WORKING PAPERS ADIS

BENCHMARKING ELECTRICITY IN THE EU

Richard GREEN, Arturo LORENZONI,
Yannick PEREZ and Michael POLLITT*

ADIS WORKING PAPER n°2005-01

Université Paris Sud
FACULTE Jean Monnet
Droit • Economie • Gestion

* Support from the European Union through the 6th Framework Programme, Grant number, is gratefully acknowledged. We have gained from attending the conferences organised as part of the SESSA project, and our debt to the experts who presented reports at those conferences is clear.

Richard Green, Arturo Lorenzoni, Yannick Perez and Michael Pollitt*
University of Hull Business School
Bocconi University, Milan
University of Paris XI
University of Cambridge

Abstract

This chapter discusses benchmarks that could be used for electricity liberalisation in the EU.

Keywords:

Electricity, market design, market power, EU enlargement, regulation, investment, sustainability

JEL: L94

Some general comments from JM

Make clear that your benchmarking is based upon normative economic insights rather than compliance with EU objectives and directives

Apply the benchmarking criteria for a set of countries and/or for some topics and make comments on the main interesting findings – I imagine indeed that it is not possible for next September to get all the indicators documented for all the 15/25 countries. However, at least an incomplete attempt is required in order we will be able to present some findings during the Sessa final conference and in the final report

* Support from the European Union through the 6th Framework Programme, Grant number, is gratefully acknowledged. We have gained from attending the conferences organised as part of the SESSA project, and our debt to the experts who presented reports at those conferences is clear.

1. Introduction

The aim of the SESSA project has been to identify good and bad practices affecting the electricity industry in the EU. Benchmarking is one way in which we can make comparisons across countries, and can contribute to that task. The European Commission has already begun this process, publishing four benchmarking reports over the past three years (European Commission, 2001, 2003, 2004, 2005).

The key to benchmarking is collecting comparable data from each country, and using to infer how well that country is performing. Three points immediately come to mind. First, it is important to collect information that actually sheds light upon the industry's performance, rather than gathering data simply because it is available. Second, some types of data give useful information about the industry's performance, but cannot be used in themselves as indicators of good or bad practice. For example, population density in a country is important in explaining the level of transmission and distribution costs, but a country cannot be accused of good or bad practice on the basis of its population density! Third, even when the data is suitable to indicate how well an industry is likely to be performing, there may be exceptions, and so each case should always be the subject of further interpretation before final judgments are made. The following two sentences are key. Do not hesitate to stress this point again in the conclusion.Benchmarks should be seen as signals rather than definitive indicators. The right choice of benchmarks, however, can minimise the number of times that a misleading signal is sent.

In this chapter, we discuss the choice and use of benchmarks in each of the five areas on which SESSA has focussed. To remind the reader, these areas are market design, market power, EU enlargement, regulation, and investment. It should be obvious that a number of benchmarks are relevant to more than one of these areas; however, our aim is to discuss the most important benchmarks for each area, and to do so in the context of that area. Where a benchmark can be used as a signal that things are going well (or badly) we will discuss the values associated with a good (or bad) signal.

In some cases, our benchmarks have been included in the European Commission's reports, but we also include suggestions of our own, where these can give additional useful information. Before moving on to benchmarks of good or bad practice, however, we list a few important pieces of information that can help put the overall performance of a country's electricity industry in context.

First, what is the level of electricity consumption, both in absolute terms and per capita? The greater the consumption, the easier it is to obtain economies of scale in production, and economies of density in distribution.

Second, what primary energy sources does the country's electricity industry use? A country with a high proportion of hydro-electricity may not be exposed to fluctuations in the prices of fossil fuels, but is vulnerable to years with low precipitation. Historically, oil prices have been more variable than coal prices, and so countries with a high proportion of oil-fired generation have seen greater changes in their input prices.

2. Market Design

When discussing market design, we are concerned with a mix of market rules and market structure. The former should be self-explanatory, but the latter has several dimensions. A full description of a market's structure would include information on the number and relative sizes of the firms within each part of the market. Where part of the market is heavily concentrated, we might expect to have problems with market power. Since market power is itself the subject of one of the SESSA work packages, benchmarks that are primarily concerned with horizontal market power are discussed in the next section of this chapter.

The first question is how much of the market is open to competition. There can be a competitive wholesale market, even if no final consumers are able to choose their retailer, provided that enough retailers are competing to buy power from generators. The European Union's policy, however, is to create competitive retail markets for electricity. Some Member States have already opened their entire markets to competition, while others have only opened part.[1]

The natural benchmark to use, and the one used by the European Commission, is the proportion of consumption (in TWh) taken by customers who are allowed to choose their retailer. We believe that customers should only be included in the competitive part of the market if they can choose their retailer directly. Where there is a system of concessions, so that all consumers in an area must buy from the concessionaire, we would not count allowing the concessionaire to decide

[1] One of the newest Member States, Malta, has not yet allowed any consumers to choose their retailer.

how to buy its power in the wholesale market as an instance of retail competition. The proportion of consumption in the competitive market gives a better indication of its economic importance than a benchmark based on customer numbers, since the largest customers are generally the first to be given this choice, and they are relatively small in number. The European Commission also publishes the thresholds at which consumers become eligible to join the competitive part of the market – these currently range from a consumption of 40 GWh a year to all non-household consumers (and of course, all consumers). These thresholds provide useful supplementary information, but the relationship between the threshold level and the proportion of the market open to competition is generally a straightforward one, and it is the latter that is the key indicator of good or bad practice.

The European Commission signals that anything less than 100% market opening is undesirable, by shading these entries in red in its summary tables. Although some economists have questioned the benefits of giving household customers a choice of retailer (see Newbery, 2002), given the present policy of the European Union, we would also interpret this benchmark in terms of best practice being associated with the highest values. Beware, the benchmark must be based on economics not on the level of compliance with EU objectives. So it is not a good reason to retain an indicator in your benchmarking just because the Commission says it is relevant.

It is generally accepted that competition in an electricity industry can be greatly weakened if the transmission operator also has interests in generation, and is in a position to favour them in its operating decisions. The second European Directive on electricity liberalisation therefore required that there should be vertical separation between transmission and the rest of the industry, and between distribution and the rest of the industry, except for networks with fewer than 100,000 customers. Our first benchmark, which is reported by the European Commission, is whether this vertical separation has been adopted, and the type of separation used. The Commission reports list four levels of separation: Ownership separation, legal separation, management separation, and accounting separation. In a few cases, it also reports distribution networks that have not been separated from other activities in the industry. Accounting separation is the weakest form, in which a company keeps accounts for its network and for its competitive activities, and must charge the competitive businesses the same fees for using the network as it charges third parties. This is intended to prevent cross-subsidies between the network and the competitive activities. Management separation requires that different people are responsible for the network business and the competitive activities, and that the network business cannot pass on information about rival

concerns. Legal separation goes further, with a completely separate legal entity to run the network. Even in this case, however, staff working for the network business will be aware of the financial interests of their parent organisation and its competitive activities, and may take decisions to further these. Only full ownership separation, when the network is an independent organisation rather than a subsidiary, can completely remove the incentive to favour one market participant over others.

