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Creating institutional arrangements that make markets work: the case of retail markets in the electricity sector

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Creating institutional arrangements that make markets work: the case of retail markets in the electricity sector

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Introduction

Over the course of the past fifteen years, the electricity industry has experienced a series of remarkable innovations—in particular, the creation of open markets. Wholesale markets come first, then retail. These markets replaced the vertically integrated and quasi-integrated structures that had prevailed mostly during the second half of the twentieth century. Few economists truly anticipated or forecasted this revolution in electricity markets. The notable exception was Paul L. Joskow and Richard Schmalensee. Their book *Markets for Power* (1983) anticipated the opening of the English wholesale market in 1990 by a full seven years. The notion of a retail market for electricity had even less currency than that of a wholesale market. Stephen C. Littlechild, another economist and British regulator from 1989 to 1998, merits being designated as the inventor of the retail electricity market. Previously this concept was so novel, so unfamiliar, that it is nowhere to be found in the *White Paper* (1988), with which the British Government prepared the way for the electricity reform, nor does it occur anywhere in the Electricity Act (1989). At that time

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only a wholesale market for generators, distributors and large industrial users were envisaged.

However the most salient feature of this innovation was not simply the introduction of markets into the industry, but rather that their creation required so much institutional activism. The competitive reforms of the electricity industry literally consisted of elaborating gigantic and complex architectures for trading on markets—comparable in some ways to architects designing skyscrapers or engineers erecting suspension bridges (Glachant & Finon 2003). In no place were market forces harnessed to build their markets themselves. Consequently, electricity reforms are better characterized as market design than as competitive opening. 'The market cannot solve the problem of market design,' as captured in a nutshell by W. Hogan (2000).

Thus we are confronted with a question that is representative of applied neo-institutional economics. What is meant by creating a retail market? Since the wholesale market already serves as a market for the commodity electricity, what specific role does the retail market play? Are the operations conducted on this retail market identical to or different from those on the wholesale market? Do the differences pertain to the object being transacted, because not exactly the same thing is traded? Or are the differences rather procedural, for trades do not occur in exactly the same way?

Wholesale and retail operations would indeed differ if the transactions conducted on these markets were not on the same commodities. This notion is already very present in business organization practices and in wholesale and retail operators' commercial strategies. As a rule wholesalers add a few complementary services that are important to their clients to the output of the production process (that is, the producer's good). Thus they provide an incentive for customers to buy from wholesalers rather than directly from producers. Retailers in turn add yet more services, which may be complementary or supplementary, and in so doing create another source of value added for their specific category of customers (Coughlan et al. 2001). The upshot is that neither sells the same good, the same set of characteristics, as producers.

Conversely another take is that these two markets, wholesale and retail, essentially transact the same commodity, but do so in a different fashion. It is mainly the transactional procedures that differ. Here wholesalers and retailers are viewed as market intermediaries. It is in fact intermediation services that they sell to their customers. These are typical of transactional services provided by third parties who interject themselves between producers and consumers when the latter find this arrangement preferable to engaging in a direct transaction (Spulber 1999).

The goal of this paper is to identify how retail electricity markets are created, to define the essence of these market designs, and therewith to find a logical explanation for the space created for entrepreneur-retailers. To accomplish this, we first explore retailers' involvement in the adaptation of the product between generation and consumption, and then how the wholesale and retail markets manage transactions within the framework of their market design. At the end of the paper, we will illustrate a typology of retail market design using three examples of the creation of retail markets in Europe.

Retailers' involvement between the generation and consumption stages

When a product exits from the production facility, it may not necessarily possess all the characteristics that are of use to all consumers. It can subsequently be more precisely tailored to the needs of consumers by adding assorted complementary services. Specifically these services may be transportation and storage, classification and sorting, disassembly and reassembly, pairing with other products and exhibiting to consumers.

The electricity industry does indeed make use of several of these adaptation services. Transmission substitutes, at least partially, for storage—which is economically not feasible—by tightly interlinking all generating plants within a zone, so as to make all power generated at any point within the zone permanently available throughout it. Since electricity is a highly normalized industrial product, and remains very homogeneous at the plant exit and on the transmission grid, it is not necessary to sort or categorize it. On the other hand, the disassembly and reassembly functions are very important and systematic. To render transmission economical, the tension of the electrical current is raised to levels much higher than are useful to consumers, at the point of exit from the generating plant. Thus, at the downstream end of the transmission grid, the tension must be reduced to its consumption level. Furthermore the transmission grid serves a very specific purpose—it is not designed to connect to all points of consumption. The link that carries the electricity to consumers' homes is the distribution network. Finally, by virtue of this funneling into households by an exclusive distribution grid, the product becomes permanently available to consumers; but it is now impossible to pair it with other goods.

