies of scale	No change	No change	Depends on scenario
b. Effectiveness and efficiency of regulation	Improvement	Improvement	Larger improvement
c. Degree of competition:			
In retail	Small improvement with modest welfare effects	Small improvement with modest welfare effects	Small improvement with modest welfare effects
In generation	Improvement	Improvement	Larger Improvement
d. Benefits of privatisation	No change	No change	Improvement
Costs			
a. Transaction costs			
Cross-border leases	Uncertainty, likely no effect	Uncertainty, but risk of large costs	Uncertainty, but risk of large costs
Other costs	Welfare decrease	Welfare decrease	Larger welfare decrease
b. Loss of economies of scope:			
Operational	Welfare decrease	Welfare decrease	Larger welfare decrease
Financial	No change	No change	No change
c. Less investments in generation	No change	No change	Unlikely to change

Secondly, compared to the Legal-Lean structure, the Legal-Fat structure levels the playing field for all suppliers and may stimulate entry both in retail and in generation. In the case of retail, entry leads to increased competition, lowering end-user prices. As the decrease in end-user prices takes the form of lower standing charges (Lijesen, 2002), this will merely redistribute wealth from retailers to consumers, rather than increase the level of wealth. In the longer run, increased competition between retailers may increase their efficiency, but given the cost share

of retail in the end-user price of energy, welfare gains are likely to be modest. For generation, per unit prices are affected, leaving much more room for welfare increases. Furthermore, gaming in generation may lead to considerable welfare losses, so that a decrease in the scope for gaming may increase welfare substantially. These benefits are (partly) achieved by applying the Legal-Fat structure, which is a stronger unbundling form than Legal-Lean.

Going from the Legal-Lean structure to the Legal-Fat structure also gives rise to costs. Making the network owner fat gives rise to one-off transition costs. Furthermore, due to the extended operational separation between network and supply, loss of economies of scope occurs.

6.4 Legal-Fat versus Legal-Fat Plus

Compared to the Legal-Fat structure, the Legal-Fat Plus structure would mainly affect the independence of network financing. Note from the table that these options are very similar in terms of costs and benefits. In the Legal-Fat Plus option, the management of networks will have increased means, as the credit rating based on network assets is now fully available for the network itself. On the negative side, giving the network more financial independence imposes some risk on old financial contracts of the holdings, such as CBL contracts. However, there is uncertainty regarding the latter effect.

6.5 Ownership versus Legal-Fat Plus

The Ownership structure alters several categories of benefits and costs compared to the Legal-Fat structure. The entirely independent status following from full ownership unbundling will further improve the management of networks, as network firms will now no longer be compromising between the interests of the network and other activities. Furthermore, depending on the scenario with respect to regional transmission, full unbundling may facilitate horizontal mergers at the transmission level, which may give rise to economies of scale.

A further benefit of unbundling is that it eases network regulation greatly, especially since the network firm no longer has an incentive to influence downstream competition. This implies that network regulation will become both more effective and more efficient.

Competition in retail or generation is further facilitated, as cross-subsidies are now fully impossible and the incentive for all forms of anti-competitive behaviour is taken away. Note that, as said before, welfare effects from competition in generation are likely to be larger than welfare effects from competition in retail. The net effect of entry and consolidation in the case of ownership unbundling depends on the current market structure. As discussed before, the Dutch supply market is already highly concentrated. It must be questioned whether ownership

unbundling would result in further concentration due to consolidation. Other measures, notably directed at tackling mergers and concentration, would be needed to prevent this outcome.

A benefit which (under the current governance structure) can be achieved by ownership unbundling is the possibility to privatise commercial activities while keeping network firms in public hands. If this option is highly valued, ownership unbundling seems to be the appropriate choice.[44] The increased transparency following from the unbundling attracts more focused shareholders for both parts of the firm, thus increasing the value of the firm to shareholders. Moreover, privatisation of the commercial activities increases shareholder pressure to raise efficiency.

