

Integrated energy markets and varying degrees of liberalisation: Price links, bundled sales and CHP production exemplified by Northern European experiences

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Abstract

Liberalisation of energy markets has during the last 20 years been gradually introduced in many countries. The liberalisation has led to concerns regarding the markets' state of competition and fears that market power existence can result in less efficiency gains than what is expected from liberalisation. Concerns have also been raised as to whether specific consumer groups will be affected by limited competition in markets.

Much of the concern has been concentrated on the electricity markets, but the development of energy sectors with integration of activities within natural gas, electricity and the oil sector creates the need to examine market power aspects across these markets.

This paper examines the concentration trends in the Northern European markets for electricity and natural gas, combined with regional district heating aspects, especially with respect to the situation in Denmark. The situation with natural gas companies supplying to both small-scale CHP and to retail heat customers is discussed, for instance, which changes of regulatory regime for domestic heating customers should be considered when the natural gas market is being liberalised?

The interlinked nature of the energy markets is described and examples of impacts from one market with limited competition to other markets with seemingly well-functioning competition are given. The specific case of large CHP production facilities with output on the regulated district heating market and the competitive Nordic electricity market is examined. How much of the fluctuations in price experienced in electricity markets should be reflected in the price of heating supplies? To which degree do the heating customers have to bear the burden of low-electricity market prices?

Regulation of liberalised markets is discussed focusing on the interaction between one regulated market and the related energy markets that are liberalised. Existing regulation on the markets are compared to a situation where liberalisation of some markets puts pressure on other markets.

We conclude that the most likely integration activity in the Danish market will be the bundling of energy goods (natural gas and electricity) to retail customers and the integration of gas-fired CHP producers with gas companies.

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1. Introduction

The liberalisation of energy markets during the last decade has drawn much attention to the potential use of market power. The study has concentrated on the

electricity sector as the first sector to be exposed to widespread liberalisation, although there are also studies examining the natural gas sector. However, only a very few studies examine the potential threat of market participants engaged in several energy markets and exercising market power across interlinked energy markets.

Market power issues in the power sector has been extensively studied (Bower et al., 2001; Garcia and

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Arbelaez, 2002; Guan et al., 2001; Gørtz and Hansen, 1999; Andersson and Bergman, 1995). There are, however, a limited number of studies examining the market power issues across the energy markets (Bunn et al., 1997). This study focuses on market power arising in the electricity market based on a dominant producer that has generating gas-based capacity. Such a producer might use an option to withdraw some gas-based capacity to increase both spot market prices and price volatility. It is assumed that the gas can be resold without losses or even with some profit. The strategy is based on withdrawal of capacity at random time to maximise the effect on market price and volatility and to make the manipulation less obvious to the regulator. The gains to the producer will mainly be associated with an increased price from production at the remaining capacity controlled by the dominant agent and secondarily from increased margins on forward contracts, hedging, etc.

Gas market liberalisation has among others been studied by Lemon, (2002). Other studies consider price effects and positive welfare gains from liberalisation of both electricity and gas markets. In (Aune et al., 2001), this is analysed in an equilibrium model of the Western European markets. The results point to large potential gains, (50%) lower electricity prices and also lower gas prices. The combination of the two markets reinforces the price effects, both as a result of the lower fuel prices and because the substitution options between natural gas and electricity in end-use force the gas price down.¹ In a recent book (Finon and Midttun, 2004) several articles covers the interdependence between electricity and natural gas markets.

For Denmark a number of studies has dealt with the consequences of liberalisation for electricity markets. In Olsen and Skytte, (2003) market power issues are covered with emphasis on the Danish electricity market as part of the Nordic system.

Like many others, we see a potential threat to a successful liberalisation from the existence of market power. However, market power reduction by strong regulatory incentives may lead to over investment that might be just as harmful as the welfare loss associated with too high prices. In other cases, regulation in the form of not allowing cross-sector activities such as sales of several energy products will not produce market outcomes that are better than having one market player exploiting the possible economies of scope.

This paper is written with a description of price links and substitution characteristics of energy markets that are important for liberalisation developments in Section 2. A discussion follows in Section 3 of the liberalisation and resulting consolidation of energy markets that are seen as specifically interesting from a Danish point of

view. Section 4 follows thereafter, which argues why two specific integration developments in Denmark is seen as most likely and finally, a policy discussion of the possible adaptation of regulatory policy follows.

2. Interdependent energy markets—price links and substitution

Considering the interdependencies between energy markets, it must be noted that energy markets are connected in similar ways for the energy types:

- (a) energy of one type is used as intermediate input (fuel) in other energy sectors;
- (b) different types of energy are substitutes in end-use demands;
- (c) energy products can be supplied in bundles to retail customers with economies of scope.

The first relation has the consequence that pricing of one energy type is important for the output price of the final energy product. Electricity produced by natural gas is one example of this. Changes in natural gas, fuel oil or coal world market prices are, therefore, important for the pricing of converted energy, such as electricity and district heating. Liberalising one energy market will thus have consequences for other energy markets.

The second relation has the consequence that anyone selling or distributing energy products has to take into consideration the pricing of other energy goods that are close substitutes to their products.

2.1. Fuel price chains

Fuel price chains will be affected by market power or other market imperfections, not only in the first primary fuel market, but also the final demand for input in production or private consumption. Firstly, a too high price on the primary energy product will lead to a reduction of the fuel used in energy conversion if there are substitutes available. This inefficiency will lead to a secondary inefficiency when the converted product has too high marginal production cost. Even though the fuel substitution can accommodate some of the price increase, there will be a significant increase in marginal production cost. The increased price of converted energy will in the end lead to a reduction in the use of this type of energy. The mix between inputs of capital labour and energy may be distorted and inefficiencies in production of other goods might be the result. Correspondingly, the private consumption of energy might be reduced to an inefficient level where, e.g., too much time and effort is spent on reducing energy consumption.

As there are some difficulties relating to the quantification of the right fuel price at first hand, it might be

¹They assume natural gas supply as exogenous.

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