Market Dominance and Market Power in Electric Power Markets

– A Competition Policy Perspective

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Preface

Market dominance and market power in electric power markets are issues of major interest from a competitive policy perspective. Electricity as a commodity has a number of special characteristics which make analysis of market power particularly demanding and which suggest that the analyst should look outside the normal toolbox when he or she assesses market power.

This is the background to the Swedish Competition Authority's request to Professor Emeritus Einar Hope to make a report on electric power and competition policy. I'm convinced that the report will be a valuable contribution in the debate on competition policy in electric power markets.

It's the author himself that is responsible for the conclusions and the analysis in the report. Thus the conclusions need not necessarily reflect the Swedish Competition Authority's findings.

Stockholm, June 2005

Claes Norgren
Director-General

Author's preface

I am grateful to the Swedish Competition Authority for initiating this project on competition policy perspectives on market dominance and market power in electric power markets, and inviting me to undertake the study. Competition policy aspects of market dominance and market power have been relatively little researched compared with the plethora of studies that have accumulated over the years on market power issues in electricity markets, and therefore deserve, in my opinion, more attention from a research perspective.

According to the contract with the SCA, the project should be limited to *unilateral* market dominance and unilateral market power issues and it should be oriented towards competition policy perspectives on, and implications of, such issues. However, due to market characteristics of electricity as a commodity and the way electricity markets function, *collective* market dominance and collective market power may also be an important competition policy concern with regard to electricity markets. Sometimes it may even be difficult in practice to distinguish between the two market dominance and market power concepts. Therefore, collective market dominance and market power issues are briefly touched upon at relevant points in the study.

The SCA appointed a Reference Group for the project, consisting of Stig-Arne Ankner, Lars Bergman, Mats Bergman, Mats Nilsson, Beret Sundet, and Lars Sørgard as members. I would like to thank the members of the Reference Group for substantive and detailed comments on preliminary drafts of the report, which have contributed to improving the presentation and the argumentation. I am indebted to my colleague, Arne-Christian Lund, for helpful discussions on potential market power issues arising from the interplay of physical and financial markets for electricity. I would also like to thank Kristian Viidas for handling the administrative part of the project so efficiently and pleasantly.

Bergen, April 2005

About the author

Einar Hope is since mid-2004 Professor Emeritus at the Norwegian School of Economics and Business Administration (NHH) in Bergen. There he was Professor of Energy Economics from 1999, in a chair donated to the NHH by the Norwegian petroleum company Statoil. During the period 1995-1999 he was Director General of the Norwegian Competition Authority. Before that he built up and headed three applied research organisations which were established from 1975 onwards and affiliated with the NHH, i.e. the Institute of Industrial Research (IØI), the Centre for Applied Research (SAF), and the Foundation for Research in Economics and Business Administration (SNF), respectively.

Most of his scientific work lies in the interface between Industrial Organisation, Energy Economics, and Competition Policy. He was instrumental in the market and regulatory design of Norwegian electricity market reform and its implementation from 1988 onwards. He has also chaired or been a member of a number of governmental committees on competition and regulatory policy issues and reforms.

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Executive summary

This study gives a competition policy perspective on market dominance and market power in electric power markets. Few issues in the electricity industry have caused more controversy and concern than the issue of market power, in the wake of the market liberalisation reforms and the restructuring process in the industry in a number of countries in recent years. What are the competition policy issues, challenges, and concerns that arise from the special characteristics and properties of electricity in market and competitive terms, and how should they best be tackled and resolved from a competition policy perspective? In particular, should special market dominance criteria and tests be applied in competition policy to account for the special market features of electricity, or should electric power markets be handled as any other market with regard to market dominance and market power? In the competition policy context of the European Union and jurisdictions with similar legislation, market dominance and market power become particularly significant, because, according to EU competition legislation, exercising market power in a way that amounts to abuse is illegal.

The focus of this study is on unilateral market dominance and unilateral market power, i.e. market power exerted independently by one dominant firm, as distinguished from collective market power, or collusion to exercise market power, by several firms. Electricity markets are susceptible to collective or collusive market power exercise because of their market characteristics, in addition to being susceptible to the exercise of unilateral market power. Consequently, both market power concepts should be considered when undertaking competition policy analyses of electricity markets. Collective market power is briefly touched upon at relevant points and connections in the report, but the focus is, as said, on unilateral market dominance and market power.

Some of the most important market characteristics and properties of electricity are:

- Electricity cannot be stored (except for water storage in hydro power based systems), and is a homogeneous product in market terms.

- Supply and demand of electricity have to be balanced instantaneously by a system operator to avoid system breakdowns or delivery fallouts.
- Demand for electricity is very inelastic in the short run. Demand responsiveness of consumers is limited and occurs generally with a time lag, because there is limited scope for real time pricing, particularly for small consumers, at least at present state of the art.
- Supply of electricity is also rather inelastic in the short run, particularly when approaching capacity constraints in production.
- Production of electricity is capital intensive and investments in capacity extensions are typically lumpy, irreversible, and long-lived. There are fairly long gestation periods for new investment, with implications, e.g., with regard to contestable entry to the market.
- The electricity transmission network is of fundamental importance as an instrument or facilitator for decentralised, market based transactions and the efficient functioning of electricity markets. Thus, capacity constraints in transmission become an important factor to consider in the definition and delineation of relevant markets in competition analysis.

Market dominance is a “dominant” feature of most electric power markets, partly because of the monopolistic structure of the industry in many countries before market liberalisation, and insufficient divestiture of the industry as part of the market reforms, and partly because of increased concentration in some markets through market restructuring by mergers and acquisitions after liberalisation. This typical market structure, combined with the special market characteristics of electricity, make electricity markets potentially exposed and vulnerable to the exercise of market power, unilaterally as well as collectively.

In the study, a distinction is made between the potential for the exercise of market power and the actual exercise of market power. The potential for market power exertion should be considered in terms of the incentives for firms actually to exploit their dominant market position in the short and long runs, and their market strategic actions under competition. Therefore, integrating an analysis of the incentives of firms and their strategic market behaviour into the competition analysis of market power is important. A relatively long list

of potential sources of market power is discussed in chapter 3. A listing of potential sources of market power should be an integral part of the market monitoring and regulatory oversight systems for electricity markets for detecting and preventing market power abuse. This is discussed in chapter 6.

Another distinction is made between the exercise of market power as an aspect of regular market transactions and the functioning of markets on the one hand and the actual abuse of market power according to legal definitions and standards on the other. Similarly, competitive market pricing and pricing which results from the exercise of market power must be distinguished. A given price increase can, under certain conditions, be the efficient competitive response of the market to changing conditions, e.g. a sudden and unexpected increase in peak demand at capacity limits, and should not necessarily be associated with market power.

The standard approach in competition policy analysis for detecting and enforcing possible breaches of prohibitions in competition law - in this context the abuse of a dominant market position unilaterally to exercise market power - is a three step procedure: a) defining and delineating the relevant market(s), b) defining and measuring unilateral market dominance, and c) determining whether or not an abuse of a dominant position actually has taken place. Thus, a *structural* market analysis approach, in terms of empirical concepts and quantitative measures of relevant markets and market dominance, is used to analyse a market *conduct* issue, i.e. the abuse of a dominant position by exercising market power.

Several issues and problems with a structural approach to the analysis and enforcement in competition policy of the abuse of a dominant position are discussed in chapter 4. In my opinion, the most important objections are that the analysis may tend to focus the attention in competition policy analysis more on market structure than on market conduct/actual abuse, and that structural criteria and measures may not be sufficiently adjusted over time to reflect changing market circumstances. In particular, I argue against a policy of applying special unilateral market dominance criteria and tests to electricity markets, e.g. in terms of lower market concentration threshold values than for other markets, because of the special characteristics of electricity markets. Rather, unilateral market dominance and the potential for exercising unilateral market power should be considered and accounted for in the

definition and delineation of relevant market(s) in competition policy analysis, e.g. by considering the degree of permanence of temporary network capacity constraints, the actual duration of a binding network constraint, and how severely a network constraint may affect electricity trade and consumption in the market area defined by the constraint. Such an approach, on a case-to-case basis, is also better suited to take into consideration the fact that, under some circumstances, even a relatively small electric power producer, when being a marginal producer, with a market share far below what is generally considered to qualify for unilateral market dominance in competition policy, may be in a “dominant” position to exercise market power to the detriment of economic efficiency. However, there is definitely a need to develop specific measures and indicators suited to reflect important market power issues in electricity markets, e.g. in relation to market power issues arising from transmission network constraints.

However, even though I argue against special and stricter unilateral dominance standards for electricity markets than for markets in general, as above, a more restrictive competition policy may be warranted for electricity markets than for other markets when considering *changes* in the market structure, particularly with regard to market restructuring, leading to increased concentration, in the form of mergers and acquisitions between electricity companies. This can be ascribed to the fact that market concentration already is fairly high in most electricity markets, that economies of scale do not seem to be wide-spread in electricity generation and retail activities, and that the scale potential generally seems to be exploited at the present level of firm size and concentration. Thus, the economies defence in merger policy analysis is generally weak, while the effects on consumer surplus of potential market power exercise from increased market concentration is generally strong, given the inelastic demand for electricity. Due to the different cost structures and production properties of thermal versus hydro power generation, special caution should be exercised in competition policy with regard to mergers between thermal and hydro power producers, which may potentially exacerbate market power issues by taking advantage of the combined properties of the two forms of production.

The special characteristics and properties of electricity markets make it difficult for competition authorities to document unequivocally *ex post* that an infringement of the prohibition against the abuse of a dominant market position has taken place, and even more so for hydro power than for thermal power markets. Therefore, the question arises whether a

market monitoring and regulatory oversight system can be designed and operationalised for detecting and preventing *ex ante* the exercise of market power to the detriment of economic efficiency, under unilateral as well as collective dominance, before it comes to actual abuse, and subsequent control and enforcement *ex post* in competition policy.

In chapter 6, I argue for establishing such a market monitoring and regulatory oversight system for electricity markets, as an integral part of an overall regulatory system for the handling of the important issue of market power in those markets from a competition policy perspective. More specifically, I argue for the establishment of a permanent market monitoring and regulatory oversight committee for electricity markets, headed by the competition authority, and consisting otherwise of representatives from the market organiser (power exchange), the transmission system operator, the sector-specific electricity regulator, and the financial regulator, and possibly also with representation from the electricity industry, for the continuous surveillance and monitoring of electricity markets with the objective of detecting and preventing the abuse of market power.

For other elements and proposals for the design and enforcement of a competition policy better equipped to handle issues of market dominance and market power in electricity markets, the reader is referred to the main report, particularly to chapter 7.

A practitioner of competition policy may look for precise answers and detailed guidelines in the report for the practical handling in competition policy of issues of market dominance and market power in electric power markets. From such a perspective the practitioner may be disappointed, and may even be left with more questions than answers after reading it. I am afraid, however, that there are no easy answers or solutions to the complex issues of market dominance and market power in the special context of electricity markets, other than through well-founded and detailed theoretical and empirical analyses, built upon a thorough knowledge of the electricity industry and an understanding of the way electricity markets function. Hopefully, this study will contribute to shedding some light on these complex issues and on the need for supplementing the “box of tools” in competition policy with analytical approaches and instruments tailored to improve the economic performance of electricity markets by mitigating the exercise of market power under market dominance.

1 Introduction

Few issues in the electricity industry have caused more controversy and concern than the issue of market power, in the wake of the market liberalisation reforms and restructuring process in the industry in a number of countries in recent years. The market power issue has stimulated a considerable amount of theoretical and empirical research, as well as an extensive and at times heated public debate.

The research has contributed to clarifying the concept and diagnosis of market power in the electricity industry and has also documented instances of outright abuse of market power by market players, unilaterally as well as collectively.[1] However, misconceptions and misunderstandings of the nature, extent, consequences, and implications of market power in the industry still seem to obscure the issue. In particular, the implications of market power for competition in the electric power markets in the short and long runs, and for the design of a competition policy for the effective handling of market power by competition authorities are insufficiently understood and resolved.

In this study we will take a competition policy perspective on market power in the electric power industry. The focus will be on *unilateral* market power, i.e. market power exerted independently by one firm, as distinguished from collective market power or collusion to exercise market power by several firms. Unilateral market power is closely linked to the concept of unilateral market dominance in competition policy in general, and in EU competition policy and law, and similar legislation in other jurisdictions, in particular. A central question to be discussed is whether there are special technical and economic characteristics associated with the electricity industry and electricity as a commodity, which make electric power markets particularly exposed or vulnerable to the exercise of unilateral market power, to the detriment of competition policy objectives. If so, what are those characteristics, how do they manifest themselves in terms of competition, and what are their implications for the design and enforcement of an effective competition policy for the electric power industry?

[1] See the survey of the literature in chapter 5.

A related question to be asked is whether the characteristics and competitive conditions of an electric power market would justify a different set of market dominance criteria and threshold values than the standard criteria and values used in competition policy for defining market dominance and testing for market power in other markets. In particular; should lower threshold values of market concentration be assigned for electric power markets than for other markets, because of the special characteristics of the former?

The electricity industry has been transformed from a strictly regulated and centralised structure to a liberalised, market based, decentralised, and reregulated system during the last decade or so in many countries. An alternative question is whether there are, indeed, some inherent market characteristics and competition properties of electricity markets that are at the root of the competition policy concern with regard to market power in the industry or whether the market power issue should be considered as a transitory phenomenon during the transition period from regulation to competition, combined with an imperfect regulatory system for the surveillance and control of market power during that period.[2]

The policy implications of the two alternative "explanations" would, of course, be rather different. Under the market characteristics perspective, the policy emphasis would be on redefining or adjusting competition policy to take proper account of those characteristics, e.g. by defining special market dominance criteria and tests for electricity markets, while the second perspective would require that policy attention be given to the proper design of a market architecture to make the transition from strict regulation to effective competition as smooth as possible, and then subject the electricity markets to regular competition policy application when the transition period is over.

In practice, it may be difficult to distinguish succinctly between the two perspectives or approaches to policy, nor it is necessarily appropriate to do so from a policy point of view. Most electricity markets can still be classified as being under transition and even in "mature" markets new competition issues with regard to market power arise, e.g. in relation to

[2] The majority of empirical studies of market power has been undertaken for the California electricity market; see chapter 5. The California electricity market reform has been ridden by serious problems from the very beginning, partly as a consequence of bad market design and implementation, and partly by badly designed and enforced regulatory and competition policies. It is therefore a question as to what extent the California experience can be generalised to other market and policy conditions with regard to market power in electricity markets.

investment market design for the optimal capacity expansion of the electricity system. There are also, undoubtedly, some special features of electricity and electricity markets that have to be taken into account in competition policy design and application. Thus, the question is more a matter of degree: i.e. how "special" are electricity markets in market and competition terms to warrant a "special" competition policy for the electricity industry?

In chapter 2 we define some basic competition law and policy concepts, in particular the concepts of market dominance and market power, and develop a general framework of analysis for the study. In chapter 3 two distinctions are made: a) between potential sources of unilateral market power and the incentives firms can have to exercise it, and b) the actual exercise of market power; c) between the exercise of market power as an aspect of regular competitive conditions in markets, and d) the abuse of market power under market dominance in electric power markets, as defined in competition law and policy.

Chapter 4 contains a discussion of properties and limitations of indicators and indices applied in competition policy analysis for measuring market dominance quantitatively in market structural terms, and problems and issues with regard to applying a structural approach to the analysis of a market conduct issue, i.e. the abuse of a dominant position by exercising market power to the detriment of economic efficiency. Chapter 5 is devoted to a survey of the literature on market dominance and market power in electric power markets and a brief discussion of some competition policy issues arising from the survey, while chapter 6 discusses the relationship between the enforcement task in competition policy of documenting and sanctioning *ex post* an actual abuse of a dominant position. It also takes up the role of competition policy in the *ex ante* design and implementation of a market monitoring and regulatory oversight process for detecting and preventing the potential exercise of market power. In the final chapter, chapter 7, some policy implications for competition policy with regard to market dominance and unilateral market power in electric power markets are discussed.

2 Market power, market dominance, and competition policy: Some preliminaries

In this chapter we will briefly define the concepts of market power and market dominance within a competition policy framework. This framework also necessitates a brief exposé on competition policy objectives under short and long run considerations.

2.1 Market power

A standard economic definition of unilateral market power is the ability of a firm to raise its product price profitably above some competitive level – the benchmark price.[3] The benchmark price is typically referred to as the (short run) marginal cost of the firm, and so market power is usually defined as the difference between the product price charged by a firm and its marginal cost of production of the product.[4] This is illustrated in Figure 1, where the monopoly price is set where marginal cost equals marginal revenue.

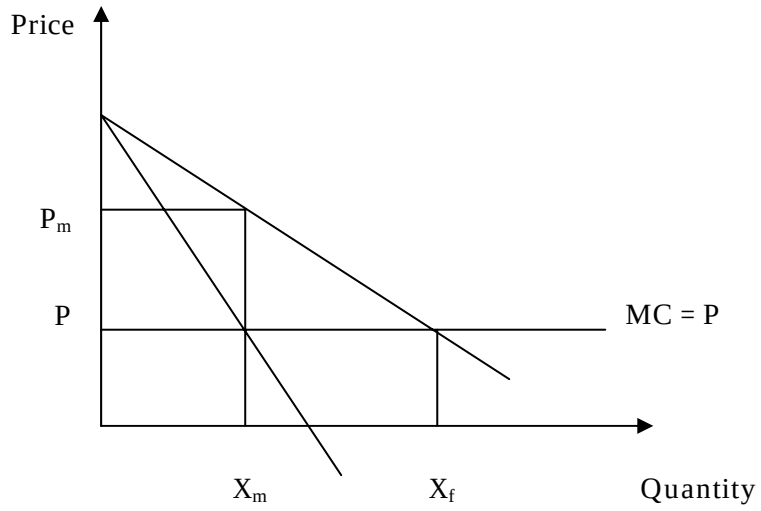

Figure 1. Short run pricing under unilateral market power (monopoly)

[3] Motta (2004), p. 40.

[4] For empirical measures and indicators of market power, see chapter 4.

For competition policy purposes, this benchmarking approach to market power suffers from two problems or shortcomings. Firstly, marginal cost can be difficult to define and measure precisely in practice. Secondly, and more importantly, the market structure and competition conditions of the idealised model of perfect competition, on which the benchmark is based theoretically, are seldom completely fulfilled in practice. If, therefore, market power is defined as the ability to price above marginal cost, then virtually all firms have at least some degree of market power, making the definition not a particularly useful concept for practical competition policy applications.

A policy oriented definition is given by Bishop and Walker (2002): "Market power is defined as the ability of a firm or group of firms to raise price, through the restriction of output, above the level that would prevail under competitive conditions and thereby to enjoy increased profits from the action". Werden (1996) gives a similar definition: "Market power on the part of the sellers is the ability profitably to maintain prices above competitive levels by restricting output below competitive levels".[5] Definitions along these lines are also contained in policy documents or competition policy guidelines by competition authorities.[6]

There are three elements or conditions to be noticed in this definition of market power: a) restriction of output below that which would be realized under effective competition, b) effective competition as the benchmark for the exercise of market power, and c) a profitable outcome of a price increase. Each of these conditions has to be specified further in relation to market power as a competition policy issue or concern. The latter condition would e.g. depend on the own-price demand elasticity of the residual demand curve facing the firm.[7] Under b), the benchmark for effective competition first has to be established, and then the question be asked whether the firm would be in a position persistently to price at a level above that which would prevail under conditions of effective competition. When it has been determined unequivocally that the firm is in such as position that it can potentially exercise

[5] In a discussion of competition policy in a game-theoretic context, Louis Phlips argues that reaching "a competitive Nash equilibrium in a single-shot game is the best antitrust policy can hope for in oligopolistic markets. ....Therefore, if normal competition is the objective of antitrust policy, it should be defined as and have the properties of a competitive Nash equilibrium." Phlips (1995, p.11). See also Phlips (1998, Part III).

[6] For formulations, see e.g. Bishop and Walker (2002), chapter 3.

[7] A characteristic of the demand for electricity is a very low demand elasticity, at least in the short run; see chapter 3.

market power, an additional question should be asked whether the firm has the incentives to actually exercise its power.[8]

2.2 Market dominance

The concept of market dominance is not as well-founded a concept in economic theory as market power, but is a term used in European competition law. Article 82 of the EC Treaty states:

> "Any abuse by one or more undertakings of a dominant position within the common market or in a substantial part of it shall be prohibited as incompatible with the common market in so far as it may affect trade between Member States.
> Such abuse may, in particular, consist in:
>
> a) directly or indirectly imposing unfair purchase of selling prices or unfair trading conditions;
> b) limiting production, markets or technical development to the prejudice of consumers;
> c) applying dissimilar conditions to equivalent transactions with other trading parties, thereby placing them at a competitive disadvantage;
> d) making the conclusion of contracts subject to acceptance by the other parties of supplementary obligations which, by their nature or according to commercial usage, have no connection with the subject of such contracts."

The list of possible abuses in Article 82 is not exhaustive, but just gives some typical examples.

Article 82 mentions "one or more undertakings", thus the distinction between unilateral and collective dominance.

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[8] It may be argued that competition authorities should not be concerned with incentives to compete when analysing market power, but only with the objective market conditions for the potential exercise of market power. Still, it is the actual use or abuse of market power that should be of competition policy concern, as discussed below. An incentive-based approach to competition policy analysis can in its own right shed light on competition and market power issues and thus broaden the analytic framework and the "box of tools" of competition policy. For further discussion, see chapter 3. See also the discussion of market dominance in chapter 4.

It is important to emphasise that it is not the dominant position as such, or the creation of a dominant position, which is forbidden according to Article 82, but the actual abuse of a dominant position. A two-way dominance test has therefore to be performed by competition authorities according to EU competition law; first to establish that a dominance position actually exists, defined by some criteria, and then determine whether the firm in question has used its dominant position to engage in abusive behaviour.

The first part, the definition of a dominant position, was established by the European Court of Justice in *United Brands v Commission*.[9] This is still the point of reference for a legal definition of dominance. The ECJ stated:

> "The dominant position thus referred to (by Article 82 (then 86)) relates to a position of economic strength enjoyed by an undertaking, which enables it to prevent effective competition being maintained on the relevant market by affording it the power to behave to an appreciable extent independently of its competitors, its customers and ultimately of the consumers. Such a position does not preclude some competition, which it does where there is a monopoly or quasi-monopoly, but enables the undertaking, which profits by it, if not to determine, at least to have an appreciable influence on the conditions under which that competition will develop, and in any case to act largely in disregard of it so long as such conduct does not operate to its detriment."

When it comes to the definition of abuse of a dominant position, the *Hoffmann-La Roche v Commission* case is still the reference case in European case law. There the ECJ stated:[10]

> "In prohibiting any abuse of a dominant position on the market .....Article 8(2) covers practices which are likely to affect the structure of a market where, as a direct result of the presence of the undertaking in question, competition has been weakened and which, through recourse different from those governing normal competition in products or services based on trader's performance, have the effect of hindering the maintenance or development of the level of competition still existing on the market."

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[9] Case 27/76 *United Brands Co. and United Brands Continental BV v Commission*. ECR 207, 1978.

[10] Case 81/76 *Hoffmann – La Roche v Commission*. ECR 461, 1979.

It is not easy to translate the legal definitions of dominance and abuse into economic terms and give precise economic meaning to concepts like “normal competition”, “the power to behave to an appreciable extent independently of its competitors, its customers and ultimately of the consumers”, etc.[11] Two questions ought particularly to be addressed: a) the relationship between market dominance and market power, and b) a benchmark or criterion for the abuse of a dominant position in relation to “normal competition”.

The relationship between market dominance and market power again raises two questions; firstly, how to express and measure market dominance empirically in competition policy analysis, and secondly, to transform measures of market dominance into indicators of the strength of market power that a dominant firm could potentially exercise. Can threshold values, e.g. in terms of market shares be defined and empirically implemented, at least as a screening device for competition authorities in the handling of market dominance cases, so that below certain values dominance can be considered to be of no concern for competition and competition policy, while above certain thresholds a closer inspection and analysis of market power is warranted? If so, is there a linear relationship between market dominance and market power above a certain minimum threshold value, so that e.g. a 70 per cent market share as a dominance test is 20 percentage points more “serious” in market power terms than a 50 per cent market share, or is the relationship a more complicated one? In particular, with regard to electric power, will special market dominance tests have to be developed to account for the special characteristics of such markets, as referred to in the Introduction? The assessment of unilateral market power in the electric power industry is the topic of chapters 4 and 5.

The benchmark for the abuse of a dominant position should be sought in the objectives of competition policy, to be discussed below. A fundamental question is whether a total welfare standard could be applied in competition policy or whether a weighting of consumer interests against producer interests should be done.[12] If preference is given to the welfare of consumers, abuse of a dominant position can be defined as a form of market behaviour by a dominant firm that significantly reduces consumer welfare, relative to an alternative form of behaviour under “normal competition”.