The costs of the Ownership option, compared to the Legal-Fat Plus are an increase in the loss of economies of scope and higher transitional costs. Furthermore, investment in generation my be affected. The loss of economies of scope is fairly small, due to the regulations already in place in all of the options in the table. The order of magnitude of transitional costs mainly depends on the risk of dissolving the current CBL contracts of some companies. As the box on cross-border leases in section 5.2 suggests, there is uncertainty regarding these costs. Regarding the generation investment, the effect is likely to be small and temporary.

How does this option compare to the Legal-Fat Plus option? From the above, it is clear that at least one of the cost elements (loss of economies of scope) is probably fairly small, whereas the benefits are larger than in the Legal-Fat Plus case. The final judgement of the step of full ownership unbundling is ambiguous however, as it depends on how one weighs the costs against the benefits.

6.6 Unbundling and reliability

So far we have mostly focused on financial costs and benefits associated with different unbundling options; in this section we would like to explicitly address the respective effects on reliability. We notice that reliability of energy supply can be affected either on the production side (sufficient production capacity) or on the network side (proper operation, maintenance and investment in the network). When analysing the costs and benefits in the previous two chapters, we highlighted several aspects that relate to reliability of supply, such as the effect of the increased independence of network companies on their performance, the effect of regulation,

[44] However, if shareholders would have more influence on decisions on the current distribution firms, as result of another governance structure, some firms would split voluntary.

possible hold up of investment in network, and financial risks for generation and supply. We give more explanation on each of these points below.

- Increased independency of network management and financing is good for reliability. Splitting the network companies from the holdings provides the independence of operational and investment decisions and ensures that all the decisions of the network are taken in its best interests. Splitting financial responsibilities fully eliminates the risk of cash lock up, which guarantees that the network has enough means to maintain good reliability. Unbundling financial capabilities of the network and the commercial activities of the holdings eliminates the risk of cash lock up for the network. This is the advantage of the options Legal-Fat Plus and Ownership unbundling.
- The more transparent the information on costs of network companies, the better the regulator will be able to create proper incentives to networks by regulation. Reliability is already included in the regulation model. The way the network companies are rewarded and fined for changes in reliability determines their incentives regarding reliability. This seems to hold under any form of unbundling.
- In general, regulation is supposed to ensure that there is no hold up of network investment. Still there may be some situation when it is difficult for the regulator to get insight regarding the efficiency of some specific investments. In particular, network investment can sometimes be a substitute for production capacity. An unbundled network firm may be reluctant to do such investment. In this vein, integrated companies may have better incentives for optimising reliability. Notice however, that this problem is particularly relevant for transmission networks, which perform the interconnection function, while there are fewer substitution possibilities between generation and distribution. According to the proposal of the Minister the management of transmission networks will be transferred to the national TSO TenneT, which provides the possibility to optimise the transmission grid and to coordinate production.
- Unbundling financial capabilities of the network and commercial activities increases risks for commercial activities, which may lead to a reduction of investment in generation by the Dutch energy holdings. However, as we have already explained in chapter 5, this does not have to be permanent as they may merge with other companies who have capital assets, and as there are also other investors in this market.

Summarising, unbundling has different types of effects on reliability. Some effects are positive, notably the enhanced independence and the focus of network management and improved efficacy of regulation. Other ones, however, could negatively affect reliability, notably an increased risk of hold up of network investment and an increased risk of insufficient investment in generators.

7 Conclusions

7.1 Introduction

In the preceding chapters, we analysed the effects of several options to restructure the Dutch energy distribution sector. This chapter presents the main conclusions from this analysis, starting with a description of the scope of our research and ending with general lessons for solving this kind of policy issues.

Scope of our research

Changing the ownership structure of an industry can have far-reaching consequences, so that a thorough analysis of costs and benefits of such a measure is necessary. Therefore, we have conducted a research into the consequences of the proposal recently put forward by the Dutch government to introduce ownership separation between energy distribution on the one hand, and production and retail on the other. We provide a systematic overview of the costs and benefits of this policy measure. This overview is of a highly qualitative nature because these types of restructuring measures are inherently hard to assess. The analysis of the effects is mainly based on theoretical reasoning and some evidence from other countries. Moreover, we focus on the electricity industry, even though the unbundling proposal of the government also includes distribution of natural gas.