The Commission signals that ownership separation and legal separation provide the best conditions for effective competition, and shades any other positions in red as a warning sign that competition may be impeded. In the case of transmission, we agree unreservedly with this assessment. Distribution networks are generally managed in a passive manner, allowing electricity to flow from the transmission network to the consumers with little intervention from the system operator. In this case, the operator has little scope to discriminate between network users in physical terms. The access charges for the network will need to be regulated, and it is harder to regulate a company that is active in several segments of the industry than one that is specialised in distribution alone – there are opportunities for it to shift costs from a competitive segment of the business into the regulated activity. There may be branding advantages to a retailing business that also operates the local network. We thus agree that competition will be more effective, the greater the degree of separation. However, we believe that incomplete separation will do less damage in the case of distribution networks than in the case of transmission.

Effective competition also requires a well-functioning wholesale market. Work package three has demonstrated how important the details of market design can be, but it is still useful to list broad categories of market institutions. The European Commission lists three main categories of wholesale market – those based upon bilateral trading (the majority), those using a Pool and contracts for differences (Ireland, Lithuania and Spain), and those with a hybrid model (the Nordic countries). Work package three suggested that a Pool (or hybrid) model had significant advantages in providing a transparent reference price, as long as the market was not so concentrated that the transparency enhanced positions of market power.

Balancing arrangements are also very important – in the end, arbitrage against the final stage of the market (or the possibility of accepting an imbalance between a company's contracted and physical positions) will affect the whole structure of market prices. The European Commission lists three main ways in which balancing charges are set – through a market, by the regulator, and by the transmission system operator. The three two-way combinations of these options also appear in the table 1.

We believe that market-based balancing is likely to produce the best results, at least as long as the market is sufficiently competitive. If the market is concentrated, then incumbent generators may be able to manipulate it, damaging entrants. This would be made worse if the transmission system operator is still linked to those generators. Charges set by a transmission system operator are likely to be second-best, while the regulator is unlikely to have the information to set charges that reflect the rapidly changing conditions on an electricity system. While we repeat the importance of drawing conclusions only after investigation, we would expect that balancing charges set by a regulator would be an example of bad practice.

A LIST OF THE WAY IN WHICH INTERCONNECTORS ARE RUN?

Yes PERHAPS PROPORTION OF CAPACITY MANAGED USING AUCTION-BASED METHODS?

All of these benchmarks have reflected the way in which the market is organised. We will propose one benchmark that reflects the way in which it is performing. This is the level of liquidity in the wholesale market, looking separately at the day-ahead market (or other market operating close to real time) and the forward markets. In a liquid market, agents can make reasonably large transactions without affecting the market price too greatly, whereas it can be very difficult to find a counter-party in an illiquid market. Liquidity in forward markets can also reflect market participants' view of how well the underlying spot market is performing. The very high liquidity in the Nordic forward markets shows that traders view Nord Pool as a well-functioning market which is unlikely to create losses by posting inexplicable prices. In contrast, the British regulator argued that the low level of forward trading around the Pool in England and Wales showed a lack of confidence in that market's price formation process.[2]

In general, the more liquid a market is, the better. No electricity market has reached the stage that the transactions costs of repeated trading have outweighed the benefits of better price discovery. DO WE WISH TO SUGGEST A LEVEL OF LIQUIDITY THAT IS "ADEQUATE"? yes, or at least good, medium and low.

[2] Government-brokered long-term contracts also reduced liquidity in the commercial forward markets until 1998, and liquidity actually rose while the Pool's abolition was being discussed and implemented.

3. Market Power

The second SESSA theme concerned market power. Many academic papers on firm behaviour have been written in what is known as the structure-conduct-performance paradigm. The structure of the market, including such features as the number of firms and the type of product they are selling, affects the way in which they act (their conduct) and the market outcomes, such as prices (its performance). While more recent work recognises that firms make strategic decisions that affect the structure of the market, it is useful to think of benchmarks in this area as those related to structure and those related to performance.

The potential for market power is clearly related to market shares. Elaborate more on the idea that the indicators signal potential for market power and not having market power, nor exercising market power. The Commission's benchmarking reports list the market shares of the largest generator, measured by capacity, and of the three largest generators taken together. These are easily understandable measures, and since the Commission includes the potential import capacity in each national total, take account of the reduction in domestic market power that comes from foreign competition. While higher levels of concentration increase the likelihood of problems, there is no clear dividing line between acceptable and unacceptable levels. The Commission gives a red warning signal to single firm market shares of more than 40%, and three-firm shares of more than 70%. Markets where the largest firm had less than 20% of capacity, and the three largest less than 40%, are given a green signal of health. Frankly, I am doubtfull about these thresholds, especially the last one. If you think like me the Commission approach is wrong , tell it.

An alternative to these concentration ratios would be the Herfindahl Hirschman Index (HHI), which takes the share of each generator in turn, squares it, and then sums the squares. The index takes a value of 10,000 where there is a monopoly, 5,000 where there are two equally sized firms, and falls towards zero as the market becomes less and less concentrated. It has the advantage that it is potentially affected by the size of every firm in the market, whereas two markets with the same concentration ratio could behave differently because of the size distribution of firms outside the top group. One disadvantage of applying the HHI to shares of capacity in European electricity markets is that it is not obvious how to treat interconnector capacity. Treating each interconnector as a single firm might actually raise the measured concentration in a small, well-connected, market, and this would be inappropriate if the neighbouring markets were competitive. It might be best to divide each interconnector's capacity according to the capacity shares (excluding imports) in the neighbouring markets. The disadvantages of the HHI are that it is slightly less intuitive than a

market share I do not think this is an relevant argument, and that more information is needed to calculate it. The European Commission's Merger Guidelines state that "the Commission is unlikely to identify horizontal competition concerns" if the post-merger HHI is below 1,000; increased by less than 150 as a result of a merger, or increased by less than 250 when the post-merger HHI is between 1,000 and 2,000 (the equivalent of five equal-sized firms).[3]

As an alternative to measures based on shares of capacity, we could calculate shares of output. Energy-limited generators, such as hydroelectric plants, or intermittent sources, such as wind farms, may have less influence on the market than their shares of capacity would imply. Base-load generators which run continuously will have relatively more impact on an output-based measure of concentration than a capacity-based measure. Since a firm's financial incentive to raise prices is generally directly proportional to the output it is producing, this might imply that the output-based measures are a better indicator of firms' incentives to exercise market power. Most electricity markets have few problems of market power when demand levels are low, however, even including the notorious case of California (Borenstein et al, 2002). Market power in generation is most likely to be a problem at times of high demand. At these times, however, most capacity will be in use, and so the capacity-based measures give a better impression of the state of the market than output-based measures. So what is your suggestion?

One disadvantage of the measures discussed so far is that the relationship between concentration and prices in electricity markets is a complex one. Various specialised indicators are used by electricity market monitors, particularly in the United States, to give a better signal of when a market may be vulnerable to the exercise of market power. For example, the pivotal supply index can be defined as the proportion of hours during which any supplier in the market is pivotal – that is, that demand could not be met without some output from that supplier's plants. In the absence of effective demand side response, the supplier could (in theory) ask for almost any price it wanted at such times. Other specialised measures are discussed by Twomey *et al*. (2005). While these measures are useful to the specialist, we do not develop them further here, because of the amount of data required to produce them, and the greater difficulty in interpreting them, compared to the more intuitive Again I do not see why intuition would matter. Moreover do you think that HHI or MS are easier to interpret than PSI ? measures we favour.

[3] The guidelines do note some exceptions, such as if one of the merging firms had a market share of more than 50% before the merger.

