QUALITY ECONOMY LEVEL IN A COMPETITIVE MARKET. ELECTRICITY'S COMPANY VISION

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INTRODUCTION

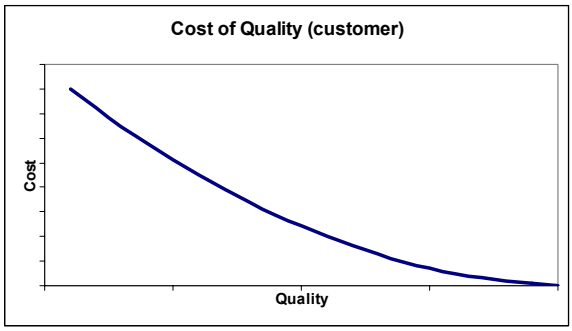
Up to date, the common practices of utilities regarding quality of service have been to keep adequate standards, defined by social pressure and policies from every zone or country.

The new regulations approved in several countries, with the objective of liberalising the markets, introduce a target level of quality of service, defined by thresholds of number and duration of interruptions, as well as penalisations so that these levels are kept (economic signal).

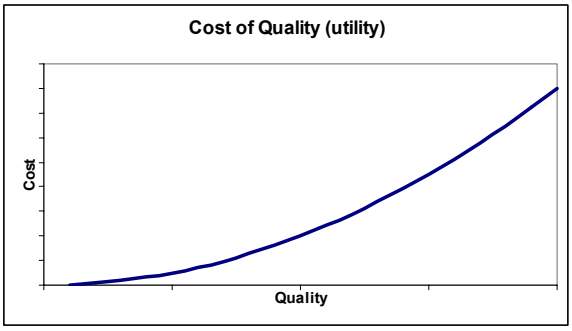
This paper describes the impact of the economic signal set by the regulator concerning quality of service provided by distributors. Moreover it analyses the adequacy of penalisations set so that the thresholds of quality of service provided to customers are enforced.

QUALITY OF SERVICE'S COSTS

Customers expect a "total" quality of service, without any kind of interruptions or alteration of the shape of the tension wave. In the hypothetical scenario of a perfect quality of service, customers wouldn't have any costs associated to non-quality1 . This kind of expectations can be translated into a costs curve of quality which happens to be decreasing for greater values of quality, tending to zero.



On the other hand, utilities know well high costs involved, with the necessity of increasing investments and operation and maintenance costs in order to provide a significative improvement of the quality of service. The sum of these costs, which utilities haven't been able to transmit to their customers, grows along with the increase of the quality of service provided, giving a costs curve with the following shape:



ANALISYS OF THE REGULATIVE SITUATION

At this point we have to distinguish between two situations. On the one hand we have the older regulations of most of the countries, based on costs recognition (and payment), which didn't take into account penalisations associated to quality of service. The marginal income of increasing the quality of service was nil. The marginal cost is known and high. In this way, neither utilities nor customers were satisfied, and there was a big potential for improvement.

On the other hand, the new situation that has arisen due to the processes of liberalisation which have started in several countries (United States, Argentina, United Kingdom, New Zealand, Spain, …) sets the bases so that the problem described before presents an optimal solution.

In the Spanish case, the administration establishes some thresholds of quality of service which must be respected by distributors, for every final customer. These thresholds are set so that the influence of the geographical dispersion of the loads is taken into account, and are the following:

Medium Voltage:

M V (1 kV < V < 36 kV)	Hours of Interruption	Number of Interruptions
Zona Urbana	4	8
Zona Semiurbana	8	12
Zona Rural Concentrada	12	15
Zona Rural Dispersa	16	20

Low Voltage:

L V (V < 1 kV)	Hours of Interruption	Number of Interruptions
Zona Urbana	6	12
Zona Semiurbana	10	15
Zona Rural Concentrada	15	18
Zona Rural Dispersa	20	24

1 In probabilistic terms, this implies in practice infinite investments and maintenance expenditures.

Where:

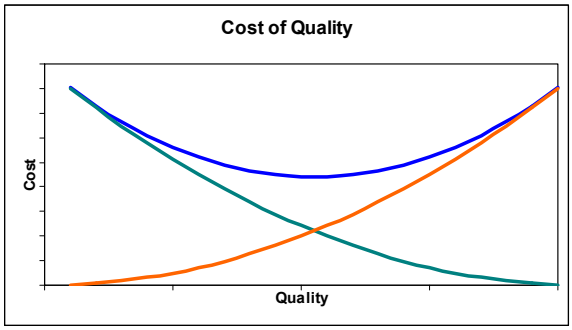
Zona Urbana (Urban zone): Set of towns in a province with more than 20,000 customers, including the capital of each province even if they don't reach that number.

Zona Semiurbana (Demi-Urban zone): Set of towns in a province with a number of customers between 2,000 and 20,000 excluding the capital of each province.

Zona Rural Concentrada (Concentrated Rural Zone): Set of population nuclei in a province with a number of customers between 200 and 2,000.

Zona Rural Dispersa (Disperse Rural Zone): Set of population nuclei in a province with a number of customers less than 200 as well as those customers outside nuclei which are not industrial or residential areas.

In order to ensure those levels of quality, penalisations which serve as pignovian taxes are set, to approach the maximum social benefit. This maximum will be reached when the level of quality is that which corresponds with the least cost of quality, given by the minimum of the sum of the two previous curves:



ANALISYS OF THE ADEQUACY OF PENALISATIONS

Economic theory proves that a Paretus Optimal will only be achieved in those cases where the marginal cost of providing the quality of service levels is equal to the marginal income (economic signal).

In order to determine if the penalisations set are appropriate to guarantee the levels of quality of service determined by the Regulator, in a global way, we will describe the costs associated to the improvement of quality.

The costs mentioned before can be decomposed into the following terms:

$$C_T = C_I + C_{OP} + C_M$$

Where:

C_T = Total cost.

C_I = Investment cost.

C_{OP} = Operation cost.

C_M = Maintenance cost.

The marginal total cost can be assimilated to the marginal investment cost, because the marginal operation and maintenance costs are of a lesser order of magnitude., according to experience.

$$\frac{dC_T}{dQ} = \frac{dC_I}{dQ} + \frac{dC_{OP}}{dQ} + \frac{dC_M}{dQ}$$

$$\frac{dC_T}{dQ} \approx \frac{dC_I}{dQ}$$

On the other hand, we may suppose that the utility is at the optimal exploitation point, where the marginal costs equal the medium costs, according to economic theory. In this way we have an estimation of the marginal costs, as follows:

$$\frac{dC_I}{dQ} = \frac{C_I}{Q}$$

At the end, the economic level of quality of service for utilities is that one where penalisations equal the increase of investments and expenditures needed to avoid them, and that will be the goal of utilities. Regulator's role will be setting the quality of service levels with the same criterion, evaluating the cost of quality, and through that the tariffs against the benefits transmitted to society.

APPLICATION TO ENDESA'S CASE

During the following year, the ratio of investment by supplied energy for Endesa equals 0.01 €/KWh, calculated through the following expression:

$$\frac{dC_I}{dQ} = \frac{C_I}{Q}$$

Taking into account that penalisations are five times the cost of the KWh in the tariff, we conclude that current penalisations are high enough so as to guarantee that the system tends to the optimal value the regulator is looking for.

CONCLUSSIONS

Penalisations set by the Spanish Regulator are more than enough to guarantee the levels of quality of service described in the regulation.

REFERENCES

[1] J. Rivier Abbad, 1999, *"Calidad del Servicio. Regulación y Optimización de Inversiones"* UPC, Madrid, Spain.