THE ELECTRICITY RETAIL MARKET: REQUERIMENTS FOR AN E-BUSINESS SYSTEM

Victor Santos
ISCAC, Polytechnic Institute of Coimbra, Bencanta Quinta Agrícola, 3040 – 280, Coimbra, Portugal
LGE / LCT, University of Coimbra, Pólo II - Pinhal de Marrocos 3030 - 290 Coimbra, Portugal
Email: vsantos@dei.uc.pt

Edmundo Monteiro
LCT, DEI, University of Coimbra
Pólo II - Pinhal de Marrocos 3030 - 290 Coimbra, Portugal
Email: edmundo@dei.uc.pt

António Gomes Martins
LGE, DEEC, University of Coimbra
Pólo II - Pinhal de Marrocos 3030 - 290 Coimbra, Portugal
Email: amartins@deec.uc.pt

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Abstract: In the last decade the electric energy market as changed is structure in several countries, mainly in the most developed, ones where the regulated activity of electrical companies where a monopoly or an oligopoly of all sectors from generation to the distribution. Changes brought new structures and new markets. The first market is between the generation plants and the wholesalers. The second market takes pace in the wholesale market where the retailers acquire the electricity that will sell to their clients the third market. To support this new reality advanced information systems are needed. This paper addresses the use of e-Commerce systems to support the electricity markets. The main requirements of the technological structure for an electricity retail company in a deregulated electricity market are identified and evaluated. The purposed solution is based on a B2B (Business–to–Business) structure to deal with the relations between the retailer and the wholesale side, and a B2C (Business–to–Client) dealing with the relation between the retailer and its clients that could be in the industrial, commercial, social or even domestic sectors.

1 INTRODUCTION

The small profit margin, the associated risk, and the price spikes at the power exchange markets are the ingredients that electricity retail companies have to deal with on a daily basis. Retailers are the agents dealing with the bottom part of the electricity value chain, the clients / electricity consumers, who are the ultimate source of income of the rest of the chain.

The electricity retailers have mainly three types of clients, industrial, commercial and domestic, all of them with different needs in quantity, capacity and quality of service. Understanding each client's needs and characteristics of consumption is crucial for the retailer to forecast its power and energy purchase requirements. An adequate technological support is fundamental to take timely decisions.

The competition retailers have to cope with force them to judiciously decide on the best way of purchasing energy and power and, at the same time, to diversify their supply portfolio of options to clients, namely by offering other energy products as gas and petrol, by providing several associated services as energy management, remote or on site

energy audits, or even by selling energy efficient equipment.

This paper addresses the use of eCommerce systems to support the electricity markets. The main requirements of the technological structure for an electricity retail company in a deregulated electricity market are identified and evaluated. The purposed solution is based on a B2B (Business–to–Business) structure to deal with the relations between the retailer and the wholesale side, and a B2C (Business–to–Client) dealing with the relation between the retailer and its clients that could be in the industrial, commercial, social or even domestic sectors.

The rest of the paper is structures as follows. Section 2 discusses the requirements of the e-Business model for the electricity retailer. Section 3 discusses the technological requirements. Section 4 discusses existing standardization activities and compatibility issues. Finally, Section 5, presents some conclusions and directions for future work.

2 E-BUSINESS MODEL OF THE ELECTRICAL RETAILER

This section discusses the requirements of the e-Business model for the electricity retailer. The requirement analysis is divided in B2B requirements and B2C requirements according to the model presented in Figure 1.

In the B2B part the interactions between the retailers and the wholesale electricity market are discussed. These include the relation with the Power Exchange Market regulated by the Independent Systems Operator (ISO).

In the B2C side the interactions involve the retailer and the final clients, either domestic commercial or industrial.