Options to restructure the electricity industry

Although the policy debate on unbundling of the energy distribution industry has been directed at ownership unbundling, we define two alternative forms of unbundling. Compared to the current structure, which we call Legal-Lean, both of the two alternatives increase separation between infrastructure and commercial activities, but do not involve ownership unbundling. In the first alternative, called Legal-Fat, all strategic network activities are allocated to the network firm which also has the economic ownership of the network assets. In the second alternative, called Legal-Fat Plus, financial ring fencing is added, implying that the financing capacities of the network firm are protected. In this option, the network firm is still part of the holding while the holding is able to influence the management of the network firm.

Categories of benefits and costs

We define four mutually-related benefit categories: performance of networks, effectiveness and efficiency of regulation, degree of competition, and benefits of privatisation of commercial activities. As there is no free lunch, unbundling also introduces costs. We distinguish transaction costs, loss of economies of scope and the risk of less investment in generation. As it is inherently difficult to quantify effects of the policy measures considered, we provide a

qualitative comparison of the four policy options for each separate cost and benefit category. In addition, we assess the trade-offs between costs and benefits that arise in each option.

7.2 Benefits of unbundling

Unbundling enhances independent network management

Unbundling creates a more independent position of the network, which provides benefits for the network performance through a better focus on the objectives of the network and a better response to regulatory incentives. Furthermore, unbundling networks from other activities may have a positive effect if it leads to achieving scale economies in network management. Here we compare the four alternative options with respect to these two effects.

As explained, more independence is beneficial for the performance of the network. In the Legal-Lean situation, which is our benchmark, networks are the least independent, as they even do not have economic ownership of their assets. Making networks 'fat' creates more transparency with respect to the network firms' assets. This and a proper allocation of the strategic tasks will decrease the interference with the holdings and secure a better performance of the network. From this perspective, the option Legal-Fat is better than Legal-Lean; and the option Legal-Fat Plus is even better as it decreases the risk of insufficient financing. The option of ownership unbundling improves on Legal-Fat Plus by removing the last distortions and focuses the performance of network companies on their objectives the best.

Regarding the possibility to realise economies of scale, we conclude that this possibility is mainly important for transmission. Therefore, the four options are equivalent with respect to this benefit, as long as the proposal of the Minister on merging the management of transmission lines goes through. Otherwise, the ownership unbundling option may have a larger benefit than the other options, as it increases the chance of merging regional transmission networks with TenneT in the future.

Unbundling improves effectiveness and efficiency of regulation

We distinguish two effects of unbundling on regulation: effect on incentive regulation and effect on the market surveillance task of the regulator. More unbundling is beneficial for both. The Legal-Fat as well as the Legal-Fat Plus options have higher benefits than the Legal-Lean option, because they introduce a proper task allocation, and hence eliminate a great deal of possible cross-subsidies and interference between the network and commercial divisions of the holding. Still, the largest improvement can be achieved only in the Ownership option, since it removes last cross-subsidies and personal links. The surveillance task of the regulator becomes much easier, as networks have no incentives to favour or disadvantage any competing company.

Unbundling enhances retail competition but welfare effects are probably small

Unbundling is likely to promote entry in retail. Although the net welfare gains achieved in the retail market may be limited, unbundling may tackle a potential tight oligopoly in this market. If unbundling results in increased competition, the welfare effects would probably be small as competitors in the retail industry compete by two-part tariffs. An increase in the number of traders likely reduces standing charges, resulting in redistribution of welfare towards consumers, but does not affect commodity prices. Furthermore, retail costs and margins form a small portion of total costs of electricity, thus limiting the potential effects of increased retail competition on welfare and distribution. Model analysis shows that an increase of the number of retailers from 3 to 4, for instance, leads to a decrease of the standing charge of approximately 14%, boiling down to 1 percent of total electricity expenditure for an average household.

The impact of unbundling on further consolidation in the Dutch retail market is probably negligible because of the currently high level of concentration. This threat of increased consolidation is likely to be dealt with by the competition authority.

