Retail Competition in Electricity

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Technical Study

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Introduction

Traditionally, the organization of electric sectors was based both on integrated monopolies and a tight regulation that left no room for market forces. This type of organization found its doctrinal foundations on the natural monopoly character of the electric sector. This meant that power generation, transmission and distribution were less costly when carried out by one integrated firm than when performed by several firms. In other words: scale and scope economies supported the organization of the electric sector around franchised and vertically integrated utilities.

In the middle of the eighties, a new consensus emerged, which questioned the natural monopoly character of the electric sector. Increasing returns may favor that only one firm should provide transmission and distribution services; whereas reduced optimum size power generating plants allows for the participation of various firms without a loss of profits derived from scale economies. This holds even in small countries. As for scope economies among the different electric service activities, the new consensus states that, due to technological developments, transaction costs arising from the unbundling of generation, transmission and distribution are minor when compared with the efficiency costs involved in an integrated monopoly. As a consequence, there seems to be no reason to support the vertical integration of generation, transmission and distribution activities.

Electricity markets are being radically transformed throughout the world. Over the last sixteen years most countries have undertaken reform processes leading to the liberalization of generation. Recently, some countries have introduced competition in the retail segments of the industry.

The main features of the paradigm pushing reform in Latin-American countries are five, as follows. First, large customers, generators and distribution companies enjoy free access to transmission and distribution networks. Second, a pool or spot market for power is established and futures markets for power are also at work in some countries. Nevertheless, in most countries large consumers, distribution companies and generators, may undertake transactions directly without using the organized spot or future markets. Third, wholesale power prices and prices paid by large customers are deregulated. Fourth, a franchise distribution company provides electricity to small and medium consumers. Customers are captives of the franchise distribution company and are, therefore, not free to switch providers in cases of poor quality service. Fifth, the lack of retail competition and free choice for small and medium consumers means regulation is needed to protect them.

Although reforms have resulted in a reduction in wholesale prices, the final outcome may be poor customer service for small and medium consumers, and regulations that disregard customer preferences in terms of price/quality ratios. Retail competition that gives all consumers choices as to how to satisfy their power needs, may promote efficiency in supplying small and medium sized customers and reduce the regulatory burden. The challenge is to introduce retail competition without loosing the scale economies that are inherent to a sole distribution network. In order to do so, most proposals for introducing retail competition usually give consumers and independent retailing companies, direct access to wholesale markets, but they usually maintain a legal or de facto distribution monopoly. As do retailers in other sectors,

power retailers buy electricity in the wholesale market and package it to meet consumer demands. Their survival and profits depend on their ability to satisfy consumer preferences and will, therefore, foster a lowering of prices and the development of new products to increase efficiency and consumer welfare. In this case, consumers instead of regulators, decide the appropriate combination of price and quality. By introducing choice at the retail stage through retailing companies or direct access by consumers to wholesale markets, market competition would ensure quality and appropriate pricing at the same time that consumers profit from a single distribution network. Regulators only have to establish rules for the retail market and will not need to set quality standards and prices.

The purpose of this paper is to analyze the issues involved when introducing consumer choice into the power sector. The approaches used by several countries to introduce retail competition are used as illustration to reach the following conclusions. First, forces pushing for consumer choice in the power sector are growing and will soon become a social demand that regulators and utilities in many countries should not ignore. Second, the costs and advantages of free choice can be only evaluated through theoretical approaches, by extending the results from other sectors or pilot experiences. This is because choice in the power sector has only recently been introduced and, in most cases, remains experimental. In addition, the benefits of choice schemes should not be measured by the number of consumers that actually change suppliers, but by the actual benefits, in terms of quality and prices, that arise from consumer choice. Third, although the relative merits of schemes for introducing consumer choice should be evaluated case by case, some degree of unbundling between distribution and retailing services is necessary in order to ensure competition at the retail level. Separation may refer to companies selling services (i.e. those that provide wires services may not be the power provider) and pricing (i.e. the pricing of wires should be an independent and transparent portion of consumers payments when wire companies provide wires and other services). Fourth, although a condition for establishing a successful consumer choice system is the existence of a wholesale market, introducing competition in the retail segment would improve the functioning and increase the competitiveness of the wholesale market. By so doing, retail competition may increase the efficiency of the whole system.

The remainder of the paper is organized as follows. Section 2 describes the forces that are pushing consumer choice and retail competition. Section 3 discusses the features of a general model for retail competition. Section 4 discusses different proposals for introducing consumer choice. Section 5 evaluates the retail competition model. Section 6 discusses the challenges of retail companies. The annexes include the framework for retail competition in five countries.

Forces Pushing Consumer Choice and Retail Competition

Although actual consumer choice is limited in the power sector, social pressures for looser regulations and more consumer freedom have increased and become more widespread in recent years. For instance, most U.S. states are implementing reforms to allow consumers to choose their power supplier. New Zealand has recently[1] introduced new regulations to extend the benefits of competition to all consumers. In October 1997 the structure of distribution tariffs in Colombia was modified to separate power services from wires services in order to promote retail competition. The same forces that transformed the banking, telecommunications, and airlines industries in the recent past also propel this transformation process. However, change in the power sector is expected to take place faster, within a few years, rather than over two decades, and be pushed by forces from within the sector.

One such force is the general claim that regulation has failed to deliver low electricity prices. These claims are grounded in large differences in average prices across countries and across regions or states of the same country, and estimates of so called "stranded costs". For example, in 1993, average prices in the United States, ranged from a low 3.7 cents per kWh in Washington State to a high 10.8 cents per kWh in New York and New Hampshire. In Europe, the purchasing power parity index of prices for domestic power consumers,[2] ranges from 100 in Norway to 411 in Portugal. Estimates of stranded cost, for the US power industry, range between $100 billion and $200 billion. In Spain, a country with a 39 million people, stranded costs have been estimated at US$17 billion.

Ando and Palmer (1998) confirm the hypothesis that regulatory failure to minimize costs is a driving force in the process toward retail competition in the United States. Their work points out that the Energy Policy Act of 1992 marks the starting point for introducing retail competition in the states, and seeks to understand why some states are moving quickly toward full retail competition, while others are moving more slowly. The hypothesis that economic considerations are the driving force in the process towards retail competition seems to be confirmed. Specifically, high average prices and high stranded cost burdens, both indicators of potentially large welfare gains from competition, have a positive influence on the propensity of U.S. states legislatures to introduce initiatives to increase competition.

Another force is that consumers have become aware of the implications of cross subsidy practices. Until recently, despite the fact that electricity is a top consumption item, consumers (commercial, industrial or residential) have had little say on the purchase of electricity and no price information. For decades, electric power has been delivered to consumers by a patchwork of utility monopolies. When small-scale energy generation became viable, the existing monopolies began to loose their large consumers because, using combined cycle and gas turbines, they could generate electricity more cheaply. In an effort to woo those large customers back, utilities began to discriminate in prices, charging industrial consumers lower rates than residential and commercial consumers. At the same time, social pressures may cause regulators in some countries to set special tariffs

[1] See New Zealand New Regulatory Framework April (1998).

[2] See IEA (1997).

for low-income consumers. As a result, medium-sized domestic and residential consumers who find themselves subsidizing industrial and low- income consumers, begin to look for a fair framework and may demand the freedom to choose providers. Yet, the presence of cross subsidies may also be a retarding factor, as discussed below.

In the power sector, freedom of choice for consumers is usually implemented progressively. In a first phase, only large consumers are permitted to choose their power providers. However, if a significant portion of them is receiving power at prices below cost from the franchise power company, they will not be willing to switch providers. This may be interpreted by regulators and utilities as a lack of interest on the part of all consumers for choosing providers. As a result, the political forces lobbying for increased competition may loose interest in the process.

Retail competition would, sooner or later, eliminate cross-subsidies to low-income consumers. A transparent system for directly subsidizing low-income consumers should be implemented. The whole process of introducing retail competition may be stymied if public authorities are reluctant to use public funds for direct subsidies. Higher power prices for low-income consumers have been presented in the literature as a mayor problem of introducing retail competition in the United States.[3]

A third force pushing the transformation process in the power sector is that the reduction in the optimal size of power plants encourages large consumers to generate their own power, giving rise to a new type of power company. Combined-cycle natural gas turbines of 50 to 100MW in size can generate electricity at lower cost (around three cents per kilowatt hour) than large coal powered plants, the traditional low-cost producers. The new smaller units are mobile, and can be plugged into existing transmission systems, making it possible for substations conduct the flow of high voltage energy from generating plants to groups of electricity users. In addition, the easy integration into transmission networks enables the sale of electricity between new firms and final consumers. The ease with which small-scale generators can be integrated in the transmission network and price competitiveness with larger scale units, makes competition in generation economically feasible.

The fourth force is the fact that the reduction of metering, communication and computational costs should facilitate the implementation of large-scale consumer choice In a retail competition scheme, metering by time of use is no longer merely a way of promoting efficient usage; it becomes a commercial necessity and a unique source of information. Each customer needs to be metered according to settlement period, on half-hour or hour basis. Since power prices change 48 or 24 times per day, it is necessary to know how much of each competing retailer's customers used in each settlement period, in order to be able to bill the right customers and settle accounts properly. Therefore, if settlement periods are short, retail competition increases not only the needs for metering, but also the communication and computational requirements.

Although the costs of metering power consumption for one hour periods have been reduced in the last decade (prices ranges from one-quarter to one-ninth of the old prices), metering may be a major problem for widening the scope of retail competition. However, the problem does not seem to be not the cost of metering but regulation. For instance, in Britain, regulations require that the flow of information provision takes place in real time. Such a settlements system does not seem to increase the efficiency of retail markets, but it does retard the introduction of choice for small and medium-sized consumers.