In the retail sector, the Commission collects information on the market share of the largest company, and the largest three companies, in terms of sales in TWh. Once again, these are intuitive measures, easily related to the potential for market power, and relatively easy to collect. The Commission's figures are collected and calculated on a national basis, however, which might be inappropriate. The problem is that competition to sell electricity to households has a strong regional (or local) basis, and that the incumbent former monopolist in each area generally has a high market share. The incumbent may well have market power within its area, but when we aggregate across areas with different incumbents, the market will look much less concentrated.

As an example, in December 2003, British Gas had a 24% market share among household electricity consumers in Great Britain, PowerGen had a share of 21%, and National Power a share of 15%. The three-firm concentration ratio was thus 60% (in this part of the market). Within any area, however, the incumbent electricity company alone had an average share of 59%, implying a three-firm concentration ratio of nearly 90%. Competition to supply non-household consumers is more national in scope, which will dilute this effect when data for the entire market are collected. Note that collecting data on a regional basis, computing the concentration ratios, and then taking their average will have little impact on the values obtained when competition is truly national, since market shares in each region should be similar. For this reason, we recommend that data should be collected and concentration ratios calculated on a regional basis, but taking national averages to present the results. I agree with you. By contrast you rejected HHI because data to be collected are larger than for market shares. I would advocate that HHI are more informative than MS and the additional information to collect is worth while.

The level of vertical integration is an important structural feature of a market. If there is a lot of vertical integration between generators and retailers, then it can be difficult for non-integrated entrants to break into the industry. This in turn helps the incumbents to keep prices high. We suggest that data should be collected on the proportion of electricity that is retailed by a company in the same corporate group as the company that generated it. This would then be an indicator of the level of vertical integration. High levels of integration are unlikely to be consistent with best practice unless both generation and retailing are unconcentrated, in which case entrant companies should face many options for obtaining, or selling, power. Maybe a better or a supplementary indicator would be the openness of the market asset measured by the number of acquisitions made by foreign investors. See for instance fig 3 and 4 in M&A report by Codognet, Glachant and Lévêque.

When it comes to the performance of an electricity industry, we would like to discuss two measures. First, what about the level of wholesale prices? The absolute level of wholesale prices is relatively uninformative, since costs can vary significantly over time and across markets. It is better to relate wholesale prices to the marginal cost of generation. In a competitive market with spare capacity (at a particular point in time), competition should drive prices down to the level of marginal cost, whereas prices significantly above marginal cost would be an indicator of market power. At peak times, however, when there is little or no spare capacity, marginal cost is hard to define, and prices should certainly rise above marginal operating costs, or generators will be unable to recover their fixed costs. A possible measure of performance is thus to compare prices with calculated marginal costs, but taking only those periods in which capacity exceeds demand by a specified margin. The standard way in which this comparison is presented is the Lerner index, which is equal to (price minus marginal cost) divided by price. A Lerner index of close to zero is a sign of a competitive market, whereas the Lerner index in California exceeded 0.5 in many hours during the summer of 2000.

The disadvantages of this measure include the significant effort required to calculate it. Although simple models of the industry can be built and maintained at low cost, and regularly updated with fuel prices and demand levels to calculate new figures for marginal costs, these models typically ignore many of the operating constraints that the real system faces. These constraints force the system operators to run expensive but flexible plants in place of cheaper, inflexible, generators, and thereby increase marginal costs. Models which do not take such constraints into account are likely to over-estimate the level of the Lerner index.

Furthermore, if an official body regularly estimated the level of marginal costs, and compared out-turn prices to its estimate, this would surely affect the development of the market. If prices were found to be regularly above the level of marginal costs, there could well be calls for action that would reduce them. Generators might decide to keep prices close to their prediction of the official estimate of marginal costs. The outcome would be a very unusual market, to say the least. For this reason, it is probably better to think of the Lerner index as a measure that could be calculated from time to time to give a "snapshot" picture of market performance, than as a benchmark to be collected on a regular basis.

Our second performance measure concerns the retail market. It is possible to measure the number of customers (or share of consumption) switching between retailers, either over the whole period since the start of competition, or over a more recent period, such as the last year. Measuring

the total number of customers who have switched at least once implicitly tells us how many customers are still with the incumbent ex-monopolist, and may signal something about that company's market power. Measuring the total number of switches over a long period does not tell us whether a small number of customers are switching frequently, or many customers are switching, but only infrequently, and is therefore a bad measure of the state of competition. At least once the market has been open for a few years, the best benchmark will be the number of consumers who have switched in the past year.

This measure does need to be interpreted with care, however. We could conceive of a really competitive market in which it was easy for customers to switch between firms, the fear of losing customers would force every firm to offer a very good price and a high standard of service. As long as they did so, customers would not need to switch, and so we would observe very little switching. At the other extreme, if switching is sufficiently difficult, customers might stay with their existing retailer despite high prices and poor service. It is not obvious that we could tell these markets apart, purely on the basis of the observed switching rates. In practice, however, there is some differentiation between companies, in terms of tariff design or fringe benefits (one British tariff sells electricity with air miles attached), giving customers positive reasons to switch between companies. In these circumstances, low levels of switching are likely to reflect barriers to doing so, and to be an indicator of bad practice.

I am struck by the absence of indicator related to demand side management and to the means to make consumers aware of prices and therefore reacting to price. As you know market power decreases with elasticity increase.

JM - Ensure that proposed indicators for benchmarking Enlargement are operational and precise enough

4. EU Enlargement

Eastern European countries are physically integrated with the west European grid, and took the first steps towards adopting the "western model" with regulated third party access for the larger customers, partial privatisation of companies within the industry (except in Slovenia) and reducing barriers to international trade. But like in the rest of Europe, each reform is unfinished regarding its market design and the existing market power let to the dominant player. Most of the Eastern European Countries have few and relatively illiquid markets for electricity services. When markets exist, they only trade less than 5% of the total electricity consumption. Bilateral contracts are the

most frequent form of "competitive" agreement in new members' states. The well known problem with bilateral contracts is the market power issue embedded in direct confrontation between seller and buyer without a possible comparison with a market price. In Eastern Europe they still are in the infancy, and when they exist, like in Poland, they aren't used in a proper way. In addition, in many Eastern European countries, national companies have been sold to strategic investors from abroad, with EdF, E.On, RWE and Vattenfall particularly active. In reaction, some countries like Czech Republic, Poland, Slovakia & Slovenia have been concerned to create national champions. These National Champions have the size to avoid being taken over by one of the large European groups with unfortunate consequences for the level of competition within their national market and for global EU 25 competitive game. One specific problem of EU enlargement is of course the rather underdeveloped academic & empirical studies regarding these countries. In EU 15 countries, information, indicators and data have existed for years and are easily available. Such development in monitoring is just starting for many of the new Member States and candidate countries.

The work of the last EU benchmarking report and the collection of data made by SESSA experts give us good starting point. This section is organised as follow: point 4.1 recalls the 10 major features of Eastern European Electricity sectors; point 4.2 stresses the two complementary roads to enhance market reforms, regional markets construction and competitive fringes increase.

4.1. Basic elements of Eastern countries Electricity sector

Our purpose here is to give a coherent picture of the major common characteristics of Eastern Electricity sectors, by doing so we acknowledge that we lost many interesting details presented in SESSA papers. But our aim here is to find easy to use indicators rather than to have a precise analysis of each country case.

1. *Increasing demand*: Eastern Europe demand growth for electricity is expected to be greater than demand growth in EU 15 countries, according to the low level of electricity consumption per capita in eastern countries and a plausible correction effect toward EU level[4]. *Forecasts in electricity demand* and *a specific indicator of demand side management* (like % of electricity demand able to be reactive to price signal) could be introduced.