Unbundling could significantly affect wholesale competition

The impact on competition in the market for generation depends on three factors: control over the transmission grid by the distribution companies, future development of small-scale generation, and development of the North-Western European power market. If the transmission grid as from 110 kV will be separated from the distribution companies, as the Dutch government also has proposed, then further unbundling will hardly have any effect on competition on the market for large-scale generation. After all, the large-scale power plants are connected to the transmission grid, not to the distribution grid. Otherwise, the form of unbundling of the distribution firms seriously impacts the playing field between producers having a grid and producers not having a grid.

In addition, unbundling could also substantially affect the competitiveness of small-scale generators connected to the distribution network. The importance of this aspect will grow if the role of small-scale generation rises, which will be the case according to some electricity experts. In such a scenario, the role of the distribution network will be comparable to that of the current transmission network, which is an essential factor in offering equal access to generators, providing a strong argument in favour of ownership unbundling of the current distribution network.

The third factor to be mentioned here is the possible impact of unbundling on the degree of competition on the North-Western European power market. This market has shown a tendency of growing horizontal concentration. Separation of Dutch power plants from the respective network companies does, however, not necessarily imply that they all will be purchased by one

of the current dominant players in this market, resulting in an even higher level of concentration. In the broader European market, we see several other potential buyers of the Dutch generation plants after the implementation of ownership unbundling. Consequently, the effect of unbundling on the degree of competition on the European market is likely small.

Ownership unbundling creates a possibility to privatise commercial activities

Currently, public authorities own the vertically integrated energy distribution firms. As a result, commercial activities, i.e. generation and supply, are conducted by firms in public hands. For public authorities, this structure might result in politically unwanted situations, such as commercial, risky ventures conducted by publicly-owned firms. Ownership unbundling separates network and commercial activities; and enables (public) shareholders to sell their shares in the commercial firms, while retaining the shares in the network firm. Privatising commercial activities generates a more clear distinction between the role of the government and activities of market parties in the liberalised part of the industry. Under the current corporate governance structure, this benefit can only be achieved by ownership unbundling, although the integrated firms could always sell parts of their holding voluntarily. If the public shareholders would now sell the commercial parts, they need the consent of the management of the holding.

Selling commercial activities of the energy holdings to private parties could generate an additional benefit, notably making these firms more sensitive to pressure from shareholders. In the current situation, the public shareholders hardly give incentives to the management of the holdings to improve efficiency. Privatisation of commercial parts would, in other words, raise efficiency.

7.3 Costs of unbundling

Unbundling gives rise to one-off transaction costs

As unbundling involves a change in the structure of the industry, one-off transaction costs will occur. The improvement of legal unbundling would already give rise to some of these costs, as several alterations would have to be implemented. Both, Legal-Fat Plus and Ownership unbundling give rise to additional one-off transactions costs, in particular costs following from changing the cross-border leases. There is uncertainty regarding the magnitude of these costs, due to confidential information about the current contracts and uncertainty regarding the possible reaction of American investors to unbundling.

Unbundling leads to loss of economies of scope

Vertical integration of network management and supply generates positive economies of scope as some activities, such as call centres and billing, can be jointly conducted. Separating network

from supply, therefore, leads to loss of economies of scope. The respective costs already follow from implementing a stronger form of legal unbundling. Ownership unbundling raises the loss of economies of scope as also common use of non-strategic facilities, such as contracts with suppliers of office supplies, have to be cancelled. The magnitude of the additional loss of economies of scope due to ownership unbundling is likely to be fairly small as legal unbundling already separates most common activities.

Unbundling could temporarily affect investments in generation

The stronger the unbundling, the less investment in generation can be financed by using the network firm, directly or indirectly (as collateral) as a source of financial means. Consequently, unbundling could affect the financial ability of the (currently) vertically integrated incumbent firms to invest in generation. This effect is likely to be relatively small and temporary. More than 50% of all generation capacity is owned by other parties than the vertically integrated firms. As a result, total investment in power plants depends on far more factors than the financing capacities of the integrated firms.

Conclusion on ownership unbundling

Ownership unbundling likely has a number of benefits but also features the risk of high transaction costs.