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[11] For a discussion, see e.g. Motta (2004), chapter 1, and Bishop and Walker (2002), chapter 6.

[12] For a discussion, see Motta (2004), chapter 1, and Ekeberg et al (2004).

Documenting that abuse of a dominant position has actually taken place in competition cases is not normally an easy task for a competition authority and it may be particularly difficult in electricity markets; see chapters 4 and 5. The question of abuse has to be determined taking into account the specific circumstances of specific cases. Therefore a case-by-case approach should generally be applied in market dominance cases. In particular, it is generally not possible to infer, e.g. according to some simple "linearity" principle, that the abuse of a dominant position is more likely, or more serious in welfare terms, under relatively strong market dominance than under a relatively less dominant position. However, because of the difficulty in proving conclusively that abuse of a dominant position has actually taken place in practice, recourse to market dominance tests is often taken in competition policy instead of testing explicitly for abuse. As a corollary, modes of competitive behaviour, e.g. aggressive pricing strategies, may be tolerated by competition authorities if exercised by a non-dominant firm, while not necessarily by a dominant player in the market, and without necessarily documenting that actual abuse has taken place in the latter case.[13]

The discussion above relates primarily to unilateral market dominance and unilateral market power under static conditions, i.e. for a given market structure. Mergers and acquisitions between firms will change the market structure and may contribute to creating or strengthening a dominant position. Therefore merger and acquisition policy should be considered an integral part of competition policy with regard to market dominance in a comparative-static or dynamic policy setting. In the new EU Merger Regulation adopted by the Commission in 2004, Article 3 (2 and 3) states, respectively:[14] 2. "A concentration which would not significantly impede effective competition in the common market or in a substantial part of it, in particular as a result of the creation or strengthening of a dominant position, shall be declared compatible with the common market."
3. "A concentration which would significantly impede effective competition in the common market, or in a substantial part of it, in particular as a result of the creation or strengthening of a dominant position, shall be declared incompatible with the common market."

[13] An actual case in mind could be the surveillance by the Norwegian Competition Authority of the dominant airline company SASBraathens on predatory pricing against the rival company Norwegian on the domestic Norwegian market for air transport and services.

[14] Council Regulation No 139/2004 of 20 January 2004 on the control of concentrations between undertakings. (the EC Merger Regulation).

In the sector-specific regulation of infrastructural sectors, like electricity, rules on market dominance and market power, expressed in terms of e.g. “strong market position” or “significant market power”, are contained. Therefore the relationship between sector-specific regulation and competition policy regulation with regard to market dominance and market power, and the division of labour and responsibility between sector-specific regulatory authorities and competition authorities becomes an important issue in the overall regulation of the sectors involved; cf. chapter 6. The concepts of market dominance and market power in sector-specific regulation have gradually converged on the definitions and concepts in competition policy. For example, in the New Regulatory Framework for electronic communications, adopted by the EU Commission in 2002, Article 14(2) states:[15]

“An undertaking shall be deemed to have significant market power if, either individually or jointly with others, it enjoys a position equivalent to dominance, that is to say, a position of economic strength affording it the power to behave to an appreciable extent independently of competitors, costumers and ultimately consumers.”

In EU competition policy, as interpreted and expressed by the European Court of Justice, the prohibition of the abuse of a dominant position should be understood in an objective sense, i.e. it is the abuse of a dominant position that is prohibited, independently of the intentions of the dominant firm in question.

2.3 Competition policy objectives

The objective of modern competition policy is economic efficiency. An early statement of this objective is found in the opening paragraph of the Norwegian Competition Act of 1993: “The purpose of this Act is to achieve efficient utilisation of society’s resources by means of workable competition.”[16] Similar formulations have since been included as the competition policy objective in the competition legislation of a number of countries, moving towards a single objective welfare standard of competition policy, economic efficiency, and away from the multiobjective specification which was typical of competition policy at an earlier stage.

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[15] Directive 2002/21 EC on a common regulatory framework for electronic communications networks and services. (Framework Directive).

[16] This formulation is maintained in the Norwegian Competition Act of May 2004, with a minor change in the wording of the paragraph of objective. “Workable” has been deleted as an adjective to competition in the new version.

A standard measure of economic efficiency is the total economic surplus, which can be divided into a consumer surplus (CS) and a producer surplus (PS), as illustrated by the shaded area in Figure 2 for the partial analysis of a market under static, full-information conditions. If the supply and demand schedules are fully known, the total surplus can, in principle, be measured empirically and be used as a total welfare standard against which the actual performance of a given market can be related; cf. above.

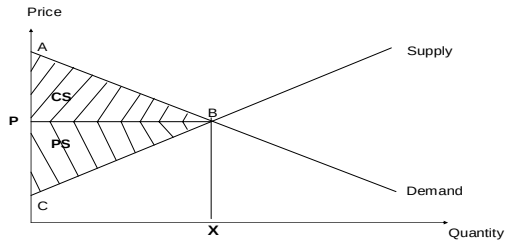

Figure 2. Economic surplus

A total welfare standard in competition policy implies no weighting of the producer surplus against the consumer surplus, while under a consumer welfare standard, consumer welfare or interests are given preference. It is difficult, however, to see from legal documents or practical competition policy in various jurisdictions whether a total welfare or a consumer welfare standard is applied, or how the weighting is actually done, if a consumer welfare standard is said to be used. In the EU, Article 81(3) allows for any agreement, decision or concerted practice “which contributes to improving the production or distribution of goods to promoting technical or economic progress, while allowing consumers a fair share of the resulting benefit.” The EU Merger Regulation allows, in principle, an efficiency defence “provided that it is to consumers’ advantage”. It is formulations like these that lead to a conclusion which seems to be generally accepted, i.e. that a consumer welfare standard is practiced in EU competition policy. That seems also to be the case in US competition policy.
The overall economic efficiency measure (total surplus above) can be decomposed in partial efficiency measures for the purpose of competition policy analysis. Some basic measures can be illustrated in a simple way by Figure 3, again for the static, partial analysis case under full information. LEK stands for long run average cost, LGRK for long run marginal cost and GI for marginal revenue.

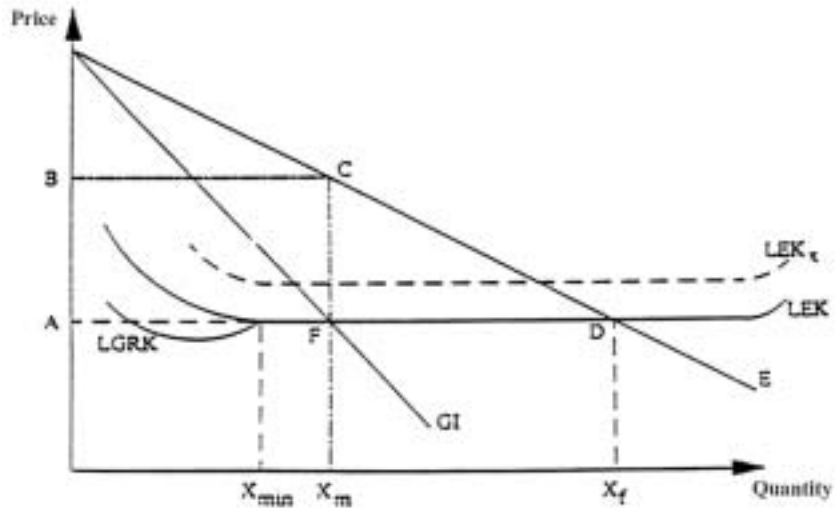

Figure 3. Efficiency concepts and measures

Cost efficiency or technical efficiency in production is defined by best practice, i.e. to produce on the LEK-curve. Economies of scale are supposed to be exhausted at X_{min}, minimum efficient scale, outside the area of possible market solutions, as illustrated here, so that cost advantages from monopolisation cannot be obtained under the given cost conditions. Allocative efficiency can be illustrated by the market outcome under perfect competition compared with that of monopoly; X_f A and X_mB, respectively. The dead weight loss CDF is the welfare loss to consumers by a reduction in consumer surplus from monopolization of the market, compared with the competitive solution, and can be taken as a measure of allocative inefficiency under monopoly.[17]

A third efficiency concept or measure is X-efficiency, which can be illustrated by the LEK_x-curve in Figure 3, here drawn as uniformly located above the LEK-curve. This concept is normally used to characterise cost conditions for firms in monopolised markets or markets with weak competition, as exemplified by the deregulation of formerly monopolised sectors like electricity, telecommunications, etc., which could operate with organisational slack and where the incentives for cost efficiency typically would be weaker than under competitive conditions.

[17] An additional welfare loss to society would arise if the resources released from monopolization by the reduction of production from X_f to X_m are not absorbed by other sectors of the economy. This is normally not taken into account, however, in partial competition policy analysis.

A fourth efficiency concept, or source of inefficiency through unproductive use of resources, is rent seeking. The incentives for rent seeking can be associated with the area of pure profit from monopoly, ABCF, in Figure 3, i.e. the incentives for a firm to be willing to spend resources on rent seeking activities, like e.g. lobbying, to obtain a privileged, private market position so as to increase profits from exercising market power, but to the detriment of economic efficiency from society's point of view.

The efficiency concepts and measures above have been derived, as mentioned, from a static, full information competition policy framework, i.e. considering static competition and static efficiency only. Do the same concepts and measures also apply under dynamic competition and dynamic efficiency? Introducing dynamic considerations, we are thus faced with two main types of competition: static and dynamic competition, and two main types of efficiency concepts: static and dynamic efficiency.[18] A simple characterisation from a competition policy perspective of the relationship between the four types is represented in the 2x2 Table 1 below.[19]

Dynamic competition and efficiency

	Static efficiency	*Dynamic efficiency*
Static competition	Static competition with static eff. measures. SCP-paradigm. Static price/quantity competition **in** the market. Benchmark: perfect comp. model	Comparative-static or intertemporal analysis, but without explicit analysis of dynamic paths and market equilibria. Analysis of drastic innovations/shift of paradigm
Dynamic competition	Static analysis of relevant market(s), with ad hoc considerations of dynamic aspects. Potential competition from entry. Contestability of markets. (Entry within e.g. two years)	Dynamic comp. analysis with explicit dynamic efficiency measures. Competition as a dynamic process; **for** the market. Incentives for innovation; innovation as a major competition parameter

Table 1. Competition and economic efficiency: a simple classification scheme

[18] For a discussion of dynamic considerations in market power analysis, see Borenstein and Bushnell (1999).

[19] The table is adapted from Hagen and Hope (2004).

A full discussion of dynamic competition and dynamic efficiency concepts and indicators in competition policy analysis is, of course, beyond the scope of this report.[20] It can e.g. be questioned whether competition *for* the market is a relevant factor or strategy, given the market characteristics of electricity markets and the potential for entry to the market. A dynamic perspective on market dominance and market power is, however, important for two main reasons. Firstly, as will be evident from the discussion of empirical measures of market dominance in competition policy analysis in chapter 4, the measures typically applied in practice are basically static or comparative-static in nature, while a dynamic competition policy approach would require a process oriented framework of analysis over time, focusing on market conditions that foster dynamic efficiency, and with explicit consideration of performance indicators that would capture dynamic efficiency aspects. In practice, dynamic competition and efficiency considerations seem to be taken on a rather *ad hoc* basis, i.e. that practical competition policy analysis at its present analytical stage may be said to fall largely within the third quadrant (static efficiency - dynamic competition) of Table 1, while a full scale dynamic approach would represent an analytical and empirical movement towards the fourth quadrant.

Secondly, if a full scale dynamic competition policy analysis cannot be made in practice, a competition authority should at least consider the potential policy error in dynamic efficiency terms that it would make by intervening in a market dominance case, that might otherwise have resulted in dynamic efficiency gains in a longer term perspective, e.g. through increased potential for exploiting economies of scale and/or scope, resources for innovation, etc. Admittedly, such a consideration could be difficult to make and document satisfactorily, bordering on the speculative, given the uncertainty typically surrounding the efficiency outcome of such cases. If it is not made, however, the competition policy might become too interventionistic in market dominance cases where dynamic efficiency gains could be had, outweighing the negative effects on efficiency from the potential for exercising market power of the dominance position.[21]

[20] For an analysis, see Hagen and Hope (2004).

[21] The opposite could also be the case, i.e. that competition policy may become too lax in the face of market dominance and potential dynamic efficiency gains, if interventions are not made; cf., e.g., the Microsoft case, where the case was brought up against the dominant firm partly on the basis of dynamic efficiency considerations (efficiency loss).

2.4 Efficiency versus equity

In the public debate the focus has, as a matter of fact, been more on the income distributional or equity consequences of high electricity prices, not necessarily related to market power, than on economic efficiency aspects. This can be exemplified by the California power market experience, particularly for the years 2000-2001, and the Nordic market experience for the winter of 2002-2003. Equity issues have also been accentuated by economic researchers on electric power market functioning, e.g. by Frank Wolak in a series of papers on the California electric power market performance, and also in an evaluation of lessons from electric power market restructuring and monitoring around the world:[22] Wolak (2004a)[23] states, e.g.: "Different from almost any other market, the exercise of unilateral market power can result in enormous wealth transfers from consumers to producers of electricity in very short periods of time. Because activities associated with the unilateral exercise of market power are not typically illegal under antitrust or competition law, these laws may be inadequate to prevent these wealth transfers. A market monitoring process is the most effective means of identifying and mitigating the harmful exercise of unilateral market power."[24]

While equity undeniably is a policy issue and cause of concern in electricity markets, it is difficult to make definite equity statements about the effect of market power on income and wealth distributions, for two main reasons; apart from the fact, of course, that it has to be ascertained unequivocally in the first instance that a given price increase of electricity is caused by the exercise of unilateral market power and not by the regular functioning of the power market, e.g. in the handling of a capacity constraint in a given situation; cf. chapter 3.[25] Firstly, the gains and losses from market power may be hard to trace among those affected on both sides of the market, as suppliers and buyers of electricity, because the simple supplier-

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[22] In the Nordic power market the public debate on equity issues of high electricity prices was particularly heated in Norway during the winter season of 2002-2003. One reason for that is related to differences in the structure of risk contracts for retail electricity consumers among the Nordic countries. While e.g. some 80 per cent of the Norwegian households are on some form of variable spot price contracts, exposing them more or less directly to variations in the spot market price on NordPool, and the remaining 20 per cent on fixed price contracts of varying length, the exactly opposite is the case in Sweden. Norwegian electricity consumers were thus much more directly and severely affected by the heavy price increase on the NordPool during the winter season of 2002-2003 than their Swedish neighbours in the integrated Nordic power market. For an analysis, see Amundsen, Bergman, and von der Fehr (2004), and Bye et al (2003).

[23] Se also Wolak (2003) and Wolak (2004b).

[24] About market monitoring, see chapter 6.

[25] The discussion on distributional consequences of market power exercise can, of course, be related to the discussion on a total welfare versus a consumer welfare standard in section 2.3 above. Given the market characteristics of electricity markets, see chapter 3, the effects on consumer surplus of a price increase due to the exercise of market power can be of considerable magnitude; thus, a consumer welfare standard can easily be argued for.

buyer dichotomy does not always hold in a clear-cut fashion. A supplier does not always act in the market just in the capacity as a seller, but sometimes also as a buyer or a consumer, and a buyer sometimes also operates in the capacity as a seller or as an owner. Other suppliers than the one who exercises unilateral market power will benefit from the price increase in the market, but so will also to some extent consumers who own shares in the supplying companies, now experiencing increased revenues and higher rates of return on investment. This may particularly be the case in publicly owned power companies, where profits typically are dissipated to taxpayers through the tax system, or in companies with dispersed ownership. A precise distributional analysis of gains and losses from a given instance of market power exploitation is therefore difficult to perform without detailed information of the actual distribution of wealth and ownership in the relevant population.

Secondly, competition policy lacks the instruments to handle "unfair" distributional effects of market power abuse, other than, of course, to try to correct for the market power problem in the first place. These instruments generally belong to the realm of income and wealth distribution policy proper.[26] This said, however, there are now clear indications that equity and income distributional considerations are taken account of as part of the sector-specific regulatory policy for a market based electricity system, which has otherwise economic efficiency as its main objective.[27]

[26] The Norwegian government took a firm stand on these issues during the winter 2002-2003 price hike of electricity, arguing for the market to handle the energy shortage in the hydro system without government intervention, and attacking the income distributional problems arising from the price increase by income distribution instruments, in particular income support to low income consumer groups. The latter part, however, turned out to be much more complicated than anticipated by the government, creating a lot of debate and confusion.

[27] See e.g. the U.K Utilities Bill, where the sector-specific regulator Ofgem has been given new general duties in relation to the interests of disabled and chronically sick, elderly people, people with low incomes and rural consumers. The regulator has also been given new duties with regard to statutory guidance on social/environmental matters which the Secretary of State has a duty to issue.

3 Potential sources of potential market power in electric power markets

3.1 Introduction

In this chapter the major potential sources of potential market power in electric power markets will be identified and discussed. “Potential” is used deliberately as an adjective in both connections, to characterise the span of opportunities that exists for exercising unilateral market power, as distinguished from the actual use and abuse, documented by empirical analyses of unilateral market power, which is the topic of chapter 5. The identification will, in particular, focus on the special market characteristics of electric power markets, as referred to in the Introduction.

Two issues should be considered, however, when identifying the potential for market power in electricity markets. The first one is to distinguish competitive behaviour from market power. The second one is to distinguish between market conditions that offer a potential for market power and the incentives to exercise power.

In analysing electricity markets, it is important to be able to distinguish between competitive market pricing and pricing which results from the exercise of market power.[28] A given price increase can under certain market conditions be the efficient competitive response of the market to changing conditions, e.g. a sudden increase in peak demand at capacity limits, and should not be associated with market power.[29]

This distinction may be particularly hard to make in hydro power markets, where factors like e.g. the uncertainty with regard to inflow of water, intertemporal aspects with regard to the use of reservoirs based on the opportunity cost of water (marginal value of water), that the individual suppliers have to consider in their production decisions at any time, as discussed below. Was, e.g., the winter 2002-2003 price increase in the Nordic power market, where hydro power represents a considerable part of the production system, a result of the competitive response of the market to “unusual” or unforeseen market conditions, or was it a

[28] Borenstein (1999).

[29] But then, on the other hand, the *potential* for the exercise of market power may be particularly large in such a situation.

consequence of the exercise of market power by dominant firm(s), or a combination of both? If a combination, how to distinguish between the two aspects in the analysis of the competitive behaviour of the market?

The simple answer in theory is that the exercise of market power is a question of an intention of unilaterally influencing the market price, while in a competitive market no firm is, in principle, in a position to affect the price, and thus, neither can exercise the intent. In practice, however, the issue may be rather more complicated for a competition authority to document and decide on, but even so the more important for it to be aware of.[30]

The second distinction made above, that between the objective conditions for market power exertion and the incentives to exercise power, is also important to observe in competition policy. The objective, necessary conditions for the unilateral exercise of market power may be there, typically in the form of a dominant market position according to defined market criteria, but for the exercise of power actually to occur, the dominant firm must also have the incentives to exploit its market position to the detriment of economic efficiency.

Incentives have to be understood in relation to the strategic behaviour of the firm in the short and the long runs – a concept and an approach to analysis in competition policy which may be unfamiliar for a competition authority to apply. The incentives for a dominant firm for not exploiting the potential for market power at any time may range from competitive strategies, e.g. in relation to potential entrants, under long-term profit maximisation, to the structure of the objective function of the firm, e.g. a satisfying objective instead of a pure profit-maximisation objective, a multiobjective function instead of a single profit objective, possibly related to ownership, e.g. to serve the customers in its defined geographical area in specified ways, thus foregoing profits. It may also simply be a question of pursuing a deliberate policy of public image building, or avoiding sanctions, of not exposing the firm to a potential competition policy case of market power abuse.

[30] In EU competition policy, as interpreted and expressed by the European Court of Justice, the prohibition of the abuse of a dominant position should be understood in an objective sense, i.e. it is the abuse of a dominant position that is prohibited, independently of the intentions of the dominant firm in question.

The outcome with regard to competition policy decisions in actual cases may not be very different from applying an incentive-oriented approach to competition policy[31], compared to the "standard" analytical framework of identifying the market structural conditions conducive to the unilateral exercise of market power. An incentive-oriented approach broadens the scope of analysis, however, by focusing on the competitive conditions for disciplining the dominant firm to exploit its potential market power, by identifying the possible strategic choices that are actually open to the dominant firm in the market, and by clarifying the competitive consequences for the firm, and for economic efficiency, of given strategic choices.

In this study we will not frame the discussion of potential sources of potential market power in electricity markets fully on an incentive-oriented approach to competition policy, but have it as a general background. Below we identify some of the major potential sources of potential market power. A listing of potential sources may serve as a checklist for the analysis of actual market power in competition policy cases. The discussion is mostly with reference to wholesale markets, but it is also relevant for some aspects of competition in retail markets, particularly section 3.7.

3.2 Market characteristics and properties of electricity markets

We have repeatedly referred to special market characteristics and properties of electricity markets above, without listing them explicitly. Some of the most important market characteristics and properties in this context are:

- Electricity cannot be stored (except for water storage in hydro power based systems), and is a homogeneous product in market terms.
- Supply and demand of electricity have to be balanced instantaneously by a system operator to avoid system breakdowns or delivery fallouts.
- Demand for electricity is very inelastic in the short run. Demand responsiveness of consumers is limited and occurs generally with a time lag, because there is limited scope for real time pricing, particularly for small consumers, at least at present.

[31] The incentive-oriented approach to competition policy is described in von der Fehr at al (1998). (In Norwegian). A summary presentation in English is given in Norman (2000). For a comment, see Hylleberg and Overgaard (2000). For an application to electric power markets, see Bye et al (2003). The discussion here draws on the latter.

- Supply of electricity is also rather inelastic in the short run, particularly when approaching capacity constraints in production.
- Production of electricity is capital intensive and investments in capacity extensions are typically lumpy, irreversible, and long-lived. Generally, there is a fairly long gestation period for new investment, with implications, e.g., with regard to contestable entry to the market.
- The electricity transmission network is of fundamental importance as an instrument or facilitator for decentralised, market based transactions and the efficient functioning of electricity markets. Thus, capacity constraints in transmission become an important factor to consider in the definition and delineation of relevant markets in competition analysis.

Market dominance is a "dominant" feature of most electric power markets, partly because of the monopolistic structure of the industry in many countries before market liberalisation, and insufficient or inappropriate divestiture of the industry as part of the market reforms, and partly because of increased concentration in some markets through market restructuring through mergers and acquisitions after liberalisation. This typical market structure, combined with the special market characteristics of electricity, make electricity markets potentially exposed and vulnerable to the exercise of unilateral as well as collective market power.[32]

From these market characteristics of electricity markets, some specific, potential sources of market power are identified in the following.

[32] The terms "collective market power" and "collective dominance" is used in European competition law and policy to describe markets that are susceptible to tacit collusion or coordination. Some characteristics of those markets, as listed by the EU Commission, are: market concentration, maturity, transparency, frequent market interaction with a homogeneous product produced by firms with similar costs and market shares, inelastic demand, and with barriers to entry. See e.g. Bishop and Walker (2002, chapter 6). Electricity markets generally show many of these characteristics.

3.3 Demand conditions

A basic characteristic of electricity is, as mentioned, a very low elasticity of demand.[33] The aggregate market demand elasticity is particularly low in the short run when the flexibility of consumers to switch to other energy forms is quite limited because of past investment decisions in energy equipment, but even in the long run empirical studies show low demand elasticities, typically in the range of –0.15 to –0.25 for household demand.[34] The short run elasticity will vary somewhat over the demand cycle - the day or the season - being particularly low at peak hours and when close to capacity limits, when the demand curve may be virtually vertical.

From a unilateral market power perspective, the relevant demand elasticity concept is the own price elasticity of the residual demand curve of the dominant firm, i.e. the total market demand less the supply of other producers at any given price.[35] The own elasticity of demand of the residual demand curve can be taken as an indicator of the potential strength of market power that a dominant firm possesses, as expressed e.g. in the simple Lerner index of monopoly power: the percentage deviation of monopoly price from marginal cost; (P – MC)/P; cf. Figure 1. The residual demand will, *ceteris paribus*, be more inelastic the more inelastic the market demand, the more inelastic the supply of the other suppliers, and the larger the share of the dominant firm of the relevant market. Each of these factors have to be taken into account in the strategic decisions of the dominant firm on how to exert its potential market power in the short and long runs, and its incentives to compete, with regard to the demand conditions for electricity.

The obvious strategy for the dominant firm under the given demand conditions for electricity is to restrict output in order to drive up the market price. Because demand is less elastic at

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[33] The demand for electricity is a derived demand from the consumers' need for light, heating, mobile transport services etc. Electricity is a homogeneous commodity in the sense that once it has been fed into the network it is not possible, in principle, to identify the supplier of the commodity in relation to a specific consumer. Electricity cannot for practical purposes be stored and production has therefore to be balanced momentarily with demand at any time, as mentioned under 3.2 above.