We here see that the functions of adapting the product to consumers, after it leaves the generating plants, are highly industrialized and automated, and that they are dispersed between the activities of the transmission and the distribution grids. However none of these adaptation functions are actually performed by retailers. Thus, in the competitive electricity industry, the retailer does not directly play a role in adapting these characteristics of the gross industrial product to the uses of consumers. So in this sense the retailer adds no value to the product (Joskow 2000; Littlechild 2002).

Wholesale markets, the exchange of rights and the implementation of transactions

The concept underlying wholesale electricity markets is that several sellers will simultaneously face several buyers to offer them supply contracts. However all these rights, having been individually traded between sellers and buyers, will ultimately be executed on the same shared grids and will take the form of a single, collective form of power on the electrical current. This is why procedures for managing transactions are of considerable interest for understanding the creation of electricity markets (Glachant & Lêvêque 2005).

When exchanging contracts for electrical energy, buyers and sellers find themselves in typical inter-individual relationships. However, at the time they seek to implement their contracts, they enter into collective interactions. The electrical current that flows from generating plants to consumers cannot be stored or divided into exclusive and transferable units. All injections and withdrawals are pooled in the shared flow of electricity that circulates through the grid. Thus what we refer as the wholesale electricity market in fact consists of several complementary modules that trigger a sequence of operations as required for satisfying the claims on the commodity. This chain, by which transactions are implemented, includes at least three distinct modules. The first module handles the individual contracts between sellers and buyers. This is simply the exchange of rights, which does not provide for the effective delivery of the corresponding product. The following two modules manage the actual, though collective, application of these rights. The transfer of products corresponding to the rights and duties of individual contracts can only occur in a collective framework that manages all transfers at the same time.

Managing the individual exchange of rights

The most well-known module of the wholesale electricity market is the individual exchanges compartment, in which rights are negotiated between sellers and buyers—either bilaterally such as over-the-counter markets (OTC) or multilaterally such as organized markets of the Power eXchange (PX) type. However, after the conclusion of individual agreements, the corresponding actions on the commodity cannot be directly taken by the buyer–seller pair. It is not possible to undertake direct inter-individual delivery on electricity transmission grids, for they are not point-to-point like communications networks. Since electrical energy is not storable, the right ceded by the seller is at most a certificate providing the right to withdraw, on demand, from the shared energy resources of the grid and covering a specified period, or at least a commitment to compensate the difference between the price contracted *ex ante* and the real cost of the power.

Managing the collective feasibility of individual exchanges

Since the commodity is neither storable nor separable into exclusive and transferable units, the execution of all individual exchanges occurs over the intermediary of the shared flow of power on the grid. Collective management of this process makes use of a third party, the manager of the transmission grid, known as the system operator (SO). This third party played no role in the negotiation of the individual programs; but it has authority over the collective management of the corresponding shared energy flows.

The first order of business for this collective implementation is to ensure that the aggregation of the individual programs is feasible, given the grid's capacity and security constraints. If forecasts indicate that some of these constraints may be violated, the SO announces that the grid is congested. Consequently some individual exchange programs will be designated unrealizable, and these must be modified under the SO's aegis.

Examining the interplay of the management of collective congestion and the operation of inter-individual transactions reveals at least four architectures for executing individual programs. Firstly, collective constraints can be managed with hardly any impact on the individual transactions negotiated *ex ante* between buyers and sellers, who were powerless to anticipate these constraints. To accomplish this, the SO assumes certain generators' commitments, being not feasible given the state of the grid, and obtains an equivalent output, from the perspective of the buyers, from other generators on a less congested part of the grid. The cost of this maneuver is subsequently spread over all participants in the wholesale market, curbing their unit cost. This class of collective management operations may be called 'redispatching' or 'countertrading', depending on the exact details of the procedure. We observe that this process assigns greater weight to supply contracts that are negotiated individually *ex ante* than to the constraints and collective costs of implementing them *ex post*.