[4] : OECD consumption per capita is 7 336 kWh whereas in Central & Eastern Europe the consumption is 2 977 kWh in 2000.

2. *Uneconomic price structure*: Some Eastern Europe countries still have distorted tariffs, typically involving domestic customers paying less than the full cost of power, at least in their capacity as electricity consumers. The correction of the uneconomic price structure may slow down the demand growth seen in the first point. Two ratios can be used as indicators: *the ratio of domestic to industrial tariffs and ratio of tariff revenue to costs*[5].

3. *Small and isolated markets by lack of transport capacities:* As everywhere in Europe international connectors are scarce and difficult to manage in an economic way in Eastern countries. Like in EU 15, they were built in order to guarantee a good level of technical security of supply and some room for common management of peak load problems. Now they are supposed to be used in more economic way, under optimisation processes of scarce capacities, and to produce price convergence in a single market perspective. Basically, in the new competitive system, international connectors have to allocate electricity flows from low cost regions to high cost regions and by doing so, they produced both a price convergence and huge redistributions of stakeholders welfare. Indicators can be used to catch up these problems: *first is the absolute level of cross-border capacity; the second the level of cross-border capacity available on the open market; and third the correlation between the net export position of the country and of competitive retailers*[6].

4. *Presence of long term contracts in transmission lines and in generation*: The problem of long term contracts is the following: in some cases, long-term contracts were used to help finance traditional fuel suppliers (mainly coal mining) and environmental improvements, before creating competitive electricity markets; in other cases, long term contracts can be see as a "quasi integration device". In Eastern countries the two situations seem to coexist: many international transmission lines are congested at the present[7] time, and there are a large number of long-term contracts that take up much of the potentially available capacity and reduce the impact of market opening. The other category of long-term contracts concerns generation. Attempts to increase competition comes up against long-term contracts that guarantee part of the market by reducing the competitive area.

[5] If it is possible in terms of data collection, the ratio could be rate of return on capital, using replacement asset value rather than the financial value of the company.

[6] In this respect, importing retailers in an exporting country might imply an uncompetitive wholesale market.

[7] Most of the transmission lines between countries are frequently congested, particularly those towards the importing countries of Austria, Germany and Hungary.

Indicators can be used to give some information on these issues: *Proportion and evolution of cross-border transmission capacity sold under long-term contracts & proportion and evolution of electricity generation sold under long-term contracts* can be used to estimate the level of possible problems.

5. *Most local market structures are dominated by a dominant player:* The typical Eastern Europe market structure is composed by a dominant wholesaler and a competitive fringe. The competitive fringe is strongly limited by the long-term contract structures that often allow the dominant wholesaler to dispatch the generator, and so it could deny other companies access to any surplus capacity not contracted in advance. It is also the case concerning the support for renewable energy which often takes the form of a feed-in tariff under which the power is sold to the dominant wholesaler, consolidating its position even more. Indicators to show these problems are: *The size of the dominant wholesaler, both in terms of physical production and in terms of production plus contracted energy; Proportion of the industry in private ownership*; H*erfindhal and Lerner Indexes…*

6. *Support for renewable energy*: In Eastern European countries the mechanism used to support renewable energy often takes the form of a feed-in tariff. This mechanism is rather problematic in Eastern countries because it offers to the dominant wholesaler the position of mandatory buyer of renewable energy. By the way, the feed in tariff consolidates its dominant position even more. *Indicator here is the total cost of renewable energy supported by feed in tariff.*

4.2 Regional market and competitive fringes

Two ways to enhance competition coexist in Eastern European countries, and we think both need to be monitored: first is the road to new competitive reforms in order to produce regional market solutions; second is the road of incremental reforms by increasing national competitive fringes in order to produce eastern Europe common competitive fringe.

The regional market solution

SESSA Experts conclude that stronger competition on a regional level might offset the unsatisfactory domestic market structures. A regional approach to market design and restructuring would be a solution compared to the individual approach taken by most countries. Companies that are large on a national basis would be small or at most medium-sized on a regional scale. Effective

regional markets could offset the limited competition within national markets, but require suitable cross-border arrangements. Indicators in that respect are the same than in previous section but recalculated on a regional perspective. The limitation of this approach is that by increasing the relevant market size all indicators would look better, without any change in competitive settings. The possible positive effect appears if the markets will become integrated and firms do have to compete within the larger area, facing more rivalry.

Definition of "competitive fringes"

In Eastern Europe the electricity markets are defined by both a dominant player and some parts of Competitive fringes. By a close look on theses competitive fringes, we propose to defined them as the sum of 7 modules of electricity business : 1) Network Grid Losses in transport & distribution activities; 2) Balancing energy ; 3) Congestion management ; 4) Import & exports ; 5) ancillary services and reserves ; 6) Market share really open to competition ; 7) if so, the renegotiation of Power Purchase Agreements (as shown by Christian von Hirschhausen's and Georg Zachmann's paper[8]). With this kind of large definition of the competitive fringes, it will be possible to show how far from this benchmark is each country. It will be also possible to give some clues about the needed "reform of the reform" in order to enlarge the competitive fringe of each country as a convergence process to this large definition of competitive fringes driven by local or EU pro-competition policies.

Indicators for measuring the competitive fringes are : *Sizes, mechanisms and actors offering theirs services to following modules of competitive fringe : Network Grid Losses in transport & distribution activities; Balancing energy to the grid operator ; Congestion management ; Import & exports of electricity; ancillary services and reserves. Two other indicators are the adjusted HHI; and if so, the opening of Power Purchase Agreements.*

Commentaire : My main comment on this part is that general ideas of indicators rather than operational and precise indicators are suggested. Please try to go further.

JM – move this up to before "market power"

[8] : Perspectives and Challenges of EU Electricity Enlargement - Benchmarking the Reforms of the Electricity Sector in the New Member States**.**

5. Regulation

The fourth SESSA theme concerned regulation. By regulation we mean the sector specific economic regulation that governs the electricity sector. Such regulation normally involves the promotion of competition in the generation sector and the setting of network tariffs for transmission and distribution. Benchmarking regulation is very difficult because it is not that easy to know what aspect of regulation to benchmark. Regulation of private or mixed systems is a necessary evil which is required when the normal processes of competition cannot be left to take their course. Thus a well functioning electricity market should consist of a minimal amount of regulatory intervention combined with the utilisation of market or private decision making wherever possible. The more favourable the market conditions and initial endowments the less need for regulation there is. Relatively small electricity markets dominated by nuclear or hydro power should require proportionately more regulatory intervention than larger markets dominated by gas or coal power.

In seeking to characterise the lessons from the European experience of regulation we look at three aspects of electricity regulation: the form of regulation, the process of regulation and the outcome of regulation. The form of regulation concerns the how regulation is organised (e.g. via an independent sector specific regulatory agency). The process of regulation is to do with the way that the regulation is actually conducted (e.g. RPI-X price control of electricity distribution with X set using comparative benchmarking). The outcome of regulation is to do with an overall assessment of the contribution of regulation to the performance of the industry (e.g. the impact of price controls on regulated prices).