[34] Empirical estimates of demand elasticities in demand studies are usually derived on the basis of "normal" changes in price and do not necessarily hold when fairly dramatic price changes are experienced, like e.g. in the California and the Nordic electricity markets, referred to above. For the Norwegian electricity market an estimate has been made in Bye at al (2003), for the period from October 2002 to April 2003, based on the NordPool spot market price, when the end-user price for Norwegian residential demand increased by 30 per cent. The temperature adjusted change in the total consumption of electricity for Norwegian residential demand fell by 6,8 per cent in the same period, resulting in a price elasticity of –0,23, i.e. an estimate in the range of a long term elasticity of energy demand. The demand response may be partly interpreted in the light of the considerable public attention given to the electricity price increase and the energy supply conditions in the Norwegian hydro system, as part of the Nordic electricity market, during that period.

[35] For a derivation and discussion, see e.g. the Nordic Competition Authorities' Report (2003), chapter 4.

peak hours and when demand is approaching capacity limits in generation or in the electricity network, it will be particularly profitable for the firm to exploit its market power potential at those points; cf. the sections 3.5 and 3.6 below.

Will a dominant firm have the *incentives* to exert its potential market power in relation to its residual demand curve? In the short run this is first and foremost a question of the probable reactions of its incumbent competitors in the market and, in the long run, the effect on entry of its pricing strategy. The reaction of the competitors will depend on their size distribution in relation to the dominant firm and whether they will operate individually or coordinated.[36] Because the non-dominant firms will benefit from the higher market price when the dominant firm is exercising its market power, they will typically accommodate their market behaviour to the behaviour of the dominant firm. Consequently, the degree of short run competition under such market conditions will be expected generally to be weak.

3.4 Capacity constraints in generation

A generating firm with market power is able unilaterally to raise the market price of power by withholding generating capacity from the market. Green (2004) distinguishes between two forms of withholding. “Economic withholding” implies that a generating plant will not offer its output as soon as the market price is high enough to cover its costs of doing so, but will wait until the price rises above its costs. “Physical withholding” implies that the output of the plant is not made available to the market at any price. In both cases, output will be restricted and the firm will forego income from the withheld plants, but under inelastic residual demand the strategy can increase the total profit of the dominant firm by raising the price received on its other production units.

This output-restricting, quantity-setting behaviour of the dominant firm largely corresponds to the Cournot model of competition – a model which seems to capture the essential features of

[36] If there is one dominant firm and a limited number of relatively equal-sized non-dominant suppliers, the market structure may correspond to a Cournot oligopoly, while some form of price leadership model, e.g. the Stackelberg model, may be appropriate to characterise competition if there is a dominant firm and a competitive fringe of small suppliers; cf. 3.5 below.

market competition and market power strategies of dominant firms in electricity markets;[37] cf. chapter 5 for further discussion and classification.

When the strategy of capacity withholding is applied successfully by the dominant firm, the market outcome will result in prices which are raised above competitive levels. The price increase will be particularly large during peak hours and when total capacity is being fully utilized. In a thermal power system the capacity constraint is typically defined by the installed production capacity of the system at any time, while in a hydro power system capacity is also defined, in addition, by the energy capacity, i.e. the production capacity over a defined period determined by the inflow of water and the storage facilities for water of the system. This creates possibilities for intertemporal strategic behaviour under market dominance, to be discussed in 3.7.[38]

A special form of capacity "withholding" is when investment in new production capacity is not undertaken optimally in response to permanent increases in electricity demand. Such withholding may be particularly troublesome from a competition policy perspective if the withholding is undertaken by an incumbent firm which is already dominant from holding a high proportion of the given capacity, because the new demand situation extends the market power potential of the dominant firm. It is troublesome, because the electric power capacity market for new investment has not yet developed by far to the same degree of sophistication and efficient operation as the short run power market, and is therefore much less analysed and understood than the latter.[39] But also in this situation it is important in market analysis to distinguish between competition conditions creating a potential for exercising unilateral market power and the incentives for the dominant firm to exploit this potential.

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[37] Most electricity markets are designed as some form of auctions markets, where suppliers bid into the market segments of their supply curve and not just a fixed quantity, as under a pure Cournot assumption; see chapter 5.

[38] In a thermal power system there is normally a fairly close correspondence between installed capacity and short run production capacity of the individual producers, while that is not necessarily the case in a hydro power system. E.g., in the Norwegian hydro power market, the largest producer, Statkraft, has a relatively larger share of the total energy or reservoir capacity of the system than of the total installed capacity. This is mainly due to the responsibility or "universal service obligation" placed on Statkraft by the Norwegian government, before market liberalisation and the expansion of the transmission system between Norway and adjacent markets, as a state owned company to supply the system with defined levels of security of energy supply, by investing in multiyear water reservoirs as an "insurance" against dry years. Now, after market liberalisation and still with temporary transmission network constraints to neighbouring markets, and given the irreversible, sunk cost nature of the investments made, this offers the company with a potential strategic "asset", or potential source of unilateral market power, if a case of market dominance for the company can be established.

[39] For a discussion, see e.g. Oren (2003) and Creti and Fabra (2004).

3.5 Vertical integration

Most of the analysis and discussion on market power and dominance have been on horizontal market power within the electricity industry. In a "vertical" industry like this industry, with a vertical value chain from generation, wholesale trading/supply, through the transmission and distribution networks, to retail trading and end-use, and where vertical integration was the typical organisational form of the industry before market liberalisation and restructuring, vertical market power can clearly also be a competition policy issue. In the first phase of liberalisation, vertical integration and vertical market power were, in fact, one of the central competition issues in electricity market design, and where the required organisational split up, as part of the market reforms, of the vertical chain in competitive activities and natural monopoly network activities, caused considerable controversy and debate.

Competition policy takes, in general, a benign attitude towards vertical integration, pointing to factors like potential vertical scale or scope efficiencies, reduction in transaction and information costs, mitigation of double-marginalisation inefficiencies by successive monopolies in the vertical chain, etc. To the extent that vertical integration represents potential competition policy concerns or sources of market power specifically for the electricity industry, it should be identified in terms of specific market characteristics and properties of electricity, as listed in 3.2 above. The specific sources especially derive from the interplay between the competitive and the network parts in the vertical chain.

Vertical integration offers two main potential sources of potential market power:

- Cross-subsidisation between activities in the vertical chain
    - between network monopoly activities and competitive activities
    - within competitive activities between markets with ineffective competition, e.g. because of market power exercise, and markets with effective competition
- Withholding of capacity in the vertical structure, particularly in the network part, to affect market competition in the competitive activities part.

The competition and regulatory policy concern with cross-subsidisation has primarily been in relation to the first form, that between monopoly (network) and competitive activities. The second form should, however, also be observed. A case in point could be the potential for

cross-subsidisation between an electricity retail market, characterised by relatively weak competition, e.g. because a more monopolised structure in the retail market, high search or switching costs for consumers, the locking in of consumers in contractual relationships, etc; cf. 3.7 below, and an efficiently functioning wholesale market with strong competition.[40] How serious this form of cross-subsidisation is as a competition distorting factor in practice, and consequently as a potential competition policy concern, is an empirical question.

Withholding of network capacity may, in this connection, be considered as a strategic option made possible for the integrated company by the regulatory authorities, allowing it to have network resources of its own as part of the regulatory regime. This is fundamentally different from the potential strategic behaviour in relation to capacity constraints in an exogenously given network structure, owned e.g. by an independent transmission company, to be discussed in 3.12 below. The potential market power problem of such potential withholding is accentuated by the present debate about what is called merchant transmission investment (MTI), i.e. transmission network investment undertaken by external investors other than the transmission company itself as transmission system operator (TSO), to expand the network or eliminate capacity constraints.[41]

The required organisational and legal split up between competition and network activities varies among countries which have reformed their electricity sectors, from separate accounting for competition and monopoly activities, respectively, within the integrated firm, via divisionalisation under some form of company holding model, to full separation of the two forms of activity in separate legal entities. In some countries, where a full organisational split in separate entities is not legally required, e.g. in Norway, many companies have, however, on their own initiative undertaken a full separation. Could this be taken as an indication that they do not consider the potential for cross-subsidisation to be there in the first place to give them a competitive advantage in the market? Alternatively, do other organisational factors, like e.g. specialisation cost advantages from concentrating on core business activities in competitive activities versus network activities, respectively, outweigh the potential gain from cross-subsidisation? Or could it simply be that firms consider the regulatory system to be so imperfectly designed and enforced in practice that issues like

[40] It is important to distinguish between the potential for cross-subsidisation and price discrimination, due e.g. to different cost structures between markets. The emphasis here is on the former, because of ineffective competition e.g. from market power exercise in one of the markets.

[41] See e.g. Joskow and Tirole (2000), Cardell, Hitt and Hogan (1997), Keller and Wild (2004) and Newbery (2004).

cross-subsidisation are not included as a factor to consider in their organisational decisions, as alluded to in Bye et al (2003)?

Presently, there seems to be a movement back towards vertical integration in the restructuring process of the electricity industry. The merchant network investment issue is one part of this process. From a market dominance, competition policy perspective, it should be a cause of concern if, as often seems to be the case in practice, the potential external investors with the necessary competence and the financial resources to undertake such investments are typically large energy companies which already have a strong market position, thus strengthening their competitive position by giving them access to network resources. The competition and regulatory policy implications of such investment options should, in any case, be addressed more carefully that hitherto seems to have been the case.[42]

3.6 Diversification

Diversification, or conglomerate growth, is not only horizontal diversification across the energy industry, broadly defined, i.e. from electricity into other energy network sectors like natural gas, district heating, oil and petrol distribution, etc, but also other to network sectors like telecommunications and water systems; cf. the term multi-utility companies, in addition to related non-network products and activities.[43] Horizontal diversification can be combined with vertical integration to create vertically integrated conglomerates. After a period of conglomerate growth in the restructuring of the electricity industry, the tendency now seems to be more of a “back to basic” approach by concentrating primarily on one line of business, but the picture is not unequivocal.

Diversification creates two main competition issues as a potential source of market power from dominance. Firstly, the potential from horizontal cross-subsidisation among competitive activities, depending upon their relative degree of market competition, as discussed under vertical integration above, or the design and relative strength of the enforcement of competition policy, if the activities of a dominant company take place in different competition

[42] Naturally, merchant transmission investments undertaken by an external investor should be operated by the network system operator as a regular part of the total network system and regulated by the sector-specific regulator as part of the network regulatory regime. There are still options open for the MTI-owner, however, to use his network assets strategically, e.g. by withholding capacity for maintenance and repair at times when it is particularly profitable for the owner as power producer to operate under network constraints; see also chapter 5.

[43] Enron is an example, admittedly an unfortunate one, of conglomerate growth.

policy jurisdictions, as may often be the case under conglomeration.[44] Secondly, vertical cross-subsidisation between competition and network activities, or network capacity withholding, if the conglomerate company is vertically integrated to one or several networks, and control network resources, as discussed above. If it is integrated vertically to several networks, a potential source of competition distortion could result from different design and/or strength of enforcement of regulatory policy across networks.

3.7 Transactions costs, customer stability, and contracts

This section pertains mostly to competition aspects and sources of potential market power from market dominance in retail markets for electricity. These aspects and sources are primarily related to various forms of transaction costs for consumers to operate in the market, to the degree of customer stability and loyalty vis-à-vis suppliers, and the ability of suppliers to lock-in customers in long term contractual relationships.

Transactions costs consist of information search costs for consumers and of administrative costs of switching supplier. Both types of transaction costs are relatively independent of the size of the transaction, measured e.g. in terms of the quantity of electricity consumed by the individual consumers, at least below some threshold values defined by metering requirements. In addition, there are regulatory transactions costs, or regulatory barriers to the possibility of actually switching supplier, e.g. in terms of national regulations and barriers, with the consequence that retail markets generally are more narrowly delimited geographically than wholesale markets. This is, e.g., the case for the Nordic electricity market, where the wholesale market is an integrated, common market for the Nordic countries (except Iceland), apart from temporary network constraints, while the retail markets, as a general rule, still are national markets.

[44] E.g. if one jurisdiction does not have an explicit prohibition of the abuse of market dominance, while the other jurisdictions in which the dominant company operates does have such a regulation; cf. e.g. the US versus the EU. This aspect could raise an interesting policy issue in its own right, i.e. the issue of competition between competition and regulatory policy regimes of different jurisdictions as a deliberate policy to influence, e.g., locational decisions of companies. This issue will not to be pursued further here, other than to emphasize the need for harmonisation of competition rules and regulations across jurisdictions to avoid distortions of competition from such sources.

Information search costs have been reduced by regulatory measures to stimulate competition[45] and switching costs have also been reduced, or at least shifted from consumers to suppliers and network owners, to the same end. Still, there seems to be a considerable degree of inertia with regard to competition among electricity retail consumers, enough to leave the market with a potential for market power exploitation by dominant firms.[46]

Electricity is a homogenous product and the scope for product differentiation and brand building in the product itself, as a basis for price discrimination, is therefore fairly limited.[47] A more promising strategy for potential market power exertion is to try to build customer loyalty, e.g. by offering various customer services in addition to a "competitive" price, and to try locking in consumers in long term contractual relationships related to price, e.g. long term fixed price contracts. If there is some degree of active retail competition present in the market, neither strategy will necessarily pay off; one strategic dilemma being that the potentially most profitable consumers are the large consumers, both because they buy large quantities of power and because the costs of handling consumers are, as mentioned, relatively fixed regardless of quantities consumed. These customers are, however, generally more well-informed about the market and their options than small consumers, simply because they have relatively more to gain from switching on given price differentials between suppliers, and are therefore less "loyal" or more difficult to locking in than small consumers.

3.8 Market transparency

In wholesale electricity markets organised as auctions, sellers and buyers meet regularly, typically every hour in a day-a-head spot market that is cleared on an hourly basis, like e.g. the NordPool power exchange for the Nordic market. Even when the individual bids are not revealed by the market operator, the price building process itself and the regularity and frequency with which the market operates and the players meet, result in a lot of open market information and data. It is also an information revealing, learning process for the market

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[45] E.g. the retail price information system developed and operated by the Norwegian Competition Authority since 1998. For a discussion of information search costs and information policy in relation to energy markets, see e.g. Waterson (2003).

[46] An alternative to retail market competition through information search and switching of suppliers, is the so-called "spot-price-pass-through" model, proposed e.g. by Hogan (1994) and Littlechild (2003). This approach is discussed in Amundsen and Bergman (2004). Their conclusion is that this model opens up for other issues of market power in retail markets for electricity

[47] Harker and Waddams Price (2004) discuss price discrimination in the deregulated British electricity and gas markets. They document cases of undue price discrimination and the various forms such discrimination may take (lock-in and win-back offers, prepayment versus direct debit payment, etc. by dominant firms). See chapter 5 for details.

participants from the past behaviour of the market. Therefore, such markets are generally information intensive and transparent.[48]

This property of the wholesale market, combined with measures to increase the transparency of the retail market, as mentioned above, may raise the question whether an electric power market – wholesale and retail trading seen together - can become too transparent, in the sense that its very transparency facilitates coordinated actions and tacit collusion among suppliers. The market may seemingly function competitively in the sense that price differentials among suppliers decrease and may ultimately almost disappear, thus eliminating the switching incentives for consumers, but the price *level* may be higher than under effective competition.[49]

The above argumentation relates to tacit collusion and collective market power, but it can also apply to unilateral power. A dominant supplier can persistently signal its price to the market, indicating that he is willing to maintain a higher price than the competitive price, by foregoing some short run profit. Because of the inelastic demand, other suppliers may find it profitable to accommodate their prices to the price leadership strategy of the dominant supplier. The end result amounts to tacit collusion or coordination, but the setting is different than above, starting out from price signalling by a dominant firm. The price spread in the retail market decreases and the price level increases, as under collective market power exertion above, to the detriment of market competition and efficiency.

Both forms of market power exertion can be difficult to detect and correct for in competition policy. This is discussed in chapter 6.

3.9 Market turbulence

Market turbulence is an expression coined by von der Fehr et al (1998) to characterise the relative degree of stability of the market structure and the general environment for competition, the uncertainty with regard to changes in the structural competitive framework in the future, and the effect on the incentives for firms to compete under different degrees of

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[48] This does not imply, of course, that power pool markets are not exposed to market power exertion, unilaterally as well as collectively, cf. chapter 5. E.g. the English Electricity Pool was abolished and replaced by the New Electricity Trading Arrangements (NETA) exactly for reasons of alleged collective market power exertion and implicit tacit collusion by the generators to manipulate the price building process of the Pool. See e.g. Newbery (2004).

[49] The question of a market becoming "too" transparent by regulatory intervention is discussed, e.g., in Harker and Waddams Price (2004) and in Albæk, Møllgaard, and Overgaard (1997).

market turbulence. In a unilateral market power context, the hypothesis would be that a dominant firm would have, *ceteris paribus*, a stronger incentive to actually exercising its market power under a relatively stable market structure compared to a more "turbulent" competitive environment, because in the latter situation the competitive reactions and repercussions on its strategy of market power exploitation are more uncertain and difficult for the firm to assess and take into account in the formulation of its strategy. Market turbulence can thus be seen as disciplining influence on the actual market behaviour of the dominant firm with regard to potential market power exertion.

Applied to the electric power market, the analytical task would be to identify the relevant structural factors for short and long run competition and on that basis characterise the market in market turbulence terms, particularly with regard to the incentives for dominant firms to exercise their potential market power under different turbulence scenarios. Just a few observations will be made here.[50]

The probably most important single factor with regard to market turbulence as a disciplining device for competition in the electric power market is entry conditions. In power generation, entry is strictly regulated by concessions and other regulatory measures in most countries, while regulatory barriers to entry are considerable lower, and may almost be non-existent, in the power trading and brokerage markets. Those markets also have low structural, economic entry barriers, so that entry is generally easy. In electric power production, structural entry barriers have come down following the introduction of small-scale production units, like CCGT plants[51] and other forms of decentralised power generation equipment, compared with the traditional large-scale production systems.

In the market design for liberalised power markets, entry conditions have played an important role, and in may cases "entry" has been created by divestiture of former power monoplies or dominant power companies, like e.g. in England and California. Those entry arrangements have not always worked satisfactorily.[52] According to Newbery (2004), entry of independent

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[50] For a discussion in relation to the Norwegian power market, see Bye et al (2003).

[51] CCGT: Combined Cycle Gas Turbine; operating a gas turbine in a combined cycle with a steam-turbine system to improve energy efficiency.

[52] See e.g Wolak (2004) and a series of papers by Bushnell et al on the California experience.

power producers (IPPs) in the wake of the British market reform led to "excessive (English) entry", mainly in the form of CCGT plants by IPPs.[53]

From a competition policy perspective one should be particularly observant of the market strategic potential of incumbent, dominant firms to restrict entry, in addition, of course, to take initiative to reducing or eliminating any unnecessary regulatory or economic barriers to entry to the power market. As mentioned under 3.6, capacity withholding is a natural strategy to apply under Cournot competition. Restricting capacity from new entry, when approaching capacity limits in generation, can be a favoured response of incumbents to the threat of capacity expansion by entrants. It can also be a credible threat, particularly when the incumbents can activate on short notice high cost production plants that are otherwise mothballed, to drive down prices temporarily to discourage entry. Again, because of the inelastic demand for electricity, a relatively small quantity of idle capacity can make the threat a credible one.

Other factors relevant to market turbulence are the potential for imports of power into the market in question, and the rate of technological change and innovation in the electric power industry.

Imports are first and foremost a matter of the capacity of the transmission network to adjacent markets, which is discussed under 3.10 below. From a technological point of view the electricity industry is best characterised as a "mature" industry, at least in terms of the basic technology of power generation and transmission. Spurred by the market liberalisation reforms, the rate of technological change and innovation in the trading and end-user parts of the market has been considerable, not to mention the "economic" innovations in market and institutional design and operation. From this perspective, the electricity industry no longer can be characterised as a mature industry with a relatively low degree of market turbulence. Compared with other network industries, especially the telecommunications industry, it still scores relatively low, though, on most turbulence criteria. Consequently, there should still remain a potential for the exertion of market power from lack of market turbulence. The

[53] An interesting question is whether the English experience with "excessive" entry is a result of the specific market design of the British reform, or whether such an outcome may be expected to follow more generally from the economic and technological characteristics of a competitive power market, or rather, will there typically be pronounced cycles in entry activity, with production capacity from new entry "overshooting" optimal capacity expansion in response to a capacity shortage in generation, because of the nature of decentralised investment decisions in the market? Too little experience is gathered so far with electric power capacity markets for such a question to be answered precisely.

implications, however, for the incentives for dominant firms actually to exploit this potential have to be assessed according to the specific circumstances of a specific competition policy case.

3.10 Ownership

Ownership raises two issues as a potential source of unilateral market power in the electricity industry. The first issue concerns public versus private ownership: are the incentives to compete and the market behaviour of publicly owned firms basically different compared to those of privately owned ones? If so, how does this manifest itself in terms of the competitive outcome of the market, and, in particular, what are the implications for the market power potential of dominant firms under the two types of ownership? The second issue is about the potential for market dominance and potential market power exertion, and their implications for competition and competition policy, of various forms of cross-ownership and ownership relations between firms in the electric power market.

The relationship between public/private ownership and competition in power markets is a little researched issue. Two cases lend themselves as interesting candidates for comparative study:

- In Great Britain the government decided to privatise the electricity supply industry before liberalisation and restructuring, with the intent to create incentives and conditions conducive for competition, while in Norway the electricity market reform was implemented without privatisation, with 85 per cent of the electricity industry under public ownership, because the privatisation issue was too controversial politically to be raised at that time. Has the Norwegian electricity market, and later the Norwegian-Swedish and finally the integrated Nordic market, also with a considerable degree of public ownership, performed significantly less effectively in competition and economic efficiency terms, due to ownership, than its British counterpart, and, if so, what has been the implicit relative efficiency loss?
- The California power market reform was modelled on the Nordic electricity market design. Market power exertion, unilaterally as well as collectively, has been documented as a serious problem in a series of studies for the California market, while such documentation largely still lacks for the Nordic market; cf. chapter 5.

> Again, to what extent can differences in competition form and market outcome in the two markets be ascribed to potential differences in market behaviour and incentives to compete under private ownership and public ownership, respectively?

Undoubtedly, it will be difficult, analytically and empirically, in both cases to disentangle the isolated effects of ownership form on competition and efficiency. From a competition policy perspective, such analyses are necessary, however, as a basis for assessing the market performance of various forms of ownership and, in particular, for advocating e.g. privatisation to improve performance. A competition authority will under such circumstances have to act in its advocacy role for policy reform with regard to ownership, since it does not normally have the power and the means to enforce such changes in ownership forms and organisation directly. More research on ownership forms needs to be done, particularly with regard to public versus private ownership, for the electricity industry before firm conclusions can be drawn on their relative benefits and effects in terms of market performance and competition.

The other form of ownership – cross-ownership and other forms of ownership relations between firms – is, however, clearly within the realm of competition policy and should, in fact, be an issue that competition authorities ought to have high on the agenda as a potential source of potential market power exertion by dominant firms in the electricity market. This is because various forms of cross-ownership, part-ownership and other ownership relations seem to have developed as an important part of the restructuring process of the electricity industry under liberalisation, and not only full-fledged ownership integration in connection with mergers and acquisitions.

Ownership relationships between firms can take many forms: active – passive ownership, direct – indirect ownership, majority – minority ownership, diversified – concentrated ownership, controlling - noncontrolling ownership, etc. Ownership relationships can be efficiency enhancing, e.g. as a means of transmission of information between firms to improve performance, or as a means of realising synergies or internalising externalities in production,[54] but they can also, of course, be used by firms as a market controlling and competition restricting device, to the detriment of economic efficiency. Because the potential efficiency gains through synergies etc from ownership relationships seem to be relatively

[54] An example of potential production externalities could be hydro generating plants located along a river, where the production of upstream plants can affect the production capabilities of downstream plants and where some degree of coordination could improve total performance.

limited in the electricity market, and because the market generally seems to be relatively efficient as a transmitter of external market information in terms of its transparency, as discussed under 3.8 above, and thus the need for internal, firm-specific information exchange between firms should be relatively less, there remain the competition restricting effects of ownership relations as a primary potential source of market power exertion for competition policy to be concerned about.

From a competition policy perspective it is not just the magnitude of ownership relationships between firms that matters, but rather their specific form in terms of the potential effects on the incentives of the firms to compete or refrain from competing. It cannot e.g. offhand be taken for granted that the market strategic interests of a dominant firm acquiring a potentially controlling ownership position in a non-dominant firm, correspond fully to the interests of the latter. This makes the analytical task of a competition authority of determining the effects of ownership relations on competition a complicated one, necessitating, in principle, a relationship-specific approach.[55]

Analytically, ownership relationships can be taken into account by incorporating them in indices of concentration, like e.g. the HHI index, by adjusting the index to what may be called an "incentive and control adjusted index".[56] Alternatively, the effects of such relations may be incorporated in simulation models of competition in power markets.[57] This is further discussed in chapters 4 and 5, respectively.