Five, the experience with the transmission grid used as a common carrier in wholesale markets, led to the notion that the distribution network could also be used as a common carrier in selling and physically delivering energy to individual consumers. After electricity has been transmitted to a geographic area, the distribution process consists of converting the high voltages into lower voltages and then physically delivering them to all sorts of users. Like transmission, the physical distribution of electricity involves large fixed equipment costs, whereas its marketing involves little cost. Wholesale power markets were possi-

[3] See Fox-Penner (1997).

ble when regulations established open-access to transmission networks to all generators, large consumers and distribution companies. In most countries, open access to transmission networks was carried out by legally or financially separating integrated utilities into three different companies: generation, transmission, and distribution. As in the wholesale markets, the sales segment of the distribution business can also be unbundled: distribution companies can sell wire services as a monopoly and retail services may become a competitive enterprise.

These forces increased the desire of consumers to manage and understand their power purchases. Beato (1997) concludes that there are no technical or economic reasons to prevent consumers from purchasing power from their preferred retail company and abandoning their captive status. J. Skilling (1997) has emphatically expressed consumer's desires:

> *Imagine the elderly and the poor having a fixed energy bill rolled into their mortgage or rent. Imagine an electric service that could let consumers choose how much of their home power is generated by renewable resources. Imagine farmers negotiating an agreement that ties their electric bill to the prices for their crop. Imagine a business with offices in ten states, receiving a single monthly bill that consolidates all its energy costs. Imagine a meter you can read.*

The media[4] has also welcomed the process of introducing retail competition into electricity supply as a way of giving "power to the people."

[4] See *The Economist* (March 16,1998).

General Retail Competition Model

The basic retail competition model[5] is characterized by the fact that it allows all customers to choose their generator, either directly or through their choice of retailer. In this model, generation is deregulated with free entry and exit, and regulation does not impose capacity requirements on generators. The retailing segment is also deregulated and competing retailers can perform the same roles as they do in other markets. Franchise companies provide transportation and distribution services in order to take advantage of economies of scale in these segments. However, these companies must provide open access or common carriage to all consumers, and are regulated to avoid monopolistic behavior.

The main differences between retail competition and wholesale competition models are the following. First, in the retail competition model all consumers may choose generator, while only distribution companies and large consumers do so in wholesale models. Second, retailing, a specific function of this model, is a merchant function, which does not require ownership of the distribution wires (although in many cases, so far, the owner of the wires also competes as a retailer). Third, distribution companies have open access to transportation services in wholesale models but consumers do not have access to distribution facilities. In the retail competition models, both consumers and retailers have open access to both distribution and transportation facilities.

OPEN ACCESS TO DISTRIBUTION WIRES

The retail model needs open access to all wires, both high voltage (transmission) and low voltage (distribution). The retail competition model separates the provision of wires from power service. Customers may purchase their power either directly from the spot market or from one or several competing power retailers. The transportation and distribution companies supply wire services to market agents. Therefore, rules for open access to wires need to be established.

Wholesale models establish rules for distribution companies and large consumers to gain access to high transmission wires. However, no such rules are required in wholesale models for low voltage wires; thus, a distribution company continues being a monopoly in its own area and needs to be regulated. In retail models, retail companies compete within the service territory formerly served by the local distribution company which remains the exclusive provider of wire services but is not allowed to compete with retail companies to supply other services.[6]

In the retail competition model, therefore, both the upstream generation and the downstream retail sale functions are deregulated and open to competition. Generating companies sell power to electricity retailers or directly to customers, instead of to a local distributor with a monopoly selling franchise. Power retailers or marketers would buy power from generators and sometimes resell it to retail customers, bundled with energy management services. The transmission function (bringing electricity from generators to local distributors) would operate and be regulated the same as it would under wholesale competition, except that power retailers, generators, or customers (not only local distributors), could also arrange for transmission services. The local distributor, or line company, would sell its services as a

[5] See Hunt and Shuttleworth (1996), and Bohi and Palmer (1996).

[6] In real world competition models, distribution companies compete with retail companies in providing power services.

regulated distributor, but it is not the actual retailer of electricity.

TRADING ARRANGEMENTS

In a general retail competition model, generators and consumers are free to enter into contracts for electric power. Consumers may buy electricity from generators, from retailers, or from organized markets. Although market rules and trading arrangements may be different across countries, most systems include a market operator and a spot market.

The retail model needs a spot market[7] to facilitate bilateral and multilateral trading. The reason for this is that carrying out contracts from multiple agents through a third party network requires rules for solving the following issues: a) settling imbalances between expected and actual power flows; b) dispatching the plants in the order of their short-run costs; c) determining the spot price at each half-hour; d) collecting money from the purchaser and distributing it to seller; e) ensuring contract fulfillment; f) providing inter-area payment schemes when different parts of a network are operated separately.

The market operator is the institution in charge of developing the spot market and ensuring that it functions appropriately. However, the existence of a market operator does not imply that there is a single buyer of power that resells it to final consumers. Market operators are not purchasing agencies, they are only market-makers. They do not own the power and they never bear the market risk. As Hunt and Shuttleworth (1996) have pointed out:

> *The expressions "selling to the pool" and "buying from the pool" misrepresent the role of the pool, since producers and retailers sell to each other and not to the pool.*

The spot markets generate prices that approximate marginal cost in real time; therefore, spot prices are variable over time. Consumers and producers may be willing to pay a premium to reduce price variability and enter into contracts that dampen price fluctuations. In these contracts, prices may be fixed for all times and volumes or they may vary according to variables that make the parties share in the spot market risk. As a result, long-term contracts between sellers and buyers are usually developed. A wide range of contracts has been implemented.[8]

DISTRIBUTION AND TRANSMISSION PRICES

Competitive retail requires open access to distribution and transmission systems. This, in turn, requires that prices be set for transmission and distribution services. Prices for access to both high and low voltage wires must provide the correct short- and long-term economic incentives. In the short term, they must give signals for dispatching the cheapest plants without creating congestion problems. In the long run, they must also provide sufficient revenues to the owners of the wires and promote efficient location plants. The problem is finding prices that meet these conditions.

Economics teaches that transportation prices should equal the marginal cost that each transaction imposes on the system. However, marginal cost pricing does not guarantee adequate revenues to cover total network cost in systems with economies of scale. Additional constraints should be added to ensure that transportation companies do not suffer losses. Ramsey (1927) proposes discriminating among consumers and setting prices in inverse proportion to the elasticity of demand so that second-best efficiency is achieved and revenues cover full costs. Although, Ramsey's proposal is theoretically correct, its implementation is difficult because it requires a central organization to solve a large optimization problem, that needs detailed information on each consumer's elasticity and on the technical properties of the network. Ramsey pricing also involves discrimination among consumers, which may be prohibited.

It should be noted that due to increasing returns and externalities in the transmission and distribution network, prices that give the right signals in the short and in the long run cannot be achieved through

[7] Since there are relatively few regulated customers in the wholesale model, a spot market is useful, but not essential.

[8] An analysis of contracts for managing price risk is beyond the scope of this paper.

markets or other decentralized approaches.[9] They can, however, be theoretically achieved through centralized mechanisms. These solutions are hardly ever applied because the central agent needs too much information about consumer and network features. The required information would be difficult to gather either because it is not available or because consumers will not reveal their preferences or demand elasticity.[10] Therefore, a trade-off needs to be made between the efficiency properties of prices and the degree of decentralization in the process of calculating them. The final result is that transportation prices become, in real world systems, a crude approximation to marginal costs.

METERING

In retail competition models, metering each consumer by the length of time of use is a commercial necessity and the sole source of information for billing. Each customer needs to be metered according to the settlement period, on the hour or half-hour. Notice that independently of the type of contract between a retailer and the generator, the actual amount of money that the retailer has to pay to generators will depend upon the actual consumption of the retailer's customers. Therefore, in order to bill a retailer, it is necessary to know the amount of power used in each settlement period by the retailer's customers. Of course, metering at each settlement period is required to bill customers, if prices are to reflect actual costs to consumers.

In wholesale competition models, since the franchise distribution company provides power to all consumers within the distribution area, metering actual consumer consumption only requires metering the power that flows in the distribution areas. That, in turn, requires metering in only a few points. Therefore, billing to a power distribution company in wholesale competition models does not represent problem, despite the fact that the largest consumers within the franchise area are free to choose their providers. In retail competition models, however, all consumers need to be measured in order to ascertain the actual consumption that each of the retailers is responsible for.

Logistical problems emerge when metering must be extended to smaller customers. These logistical problems may be worsened, as happened in Britain, by the specifications of the settlements system that requires that the flow of information be provided in real time, a measure that does not seem necessary for the proper working of the system. To avoid these types of problems in markets open to retail competition, countries introduce measures for ensuring metering capacity before the date when market is liberalized. For instance, in California and Britain, measures have been introduced before the date for full retail access, in order to allow customers with loads between 20kW and 50kW in California and under 100kW in Britain, to rely on load profiling during a fixed transition period. In California, the May 1997 Unbundling Decision, allows retailing companies to provide for their customers meters, other than those commonly furnished by the distribution company.

