



Competition Competence Report

INCENTIVE BASED REGULATION IN ENERGY MARKETS

QUALITY OF SERVICE REGULATION

Quality of service has emerged as an important issue in the regulation of electricity distribution networks. Incentive regulation is supposed to promote cost saving, investment efficiency as well as service quality. Service quality regulation may involve a political aspect that may come into conflict with economic considerations. Although individually tailored service qualities would result in an efficient outcome, it could also expose poorer consumers to socially unacceptable levels of quality. In this area, lack of detailed and accurate data is a common problem.

The draft report of the Bundesnetzagentur covers this issue with elaborateness. The German reform progressively evolves beyond pure cost efficiency considerations to encompass non-marketable aspects of electricity distribution networks. In an idealized competitive electricity market, customers would be able to choose a network provider offering a level of service quality that reflects their willingness to pay for it. Assuming that the maximum amount that consumers would pay for quality equals the total quality-induced costs they incur, the socio-economic optimum occurs at a quality level where the sum of the total cost of quality provision by network operators and the total quality-induced costs faced by consumers is minimized. In the absence of incentive regulation, electricity distribution utilities may operate at sub-optimal quality and social cost level. Therefore, in order to prevent an inefficient allocation of resources, service quality standards and incentives need to be incorporated in the regulation of the utilities.

There exist a number of generic approaches for providing quality incentives to companies, including (i) marginal rewards/penalties, (ii) absolute fines and (iii) quality incorporated benchmarking. Under the marginal reward and penalty scheme, companies receive rewards (penalties) per

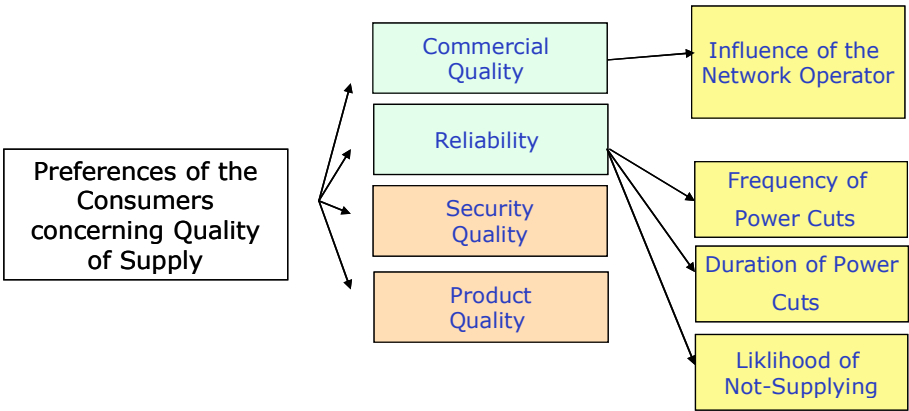
unit of quality improvement (degradation), which should be calibrated to reflect the marginal value that customers attribute to quality. In equilibrium, a profit-maximising firm chooses to operate at the efficient level, which varies according to its individual marginal cost curve. Mechanisms of this type are referred to as „decentralised“, as they allow firms to choose their own level of quality provision. Absolute fines have on the other hand a “centralized” nature in that they require companies to pay a prespecified amount if quality drops below a threshold. The regulator sets both the amount and the threshold. Although absolute schemes are economically inferior to marginal ones, they entail broader social and political benefits by ensuring that customers are protected through guaranteed standards of performance.

QUALITY OF SUPPLY

The conflict between costs to a network operator and quality of supply is inherent. An incentive regulation forces network operators to decrease their costs. This cost pressure might lead to undue reductions of necessary investments, maintenance etc. This aspect gained importance because electricity supply was down for days in Münsterland and Bavaria last winter: thus the integration of quality of supply into the incentive regulation is essential.

The quality of supply consists of four dimensions, which are illustrated in the following chart: security quality, reliability, product quality and commercial quality.

Chart 1: Dimensions of Quality of Supply



Security quality is defined as prevention of damages to people and equipment whereas product quality represents the technical quality of the products electricity or gas. Both, security quality and product quality are substantially determined by existing technical standards. Their level, once determined, is not flexible.

On the contrary, reliability and commercial quality are flexible: network operators can influence these quality dimensions themselves in accordance with their cost-benefit considerations. Reliability means the ability of a network operator to transport energy from one place of the network to another while meeting assigned quality parameters. Commercial quality describes the relationship between customers and network operators and focus on services by the network operators like keeping appointments, quality of accounting etc. A higher reliability or commercial quality implies a higher benefit for customers and may therefore also justify higher prices.

The requirements on quality regulation are thus determined by **the preferences of the network customers**. Therefore, it is necessary for a regulatory authority to examine and determine the desired level of quality as well as the customers' willingness-to-pay for such a certain quality.

This willingness-to-pay represents the crucial element in an incentive based quality regulation, because it constitutes the base for the minimum standards as well as the appropriate rewards/penalties. It is difficult to anticipate the demands of network customers. The German Bundesnetzagentur recognises this problem and proposes therefore to deal with this challenge by means of a stepwise implementation. Missing information about the level of quality as well as insufficient knowledge about the willingness-to-pay of customers and about the effect of regulatory measures on regulated firms require such a stepwise, balanced implementation. Thus, in the first regulatory phase a substantial penalty will apply if quality drops below minimum standards. Within the second regulatory period, the willingness-to-pay (WTP) and the willingness-to-accept (WTA) of different customer groups will be applied to integrate quality standards into the efficiency benchmarking.

