

INFORMATION SYSTEMS FOR IMPROVING COMPETITION IN A DEREGULATED ELECTRICITY MARKET

A. Carrasco¹, J. Luque¹, I. Borrero²

¹*Dpt. Tecnología Electrónica
Facultad de Informática
Avda. Reina Mercedes, s/n.
41012-Sevilla-SPAIN
Phone: +34.95.4557095
Fax: +34.95.4552764
Email: carrasco@dte.us.es*

²*MIDEC Servicios, S.A.*

Abstract:

This article intends to reflect the dynamism of the process of liberalization currently taking place in the Spanish and European electricity sector. It expresses the need for the utilization of an information system which may help companies in this sector make swifter purchases, sales and bids, study market trends, in addition to facilitating cost studies and forecasts for the distribution and regulation of energy. It presents software developed for that purpose and the experiences of companies of the sector.

Keywords: Electric utility industry deregulation, Electric energy bidding, Distributed Management Systems.

1. Introduction

The implementation of the new law liberalizing the Spanish electricity market opens up a new and revolutionary phase whose dynamism contrasts with the passivity of the previous system, completely regulated and with fixed rates. Although this currently affects only the largest energy consumers, this market is foreseen to evolve rapidly and soon all of us consumers will find ourselves involved, so that contracting a power supply and purchasing energy will be similar to the contracting of telephone lines, with special or personalized rates, etc., allowing us to switch companies very easily.

The infrastructure therefore needs to be prepared to be able to offer these services and

be competitive, which has given rise to a movement within this industrial sector to make it possible. It therefore makes sense to consider new metering systems and especially new systems capable of handling rapidly and efficiently the huge amounts of information generated by the appearance of new agents in the market and especially the great number of clients which come to form part of a mechanism which had so far been rather reduced, normalized and regulated.

This is a general trend in all of Europe, although at varying speeds. Basically, it is a matter of establishing transparent conditions of network access for the new producers who come into the new liberalized system, while protecting consumer interests. The present regulations seek to be sufficiently flexible to

allow new investors an access to the sector, with greater competitiveness being a price moderating factor in the electrical energy sector.

2. The Electricity Market

As a result of the Electricity Sector Law of November of 1997, the wholesale electricity market was created, organized, regulated and put into practice starting January 1, 1998. The functioning of the market is based on four consecutive and interrelated processes.

As stipulated by the regulations, the daily market, in which the buying and selling transactions of electrical energy for every hour of the following day are carried out, is managed by the Market Operator, the Operating Company of the Spanish Electricity Market, S.A.

Technical restrictions, that is, the modifications which need to be performed on the production base program obtained in the daily market as a result of the limitations derived from the transportation network or from the system, are managed by the System Operator in cooperation with the Market Operator. The System Operator is also responsible for the complementary services market, secondary and tertiary regulations, as well as the mechanism for the management of deviations.

In all operation markets a similar procedure is followed: agents send their bids electronically to the computer of the operator in charge, which carries out the repeal of bids, that is, it determines the price and the accepted power for each offer, the results of which it then communicates to all agents.

The sequence of a day's operations begins with the daily market, in which the base program and the hourly prices for the following day are obtained. Once possible technical restrictions have been analyzed, if necessary, the base program is modified based on the order of preference set by the Market Operator, and on

the bids sent in for the resolution of restrictions. The System Operator then summons the complementary service markets, informing the agents of the existing secondary and tertiary regulatory needs. As a result of this sequence, a viable and definitive daily program is obtained.

Once the viable and definitive daily program is known, the first intraday market is summoned, from which the base intraday program is obtained, which becomes the final hourly program after the incorporation of possible modifications arising from technical restrictions. The complete application of the intraday program leads to the summoning of twenty-four sessions, one for each hour of the day.

The actual operation of the system is performed by REE (Red Eléctrica de España, S.A.), following the final hourly program, and making use of the complementary services contracted. If deviations exceed a certain preestablished level, REE summons a deviation management session in order to reduce the additional costs that might originate from operating only with the complementary regulation services.