UNBUNDLED SERVICES

The vision of the electric services industry that emerges under retail competition schemes is one of great diversity in customer services and in service providers. The achievement of this diversity is based on the unbundling of services traditionally supplied by a vertically integrated utility. The results of this unbundling are the provision of opportunities for new entry, for new rivalry among existing suppliers, and for new services to consumers. Thus, from a market structure standpoint, the unbundling of electric services has been identified as a condition for the attainment of a more open market for suppliers and customers. Unbundling can also provide welfare improvements by allowing customers to better align their preferences with available service options.[11]

Unbundling electrical activities is not a benign decision from the standpoint of either efficiency or equity. Moreover, in certain circumstances, it is

[9] See Calsamiglia (1977).

[10] Assume that a central agent wishes to calculate Ramsey prices and try to know consumer elasticities by making consumer surveys. As Ramsey prices are inversely proportional to consumer elasticity demand, consumers, willing low prices, will reveal high demand elasticity.

[11] See Oren and Ray (1997).

not an achievable objective due to economic and technical constraints. Although unbundling is instrumental to increase competition in the electric services industry, it may also raise short-term concerns about undesirable outcomes, such as facilitating the exercise of market power or increasing the cost of service. On the cost side, there are several circumstances in which unbundled supply could be disadvantageous. For example, high fixed or start-up costs or production and delivery economies associated with unbundling, could harm profits and social welfare. In addition, metering costs for the separate unbundled goods would be higher than for the bundled ones. However, even with these shortcomings in mind, unbundling is an essential element for electricity markets in which end-users wish to tailor their service purchases to their service needs by choosing the sellers that are most able to provide those services.

Although unbundling is frequently taken to mean the provision of services by many suppliers (in particular the separation between market and monopoly activities), and bundled service is interpreted as being provided by a sole supplier, it should not be limited to that end. From a broader perspective, unbundling simply means giving customers the right to assemble their own service bundles. Separating structural issues (involving who provides the services), from service selection issues is important because, broadly speaking, unbundling gives consumers additional rights, while more narrowly it limits producer alternatives.

Separation between Generation and Retail

A potential self-dealing conflict exists in the wholesale competition model, when a company is both a generator and a distributor. When purchasing self-generated power, the distribution company, which is the sole retailer in the franchise area, will show little interest in minimizing costs since they can be passed on to captive customers. In the retail competition model, this is no longer a problem because competition in generation and retail allows customers to choose other generators or retailers.

Hunt and Shuttleworth (1996) find reasonable the integration of generation and sales to final customers, based on the little value added of retailing electricity. Their argument is that retailers in other trades perform various functions, such as displaying goods, making choices among manufacturers and unbundling large shipments for sale as smaller bundles. These are value-added activities that earn the retailer a return. The electricity retailer can perform the same activities: taking risks and unbundling services, buying bulk electricity and repackaging it in tariffs or other forms of contract. According to the authors, generators can equally easily perform these useful functions. They conclude that retailing, as an independent activity appears to be a high-risk and low-return business although the presence of independent retailers introduces discipline into the market. However, that presence could be curtailed if generation companies controlled the retail market because market contestability would be affected and effective competition hampered.

Separation between Transmission and Distribution

Distribution (low voltage) and transmission (high voltage) are similar functions at different level of voltage. Hunt and Shuttleworth (1996) point out that there are no efficiency reasons for separating them. However, separate companies provide these services in real world electrical systems even after introducing retail competition. The reason is that the process of reforming electrical systems started by the introduction of wholesale competition. In this model, open access to transmission was required, while open access to distribution was not. Therefore, vertically integrated utilities were separated into three segments: generation, transmission, and distribution. In most countries all transmission assets were pooled in one company or, at least, managed by a unique agent. Distribution assets were assigned to different companies that provide distribution and retail services.

Although there are no strong efficiency reasons for separating distribution from transmission and, no clear distinction between the two functions other than an arbitrary level of voltage, separation between them seems more appropriate for the following reason. The operation of the transmission network by a unique agent seems to facilitate open access to generators and consumers because network capacity may depend upon the manner of network operation. However, distribution wires

with little interrelation with transmission networks may be better operated in small loops. In addition, several distribution firms may allow yardstick competition and provide information to regulators.

Separation between Distribution and Retail Services

The basic retail competition model assumes that distribution wires are operated separately from retail activity. The reason for such separation is that the wire service will remain a monopolized activity, whereas the sales segment is open to competition.

Both retailers and distribution companies bill separately to customers. Nevertheless, they may enter billing agreements and send only one bill on behalf of both or, alternatively, the customer could be sent two bills. For instance, in California, the range of options offered to a consumer is even wider. If a customer chooses to purchase energy from a retailer, three billing options are available: (1) Retailer Consolidated Billing in which the customer receives one bill from the retailer which includes charges from the distribution company; (2) Consolidated Distribution Company Billing in which the customer receives one bill from the distribution company which includes the charges of the retailers; (3) Dual Billing in which the customer receives separate bills from the non-utility electric service provider and the utility distribution company.

Allowing distribution companies to perform retailing may reduce market competition because distribution companies may subsidize their retail customers by imposing a wire tariff larger than the cost to their captive customers, all within the same distribution territory. The distribution company may also discriminate between both classes of customers. For instance, in cases of wire damage, the distribution company will have greater incentives to fix those servicing its own customers first. This sort of situations should be handled by regulators in order to prevent a failure of competition. Nevertheless, most of the companies being restructured own the wires and sell the electricity at the retail level. This may be the reason that only a few customers seek retailers other than their distribution companies. Box 1 offers information on the number of California consumers that switched electricity suppliers.

Box 1: Entry Barriers for Power Retailers in California

Around 300 new energy services providers (retailers) entered the market when it opened in April 1998. By mid-May, of the nearly 10 million California customers of the three IOUs, approximately 40,000 had bothered to change supplier. Although it is still too soon to gain some hindsight on the matter, early evidence shows that several important players are already leaving the market due to the scarce numbers of customers ready to switch suppliers. Reasons for this are as follows:

First, consumers are automatically entitled to a mandated 10 percent reduction in prices if they do not change supplier.

Second, also a direct result of the restructuring legislation, is that all customers, regardless of who they buy energy from, have to pay the *competition transition charge*, a non-bypassable tax to pay off stranded costs of the investor-owned utilities

Third, only the 25 percent of consumer charges is subject to competitive pricing. As stipulated under (AB) 1890, roughly half of that bill will go to the incumbent utility for *poles and wires* charges. Another 25 percent will go to pay for competition transition charges.

Distribution Companies Providers of Last Resort

The unbundling of distribution and retail functions could have consequences on the distribution companies role as default providers of power. For such an essential commodity as electricity, there may be the need for a purveyor of last resort, be it the local distribution companies or any other, with the obligation of offering a tariff to any customer, irrespective of load characteristics or payment record. Regulators have tackled this complex issue in different ways. In Britain, the distribution companies in each area hold first-tier supply licenses that allow them to supply both the franchise and the non-franchise market; whereas competing retailers get second-tier licenses that enable them to supply only the non-franchise market. In California, local distribution companies are default providers in any instance where a retailer fails to comply with supply obligations.

Designing Retail Competition Mechanisms

Section 3 discusses a basic model for introducing retail competition in the power sector. In this model, all consumers independently of their size are eligible to access wholesale markets. Consumers are free to purchase power: they may buy electricity in the spot markets and may engage in all kinds of contracts with generators and retailers. On the supply side, free entry and deregulation is the rule in the competitive segment. The distribution segment remains a regulated monopoly and the model also establishes complete separation between companies providing wires and other services.

Although, the range of proposals for introducing retail competition in real world electricity sectors is wide, none of them meet all the features of the basic model described in Section 3. The purpose of this section is to analyze the main features of real world proposals for introducing retail competition into electricity markets.

An important aspect for defining the scope of consumer choice is the requirements that consumers have to meet in order to be able to buy power without using the distribution company. Regulations set a minimum level of consumption for a consumer to be able to buy electricity from retailers or generators. The scope of eligibility plays a fundamental role in the dynamism of the market and is the key element through which consumers are able to obtain their share of efficiency gains resulting from bulk electricity markets. However, the process toward full customer choice encompasses not only increased efficiency in the allocation of resources, but also an income redistribution process that may affect both consumers and producers in unpredictable ways. That is why a transition period has usually been established based on a gradual market opening, starting with the largest consumers and progressively lowering eligibility thresholds down to full consumer choice after a few years[12] (see Boxes 2 and 3). Although transition schemes are relevant, what follows assumes that the transition periods have ended and all consumers have several choices for buying electricity.

Most proposals for introducing retail competition result from the combination of three features: retail arrangements, market mechanism, and transmission pricing. The organization and relationships between consumer, retail companies and distribution companies define the retail arrangements of a proposal. The market mechanism is delimited by the choice of trading through power pool or bilateral contracts and the scope of consumer options in terms of access to bulk markets. An extreme transmission pricing option is to set optimal local prices at each node for both power and transmission. Other option consists of separating generation and transmission prices. Most real world arrangements separate transmission and power prices. However, transmission prices are not usually fixed through markets.

[12] CSEN (1997) points out that countries where restructuring has started at a later date, and where electricity prices were higher, seem to be opening their retail markets at a faster pace.

Box 2: Local Authorities Establish the Eligibility Path

The Energy Policy Act of 1992 prohibited the Federal Energy Regulatory Commission from ordering a U.S. utility to provide open access to its transmission grid for the purposes of completing a retail transaction. The Act is implicitly reserving for the states the capacity for establishing the eligibility path.

The 1996 Electricity Services Directive of the European Union allows member country governments to decide on the path of retail choice eligibility, although a six-year calendar sets minimum compulsory eligibility thresholds, from 40GWh/year the first year to 9GWh/year the sixth year.