Secondly, we can oblige contracts that are negotiated individually *ex ante* to account up front for the constraints and collective costs of their future execution. If this *ex ante* internalization of collective constraints occurs on an organized market (PX), it takes the form of direct incorporation into the prices and volumes of inter-individual exchanges on the market. As a result only operable individual contracts are exchanged *ex ante*. This internalization of collective constraints into individual exchanges can be exhaustive if the SO and the PX collaborate closely to identify the contribution to the congestion from each elementary unit of the grid (that is, each of its hundreds of nodes). Thus the term nodal pricing is used to describe this way of managing collective constraints.

Thirdly, the internalization may also occur at a much higher level of aggregation, so that only a few broad zones are differentiated and becoming autonomous sub-markets of the same PX. The threshold for the volume of exchanges between zones at which the PX is splintered into sub-markets is set by SOs. They behave as if the impact of each zone on the collective constraints was homogeneous, and all traded contracts are thus realizable. This maintains sufficient liquidity on each sub-market of the PX to ensure that there is a single energy price throughout the zone. Consequently this way of managing collective constraints is called ‘zonal pricing’.

Fourthly, there exists another means of *ex ante* internalization of grid constraints on either bilateral (OTC) markets or organized (PX) markets that does not require an *ex ante* coordination of markets with the SO. In this fourth category of collective constraint management strategies, the SO makes his own *ex ante* commitment to guarantee that a firm capacity will be available on a given segment of the grid and sells it off at auction. Thus the grid is de facto divided into zones; but these zones are only delineated by virtual entry and exit points or gates. Here SOs are acting like traditional road, railway and air transporters. They are not directly involved in the collective adaptation of individual energy supply contracts on either side of the gates. It is rather incumbent on sellers and buyers to separately and independently arrange their contracts on the basis of what they can foresee in terms of common consequences solely from the signals yielded by the capacity auctions.

The diversity of market designs corresponds to different architectures for negotiating and implementing energy transactions (Glachant & Lévêque 2005; Glachant 2006). These designs differ in how individual programs of exchange are negotiated (that is, bilateral against organized markets) in the first instance, and, in the second instance, in the provisions for rendering these individual programs compatible with collective constraints during their execution (for instance *ex post* redispatching arrangements, *ex ante* nodal, zonal or capacity auction arrangements). All these designs also define the role of a third party, the SO, the central agent for the collective implementation of the claims acquired during the individual exchanges.

Managing collectively uncertainty in individual programs

The execution of individual programs is not only subject to uncertainty attributable to collective constraints on the grid. A further category of uncertainty arises from the individual conduct of buyers and sellers. Will they strictly adhere to the exchange program they agreed on? Or will they digress from it, for any reason whatsoever? In principle, in most other industries, any divergence of buyers and sellers from a contractual agreement is a matter strictly between themselves. This cannot apply to the electricity sector, owing to the fact that this commodity is neither storable nor divisible into exclusive and transferable units, so the shared flow of power is immediately influenced by any individual deviation from the programs.

To ensure the overall feasibility of the individual programs, SOs' responsibilities also extend to managing the continuity and quality of the shared flow of power. To accomplish this they administer an ongoing service of adjusting the flow of electricity on the grid, reacting every ten or fifteen minutes to continual fluctuations in injections and withdrawals. This is possible because they have access to generating capacity that is held in reserve and ready to kick in, as well as rapid upward and downward sources of power. This arrangement can be called ‘balancing’. Though this service was originally conceived as a network reliability feature during the era of vertical integration, it clearly functions during the era of open markets as an energy market. It is in fact the only real trading place for physical energy, since all inter-individual negotiations that precede the opening of the balancing only actually deal with promises for future delivery, and not with the direct exchange of a product that is available immediately.

In an open-market context, the SO cannot manage a physical energy market without billing the users directly for this supply. For obvious reasons of incentives, it is necessary that the costs of individual deviations from the exchange programs be assumed by those who cause them. This cost cannot be socialized, as in some of the formulae for managing congestion. However, to be able to charge this balancing to those who are liable for it, it is necessary to be able to record all individual deviations from the injection and withdrawal programs. Thus all private programs need to be collected—in principle one day ahead. It is also necessary to have a complete series of physical measurements of individual injections and withdrawals operated on the grid over the day. Since the price of electrical power is determined on wholesale markets every hour or half-hour, individual physical metering must be performed by special meters with the same degree of precision. This is true for both generators and buyers. Consequently the SO must conduct a full physical accounting of the compensating operations of the grid users’ programs and the suppliers of balancing services. This physical clearing of wholesale market transactions allows the collective implementation of individual transactions to be concluded. Thanks to physical clearing, the

SO can initiate financial settlement of individual deviations. This completes the collective framework for individual transactions.