3.11 Trading spot and futures

Issues of market dominance and market power may arise in an electricity market system consisting of markets for the physical trade in electric power (spot) and for risk hedging (financial markets - forward, futures, options etc.), by considering the markets in combination by a dominant firm.[58]

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[55] In EU competition law only ownership relationships resulting in a controlling influence over another firm can be taken into account in merger cases. This limits the possibility of sanction in relation to the potential for competition restricting market behaviour from ownership relations in practice.

[56] See e.g. von der Fehr et al (1998), and the Nordic Competition Authorites' Report (2003).

[57] Such an analysis has been made for the Nordic power market by Amundsen and Bergman (2002).

[58] For an analysis of energy risk, without explicitly considering market dominance and market power within the energy market system, see Pilipovic´ (1998). See also Gjølberg and Johnsen (2003) for the Nordic market.

Exercising unilateral market power by a dominant firm in the spot market will affect the spot market price and the volume of transactions in the market and may, thus, reduce the liquidity of the spot market and the value of the spot market price as an efficient reference price for the price formation in the forward market. Consequently, an efficiency loss will be inflicted upon the whole electricity market system from the unilateral exercise of market power in one market.[59]

However, market power can also be exercised in the forward market with an effect on transactions in the spot market. If a dominant firm has taken a certain position in the financial forward market, and market conditions change in relation to the expectations of the firm when it entered into its forward position, e.g. because of changes in expected water inflow in a hydro power system with storage, the firm may try to compensate for this by affecting the spot market price to its advantage. Under certain market conditions, this may even result in a reduction in the spot market price, e.g. when a hydro power producer is induced to increase his production to deliver to the spot market in order to obtain an extra payment on the forward contract he has entered into for future “delivery”.

Asymmetry with regard to the organisational form of an electricity firm may also have implications for the exercise of market power in an electricity market system. An un-integrated electric power producer (i.e. not integrated forward to the retail market) operating in the wholesale market is generally in a stronger market position both in the spot and financial forward market, and less exposed to risk, than an un-integrated retailer having to buy all his electricity in the market, while in both cases the un-integrated firms may be in a weaker market position in this regard compared to an integrated generating-retailing firm.[60]

3.12 Network constraints

An electricity transmission network not only performs a transportation function by transporting electricity from where it is produced to where it is consumed. It has also an important market function to perform in a decentralised, market based power system, by

[59] Stoft (2002) argues that if the spot market is functioning competitively, this will have a disciplining effect on the forward markets to make them behave competitively too. In an early paper by Green (1992), he shows in a two-period model, that if generators have contracted all their energy in the forward market, they have no incentive to distort the spot price, and will therefore bid competitively. See also Joskow and Kahn (2002).

[60] See section 5.4 for further discussion.

serving as an instrument for market transactions and by promoting competition among producers to serve the same customers in an integrated market, defined by the extent and capacity of the transmission network. This market role of the network has typically been underestimated and imperfectly understood as part of the liberalisation and market reform process for electricity in most countries.

The market efficiency outcome depends upon how well the transmission network is designed and operated to perform its market function. In particular, in a market power context, network capacity constraints as a potential source of (local) market power play a crucial role.

Network capacity constraints can be permanent or temporary, the distinction between them being that a permanent constraint is defined in relation to the time it takes to reduce or eliminate the bottleneck by investing in network capacity expansion, which can be a period of anything from e.g. three to ten years depending on the circumstances, while a temporary constraint is defined in relation to the variability of demand over the cycle (day or season); in particular, the duration of the peak demand. A permanent constraint can create a virtual local monopoly position for a dominant producer located within the constrained network area, at least for the time it takes for the network operator or a network investor to eliminate the constraint.[61]

A network capacity constraint creates a congestion rent. If the transmission network is fully separated from generation, the transmission network owner will, under perfect competition with nodal pricing,[62] capture the congestion rent and can use it to invest optimally in the network to achieve long run efficiency. If full separation is not in place, a dominant producer may be able to extract part of the rent; cf. 3.8 above. Even with full separation, a dominant producer can be in a position to capture part of the rent by operating strategically in relation to the given constraints in the network.[63]

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[61] In a meshed electric power network it can be difficult to identify specific network constraints, because of physical properties of power flows and because electricity can be rerouted almost costlessly by the network operator.

[62] Under perfect competition, transmission is priced at its opportunity cost. This is called nodal spot pricing (Bohn et al (1984) and Schweppe et al (1988)). This pricing scheme ensures that, given the constraints of the network, generation and transmission are scheduled to achieve short run efficiency.

[63] Bjørndal and Skaar (2004). Joskow and Tirole (2000) show that market power can be exercised in relation to network capacity constraints to capture part of the congestion rent from three categories of market players, i.e. consumers, other producers, and the transmission network owner. One possible strategic action in relation to the network owner is e.g. to withholding power by buying physical transmission rights without using them.

A dominant producer may also be able to create temporary bottlenecks in the network by strategic actions. Consider a situation with the network capacity into a geographic network area not being fully utilised, so that the market is integrated and power flows from adjacent surplus or low-price areas into this deficit or high-price area. By withholding production in the high-price area over and above the quantity that would result in full transmission capacity utilisation and power price equalisation among network areas under nodal pricing, a dominant producer has thus created a local network constraint and can raise the price in the area unilaterally, without other producers outside the area being able to respond to the price increase.[64]

To determine whether this is a profitable short run strategy, the dominant producer has to balance the loss of revenue from withholding production in the high-price area against the increase in revenue from monopolistic pricing in relation to the network constraint. In this context, there is a fundamental difference to be observed between a hydro power system with reservoirs for water storage and a thermal power system. In the former system a dominant producer has to consider the inter-temporal decision problem of how to dispose optimally in future periods of the water saved by the withholding of generation capacity in this period; cf. 3.13 below. This is not the case, to the same extent at least, for a thermal system where inputs to power production, e.g. oil, can be purchased in a market and where dominant power producers typically are so small in relation to the total market that they can be considered as price-takers.

In a long term strategic perspective, the dominant producer creating a network constraint will have to consider the risk of the constraint being eliminated by network investment by the transmission network owner to improve the market function of the network in relation to the power market.

From a short run efficiency perspective the reduced congestion rent for the network owner from such actions of the dominant producer is an income transfer from the network owner to the dominant firm, but in a long run perspective considerable efficiency losses can be involved, e.g. in terms of reduced incentives to invest in new transmission capacity to reduce capacity constraints.

[64] It follows, antithetically, that the exercise of market power can have the effect of eliminating network constraints, e.g. when a dominant producer withholds production in one network area to the extent that transmission capacity is exactly fully utilised and power prices are equalised across network areas.

It follows from the discussion above that there are three crucial questions to be asked about market dominance and potential (local) market power in relation to network capacity constraints:

- Is a producer sufficiently dominant to be able to influence power prices in relation to given network constraints or to create network constraints by withholding production strategically? In order to do so, he has to be a marginal producer in the sense that he can cover any residual demand locally, when all other producers produce at full capacity in relation to a network capacity constraint.[65]
- Are the duration of the temporary capacity constraint sufficiently long, and the elasticity of demand at peak demand sufficiently high, to make a short run capacity constraint strategy of production withholding profitable? Special attention should be given to periods when a network area is a high-price area and the capacity of other producers than the dominant firm is fully utilised in relation to the network capacity into the area.
- How long will a network capacity constraint be sustained before it is eliminated by new network capacity investment, and will the decision by the network owner to invest be influenced by the strategic actions of the dominant producer in relation to the constraint? In the literature on network capacity constraints and competition, to be reviewed in chapter 5, it is documented that a relatively limited increase in transmission capacity can, under certain circumstances and network configurations, have a considerable impact on electric power market competition.

With temporary network capacity constraints, a power market that is otherwise integrated can fall apart in temporary local submarkets, delineated by the constraints. This has implications for the definition and delineation of relevant markets for the purpose of competition policy analysis of the exertion of unilateral market power under market dominance, as well as for the properties and relevance of empirical measures of market dominance. This is discussed in chapter 4.

[65] The concept of the marginal producer is related to the concept of the pivotal supplier, and the pivotal supplier index as an empirical measure; see chapter 4.

3.13 Hydro power and market power

As mentioned above, a hydro power system with water storage has certain market characteristics and properties that have to be taken into account in an analysis of market power in electricity markets. Some of these characteristics are:

- The production capacity of the total hydro system in a given time period is determined by the (uncertain) inflow of water to the reservoirs and the capacity of storage of the reservoirs. While the momentary production capacity is defined by the installed capacity, as in a thermal system, a hydro system is energy dimensioned in relation to total demand in the sense that there must be sufficient input of water in the system, considered in isolation, to meet the demand for energy over the defined time period, e.g. a year. If water is scarce, the actual production capacity can be less than the installed capacity.
- Likewise, the production capacity of a dominant producer is determined by the (uncertain) inflow of water and the capacity of storage of his reservoirs, and also by the location of his generating plants in relation to permanent or temporary capacity constraints in the transmission network.
- In a hydro system, a producer is faced with an intertemporal decision of how much to produce today, or withholding of production today to exercise market power, compared to the opportunity cost of using the water resources at the best point in time in future periods. This is defined by the marginal value of water concept. Given the uncertainty of water inflow, the producer can run the risk that withholding of production today may lead to overflow of water in his reservoirs in a future period, with marginal water value of zero as a result.
- In a hydro system, production can be regulated up or down by the producers on very short notice, almost momentarily, compared with a thermal system. This property makes a hydro based market system more susceptible, *ceteris paribus*, to production manipulation to exercise market power by dominant producers in relation to exogenous temporary capacity constraints, or constraints created strategically by a hydro power producer, than in a thermal system.[66] However, because strategic

[66] Market dominance should here be understood in relation to the properties of an electricity market. As mentioned earlier, a producer may be able to exercise market power as a marginal supplier, e.g. behind a binding temporary constraint in the

behaviour in relation to network capacity constraints can also have the effect of eliminating such constraints, the opposite conclusion may also be drawn.[67] A dominant producer with generating plants located in several network areas defined by temporary network constraints is generally in a better position to use this position strategically to his benefit than a producer located in just one area.

Due to the market properties of a hydro power system, market power is normally more difficult to detect and document for a competition authority in a hydro power market than in thermal system. If a dominant hydro power producer e.g. withholds generation at a certain time of the year, is that because he is exercising market power in relation to the total market for in relation to capacity constraints, or is it simply because he considers this generation pattern to be his optimal use of his production and storage facilities, given the inherent uncertainty connected with water inflow and power demand in future periods.[68]

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transmission network, with a market share far below what is generally considered to qualify for dominance in other markets; see e.g. Bushnell (1999).

Because of the different cost structures and production properties of hydro power versus thermal power production, a producer with both generating forms will generally be in a stronger position to exercise market power than a single form producer. This may have implications, e.g. for merger policy; see chapter 7.

[67] Skaar and Sørgard (2004).

[68] See e.g. Bye et al (2004)

4 Structural market analysis – measuring market dominance and market power

The standard approach in competition policy analysis to detecting and enforcing possible breaches of prohibitions in competition law, *in casu*, the prohibition against the abuse of a dominant market position unilaterally to exercise market power, is, as mentioned in chapter 2, a three step procedure: a) defining and delineating the relevant market(s), b) defining and measuring market dominance, and c) determining whether or not an abuse of a dominant position actually has taken place. Thus, a *structural* market analysis approach, in terms of empirical concepts and quantitative measures of relevant markets and market dominance, is used to analyse a market *conduct* issue, i.e. the abuse of a dominant position to exercising market power to the detriment of economic efficiency.

The acid test of the structural approach is whether it is an applicable and appropriate way to approaching the analysis of abuse of market power as a market conduct phenomenon. This the more so, also mentioned in chapter 2, as recourse to structural market dominance tests is often taken in competition policy analysis, stopping short of testing explicitly for unilateral market power abuse. For electric power markets, this becomes even more of an important analytical issue, because it is often argued that those markets have characteristics and properties that necessitate stricter dominance tests, expressed e.g. in terms of lower threshold values of market shares, than are normally applied to other markets.

In the following, we will point to some problems and limitations of the structural approach when applied to the analysis of electric power markets and testing for the abuse of dominance. The main message from the discussion will be that, in our opinion, less emphasis should be placed on the analysis and assessment of market dominance as such, and more on the analysis and assessment of the unilateral abuse of market power.[69]

[69] For a comprehensive, general discussion of market definitions, dominance criteria and tests, etc, mostly as applied in EU competition law, see Bishop and Walker (2002), Motta (2004), and Whish (2003).

4.1 Market definition

Defining and delineating the relevant market is the cornerstone in any market power analysis.[70] When applied to electricity markets, three issues should be particularly observed:[71]

a) Static versus dynamic considerations in defining the relevant market.
b) Implications of transmission constraints for market delineation
c) Implications of lack of harmonisation of rules and regulations across product markets and geographical areas in otherwise integrated markets

4.1.1 Static versus dynamic considerations

The relevant market delineation according to the SSNIP test is basically static in nature. The starting point for the analysis is typically the present market structure, defined along dimensions considered relevant for delineating the market(s), and primarily as an analysis of competition among the incumbent firms.[72] In the wake of the liberalisation of the electricity industry, the structure of electricity markets has changed significantly, particularly with regard to the geographic market dimension under market integration, and this ought to be reflected in the relevant market definition. Otherwise, markets will tend to be defined too narrowly and market dominance exaggerated, structurally. Thus, dynamic structural aspects of markets need to be integrated into the analysis in a more consistent manner than generally seems to the case under the present practice.

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[70] The EU Commission (1997) has defined the relevant market as follows: "A relevant product market comprises all those products and/or services which are regarded as interchangable or substitutable by the consumer, by reason of the products' characteristics, their prices and their intended use.

The relevant geographic market comprises the area in which the undertakings concerned are involved in the supply and demand of products or services, in which the conditions of competition are sufficiently homogeneous and which can be distinguished from neighbouring areas because the conditions of competition are appreciably different in those areas."

This definition is somewhat different, but comes for practical purposes close to the commonly accepted hypothetical monopolist test, first developed by the competition authorities in the US, also called the SSNIP-test (Small but Significant and Non-transitory Increase in Price), as defined in the 1997 US Horizontal Merger Guidelines: "A market is defined as a product or group of products and a geographic area in which it is produced or sold such that a hypothetical profit-maximizing firm, not subject to price regulation, that was the only present and future producer or seller of those products in that area likely would impose at least a "small but significant and non-transitory" increase in price, assuming the terms of sale of all other products are held constant. A relevant market is a group of products and a geographic area that is no bigger than necessary to satisfy this test." (The US Department of Justice and the Federal Trade Commission (1997)).

In the US, a "small" price increase in this connection is normally defined as 5 per cent as a standard, while the EU Commission has defined it in the area of 5-10 per cent.

[71] For a detailed discussion of relevant market definitions and demarcations for electricity markets, see Nordic competition authorities (2003). For the Nordic market in particular, see Copenhagen Economics (2002a).

[72] Competitive pressure from potential entry is taken account by considering the possibility of entry, typically within a time horizon of two years.

Another aspect with a structural relevant market definition according to the SSNIP test, alluded to in chapter 3, is that it may direct the focus of the analysis more towards the market structure as such, rather than towards the incentives to compete. In other words, the potential for exercising market power may not be distinguished from actual exercise. Therefore, incentives for competition should be considered in addition to the structural parameters for relevant market delineation.

Electricity (spot) prices are highly volatile over the cycle (day, season etc). Particularly for electricity markets with a high proportion of hydro power, it may be difficult to distinguish between price effects as a consequence of the ordinary functioning of the market on the one hand and exercise of market power on the other. In addition, in some countries that have deregulated their electricity sector, electricity prices are still regulated, e.g. with a price cap on the retail price. This can make the concepts of “small” and “non-transitory” in the SSNIP test difficult to apply to the definition of relevant markets for electricity.

The EU Commission relevant market definition explicitly considers supply side substitution, while that is not the case under the US definition. Supply substitution is a relevant factor to take into account when delineating electricity markets, because of the potential for such substitution under the prevailing technology for electricity generation.[73]

4.1.2 Transmission constraints

Temporary transmission constraints can make an electricity market fall into geographic submarkets when the constraints are binding. Transmission constraints can have a huge impact on the definition of relevant market and dominant market position in specific competition cases. E.g. in the recent acquisition of Agder Energi by Statkraft in Norway, the market share of Statkraft in the integrated Nordic power market was calculated at 15 per cent, while it was approximately 65 per cent in the Southern Norway market, defined by a temporary transmission constraint which the Norwegian Competition Authority found sufficiently binding temporarily to warrant a ban on the acquisition.[74]

[73] See Copenhagen Economics (2002a).

[74] The decision was appealed to the Norwegian Ministry of Labour and Administration as the Appellant Body, which accepted the merger on the condition that some modifying undertakings were made.

The question to be decided on with regard to temporary transmission constraints for relevant market delineation is:

1) how "temporary" is the constraint, i.e. for how many hours per time unit is it binding to make an appreciable effect on the profit potential of the dominant firm to make it worthwhile to exercise its market power in the short run, and does it qualify for the exercise as an abuse according to competition law?[75]

2) is the exercise of market power a sustainable proposition when considering it in a medium to long term perspective, or will the potential be eroded by e.g. new investment in transmission capacity?

3) are the incentives for the dominant firm actually to exercise its market power sufficiently strong when taking into consideration the possibility of being exposed to legal proceedings and sanctions for the abuse of a dominant position, or reactions from the transmission system operator for possibly offending transmission network regulations?

For further discussion, see chapters 5 and 6.

4.1.3 Lack of harmonisation of rules and regulations

If legal or technical regulations differ sufficiently enough between parts of an otherwise integrated electricity market, e.g. the retail markets being national markets because of national regulations, while the wholesale market being integrated, as e.g. is generally the case for the Nordic electricity market, this has, of course, be taken account of when defining and delineating relevant electricity markets and measuring market dominance.

4.2 Measures of market dominance and market power

Three issues should be considered with regard to designing applicable measures or indicators of market dominance and market power of electricity markets:

a) Properties of standard measures of concentration and dominance in competition policy analysis as applied to electricity markets

[75] It should also be taken into consideration that strategic market power exercise can have the effect of eliminating transmission constraints; see chapter 5.

b) Extensions or modifications of standard measures to accommodate important characteristics of electricity markets
c) Should special measures be designed or special threshold values of standard measures applied to the analysis of dominance and market power in electricity markets?

4.2.1 Properties of standard measures of concentration and dominance

A commonly applied market concentration measure is the Hirschman-Herfindahl Index (HHI), defined as the sum of the squared market shares of each individual firm in the market.[76] The boundary value of the HHI is 0 when the market is atomistic (perfect competition) and 1 when there is just one supplier (monopoly). The US Merger Guidelines define a market as un-concentrated when the HHI is less than 0,1, moderately concentrated when it is between 0,1 and 0,18, and concentrated when the value of the HHI is above 0,18. These cut-off values of the index now seem to be generally accepted as indicators for the classification of markets according to the degree of market concentration for the purpose of competition policy analysis.

The HHI comprises in principle the whole distribution of firms in a market and cannot therefore be used as a measure of unilateral market dominance by one firm. For that purpose, market concentration ratios in terms of market shares of individual firms are normally used.

The EC Commission has declared that a dominant position can generally be taken to exist when a firm has a market share of 40-45 per cent of the relevant market. However, market shares in the region of 20-40 per cent cannot be ruled out as qualifying for unilateral dominance, depending on the particular circumstances with regard to market structure and competition in the specific case under investigation. When considering market shares, it is relevant to look at the market share of the largest firm relative to its competitors; the smaller the shares of its competitors, the likelier the Commission will hold that the largest firm is

[76] For definition and derivation of the HHI, see any text in competition policy, e.g. Motta (2004). For application to electricity markets, see Nordic competition authorities (2003).

(unilaterally) dominant.[77] Other factors than market shares can also be considered in relation to dominance, e.g. entry conditions.[78]

The HHI as a concentration measure and market shares as indicators of market dominance suffer from the same limitation mentioned for the relevant market definition in 4.1 above, i.e. that they basically are static in nature, characterizing a given market structure at one point in time. The HHI also gives a representation of Cournot competition only, i.e. a market situation where producers compete in quantity (capacity), which may not be a fully appropriate representation of electricity market competition.[79]

There is a simple relationship between the HHI and the Lerner index of market power, defined as the percentage deviation of market price from marginal cost, i.e. the Lerner index equals the HHI divided by the elasticity of demand.[80] For a discussion of the use of the Lerner index in market power analyses of electricity markets, see chapter 5.

4.2.2 Extensions of standard concentration measures to fit electricity markets

As mentioned in chapter 3, a common form of ownership concentration in electricity markets, at least in Europe, is through various forms of acquisition of cross-ownership positions in electric power companies. Because such ownership forms may affect dominance positions and the potential for exercising market power by dominant firms, they should be taken account of and reflected in measures of concentration in electricity markets.

Such an extension of standard concentration measures, *in casu* the HHI, has been done in the report on competition in the Nordic electricity market by the Nordic competition authorities (2003), under different assumptions about the form and importance of ownership relations among companies. A distinction is drawn between passive ownership relations, implying no direct control, but affecting the incentives for companies to compete in the market, and

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[77] If the largest firm is dominant according to the general definition, i.e. in the area of 40-45 market share and the nearest competitor is also relatively large, say above 30 percent market share, this may be defined as collective dominance rather than unilateral

[78] For discussion, see e.g. Whish (2003), chapter 5.

[79] See Borenstein et al (1999). For further discussion of the relevance of Cournot competition to electricity markets, see chapter 5.

[80] For derivation, see e.g. Nordic competition authorities (2003). The incentive adjusted approach was first suggested by von der Fehr et al (1998).

ownership relations implying some degree of control over other companies. For the former case an "incentive adjusted" HHI (HHI^{i}) is derived, while the latter case is represented by an "incentive and control adjusted" HHI (HHI^{ic}).[81]

The two concentration indices have been calculated for 2001 for each of the Nordic countries and for the Nordic electricity market as a whole. The results are summarised in Table 2 below.

Country	HHI	HHI^{i}	HHI^{ic}
Norway	0,1634	0,1980	0,3325
Denmark[82]	-	-	-
Finland	0,1766	0,2037	0,3005
Sweden	0,2893	0,2923	0,2988
Nordic market	0,0892	0,0989	0,1138

Table 2. Concentration indices for the Nordic countries

According to the market concentration criterion defined above, the Nordic market as a whole comes out as un-concentrated, except for the incentive and control adjusted index HHI^{ic} which gives a moderate concentration a little bit over 0,1. The national markets are moderately to highly concentrated, even when measured with the unadjusted HHI. We see that ownership relationships are particularly strong within the national markets, and especially so for Norway and Finland, where the HHI^{ic} increases significantly in relation to the unadjusted index HHI and the incentive adjusted (passive ownership) index HHI^{i}. For Sweden, market concentration is high even for the unadjusted HHI and the index does not increase very much when passive and controlling ownership relations among companies within the country are taken account of.

For an integrated wholesale electricity market like the Nordic market, the relevant market definition should comprise the whole market and market concentration and dominance should be defined and measured accordingly. Exceptions should only be made for possible

[81] For derivation and calculation, see Nordic competition authorities (2003), chapter 3. For the incentive and control adjusted index it is assumed that the degree of control is proportional to the ownership share in the company. See also Bye et al (2003).

[82] The Danish electricity market consists of two separate markets without transmission connections. The two markets are both very highly concentrated.

temporary transmission constraints for the wholesale market that would affect competition significantly, and lack of harmonisation of rules and regulations for the retail market(s), as discussed above.

Table 1 indicates the importance of taking ownership relations among electricity companies into account when defining and measuring market concentration, and not just actively controlling ownership positions. Attention should therefore be given to such relations in the competition policy for electricity markets. This includes seemingly "innocent" positions in the form of the acquisition of relatively small ownership shares. If minority positions are acquired in several competing companies, the total effect on concentration and competition can be considerable. It may be particularly worrisome from a competition policy perspective if such acquisitions are "disguised" from market concentration or dominance, so as not to challenge the competition authorities' notion of concentration or dominance according to standard definitions and measures.

4.2.3 Specific concentration measures for electricity markets. The Pivotal Supplier Index

The Pivotal Supplier Index (PSI), proposed by Bushnell et al[83], is an attempt to incorporate the concept of a marginal supplier into the empirical analysis and measurement of market power in electricity markets, and thus also incorporating demand conditions. This indicator examines whether a given producer/generator is "pivotal" or necessary in serving demand at a given point in time. Bushnell et al defined the PSI as a binary indicator, which is set equal to one if the supplier is pivotal, and zero if the supplier is not. The index value for each hour over a period of time can then be aggregated to determine the percentage of time a producer can be defined as pivotal.[84]

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[83] Bushnell et al (1999). See also Bushnell (2003).

[84] In an *ex ante* study of the Wisconsin region, they found e.g. that the largest supplier would be a pivotal supplier in 55 per cent of the hours of the year.

For a discussion of other, similar indicators and measures, see e.g. Twomey et al (2005).