Box 3: Transition Periods to Full Eligibility in Selected Countries

less than 2 years	between 2-4 years	over 4 years
Norway (1991)	Finland (1995-97)	England and Wales (1990-97)
California (1998),	Victoria (1994-1998)	Spain (1998-2007)
New Zealand (1993-1994)	(Australia)	

RETAIL ARRANGEMENTS

Power retail and power distribution are two separate functions. The first refers to the activity of buying power directly from generators or in the wholesale markets and selling it to final consumers. Distribution refers to the activity of carrying electricity from the transmission network to the consumer. Other services may be found when providing electricity, such as metering, financing, and billing.

Arrangements for providing distribution and retail services differ among the various retail competition proposals. The most important difference is the degree of separation between companies providing both services because distribution service is provided under monopoly, while retail services are competitive. Welfare and competition approaches demand complete separation between distribution and retailing companies. However, historical and institutional reasons justify so far a weaker separation.

Complete Separation between Retail and Distribution Companies

This option means that one company may not offer distribution and retailing services. Proponents of this option argue that because of the monopolistic nature of distribution networks, distribution companies should be allowed to sell only wire services. The reason is that a company providing both services may easily cross-subsidize them and discriminate between customers purchasing only wires and customers purchasing both power and wires. Although that argument is solid (see Fox-Penner, 1997 and Bohi and Palmer, 1996), all real world distribution companies are allowed to sell both wires and power services and to serve customers that wish unbundled services as well as those wishing bundled services. Failure to separate wire services from power selling can be attributed to several reasons. One reason is the resistance of traditional distribution companies to reduce the scope of their business. Another is that consumer transaction costs may be

sizeable and consumers will be reluctant to accept a forced shift from their traditional supplier to a new one. After all no legislator will force consumers to abandon their traditional supplier when the point is to give consumers freedom of choice.

Separation may be legal and financial. Legal separation means that one company may not provide both services, but legally independent companies within the same economic group may provide both services. Legal separation makes it more difficult to subsidize bundled consumers at the expense of unbundled ones, thus making the regulation of distribution companies more efficient than without any separation at all. However, economic and financial incentives for discrimination remain as in the non-separation arrangement. Spain's regulatory framework establishes that retailing and distribution companies should be legally independent. The law does not require economic and financial independence for providing both services. The transitory period for legal separation is so long (ten years), that the unbundling may never take place.

Separation between Retail and Distribution Is Not Mandatory

In these mechanisms, one company may provide both services, but independent retail companies may offer retailing services. Distribution companies may offer bundled services and unbundled services. Thus, a distribution company may provide wire service and power to some customers and only wire service to others. If distribution companies sell wire service as well as power, the incentive for cross-subsidizing and quality discrimination is large. The reason is simple, small consumers prefer bundled services to avoid transaction costs. If wire prices are over marginal costs, the distribution company may sell power to final consumers below costs in order to retain them, thus hampering the development of retailing companies. Distribution companies in Australia, Colombia, New Zealand and England may sell both services, but retailers in those countries may also offer retailing services. As mentioned above, lobbying from electricity companies and consumer reluctance to enter into contracts with two companies may explain this model where pure retailing companies have to compete with companies that perform both retailing and distribution. Within such a setting, competition is unfair for pure retailers and retailing companies are unable to grow. The market share of pure retailers is negligible in most countries where arrangements like the one just described prevail, and all customers are large industrial ones. For pure retailers to compete, companies providing both wire services and power should, at least, abide by the following separation rules. First, the accounting information of each activity should be separated in order to allow regulators to fix the price of distribution equal to its marginal costs and avoid cross-subsidization. Second, distribution companies should separate billing for wires and retail services.

Since 1994, Colombia's regulatory framework permits the establishment of retailers for power services. Consumer choice and free entry is allowed for all activities that are not explicitly restricted in the Colombian Constitution. In addition, the 1994 Electricity Service Act and later resolutions of the Energy Regulatory Commission ratify and build on this principle. Nevertheless, pure retailers have not been established. Distribution companies are publicly owned and their losses are absorbed by the national or municipal budgets, making it impossible for a private for-profit firm to compete with them. Consumers purchasing only wire service from a distribution company pay higher price than those requiring both wire and power services. In 1997, two reforms were enacted to make competition fair for retailer companies in Colombia. On the institutional side, distribution companies will be sold to the private sector. On the regulatory side, a new resolution establishes that distribution companies shall bill each service independently, in an itemized fashion.

Only Distribution Companies May Offer Retailing Services

Distribution companies continue to offer both wire and power services. However, distribution companies may buy electricity in the wholesale market on behalf of consumers. In theses schemes, consumers do not negotiate with generators, but they may choose between buying bundled wires and power or purchasing power on a real time price basis, as in the efficient direct access model (Hogan, 1994).

Unbundled Experiences

Faruqui and Kirsch (1998) analyze the experiences of Argentina, Australia, Canada, Chile, Norway and the United Kingdom. Their conclusions are discussed next.

Argentina, Canada, and Norway do not have unbundled distribution and other retail services and those nations that have unbundled services have done so only very recently. In nations that have separate services for distribution and retailing, those services account for only a small share of distribution costs. The utilities are reluctant to unbundle distribution and retailing services because of the difficulty in identifying sensible schemes for separating them and the fear of imposing huge costs on consumers. The unbundling initiatives generally originate from governments and regulators. In fact, utilities representatives in Australia and Britain consider the unbundling of distribution a consequence of government policies to promote competition, and they only vaguely believe that competition will benefit consumers. Utility representatives in these countries report that technological problems do not pose insurmountable barriers to unbundling distribution, but they do add to cost and time requirements. They are concerned with metering, billing and information-handling technologies and indicate that the introduction of competition is smoother if it is staged to allow sufficient time to implement the new information systems and build the infrastructure necessary for handling competitive market transactions.

The set of potentially unbundled distribution services comprises facilities services, revenue cycle services, and energy services. Facilities services (corresponding approximately to wires services) comprise: connections, line drops, transformers, and power factor corrections. They are provided by equipment throughout the distribution network, but these services sometimes are unbundled when provided by equipment on or near a customer site. Connections and line-drops services connect the customer load to the power system either through a standard single connection path or through an enhanced double path that reduces the chances of customer outage. Transformers, power factor corrections and premium power quality services control the quality of the power received by the customer and also control the effects of the customer load upon the power system. Meter installation service provides the equipment that measures the customer's use of power. Revenue cycle services include monthly meter reading and billing services, as well as less regular customer contact services. Energy services (supply, audits, analysis and reporting, and equipment financing) are debatably not a part of the distribution function at all, for example, in Australia these services are offered in an unbundled competitive fashion as are most facility and revenue cycle services. In Britain, the latter are also offered unbundled and competitively.

Country practices show that unbundling may occur with and without opening services to competition. The relationship between unbundling services and opening them to competition is different among countries and between services. For instance, in Canada and Norway some services once offered as part of bundled distribution service, such as energy audits or extra transformers, must now be purchased separately by the customer on a competitive basis. Customers in Argentina and Chile must purchase line maintenance, meter reading, customer connection and billing services separately but through their local distribution monopolies. However, to better control costs, these monopolies have adopted the practice of purchasing the services from subcontractors through competitive processes. A mixed arrangement is the installation and maintenance of assets as connections, transformers and meters in Britain, where the installation of new assets is competitive; but once installed, maintenance of the equipment becomes the responsibility of the distribution monopolist.

TRADE MECHANISM

In the retail competition model discussed in section 3, consumers can buy power either directly from the spot market run by an independent agent, or from one or several competing retailers. In practice, however, going directly to the spot market is feasible only for large consumers, able to obtain the information required and to afford the transaction costs involved. Small and medium-size consumers are more likely to either aggregate their demands, if the system allows for this option, or use the services of a retail firm.

The alternatives are as follows: (1) consumers may access wholesale markets directly or through retailers or marketers; (2) consumers are not allowed to use intermediaries to access the wholesale market; (3) consumers may not buy directly from the wholesale market, but must use retailers or marketers; (4) consumers may not buy wholesale electricity.

Scheme four is a wholesale scheme whereas the others involve retail competition. While the first alternative provides consumers with more options, in the real world individual consumers face several constraints (such as minimum volume and payments guarantees) to access wholesale markets. Although their purpose is not to restrict competition but to ensure market security, these practices may be use for preventing access wholesale markets by mid-sized consumers.

In New Zealand and Norway, consumers, regardless of size, may buy power in the wholesale market. However, small consumers have to resort to retailers in order to profit from competition because barriers to entry into the wholesale market for residential consumers are large both in terms of operator fees and metering practices. In Britain non-franchise customers have the option of choosing their supplier from one of the twelve distribution companies or from any of the generating companies.

DISTRIBUTION AND TRANSMISSION PRICING

Section 3 notes that transmission and distribution pricing is a necessary condition for open access to wires. However, available pricing schemes are not satisfactory either because they require centralizing too much information or because they do not meet appropriate efficiency requirements. As discussed, the lack of efficient and decentralized models for pricing transportation (both transmission and distribution), is not due to lack of research, but to the impossibility to find such schemes in electrical networks because they present both economies of scale and externalities.

The purpose of this section is to discuss the main options for addressing transmission and distribution pricing in retail competition models. The discussion assumes that independent companies provide distribution and transmission services. By so doing, the cherry-picking problem (a major concern of distribution utilities selling retail services), and the ability to institute cross-subsidies (a major concern of pure retail companies), are not directly addressed. Nevertheless, the results may easily extend to cover cases with bundled retail and distribution services.[13] The analysis will also assume that a unique company provides all distribution and transmission services so that competition is not feasible and transportation prices remain regulated. Nevertheless, results may be extended to the case of several companies holding monopoly power within their franchise territory.