5.1 The form of regulation

The 2003 Electricity Directive discusses electricity regulation in some detail (Article 23 on Regulatory Authorities). Each country is required to set up an independent regulatory agency (or agencies) responsible for 'ensuring non-discrimination, effective competition and the efficient functioning of the market.' (L 176/49)

There seems to be empirical support for the idea that electricity market reform requires an effective independent regulatory system (Bergara et al., 1998). An independent sector specific regulatory agency is seen to be part of this regulatory system. Independence itself is not enough. This would need to be combined with the regulator having power over the key elements of

electricity regulation to promote an effective market. These include the power to: set network access conditions (and thus not to arbitrarily deny market access to new competitors); resolve disputes between parties (particularly between generators and network companies); determine regulated prices in advance (thus providing clearer incentives to regulated firms and reducing the scope for lobbying); and acquire relevant information from companies. The 2003 Electricity Directive does not discuss the methodologies that should be employed in regulation.

There is a continuing debate about how heads of regulatory agencies or commissioners should be selected. The formal literature from the US seems to suggest that elected regulators are to be preferred in that they achieve lower prices (Besley and Coate, 2003) and keep the costs of regulation down (Mixon, 2001). However in other jurisdictions the situation is not so clear cut. In developing countries elected regulators may just represent different interests rather than being independent (see Estache and Martimort, 1999). In mature democracies with little tradition of direct election to specialist jobs (such as most countries in Europe) election does not seem appropriate. However it clearly is important to appoint individuals without clear conflicts of interest and to protect them from summary ? political interference. This can be done by limiting the conditions under which they can be dismissed and fixing their term of office.

In Table 4 in the annex we score each country on whether they have ex ante regulation (= 1, ex post = 0), ministerial involvement (1 = no, 0.5 = some, 0 = yes), network access conditions set by the regulator (1 = yes, 0 = no), dispute settlement by the regulator (1= yes, 0 = no) and strong information acquisition powers (1 = yes, 0 = no).

The table suggests that in 2003, these strong conditions were met in only 7 countries. Germany continues to have no regulatory agency in mid 2005, with oversight of the electricity sector being in the hands of the German Competition Authority (the Bundeskartellamt).

As part of the SESSA research programme Larsen et al. (2005) conducted a detailed survey of European electricity regulators to review their responsibilities and organisation. They found that there was a significant variation in the objectives of independent regulatory agencies. Of the 15 they examined, 14 had the promotion of competition as one of their legislative objectives, however only 6 had socially responsible prices as an objective. Indeed the total number of objectives varied between 7 for Ireland and 1 for Sweden.

Larsen et al. also showed that most heads of the regulatory agency had 4-6 year terms, could not be sacked for matters related to policy, and could not hold offices in government. Regulatory

agencies are mainly funded by fees levied on regulated firms, have control of their own expenditure within their budget limit, and personnel appointments. However there is a wide variety in who appoints the head of the agency with only 4 countries having the head appointed by legislature and the executive and 5 countries, including the UK making the appointment by one or two ministers. Some countries do not allow an industry figure to be head of their agency (e.g. Austria).

Indicators of form of regulation suggested: Functions of regulatory agency, tenure and terms of appointment of head of regulatory agency, how regulatory agency is financed (eg. Industry levy or by taxpayer) and salary scales of staff

Elaborate in the text about the relevancy of this last indicator. Unclear for me.

(i.e. civil service or independent).

5.2 The process of regulation

Regulatory agencies must carry out their work competently and use state of the art methods. They should demonstrate a willingness to be transparent and a process of appropriate stakeholder engagement in the course of decision making. This is important for two reasons. First, transparency is important for the democratic legitimacy of any regulatory agency that operates at arms length from political control. Second, transparency and stakeholder engagement should lead to better regulatory decision making as regulators can benefit from the informed comment which stakeholders and independent observers can make on their decision making processes.

Casual observation of European regulators reveals wide differences in the degree of transparency between regulators. Ofgem in the UK and NVE in Norway have comprehensive information available on their website and readily respond to requests for information and regulatory data. By contrast CRE in France do not publish much material (for example with respect to the performance of the distribution departments of EdF) and E-Control in Austria is not allowed by law to publish certain types of data on the performance of regulated companies that is readily available in the UK and Norway.

An efficient process of regulation involves procedural efficiency on the part of regulators with timely reporting and a pro-active agenda. Ofgem publish regular work plans and issue consultation reports on issues such as how to set prices on the distribution network to encourage

embedded generation. For their regular price reviews of electricity distribution and transmission charges they adhere to well worked out 18 month work plans which deliver final proposals 4-5 months prior to the start of a new price control review period. By contrast, other countries have had serious procedural efficiency problems. For instance the Netherlands first electricity distribution price control review, undertaken by the DTe, was only completed more than two and a half years after the initial deadline and only just ahead of the subsequent price control review period.

Systematically comparing the process of regulation in different European countries requires some objective measure of what a good regulatory process would look like. The work of Jamasb and Pollitt (2001) provides some information on this with respect to transmission and distribution price reviews. For a sample of 18 OECD countries, of which 14 were in Europe, they examined the use of benchmarking methods. They identified 6 countries that could be thought of as leading countries who were using sophisticated bencharking techniques (such as data envelopment analysis) – Chile, UK, Norway, Netherlands, US and Australia (New South Wales). Several of these countries also employed ex ante regulation what do you mean ex ante competition regulation in addition to merger control ? I do not understand because all EU countries but Germany maybe employ ex ante regulation and by essence regulation is ex ante., had a process of consultation and incentivised supply quality of service and investments. These countries also published information on the web and were open to third-party studies of benchmarking. This study strongly suggests that where it is possible to specify what a good process of regulation might look like it is possible to identify countries which practice such a process. Fillipini et al. (2005) provided updated information on the use of benchmarking methods by European regulators and showed that the UK, Norway and the Netherlands have continued to provide the lead in their process of regulation.

Leading European regulators are increasingly co-operating on matters of mutual interest (often via the Council of European Energy Regulators or CEER). This is imperative in the area of electricity transmission where almost all countries have too few domestic comparators to make a meaningful assessment of the scope for cost savings and hence X factors. This issue is becoming more important in the area of electricity distribution, where initial conditions and mergers have begun to reduce the number of effective comparator firms. Co-operation is required to standardise definitions and data collection and to share lessons from the use of different methods. It is interesting to observe that the same group of countries is frequently seen to be taking the lead in the area of co-operation: the UK and Scandanavia. This contrasts with the absence of France, Germany and Spain from many of these discussions.

In terms of process both the UK and Norwegian regulators seem to score very highly Please apply your list of indicators to show it instead of observing that it seems… They have the longest and most consistent experience in Europe with electricity reform and seem to provide the most obvious role models for other European countries.

Indicators of process efficiency suggested: all documents are routinely published on the regulator's website (Y/N), whether important documents are additionally available in English for not English speaking regulatory agencies (Y/N), the presence of a work plan on the website (Y/N), whether targets for work delivered are routinely met in a timely way (Y/N), whether use is made of external advice (Y/N), which benchmarking methods are used,

Whether regulator's action are ex post assessed (never, randomly, periodically)

whether the country is an active member of the CEER by serving on one of its working groups (Y/N) and the number of named CEER collaborations it has been involved with.

5.3 The outcome of regulation

Measuring the performance of a regulatory agency in terms of outcomes which are valued by society is complicated by an identification problem. Regulation is just one factor explaining the performance of an electricity sector. Regulation may be implemented at exactly the same time as restructuring or privatisation, making it difficult to access its unique impact. The strength of initial legislation or general competition policy may also be important factors behind the success of regulatory processes.