Being responsible for the provision of balancing power, the SO is in charge of both a clearing service and a settlement service. These two services, founded on accounting and measuring individual exchange programs, constitute the core of this second and last module of collective implementation of the wholesale transactions.

A shared measurement system

The interface that links the three modules required for implementing the wholesale transactions is known as the architecture of wholesale electricity markets. In principle, buyers and sellers cannot anticipate *ex ante* the *ex post* feasibility of their individual transactions without the intervention of a third party, the SO, who functions as the architect of the markets so to speak. Similarly sellers and buyers are in no position to manage the uncertainties associated with their individual injections and withdrawals in an exclusively bilateral fashion. Therefore SO's collective management activities are indispensable for implementing the individual transactions—not merely supplementary services that add some product value with the exception of reliability, which is really valuable but not necessarily priced. While several market designs are possible, and hence several operating modes for SOs, all of these market designs are mainly institutional infrastructures for executing individual transactions on the wholesale electricity market. We here have a striking illustration of what Ronald Coase (1992) was talking about the institutional structure of production.

Nonetheless the fact that a designated third party, the SO, manages this collective infrastructure, this governance structure of the market (Williamson 1985 and 1996), does not invalidate all wholesalers' economic functions on wholesale markets. They still play a role in the elaboration and administration of purchase and sales contracts.

During the establishment of contracts on PXs, traders can intervene between generators and buyers and play the traditional role of price makers by exploiting the existence of a purchase/sales price spread with their ability to understand or anticipate market movements, or to arbitrate differentials within the market. Outside of PXs, brokers can offer traders similar opportunities on the bilateral market (OTC). All these electricity trading activities can include transactions that internalize the collective constraints on the grid *ex ante*.

Similarly aggregators of individual power exchange programs may intervene between buyers and sellers to aggregate the individual programs before submitting them, at time minus one unit, to feasibility control by the SO. This position of intermediary also allows aggregators to conduct an initial, private clearing of their clients' imbalances prior to addressing aggregate physical clearing and financial settlement with the SO.

The two typical functions of wholesalers, namely trading and the aggregation of programs, can also be accomplished by generators (upstream integration) or large consumers (downstream integration such as Norway's Norsk Hydro in continental Europe). Up- or downstream integration of these wholesale activities by producers or consumers does not affect the function of the transaction. Trading and program integration are typical activities of market intermediaries who capitalize on their knowledge of the market, on economies of scale, or on the frequency with which they repeat transactions to reduce transactions costs.

The functions of the SO and of the wholesaler are thus complementary. Wholesalers manage private units of transactional services; the SO, the collective infrastructure for all transactions. The two roles, however, are not symmetric. The creation of the SO and market architecture is an absolute prerequisite for the existence of a wholesale market, while independent wholesalers can be dispensed with. Nonetheless, despite the absence of symmetry, there still exists a pronounced mutual interdependence around a shared measurement system.

On the one hand, SOs would be utterly incapable of carrying out their collective duties if most of the bilateral or organized transactions on wholesale markets (PXs) were not already semi-aggregated by several dozen wholesalers—vertically independent or integrated—who bring their credibility to the table as intermediaries by assuming responsibility from a business and financial perspective. On the other hand, SOs would be unable to accomplish their clearing and financial settlement tasks without access to private data pre-formatted for these calculations. Even assuming that all generators are directly hooked into the transmission grid (which is not always the case), and that their injections are thus directly measured by the SO, it would remain necessary to have access to hourly or half-hourly meter readings of individual consumption and to group them aggregator by aggregator. To allocate these individual readings to the aggregators, a pre-configured registry identifying the affiliation of each consumer with an energy seller would be needed. In practice, the performance of collective tasks by SOs thus presupposes that they can make use of large amounts of private data from metering systems. Consequently there is a great deal of interdependence between the two systems for monitoring transactions information, private and collective.

Retail markets, the exchange of rights and the implementation of transactions

What else is required for the exchange of rights between sellers and buyers on the retail electricity market, and for implementation of these transactions that cannot already be found in the architecture of wholesale markets? It is not some requirement to adapt the commodity gross electricity to the needs of individual consumers, since we know that this is automatically done by transmission and distribution grids. Nor is it any inability of wholesale markets to handle individual consumption data, since we know that the functions of the SO and the wholesalers are articulated around a shared metering system. However from the perspective of the wholesale market, the structural particularity of the retail market—and its Achilles heel—is this measurement system.