Most pricing schemes use two transportation prices. One price, the access fee, covers the cost of having the network available, which may be considered as the right to use the existing network. The second price should reflect the marginal cost of transporting power through the existing network, which consists of energy cost. This cost, in turn, is often broken down into two components: the cost of power losses and the cost of dispatching expensive plants due to network restrictions.

Pricing Long-Term Cost: Access Fee

The problem of setting access fees for consumers and generators may be solved in two steps. The first step determines the revenues that the company that owns the network should receive for allowing market agents to use it. The second step assigns payments to market agents.

Regarding the first step, a distinction should be made between the existing network and new additions. For the existing network, traditional methods estimate the operational cost, excluding power losses,[14] and the capital cost for a specific period of time (usually a year). While the calculation appears simple, there are serious problems of incentives and regulation. Regulations should ensure that if a company is efficient in managing assets, it could earn an appropriate rate of return

[13] For a discussion of access prices in the case of integrated firms, see Laffont and Tirole (1996).

[14] Losses are taken into account through the so-called "short-run transportation price."

on its investment. It should be noted that the regulated company will have incentives to exaggerate costs since the regulator will assign revenues based on his assessment of company costs. Several alternatives, which are beyond the scope of this paper, may be used to mitigate this risk, standard costs and yardstick competition, among them.

The construction and operation of new lines is often assigned through a public bid process. The winning proposal is the one requiring the smallest payments.[15] This procedure means that regulators do not have to calculate operational capital costs every year because company revenues would be included in the bid proposal. If there are several proposals, competition for the line drives bidders to minimize cost. However, the optimal expansion of the network requires that a new line should be undertaken only if the payments of the winning proposal are larger than the expected value of power cost reductions resulting from the new line.

The assignment of payments among consumers is the second step. Most systems distribute payments as a function of the power provided to the grid independent of the source, destination or contract. The price per unit is calculated by dividing the network total cost by the number of power units expected to be delivered by the systems. Expected demand for transmission and distribution during a year may be relatively easy to forecast from current usage patterns. Although errors may be expected, differences in the revenues of the transportation company due to demand errors in forecasting may be compensated for in the next regulatory period.

Other approaches for assigning payments among consumers have been used. For instance, Spain uses several prices, one for each group of consumers. The price for each consumer group is inversely related to demand elasticity. In Germany, the distance between the production and consumption location is taken into account to figure out the transmission network cost. For bilateral contracts, the relevant distance is that between the power plant and consumer locations. For trading through the pool, the pool is assumed to be located in a specific node of the network and a transportation price is assigned to pool power. Transportation prices for consumers are the result of summing up pool transportation cost plus the transportation cost from the pool to consumers' locations. Another proposal assigns network cost as a proportion of the profits received by each relevant group.[16] These nonlinear approaches try to avoid the inefficiency problems inherent in the simple linear scheme. However, if common costs are small in relation to power costs, the distortion from more theoretically efficient and complicated price schemes may be larger than distortion from simple linear prices. Distortions in complicated schemes come from gathering information, computational requirements, and the lack of social acceptance of price schemes that are discriminatory and difficult to understand.

Nodal Prices versus Congestion and Power Loss Prices

The Problem

If network users have already paid an access fee that covers the fixed cost of the existing network, a price for covering the short-term energy cost associated with the use of the network should promote optimal dispatching. The price needs to ensure balance between payments and power costs.

An optimal dispatched system is a system that minimizes the generation cost of satisfying the demand at each node of the network given the available network. In such an environment, the marginal cost of generation at each network node may diverge as a consequence of network restrictions. If the network has excess capacity, the marginal cost of generation at each node will be similar. If the network has restrictions, then the marginal cost of generation at each node will differ. Therefore, the short-run marginal cost of transportation from one node to another will be the difference between marginal cost of generation in both nodes.

[15] Payments may be established in terms of a price per unit of transported power, in terms of annual fees, or a combination of them.

[16] See Bosch and Escribano (1988).

Applying this rule requires estimating the marginal cost of generation at each node. For so doing, two approaches may be envisioned. The first is an optimization approach that would use complicated models for estimating optimal generation and nodal generation prices. The transportation cost would be calculated as a difference of optimal nodal prices. The second is the market approach which proposes a market at each node, resulting in a market price at each node. Again, the difference between two market nodal prices would be the transportation cost. The market approach may be useful for some specific nodes, where many buyers and sellers are willing to trade. For instance, for trading electricity in a node at the border of the country. There, the market power of each agent is small and the resulting prices would be competitive. However, lack of competition at most nodes of a network, where only a few agents are willing to trade, makes the market approach to nodal and transportation prices not useful.

Solution through Nodal Prices

Some authors have pointed out that calculating the short-term marginal cost of transportation becomes redundant for two reasons. One is that calculating short-term marginal cost is equivalent to calculating power nodal prices. The other is that the correct signals for minimizing generation cost are better given by nodal prices than by transmission prices. The recommending that stems from this analysis is that nodal spot prices should be used and avoid calculating transportation prices. In this environment, generators choose the quantity that they are willing to sell at each node by maximizing profits. Similarly, consumers and retailers choose the quantity that they are willing to buy at each node. When the market clears at each node, the production at each plant is optimal.

This approach is theoretically correct. However, estimation of optimal nodal prices through markets is not feasible due to lack of competition at most nodes. As mentioned before, competitive power markets can be established only at nodes with particular commercial features; for example, nodes at a country's border. If nodal prices cannot be calculated through markets, they should be calculated through optimization models. This, in turn, rises two questions. The first one refers to practical issues: may a centralized agent gather the huge amount of information required to calculate optimal prices? Even more to the point: will generators and consumers willing to reveal the correct information about themselves? The second question refers to a philosophical issue: If optimal prices are calculated by using mathematical models why is retail competition is needed? As Hunt and Shuttleworth (1996) point out:

> *The transmission system may be complex and difficult to operate, and energy may flow in all directions, but it has the same economic characteristics as other transport systems. The price of the electricity at two locations will differ by the price of transport. If the price is badly set, by poor regulation, then the amount of transport will be sub-optimal. If it is set at marginal cost including the shadow prices of constraints, and if the system is expanded when the cost of constrains exceeds the cost of relieving them, then the transport system will be optimal. This is the job of the regulator of the monopoly transmission system.*

Solutions through Congestion and Power Loss Prices

As mentioned above, short-run transmission and distribution costs have two components: the cost of losses and increases in generation cost due to network restrictions. Most systems solve the problem of distribution and transmission pricing by dividing it into two partial problems. One partial problem is the calculation of the additional power losses in the network that result from an increase in consumption at a network node. The other problem is the cost incurred due to an increase in consumption at a node that provokes congestion and prevents use of the cheapest plant.

Regarding the first problem, each transportation customer should be responsible for the marginal losses associated with their specific transaction. These assignments are usually calculated from the penalty factors that electric power systems use for generator dispatch. However, some systems, for instance U.S. power industry, make each customer responsible for losses that are set equal to average loss rate of the power system. This approach will encourage costly transportation transactions and

discourage transactions that are cheap or contribute to loss reduction.

Regarding the second problem, two basic mechanisms are used. The centralized approach where a central agent calculates transmission prices, in real time or some hours in advance, according with the bids of all market agents. Transmission price is the difference between power prices at different nodes. This centralized mechanism is feasible because it is based on optimal dispatching programs that already exist. The market mechanism will give the right of power transmission to those market agents offering the highest prices for the transmission rights.

OPTIMIZATION VERSUS MARKET APPROACHES

Hunt and Shuttleworth (1996) discuss two approaches for selecting the features of a scheme for retail competition: trading arrangements, pricing schemes and retail arrangements. In the market one approach, the goal is to ensure that electricity markets work as any other market, while in the optimization approach, the goal is to ensure optimal resource allocation.[17]

The market approach results from observing normal markets, where producers, wholesalers and retailers own a physical product and transport it from one place to another in different ways. The retailer purchases electricity from the pool, repackages it into contracts and tariffs and sells it to customers. A market model for retailing (i.e. a model designed using the market approach) requires a large amount of settlement software to clear central accounts. Those who use this approach observe that, if the trading system is set up to accommodate bilateral energy transactions, competition will insure that arbitrage and contestability will push the market price to the competitive level. Under the alternative approach, electricity is not considered like other commodities, buyers and sellers do not arrange their trading price and quantity directly but through a central auctioneer. The auctioneer receives bids from buyers and sellers, and sets a price that clears the market, and all trading proceeds at that price. The generation or the distribution company delivers power to the final customer, charging the spot price. As final consumers pay the same price, the optimal price, regardless of who is the electricity provider, the generation or the distribution company, the conclusion would be that the distribution company may do the job and cumbersome settlement procedures would be avoided. Under this approach, the customer will be free to make his own arrangements for insurance and hedging against the spot price.