- Ownership unbundling strongly increases independence of network management, fostering the focus of network companies on their direct activities. This encourages investment and innovations in the grid and hence reduces the risk of insufficient investment in networks.
- This effect is related to the improved effectiveness of regulation, enabling the regulator to acquire adequate information needed to determine appropriate access charges. Related to this, ownership unbundling increases efficiency of regulatory activity as the regulated parties have less incentives to strategically relocate costs and benefits and affect competition in the market.
- Ownership unbundling facilitates competitions in retail by tackling the potential tight oligopoly in this market, but total welfare would be hardly affected by this.
- The impact of ownership unbundling on welfare is higher if it facilitates competition in the wholesale market which mainly depends on the future development of small-scale generation and separation of the transmission grid.
- Furthermore, ownership unbundling enables privatisation of commercial activities, making them more sensitive to shareholder pressure to increase efficiency and giving current public shareholders the option to withdraw their capital from commercial activities.
- This generates a more clear distinction between the role of the government and activities of market parties in the liberalised part of the industry.
- The realisation of these results is, of course, not a free lunch. Ownership unbundling reduces economies of scope and, furthermore, creates one-off transaction costs. There is uncertainty

about the size of the one-off transaction costs caused by the impact of unbundling on the current cross-border leases.

- Unbundling may also affect investments in generation by the currently vertically integrated Dutch utility holdings, but this is unlikely to affect overall investments in power plants.

Mainly because of the uncertainty about the future role of small-scale generation and the uncertainty about the magnitude of the transaction costs related to the cross-border leases, the net effect on welfare of ownership unbundling is ambiguous.

Ownership unbundling is not the only option to realise some of the benefits mentioned above. By fierce regulatory surveillance and competition policy, competition in the retail market can be improved. Moreover, changing the corporate governance structure can give (public) shareholders the option to withdraw from risky, commercial activities. As in that case shareholders have information on the magnitude of the transaction costs they incur by unbundling a specific utility, voluntary unbundling will take place where it is efficient.

7.4 Final remarks

General lessons

When considering unbundling of a vertically integrated firm, policy makers face at least four problems. First, it is always hard to quantify benefits. Sometimes one can lean from foreign experiences, but in the absence of useful comparisons one has to rely on theoretical arguments, expert judgement and educated guesses. This may seem unsatisfactory, in particular for the parties involved, but one can not do better. Second, even if direct benefits of unbundling seem to outweigh costs, the policy maker has to assess if he wants to incur the transaction costs and risks associated with (radical) changes. These costs are also difficult to assess, in particular the risk part. Third, both on the cost side as well as on the benefit side, there are elements of political judgement. For instance, ownership unbundling creates an optimal platform for keeping the distribution in public hands, providing an extra argument for unbundling if the political forces favour public ownership of electricity distribution networks. Fourth, these kinds of changes often require trading off long and short term. Unbundling seems only wise if it creates the best market outlay in the long run. In the short run, economic (transaction) and political (fierce lobbying, impatience) costs need to be incurred.

Our conclusions on benefits and costs of ownership unbundling should thus be interpreted in the context of these four problems.

Other factors which should be taken into account

Besides the benefits and costs considered above, other factors should be taken into account. One factor is the impact of the decision on unbundling on future freedom to change policies. Contrary to the legal-unbundling options, ownership unbundling is a radical measure. The uncertainty regarding the welfare effect suggests the alternative of postponing the decision on unbundling in order to wait for more information, in particular on the development of small-scale generation and the degree to which it is encouraged or hindered by the currently legally unbundled distribution networks.

A comparable 'wait and see attitude' is now adopted by several states in the United States regarding introducing competition in the electricity industry, waiting for more evidence on effects of restructuring the electricity industry in states running at the forefront in this process. According to Joskow (2003a), experts do not agree on the most appropriate way for proceeding with structural and institution reforms. An additional argument for this attitude follows from the European perspective. None of the other EU-members has already introduced ownership unbundling or is now considering doing so. These are arguments in favour of maintaining or improving legal unbundling possibly in combination with other policy measures improving independence of network management, such as increasing the power of shareholders and improving regulation and competition policy.

On the other hand, waiting to decide creates uncertainty about the future institutional design. This could cause a hold-up problem: private firms delaying investment decisions because of the risk that the government will alter conditions affecting profitability of these investments in the future. This is an argument in favour of ownership unbundling, as that decision would strongly reduce uncertainty. However, uncertainty would also be reduced by legislation determining the legal structure for a long period of time.