In developing countries the measurement of performance can be measured by the general health of the electricity sector. This can be easily gauged by the size of system losses, shortages of capacity and the amount of investment in the sector. All of these we would expect to see strongly correlated with the exact timing of reform. For developed countries these indicators become difficult to interpret. For example increased efficiency may mean less investment for a fully developed electricity network. Often however the co-incidence of several changes at once masks the impact of regulation per se.

It is possible to conduct cost benefit analyses of individual pieces of regulation. For major discrete changes in market design or regulatory process may lend themselves to this sort of analysis. A good example of this is Green and McDaniel (1998) which looks at the impact of the introduction of full retail competition in the UK. They found that the benefits in terms of lower prices and improved induced efficiency barely matched the considerable implementation cost in terms of new information technology aimed at facilitating residential customer switching. This analysis suggested that at the very least a cheaper IT system, which the regulator failed to deliver, would have been necessary to deliver unambiguous benefits to society. In a subsequent study Evans and Green (2003) found that the introduction of the new electricity trading arrangements (NETA) which replaced the power pool in England and Wales may not have delivered lower prices of wholesale energy in spite of costing at least £1bn to implement. The effect of this decision was masked by the fact that regulator-initiated changes in generation market structure took effect around the same time.

The 2001 – 2003 electricity distribution price review in the Netherlands provides a further example of how ex post assessment of regulatory outcomes may be possible. Nillesen and Pollitt (2004) report that the X factors were revised three times and implemented almost 3 years late, with the final X factors delivering around 200m Euros less benefit to consumers than might otherwise have been the case. This example of regulatory failure to deliver was a much the fault of the original badly drafted legislation as it was the fault of the badly managed process of regulation. The combination of these two unfortunate factors led to quantifiable losses for electricity consumers. It was also partly responsible for the need for the Dutch parliament to pass subsequent legislation strengthening the powers of the regulator and correcting the previous ambiguous drafting of the legislation.

Ideally, we would like to do an efficiency assessment of regulatory agencies in order to judge their performance. Cost of regulation would be the input to the efficiency analysis. Sector performance controlling for size and complexity of the task would be the outputs. Domah and Pollitt (2002) have gone some way towards this by calculating the efficiency scores of a sample of 33 regulators in developed countries using cost as an input and measures of system size and complexity (such as electricity sales and number of firms) as outputs. They found that the Swedish regulator performed very well on this measure due to its very low costs per customer. It is interesting to note that recently Ofgem subjected itself to a revenue cap of RPI-3 for 5 years from 2005-2010. Such an approach has the merit of limiting potentially damaging and expensive regulation but does obscure the point that direct regulatory costs are usually small in relation to total

electricity revenue and that the benefits of small increases in regulatory expenditure in terms of improved social welfare can be very large. Thus it may be that unmeasurable benefits and unmeasured external costs may drive an accurate social cost benefit analysis of regulation.

Indicators suggested for the outcome of regulation: the performance in social cost benefit analysis of regulation, the size of X factors and savings from price control reviews, the cost of the regulatory agency per customer, the trend in electricity price relative to European average since beginning of reforms and the presence of incentives on regulator to be efficient.

5.4 Conclusions

There is widespread agreement that independent regulation aimed at promoting competition in generation and supply markets while providing for incentive based regulation of transmission and distribution tariffs is the best form of economic regulation of electricity markets. Best practice processes of regulation are those which involve transparency and effective engagement with stakeholders. Such processes must involve learning from the successes and failures of other regulatory jurisdictions. This is particularly true for technical issues such as how to set network prices for embedded generation or how to benchmark network utilities. The overall outcome of regulation is difficult to measure, but the success or otherwise of major regulatory decisions should be quantified using social cost benefit analysis. There also seems to be further work that is possible on trying to develop good measures of the performance of regulators over time.

It remains interesting to observe that while the principles of good regulation in the electricity sector are increasingly well established, the speed of their implementation across Europe is strongly correlated with the strength of general competition policy and a pro-competitive government policy. It is also the case that good regulatory outcomes are facilitated by the comprehensiveness of initial market structure reforms in the sector, such as horizontal and vertical unbundling. Thus it is Scandinavia and the UK that continue to lead in the practice of regulation. Again show it in using your indicators.

6. Investment

The liberalisation of the electricity sector has focused the attention of most stakeholders on the short term outcomes of the reform process, assuming that short term efficiency automatically implies the capability of the industry to optimize investments in the long run.

Taking a long term perspective on the sector requires considering the issue of its sustainability in environmental, social and economic terms (Perez Arriaga 2004). These three dimensions of the electricity sector's sustainability are directly linked to the main targets of any energy policy: efficiency, security of supply and environmental impact (De Paoli 2001).

In other words, a sustainable energy model has been effectively summarised by Perez Arriaga in adequate capacity, low environmental impact, widespread access to the best technological solutions.

A major issue in the economic literature and in the policy debate concerns the effects of the search for sustainability on the competitiveness of the industry (Eikeland 1998).

Even if looking for specific benchmarks on the electricity industry, it should be considered that a discussion on sustainability cannot be restricted to one industrial sector, but necessarily implies a view on the general economic and environmental policies of a country.

While evaluations of the environmental performance of the electricity industry are relatively common, the economic and social dimensions are far more difficult to assess and the related literature is much thinner.

In this part of the work some indicators related to all of these three dimensions of sustainability are proposed, with a few being calculated.

Social sustainability

The social dimension of sustainability has several implications that are only partially perceived by the consumers, which do not have direct information on the national dependence of the economy on foreign energy sources. A focussed effort should be done to bring the long term social risks to the attention of European citizens and policy makers.

The European Union, after pushing the liberalisation of the electricity sector with the Directive 96/92/EC, has addressed its policy on longer term targets, with the green paper on security of supply issued in 2001 (EU 2001). This document started a process of confrontation at EU level that defined new drivers for the future energy policy.

The four political challenges that the EU identified in the revision of its policy for energy security are the following (EU 2005):

1) managing demand, with the aim to reduce energy consumption wherever possible,

2) diversifying European sources, enhancing the use of all internal energy sources,

3) streamlining the internal energy market, with strengthened coordination amongst operators even in the liberalised market,

4) controlling external supply, entering into strategic partnerships with major potential suppliers such as Russia and even far-off countries.

The indicators that can capture the risks involved in the dependence of the sector from imported energy sources are the following:

- Degree of energy independence (%),
- Degree of diversification of the imported energy sources,
- Expense in energy research / expense for energy (or per unit of energy used).

The first indicator is rather simple and self explaining, assuming that the domestic sources are more reliable than imports.

The degree of diversification can capture the effort made by a country to manage the risk of dependence from a single energy source and can be calculated as the sum of squared quotas of each source, excluding domestic resources not contributing to increase the social risk. The lower the indicator, the higher the security of the energy sector.

The third indicator shows the effort made to improve the future conditions of the energy sector in relation to the incidence of the cost of electricity. It helps understanding the readiness of a country to face the challenge of long term sustainability.

Environmental sustainability

The most familiar aspect of sustainability is related to the effects of electricity generation on the environment. Many studies investigated the consequences of liberalisation on environmental performance, showing that strict regulation is necessary to avoid that excessive focus on competition distracts the attention from controlling the environmental impact (e.g. Froggatt, 2000, Kemfert 2004, Hertin 2004). Leaving aside the aspect of the companies' performance, which is anyway important, the countries' policies are considered here.