If models derived from both approaches work well, their results are similar. However, mechanisms derived from the market approach seem to work better than those derived from the optimization approach. The reasons are two. One is that the working of the later rests on central auctioneer calculations that, due to large computational requirements, may be wrong. The other is that the central auctioneer's lack of the incentive for performing well. Black (1994) summarizes the debate around the optimization and market approaches:

> *Anyone who is familiar with the long theoretical debate among economists over whether central planning is more efficient than market allocations of good and services, can only find the debate amusing. The central economic lesson of this century is that imperfect markets work a lot of better than imperfect central planning. But the proof is not to be found in academic debates. It is to be found in the real world, as consumers look for bargains and ask regulators to get out of the way. It is to be found as we ask how we ever built a system that delivers power to residential consumers at 150 percent or 200 percent of what the market-clearing price ought to be. I live in Con Edison territory. I get a lesson in utility inefficiency every month, when I open my electricity bill.*

Retail Arrangements

The bundled provision of wires and power services can be readily associated with optimization paradigms, whereas unbundling them seems to be an inherent condition for the proper working of any

[17] Economists have used these two approaches extensively to discuss mechanisms for resource allocations. In the controversy between Lange (1938) and Hayek (1989), Lange derives his proposals from an optimization approach, while Hayek derives his from a market approach.

market scheme. A quick overview of unbundling objectives might be clarifying in that respect. First, unbundling wires and other services is a necessary condition for consumer choice. If these services are bundled, consumers do not have a choice other than buying both services to the franchise company. Second, unbundling improves economic welfare in the consumption of end-use services. Insofar as it allows consumers to receive and pay for the particular service attributes that they desire. Third, unbundling reduces price discrimination by motivating more detailed, service-specific cost analyses. Fourth, unbundling constrains market power arising from tie-in sales. Tying can be used to raise entry barriers by reducing customer choice and the potential market share for entrants, and also by forcing new entrants to offer similar bundles. If bundling can be used to extend market power, then unbundling may prevent the leverage of market power from one market to another, so as to facilitate increase in competitive pressures within the industry. Fifth, unbundling provides information about the cost of each service that facilitates consumer rational decision-making and, for alternative suppliers to identify opportunities for entry.

Trade Mechanism

Under the market paradigm, consumer access amounts to consumer's ability to purchase electricity through bilateral contracts with generators or at spot prices. Retailers, independent from distribution companies, are also allowed to supply power to customers choosing an energy services provider for the energy portion of their demand. Under the optimization paradigm, customers cannot enter directly into commercial arrangements with generators (this allows wholesale competition for commodity electricity), and there are no independent retailers. Therefore, consumers do not have direct retail choice. Distribution companies supply power and wires to captive, franchised customers who are only able to choose between traditional rates or real-time rates for the power portion of their bills.

Distribution and Transmission Pricing

Although nodal prices may be calculated through markets or by using optimization models, proponents of nodal prices are regarded as favoring an optimization approach, whereas proponents of pricing the distribution and transmission services explicitly are taken to have a market approach, (even though distribution and transmission prices, the marginal cost of losses and the cost of congestion are calculated through optimization models).

The reasons for such characterizations are the following. First, for market prices at each node to represent marginal cost, some competition is required at each node. This feature, many traders at each node, is not met by real world networks. Therefore, it is not feasible to calculated nodal prices through markets, they must be calculated through centralized optimization models. Second, explicit separation between prices for generation and those for distribution and transmission leaves room for markets regardless of what the regulator determined.

Examples of Optimization versus Market Approaches

The efficient direct access model, proposed by Hogan (1994) follows an optimization approach, whereas, the basic retail model of section 3 is an example of the market approach.

Hogan's proposal rests on three features. First, exclusive retail sales franchises for distribution utilities, which means that consumers do not have retail choice. Second, a competitive wholesale market with a readily available spot price. Third, distribution companies offer real-time pricing to all customers who want it. This, in turn, requires that the market have an efficient pool for pricing electricity to final consumers. Advocates of this model argue that if a wholesale market is correctly set up to produce accurate hourly prices, and these prices are made available by traditional franchised monopoly distribution companies (in place of the simple retail tariffs they use today), then every retail customer will be able to achieve the equivalent level of efficiency he would obtain in a robust competitive retail marketplace, without the hassle of shopping and contracting for suppliers. In Hogan's words:

> *The customers would become de facto direct access customers in every way that can be justified, consistent with an efficient and competitive generation market. Faced with the uncertainty and volatility of the spot*

price, customers may look for longer-term arrangements that would reduce or fully eliminate the risk. Generators, selling into the same market for the spot price, would have the complementary interest and would be the source of long-term contracts for those customers who felt the need. These contracts to protect against price changes would be the functional equivalent of the long-run contracts for differences relative to the pool that are at the heart of the long-run market in the UK system. There would be no need for the customer to announce to either the regulator or the utility that a contract for price hedging had been obtained from a broker in the market, found through the yellow pages. There would be no need for regulators taking any further action. With the competitive wholesale market arms-length spot prices, and time-of-use rates, Efficient Direct Access would be in place.

The efficient direct access model eliminates retail competition and forces the existence of a pool for fixing power prices, two marks of the optimization approach. By assuming optimal wholesale markets, consumers may attain all benefits of competitive markets without their costs. However, if wholesale markets are not optimal, distribution companies do not have an incentive to make them work because their profits are independent of wholesale prices. Arm-length spot prices may guarantee optimal prices if wholesale markets are efficient. However, when they are not, there is any mechanism driven the wholesale markets toward optimality.

Under the retail competition model of section 3, unregulated retailers and consumer free choice are essential for the model to work adequately. A wholesale market is required, but it can be developed through bilateral contracts or by a pool. In this model regulators are concerned with transportation prices, but they do not worry about power prices. These characteristics correspond to market approaches. Fox-Penner (1997) concludes that the retail choice model is the one that more closely replicates the conventional modes of buying and selling products in other markets, which is the goal of market approaches.

Evaluation of the Retail Competition Model

This section analyzes the advantages and problems of electricity retail competition schemes from different perspectives: conventional economic theory, risk management and experiences from other industries. This type of analysis may be useful insofar as evidence is still scarce as of how retail competition schemes work in real life. Once the retail competition models become widely adopted and enough time elapses, more robust evaluation exercises may be performed.

CONVENTIONAL ECONOMIC APPROACH

Benefits of Retail Competition

Retail competition models introduce competition on the demand side and complete the liberalization of electric systems. For the sake of coherence, after large consumers and the utilities are able to profit from wholesale market opening, full retail choice will allow benefits to all customers. Competing retailers put an end to the old idea of franchised, captive customers, unable to choose and, therefore, forced to abide by monopoly conditions, both in terms of prices and of quality. Nevertheless, high prices and low quality would not be the unique outcomes of a monopoly scenario; receiving bundles of products that the consumer did not choose, and being unable to choose a provider and a preferred combination of services would prove equally frustrating. Retailing is transforming the stodgy utility culture into a normal business culture. Therefore, the expected benefits from retail competition are similar to those expected when introducing competition in any other industrial sectors; namely, efficient prices, greater diversity and innovation, and more attention to consumers. In addition, retail competition fosters transparency within the power systems by way of providing information on real costs and prices among different activities and demand segments. This information will prove most useful to regulators.

Favor Efficient Pricing

Retailing allows price arbitrage when costs are not properly reflected in prices, therefore favoring efficient pricing. Arbitrage consists in taking advantage of the differences in prices and margins among different demand segments by offering lower prices to high-price and high-margins segments in order to attract that demand and obtain a profit. If arbitrage is feasible, the final outcome will consist of prices that are adjusted to the costs prevailing in each demand segment, up to the point where no more profit is achievable. Competitive retailers will be instrumental in introducing price arbitrage, by means of price differentiation in terms of the different consumption patterns of their customers. Competition among retailers will advantageously replace tariff regulation by delivering cost-adjusted prices with no cross-subsidies or excessive margins. Even in systems where retailing coexists with centralized tariffs, consumers can get better terms than under the tariff regime. Although incumbent utilities will do what is necessary to keep their customers by means of standard offers (New England) and plain rate reductions (California), the mere existence of retailers benefits all consumers since arbitrage will provide useful information to regulators and consumers, even those who decide not to change providers.

Products and Services

Retail competition mechanisms are expected to increase the diversity of products and services, enhancing consumer welfare and economic efficiency. In contrast to regulated distribution companies, unregulated retailers can profit from selling power or other products to consumers. Moreover, competi-

tion will prompt retailers to differentiate their energy services. Some may choose to specialize, for instance, in renewable energy to be sold to environmentally-conscious customers willing to pay higher prices to protect the environment.

Technologies and Innovations

In retail competition schemes, economic agents face the appropriate incentives to develop new technologies that will lower the costs of supplying or using electricity or expand the range of productive uses of electricity. The incentives for innovations in power supply are likely to be similar since the status of generating companies does not differ between retail competition and wholesale schemes. This includes more efficient generation technologies, new methods of monitoring transmission system use and electricity consumption, and new methods of metering and storage.

Incentives for demand-side innovations such as new energy efficient appliances and equipment, new uses of electricity such as electric vehicles, and new ways to shift load from high-cost to low-cost periods are strong in the retail competition models. The reason lies in the pressures inherent to a competitive environment that requires new products for satisfying consumers and increasing market share.

Attention to Consumers

Utilities holding a monopoly in the sector have traditionally paid scant attention to customer service. The presence of retailers, or the mere possibility of future competition has forced existing distributors to establish appropriate customer services and commercial divisions. This is in response to the forthcoming scenario where clients became more sophisticated in a diversified and dynamic retail market.[18] These clients will be allowed to exercise their options to select their preferred quality-price-service mix. Even partial retail competition will mean improved customer service.

[18] The headline, "As Spain Opens Up Electricity, Iberdrola and Others Aim to Please," of a recent Wall Street Journal (May 15, 1998) article on the opening to competition of Spain's electricity market shows the change in corporate culture within the incumbent utilities.

Reduction of the Regulatory Burden

Market mechanisms operating under full retail choice schemes are expected to progressively replace regulators in many fields. The pace and scope of that replacement process will depend, among other factors, on the political will of the regulatory authorities, and on the technological and institutional features of the different restructuring experiences. One clear outcome of all unfolding retail competition models appears to be increasing customer freedom in terms of moving away from expensive, low-quality power providers. The ability of consumers to choose electricity retailers constitutes the most efficient regulatory mechanism when it comes to striking a suitable balance of quality and price for each customer.