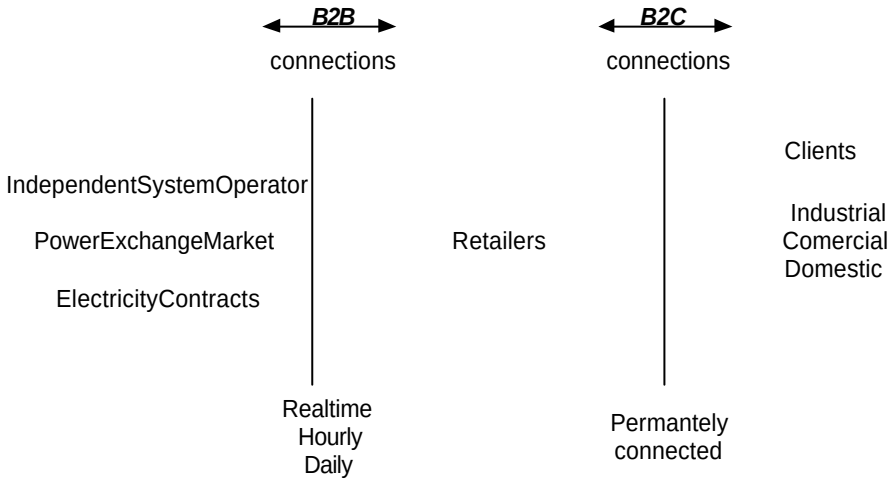

Figure 1 – Electricity Retailer a two side business with time constraints

2.1 B2B Requirements

The B2B requirements are of two kind, technological and business requirements. The technological structure to develop has constraints of different kind: time, reliability and security of both sides of the business are retailer's main concern.

At B2B side retailers have two main goals, buy energy at the lowest price they can get and to ensure the supply of the needed amount of energy each day to their clients. In a deregulated market retailers have several ways to buy electrical energy. At a power

exchange where there are several schedules and regulations to use the electrical structure known as the transmission and the distribution and establishing contracts with the wholesalers.

Electricity as a commodity is ideal to online trading because it is traded independent of his brand, the information needed to sell it to the final user could be easily managed online, and the speed of the transaction is without question faster than a usual trade. Nevertheless this type of transaction involves participating in a centralized electronic marketplace with different types of structures, where online transactions represent faster and cheaper communications.

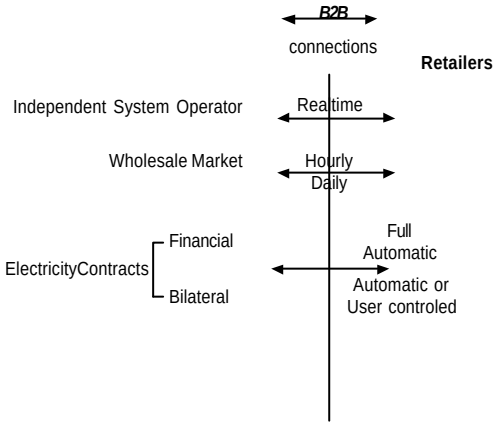

Figure 2 – Main connections on the B2B side

The main difference from other commodities is that electricity could not be stored, only small amounts are possible or in an indirect way by controlling a hydro storage plant, possibilities that do not permit to make an increase of supply immediately. This particular issue demands that retailers have to know in advance the value that insures their compromises with their costumers. And to acquire a superior value that represents the margin that we never know when it will be needed. With an e-business system structure represented at Figure 1 is possible to adjust the inputs reflecting the demand on the B2C side, in real time and with quantities of adjustment that never would be possible without an e-business solution.

Retailers have a short margins of profit, around 2 to 3%, which means that a small change of price at the B2B side will represent an adjust on time at the B2C price. Hence delays could represent a severe lost to economic healthy of a retailer.

There are three types of market structures that can be adopted by the countries or states where electricity deregulation is implemented. They are Poolco, Bilateral Exchange and Power Exchange. In Poolco there is only one buyer, a governmental agency that sells to everyone, the Poolco operator also runs the power system. The second type of market is the Bilateral Exchange where individual buyers and sellers make their deals privately. However they might be forced to reveal part of their agreements, because the Independent System Operator must know and build the power schedules based on that type of transactions. The third type is the Power Exchange market where there is a marketplace where buyers and sellers make their bids and the independent system operator coordinate the marketplace and the power system. These three types of market structures are not mutually exclusive, as it has been said above and it is possible to have some common characteristics of them in a market, depending of the structure adopted by the region, country or state (Philipson, 1999).

