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Agenda

Advancing economics in business

Taming the beast? Regulating German electricity networks

Germany was one of the first European countries to fully liberalise its retail energy market. Yet customer switching rates have been low, and a lack of effective network regulation has been cited as a reason why effective competition has been slow to develop. To address this, the introduction of incentive regulation of distribution and transmission network operators is proposed for 2009. Given the market structure, characterised by a large number of operators with different ownership frameworks, what regulatory challenges lie ahead?

The liberalisation of the German electricity market in 1998 was met with mixed reactions. Some commentators suggested that security of supply and grid investments would be adversely affected and prices would become more volatile; others maintained that having a small number of incumbent energy firms with market power was not a prerequisite for sustainable energy systems and stable prices, and that liberalisation would result in a reduction in electricity prices.

The effectiveness of competition in those areas where it can be implemented (generation and supply) critically depends on the ability of generators and suppliers to gain access to third-party networks—ie, those networks not owned by the generator and/or supplier—a message reinforced by the European Commission's energy sector inquiry.[1] Following liberalisation, the terms of access were determined largely through negotiated third-party access—so-called 'Association Agreements' between suppliers and consumers' associations in the electricity and gas markets. Network access prices were subject to ex post control by the Federal Cartel Office according to competition law.

Following EU legislation, electricity transmission was legally and managerially unbundled, while the structure and conduct of regulation was light-touch.[2]

In the absence of measures limiting vertical ownership integration in the industry, liberalisation sparked a wave of mergers.[3] By the early 2000s, the eight vertically integrated inter-regional electricity suppliers had merged into the four major players, which today account for around 80% of power generation capacity (E.ON Energie AG, RWE AG, EnBW AG, and Vattenfall Europe AG).[4] Their subsidiaries also own and operate the four transmission grids in the four German control zones. The electricity distribution networks are highly fragmented at the local level—more so than in any other Member State—with around 50 regional utilities and 840 local-municipality-owned utilities (Stadtwerke), many of which have fewer than 100,000 customers.[5] Through the acquisition of stakes in these utilities, the four main companies also have a large share of the distribution networks.

The story so far

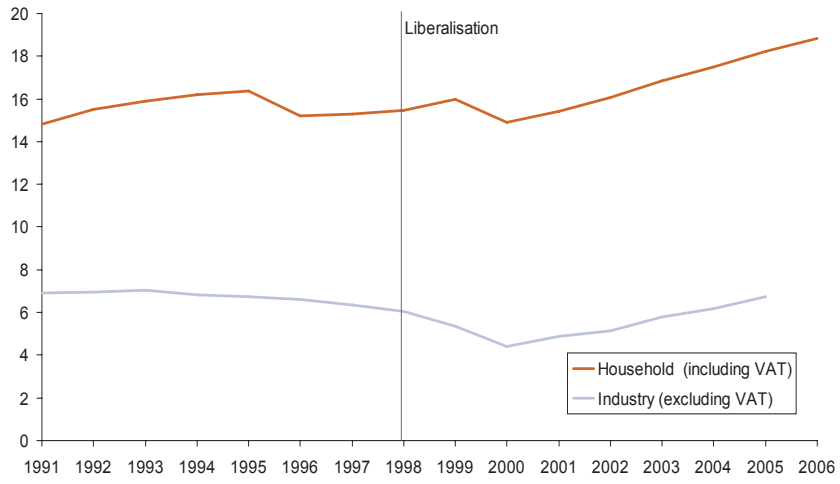
The impact of liberalisation on electricity prices

One indicator to consider when assessing the impact of liberalisation is the retail price.[6] Figure 1 illustrates the development of (weighted average) electricity prices for households and industry since 1991. Following liberalisation, between 1998 and 2000, tariffs fell by 1.8% and 13.7% per annum for households and industrial customers, respectively.[7] However, this decline has since been more than reversed. The retail price of electricity in Germany (excluding tax) is one of the highest in Europe for both industrial and household customers.[8]