4.3 Market dominance measures and concentration threshold values for electricity markets

On the basis of the above discussion: Should special measures be designed or special threshold values of standard measures be applied in competition policy to the analysis of dominance and market power in electricity markets, given the special characteristics of such markets?

In order to answer the question, let us make a brief detour to dominance criteria and threshold values applied in the *ex ante*, sector-specific regulation of two other sectors or industries with network characteristics, i.e. the telecommunications and media sectors, with examples from the EU and the Norwegian regulatory regimes, respectively.

The new regulatory framework (NRF) for telecommunications, adopted by the EC in 2002, can be seen as a movement from a strict regulatory regime based on defined quantitative criteria, e.g. of market dominance (strong market position), and *ex ante* regulation, towards more reliance on dominance standards from competition policy and *ex post* competition policy regulation.[85] Under the former regime, a strong market position (SMP) was generally associated with a market share of 20 per cent of the relevant market, while under the NRF, according to the Framework Directive,[86] .."An undertaking shall be deemed to have a strong market position if, either individually or jointly with others, it enjoys a position equivalent to dominance, that is to say, a position of economic strength affording it the power to behave to an appreciable extent independently of competitors, customers and ultimately consumers."

This definition of SMP is identical to the standard definition of dominance in EU competition law, referred to in chapter 2. The analytical approach of the NRF follows also closely the standard approach in competition policy analysis: defining and delineating the relevant market(s), identifying market dominance, and formulating remedies to deal with infringements on competition law. However, the NRF prescribes fairly detailed market

[85] For accounts, see e.g. Cave and Crowther (2004) and Hope (2003).

[86] The NRF consists of several EC Directives, including the Framework Directive. It also contains a Recommendation on Relevant Markets, and Guidelines on Market Analysis. The Recommendation lists three cumulative criteria for identifying markets suitable for *ex ante* regulation: a) high and non-transitory barriers to entry, b) the expected persistence of such barriers to entry over a relevant time period, and c) the inability of competition law adequately to address the particular issue under investigation.

definitions for the practical delineation of relevant markets, leaving little leeway for the national regulatory authorities in adjusting the market definitions to the specific circumstances in a particular dominance case.

The Norwegian economic regulatory regime for the media sector is interesting in a market dominance context, because fairly detailed market concentration threshold values have been proposed introduced in new media legislation. In the Norwegian media regulatory regime the emphasis has traditionally been on ownership regulation.[87] The equivalent to market dominance in competition policy has been expressed in the term "considerable ownership position" in the Media Acquisition Act. The Norwegian Government has proposed a number of changes in the media ownership regulations, the most important ones being:[88]

- Extending the coverage of the Acquisitions Act to include electronic media and changing the name to Media Ownership Act.
- Extending the scope of the Act to cover cooperative agreements between media firms and not only acquisitions; and also covering multimedia and cross-ownership.
- Defining "considerable ownership position" in terms of market concentration threshold values and introducing threshold values for media markets explicitly into the Act. The proposed thresholds are:
  For *national* media markets:

  1. 40 per cent or more of the total daily circulation for the daily press market. The same threshold value applies for the television market, measured in terms of number of viewers, and the radio market, measured in terms of number of listeners (voice).
  2. 30 per cent or more in one of the media markets under 1 above and 20 per cent or more in one of the other markets under 1, or
  3. when a media firm controlling 10 per cent or more in one of the media markets under 1 becomes owner or part owner in a firm belonging to another ownership constellation controlling 10 per cent or more within the same media market (cross-ownership).

[87] For details, see Hope (2005).

[88] Ot.pr. nr. 81 (2003-2004).

For *regional* markets:

1. 60 per cent or more of the total daily circulation of regional and local newspapers in a media region.
2. 45 per cent or more of the total daily circulation of regional and local newspapers and 33 per cent or more of the market for local TV or local radio i the same media region; the media regions being defined by the government (the MOA) and introduced by secondary legislation. The concept of local media markets, as a separate geographic market entity, no longer exists in the new law proposal.

The wording of the proposed paragraph in the Media Ownership Act parallels closely the formulations of the abuse of dominant position paragraph (§ 11) in the Norwegian Competition Act. We see that rather detailed threshold values for "considerable market position" are prescribed to be included directly in the Act. The threshold values have been raised considerably in comparison with the former Acquisition Act, where a 20 per cent market share generally was considered the benchmark for considerable ownership position. The regulations are supposed to be enforced by the sector-specific authority, the Media Regulatory Authority.

The two examples of regulatory developments listed above indicate a convergence of analytical approaches and regulatory measures applied under *ex ante* regulation to *ex post* competition policy regulation. This seems to be a general movement in the policy approach to the regulation of network industries. Would it then, on this background, be advisable to advocate the introduction of special dominance criteria and threshold values for the *ex post* competition policy regulation of electricity markets as a means to control for the exercise of unilateral market power? There are some strong arguments against such an approach, in my opinion.

Firstly, special dominance criteria in terms of specific, predetermined threshold values for market shares, as e.g. in the case of Norwegian media regulation, may tend to draw attention more to market structure as such than to market behaviour, i.e. the actual abuse of a dominant position, as mentioned above.

Secondly, a major determinant in the delineation of relevant electricity markets in competition policy analysis is transmission constraints; cf. chapters 3 and 5. Transmission constraints are typically temporary, dependent upon the actual flow of electricity over the lines in the short run and the decisions of the transmission network owner(s) for network expansion in the long run. In a meshed transmission network, it may, as mentioned, be difficult actually to identify the binding network constraints in a given load situation, and the network operator has then some discretionary power to reroute flows and relocate constraints in the short run. Under these circumstances it will be difficult to delineating relevant markets and defining dominance with any degree of permanence as a market structural phenomenon for ex post competition policy purposes, and to signalling this to market participants in a consistent and predictable way.

Thirdly, under certain market conditions, a small electricity supplier, of a relative size far below what is generally considered as qualifying for market dominance in competition policy, may be able to exercise unilateral market power as a marginal producer, particularly in hydro based power systems, as documented in chapters 3 and 5. To capture such situations in market structural terms, might make the dominance concept somewhat ill-defined and illusory for practical applications.

This said, however, it cannot, of course, be denied that electricity markets have characteristics and properties that give potential scope for the unilateral exercise of market power. There seem to be three aspects or dimensions in a competition policy to handle this market dominance – market power issue:

- Instead of taking recourse to special dominance criteria and threshold values for electricity markets, for a *given* market structure, the focus in competition policy should be on documenting and sanctioning the actual infringement of the prohibition against the abuse of a dominant position rather than on predefined dominance criteria as such. Dominance should be defined on a case-to-case basis, taking the special circumstances of the actual case into consideration. Admittedly, this flexibility in defining and measuring dominance may be detrimental with regard to considerations of consistency and predictability in competition policy; however, a balance has to be struck. Such an approach attacks the issue of the abuse of market dominance directly and it is generally in line with the stated EC Regulation 1/2003 that ...”Structural

remedies can only be imposed either where there is no equally effective behavioural remedy or where any equally effective behavioural remedy would be more burdensome for the undertaking concerned than the structural remedy", when an infringement on Article 82 has been made.

- A stricter competition policy may be warranted for electricity markets than for markets in general when it comes to *changes* in the market structure, particularly with regard to market restructuring and increased concentration from mergers and acquisitions, because of the special characteristics of electricity markets in competition terms and because concentration in most electricity markets already seems to be fairly high. This also includes acquiring part- or cross-ownership positions through mergers and acquisitions, as discussed above.
- Attention should be given in competition policy to the design and enforcement of an effective market monitoring system for electricity markets for the detection and sanction of the unilateral exercise of market power; cf. chapter 6.

These aspects are discussed further in chapter 7.

5 Market dominance and market power in electric power markets: A survey of the literature

In this chapter we will review some of the available literature on market dominance and market power in electricity markets. A large number of studies have been undertaken on market power issues in electricity markets, due to the attention devoted to such issues in the wake of the liberalisation and restructuring process; therefore a survey necessarily has to be selective. The focus will be on empirical studies of unilateral market power, reviewing analyses that have been particularly interesting in terms of substantive results or innovative in terms of analytical approach, methodology, and use of empirical data.

A variety of approaches has been made to the study of market power in power markets in order to capture the properties and specificities of such markets, as discussed in chapter 3. In chapter 4 we discussed one such approach, i.e. horizontal market power analyses based on various types of concentration measures and indices of market structure and market dominance, where also some limitations and shortcomings of this approach under static and dynamic considerations were mentioned. A second and "dominant" approach is to analyse strategic market actions and behaviour in various forms of oligopoly models of electricity markets, while a third approach, called the market-level approach,[89] examines whether the market as a whole is setting competitive prices.[90] The model outcome is then compared to actual market prices and on that basis market power or other market inefficiencies can be assessed.

In the first part of the survey, section 5.1, market power analyses without taking transmission capacity constraints into consideration are reviewed. Then, in section 5.2, analyses with transmission constraints are introduced. In section 5.3 studies of market power in hydro power systems, with and without transmission constraints, are discussed. Most of this literature refers to wholesale electricity markets. Finally, in section 5.4, some studies of market power in retail markets are reviewed. Reference will be made to the discussion of potential sources of market power in chapter 3.

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[89] Borenstein et al (2002).

[90] There are also many large-scale power system simulation models that have been used e.g. for planning purposes. These models typically model the complexities of the whole system in considerable detail, often with emphasis on technological and physical aspects, but are generally not suited to study strategic behaviour by individual players. Such models are not covered here.

As mentioned in the Introduction, a large proportion of the empirical studies of market power, in a regional context, have been undertaken for the California electricity market and also for other regional markets in the US. The UK market has also been covered relatively extensively. Other regional and national markets that have been analysed are, among others, the Nordic, the German, the Spanish and the Dutch markets, to be reviewed below.

5.1 Market power in oligopoly models of strategic market behaviour

There has been some discussion and controversy in the literature about which oligopoly model best represents competition and strategic options for competitors in electric power markets; in particular, whether a Cournot or a Bertrand model of competition should be applied. In a Cournot model, producers compete in quantities, while in a Bertrand model competition takes place in prices. It has been argued, e.g. that since electricity is a non-storable commodity, so that production has to be sold instantaneously, Bertrand competition appears to be a more suitable assumption with regard to strategic behaviour than Cournot. On the other hand, and especially in periods of high demand and facing capacity constraints, the Cournot assumption seems more appropriate; cf. the discussion of capacity withholding in chapter 3. In the Bertrand model, any firm can capture the entire market by pricing below other competitors, but with increasing marginal cost and limited installed capacity as the typical situation for electricity markets, the Bertrand assumption appears less realistic than Cournot.[91]

However, in electricity markets organised as pools or power exchanges, producers typically do not compete by bidding a fixed price or quantity into the market, or submitting a single quantity that would determine a single price as under the Cournot assumption, but rather compete in price and quantity schedules, i.e. in supply functions.[92] Faced with an uncertain demand, producers must choose their strategies in advance before they know what the market

[91] In some circumstances, however, e.g. in periods of low demand, some authors have suggested that the Bertrand model might be a relevant representation; see e.g. Wolfram (1998).

[92] E.g. all European power exchanges use price-quantity bids.

outcome will be. Due to this feature, the supply function equilibrium (SFE) approach has been used in a number of studies of competition and market power in electricity markets.[93]

5.1.1 Supply function equilibrium competition

The first papers on competition in the England and Wales electricity market used a SFE approach to study bid-based price increases resulting from market power exertion. Green and Newbery (1992) showed that the duopoly of National Power and Powergen resulted in equilibrium prices well above the competitive level.[94] Their findings were supported by von der Fehr and Harbord (1993), in a different methodological setting. They used an auction model to show that producers would bid above marginal costs, although they did not model in detail the producers' production capacities and cost structures.

Other studies based on a SFE approach include Bohn et al (1999) for the California market, taking e.g. into account the fact that in the former California pool generators could bid a different supply curve for each period, while in the former English pool generators had to make a single bid for all 48 defined periods of the day. Hobbs and Rijkers (2002) have applied a similar model to the Benelux, French and German markets, but with emphasis on inefficiencies in transmission pricing in Europe. Ciarreta and Espinosa (2003) have analysed the market performance of the Spanish electricity pool. To measure market power they compared the behaviour of generators under the ownership of large generators (firms) with that of generators owned by smaller firms. They concluded that large generators were exploiting their market power by consistently submitting supply curves with higher prices than their competitive benchmark. Boisseleau et al (2004) used a SFE approach combined with forward contracts, following the approach of Newbery (1998), to model competition in the Dutch electricity market. In their simulations with the model, they found that the level of the price mark-up increased significantly with the level of demand. At certain points the mark-up increased dramatically, indicating substantial market power for some generators. This may be explained by the fact that in such a situation other generators have already bid all of their capacity into the market, while generators that still have available capacity can

[93] The supply function equilibrium (SFE) approach was developed by Klemperer and Meyer (1989). They showed that, for a given demand function, for any price above the competitive one, there exists a corresponding Nash equilibrium. The SFE model typically yields market outcomes that lie between those of the Cournot and Bertrand models.

[94] See also Bolle (1992). This study is, however, about collective market power exertion through tacit collusion.

exercise significant market power. This effect may thus lead to extreme mark-ups by dominant firms.[95] It can also be consistent with a market situation mentioned in chapter 3, that even a small producer can exercise market power on his residual demand curve, when all other producers have bid all of their capacity into the market, and there is a small increase in demand.

The attractiveness of the SFE approach lies partly in the fact that it captures important characteristics and features of electricity markets and partly that the market outcome and competitive evidence from various markets seems to be consistent with the model, as a middle-path between the extremes of the Bertrand and Cournot assumptions, respectively. In periods of low demand and spare available capacity, competition becomes more intense and closer to Bertrand price competition, while when demand increases and capacity margins become more tight, competition comes closer to the Cournot assumption.[96] Most of the studies based on the SFE model have documented market power exertion in the sense that producers typically bid above marginal cost, with resulting mark-ups of prices above costs.[97] However, as long as the bids from the individual producers are not known, and, in particular, the bids of dominant producers, it will be difficult to document the specific exercise of unilateral market power and to distinguish unilateral power from collective market power, or tacit collusion.[98]

The SFE approach has, on the other hand, been criticised on theoretical, methodological, and computational grounds.[99] The main problem with the approach is that it tends to yield several possible equilibria and that the conditions for an equilibrium to exist and to be unique are quite restrictive. This limits the general applicability of the approach to market power analysis of competition in electricity markets, in spite of its otherwise attractive attributes.

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[95] See also von der Fehr and Harbord (1993).

[96] This is with regard to actual competition, when producers fully utilise their market power potential. Since market power abuse is illegal under (European) competition law, this may have a restraining effect on the actual exercise of market power, as discussed in Chapters 2 and 3.

[97] Some authors maintain that market prices have actually been much lower than predicted by SFE models; see e.g. Wolfram (1999), with reference to the British market.

[98] An important feature of an electricity market organised as a pool or power exchange, which may be not fully captured by a SFE model is that it a repeated auction, where the players meet every day or hour, with disclosure of the market outcomes available to all participants with a relatively short time lag. See Newbery (2004) and the discussion of market transparency in 3.6.

[99] See e.g. Baldick and Hogan (2001) and (2004).

5.1.2 Cournot model competition

The Cournot model has been used in a number of studies of competition and market power in electricity markets.[100] In Cournot models, firms compete in quantities, or rather in capacities in electricity markets, as mentioned in chapter 3. The models generally result in a unique equilibrium and they can make use of the rich cost data that is usually available for electricity markets. Below we have reviewed some studies based on the Cournot assumption, analysing various aspects of market power in power markets.

Borenstein and Bushnell (1999) used a Cournot model with a competitive fringe to simulate the potential for market power in the deregulated California market.[101] The model was implemented for 2001, using cost data for the pre-deregulation structure of the market. They found evidence of a significant potential for market power in high demand hours for several month of the year, and especially in the fall and early winter periods, when hydro power production was at its lowest level relative to demand. The availability of hydro power production and the regulatory flexibility of hydro power, as mentioned in 3.11 above, can thus be important determinants of competition and the potential for exercising market power; cf. also Section 5.3 below. They also found that the potential for market power was significantly reduced when the elasticity of demand is increased. This effect indicates that competition authorities should be concerned with the time response of consumers to power price changes, shortening the time lag down to real-time pricing, if possible, and not only the level of prices.

Bushnell et al (2004) examine market outcomes under an assumption of perfect competition and under an assumption of Cournot competition in three US electricity markets with different market designs and structures: California, New England and PJM (Pennsylvania, New Jersey and Maryland). The purpose is to measure market performance relative to benchmarks that abstract away from market design characteristics but capture important structural elements. Their findings suggest that vertical arrangements between suppliers and retailers strongly affect estimated market outcomes. When vertical arrangements were included in the objective function of firms, Cournot equilibrium prices in both New England and PJM fell dramatically. In the California market, such arrangements do not exist. After accounting for vertical relations, performance in each market relative to Cournot is similar,

[100] In addition to the analyses specifically mentioned below, see e.g. an early study by Anderson and Bergman (1995).

[101] See also Borenstein et al (1999).

particularly during hours of peak demand. The least competitive horizontal structure was found in the PJM, due to concentration of ownership and low elasticity of import supply, where there is also a retail price cap in a majority of hours. For competition policy, the results imply that, since similar horizontal structures can produce radically different outcomes under different vertical arrangements, such arrangements should be taken account of in the competition policy analysis, and not only the horizontal structure of markets; cf. 3.3.

Amundsen and Bergman (2002) analyse the effect of cross-ownership on competition in the integrated Norwegian-Swedish power market, using a numerical model based on Cournot behaviour. The aim is to explore to what extent increasing cross-ownership among the major power companies in Norway and Sweden, due to mergers and acquisitions in the market restructuring process, might re-establish the market power that was lost when the two national markets were integrated in 1996. Their simulation results indicate that cross-ownership and partial ownership tend to increase horizontal market power in the market and thus the market price of electricity. This suggests that competition authorities should be concerned with market power issues resulting from increased market concentration by mergers and acquisitions, and that ownership issues should be considered in assessing competitive performance.

Some studies on the Cournot assumption examine specifically the decision of producers to offer their capacity to the market, and in particular the decision to withhold capacity to exercise market power. One withholding strategy[102] could be to reduce the overall level of capacity available, keeping high-cost plants from the market and thus raising the component of the spot price designed to reward capacity when it is scarce. Another strategy could be to reduce the overall level of capacity by keeping low-cost plants from the market, ensuring that a higher-cost plant sets the energy component of the spot price, and then at a higher level than if all capacity was available. Both strategies have been studied in relation to the British electricity pool market.

The first strategy was studied by Newbery (1995). He showed that the capacity payment system (the VOLL and LOLP mechanisms) that was designed and implemented for the British power pool gave the generators an additional incentive to keep some of the capacity

[102] Green (2004).

away from the market, with the effect that they received enough revenue per kW of capacity at seasonal peaks to cover almost all overhead costs.

The second strategy was studied by Wolak and Patrick (1997).[103] They showed that British generators declared roughly the same quantity of available capacity, relative to peak demand and off-peak demand months, during a period from 1991 to 1995. They suggest that generators would prefer to withhold capacity from the market, compared to raising their bid prices, because capacity withholding could be defined as maintenance and repairs of their production system, at strategically "convenient" periods, while the market regulator would be able to compare the bid price of each plant with an estimate of its marginal cost.

Starting from the observation that, in some circumstances, withholding capacity from the market is a perfectly acceptable competitive response, Green (2004) develops a test to distinguish between a proper competitive response with regard to capacity withholding versus market manipulation to exercise market power in relation to capacity payments, defined on the basis of avoidable cost. If the price is above the avoidable cost of keeping a generating plant open over the relevant period, the competitive market response would be to make it available, while the plant should be withdrawn if the price is lower than its avoidable cost. Thus, if generators had perfect foresight and acted competitively, capacity payments should equal the avoidable cost of a peaking plant, while higher capacity payments would imply market power exertion. Green studies both the strategies of capacity withholding mentioned above on the basis of pool data and concludes that, from the available evidence from the period examined, neither strategy seems to have been significant in the British pool. The evidence for large-scale capacity withholding is generally weak. This may be due to the fact that, after an initial period of abuse of the capacity payment, the regulator (Ofgem) partly adjusted the capacity payment system and partly that the regulator required the generators to provide information on their capacity and its availability.[104]

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[103] See also Wolfram (1998) and Wolak (2003b).

[104] Capacity decisions are also studied by Crampes and Creti (2001). They show that generators would have an incentive to reduce the amount of capacity offered into the market, if this would turn the market form one with excess capacity and low bids into a capacity-constrained market with high prices in equilibrium. Creti and Fabra (2004) discuss various designs of capacity markets and capacity payment systems and develop a model where generators have to make a decision of how much of their production resources to commit in a capacity market for electricity and how much energy to allocate to an adjacent national and foreign market, respectively, and investigate how these decisions are affected by the form and degree of competition.

5.1.3 Other approaches to market power analysis

The general approach of the analyses under 5.1.2 is to try to replicate the strategic actions of suppliers in an electricity market by studying their bidding behaviour and output supply or capacity withholding decisions of each firm in the market to detect attempts to affect prices. Another approach is suggested by Borenstein et al (2002), i.e. to try to replicate the competitive market outcome by examining whether the market as a whole is setting competitive prices, given the production capabilities of all the players in the market. This can be called the market-level approach to market power analysis.

Starting from what they call "the fundamental measure of market power", as the margin between price and marginal cost of the highest cost unit necessary to meet demand, they estimate price-cost margins based on what the system marginal cost of serving a given level of demand would be if all firms were behaving as price-takers. This competitive benchmark is then compared to actual prices in California for the period from June 1998 to October 2000 in order to detect market power.

The results of their numerical analysis indicate that market power was a significant factor during the high-demand summer months of the three years, while there was near-competitive pricing during the lower-demand months of the first two years. By decomposing wholesale electricity payments into production costs, infra-marginal competitive rents, and payments resulting from the exercise of market power, they found that in the summer of 1998, 25 percent of total electricity expenditures in California could be attributed to market power; a figure that rose to 50 percent in the summer of 2000.

The authors acknowledge potential drawbacks of their approach to market power analysis, in that it captures all inefficiencies in the market, some of which may not be attributable to market power, e.g. market design flaws, faulty dispatch arrangements, regulatory shortcomings, etc.[105] Also, the approach makes it difficult to distinguish between the exercise of unilateral market power and collusive attempts to exercise such power. From a competition policy perspective, an important result of the study is, however, that it points to the substantial

[105] The market-level approach has been criticised by Harvey and Hogan (2002). They point e.g. to the fact that generation capacity is a highly durable asset with a long gestation period for new investment. Thus, it is reasonable to expect periods with high prices due to capacity shortage before new capacity is brought into the system.

potential for market power exercise at peak demand periods or periods with high capacity utilisation more generally.

A market-level approach was also applied by Wolfram (1999), in an empirical analysis of actual market power in the British electricity market from 1992 to 1994.[106] She estimated price-cost margins, using direct measures of marginal costs and several methods of estimation that did not rely on cost data. The results indicate that, although the generators charged prices significantly higher than their observed marginal costs, they did not take full advantage of the inelastic demand to raise prices to level predicted by theoretical oligopoly models, and considerable lower than predicted in the empirical analyses of potential market power in the SFE and Cournot traditions, as discussed above. She ascribes the restraining behaviour of the generators with regard to potential market power exercise to the threat of entry by new suppliers, to financial contracts between the suppliers and their customers, and to regulatory constraints on capacity withholding etc., put in place by the regulator.

Another study of market power in the British electricity market, with a similar approach, has been done by Sweeting (2004), for the period 1995-2000, i.e. after Wolfram's study. He finds that that the generators exercised market power during that period, and more so from 1997 to 2000 than for the previous years, even though the market structure became much less concentrated over time, as measured by standard market concentration measures. In examining whether this was consistent with predictions of static oligopoly models in the Cournot tradition, he finds that this was the case for 1995 and 1996, but that a significant change in behaviour occurred in late 1996. After 1996 the behaviour of the generators was inconsistent with the Cournot assumption, but it was consistent with tacit collusion.[107]

5.2 Network capacity constraints and market power

The studies of market power reviewed in 5.1, did not explicitly consider the impact of capacity constraints in the transmission network on the scope and potential for market power exercise in generation. Following up on the discussion of network constraints in 3.10 in

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[106] See also Joskow and Kahn (2002) for the California market.

[107] An alternative explanation, which does not preclude tacit collusion, could be that generators exercised market power by increasing pool prices in order to raise prices in future contracts.

As mentioned in chapter 3, exercise of market power under the British power pool system, unilaterally as well as collectively, was one reason for the decision to abolish the Pool and replace it with a series of bilateral markets in the NETA system. See e.g. Green (1999) and Newbery (2004).

chaper 3, we will review some studies on the interaction between the availability of transmission capacity and market power in generation.