Another factor which should be taken into account is the relationship between unbundling and privatisation. If the government were to choose for legal unbundling and subsequently privatise the vertically integrated companies, it loses the chance to split privatised companies in the future if such a measure appears necessary. In addition, given the reservations of the politicians regarding privatisation of the infrastructure, improving legal unbundling instead of imposing ownership unbundling hinders the possibilities to privatise commercial activities. This is also an argument in favour of ownership unbundling. However, improving the corporate governance structure can give the current public shareholders the power to sell commercial businesses of the utility holdings.

From these considerations, another route regarding the utility industry might be an option. This route consists of improving the current legal unbundling structure and improving the corporate

governance structure. When these measures appear not to be sufficient for the development of small-scale generation and the privatisation of commercial activities, ownership unbundling is the logical next step.

References

Ackermann, T. G. Andersson and L. Söder, 2001, Distributed generation: a definition, *Electric Power Systems Research*, 57, pp. 195-204.

Armstrong, M., C. Doyle and J. Vickers, 1996, The access pricing problem: a synthesis, *The Journal of Industrial Economics* vol. XLIV, pp. 131-50.

Awerbuch, S. and A. Preston (eds.), 1996, *The Virtual Utility*, Kluwer Academic Publishers, Boston.

Baumol, W.J., J.A. Ordover and R.D. Willig, 1997, Parity pricing and its critics: A necessary condition for efficiency in the provision of bottleneck services to competitors, *Yale Journal on Regulation* vol. 14, pp. 145-63.

Beard, T.R., D.L. Kaserman and J.W. Mayo, 2001, Regulation, vertical integration and sabotage, *The Journal of Industrial Economics* vol. XLIX(3) pp.319-33

Bijl, P. de, 2004, Structural Separation and Access in Telecommunications Markets, TILEC Discussion Paper, Tilburg University, DP 2004-011.

Bureau of Transport and Regional Economics, 2003, Rail Infrastructure Pricing: principles and practice, Report 109.

Burkart, M., D. Gromb and F. Panunzi *et al.*, 1997, Large shareholders, monitoring and the value of the firm, *The Quarterly Journal of Economics*, pp. 693-728.

Canoy, M. and S. Onderstal, 2003, Tight Oligopolies; In search of Proportionate Remedies, CPB, The Hague.

Cate, A ten, and M.G. Lijesen, 2004, The Elmar model: output and capacity in imperfectly competitive electricity markets, CPB Memorandum 94.

CBS, 2005, Productie Middelen Elektriciteit 2002, http://statline.cbs.nl.

CPB, 1997, Challenging Neighbours; Rethinking German and Dutch Economic Institutions, Springer Verlag, Berlin - Heidelberg.

CPB and OCFEB/SEOR-ECRi, 2004, Better safe than sorry, Reliability policy in network industries. CPB Document 73. The Hague.

Connor P. and C. Mitchell, 2002, A Review of Four European Regulatory Systems and Their Impact on the Deployment of Distributed Generation, University of Warwick. http://www.sustelnet.net/docs/wp2/wp2_final_report.pdf

Damme, E. van, and A. Kanning, Opsplitsing van regionale energiebedrijven: Onderzoek voor de Provincie Noord-Brabant, Universiteit van Tilburg, April 28, 2004.

Damme, E. van, and G. Zwart, 2003, The liberalised Dutch green electricity market: lessons from a policy experiment, De Economist, 151(4), 389-413.

Danish Electricity Supply Statistical Survey 2003.

Denis, D.J., D.K. Denise and A. Sarin, 1997, Agency problems, equity ownership, and corporate diversification, *Journal of Finance* 52(1), pp 135-60.

Domah, P. and M. Pollitt, 2000, The Restructuring and Privatisation of Electricity Distribution and Supply Businesses in England and Wales: A Social Cost Benefit Analysis, Cambridge Working Papers in Economics 0007, Department of Applied Economics, University of Cambridge. Cambridge, UK.

DTe, 2004a, Advies onafhankelijk netbeheer, 15 april.

DTe, 2004b, Advies taken en activiteiten van de netbeheerder na splitsing, 16 december.