Of course orders of magnitude separate the measurement system that manages several hundred or thousand large corporate consumers from one that manages millions and tens of millions of consumers in the mass market. This distinction does not necessarily imply a structural difference between wholesale and mass markets. The structural constraint on the wholesale market is that the data communicated to it must be formatted according to its own rules of operation. It assumes in particular that meter readings of individual consumption are taken hourly or half-hourly, and that all these individual volumes are assigned to the various aggregator accounts to ultimately yield physical clearing and financial settlement.

Then the essence of market design for the retail market is the organization of its measurement system, since this constitutes its interface with the two modules of collective governance of the wholesale market. Consequently what we find there are four potential architectures for retail markets, which are also variants on their market design. In the first variant, the retail market is not really distinct from the wholesale market, since they both share the same hourly metering system for individual consumption. Things are very different for the three other variants. None of them feature the hourly metering system of the wholesale market, but rather consumption approximations computed from profiles of demand proxies, simply known as profiles. These measurement proxies are applied to consumption volumes that have been accurately metered, from the perspective of the wholesale market; but that apply to a very large number of consumers who are the customers of different sellers. It is with the border effect, resulting of the design of the zones for which these measurement proxies are computed, that these three variants of profiling within the retail market design differ.

Nodal retail design

The first variant of the retail market is a simple internal compartment of the wholesale market, since their measurement systems are identical. Each consumer is equipped with a smart meter. This counter transmits hourly or semi-hourly consumption data to a database that allocates it using a registry matching consumers' affiliation with sellers. With this type of system, no equalization between consumers, sellers and aggregators is required for the SO. In an analogy with the terminology of wholesale market design, this could be called a 'nodal measurement system', where each consumption node is metered individually and can be handled independently of the others. This specific type of retail market appeared subsequent to the introduction of competitive electricity reforms. It was in fact not distinguished from the wholesale market as such, until questions arose concerning the barriers to entry for small-scale consumers raised by the cost of metering equipment.

System operator retail design

In the following three variants, the retail market is distinct from the wholesale market, because its measurement system is different. Rather than proceed with hourly metering of individual consumption, volume approximations are computed from demand curve types or profiles. These profiles serve as keys for allocating hourly volumes of global consumption that are not based on individualized data. These global volumes are computed from the perspective of the wholesale market; but they sum over very many consumers who are clients of different sellers. Underlying this system of profile-based metering is a systematic equalization between consumers said having the same profile. It may also involve transfers between profiles. Thus several types of cross-subsidies are affected between consumers, sellers or aggregators when treated by the SO.

In the first of the three profiling variants, the allocation keys or the profiles are computed on the same scale as the clearing and financial wholesale balancing operations. They are performed by the SO or an equivalent agent. While distinct from the wholesale market, this type of retail market still functions as an approximation to it, since the proxies sent to wholesale clearing and financial settlement are computed on the same scale, sometimes even by the same services. The logic underlying this design is that the retail market is treated like a single zone of measurement proxies for the wholesale, rather than as an accumulation of local markets.

This retail market design closely corresponds to the case of England and Wales. While the defunct compulsory wholesale market, the Electricity Pool, was not responsible for the overall architecture of the retail metering system, it profoundly affected the clearing and settlements system. In addition the profiling standard, based on eight domestic consumption profiles, was designed by the British Electricity Association. Each year the forecasts of electricity consumption are updated for each profile on the basis of real data dated from two years back (Maclaine 2003).

Zonal retail design

Conducting profiling on the same scale as the wholesale market—as in SO retail design—is in fact a very particular choice. In practice all elementary data necessary for computing the profiles are collected on a more disaggregated scale, the local level. Locally, that is on the level of the distribution grid or the supplier at the point of consumption, one can maintain a registry of consumer–supplier affiliations, updated when a consumer changes supplier; one can conduct precise hourly metering of the global consumption of a population of profiles; and one can also perform periodic metering of actual individual consumers within the population of profiles. Finally, by combining these various data, one can refine or rapidly adjust the profile definitions or conduct various operations to reconcile the data.

However, when that much emphasis is placed on the local scale, where the data are directly accessible, the market becomes highly splintered in terms of calculating profiles and settlements. These profiles may be closer to the consumers or the places of consumption, but they also become zonal profiles for purposes of zonal settlements. The national consumption-profiles market dissolves into a collection of proxies embedded in various zonal profiles with a non-negligible potential for border effects between the zones.