The investments for sustainability cover a large spectrum of initiatives, ranging from research and demonstration of new technologies, to the reduction of pollutant emissions, to the support for cleaner energy sources and for energy saving initiatives. The evaluation of performance on these areas can be difficult for the lack of comparable data among countries, but some indicators for the environmental sustainability of the electricity industry can be proposed:

- CO_2 emissions per kWh generated,
- expense for research on renewable energy,
- rate of increase of renewable generation,
- expense for the promotion of renewable energy,
- concentration of pollutants in urban areas.

Renewable energy is taken as benchmark thanks to its long term sustainability and security (EEA 2004). Considering that some countries have more natural resources, the rate of increase in the share of electricity generation is considered as a sign of the country's commitment. Moreover, the investments made in research are equally linked to the effort made for sustainability.

The overall performance of a country emerges clearly from such indicators, covering most of the policy aimed at environmental sustainability.

Energy saving has also an environmental value and would deserve attention under this perspective, but thanks to its economic profitability will be considered in the following section.

Economic sustainability

The adequacy of capacity and the capability of the industry to supply electricity at competitive prices in the long term are major issues in the evaluation of sustainability. A particular emphasis is given to the efficiency in the final uses of electricity. This is well captured by the intensity of the electricity use and its trend. The burden related to the acquisition of energy sources can be defined by the incidence of the expense for importing of energy products on national income. The indicators proposed are thus the following:

- electricity intensity and its rate of change,
- Energy imports/GDP

With reference to the security of supply in terms of capability of the industry to meet the long term demand with proper investments, the reserve margin in the electricity generation capacity can be a suitable indicator. The average age of the thermal power plants could also explain the capability of the industry to be efficient in the long term.

As a conclusion capturing all the aspects of sustainability with a single indicator appears challenging (and potentially misleading), but the general picture emerging from the illustrated indicators can help evaluating the commitment towards sustainability. This conclusion is trivial.

This part is clearly unfinished but looks like a good starting point.

7. Conclusions

Need to wait until we've written the rest! (and perhaps even seen what the other WPs come up with)

Bibliography

Bergara, M.E., Henisz, W.J. and Spiller, P.T. (1998), 'Political Institutions and Electric Utility Investment: A Cross-Nation Analysis', *California Management Review*, Vol.40, No.2, pp.18-35.

Besley, T. and Coate, S. (2003), 'Elected versus Appointed Regulators: Theory and Evidence', *Journal of the European Economic Association*, Vol.1, No.5, pp.1176-1206.

Borenstein, S., J. Bushnell and F. Wolak (2002) "Measuring Market Inefficiencies in California's Restructured Wholesale Electricity Market" *American Economic Review* vol. 92, no. 5 (December), pp 1376-1405

De Paoli L. (editor), (2001), *The Electricity industry in transition – Organization, Regulation and ownership in EU Member states*, FrancoAngeli 420.37, Milano, ISBN 88–464–3520-6

Domah, P. and Pollitt, M. (2002), *Regulating the Regulators*, Presentation to ISNIE Conference, Boston, September.

European Commission (2004) *Third benchmarking report on the implementation of the internal electricity and gas market*, Brussels, Commission of the European Communities

EC (2004), European *Research spending for renewable energy sources*, project report EUR 21346, European Commission Community Research, ISBN 92-894-8286-9, December

EC, DG Tren (2001): *Green Paper, Towards a European strategy for the security of energy supply*, ISBN 92-894-0319-5

EC (2005), *Sustainable Development Indicators to monitor the implementation of the EU Sustainable Development Strategy*, SEC(2005) 161 final, COMMUNICATION FROM MR. ALMUNIA TO THE MEMBERS OF THE COMMISSION, 9.2.2005

EC, DG Tren (2005): *Report on The Green Paper on Energy, four years of European initiatives*, June, KO-63-04-553-EN-C, available from http://europa.eu.int/comm/energy_transport/en/lpi_lv_en1.html

EEA (2004), Greenhouse gas emission trends and projections in Europe 2004, Report No 5/2004, ISBN 92-9167-701-9

Eikeland P. O. (1998), Electricity market liberalisation and environmental performance: Norway and the UK, *Energy Policy*, Volume 26, Issue 12, October, Pages 917-927

Estache, A. and Martimort, D. (1999), *Politics, Transaction Costs, and the Design of Regulatory Institutions*, World Bank Policy Research Working Paper Series, No.2073

Evans, J. and Green, R. (2003), *Why did British Electricity Prices fall after 1998?,* CMI Electricity Project Working Paper No.26.

Filippini, M., Farsi, M. and Fetz, A. (2005), *Benchmarking Analysis in Transmission and Distribution,* Presented to SESSA Conference on Regulation, Bergen, March.

Froggatt A. (2000): *The Liberalisation of Europe's Electricity Markets - Is the environment paying the price for cheap power?* May, report commissioned for Greenpeace International

Green, R.J. and McDaniel, T.M. (1998), 'Competition in Electricity Supply: Will '1998' Be Worth It?' *Fiscal Studies*, Vol. 19, No. 3, pp. 273-93.

Hertin, J. (2004) Benchmarking sustainability performance. *Environmental Policy and Procedures Special Report*, No. 92, 20 May, London: Croner Publications.

IEA (2004), Renewables Information (2004 Edition).

IEA (2004b), *CO_2 Emissions from fuel combustion 1971 – 2002,* 2004 edition, ISBN 92-64-10738-X

Jamasb, T. and Pollitt, M. (2001), Benchmarking and regulation: international electricity experience, *Utilities Policy*, Vol.9, pp.107-130.

Jamasb, T. and Pollitt, M. (2005), 'Electricity Market Reform in the European Union: Review of Progress toward Liberalization & Integration', *Energy Journal*, Special Issue on European Electricity Liberalisation, pp. 11-42.

Kemfert C. (2004): *Modelling the interaction of the electricity market and the environment*, German Institute for Economic research.

Larsen, A., Pedersen, L.H., Sorensen, E.M. and Olsen, O.J. (2005), *Independent Regulatory Authorities in Europe*, Presented to SESSA Conference on Regulation, Bergen, March

Mixon, F.G. (2001), The Impact of Agency Costs on Regulator Compensation and the Size of Electric Utility Commissions, *Energy Journal*, Vol.22, No.2, pp.17-34.

Newbery, D.M. (2002) "Problems of liberalising the electricity industry" *European Economic Review*, vol. 46, pp 919-927

Nillesen, P. and Pollitt, M. (2004), *The Consequences for Consumer Welfare of the 2001-2003 Electricity Distribution Price Review in The Netherlands*, CMI Electricity Project Working Paper No. 50.