DTe, 2004c, Standpuntendocument Decentrale Opwekking, Gevolgen van decentrale opwekking voor de regulering van elektriciteitsnetwerken, The Hague (in Dutch). http://www.dte.nl/images/12_18957_tcm7-4477.pdf

EC, 2004, Third benchmarking report on the implementation of the internal electricity and gas markets.

EC, 2005, Fourth benchmarking report on the implementation of the internal electricity and gas markets.

ECN, RIVM, 2005, Referentieraming Energie en Emissies 2005-2020, Petten/Bilthoven, ECN-C--05-018.

Economides, N., 1998, The incentive for non-price discrimination by an input monopolist, *International Journal of Industrial Organization* 16: 271-84.

Energiened, 2003, Energie Nederland Special, April 2003.

EIA, 1996, *Privatization and the Globalization of Energy Markets*, DOE/EIA-0609(96), Washington DC, http://tonto.eia.doe.gov/FTPROOT/financial/060996.pdf

Fraquelli, G., M. Piacenza, and D. Vannoni, 2004, Scope and scale economies in multi-utilities: evidence from gas, water and electricity combinations, Applied Economics, 36, pp. 2054-2057.

Gilsdorf, K. 1995. "Testing for Subadditivity of Vertically Integrated Electric Utilities." *Southern Economic Journal*, 62, 126-138.

Giulietti, Waddams Price, Waterson, 2006, Redundant Regulation? Competition and Consumer Choice in Residential Energy Markets, Economic Journal, forthcoming.

Green, R., 2003, Retail Competition and Electricity Contracts, CMI working paper 33, Cambridge, UK.

Hart, O., A. Shleifer, and R. Vishny, 1997, The Proper Scope of Government: Theory and Application to Prisons, *Quarterly Journal of Economics* 112, 1091-1126.

Jamasb, T. and M. Pollitt, 2005, Electricity Market Reform in the European Union: Review of Progress toward Liberalisation & Integration, University of Cambridge, March 24.

Jensen, M.C. and W.H. Meckling, 1976, Theory of the Firm Managerial Behavior, Agency Costs, and Ovwnership Structure, *Journal of Financial Economics*, 11, pp. 5-50.

Joskow, P., 2003a, The difficult transition to competitive electricity markets in the U.S., The Cambridge-MIT Institute, CMI-Working Paper 28.

Joskow, P., 2003b, Vertical integration, forthcoming in *Handbook of New Institutional Economics*, Kluwer.

Joskow, P., 2004, Transmission Policy in The United States, AEI Brookings Joint Center for Regulatory Studies, Washington D.C.

Joskow, P., and J. Tirole, 2004, Retail Electricity Competition, mimeo, MIT and IDEI.

Karpoff, J.A., 2001, Public versus Private Initiative in Arctic Exploration: The Effects of Incentives and Organizational Structure, *Journal of Political Economy*, 109, pp. 38-78.

KEMA, 2004, Transportnetten in Nederland: 50 kV en hoger, report commissionned by TenneT.

Kittelsen, S., 1993, Stepwise DEA. Choosing variables for measuring technical efficiency in Norwegian electricity distribution. Memorandum 6/93 from the Department of Economics, University of Oslo.

KPMG, 2004, Onderzoek modelovereenkomst netbeheerder en leverancier binnen het leveranciersmodel, in opdracht van DTe, dossiernummer 101819.

Künneke, R.W., 2003, Innovations in electricity networks, paper presented at the Research Symposium European Electricity Markets, The Hague, September 2003

Laffont, J.-J. and J. Tirole, 1993, A Theory of Incentives in Procurement and Regulation, MIT Press, Princeton.

Laffont, J.-J. and J. Tirole, 1994, Access Pricing and competition, *European Economic Review*, vol 38, pp. 1673-710.

Lijesen, M., 2002, End User prices in liberalised energy markets, CPB Discussion Paper 16.

Lijesen, M.G. and B. Vollaard, 2004, Capacity to spare? A cost-benefit approach to optimal spare capacity in electricity production, CPB Document 60.

London Economics, 2004, Structure and Functioning of the Electricity Market in Belgium in a European Perspective, final report to Le conseil général de la Commission de Régulation de l'Electricité et du Gaz.