From third-party negotiated access to incentive regulation

With the 2005 Energy Act, which sets the broad guidelines with which the formal regulatory framework must comply, the German government is seeking to address the perceived failings of the system of negotiated third-party network access.[9] The Act requires all distribution and transmission companies with more than 100,000 customers to adopt operational and accounting separation for their network activities and generation and sales from July 13th 2005. Distribution

Figure 1 Developments in German electricity prices (€ cent/KWh)



Source: Bundesministerium für Wirtschaft und Technologie (2007),' 'Entwicklung von Energiepreisen und Preisindizes', April 11th.
See http://www.bmwi.de/BMWi/Navigation/Energie/energiestatistiken,did=180914.html.

networks with more than 100,000 connections are required to legally unbundle, in line with EU legislation, by July 1st 2007.[10]

On April 4th 2007, the Ministry of Economy and Technology published draft legislation to formally implement proposals by the regulator (Bundesnetzagentur, BNetzA), bringing the introduction of incentive regulation one step closer to its envisaged start date in 2009. The BNetzA and the German government expect ex ante incentive regulation, in combination with incentives for quality of service, to drive efficiency improvements that will ultimately benefit customers through lower energy prices, while ensuring an appropriate level of security of supply.[11]

The BNetzA is the main regulatory body supervising grid access and monitoring grid fees for energy networks. For distribution networks that have fewer than 100,000 customers and that operate within the boundaries of a single state, regulatory tasks are delegated to federal state regulatory authorities with the option of re-delegation to the BNetzA. Several federal states have elected to do so.[12]

The existence of multiple regulators raises the potential issue of regulatory inconsistency between the BNetzA and state regulators. The Energy Act requires the creation of a committee to ensure that different regulators adopt a consistent approach, and the BNetzA is working in close cooperation with the federal state regulators to ensure that this is the case. However, the existence of more than one regulator could give rise to a conflict of interest.[13] For example, federal state regulators may have interests that are aligned with those of local governments, which often own the networks.[14]

The regulatory framework

The proposed ex ante regulatory framework initially takes the form of a revenue cap, consisting of two regulatory periods, each with a four-year duration. The revenue cap sets the maximum change in revenue from network access charges that companies are allowed to earn after taking into account year-on-year movements in the Consumer Price Index. Companies have the opportunity to outperform regulatory targets by lowering their costs below the levels set by the regulator. The prospect of increased profitability from outperforming targets incentivises companies to reveal valuable information such as that relating to efficient cost structures. It thereby overcomes one of the key issues of asymmetric information in economic regulation whereby the regulator knows less about the operation of a utility than the companies.

In setting the allowed change in revenue, the BNetzA takes into account the following factors.[15]

– **How far away is a company from industry best practice?** This measures the company's cost efficiency relative to other network operators and is usually referred to as catch-up or the individual X-factor (X_I). It therefore measures the extent to which a company can reduce its costs in order to catch up to a benchmark. The techniques that the BNetzA intends to employ to assess the scope for catch-up are explained in the box below.

– **By how much are companies expected to be able to improve their costs going forward?** The frontier shift or general X-factor (X_G) measures the general efficiency improvement that all network operators (electricity and gas) can be expected to achieve, including those that are already deemed to be relatively efficient.

– **Quality-of-service adjustment**. Adjustments to revenue from exceeding/failing quality-of-service targets are to be made under a reward/penalty system.

In general, one of the central questions in incentive regulation is how to set cost-reduction targets (ie, X_I and/or X_G) that are achievable and can provide sufficient incentives (ie, that leave scope for outperformance). The most common system adopted in the UK regulated industries (including water, electricity, gas and postal

services sectors) combines a price cap with yardstick regulation. Under this system, companies' costs at the beginning of each regulatory period form the basis on which allowed price changes over that period are computed. The annual allowed change in prices is based on (or informed by) benchmarking (between companies in the industry or otherwise) to identify an appropriate yardstick or benchmark in reference to which the scope for catch-up and/or frontier shift can be established. One of the downsides of this system is that allowed price levels are set partly in reference to companies' own costs. Therefore, companies have an incentive to increase their costs at the end of regulatory periods to avoid being set a starting cost level that may leave them insufficient scope for outperformance over the following regulatory period.