Perez Arriaga I., (2004), *Energy, sustainable development and European competitiveness,* 2004 Annual Forum on energy and sustainability, Chinchon, November

Sorrell S., Hertin. J, Cirillo M. (2005), *PERFORM Sustainability Performance Benchmarking, Statistical analysis of the PERFORM dataset,* SPRU working paper, http://www.sustainability-performance.org

Twomey, P. R.J. Green, K. Neuhoff and D.M. Newbery (2005) *A Review of the Monitoring of Market Power: The Possible Roles of TSOs in Monitoring for Market Power Issues in Congested Transmission Systems*, CMI Working Paper EP 71, University of Cambridge

TABLES

Table 1: Indicators relevant to market design

Country	Market opening	Type of unbundling		Market model	Balancing prices set:	Turnover in	
		Trans	Dist			Power exchange	Standard contracts
Austria	100%	leg.	leg.	Bilateral	market	2%	
Belgium	c.90%	leg.	leg.	Bilateral	regulated	-	-
Denmark	100%	leg.	leg.	Hybrid	market	34%	340%
Finland	100%	own.	acc.	Hybrid	market	34%	340%
France	70%	leg.	Man.	Bilateral	market	2%	
Germany	100%	leg.	acc.	Bilateral	market	8%	69%
Greece	62%	leg.	None	Bilateral	TSO		
Ireland	56%	leg.	Man.	Bilateral	reg\mkt	-	-
Italy	79%	own.	leg.	Bilateral	Reg\TSO	5%	20%
Luxembourg	57%	man.	Man.	Bilateral			
Netherlands	100%	own.	leg.	Bilateral	market	15%	n.k.
Portugal	100%	own.	acc.	Bilateral	regulated	-	14%
Spain	100%	own.	leg.	Pool	market	99%	2%
Sweden	100%	own	leg.	Hybrid	market	34%	340%
UK	100%	own.	leg.	Bilateral	market	11%	660%
Norway	100%	own.	leg.\acc.	Hybrid	market	34%	340%
Estonia	10%	leg.	leg.	Bilateral	TSO	-	-
Latvia	76%	HH	acc.	Bilateral	TSO	-	-
Lithuania	n.k.	leg.	leg.	Bilateral	Reg\TSO	19%	-
Poland	52%	leg.	acc.	Bilateral	market	1%	-
Czech Republic	47%	leg.	acc.	Bilateral	market	-	-
Slovakia	66%	leg.	man.	Bilateral	regulated	-	-
Hungary	67%	leg.	acc.	Bilateral	regulated	-	-
Slovenia	75%	leg.	acc.	Bilateral	market	3%	-
Cyprus	35%	man.	None	Bilateral	TSO		
Malta	0%	n.a.	Single buyer	n.a.	n.a.		

Source: European Commission (2005)
Turnover figures are relative to consumption in the country, or the Nord Pool area in the case of Denmark, Finland, Norway and Sweden. A dash indicates that no figure is reported by the Commission, a blank space that the country is not listed in the relevant table.

Table 2: Indicators relevant to market power

Country	Capacity share in generation (%)		Market share of top 3 retailers (%)	Vertical integration	Customer switching in 2003 (%)	
	Largest	Top 3			Large	Small
Austria	45	75	67		7	1
Belgium	85	95	90		8	19
Denmark	15 a	40 a	67		22	5
Finland	15 a	40 a	30		16	4
France	85	95	88		n.k.	N/A
Germany	30	70	50		n.k.	n.k.
Greece	100	=	100		0	N/A
Ireland	85	90	88		6	1
Italy	55	75	35		n.k.	N/A
Luxembourg	n.a.	n.a.	100		n.k.	N/A
Netherlands	25	80 b	88		n.k.	n.k.
Portugal	65	80	99		7	1
Spain	40	80	85		5	0
Sweden	15 a	40 a	70		5	10
UK	20	40	60		n.k.	22
Norway	15 a	40 a	44		15	19
Estonia	90	100	n.k.		0	N/A
Latvia	95	100	99		0	N/A
Lithuania	50	80	100		17	N/A
Poland	15	35	32		7	N/A
Czech Republic	65	75	46		n.k.	N/A
Slovakia	75	85	84		3	n.k.
Hungary	30	65	56		19	N/A
Slovenia	70	95	71		10	N/A
Cyprus	100	=	100		0	N/A
Malta	100	=	100		0	N/A

Sources: European Commission (2005)
a Data for Denmark, Finland, Norway and Sweden are for the countries combined.
b Data are rounded to the nearest 5%, implying that the top 3 generators in The Netherlands each have a share very close to 25%, with an average of 26% or higher.
Market share in retailing includes non-eligible customers, except in The Netherlands, where the data are for household customers

Table 3: Indicators relevant to EU Enlargement
DO WE WANT ALL THE COUNTRIES OF EU-25 IN THIS TABLE, or just the ten new ones?

Country	Ratio of domestic to industrial prices		
Austria	1.69		
Belgium	1.46		
Denmark	1.30 a		
Finland	1.39		
France	1.54		
Germany	1.45		
Greece	0.92		
Ireland	1.20		
Italy	1.65		
Luxembourg	1.89		
Netherlands	0.89 a,b		
Portugal	1.67		
Spain	1.37		
Sweden	1.56		
UK	1.61		
Norway			
Estonia	1.23		
Latvia	1.21		
Lithuania	0.99		
Poland	1.18		
Czech Republic	1.32		
Slovakia	1.35		
Hungary	1.01		
Slovenia	1.40		
Cyprus	0.83 a		
Malta	0.87		

Sources:
The ratio of prices is the average of the ratios, taken in January and July 2004, of the Eurostat price for domestic customers (type DC) to the prices for type IB (larger) and type IC (smaller) industrial customers.
a Data are for smaller industrial customers only. In the countries with data for smaller and larger customers, the average for smaller customers is 0.95, for larger ones 1.76
b Data for 2001

Table 4: Indicators relevant to regulation

Country	Strength of regulator	Cost of regulation
Austria	4.5	0.145
Belgium	5	0.283
Denmark	3	0.756
Finland	4	0.016
France	4	0.086
Germany	0	N.A.
Greece	3	0.293
Ireland	5	0.833
Italy	4.5	0.102
Luxembourg	3.5	0.100
Netherlands	3	0.109
Portugal	5	0.355
Spain	3	0.102
Sweden	4	0.022
UK	5	0.170
Norway	5	0.016
Estonia	3	>0.300
Latvia	5	>1.700
Lithuania	4	>0.600
Poland	4	0.140
Czech Republic	5	0.253
Slovakia	4	0.375
Hungary	3	0.689
Slovenia	4	0.250
Cyprus	4	0.500
Malta	2	>>>10

Sources: Strength of regulatory agency on a scale of 1 to 5 (Jamasb and Pollitt, 2005)
Cost of regulation equals Annual Budget 2003 euros divided by size of open market in TWh (European Commission, 2004).

Table 5: Indicators relevant to sustainability

Country	Research effort		CO2 emissions	Increase in RES	Electricity intensity	
	In energy	In RES				
Austria	1,029*	12.5	192	2.3%		
Belgium	1,074**	12.1	274	5.8%		
Denmark	1,301	24.0	336	19.8%		
Finland	2,163*	51.6	234	5.6%		
France	1,710*	52.6	70	1.5%		
Germany	0,872	294.8	508	7.1%		
Greece	0,343*	2.5	820	6.7%		
Ireland	0,505	0.3	660	4.8%		
Italy	1,876	32.7	500	3.3%		
Luxembourg		0.3	201	2.0%		
Netherlands	2,023*	115.7	439	13.1%		
Portugal	0,068	2.0	470	0.4%		
Spain	0,396	29.7	404	3.3%		
Sweden	2,152	30.1	37	-0.4%		
UK	0,231	28.3	458	5.0%		
Norway						
Estonia						
Latvia						
Lithuania						
Poland						
Czech Republic						
Slovakia						
Hungary						
Slovenia						
Cyprus						
Malta						

Sources:
Research effort in energy is spending in the energy sector ($ 2003 per tep what is a tep? consumed) (IEA 2004) * = 2002 data, ** = 1999 data
Research effort in RES is total expenditure for RD&D for RES in each EU country in 2001 (EC 2004)
CO2 emissions in grams per kWh from electricity and heat generation (IEA, 2004b)
Increase in RES is the average annual percentage growth rate of renewable electricity generation from 1990 to 2002 (IEA, 2004)