As with the analyses of market power in 5.1 above, studies of market power and transmission constraints vary considerable in terms of market model specification as well as transmission network specification and modelling. The majority of studies have applied a Cournot market model of imperfect quantity competition, while some (e.g. Bushnell (1999) and Joskow and Tirole (2000)) have proposed Bertrand models of imperfect price competition. With regard to transmission network specification, the models vary from a single transmission line two-node model with various configurations of producers and consumers on the line (e.g. Willems (2002), Borenstein et al (2000), and Joskow and Tirole (2000)), to the favoured three node network model (e.g. Léautier (2001)), Bjørndal and Jörnsten (2004) and Bjørndal and Skaar (2004)), to more complicated representations in models replicating actual networks (e.g. Cardell et al (1997)), to full scale network models of actual networks applied in practice by network operators. The survey below on network capacity constraints and market power is structured on the transmission model representation and not on the electricity market model specification.[108]

Already in 1983, when the discussion of the deregulation of the electricity sector was in an early stage, Joskow and Schmalensee[109] pointed to the crucial role of the transmission network for the efficient functioning of electric power markets and warned against liberalisation of the markets without taking transmission access issues, transmission rights and network capacity constraints into account. In 1984, Schmalensee and Golub, in an article about the deregulation of the power sector in the US, where they estimated effective concentration in various US electricity markets, they stated in their conclusion: " First, there is considerable uncertainty as to the likelihood of effective competition in bulk power supply in many areas of the country. The key unknown is the impact of transmission capacity on the effective extent of geographic markets."

[108] From an empirical and competition policy perspective, a crucial question is to what extent the stylized representations of transmission network configurations impact on the policy conclusions that can be derived on the basis of the network analyses with regard to market power and capacity constraints. As with any model, there is a trade-off between model simplicity and empirical realism. Cf. the concluding section

[109] Joskow and Schmalensee (1983).

5.2.1 Market power and capacity constraints in two-node transmission network models

Willems (2002) develops a model with Cournot competition between two generators located at one end of a transmission line to provide electricity to price-taking consumers located at the other end. There are no capacity constraints in generation. A central theme of the paper is to highlight the role of the network operator to organise for market competition and extracting congestion rent from the generators when there are capacity constraints on the line.

He finds, maybe somewhat surprisingly at first sight, that the market for electricity may become more competitive with a capacity-constrained transmission line than without, when generators are located on the same end of the line. The reason is that, due to the structure of the model, the network operator can organise for competition by rewarding players to bid more aggressively. When there is a network constraint, the assumption is that the network operator allocates the transmission capacity proportionally to the bids. Generators bid more aggressively for the constrained capacity, because this reduces the capacity available to the other competitor in the duopoly. In this sense, the generators are rewarded for bidding aggressively by obtaining some share of the congestion rent from the network operator.[110]

Borenstein et al (2000) study a model with two identical regions, two producers and a transmission line between the two regions.[111] The producers are located at each end of the line and they act strategically in Cournot quantity strategies.[112]

The issue of potential local market power from exogenous network capacity constraints is clearly demonstrated in the analysis. They also show that limited transmission capacity can give a producer the incentive to reduce production in order to create a constraint on the transmission line and thus be able to exercise unilateral market power behind this bottleneck in its area of dominance. Another interesting result or insight from their analysis is that there may be no relationship between the effect of a transmission line in stimulating competition and the actual electricity that flows on the line in equilibrium. In some circumstances, modest additions to a transmission network can yield very large social benefits in terms of reduced

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[110] Willems has also formulations with perfect information on the side of the network operator and full taxation of the capacity rent.

[111] The authors think of this as a first-level approximation to the market distinctions between northern and southern California, and the effects of network capacity constraints in the model are discussed in the context of the deregulated California electricity market.

[112] There is, however, also a discussion of Bertrand competition in the paper.

power prices by mitigating the potential for exercising market power, increasing consumption, and lowering deadweight losses, even though there would be little actual power flowing over the network; in fact in some cases the power flow might even be reduced.

On the basis of the results and insights of their study, the authors criticise the present methods and principles used in network operation and investment planning by regulatory authorities, in this case the Federal Energy Regulatory Commission (FERC), for not taking sufficiently account of network capacity constraints and the welfare consequences of market power exercise thereof, in their network capacity dimensioning standards and procedures. Such standards and procedures have, in the authors' opinion, almost exclusively been focused on network reliability issues. To the extent that cost-benefit analysis of network capacity expansion to relieve transmission bottlenecks has been applied in network planning, the focus has been on the assessment of benefits of reduced curtailment in service or on revenues from capacity payment systems for the usage of the new capacity, without taking into account that even unused transmission capacity may be providing benefits in terms of increased competition and mitigation of the potential for the exercise of market power.

Joskow and Tirole (2000) also use a two-node network between two regions to analyse market power issues, but in a somewhat different context. Here the transmission line connects a region with cheap generating supplies, and thus exports of electricity from the region, with an importing region with expensive production. They analyse whether and how the allocation of transmission rights associated with using electric power networks affects the behaviour of generators and consumers with market power. In a comparison of the competition and welfare properties of financial transmission rights and physical rights, they find that both type of rights can enhance the market power of producers (and consumers with monopsony power) in essentially the same way. Because physical transmission rights can be withheld from the market, they may, however, give scope for a larger potential for the exercise of market power and thus have worse welfare properties than financial rights. A general conclusion of the study is that the outcome with regard to the allocation of transmission rights and market power is strongly dependent on the specification the microstructure of the markets.

5.2.2 Market power and capacity constraints in three-node transmission, and more complicated, networks

A three-node transmission network representation allows for a richer specification of the underlying market structure and of network capacity constraints, incorporating properties of the physical flows of power over the network more accurately, than the two-node network model. Three-node network configurations are therefore commonly used to illustrate effects of network capacity constraints in models of electricity markets to analyse market power issues.

Léautier (2001) develops a symmetric three-node network model, with one generator located at one node each and all demand is located at the third node. The generators act strategically as Cournot players. He summarises the outcome of his analysis in four propositions:

1. An increase in transmission capacity has two effects: a) cheaper power can be substituted for more expensive power to meet demand (the substitution effect), and b) competition among generators is increased, resulting in lower short-run profits (the strategic effect). While the first effect is always welfare improving, the second effect raises an equity issue with regard to the income distribution of consumers and producers.
2. Policy makers (regulators) can and should use transmission expansion to increase competition in generation.
3. Even if they were to receive transmission payments corresponding to their investment, generators would not expand the transmission network, because the loss of local market power from expansion (elimination of bottlenecks) would outweigh the gains from access to new markets, and the transmission payments.
4. Generators generally desire too much network congestion. This strongly supports vertical separation of the power industry, beyond the traditional foreclosure argument. Even if connection agreements between generators and grid owners were perfectly monitorable and enforceable, vertical integration could still be detrimental, for a transmission company also involved in generation could strategically plan to invest in too little expansion of the transmission network in relation to demand, or fail to appropriately maintain existing lines, to increase profits.

The results and policy implications of the analysis are, as we see, rather similar to those of Borenstein et al, with regard to the effects of network capacity constraints on competition and market power in power markets. The stylized representation of the network and of the market structure should, again, be considered, though.

Oren (1997) studied both a two and three node Cournot model of competition across congested transmission lines, where an Independent System Operator (ISO) dispatches generators optimally, based on bid prices. He showed that, absent active transmission rights trading, the resulting equilibrium may be at an inefficient dispatch and congestion rents will be captured by the generators. Thus, in a system of passive transmission rights, such as the Transmission Congestion Contracts proposed by Harvey, Hogan and Pope (1996), the expectation of congestion and passive transmission rights can lead to implicit collusion among the generators, even in the absence of local market concentration in generation. The passive transmission rights will be pre-empted by the active traders who will adjust their prices to capture the congestion rent, resulting in short and long term inefficiency by departing from marginal cost pricing. On this basis, Oren demonstrates how active trading of transmission rights in parallel with a competitive electric power market could prevent the price distortion and inefficient dispatch associated with passive transmission rights.

Cardell et al (1997) compute numerically the equilibrium solutions in a Cournot model with various specifications of the market structure, with some players acting as a competitive fringe while some act as large strategic firms, anticipating the response of the competitive fringe. The analysis is based on a three node representation of the transmission network, but extended for illustrative purpose to a test model of a larger network.[113] One interesting finding of the analysis is the “leverage effect”: a producer with multiple power plants located in strategic positions relative to transmission constraints would be in a position to exercise local market power by increasing his production at one point to block transmission of a disproportionate amount of competing generation, thus increasing congestion and raising his overall profits. Thus, while Oren documented above that imperfect competition (collusion) among generators could result in a transfer of congestion rent from transmission asset owners to generators, Cardell et al demonstrated the potential exercise of unilateral market power by a

[113] The test model included 36 busses and 52 lines, with generation units at 13 locations owned by two large firms and a competitive fringe, and some arbitrary constraints on the various transmission lines. The particular results revealed price and production profiles that differed sharply form the competitive benchmark.

multi plant producer, acting strategically in relation to the transmission network, to capture part of the congestion rent. Increasing production at one point in the network to create a transmission constraint may at first sight seem counterintuitive, but in this particular context it is a workable strategy.

Green (2005) discusses optimal transmission pricing rules and the welfare losses from deviation from such rules, applied in a simplified model of the England and Wales electrical system. The paper also studies the interaction of market power and transmission pricing. He finds that, looking at operating costs alone, and taking nodal pricing as the optimum, welfare would fall by 0.8 % of wholesale revenue if a uniform demand price was applied, and by 1.5% if uniform prices for both demand and generation were adopted. When market power is accounted for, he finds that the cost of sub-optimal pricing rises to 1.2% and 1.8%, respectively. These may seem as relatively small numbers, but Green gives some qualifying comments to the analysis and results. The gains from optimal pricing and mitigation of market power may, e.g., be greater once their effects on investment signals to producers are considered.

The purpose of the analysis of Bjørndal and Jörnsten (2001) is to calculate and assess potential economic gains from establishing a common transmission system operator for the integrated Nordic electricity market, instead of the five decentralised national transmission network operators present in the system, from a better and more coordinated handling of transmission capacity constraints in the total network system. They base their analysis on a simplified model of the Nordic transmission system, where supply and demand are represented in 13 nodes in the grid and the transmission network is represented by 21 lines connecting the nodes. The benchmark for calculating the cost of network capacity constraints is the optimal (unrestricted) flow of power over the network.

Bjørndal and Jörnsten derive several interesting results from their analysis, though not specifically for market power in relation to network capacity constraints. Indirectly, however, the results have market power implications. Their examples show e.g. that the differences in the costs of capacity constraints can be of the same order of magnitude as the capacity constraint cost in itself, implying that a considerable reduction in the total cost of capacity constraints might be obtained from a more efficient, coordinated handling of capacity constraints for the whole network system. It is also demonstrated that, depending upon the

load situation and which constraints are most binding, a system with variable price zones delineation by the network operator is better than a fixed price zone system.[114] Finally, it is shown that, when the Nordic market is split up in price areas because of network capacity constraints, an efficiency gain can be obtained by operating the transmission network as an integrated whole and letting the actual capacity constraints determine the price area delineation.[115]

5.3 Market power in hydro power systems

The models of competition for analysing market power in electric power markets, with or without transmission constraints, which we have surveyed above, are mainly static models of competition. As mentioned in 3.13, such models fail to capture an important aspect of hydro power generation with water storage, i.e. the inter-temporal allocation of scarce water resources over time, where production in one period affects production in other periods. In addition, the flexibility of hydro generation with regard to the short run capacity of energy production regulation, compared with thermal generation, accentuates the issue of the potential for short run market power exertion in hydro power markets, particularly when a hydro power producer is the marginal supplier.

Because of the high proportion of hydro power in the integrated Nordic power market, where the Norwegian generation system is wholly hydro based, the majority of studies of competition in hydro power markets is undertaken with reference to this market. However, with the exception of Norway and to a lesser degree a few other countries,[116] most generation systems are mixed hydro and thermal systems. Therefore, competition issues arising from the interaction of hydro and thermal electricity generation might be important from a market power and competition policy perspective, in addition to those originating in a pure hydro

[114] An implication of this result, in market power terms, is that a variable price area definition may be less prone to strategic bidding by the power producers than a fixed price area model, because it may be more difficult for them to foresee which capacity constraint will be most binding, exogenously. However, the potential for dominant players to act strategically to create a constraint is still there.

[115] For discussion of the Nordic congestion arrangement and the potential for "opportunistic" behaviour of the TSOs to distort price signals in their own interests in relation to capacity constraints, see Glachant and Pignon (2002).

[116] E.g., New Zealand, Brazil, Chile, and Colombia. A comprehensive economic analysis, in Norwegian, of pure hydro power storage systems, including market power analysis, is Førsund et al (2003).

power market. Both types of market studies are surveyed below,[117] as well as studies with or without transmission constraints.

Scott and Read (1997) were among the first to model the inter-temporal aspects of hydro power production in a competition analysis setting. They developed a simulation model of the deregulated electricity market in New Zealand, where, as mentioned, hydro power plays an important role. The results from their analysis suggest a relatively low efficiency loss due to market power. They ascribed this result to a feature of the New Zealand power market structure, i.e. that a large proportion of the generator capacity was sold on long term contracts with prices defined as "reasonable" prices.

Garcia et al (2001) analyse the price formation process and its policy implications in an infinite-horizon duopoly model where two hydro generators engage in dynamic Bertrand competition. Each player uses a Markov strategy based on the state of water reservoirs at the beginning of each period, while replenishing of the reservoirs, which affects the generators' productive capacity of energy, is governed by a stochastic process. The authors study a regulatory situation where a regulator imposes a binding price ceiling or cap on the maximum allowable bids from the generators. The analysis is extended to a) situations where hydro generators face competition from thermal production, b) hydro producers face different circumstances with regard to water replenishment (uncertainty), and c) situations where reservoir size is increased. We concentrate on the implications for market behaviour and outcome of a regulatory price cap.

It is shown that a price cap potentially affects the entire equilibrium pricing distribution over time in hydro power markets. Hydro generators face an opportunity cost of producing power, expressed by the marginal value of water; cf. 3.13. The analysis demonstrates that the imposition or tightening of a price cap affects the opportunity cost of producing power in the present period, because it constrains future power prices. Thus, a decrease in a price cap shifts the entire pricing distribution downward. The results also show that prices in "competitive" states, i.e. where both producers have available water reserves to produce from, decline when the discount factor decreases or the probability of water replenishment increases.

[117] A survey of competition and market power analyses, with focus on hydro power markets, is contained in the introductory chapter of Jostein Skaar's dr. oecon dissertation; Skaar (2004).

Crampes and Moreaux (2001) analyse the interaction between hydro power and thermal production of electricity. The analysis is conducted within a two period model framework of a social planner who maximises the net total utility from electricity, where there are two technologies, hydro and thermal generation, and where the respective producers compete in the market. They consider a case where a monopoly producer controls both technologies and a situation where hydro and thermal producers compete. One of the main points of their paper is that even though thermal generation of electricity is basically static in nature, production based on thermal technologies is affected by demand and costs in other periods through the intertemporal allocation of water between periods.

Crampes and Moreaux derive the general result that the social optimal allocation of water and production of electricity based on thermal resources, under competition, is where the price in each period is equal between them, and this price is equal to marginal cost in thermal generation. If this result is compared with a situation where a monopolist is controlling both technologies and it is assumed that all water is used, it is found that market power has resulted in a reduction only in thermal generation, because the monopolist, or any other producer with market power, would equate marginal cost with marginal revenue rather than price.

The effect of market power exerted by a pure hydro producer may be limited in the case where total production is unaffected. However, if the producer controls both technologies the outcome would change. The producer is now able to reduce total production through a reduction in thermal output. Because of this effect, regulators should be concerned with mergers and acquisitions where the two technologies combine. Hydro power producers who previously were constrained in their actions by the constraint on total production may now be in a position to exercise significant market power.

Bushnell (2003) develops a numerical model where producers of hydro and thermal power production capacities engage in Cournot competition. The model is tested on data from the Western US electricity market. A central result from the analysis is that producers acting strategically may profit considerably by shifting hydro production from peak hours to hours with lower demand.

This result may at first sight seem surprising, because a basic feature of hydro generation is, as mentioned, that it may profit from its flexibility in production compared with thermal

power, to take advantage of peaks in demand. Bushnell explains the result by the fact that at peak hours several producers are "pivotal", as he calls it[118], in the sense that all their production capacity must be used in order to clear demand. At these times a hydro power producer might be able to induce a large increase in price by a small reduction in production without the other (thermal) producers being able to increase their production. Thus, in such a situation it may be profitable for the hydro producer to shift some generation from peak to off-peak hours.[119]

The above analyses of market power issues in pure hydro power and mixed hydro and thermal power production systems are based on theoretical models or simple numerical simulation models with reference to actual markets for illustrative purposes. Hjalmarsson (1999) performs an empirical, econometric study of market power in the spot market of NordPool, the joint Nordic power exchange. He uses a dynamic extension of the Bresnahan-Lau model, and weekly data from NordPool for the period from 1996 through April 1999. The basic assumption of the Bresnahan-Lau model it that profit-maximising firms will set their marginal cost equal to their perceived marginal revenue. A test for market power exertion would thus be to see whether an hypothesis based on this assumption could be traced in the data.

The outcome of the analysis is that Hjalmarsson is not able to reject a hypothesis of perfect competition, in other words that market power exertion could not be detected in the Nordic spot power market for that period. Because of data availability and the fact that transmission constraints were not explicitly considered in the analysis, he could not rule out the potential existence of local market power. He ascribes the main reason for his result of no market exertion to the market structure of the Nordic power market, with a considerable number of producers and low market concentration, different e.g. in comparison with the UK and California markets.

The analytical and empirical approach of Hjalmarsson is followed up by Steen (2004) in an empirical study of the Norwegian electricity market, with transmission constraints explicitly considered. The study was initiated by an acquisition by the Norwegian power producer,

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[118] Cf. the definition of the Pivotal Supplier Index in chapter 4.

[119] This effect can be reconciled with the results derived in the analyses of the UK electricity market, referred to above, i.e. that the market power problem is more severe in times of high demand. However, hydro production is more flexible than thermal generation. Thus, the problem of market power may be even more severe at times of high demand in markets with both flexible hydro and inflexible thermal technologies.

Statkraft, of one of its smaller competitors, Agder Energi, where the issue of market dominance and potential market power exercise was accentuated for the Southern Norway market area, delimited by a temporary transmission constraint.

Steen uses the dynamic extension of the Bresnahan-Lau model to estimate market power for periods with no transmission capacity constraints and periods with such constraints, based on high frequent hourly data for 22 months from January 2001 to October 2002. He extends the model to allow for separate mark-up estimates for the transmission bottleneck periods. In the sample, such bottlenecks were observed in around 13 percent of the 16 000 hours of total duration. On average, he finds the market to be competitive. However, the bottleneck period estimates suggest a statistically significant, but small, short run mark-up. Therefore, within the days or hours when transmission constraints occur, it seems as if the producers are in a position to exploit some limited short run market power. He finds no indication of long run market power, i.e. between different days. Given the relatively short duration of observed transmission constraints, Steen concludes that the economic significance of the bottleneck problem seems to be small in this case. However, he issues a competition policy "warning" that one "should be careful to allow more concentration in this market, unless we get rid of the potential bottlenecks in the grid."

Johnsen et al (1999) also analyse the Nordic market, focussing on transmission constraints and local market power. They do not attempt to measure actual power in the whole Nordic market, but examine instead five Norwegian bidding areas, finding evidence of market power in one of them and limited evidence in another.

Skaar and Sørgard (2003) analyse market power in the context of an acquisition of a producer by another supplier in an electric power system dominated by hydro power and with temporary bottlenecks. In their model there are two geographical regions, E and W, and two time periods, 1 and 2, defining four different submarkets. The question to be analysed is whether the incentives for a hydro power producer to exploit market power change when he acquires a producer in another market, which is separated by a transmission constraint that is sometimes binding. The authors study a number of different situations and outcomes, classified on the basis of different assumptions about the competitive market structure, the location of the acquired firm in the two regions, the transmission constraints, the water storage potential of the producers, the introduction of thermal production in the model, etc.

An important insight from their analysis is that the competitive outcome depends crucially on the structural specificities of each particular case to be analysed and that one therefore has to specify carefully the assumptions and circumstances in applied competition analyses of mergers and acquisitions in such systems.

Bjørndal and Skaar (2004) combine an inter-temporal analysis of market power in a hydro power system with an explicit representation of capacity constraints in the transmission network, within a three-node network model and two-period hydro power allocation model, to analyse market power.[120] Network system operation is represented by a network system operator who calculates optimal power load flow based on given bids in the underlying power market and allocates network capacity based on optimal nodal prices. They demonstrate that a strategic player with market power may be able to achieve a reduction in the total congestion rent in the network by capturing some part of the rent for himself. They also demonstrate that the strategic player, by eliminating the capacity constraint in one period by reducing his production sufficiently, may be able to obtain a higher price in the second period from another node in the network, to increase his total profit.

5.4 Market dominance and market power in retail markets

Market dominance and market power in retail markets for electricity have not been studied to the same extent as for wholesale market. Here we will briefly review two empirical studies of competition and market power in retail electricity markets, one for the UK and one for the Nordic market.[121]

Harker and Waddams Price (2004) trace the evolution of competition in the UK residential energy markets (electricity and gas) from monopoly and *ex ante* regulation to competition and *ex post* competition policy regulation. They distinguish between two options that energy consumers have to express their interests and power in the markets to influence competition, i.e. consumer “exit” and consumer “voice”. Under consumer exit, consumers switch to a different supplier, while consumer voice means that they exert their influence through consumer interest organisations, lobbying vis-à-vis regulators or the political system, etc.

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[120] For a study of market power derived from network capacity constraints within a one-period model, see Bjørndal and Jörnsten (2004).

[121] For a theoretical study of retail electricity competition, but not specifically focussing on market power, see Joskow and Tirole (2004).

With regard to market power, Harker and Waddams Price document several examples of actual market power exercise for both electricity and gas, particularly by dominant incumbent retailers in the form of locking in of consumers and various types of price discrimination against customers: between customers who have switched or not, selective discounts on prices, win-back offers, discrimination between prepayment and direct debit payment tariffs, etc. The regulator, Ofgem, has generally not intervened against such discrimination as long as it has not been considered to offend the avoidable cost test of predation, defined by the regulator. In both markets, the effect on competition from consumer exit in terms of switching seems to be rather limited, so that, five years after the introduction of competition, substantial mark-ups can still be maintained by the incumbents while retaining more than 50 percent market share. With the continuing consolidation of the energy industries taking place, the authors express “real concern about the coordinated effects between suppliers” on competition.

von der Fehr et al (2005), in an analysis of retail competition in the Nordic electricity market, as part of a study of the market functioning in relation to the supply shock to which the Nordic market was exposed in 2002-2003, the authors observe considerable retail price differences between national markets and sub-markets, while the wholesale market generally follows the law of one price, except for transmission network constraints. This may be partly due to the fact that, while there is complete market opening in all the Nordic countries, there are still some barriers to trade between the countries in the retail segment of the market.

In a comparison of electricity retail prices in Norway and Sweden, taking account of factors that may be conducive to competition, e.g. the fact that Swedish retail consumers can buy power from suppliers in any Nordic country while Norwegian consumers are still more restricted to the Norwegian market, retail prices continue to be higher in Sweden than in Norway, in spite of the fact that retailers buy electricity at the same wholesale price in the integrated wholesale market. A possible explanation could be ascribed to the exercise of market power in the Swedish retail market, due to a more concentrated retail market structure there than in Norway.

In Sweden, several independent retailers have left the market in recent years, while at the same time there has been an increase in the number of integrated generation-retailing firms.[122] As a consequence, market concentration has increased, horizontally as well as vertically. Thus, by allowing vertical integration between generation and retailing in market regulation, while requiring legal separation between retailing and distribution, this may have increased the potential for market power exercise in the retail market. This hypothesis is not, however, tested empirically by the authors.

5.5 Some concluding remarks

In this literature survey of market dominance and market power in electric power markets, we have surveyed a number of quite varied analyses in terms of methodological and empirical approach, ranging from theoretical studies to stylized market simulation models, with or without capacity constraints, to econometric analyses based on various forms of market data, and applied to different national or regional markets, with a concentration on the US/California, the UK, and the Nordic electricity markets. Some general conclusions with regard to market power seem warranted to draw from the survey:

- The potential for the exercise of market power, unilaterally as well as collectively, seems to be of substantial magnitude in liberalised electricity markets due to their market characteristics. Several studies have documented the actual abuse of market power, while other studies have not documented such abuse. This may partly be related to empirical problems of documenting the actual abuse of market power under different market structures, but may also, of course, be explained by the actual functioning of different markets with regard to the exercise of market power.
- It may be difficult sometimes to distinguish the exercise of unilateral market power form collective market power in electric power markets. With increased vertical integration between electric power generation, wholesale trading and retailing, through vertical mergers and acquisitions, the scope for unilateral market power increases. Similarly, the potential for horizontal unilateral market power exercise increases with increased horizontal concentration, but so does the scope for collective market power exertion through tacit collusion and coordinated behaviour among the producers.