The BNetzA's preliminary efficiency assessment shows a considerable spread in companies' cost efficiency.[16] The objective of the first eight years of regulation, considered to be the first phase, is to reduce the large efficiency variance, and the philosophy is similar to that of the regulatory systems in the UK.[17] However, once convergence in performance has occurred (ie, currently assumed to be after eight years), the option of introducing a form of pure yardstick competition as a second phase will be considered. Under pure yardstick competition, allowed revenue (rather than its change over the regulatory period) and outperformance are set according to an agreed target (eg, the average industry cost). This decouples companies' allowed revenues from their actual costs, and reduces their incentives to allow costs to rise at the end of a regulatory period. Pure yardstick competition might be considered risky from a company viewpoint. Even when company efficiency levels are allowed to converge, the regulator needs to be certain that the approach to setting the yardstick is such that like-for-like comparisons between companies' costs are made. Otherwise the financial viability of companies might be compromised.

The most common form of incentive regulation is some form of hybrid system between a revenue/price cap and yardstick regulation. While pure yardstick regulation is appealing from a theoretical point of view, in countries such as the UK it is debatable as to whether there is convincing evidence that the degree of convergence required for making pure yardstick competition workable has been achieved. Whether the BNetzA implements such as system after only eight years remains to be seen.

Operators with a range of ownership structures will be treated as comparable and therefore benchmarked against one another. It will be interesting to observe how market will react to this—eg, whether companies argue that different incentives and possibly different objectives may mean that benchmarking between public and private sector companies may not be appropriate.

A further outcome from regulation may be the impact on the market structure. If the margins of network

Proposed techniques for assessing the scope for cost reductions through catch-up

The BNetzA's benchmark selection and the estimation of distribution network operators' efficiency targets is based on the complementary use of data envelopment analysis (DEA) and stochastic frontier analysis (SFA) efficiency benchmarking.[1] Both techniques have advantages and disadvantages.

Using linear programming techniques, DEA constructs an efficiency frontier that is used as a benchmark against which the efficiency of each company is assessed. DEA has the advantage of requiring few assumptions; in particular, it does not require the specification of a functional relationship that exists between costs and cost drivers. DEA assesses efficiency only relative to a company's efficient peers (companies deemed to be similar in terms of scale, for example). A disadvantage of this approach is that a company that differs from others such that it has few peers is automatically classed as efficient.

SFA is an econometric technique in which the parameters of a cost function are estimated and, on this basis, an efficient frontier is established in relation to which individual benchmarks are computed. Benchmarking techniques, including DEA, start from the presumption that the difference between a company's actually observed costs and those of an efficient operator represents inefficiency. In practice, this difference may also be a result of 'noise', including modelling and measurement errors. SFA relaxes this assumption by distinguishing between modelling noise and inefficiency. Given the additional informational requirements imposed on the data to undertake this split, SFA tends to be applied to large datasets—this is appropriate for the German market due to the large number of operators.

In European energy network regulation, the most frequently used efficiency measurement tool is DEA. One exception is the UK, where Ofgem and other regulators do not use DEA as a main technique for assessing efficiency.

The regulatory database underlying the benchmarking will be available only to the regulator. However, efficiency scores and rankings, as well as cost-reduction targets, will be published in a non-anonymous form.[2]

Notes: [1] The BNetzA proposes the use of international benchmarking, analytical cost models and investment plan appraisals for transmission companies. This takes into account the wider scope of their work and the lower number of comparators.
[2] Source: Bundeswirtschaftsministerium für Wirtschaft und Technologie (2007), 'Verordnung zum Erlass und zur Änderung von Rechtsvorschriften auf dem Gebiet der Energieregulierung', April 4th.

operations come under increasing pressure from regulation and competition, a consolidation among smaller companies may take place.