Mandy, D.M., 2000, Killing the goose that may have laid the golden egg: only the data know whether sabotage pays, *Journal of Regulatory Economics* 19(2): 157-72.

Markiewicz, K., N.L. Rose, and C. Wolfram, 2004, Does Competition Reduce Costs ? Assessing the impact of Regulatory Restructuring on U.S. Electric Generation Efficiency, NBER Working Paper no. 11.001, December.

Matsusaka, J.G., 2001, Corporate Diversification, Value Maximization, and Organiszational Capabailities, *Journal of Business*, 74(3), pp. 409-31.

Ministerie van Economische Zaken, 2004, Aanpak splitsing energiebedrijven, 11 oktober.

Mota, R.L., 2004, Comparing Brazil and USA electricity distribution performance : what was the impact of privatisation?, Cambridge Working Papers in Economics 0423, Department of Applied Economics, University of Cambridge. Cambridge, UK.

Newbery, D.M., 2002a, Issues and Options for Restructuring Electricity Supply Industries, University of Cambridge, CMI Working Paper 01.

Newbery, D.M., 2002b, Regulatory Challenges to European Electricity Liberalisation, University of Cambridge, CMI Working Paper 12.

NRC, 2005, Shell verkoopt Energiecentrales, 20 april 2005. (in Dutch).

Ofgem, 2004a, Financial ring-fencing for new and existing independent gas transporters. Initial proposals, 12 November.

Ofgem, 2004b, Electricity Distribution Price Control Review: Final Proposals, November 2004.

Ofgem, 2005, Distributed Generation, Incentive Innovation Funding, Incentive Registered Power Zones, Regulatory Instructions and Guidance, Version 1.

OECD, 2001, Restructuring Public Utilities for Competition. Competition and regulatory reform.

OECD, 2003, The benefits and costs of structural separation, Working Party No.2 on Competition and Regulation, DAFFE/COMP/WP2(2003)2, January 10.

OECD, 2004, Structural reform in the rail industry: should train operators be separated from the provision of the track infrastructure?, Working Party No. 2 on Competition and Regulation, DAF/COMP/WP2(2004)6, December.

Pollitt, 1995, Ownership and performance in electric utilities, Oxford University Press, Oxford, UK.

Pollitt, 1999, A survey of the liberalisation of public enterprises in the UK since 1979, Cambridge Working Papers in Economics 9901, Cambridge, UK.

Pollitt, 2004a, Electricity Reform in Chile: Lessons for Developing Countries, CMI working paper 51, Cambridge, UK.

Pollitt, 2004b, Electricity Reform in Argentina: Lessons for Developing Countries, CMI working paper 52, Cambridge, UK.

PWC (2004) Ring-fencing of municipal electricity businesses, practical first steps, presentation of February 20, 2004.

Sequoia, 2004, Valuation and Financing of Unbundled Energy Companies, presentation at the CIEP Energy Market Seminar "Ownership valuation of Electricity and Gas Companies", The Clingendael Institute, February 9, 2005,

Steiner, F., 2000. Regulation, industry structure and performance in the electricity supply industry. OECD Economics Department Working Paper, ECO/WKP 11.

Timpe, C. and M.J.J. Scheepers, 2003, A look into the future: scenarios for distributed generation in Europe, Öko-Institut/ECN, http://www.ecn.nl/docs/library/report/2004/c04012.pdf

Tirole. J., 1988, The Theory of Industrial Organization, Cambridge, Massachusetts.

Tweede Kamer der Staten Generaal, 2004-2005, Liberalisering energiemarkten, 28 982, nr. 29.

Varian, Hal. R., 2003, Intermediate Microeconomics; a modern approach, W.W. Norton & Company, New York, London.

Wals A., E. Cross and E. van Sambeek, 2003, Review of current electricity policy and regulation - Dutch Study Case, ECN, http://www.ecn.nl/docs/library/report/2003/i03005.pdf

Woolf, F. and J. Halpern, 2001, Integrating Independent Power Producers into Emerging Wholesale Power Markets, Policy Research Working Paper 2703, World Bank, Washington D.C.