One can nevertheless mitigate these potential border effects between local profiling zones by adopting common calculation methods as well as a shared interface for querying and exchanging data. Consequently, in an analogy with the terminology of wholesale market design, this could be called a ‘zonal metering system’. Each consumption profile is metered and handled within a single distribution zone; but since all zones apply open and equivalent procedures, it is no gross exaggeration to state that they tend to function as a common infrastructure for the interface between the retail and the wholesale market.

This type of retail market design corresponds to the case of Norway, where each distribution grid computes a single consumption profile for its zone and then directly derives the settlement owing from each supplier. While this profiling standard, with a single consumer type in each zone, appears very simplistic, the fact that it is updated weekly goes some way toward mitigating its inherent lack of precision. Finally, on the national level, this methodology is framed by the regulator (NVE 1999), while a common national system for querying and transmitting data (EDIEL) facilitates exchanges between all suppliers and all distribution grids.

Borders retail design

When local distributors are collecting data, computing profiles or determining the corresponding settlements, they may have no obligation, incentive or inclination to adopt common procedures or to converge toward a shared data query and exchange protocol. Thus it is possible for border effects between retail zones to be of the same order of magnitude as those between non-coordinated wholesale zones. Moreover it would be inappropriate to designate these local entities as zones of a retail market, since each one is in fact a self-contained retail market. It is the extent of border effects between profiling zones that motivates the division into local retail markets. Thus we can define this retail design as a measurement system with borders. Consumption profiles are measured and handled differently within each zone. There are no open and equivalent procedures that might constitute a common articulating infrastructure between these various retail markets and the wholesale.

This type of retail market design corresponds to the case of Germany, where each distribution grid has its own approach to computing consumption profiles for its zone and then dictates the settlement due from each supplier. In the absence of national regulation and a national regulator until 2005, only voluntary participants, including the four largest generators-transmitters, subscribed to a shared protocol for computing and exchanging data. By comparison approximately eighty per cent of local suppliers and distributors retain retail practices that are essentially local (Müller 2005).

Conclusion

The goal of this paper has been to identify how retail electricity markets are created, to define the nature of their market designs, and therewith to find a logical explanation for the space created for entrepreneur-retailers. We can ask what is meant by creating a retail market, since the wholesale market is already a market for the commodity electricity. Of course the assumption is that the retail market will conduct operations that differ from those on the wholesale market. However these differences can bear on the object of the transaction such as exchanging differentiated goods or rather on procedures such as differentiated market mechanisms.

We have observed that retailers do not play any significant role in adapting the electrical commodity between the stage of generation and that of final consumption, and that adaptation of the commodity is automatically performed by the transmission and distribution networks. We have established that the core of the market designs consists of the layout of a chain of transactional modules necessary for implementing the rights exchanged. Firstly, there is a module of inter-individual transfers of rights between sellers and buyers, with trade places that are bilateral (OTC) or organized (PX). Secondly, there is a module for the collective management of the feasibility of individual exchange programs (congestion management). Thirdly, there is a module for the collective management of uncertainties involving individual conduct for imbalances management, clearing and settlement. Within this institutional architecture, it is a common third party, the SO, who manages the collective part of the transactions governance structure. All the while market intermediaries (wholesalers) sell private services to facilitate transactions notably trading and program aggregation. Between the common third party and the private intermediaries there exists an extensive interface over a measurement system that allows monitoring and executing individual transactions within the externalities-rich context of the grid.

Retail market design is one particular derivation of this interface which coordinates private intermediaries and a common third party around a measurement system. It specifically deals with market situations in which the consumption of individual consumers is not metered, though they maintain direct access to the shared resource—the electrical current. Thus new types of market design appear with retailing. They are characterized by the introduction of proxies into the measurement system to support the collective implementation of individual transactions.

On this new type of market, retail market intermediaries sell private services to assist their customers' transactions. Like wholesalers, they also sell trading and program aggregation; but they add services that are typical of electricity retailing, demand aggregation which opens access to trades on OTC and PX wholesale markets, and data processing logistics, which notably begins by registering customers within a proxy measurement system and which ends with sending them the bill.

Empirical evidence shows that around and under the new doors for competition several layers of hard institutional foundations have had to be built. It first covered the definition of rights and duties of generators, transmitters, distributors, traders, suppliers and consumers having to result in a feasible set of exchangeable rights. It then needed a chain that controls the consistency of individual rights and of registering and clearing of the uses of these rights. It assumed that commercial and financial consequences of these uses can be identified, measured or proxied and assigned to any user according to defined circumstances of her individual use.

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