Setting cost-reduction targets

In addition to the regulatory framework per se is the issue of techniques used to set the scope for catch-up and frontier shift. In determining catch-up in the first phase of regulation, the BNetzA intends to focus on two combined techniques: DEA and SFA (see box above).[18]

The use of two techniques raises two questions: how the regulator intends to use the information to set actual cost- reduction targets, and how it will choose between approaches should they generate different results.

– **Using efficiency scores in setting targets**. The BNetzA proposes to translate the efficiency scores derived from benchmarking directly into targets. This is considered necessary from a practical point of view in that more detailed analysis (eg, reviewing investment plans for each company) may be too resource-intensive. To this end, total controllable cost (TOTEX) will be used in benchmarking.[19] This is in contrast with the most commonly adopted 'building block' approach taken in the UK, where OPEX and CAPEX are assessed separately.

– **Use of 'best-off' efficiency score**. In terms of translating the efficiency scores into regulatory targets, the proposal is to use the efficiency score that is more favourable to a company. This is aimed at improving the robustness of the efficiency comparisons. It also helps to ensure that the target can be met and surpassed.[20]

While it is proposed that regulatory targets are used directly in setting targets, the BNetzA's framework includes several mechanisms aimed at ensuring that companies' financial viability is not compromised.

– **Special structural factors**. Companies will have the option to submit evidence to the regulator that demonstrates that the efficiency comparison does not appropriately take into account the local operating conditions and results in a material impact on costs.

– **Special arrangements**. Under certain circumstances, companies may apply for special treatment, such as having their targeted efficiency improvements set over a longer period than would usually be the case (ie, longer than four years).

– **Floor at 50% inefficiency**. The maximum value a company's inefficiency can take is 50% of total controllable costs. An efficiency value of 50% also applies when operators do not supply the data required to undertake the efficiency assessment.

The use of discretionary measures is often used in other countries (eg, in the UK through special factors and other regulatory judgements). While the burden of demonstrating the materiality of impacts is on companies, given the large number of operators, the regulatory burden on the BNetzA of investigating individual applications could grow considerably.

Conclusion

Germany is one of the first countries to have fully liberalised its electricity market. However, the regulation of networks has not been sufficiently effective to ensure equal access at efficient prices. The proposed regulatory framework, which is designed to redress this, incorporates a number of solutions designed to fit the German market structure, which is characterised by a large number of operators. These include the adoption of a revenue cap, which avoids a detailed examination of tariffs, and the use of a combination of two approaches to setting cost-reduction targets designed to make assessments more robust. While there are measures that allow for discretion, overall, the system attempts to set cost targets in a way that is as mechanistic as possible and that involves minimum regulatory intervention. To spread the burden of the regulatory tasks, duties have been delegated to federal state regulatory authorities for addressing certain operators' issues. In addition, incentive regulatory regimes were primarily designed with (profit-seeking) private sector companies in mind. In the absence of incentives to outperform to remunerate equity interests, it will be interesting to see whether incentive regulation drives different levels of performance for companies with different ownership structures.

While the framework attempts to minimise the regulatory burden, the high number of companies may yet prove to be an important obstacle during price determinations. Provisions that require the BNetzA to explain and, if necessary, justify in a court of law the individual targets may result in significant regulatory resources being devoted to resolving disputes. Effective network regulation in Germany may depend on balancing what is optimal in theory with what is practical.