Besides the above, there are multiple ways retailers can buy electricity. To characterise these transactions some parameters must be known. Price and quantity are defined in some markets, where others only define capacity, independent from the price (United Kingdom). Besides the electrical structure is de-regulated there is always a market operator (deals with the economic structure) that can also be the system operator (physical structure). Also we can find different types of operators, some more centralised others, more liberal. The market operator known also as the Independent System Operator - ISO (Rahimi, 2001), runs the electrical transmission network, that usually belongs to a regulated or state entity, that is independent from any business intervenient. ISO also ensures that buyers at the Power Exchange have the best price usually obtained at a reverse auction where sellers state their prices.

To retailers, electricity could be bought at different periods of time, from an hour to a few months, depending of the market design. The most common is the day-ahead market to dispatch before the operation day, next may be a long period market preceded by an hour-ahead market. Besides the electricity marketplace there is another way for retailers to buy electricity, making several types of contracts that could have public and financial

representation at the marketplace. The structure is identical to a common financial market with financial products, where there are several types of contracts which goal is to minimize the risk. There are also bilateral contracts between sellers and buyers negotiated outside the market, although same parameters necessary to be revealed to the ISO. This way congestion avoidance is granted to all the electrical structure, meaning to system retail that it could be possible to have some contracts that are ISO dependent. Retailers supply about 80% of their needs with contracts of a few to six months, and buy the rest at the electricity marketplace.

Figure 2 depicts all the significant entries to the B2B. Next we will analyse the B2C outputs and the requirements that could be improved by different e-business models. An online structure for both sides (B2B and B2C) is a must to the retail system.

There are basically three types of online transactions: bilateral, market make exchange and the multilateral exchange. The first one involve two entities that which to make a trade The second one market make exchange, basically is a market where several buyers made bids to get a product, in this case the transaction only occurs when the seller agrees with the price offered. The multilateral exchange several buyers and sellers trade at a market where they are anonymous and in a neutral place. This is the ideal platform for a power exchange where retailers are buyers and wholesale or generators are sellers.

2.2 B2C Requirements

After bought the electricity how is built the price for retailers costumers? Basically we have four elements, the network price (transmission and distribution use-of-system charges), electricity losses, market fees (including ancillary service fees) and retail gross margin (profit plus remaining retail costs). To better explain the strategy for the B2C side some questions must be answered.

What are retailers needed for? For generators and wholesale power entities retailers represents the costumers will. For industrial, commercial, small business and residential clients retailers provide the different needs in quantity, capacity and price. Additionally, retailers provide complementary products (energy efficient products, financial products), services like energy management consultant and energy procurement (warnings, energy saving programs, industrial and commercial electricity projects).

How can retailers improve the services they offer? Besides the services mentioned above new value-added products like green power (solar, wave and wind energy), bundle products like gas, water, telephone and internet services. New services that could change entirely the way this business is made.
An e-Business system is a better system then the traditional? An e-Business structure is the right one from perspectives, retailer and clients. Marketing and billing savings, customization of services is now possible. A fundamental point is to massively implement remote metering, creating incentives for clients who acquire smart meters, which will be the master piece to complete the all structure of an e-business retailer system. Smart meters will represent the better end from generation to the final consumer, passing wholesale market, the retailers and reflecting at the end the market variations.

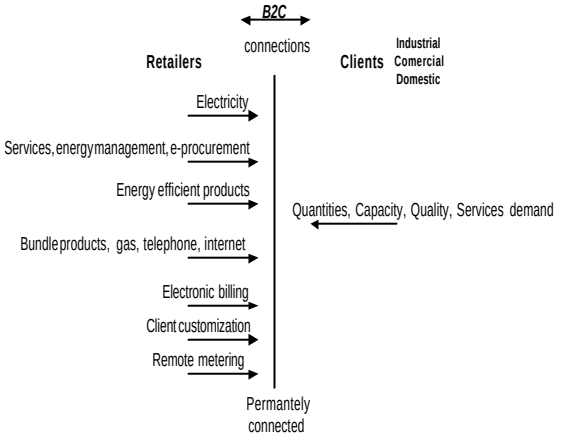

Figure 3 – Main connections on the B2C side

Nowadays using internet over the power line will permit real time prices, real time algorithms important instruments to build and treat historical data from retailer's client's profile, without additional costs, once it is possible to read, send and process data at retailer centre all over power line. With this structure retailers could say to his client not only how much electricity they consume, but when and what cost will pay with time constraints. Figure 3 summarizes the connections between retailers and their clients.