The performance of customer surveys represents the appropriate methodology to identify the willingness-to-pay or the satisfaction of customers. Such surveys have already been carried out in the Netherlands and in the U.K. In the following the experiences with those surveys are illustrated.

CUSTOMER SURVEYS ON QUALITY OF SUPPLY IN THE NETHERLANDS

To perform the customer surveys conjoint analysis was used in the Netherlands. Conjoint analysis is a state-of-the-art tool in empirical market research that enables analyses about consumer's choice behaviours. conjoint analysis is based on the premise that each consumer's choice behaviour is governed by utility trade-off values. Consumers choose between differing concepts of products and thus the utility trade-offs are revealed. The concepts of products used in such a survey are descriptions of products offered by energy companies on the basis of certain product features and their characteristics. Within such a conjoint analysis, end customers are interviewed what compensation they would ask for if frequency or duration of the power cuts increases. The results of the conjoint study in the Netherlands are presented below.

- Pilot phase: First, in a pilot phase carried out in January 2003, 200 small and medium enterprises (SME) as well as 690 households were interviewed in two seasonal surveys.
- Sample: The total sample size (excluding the pilot phase) was 2.481 SMEs and 12.490 households. The interview profile included the company size, the industry branch as well as the network operator.
- Content: The following attributes were included in the questionnaire: frequency and duration of power cuts, time of day, day of the week, season, warning and price change of electricity bills.
- Result: SMEs are not willing to pay to network operators over and above in case of a power cut of 14 minutes once every 12 years. On the other hand, they do not ask for any compensation payment either. However, for longer power cuts SMEs want to be compensated. In case power cuts are shorter than average, a willingness-to-pay is given. For households, this threshold is one power cut in eight years with duration of less than 21 minutes.

CUSTOMER SURVEYS ON QUALITY OF SUPPLY IN THE UK

Similarly, conjoint analysis was used in the UK as well in order to determine the willingness-to-pay (WTP) and the willingness-to-accept (WTA) of customers.

- Sample: 2.118 households and 1.965 companies were surveyed. Interviews performed covered all DNO areas and were weighted accordingly to reflect DNO profiles of age, socio-economic group (SEG), rural and urban location and experience of cuts (domestic), company size, experience of cuts (business) as well as bill size.
- Content: The following attributes were incorporated into the survey: number of power cuts, urban/rural area, duration of cuts, improvement of network reliability, and duration of removal after a big storm, compensation for unplanned cuts, automatically compensation as well as provision of information during the cut.
- Result: Domestic consumers are willing to pay £22 a year for improvement in maximum restoration times from the current level of 48 hours to 24 hours; business consumers are willing to pay 4,9% of their electricity bill. Another high priority for domestic consumers is to ensure that they receive accurate information during a power cut. Willingness to pay to ensure that information is updated every two hours is £22 or 6% of their total bill. Most business consumers do not require improvements in information on the other side. Both, domestic and business consumers value a reduction in the duration of power cuts. For domestic consumers, a reduction in the average length of cuts of 20 minutes would be valued at £22. For business consumers such an improvement is valued at 2,8% of their bill. Domestic consumers are not prepared to pay more for improvements in the multiple interruption standards. Business consumers in contrast see some value in tightening the standard to three cuts or more. Domestic consumers expect a reduction in their total bills if the trigger for compensation is relaxed to five cuts longer than three hours, a discount of £21 or 5.7% of the bill would be required in this case. Business consumers do not expect a reduction if the standard is relaxed to five cuts. In general, business consumers comment that compensation amounts are not adequate to make up for business losses caused by power cuts.

The experiences with the surveys in both countries are really valuable for the implementation of the incentive based regulation in Germany. In the following, a possible implementation in the German market is discussed.

EE&MC APPROACH: CUSTOMER SURVEYS ON QUALITY OF SUPPLY IN GERMANY USING CONJOINT ANALYSIS

In accordance with the experiences in the Netherlands and the UK with conjoint analysis, EE&MC recommends the implementation of such a conjoint analysis in Germany as well. Such a conjoint analysis measures the willingness-to-pay as well as the relative importance of certain attributes used for the incentive based regulation. Conjoint analysis determines how the price which the end consumer is willing to pay respectively the compensation which he claims changes if quality varies.

These values are gained by evaluating buying decisions of two different product concepts. A simplified example for such a choice is illustrated in the following chart.

**Chart 2:
Conjoint Analysis Question**

| Which alternative do you prefer? | |
|--|---|
| 1 power cut a year Average duration of the cut is 2 days If the removal overruns 3 hours, a compensation of €10 is payed | 4 power cuts a year Average duration of the cut is half a day If the average cuts are reduced to one cut a year, monthly payment increases by . €10 |

Based on the surveyed data, the relative importances of quality parameters as well as the willingness-to-pay for changes in quality can be calculated. The relative importance of an attribute is its percentage share of all attributes which influences a consumer's buying decision. The actual calculation of the willingness-to-pay is performed with the conjoint model simulator.

- In these simulations, changes of several quality attributes are carried out. Hereby, changes of the probability of buying are observed.

- Subsequently, the price is varied so that the original probability of buying is restored.
- The relative difference between this price and the original price represents the relative willingness-to-pay based on the varied quality attributes.
- These evaluations can be made for certain groups (segments) of respondents.

EE&MC possesses extensive experiences in conducting conjoint analyses on different issues. The methodology EE&MC applies is *state-of-the-art* econometric analyses suited in particular to evaluate in a scientifically established and legally solid manner the willingness-to-pay (WTP) and the willingness-to-accept (WTA) of network customers for the future incentive based regulation in Germany.