[1] European Commission (2007), 'DG Competition Report on Energy Sector Inquiry', January 10th.
[2] See Kuhlmann, A. and Vogelsang, I. (2005), 'The German Electricity Sector: Finally on the Move?' CESifo DICE Report 2/2005.
[3] The two largest energy companies, RWE and E.ON, acquired new equity interests in around 40 local utilities between 2000 and 2002 without intervention from the Federal Cartel Office. See Kuhlmann, A. and Vogelsang, I. (2005), op. cit.
[4] Heck, V. (2006), 'Regulation of the Electricity Market in Germany', CESifo DICE Report 2/2006.
[5] Brunekreeft, G. and Twelemann, S. (2005), 'Regulation, Competition and Investment in the German Electricity Market: RegTP or REGTP', *Energy Journal*, **26**, special issue. The Stadtwerke also account for around 10% of generation (see Kuhlmann and Vogelsang 2005) and provide heat, water supply, waste collection and public services. Gas distribution network infrastructure is similarly fragmented, with around 700 operators.
[6] Observed prices tell only part of a complex story. The most relevant comparison would be one between observed prices and the counterfactual—ie, what prices would have been in the absence of these developments. In addition, prices may provide only part of the picture of the adequate working of an energy market. Importantly, an exclusive focus on cost and competition as determinants of prices ignores security of supply considerations or environmental objectives (including the Kyoto agreement and Germany's current objective to switch off all nuclear generators by 2023), which tend to have the opposite impact on prices.
[7] Oxera calculations based on Bundesministerium für Wirtschaft und Technologie (2007), 'Entwicklung von Energiepreisen und Preisindizes', April 11th.
[8] Eurostat (2007), http://epp.eurostat.cec.eu.int, and Oxera calculations.
[9] Matthias Kurth (President of BNetzA) (2005), speech to introduction of 2005 Energy Act, July 20th, http://www.bundesnetzagentur.de/media/archive/2821.pdf.
[10] Distribution networks with fewer than 100,000 connections are only required to hold separate accounts and are exempt from legal and operational unbundling.
[11] Bundesnetzagentur (2006), 'Bericht der Bundesnetzagentur nach §112a EnWG zur Einführung der Anreizregulierung nach §EnWG, June.
[12] Bundesnetzagentur (2006), 'Jahresbericht 2006'.
[13] Distribution networks owned by local municipalities have the discretion to set network fees and local levies, enabling them to cross-subsidise public local infrastructure (eg, local transport networks and swimming pools).
[14] OECD (2006),'Economic Survey of Germany 2006: Sustained Competition is Absent in Energy Markets'.
[15] In addition, adjustments for volume growth and factors that are deemed to be uncontrollable over the short/medium term are included in the regulatory formula.
[16] Bundesnetzagentur (2006), 'Bericht der Bundesnetzagentur nach §112a EnWG zur Einführung der Anreizregulierung nach §EnWG, June.
[17] A revenue cap, unlike a price cap, does not require information about the operator's tariff structures. Given the large number of operators, the BNetzA therefore prefers the use of a revenue cap since it has overall lower data requirements. It also has the advantage of a minimising the regulatory burden and leaving the maximum possible commercial freedom to operators. Bundesnetzagentur (2006), 'Bericht der Bundesnetzagentur nach §112a EnWG zur Einführung der Anreizregulierung nach §EnWG', June.
[18] The BNetzA originally proposed a 2.54% productivity improvement for frontier shift. This was based on historical trends and was strongly objected to by the industry. It then undertook an international comparison. The latest government proposals contain an annual rate of 1.5% for the first regulatory period. Source: Bundeswirtschaftsministerium für Wirtschaft und Technologie (2007), 'Verordnung zum Erlass und zur Änderung von Rechtsvorschriften auf dem Gebiet der Energieregulierung', April 4th.
[19] The use of TOTEX is also justified on the basis that it avoids providing potentially economically inefficient incentives to change the CAPEX–OPEX mix such that the overall efficiency result is more favourable for the company. Benchmarking based on TOTEX is also not without drawbacks—eg, the different age profiles of the assets must be allowed for.
[20] Bundeswirtschaftsministerium for Wirtschaft und Technologie (2007), 'Verordnung zum Erlass und zur Änderung von Rechtsvorschriften auf dem Gebiet der Energieregulierung', April 4th.
[21] Bundesnetzagentur (2007), 'Jahresbericht 2006.'