[122] A possible explanation for this development, according to the authors, could be that an integrated generation-retailing firm might be more efficient than an un-integrated retailer in terms competence and resources for risk handling in the markets.

- A majority of the studies of market power has been undertaken for electricity markets in transition from monopoly and *ex ante* regulation to liberalised, decentralised markets with a combination of ex ante and *ex post* competition regulation. It may be difficult to assess to what extent market power issues in a specific context should be considered to be a transitory phenomenon due to the market and regulatory transition process, or a more permanent or basic feature due to the market characteristics of electricity markets.
- Market design and market structure matter. It is interesting e.g. to compare the competitive performance of the US markets, especially the California market, where both unilateral and collective market power have been clearly documented, with the UK market which seems to more exposed to collective market power exercise, and both of them with the Nordic market where market power studies have not generally revealed significant market power exertion.
- Capacity constraints in the transmission network are an important potential source of market power. Dominant suppliers may be able to create network capacity constraints and capture part of the congestion rent by acting strategically in relation to the network capacity. In some circumstances, modest extensions of the network capacity may reduce the problem of market power substantially. This raises the question of how network investment analysis should take market power issues into account in network capacity dimensioning.
- The inter-temporal aspect of hydro power production with water storage presents a potential for market power exertion, making it at the same time difficult for a competition authority to detect and react against an abuse of market power. The flexibility of hydro power generation compared with thermal generation creates a potential for market power exercise at times of high demand, with a hydro power producer as the marginal supplier. Suppliers with both hydro power and thermal power production resources have a special potential for exercising market power, *ceteris paribus*, because they can take advantage of the differences in cost structures and production properties, e.g. with regard to regulation capabilities, of the two systems.
- Retail market competition in electricity markets has not generally developed to the same level of competitive performance and maturity as for wholesale markets. The inertia and lack of incentives for consumers to respond to price signals and engage in

competition, e.g. through switching of supplier, seem to create a significant market power potential for incumbent retailers against entrants to the retail market.

- Analysis of competition and market power in electricity markets sometimes provides counterintuitive results, at least at first sight, particularly in complex market situations with mixed hydro and thermal power generation, and capacity constraints in the connecting network. From a competition policy perspective, these aspects point to the need for a careful and well-founded methodological and empirical analysis, using a variety of approaches, to handle market power issues in relation to the analysis of specific competition cases as a basis for considering competition policy intervention against market power.

6 Market monitoring and enforcement in competition policy with regard to unilateral market power in electric power markets

This chapter is devoted to a discussion of the role of competition policy in market monitoring and regulatory oversight to detect and prevent the potential exercise of market power *ex ante* and the enforcement policy task to intervene against and sanction a documented actual abuse of a dominant position to unilateral market power exertion *ex post*. This to some extent boils down to the commonly used distinction between *ex ante* sector-specific regulatory policy and *ex post* competition policy regulation.[123]

It should be evident from the preceding chapters, that *ex post* competition policy regulation of the electric power sector is insufficient alone to monitoring and enforcing a policy to control for the unilateral abuse of market power. Take e.g. the potential for market power exertion in relation to transmission capacity constraints, where a transmission system operator and a network regulator normally need to be involved or consulted. The regulatory experience with deregulated and liberalised electricity markets has also shown that the regulatory task of preventing and controlling for the exercise of market power is quite complex, given the special characteristics and properties of an electricity market, needing the concerted efforts and competencies of several regulatory bodies to succeed.[124]

A typical constellation of regulatory bodies that might be involved in a regulatory oversight and enforcement process with regard to market power in electricity wholesale markets is: 1) a general competition policy regulator for the physical markets (spot, capacity regulation etc), 2) a general financial services regulator for the financial derivatives markets (forward, futures,

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[123] For a critical discussion of the ex ante/ex post dichotomy in sector-specific regulatory policy versus ex post competition policy regulation, see Hope (2003) in relation to the economic regulation of the energy sector and Hope (2005) in relation to the economic regulation of media. Merger policy can e.g. be considered as an *ex ante* approach to competition policy.

[124] When e.g. Ofgem, the British combined electricity and natural gas sector-specific regulator, considered abolishing the British Power Pool, partly because of alleged (collective) market power exertion, and substituting it with the New Trading Arrangement (NETA), as discussed in chapter 5, it also proposed introducing a so-called Market Abuse Licence Condition (MALC) as a part of the market monitoring process. In that connection it wrote: ... "Neither, we believe, can the potential abuse of substantial market power be adequately regulated under general competition legislation (although the Competition Act of 1998 provides a welcome strengthening of regulation against anti-competitive agreements and abuse of dominant positions) nor financial services regulation. This is because of particular physical and economic conditions associated with electricity wholesale markets and electricity networks – specifically the need for instantaneous (real-time) matching of supply and demand to maintain scurity and quality of supplies, coupled with the non-storability of electricity and the limited ability of the demand-side to respond to price movements in the very short-term." (Ofgem (2000)).

options, etc, plus clearing functions), 3) a sector-specific regulator for the transmission and distribution network services for electricity alone or combined with other network based energy forms like natural gas and district heating, or with non-energy networks like telecommunications, 4) the surveillance and market monitoring tasks and obligations of an organised power exchange, like e.g. the NordPool for the Nordic market, and 5) the oversight tasks of the network system by a network system operator, e.g. in relation to the handling of transmission constraints. It is of crucial importance for the design of an effective market monitoring and enforcement process that the division of labour and responsibility between the regulatory bodies is as clear and transparent as possible, and at the same time that procedures and agreements for cooperation in case handling, data collection, exchange of information, etc, are well-defined.

In section 6.1 we take up some aspects of the ex ante – ex post dichotomy and the requirements for the design of an effective market monitoring process for the potential exercise of market power in electric power markets. Section 6.2 discusses various methods to detect and control for unilateral market power by a competition authority in cooperation with other regulatory bodies, while section 6.3 treats more specifically the relationship between sector-specific regulation and competition policy regulation as part of the regulatory oversight process. In section 6.4 we use the monitoring and enforcement system of the Nordic power market as a concrete example of the design and implementation of a regulatory oversight process for an integrated market, because this market has not been given the same attention as other electricity markets in this connection.[125] The chapter ends with a brief discussion of the issue of regulatory failure versus market failure in section 6.4.

6.1 Market monitoring and regulatory oversight ex ante versus enforcement and control ex post

There are two main reasons why it is important to design and operationalise an *ex ante* market monitoring and regulatory oversight process for detecting and preventing the exercise of unilateral market power before it comes to the intervention against an actual abuse *ex post*. Firstly, the need for discovering and correcting flaws in the market and regulatory design of electricity markets that could facilitate the exercise of market power, e.g. insufficient vertical

[125] See e.g. the survey of the US, UK, New Zealand, Australian, and Spanish experience with market monitoring processes in Wolak (2004a). See also Wolak (2004b).

separation of market based activities from network activities, facilitating market dominance through vertical integration and cross-subsidisation between competitive and monopoly activities. Secondly, the need for avoiding a lengthy and costly *ex post* enforcement process for the actual abuse of a dominant position where, in addition, the outcome may be uncertain because of the difficulties of providing sufficient proof of a breach of the abuse condition for electricity markets, by implementing remedies *ex ante* for an effective market monitoring and oversight process.

Drawing on the discussion in the preceding chapters, there are four main ways to exercise unilateral market power:

- Taking advantage of flaws and functional shortcomings in the market and regulatory design of the electricity market with the intent to exercise market power, e.g. by lack of vertical separation as mentioned above. Depending on the actual flaws, it could be the responsibility of any of the regulatory bodies mentioned above to correct for such flaws, in cooperation with the competition authority.
- A deliberate breach of a regulatory prohibition against forms of market behaviour, e.g. abusing a dominant position by withholding production of electricity to raise prices. This would typically be the responsibility of the competition authority alone, but normally in cooperation with the sector-specific regulator to document withholding of production.
- Strategic behaviour of a dominant supplier to create capacity constraints in the transmission network to raise prices. Documentation of such behaviour would normally be done in cooperation with the network system operator and maybe also with the sector-specific regulator.[126]
- Manipulation of market rules and regulations to exercise market power.

The last form falls largely within the domain of regulatory oversight with market behaviour in the financial services and derivatives market, where market manipulation is explicitly defined by the market rules. Certain forms of behaviour or actions by the market players are prohibited, when the intent and the effect of the action is market manipulation, e.g. to corner

[126] An interesting paper, with special emphasis on the role of the transmission system operator in the monitoring of market power in congested transmission systems, is Twomey et al (2005). The study was published, and came to my attention, after this report was completed and sent over to the Reference Group. Therefore, it has not been possible to incorporate it, and give due credit to it, in the report.

the market, and thus inflicting significant harm on other market participants and the market outcome. The Norwegian market rules and regulations with regard to market manipulation in the Nordic financial derivatives market for electricity are briefly reviewed in section 6.4. In the Norwegian sector-specific regulatory system for the electricity network, a prohibition rule against cross-subsidisation between market and network activities is defined. It is unclear, however, how the prohibition is actually monitored and enforced by the regulator, the NVE.

Wolak (2004a) draws five lessons from his survey of the market monitoring and regulatory oversight process for the electricity markets covered there, i.e. the US/California, the UK, the New Zealand, the Australian, and the Spanish electricity markets:

1. The market monitoring process should be forward-looking, anticipating how small market design flaws can develop into market failures that may significantly harm market participants.
2. The market monitoring process must be fully supported by the regulatory process. The responsible regulator must have the willingness and the ability to intervene as rapidly as possible to fix any problem discovered by the market monitoring process that may cause significant harm to the market participants and the market outcome.
3. The market monitor ought to prepare consistent measures of market and system performance that are comparable over time and across markets.
4. The need for public release of all data submitted to and produced by the market and system operators should be clearly recognised.
5. The market monitoring process should be independent of the market operator, system operator, and the political process.

These may seem as stringent requirements, but they should be observed and adhered to in order to make the market monitoring process an effective one. An effective *ex ante* market monitoring process will, of course, never be a perfect substitute for an *ex post* enforcement of actual violations of competition rules, e.g. the abuse of a dominant position to exercise market power, but it may significantly reduce the legal efforts and costs of enforcement.

6.2 Detecting and controlling for unilateral market power in competition policy

There is a variety of approaches available for a competition authority in its market monitoring to detect possible infringements of competition or regulatory rules to exercise market power, some of which are:

6.2.1 Market simulation models

In chapter 5 we reviewed a number of calibrated market models for the simulation of explicit market operations under various assumptions about market structure and competition in electricity markets, mostly oligopolistic structures and oligopolistic competition. So far, such modelling exercises applied to electricity markets seem to have had very little impact on policymaking.[127] However, there seems to be a growing awareness in competition policy analysis of the potential benefits of applying numerical market models to market monitoring to obtain better insights in the functioning of markets and the impact of structural market conditions on competition and market performance. Recently, competition and regulatory authorities have solicited the development of market simulation models for electricity market analysis from research institutions or consultancy firms as part of their market monitoring process, and more specifically for the detection of market power exertion.[128] Of course, a market simulation exercise cannot prove that market power has been exercised, but it can be used as a screening device to clarifying market conditions that may be conducive for the potential exercise of market power.

6.2.2 Benchmarking analysis

Benchmarking analysis has been applied quite a lot to the network part of the electricity industry, in particular the distribution network,[129] but not to the same extent so far for the

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[127] Bushnell (2003). For a discussion of properties of market simulation models applied in competition policy analysis of market power, *in casu* merger analysis, see Werden and Froeb (2002).

[128] See e.g. Nordic competition authorities (2003). Here the market simulation model MARS, developed by the Danish power company Eltra, is used to simulate effects of hypothetical mergers between major generators in the Nordic electricity market. The Norwegian Competition Authority (NCA) and the Norwegian Water Resources and Energy Directorate (NVE) have solicited a study from ECON on a market monitoring system for market power in the electricity market and how the exercise of market power can be detected. (ECON 2003) (not publicly available).

[129] See e.g. Jamasb, T. and M. Pollitt (2003): "International benchmarking and regulation: an application to European electricity distribution utilities". *Energy Policy*, 31 (15), pp 1609-1622. A benchmarking study of the performance of South American main electricity distribution companies is Estache et al (2004).

generation and trading parts. There exists, however, a plethora of engineering and economic information and data on production capacities, costs, outages, etc, that can be used for benchmarking purposes for the competitive part too. With capacity withholding in generation as a strategically "strong" instrument for exercising unilateral market power for dominant producers, as discussed in chapter 5, it might be particularly important to have data on outages of generation capacity and the time profile of such outages built into the market monitoring system.[130]

6.2.3 Statistical analysis of market data

By analysing statistical "irregularities" in secondary market data released e.g. by a power exchange, statistical analysis can be applied to identify the potential exercise of market power.[131] Again, such analyses can only give indications of market power and can neither prove the intent to exercise power nor the actual abuse of a dominant position by exercising market power.

6.2.4 Explicit regulatory clauses or conditions with regard to market power

An issue of a somewhat different kind is market monitoring and market power detection in connection with explicit clauses or conditions written into the regulatory system to control for market power exercise. An example of such a condition is the Market Abuse License Condition (MALC) in the UK, proposed by Ofgem to be written into the license that allowed each supplier of electricity to sell the product only if the supplier agreed to be subjected to sanctions for abusing its market power. The UK Competition Commission was empowered with the authority of enforcing the MALC. The MALC proposal was eventually withdrawn, mainly because the Competition Commission found it difficult to distinguish between the "minor" unilateral exercise of market power as an element in the ordinary functioning of a market, without necessarily the deliberate intent to exercise power, and the intentional abuse of market power in competition policy terms, subject to penalties and sanctions.[132]

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[130] Wolak (2004b) discusses outage information in terms of scheduled outage and forced outage declarations, respectively, and points to the need for a consistent information system for the system operator and regulator in order to avoid "sick day" unplanned generation outages for the withholding of generation capacity to exercise market power.

[131] See e.g. the study of Hjalmarsson (1999).

[132] Another example of a similar condition is the prohibition against cross-subsidisation between competition and network activities, written into the Norwegian regulatory regime for network owners, enforced by the sector-specific regulator, the NVE.

6.2.5 Collection of primary data for market power detection and control

The final stage in the regulatory oversight process commences when there is a well-founded reason to suspect that a dominant position has been abused. Then primary data and information collection normally is needed to document abuse. Such information collection typically takes two main forms: firstly, access to individual bids on the power exchange, information on generation plant outages, etc, and secondly, access to relevant documentation acquired by the competition authority by "dawn-raids" on the premises of the suspected firm(s), according to legal procedures.

The last item raises an important general issue about the access to relevant data in the market monitoring and enforcement process, and the release of data to interested parties to achieve sufficient transparency in the market to make it function efficiently. A balance has to be struck between the need for protection of confidential information, the equal treatment of market participants, and the general confidence of all interested parties in the impartial and independent functioning of the market process on the one hand, and the need for transparency and detection of market manipulation and abuse of market power on the other.

A crucial issue in this connection is the access to and public release of individual bid data on the power exchange. On this score, the practice seems to vary considerably from country to country.[133] Australia seems to have the most liberal practice in the sense that the National Electricity Market (NEM)[134] has adopted an information release policy of full public disclosure the next day of all bids, schedules and output levels. In the US the Federal Energy Regulatory Commission (FERC) releases bids, schedules and output with a six months lag and with anonymity of the market participants' identity. A similar data release policy to that of the FERC has now been adopted in New Zealand, while under the UK Pool system data was only released to other members of the Pool. In the Nordic market NordPool does not release individual bid data, even on an anonymous basis.

The interesting question from a market monitoring and regulatory oversight perspective is how the different data disclosure practices influence the effectiveness of the market process

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[133] See e.g. Wolak (2004a).

[134] The NEM is goverened by the National Electricity Code and being subordinated to the Australian Competition and Consumer Commission (ACCC). According to the Code, one of the objectives to further transparency and market monitoring is to collect information and statistics, publish reports and disseminate information relating to performance, administration, enforcement and adequacy of the Code and the performance of the NEM.

and the behaviour of market participants, and, in particular, how the Australian policy of full disclosure affects the balance between confidentiality and transparency mentioned above. If this policy works, as it seemingly does, to the benefit of market transparency and effective regulatory oversight in the process, without inflicting unnecessarily on the demand for confidentiality in market transactions and confidence in the trading system, why should not the same policy be adopted as a general principle for information disclosure for other electricity markets, under similar conditions with regard to legal basis and institutional structure? The question is important in relation to market dominance and market power issues and deserves at least further consideration; see also chapter 7.

6.3 Sector-specific versus competition policy regulation: Division of labour and responsibility

Sector-specific regulation is here understood as the regulatory regime monitored and enforced by the regulatory authority for the electricity sector, or for the energy sector, if e.g. electricity and natural gas are regulated by the same authority. The question to be discussed here is how the division of labour and responsibility should be between sector-specific and competition policy regulation, and between the regulatory authorities for the respective areas, when it comes to the monitoring and enforcement of a regulatory policy in relation to unilateral market power in electric power markets. As with the policy and practice for the disclosure of information for monitoring electricity markets referred to above, the policy and practice with regard to the division of labour and responsibility between sector-specific and competition policy regulation also seems to vary considerably among countries.

The division of labour and responsibility between competition and sector-specific regulatory authorities has a vertical and a horizontal dimension. Vertically, it concerns the division between different levels of government, e.g. between governmental ministries and subordinated sector-specific regulatory bodies, or between supranational bodies, e.g. the EU-Commission and national bodies, according to the modernisation programme of EU competition legislation.[135] Horizontally, it is a question of how the division is organized between regulatory bodies at the same level of government, *in casu* between competition and sector-specific-authorities, respectively, but also among sector-specific authorities

[135] See e.g. Whish (2003) for a comprehensive coverage.

themselves, e.g. between regulatory authorities for electricity and telecommunications, if those activities are integrated within one firm under regulation. Only the horizontal dimension is discussed here.[136]

Along this dimension the division of labour and responsibility between competition and sector specific regulatory authorities can be organised according to four main types of model:[137]

- The competition authority has exclusive competence to monitor and enforce competition and (economic) regulatory policies in all sectors and markets.
- The sector-specific authority has exclusive competence to monitor and enforce competition policy regulation and sector-specific regulation for the respective sector(s).
- The two authorities have parallel or overlapping competence.
- The two authorities both have competence, but in clearly defined competence areas: the competition authority has exclusive competition policy competence and the sector-specific authority has exclusive regulatory competence for its sector(s).

In practice, the models are rarely found in their pure form; most sector regulatory regimes contain elements from more than one model. A common feature of the choice of institutional model in practice, however, is that the horizontal division of competence is vague and unclear with considerable overlaps and ”grey zones” between competition and regulatory authorities. The third model above thus seems to capture the actual division in most countries. Such overlaps may create regulatory uncertainty with regard to case handling and outcome, duplication of regulatory efforts and resources, conflicts of competence among regulatory bodies, and inertia with regard to adjusting regulatory policies to a changing environment.

For liberalised electricity markets, with a consistent and well-defined institutional and regulatory policy design, the division of labour between sector-specific and competition policy regulation should be obvious: the sector-specific regulatory authority should have exclusive competence to monitor and enforce the regulatory system for the natural monopoly part, i.e. (incentive) regulation of network activities, broadly defined, while the competition authority should have exclusive competence to monitor and enforce competition policy for the market based or competitive part, including market dominance and unilateral market power

[136] Vertical aspects are covered e.g. in Fehr (2000).

[137] Hope and Thorsen (1997), Hope (2003), and Hope (2004).

issues; i.e. in accordance with the fourth model above. To the extent that competence areas may overlap, e.g. in relation to (local) market power issues that may arise from temporary transmission constraints, this should be sorted out by cooperative agreements between the regulatory bodies for the exchange of information relevant to the specific cases, procedures for case handling, harmonisation of rules and principles e.g. for market delineation and capacity constraint handling for integrated electricity markets where several sector-specific and competition authorities may be involved, etc.

When deviations from this simple division of labour model are the rule rather than the exception in practice, four reasons are usually given:

- Competition policy lacks the mandate and the instruments for a consistent enforcement of unilateral market power exercise to the detriment of competition and economic efficiency in electric power markets.[138]
- Structural solutions to electricity market competition by means of competition policy interventions in the form of e.g. divestiture of dominant firms, regulations to easy entry, restrictive merger policy to prevent dominance, etc, are not sufficient to create effective competition, but have to be supplemented with behavioural measures, e.g. price regulation, to prevent harmful effects on consumers from significant exercise of unilateral market power in "constrained" market situations.[139]
- The case-by-case, *ex post* approach of competition policy is not applicable to electricity markets for detecting and enforcing unilateral market power abuse; those markets have to be monitored on a continuous basis.

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[138] Cf. e.g. Wolak (2004b): „The primary concern of the regulatory process is protecting against the economic harm associated with unilateral exercise of market power. Antitrust policy is concerned with detecting coordinated actions to raise prices and combinations (typically mergers) that result in a substantial lessening of competition. Antitrust law also prohibits attempts to monopolize, but this is unlikely to be relevant for the electricity industry beyond its implications for merger analysis. .....I am extremely sceptical that the antitrust authority can eventually replace the industry-specific regulator, because antitrust law is not concerned with the unilateral exercise of market power that causes significant harm, which has historically been a major problem in wholesale electricity markets." (pp 99 – 100).

[139] Bushnell (2003) calculated the potential gain from a hypothetical divestiture policy to create a less concentrated California market structure, applying the oligopoly model first developed in Borenstein and Bushnell (1999) to data for the California market for the summer of 2000, finding a substantial potential gain. He concludes: "The results described here demonstrate that it is premature for policy makers to throw up their hands and abandon attempts at structural solutions to electricity market competition. This is not to say that structural solutions are a panacea, only that their potential benefits are real enough to warrant a serious discussion about the methods that might be used to achieve more competitive market structures, the potential costs of such methods, and the potential costs of the alternative forms of regulation that are evolving as substitutes for competitive market structures."

- The competition authorities typically lack the sector-specific knowledge and competence necessary to monitor and enforce a regulatory policy to combat unilateral market power exertion.

The remarks of Wolak and Bushnell in the footnotes have to be understood partly against the background of the rather special and extreme competition conditions developing under the California power market "crisis" and partly as a reflection of the wide powers given in the US to the FERC as a regulator also in competition policy matters. On the other side of the regulatory policy "extreme" in this context we find countries like Germany, Sweden and New Zealand, which decided at the outset of the deregulation of the electricity market not to have (economic) sector regulation and regulator, leaving this to the realm of *ex post* competition regulation and the competition authority. Australia also falls in this category, where sector-specific regulation was transferred to the ACCC as part of the market reform process, as mentioned above. The UK seems to be somewhere in a middle-position between the two sides, with competition regulation as the primary responsibility for the OFT, but with some delegation to the Ofgem in practical regulation of electricity markets. The tendency towards general competition regulation seems clear, though.[140]

Most of the recent debate about the relationship between sector-specific and competition regulation has not been so much about the transfer of regulatory powers and competence from competition regulation to sector-specific regulation in network based industries, but rather in the opposite direction. This has been stimulated first and foremost by the EC directives on electronic communication services regulation, with the stated intention there of "rolling back" sector-specific regulation to general competition regulation over time.[141] This has paved the way for a more general discussion of the application of this rolling back principle for other network based industries too, including electricity, and its implication for the institutional organisation of regulatory policies.

The most interesting case in this regard is represented by the Netherlands, where a stated institutional policy objective of the government has been to pave the way for a so called "sector-specific competition authority" organisational model, under which sector-specific regulation should be gradually transferred to the Competition Authority (Nederlandse

[140] Harker and Waddams Price (2004).

[141] For a discussion see Cave and Crowther (2004) and Hope (2005).

Mededingingsautoriteit (NNa)) and organized as sector divisions within the NNa, as a transitory phase until full integration of the sector divisions into the NNa could be implemented. This should be the model not only for sectors like telecommunications, where the rolling back intention was stated in the EC directives on telecommunications, as mentioned, but also for sectors like e.g. energy, health, and media. This model has already been implemented for telecommunications and is under consideration for energy.

The objections raised above to competition policy regulation of electricity markets to detect and control for unilateral market power exercise and abuse should, of course, be observed, but should not prevent the design of a competition policy for facing squarely the issue of monitoring and enforcing a policy for the unilateral exercise of market power in electric power markets, as a matter of principle. In a transitory period from strict regulation to mature electricity markets in regulatory terms, there may be some need for regulating aspects of competition in electricity markets under the umbrella of sector-specific regulation or, alternatively, that competition policy regulation would have to take on forms of regulation that may seem “foreign” to it from a traditional competition policy perspective, e.g. price regulation under heavily constrained market conditions where the potential for market power exertion could be particularly problematic from an efficiency or equity objective, but this should clearly be understood as a transitory phase to general competition policy application. For discussion of competition policy implications of such a transition and for the design of a monitoring and enforcement system with regard to unilateral market power in electricity markets, see chapter 7.