Sector Reform Requirements

Introducing wholesale competition requires the separation of generation and transmission, as well as separation between retailing and generation due to the conflicts that potential self-dealing could give rise to. Retailers owning some generation capacity would not represent an obstacle for the proper working of a retail competition model. When purchasing from its own generation, the distribution company (sole franchise retailer in wholesale models), will show little interest in minimizing costs that can be passed on to captive customers. In the retail competition model, this is no longer a problem because customers can choose other generators or retailers.

Objections to Retail Competition

Reliability

Retail competition opponents maintain that a fully competitive market will reduce the reliability of electric service. They argue that if the utility loses its monopoly, capacity reserves will be at risk. However, making service available when other power sources are already being used is a market service like any other, and suppliers will provide peaking service if there is demand for it. Moreover, competition seems likely to improve reliability because it would increase of number of consumers choosing interruptible services and provide an incentive for good maintenance. In a competitive en-

vironment, more customers will choose interruptible service in return for lower rates, which will improve reliability for customers choosing noninterruptible service. In addition, power plant outages should be less common in a competitive market because an unregulated producer cannot earn a return on out-of-service assets nor keep his customers if he provides poor service.

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Evidence does not show that regulated monopolies are more reliable that deregulated ones For instance, the deregulated natural gas industry in the United States successfully faced harsh weather conditions during the winter of 1993, whereas many electric utilities suffered important shortages. Also the reliability of postal services, air transport or telecommunications services did not worsen when competition was introduced.

Uneconomic Bypass

A second complaint raised by opponents of competition is that some customers will leave the utility system when it becomes for them less expensive to be served by the incumbent utility. This uneconomic bypass is economically implausible, can occur only in specialized factual settings and, therefore, is unlikely to be economically significant. If it were significant, the need for more deregulation would become all the more apparent. In fact, given prevailing utility inefficiency, reflected in above-market rates, situations of uneconomic bypass are surely swamped by situations where bypass would be efficient because the new producers have lower costs. There are also examples of sensible uneconomic bypass, based on green or renewables options from ecologically minded customers ready to pay higher rates for environment preservation. The only worrying option, therefore, is that of uneconomic nonbypass, by ill-informed customers fearful of exercising their right to choose.

Cherry- Picking

A further complaint leveled against retail competition is that new producers will pick the best customers. Actually, what will happen is that competition will eliminate cross-subsidies. No customer, regardless of size, will be supplied at below-cost prices, since this would cause the business to lose money. The elimination of cross-subsidies is not a shortcoming, but an advantage of competition.

Public Interest Programs

In the past, electric utilities have played a key role in providing a variety of public goods, including universal service, protection of low-income customers, protecting the environment, and serving various national energy policy objectives. With few exceptions, the legal obligation to provide these goods were imposed on utilities that either owned generation or sold at retail. Retail choice makes the allocation of responsibilities like these more difficult. Discussions of retail regulation have raised the question of which segment of the new industry, if any, should bear future public interest obligations. Because of the nature of these obligations, the principles that guide efficiency in private goods markets offer only limited insight. Moreover, because the physical, economic, and political nature of these public goods are different, generalized solutions are essentially impossible.

Transmission Capacity

In competitive models, the impetus for expanding capacity will come from the parties that will benefit from the expansion, who will be expected to pay for it. The problem is that the benefits from investment in transmission capacity cannot be fully appropriated by those bearing the cost of the investment, since all parties connected to the grid will benefit. Market incentives will generally lead to underinvestment in transmission capacity. The possibility of underinvestment is less serious in the wholesale than in the retail model because the cost of additions to transmission capacity will likely be a smaller share of the total cost of power transactions and the parties involved would be less inclined to risk losing the transaction by resorting to free-riding. In the retail model, in contrast, the smaller marketing companies will not be able to exploit the scale economies in transmission and the incentive to free-ride will be stronger.

MANAGING RISK APPROACH

Section 3 pointed out that consumers and producers may be willing to pay a premium to reduce

spot market price variability and engage in contracts that mitigate price fluctuations. An evaluation of retail competition models from a risk management standpoint requires analyzing if contracts for mitigating and managing price risks are expected to work better under retail competition than under other trading arrangements.

Bohi and Palmer (1996) compare the performance of market contracts in wholesale and retail competition schemes and conclude that, from a risk management perspective, retail competition schemes are better than wholesale ones. They argue that the trade-off between premium and risk and the allocation of risk is more efficient in retail competition than in wholesale models. They also point out that in the retail competition model the risk is borne by consumers who are able to manage this risk better than generators.

The following arguments support the authors' conclusion regarding the trade-off efficiency. The incentive to enter into contracts and the relationship between the spot price and the contract price will depend on the risk preferences of buyers and sellers. If both parties were risk neutral regarding spot price variability, they would be indifferent between buying at the variable spot price or at a fixed contract price that equaled the mean value of spot prices. Risk-averse buyers, on the other hand, would be willing to pay more than the average spot price for a contract that smoothed the acquisition cost of electricity, while risk-averse sellers would be willing to take a fixed contract price at less than the average spot price. A contract is efficient if it achieves an optimum trade-off between risk bearing and the cost of shifting risk to another party. The trade-off between risk and price will vary across customers and generators, so that the market model that best represents the diverse interests of customers will likely achieve the highest efficiency level.

The model that better represent preferences of consumers and generators is a model where final customers enter into contracts directly with generators, because their interests will be better represented than if they use a non-competitive intermediary, such as a regulated distribution company. Therefore, retail competition models that allow this direct relationship among consumers and producers are expected to perform better than wholesale models. However, the transaction cost is large because individual consumers and producers need to accumulate and manage too much information.

Retail competition models with retailer companies may not do a good job representing consumers' preferences. However, competitive pressure will force retailers to improve their knowledge of consumers' preferences. In contrast, distribution companies will not feel the same competitive pressures, and will not be as responsive to changes in consumer preferences. The result is that retailers will obtain a better trade-off between price and risk than distribution companies. Therefore, a superior trade-off is likely to occur in retail competition models where consumers engage in contracts through competitive retailers.

The second argument used by Bohi and Palmer (1996) is that contract efficiency requires that risks are borne by the party that is most able to manage it. Since the primary sources of price risk come from variations in consumption and in the marginal cost of generation, and consumers have much more flexibility to alter consumption patterns, the retail model is more likely to encourage efficient responses from consumers.

Transaction costs involved in creating and enforcing contracts are relevant to evaluate the capacity for undertaking efficient contracts to manage risk. Transaction costs will increase directly with the number and variety of transactions that take place, which may be expected to be higher in the retail model than in the wholesale model. However, retailer companies may specialize and reduce the transaction costs of gathering information on consumers' preferences. Therefore, specialized retailers are expected to appear offering a few contracts appropriate for different groups of consumers, thus reducing transaction costs.

LESSONS FROM OTHER INDUSTRIES

There is more than a decade of experience in the industrialized nations with regulatory reform in a variety of industries that share some similarities with electricity. Natural gas, telecommunications, airlines, railroads, and trucking are all industries in which competing producers use a network of wires, pipe, roads, or rails to reach their customers.

Economists have analyzed the effects of deregulation and restructuring on these industries in great detail, aided by a wealth of data collected by regulators and trade associations. An overwhelming consensus emerges from these scholarly studies, namely that real world competition, though not necessarily perfect, is far better for consumers than economic regulation.

Reforming Analogous Industries

From an economist's perspective, these five network industries share a number of similarities with electricity. Like the electric industry, all five have a production, transmission, and distribution stage. Gas wells, telephone equipment, trains, airplanes, and trucks are, at the production stage, analogous to power plants. Interstate gas pipelines, long-distance phone lines, railroad trunk lines, airways and air traffic control, and interstate highways offer long-distance transportation similar to high-voltage transmission lines. And local gas pipes, local telephone lines, rail sidings, airports, and local streets are economically similar to electric distribution lines.

The production side of the other network industries was deregulated[19] in the late 1970s and early 1980s. Most natural gas wellhead prices were deregulated between 1978 and 1984. Competition in telephone equipment came in the late 1970s. Airline route and rate regulations were phased out beginning in 1978, and surface freight companies were partially or fully deregulated in 1980. Large segments of these industries are also subject to some form of open access regulation. Interstate natural gas pipelines became open access transporters during the late 1980s. When AT&T was broken up in 1984, local phone companies were required to allow competing long-distance companies to use their lines to reach customers. The federal US government has long had authority to impose open access on a railroad in specific cases. Airlines and trucking companies, meanwhile, both use publicly owned infrastructure that is generally open to all competitors.

[19] In economic terminology, deregulation means the partial or complete elimination of governmental restrictions on prices and entry.

Customer Benefits

In all five industries, regulatory reform produced significant customer benefits that grew over time. Inflation-adjusted prices fell within two years after regulatory reform, often by 10 percent or more. Within ten years, prices were at least 25 percent lower and, in some cases, 50 percent lower.

Although regulatory reform did not cause all of these price reductions, it is worth noting that most predictions of price reductions from electric restructuring fall comfortably within this range. In an August 1997 report, the U.S. Energy Information Administration estimated that in the next two to three years, competition would lower the average retail price of electricity by between 6 and 22 percent; by 2010, the price would be roughly 11 to 28 percent lower than it is today. Citizens for a Sound Economy Foundation (1995) projected that retail competition would reduce the price of electricity by 13 percent in the short run and 42 percent in the long run.