3 TECHNOLOGICAL REQUIREMENTS

Both sides of the e-Business electricity retail structure require different technological supports for implementing a reliable, interactive and secure system. The connections between the B2B and the B2C sides are quite important to timely decisions, requiring fast answers to external changes of the markets and/or the client's needs. At the B2B side there are three types of connections, first between the retail system and the marketplace, a second connection must exist in a parallel way to the independent system operator (the entity that operates the financial and physical structure). This connection is crucial and must function as a permanent line since all limitations, and problems of the physical structure are anticipated by a direct ISO connection. Third a web site must exist for bilateral contracts are establish between retailers and wholesale electricity sellers. This site will enable bilateral online transactions in private, automatic or by means of human intervention.

At the B2C side retailers could develop several types of services but technological requirements will depend first of the client connection or induced connection that could be sold as a service bundle with other products among electricity. Nowadays Internet over power lines is a reality and this technology put retailers services at domestic client's home. Remote real time electricity connections make several services like energy management and e-procurement possible to commercial and industrial costumers. Retail connections to large clients like industries, commercial, social and state buildings are important if they could be permanent, for timely decisions. Data communications over power line with Internet connection have a physical medium well known to retailers. Besides Internet services associated, this connection will permit a better client support to electrical client facility, opening the door to remote services, like energy audits, energy management services, electronic billing.

4 NEW STANDARDS DEFINITION

Several efforts have been made to allow the definition of new standards already established for different areas of energy management information systems, also the creation of open communication architectures trying to join different communication needs of the distribution system (CEIDS DER/ADA Project Plan, 2003), or also the standardisation of consumer appliances and equipment in an advanced communication networks could improve the transformation of the energy system (Bosquet, 2004).

One important characteristics of a retailer e-business structure is the need to manage the same information but in different contexts. This means that the same information used as a market information data, can also be important to retailer costumer or even to other different entities of the deregulated electricity system like the ISO, the wholesalers or at the head of the process to the generators. As an example we could thought that the amount of electricity that has been negotiated between a retailer and his costumer will be billed depending of the day ahead electricity value paid by the retailer at the wholesale market, which is influence by supply demand market balance. In the end the Energy Management System of the retailer client, or his smart metering system could also respond (load management) to the increase/decrease of electricity price. The faster the information spreads the faster the reaction of all the players, all depending of the communication system. If this communication structure could have a common message structure will improve system behaviour to all kind of situations. Nowadays we have a high number of standards all of them context depending, meaning that we have several areas where the same information is classified in the context of the standard where it is applied. Areas like Residential, Commercial, Buildings, IT, Telecommunications, Market, Trading, Business, Industry, Systems, Control, and Energy, Electric Generation, Transmission & Distribution do have common information at the deregulated electric system. The creation of common standard or a common communication e-business architecture is the research main problem to the ubiquity of electricity information in its system.

5 CONCLUSION

E-Business structures are fundamental to improve transparency price policy with the benefits that it represents to all. The electricity production chain can reduce costs if costumers are inducing to a better energy use all over the world. Smart meters have an important roll in the e-business retail structure because permits real time lecture, in a short time periods,

representing fundamental information for historical data client profile implementation, and future forecast consumes. Internet over power lines made possible cost reduction for the e-Business retailer structure since it don't need an external physical structure for data communications. E-Business is the natural structure for electricity retailers definitely.

Several benefits of the e-Business retail system where presented. In the retail company infrastructure costs are reduced, common software represents less costs and a better adaptation and easy training to the e-business system. Most of the times the hardware used could be reused. Better adaptation to clients needs means customization due to online services. In competition with other companies, where time-to-market improvement meaning a cost-effective market entry in B2B and B2C sides. Improve customer service and a faster costumer response, increase revenue due to sales and marketing efficiencies based on a B2C structure. Finally brand dissemination has here a fundamental tool.

The definition of a common communication e-business standard could eliminate information redundancy at standard definition, widen application areas, reduce information misunderstanding, and optimise information distribution among all deregulated electric system. For sure a research subject for future developments.

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