The relationship between sector-specific and competition policy regulation becomes even more complex when other sector-specific regulatory relationships are taken into account, e.g. telecommunications regulation for diversified energy firms offering telecommunications services in addition to energy. Other forms of regulation have to be considered as part of the total regulatory system surrounding the electricity market, including securities and financial regulation of the financial derivatives markets for electricity, as well as legal regulation and self-regulation monitored and enforced by entities within the electricity sector itself, like trading institutions and network system operators. The degree of regulatory complexity increases even more when a common regulatory system for an integrated market consisting of countries or states with different regulatory systems in place for their national markets.

Different models and practical solutions have been developed to cope with these complexities. The Netherlands have established an independent Market Surveillance Committee consisting of three external experts, with a secretariat with the Dutch energy regulator. In the US, the Office of Market Oversight and Investigation has been established, New Zealand has a seven member Electricity Commission for regulatory oversight and coordination, while in Australia there is the National Electricity Code Administrator with similar regulatory powers. In Australia there is also a National Competition Council acting as an independent advisory body to oversee the implementation and coordination of a national competition policy across the Australian states, including electricity. The Nordic regulatory system for electricity is surveyed briefly in the next section.

6.4 The monitoring and regulatory oversight system for market power exercise in the Nordic electric power market

As mentioned in chapter 5, market power exercise has not been documented in any of the studies undertaken for the integrated Nordic electricity market. This does not necessarily mean, of course, that market power has not been exercised in practice, unilaterally or collectively, but the studies have not been able to disclose the actual exercise of market power due to methodological or data availability problems. Or could it simply be that the market monitoring and regulatory oversight system works so efficiently and transparently that market players with the potential for exercising market power refrain for using it because this is likely to be revealed and sanctioned in the market monitoring and regulatory oversight process?

It may be particularly difficult actually to prove the exercise of market power in the Nordic market, because of the high proportion of hydro power in the system and market power documentation problems associated with the intertemporal allocation of hydro power; cf. chapters 3 and 5. Still, market power is a recurring issue in the debate about the performance of the Nordic market, particularly due to persistently high electricity prices and increased market concentration. Therefore the market monitoring and oversight process for detecting and controlling for market power exercise is very much in focus.

In this chapter I will give a brief description of the structure of this process and the division of labour and responsibility between the various institutions involved in it. This is done from the perspective of the legal and institutional structure of one country, i.e. Norway. The need for

harmonisation of monitoring and regulatory principles and rules among the Nordic countries, and cooperation to detect and enforce sanctions against the abuse of market power is discussed at the end.

There are five market monitoring and regulatory bodies involved in the regulation of the Nordic market on the Norwegian side, three public or external regulatory bodies and two internal ones: the Norwegian Competition Authority (NCA), the Norwegian Water and Resources and Energy Directorate (NVE), the Norwegian Securities and Exchange Authority (NSEA), the NordPool ASA itself, and the transmission system operator, Statnett.[142] NordPool and Statnett are regulated by, and subordinated to, the NSEA and the NVE, respectively, but conduct also some self-regulation of the market.

The NCA is the general competition policy regulator. After the revision of the Competition Act in 2004, the NCA now has the legal foundation to sanction the abuse of market power by dominant firms, similar to the EU harmonised legal definition of market dominance and abuse of market power introduced in the competition legislation in the other Nordic countries too. The NCA has intervened in several merger cases in the electricity industry in Norway, but due to the appeal system where decisions by the NCA are appealed to the above Ministry, now the Ministry of Modernisation, the decisions have invariably been modified in the process, the latest decision being the acquisition of Agder Energi by Statkraft. In its advocacy role, the NCA has argued against the predominant form of concentration by cross-ownership acquisitions in the electricity industry and has advocated a divestiture of Statkraft.

The NCA has developed and operates a market monitoring and price information system for the retail electricity market to increase the transparency of the market and stimulate competition through consumer “exit”, i.e. the switching of supplier. It has, so far, not intervened against the abuse of market power, neither in the wholesale nor the retail markets. Neither has it used its legal powers to acquire information from the NordPool in the form e.g. of individual bid-data to investigate incidents where the exercise of unilateral market power in the spot market might be suspected.

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[142] For more information, see www.konkurransetilsynet.no, www.nve.no, www.kredittilsynet.no, www.nordpool.com, and www.statnett.no, respectively, in the order listed above. A survey is given in Storlid (2004).

The sector-specific regulator, the NVE, has been given wide powers in the Energy Act to monitor and regulate the physical production, transmission, and distribution system, including the incentive regulatory mechanism for the network owners in general and the transmission system operator, Statnett, in particular. Of special relevance here is the regulatory task in connection with capacity constraint handling in the transmission network to avoid market power abuse. The NVE has also the regulatory responsibility for the physical trade in electricity at the NordPool.

The regulatory framework for network regulation includes legal requirements for the vertical separation of functions to avoid e.g. cross-subsidisation between competitive and network activities, which is prohibited, for access to the transmission network on non-discriminatory terms, and other conditions necessary to achieve an efficiently functioning power market. When it comes to system operation functions, all participants in the market and network system are obliged to follow instructions of the transmission system operator under its responsibility as operator. For example, the participants are required to in their bidding procedures in the physical markets to balance their obligations and rights, inclusive of own production. The intention with this regulation is to prevent players from speculating in the capacity market to the detriment of trade and liquidity in the spot market. If irregularities in relation to the rules are discovered by Statnett, it should be reported to the NVE, who may undertake actions.

The bilateral market for trade in electricity, outside of the NordPool, is not specifically regulated by the NVE, other than through the concession requirements for electricity trade. However, the NVE has the right to monitor the market and to solicit information from the parties, e.g. if it suspects that market power is being exercised. This will then be reported to the NCA for enforcement.

NordPool Spot has a power exchange concession from the NVE, according to the Energy Act. It is obliged to give NVE all necessary information for the monitoring and regulatory oversight of the network (monopoly) activities and to further competition in the market, including changes in contracts and agreements between NordPool and its trading members, changes in trading systems and procedures, irregularities in market transactions, market behaviour potentially in restraint of trade, etc. NVE and NordPool meet regularly to exchange information and discuss problems related to the functioning of the physical markets.

The NSEA monitors and regulates the financial derivatives markets and settlement arrangements for electricity operated by the NordPool ASA, according to the Stock Exchange Act and the Financial Trade Act. In the latter Act there is a general prohibition against unreasonable business methods and deliberate market manipulation to affect prices. Market manipulation can also be enforced under competition policy regulation if more than one player is involved (collective market power) or if it amounts to the abuse of market power. Under the Stock Exchange Act, the NSEA monitors the market according to rules and regulations with regard to market efficiency, neutrality, non-discrimination, transparency, price notifications, true information, etc., and requiring the NordPool to give the financial regulator all information necessary to perform its monitoring and regulatory functions effectively.

The NSEA has investigated some cases of alleged market manipulation reported to it by NordPool. In one case, still pending, the NSEA found evidence of deliberate market manipulation by one player in the financial markets and reported the case to the special economic crime investigator, the Økokrim, in March 2004. The case is about price manipulation in the financial forward market with the purpose of increasing the profit on long-term option contracts. According to the NSEA, the player, identified and publicly named as Morgan Stanley, issued call options on the underlying forward contract. The forward contract was traded at NordPool, but the liquidity in the forward market was at that time (end of 2000) low. The company sold large volumes at the end of the trading day when the call options should be settled, which led to a downward pressure on the price of the forward contract, resulting in a financial gain for the company. If this is the way the market has been manipulated, it illustrates the importance of liquidity for market efficiency and the resulting potential for deliberate market manipulation by individual players.[143]

The independent monitoring and oversight powers of the "internal" entities, the NordPool and Statnett, represent some self-regulation within the general legal framework referred to above. NordPool has a Market Surveillance Committee for the surveillance of the functioning of the markets and the detailed contractual arrangements, rules, and procedures under which the

[143] The Swedish Financial Supervisory Authority (Finansinspektionen) has started an investigation of potential insider trading in the Nordic electric power market. According to a recent report from the Authority, it states that the players in the market do not alwasy receive the same information at the same time. Moreover, in many companies there seem to be holes in the "Chinese wall" that is supposed to divide the financial trading business from production. The Authority intends to report and discuss their findings with the NSEA, which has the supervisory function of NordPool, and NordPool. (*Energyforum Network*, May 11, 2005).

company operates. The Committee has investigated a number of incidents of seemingly irregularities in market transactions and behaviour as possible indications of infringements on market rules to manipulate the market or exercise market power, and in some cases it has reported its findings to the NSEA or the NVE.

Statnett has, in principle, similar tasks in relation to the transmission network and system operation. The company has started a process specifically to clarify its role and responsibility with regard to the exercise and abuse of market power in relation to transmission constraints and other aspects with the system that might have market power implications.

The three regulatory authorities, the NCA, the NVE, and the NSEA, have developed a system of bilateral as well as common agreements and contacts for the exchange of information, division of labour in information collection, procedures for case handling when competence areas overlap, etc, in connection with issues related to market monitoring and regulatory oversight to detect and control market power exercise and market manipulation in electricity markets.

At the Nordic level, a similar system of agreements and contacts among all the regulatory authorities involved in the market monitoring and oversight process of the common electricity market of the four countries has not yet been developed to the same extent, but some developments and initiatives to this effect are underway.[144] The process at the Nordic level still suffers from two regulatory shortcomings: a) insufficient harmonisation of national rules and regulations for the common power market, e.g. for the handling of transmission constraints and for an integrated transmission system operation, b) insufficient coordination and cooperation across national borders with regard to the detection and enforcement of potential market power abuse, e.g. in connection with transnational mergers and acquisitions in the Nordic electric power market.

6.5 Regulatory failure versus market failure in the market monitoring and regulatory oversight process for electricity market

The electricity market is subjected to a comprehensive and complex regulatory system, more comprehensive and complex than perhaps for any other market. The regulatory system has

[144] See Nordic competition authorities (2003), and developments in the aftermath of the report.

developed in response to the need for regulation, given the special market characteristics and properties of electricity as a commodity, correcting for market failures and controlling for the unilateral exercise of market power to the detriment of economic efficiency. However, the regulatory system is vulnerable to “failures” too, due to e.g. asymmetric information between market actors and regulatory authorities, lack of relevant data for market monitoring and regulatory purposes, insufficient resources and competence in regulation, etc. A balance has therefore to be struck between market failure and regulatory failure in the optimal design and implementation of the regulatory system. Four issues have, in particular, been identified above as issues to be observed in the market monitoring and enforcement process with regard to market power:

a) the problem of distinguishing between the unilateral exercise of market power as part of the regular, commercial market process and the abuse of market power to the detriment of economic efficiency,

b) the problem of distinguishing unilateral market power exercise from collective market power in concentrated electricity markets,

c) the need for harmonisation of rules and regulations across regulatory domains to increase market transparency and stimulate competition, and

d) the need for a clear division of labour between regulatory bodies to reduce regulatory uncertainty and resource use in regulation, supplemented with cooperative agreements to improve the market monitoring and regulatory oversight process.

7 Some implications for competition policy of market dominance and unilateral market power in electric power markets.

In this final chapter I will sum up some implications for competition policy of market dominance and unilateral market power in electric power markets, from the discussion in the preceding chapters, due to the special characteristics and properties of electricity markets in terms of market structure and competition.

7.1 Legal basis

In European competition law, Article 82 of the EU Treaty and corresponding regulation introduced in the competition legislation of most European countries, it is not market dominance as such that is forbidden, but the actual abuse of a dominant position. The abuse condition should be understood, as mentioned in chapter 2, in an objective sense, according to the European Court of Justice, i.e. it is the abuse of a dominant position that is prohibited, independently of the intentions of the dominant firm in question when exercising its market power.

When enforcing competition policy with regard to market dominance, it is important that the focus is on market conduct - abuse - rather than on market structure, i.e. criteria for defining and measuring dominance positions in markets in practice. Structural criteria, e.g. certain threshold levels for market shares above which market dominance is generally defined potentially to occur, should be considered principally as a screening device for competition authorities in their competition policy analysis, rather than as a legal prerequisite for intervention against the unilateral abuse of market power. However, partly because of the problems and resource use associated in practice with documenting conclusively that abuse of a dominant position actually has taken place, recourse may be taken to predefined structural dominance criteria instead of conduct analysis. Such criteria may be particularly difficult to define consistently for electricity markets, given the characteristics and properties of such markets. The enforcement of a competition policy along these lines may become too interventionistic, e.g. by prescribing divestiture of a firm being defined as dominant

according to structural criteria, without assessing through conduct analysis whether the firm actually is in a position to exercise market power to the detriment of economic efficiency, or has the incentives to do so.

An important regulatory difference between *ex ante* sector-specific competition regulation and *ex post* competition policy regulation should be noted in this regard. While market concepts like "strong market position" and "significant market power" applied in sector-specific regulation, exemplified by the new EU Regulatory Framework for electronic communications,[145] have gradually converged to the dominance concept of competition policy, there is a difference between the two policy areas in the sense that in the former *ex ante* remedies are prescribed in the form e.g. of non-discrimination, mandatory access, cost-oriented pricing, etc, to be followed up more or less continuously by sector-specific regulatory authorities in relation to firms defined as having significant market power (dominance). In *ex post* competition policy, however, there is generally no such competition oversight process for dominant firms, in fact, no special remedies or oversight procedures are typically applied to dominance as long as an infringement of the prohibition against the abuse of a dominant position has not been considered to have taken place. A structural approach to market dominance, with predefined threshold values for dominance may, under such circumstances, imply a lax enforcement and market surveillance policy practice, because the competition authorities may tend to become more preoccupied with structure than with conduct. If sector-specific and competition policy regulation are closely coordinated or integrated, e.g. on the Dutch institutional integration model discussed in chapter 6, policy improvements could be realised by taking advantage of the strength and weaknesses of the two policy approaches with regard to market dominance and market power.

[145] See e.g. Cave and Crowther (2004). Article 14(2) of the Framework Directive states: "An undertaking shall be deemed to have significant market power if, either individually or jointly with others, it enjoys a position equivalent to dominance, that is to say, a position of economic strength affording it the power to behave to an appreciable extent independently of competitors, customers and ultimately consumers."

7.2 Special dominance criteria for electricity markets?

A central, underlying question in this report has been whether special dominance criteria in competition policy should be applied to electricity markets, in the sense of lower threshold values for market shares than generally defined for other markets, because of the special characteristics of electricity markets, making (unilateral) market power more of a “burning issue”.

In the preceding chapters I have argued against such an approach, particularly in chapter 4.

The argumentation relates partly to the general issue of regulation of conduct versus structure, for a given market structure, referred to above, but more specifically to problems of delineating markets, measuring market dominance and setting predefined dominance standards with a sufficient degree of consistency and permanence for practical policy purposes, due to aspects like temporary transmission constraints, the duration of the time period during which market power can be exercised unilaterally, the composition of the production system for electricity (hydro, thermal, storage facilities, etc), vertical relations between wholesale and retail markets, relations between spot and futures markets, etc. This means that market dominance in electricity markets should be expressed along many more dimensions than in the standard, one-dimensional market share approach to dominance traditionally applied in competition policy analysis, which, again, calls for a flexible and tailored case-to-case approach to be applied to market dominance analysis, focusing on the abuse of dominance as a market conduct issue.

However, even if special dominance criteria for electricity markets are not advocated, it should be acknowledged that such markets have special characteristics and properties which make them particularly vulnerable to market power exercise. This could be related to transmission capacity constraints, which might, under specific circumstances, imply a relatively narrow geographical delineation of relevant markets. Under certain market circumstances, a producer may, as mentioned in chapter 5, have a dominant position even with a market share far below what would qualify for dominance in competition policy, as traditionally understood. These and other specific aspects related to electricity markets

should be taken into account in competition analysis of market dominance and market power.

7.3 Mergers and acquisitions - divestiture

7.2 above refers to a given market structure. In the electricity industry considerable restructuring has taken place through mergers and acquisitions as part of the market liberalisation process, leading to increased market concentration, horizontally as well as vertically.[146] In this process, market dominance positions may have been created or strengthened.

The new EU Merger Regulation, Article 2(3), states that: "A concentration which would significantly impede effective competition, in the common market or in a substantial part of it, in particular as a result of the creation or strengthening of a dominant position, shall be declared incompatible with the common market."[147]

At the present level of concentration in most European electricity markets, a restrictive merger policy concerning mergers and acquisitions between electricity firms, creating or strengthening a dominant position, should be called for. There are three main general arguments for such a restrictive merger policy approach:

- Empirical evidence indicates that economies of scale in generation and retail are not wide-spread and that the scale potential generally seems to be tapped at the present level of firm size and concentration in the electricity industry.
- Economies of information-sharing and coordination of decisions between firms, as has been argued, in particular with regard to the acquisition of part-ownership in and cross-ownership between firms, can be internalised in an efficiently functioning electricity market.
- The exercise of unilateral market power in an electricity market has wide-spread effects in the sense that it affects literally all consumers in the market, digging deeply

[146] For a survey of mergers and acquisitions in the European electricity sector, see Codognet et al (2003).

[147] Council Regulation (EC) No 139/2004 of 20 January 2004 on the control of concentrations between undertakings (the EC Merger Regulation).

into the consumer surplus, because of the product and market characteristics of electricity.

Thus, in the trade-off between scale economies, broadly defined, and consumer surplus effects in merger analysis, the economies defence is generally weak and the consumer surplus "defence" generally strong for electricity mergers at the present level of market concentration.[148]

The policy should be particularly restrictive with regard to the acquisition of part- and cross-ownership positions, because the efficiency arguments for such acquisitions seem to be particularly weak, while the market controlling arguments and incentives are strong. When measuring market dominance quantitatively, concentration indices incorporating such ownership positions, e.g. as suggested in the Nordic competition authorities' report (2003) on electricity markets, should be applied as a screening device for conduct analysis in dominance cases.

Because of the different cost structures and production properties of hydro power versus thermal power generation, special considerations should be observed by competition authorities in mergers and acquisitions involving both generation forms.

European competition law opens up for the divestiture of the assets of a dominant firm, if an infringement of Article 82, or corresponding national legislation, has taken place, as part of the remedies that the competition authorities can prescribe to bring the infringement to an end. However, according to regulations issued by the Commission on Article 82, a structural remedy like divestiture can only be imposed "either where there is no equally effective behavioural remedy or where any equally effective behavioural remedy would be more burdensome for the undertaking concerned than the structural remedy." (Regulation 1/2003).

Could divestiture be applied as an *ex ante* structural remedy against market dominance even when an *ex post* infringement of the prohibition of abuse of a dominant position has not taken place or at least has not been proved conclusively by the competition authority? The

[148] In chapter 2, the concepts of a total welfare standard versus a consumer welfare standard were discussed. Given the properties of electricity markets, a consumer welfare standard may be called for with regard to market power analysis.

question has e.g. been raised in connection with the wide-spread strategy in electricity markets of the “incremental” strengthening of market positions through the acquisition of part-ownership positions in other energy companies, or cross-ownership positions, leading to the potential control over the market decisions by other market players, or the coordination of decisions.

Extreme caution should be used by competition authorities in such a policy approach to market dominance. Apart from the general restriction on structural remedies referred to above, when an infringement on dominance actually has taken place, this approach would represent a step back to focusing on structure rather than on conduct, as warned against earlier. Indirectly, it also represents a critique of the enforcement policy practiced by the competition authority: if it has allowed the “incremental” acquisition of ownership positions without intervention, it may seem strange to prescribe the divestiture of assets, as an *ex ante* measure, when some arbitrarily defined dominance position has been reached, without an *ex post* infringement in the form of an abuse of the dominant position has been documented to have taken place. The matter may be considered somewhat differently if the acquisitions have been undertaken before competition legislation has been made fully to bear on electricity markets, e.g. in an early stage of the market liberalisation process, but even in this case considerable caution with regard to divestiture as a structural measure against market dominance should be observed.

7.4 Sanctions

When an infringement on the abuse of a dominant position has taken place, it should be sanctioned in proportion to the damage inflicted on market participants and society at large. Because electricity is a product used by everybody and because of the low short-run elasticity of demand, the impact of an abuse of a dominant position on consumer surplus will typically be of considerable magnitude, implying that maximum standards for fines and other type of sanctions, e.g. the withdrawal of certain concessionary rights, may easily be reached in specific cases. The preventive effects of such a sanction policy should not be underestimated, in addition to the “voice effect”, discussed in chapter 5, to which a

dominant electricity firm exposes itself, if it deliberately infringes on the abuse of dominance clause.

7.5 Market transparency

Electricity markets are generally characterised by a high degree of market transparency, as discussed in chapters 3 and 6; in fact, a transparency issue worth investigating is whether the markets are so transparent so as to facilitate the exercise of collective market power through coordinated actions and tacit collusion among suppliers.

However, for electricity markets organised as power exchanges or other form of bidding systems, information about the bidding behaviour of individual players is normally not being publicly released or made available externally by the exchanges for specific purposes, e.g. for research on the behaviour of markets. Such information is of crucial importance for the detection of the unilateral exercise of market power by dominant firms, for the various electricity markets operated by the power exchange considered separately, as well as for the markets considered in combination, e.g. exercising market power by taking positions to this effect in the physical spot market and in the financial forward market. Competition authorities will normally have access to information on individual bidding behaviour, if they have reasons to suspect that abuse of market power has taken place under specific circumstances.

In order to improve market efficiency in this context, it should seriously be considered to implement measures to increase market transparency by better access to such data by interested parties and by the public release of the data after some specified time period. There are many issues to be taken into account in such an assessment of market transparency, e.g. the legal form and organisation of the power exchange, the probable effects on the behaviour of market participants, on the transactions, the liquidity, and the efficiency in the operation of the exchange, etc. However, the transparency issue is so important in market power terms that it deserves to be studied and discussed as a competition policy measure for electricity markets.

7.6 Market monitoring

I have warned against an *ex ante* structural approach to market dominance and unilateral market power, but I are very much in favour of developing an *"ex ante"* market monitoring and regulatory oversight system for the detection and prevention of the exercise of market power as a conduct phenomenon. This is partly motivated by the problems of documenting the actual exercise of unilateral market power and the abuse of a dominant position *ex post*, as mentioned repeatedly, but has also a broader perspective on market power issues in electricity markets, including collective market power.

A market monitoring system should be designed and implemented from a competition policy perspective and within the competition policy domain. This implies, *inter alia*, that the system should be structured on the basis of competition policy principles and concepts, e.g. for the delineation of markets, definition of market power (unilateral and collective), criteria for market dominance and abuse of dominant positions, etc, and that the competition authority should be in the front seat in the design and operation of the system to give focus on competition issues. The need for cooperation and coordination with other regulatory bodies, in particular sector-specific bodies, should be derived from a competition policy perspective on the market monitoring system and not the other way around, as often seems to be the case in the regulation of infrastructural sectors.

In order to facilitate cooperation and coordination among institutions and bodies with responsibilities and tasks with regard to market monitoring and regulation, a permanent market monitoring and regulatory oversight committee should be established for the continuous surveillance and monitoring of electricity markets with the objective of detecting and preventing the abuse of market power. The committee should be headed by the competition authority, and should have representatives from the sector-specific electricity regulator, the financial regulator, the market organiser (power exchange), the transmission system operator, and possibly also from the electricity industry.

Developing such a market monitoring system would imply that the competition authorities would have to follow the electric power more closely and continuously than is typically the

case in competition policy regulation of markets. It would also imply that the necessary information and data bases be built up and maintained for the system and that numerical models be developed as part of the "box of tools" that the authorities would need to monitor the markets. This is to some extent a matter of coordinating and structuring information and integrating models which have already been developed, but much work still has to be done to have a comprehensive and reliable market monitoring system in place for most electricity markets.

7.7 Self-regulation - contracts - voluntary agreements

Some self-regulation is already performed by the electricity industry itself with regard to market dominance and market power, particularly as part of the legal framework for the operation of power exchanges and the market surveillance system developed by the exchanges. This could be furthered developed. It is particularly important that market dominance and market power issues in relation to the transmission network be integrated with this market surveillance and self-regulatory system by agreements and contracts between the transmission company/system operator and the power exchange. The transmission company/system operator should also independently clarify its role and responsibility with regard to market dominance and market power issues resulting from the operation of the transmission network in the short run, and from investing in the network to reduce the market effects of network capacity constraints in the long run.

7.8 A concluding remark

A practitioner of competition policy may look for precise answers and detailed guidelines in the report for the practical handling in competition policy of issues of market dominance and market power in electric power markets. From such a perspective the practitioner may be disappointed, and may even be left with more questions than answers after reading it. I am afraid, however, that there are no easy answers or solutions to the complex issues of market dominance and market power in the special context of electricity markets, other than through well-founded and detailed theoretical and empirical analyses in competition policy analysis, built upon a thorough knowledge of the electricity industry and an understanding of the way

electricity markets function. Hopefully, this study will contribute to shedding some light on these complex issues and the need for supplementing the “box of tools” in competition policy with analytical approaches and instruments tailored to improve the economic performance of electricity markets by mitigating the exercise of market power under market dominance.

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