3. Framework and Environment

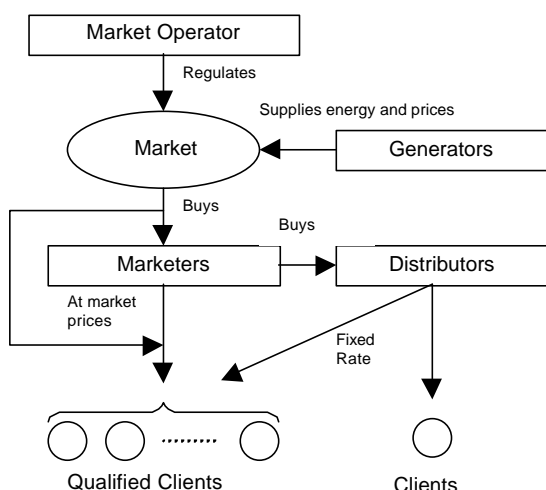
Thus far, the energy market was regulated and subject to pricing at the purchasing as well as at the selling level. Now we have a completely different framework with a totally liberalized market in which different agents are involved:

On the one hand, the distribution companies whose primary aim is to transmit power from the transmission networks to the consumer points with adequate conditions of quality, as well as to sell the electrical power to consumers or distributors who might acquire it at a rate.

A new agent appears which had thus far been missing in the Spanish market: the marketers responsible for the purchasing of electricity in the liberalized market, reselling it later to those consumers considered "qualified" clients.

Marketers can also act as market agents in the electricity production market.

At present a "qualified" client is one whose yearly consumption surpasses one million KWh, and starting next summer all medium voltage clients (>1 KV) will be included in this group, regardless of their volume of consumption. This will increase the total number of clients in Spain by some 60.000.



We are thus facing a market in which, as has occurred so far, the generators provide the energy as well as their prices, in relation to the demand and consumption, while the operator regulates the market and sets the prices. This liberalized market is open to distributors, marketers and "qualified" clients not wishing the intermediation of a commercializer. As Agents of the System, the distributors acquire with their bids the electrical power they need in order to sell exclusively to clients at a rate or to other distributors who might purchase the power at a distribution tariff (D). The marketers in turn acquire energy in the market for the rest of the clients, that is, the "qualified" clients who may decide not to go directly to the market.

The marketers will have a purely commercial function, as they lack the infrastructure of fixed assets (lines, CT, substations, etc.), and are obliged to rent these from the distributors in

order to offer energy to their clients.

4. Needs

Within the new framework of the Spanish electricity sector, a few needs arise, amongst which the following are noteworthy:

Although it has always been interesting to know the rating charts of the clients, now it is an indispensable task for the successful realization of a personalized offer, as well as for calculating the purchasing volume the marketer or distributor needs to realize on the market. To know the evolution of the market and to contrast against the prices of regulated tariffs is another crucial task for the optimization of costs and consumption. Another need which arises is the calculation and billing of the toll fees that the by the distributors pass on to the marketers.

5. Objectives

The objectives proposed are first of all to meet in a simple and effective way the aforementioned needs, which call for the study, development and installation of metering equipment capable of recording the required data, and an information system which can interpret and process that data, and obtain legible results to meet and fulfill those needs.

Another objective is to carry out market studies, observing market evolution and trends, and allowing marketers to improve offers, to enjoy better margins, etc. And, allowing in turn distributors and "qualified" clients, to minimize costs and carry out purchases successfully.

6. Description of the system

All of this has been successfully put into practice by companies of the Spanish electricity sector. The commercializing company MIDECSERVICIOS, made up of five companies from the electricity sector of Western Andalusia, has contributed to this project, as has the distributing company Medina Garvey, S.A.,

responsible for supplying part of the province of Seville.

The system developed is composed of:

Metering equipment: high precision combined meters of class 0.2 and 0.5, with active and reactive recording, and maximeters installed in the high voltage intakes of the "qualified" clients. This equipment includes a meter for the active and reactive consumption and a tariff device which stores the quarter-hourly values of consumption, which will then become the data to be processed.

Communications equipment: since the metering equipment is in remote locations, the readings are carried out via telephone-modem, though it is also possible to connect the equipment via radio, optical fiber or any other means, with an RAC in the control center multiplexing all remote signals and transmitting them to a central computer in which the software application in charge of processing this information is located.

ELECTMET software: developed in a visual environment and backed by a very commercial data base manager, it is very easily adaptable to current computer platforms and requires a medium range PC for smooth execution. The application has a data base, with the information on the active and reactive consumption of the clients captured by the meters and transmitted via telephone-modem. Furthermore, this data base automatically imports the values of the final hourly price established by the market operator, publishing it on an Internet web page.

By using the received data on the consumption and the prices established on the market as an information source, this tool calculates the rating chart of the client, a basic element in the calculation of the following results:

- Hypothetical bill for the "qualified" client at a market rate or at a regulated rate, enabling a comparison of advantages and disadvantages, as

well as the most convenient hourly discrimination in the case of regulated rates.

Specifically for marketers:

- Personalized offer for each of the clients in four formats:

- a) with personalized prices for each of the six daily periods established in the regulations, with their respective surcharges and bonuses.

- b) with a triple rate (peak, normal, low) with their respective surcharges and bonuses.

- c) with a regulated rate.

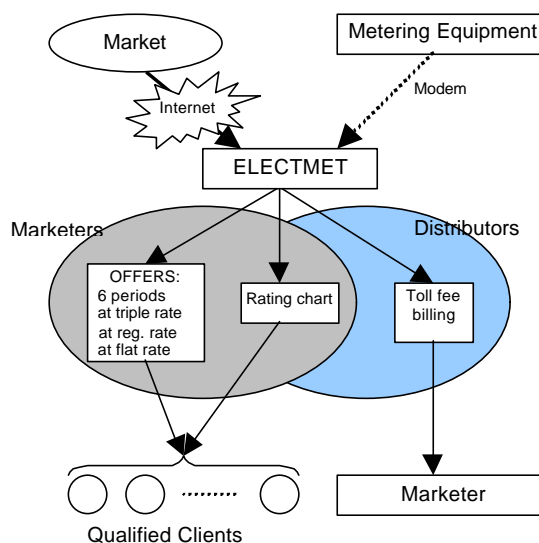
- d) with a personalized flat rate.

- Calculation and portrayal of the accumulated consumption of all the clients, indicating the total amount of energy consumed.

- Calculation of the costs of the toll fees.

Specifically for distributors:

- Production of bills for the toll fees corresponding to the marketers that use their installations to supply power.



7. The Internet Model, an added value

In view of the growing importance of Internet in the workplace, and making use of the great advantages it offers, we are called to utilize this medium to offer an added service to the clients.

The idea is to centralize all information on a web server, allowing clients, marketers or distributors to check their rating charts, most recent bills, market evolution, etc., in a personalized and safe manner, from any part of the world.

Depending on the user profile and the information requested, a form will be filled in on a web page, producing as a result another web page with the requested information.

8. Conclusions

Since the introduction of the system in the company Medina Garvey in July of 1998, and after close study of its evolution by experts from the Ministry of Industry, Endesa Energía and other distributors, we can reach the following conclusions:

It is inevitable and at the same time crucial to use new technologies to offer an efficient service, with quality and profitability. Without these systems we would lack the necessary agility to face the markets, to make offers, to get to know the client, etc. Everything would require considerable amounts of studies, data gathering, calculations, etc., which would imply high personnel efforts and costs, as well as a loss of efficiency in the market.

The rapid evolution of the market has created a great uncertainty in the clients, due to the lack of relevant information, as well as the lack of infrastructures for adapting to the market, which has endowed marketers or distributors with a great degree of confidence, as they offer the greatest possible information, and this, the added services, is a key factor for maintaining clients.

The most important value of a system of these characteristics does not reside in the production of bills or offers, though that is admittedly one of its aims, but rather in the resource of information it makes available for swift decision-making: changes in the hourly discrimination, types of rates, purchasing in the

most advantageous markets, etc. In practice, it means a considerable savings, with the cost of the system paying for itself in a few months.

9. References/Bibliography

Allen, E. and Ilic, M., 1999. *Price-Based Commitment Decisions in the Electricity Market (Advances in Industrial Control)*. Hardcover.

Guan, X., Gao, F. And Svoboda, A., 1998 Energy Delivery Scheduling and Realizability in Deregulated Electric Energy Market. *IEEE, Proceedings of the Thirty-second Annual Hawaii International Conference on System Sciences, 1.998*.

Comisión Nacional del Sistema Eléctrico (CNSE), 1999. *Reglamento de transporte, distribución, comercialización, suministro y procedimientos de autorización de instalaciones de energía eléctrica*. 17 de Noviembre de 1999.

Overbye, T., Weber, J. And Patten K., 1998 Analysis and Visualization of Market Power in Electric Power Systems. *IEEE, Proceedings of the Thirty-second Annual Hawaii International Conference on System Sciences, 1.998*.

Pfrang, E., 1999. *Towards Liberalisation of the European Electricity Markets: The Directive Concerning Common Rules for an Internal Market in Electricity in the Frame*. Paperback.

Real Decreto 2819/1998, de 23 de Diciembre. *Regulación de transporte y distribución de energía eléctrica*. 1998.

Thumaunn, A., 1998. *Customer Choice: Purchasing Energy in a Deregulated Market*. Hardcover.