Statistical studies of transportation industries that control for other factors affecting prices have consistently shown that regulatory reform produced more than $50 billion annually in price reductions and other consumer benefits (see Crandall and Ellig 1997). A significant portion of these benefits came in the form of improved quality of service. In the airline industry, for example, one study found that increased flight frequency accounted for more than half the value of consumer benefits. Surface freight deregulation also generated billions of dollars in shipper savings due to the improved reliability of rail and truck transportation.

Distribution of Benefits among Consumers

Another major fear about electric regulatory reform is that lower prices for some consumers will come at the expense of higher prices for others. The experience of other industries, however, demonstrates that high-cost customer relief does not come at low-cost customer expense. Rather, all customers gain as increased efficiency and productivity make it possible to reduce rates for all. Crandall and Ellig (1997) show that the reforms of natural gas, airlines and rail in the United States reduced prices for most consumers.

In the gas sector, the average wellhead price fell by $2.32/mmcf in the ten years following 1985, when most wellhead prices were deregulated. Prices paid by every customer class fell by even more: $2.93/mmcf for residential customers, $3.13/mmcf for commercial customers, $3.53/mmcf for industrial customers, and $3.41/mmcf for electric utilities. The additional price reductions came largely out of the margins earned by interstate pipelines for transporting gas. Despite such figures, the general notion is that large industrial customers got most of the benefits of wellhead regulation. This misperception survives because the savings are often expressed as percentages of previous bills and these percentages[20] are larger for industrial consumers than for residential and commercial ones. This pattern stems from the fact that the share of residential and commercial gas bills is much greater than their share of industrial bills. Distribution, metering, and billing expenses per unit are higher for residential and commercial customers, and thus the total cost per unit is higher. As a result, even an equal price reduction for all customers would amount to a smaller percentage for residential and commercial bills.

Airlines provide another example of widespread benefits. Few people dispute that deregulation lowered airfares on average. Less known is that even captive markets enjoy lower fares than under regulation. For example, in hub cities dominated by one carrier, real fares were 19 percent lower in 1995 than they were in 1979. On routes dominated by a single carrier, fares were 27 percent lower. Fares for small, medium, and large cities were all lower in 1995 than in 1979. It is true that fares for some cities and routes dominated by one carrier are generally higher than for other cities and routes, but most of these fares are still lower than they would have been under continued regulation.

Prior to 1980, the Interstate Commerce Commission dictated that bulk commodities, like coal and farm products, would pay relatively low rail rates compared to high-value products like automobiles and other manufactured goods. Deregulation, it seemed, would lead to lower rail rates for manufactured products and higher rates for bulk commodities. In reality, all rates fell. Within two years after deregulation, average inflation-adjusted rail rates had fallen by 4 percent, coal rates had fallen by 1 percent, and rates for farm products had fallen by 18 percent. Within ten years, coal and farm rates had fallen by 38 and 50 percent, respectively. Low-cost and high-cost shippers alike got lower rates because railroad productivity more than doubled in the ten years following deregulation, after a decade of stagnation (Association of American Railroads, 1997).

Trucking provides a similar example. Less-than-truckload shipments are more expensive to haul than truckload shipments, but the cost of both fell following trucking deregulation. Between 1977 and 1993, the inflation-adjusted operating cost per mile for less-than-truckload shipments fell by 35 percent, while the cost of truckload shipments fell by 75 percent.

INAPPARENT EFFECTS OF COMPETITION

A great deal of the electricity debate focuses on how an existing pool of costs will be divided among arbitrarily-defined groups of customers: industrial, residential, captive, low-cost, high cost, and so forth. From a consumer perspective, this debate is highly misleading, for two reasons. First, even if some big customers receive the lions' share of deregulation benefits, this does not mean that the rest do not benefit at all. If big consumers receive lower utility bills, they do not keep all of those savings as profits. Their competitors will also save money as a result of deregulation, and competition will force them to pass some or all of their savings on to their customers. For this reason, consumer advocates who focus only on residential electric rates overlook many of the more significant consumer benefits deregulation can produce. Second, experience shows that regulatory reform does not simply redistribute costs from one group of customers to another. Instead, competition unleashes processes of efficiency gains and innovation across-the-board. Exposed to both increased competition and greater risk, gas pipelines increased their operating efficiency, railroads doubled their productivity, and truckers found ways to move more freight with fewer resources. Airlines not only reduced costs, but also created a new corporate culture that propelled change in the nature of the product. Such innovations were difficult, if not impossible to predict in advance (see Crandall and

[20] Residential customers save 32 percent and industrial customers 57 percent of previous bills.

Ellig, 1997). We are just starting to see the way in which the introduction of competition in electricity retail sets in motion a "virtuous circle" that enhances technological creativity and customer welfare toward a new horizon.

Challenges for the Power Companies

The electricity industry is being transformed into a competitive industry, with open access for all customers to electricity providers and new entrants in the field of electricity retailing. Many uncertainties surround any attempt at figuring out what electricity retailers will look like in the future: Will utility firms dominate the retail electricity market? What will be the role played by outsiders from other services sectors? Will any pure retailers survive?

THE ROLE OF UTILITIES

Incumbent utilities, be them generators or distribution companies are reluctant to loose control over the slightest shred of their traditional, integrated business. These utilities are ready to use all of their lobbying and financial power in order to slow down any cultural or institutional change that endangers their position. Horner (1997) shows that in all areas related to competitive retailing, brand marketing, sales, billing, meter reading, collections, trading, logistics, and risk management, utility rates range from weak to very weak. However, financial services companies, telecommunication and oil firms, outsourcers and logistic specialists are world class firms in their areas and should, therefore, be well placed in the competitive race for controlling the retail segment of the electricity business.

EPRI surveys conducted in 1995, 1996, and 1997 provide some evidence that electric utilities could keep many more of their customers under deregulation by improving the quality of customer service. Many customers would not change suppliers only for reasons of lower price, although the results do not indicate any strong loyalty to current energy providers.

The retail consumer makes three broad buying decisions: planned, spontaneous, and imposed. The first kind applies to homes, cars or longer vacations. The second governs most small transactions, like entertainment, books and gifts. The third applies largely to purchases from monopolies, such as energy utilities and governments. With retail competition, the buying decisions of the energy consumer will shift from imposed to a combination of planned and spontaneous. Product positioning will drive this shift, along with promotional inducements and discounting plans.

According to Dar (1997):

> *Many energy utilities have just acknowledged consumer sovereignty and the primacy of consumer content. Of the five levels of marketing (tactical peddling, mass selling, mass marketing, micromarketing, and mass customization), energy companies occupy, at best, the first two. Even at those levels, energy utilities appear to be regressing toward tactical peddling, rather than progressing to mass marketing. Few energy firms bother to distinguish between marketing and selling. Selling is monetizing production assets, a disposal business; whereas marketing deals with monetizing consumption assets. Marketing is more valuable because consumption assets, such as customer loyalty, outweigh production assets. Every competitive industry contains far more producers than merchants, because knowledge of supply is easier to acquire than consumption knowledge and customer insight.*
>
> *Energy as a product now stands in the midst of transition from a utility, to a staple, to a consumer good. That means a shift from little choice and few features to differentiation, first by price and reputation, later by branding, ubiquity, and perceived value in use. Energy retailing, so far, has much in common with the village gen-*

eral store of the last century: a low-volume, limited selection, indifferent quality, high margin business, conducted by many with little sophistication and modest knowledge. Within the next decade, the emerging infrastructure anchored by an evolved multimedianet will transform energy retailing into a high-volume, high-selection, superb-quality, and relatively low-margin business, conducted by a few with great sophistication and intimidating knowledge.

CUSTOMER ROLE

The heart of second-generation regulatory reforms is giving the customer free choice for buying electricity services. Therefore, the fortunes of electricity retailers will largely be determined by how well they understand their customers and respond to their needs and preferences in terms of prices, services, products and expectations.

The old business model emphasized industrial technology and quantitative increases in the consumption of energy commodities. The new model will accentuate information technology and qualitative increases in the consumption of energy services. Exploiting new service opportunities in restructured energy markets (see Rabl, 1997), will become a first priority in all deregulated markets. The new strategy focuses on the customer role at the center of the entire process and the utilities endeavors to meet the challenges of the new market structure.

The new customer is able to choose and, hence, willing to demand greater value in exchange for his loyalty. In this situation, the provision of top-quality customer services and the supply of innovative products that anticipate or meet customer demands, will be key factors in the competition race. But the race will prove to be especially difficult because, as EPRI market research demonstrates, electricity customers needs and priorities are very different from one another. Therefore, there seems to be no way to design a single product or service able to meet the needs of a substantial market fraction. Sophisticated market segmentation techniques must be applied to retailer offerings, just as they are for other consumer products.

Dar (1997) points out that the gas and electricity industry in the United States control about $900 billion in assets an employ these assets to serve about 150 million customers. But they manage to offer only two rudimentary products, molecules and electrons, and at only two levels of service: continuous and interruptible. Such a poor consumer content stands without precedent in the history of world business. Retail competition will bring this game to an end.

Retail competition in the gas and electric industry will become a transforming and quotidian reality within a few years, creating great shifts in revenue and capital. By itself, electricity as a commodity may do few things for the consumer. However, electricity plus technology plus knowledge about consumer needs, leads to a variety of services designed to satisfy customer preferences. These satisfied customers will pay willingly for energy service, but remain loath to pay much for just electricity at the meter.

Real spending on energy commodities will fall noticeably over the next couple of decades because the real prices of molecules and electrons can only go down. However, real spending on energy services may rise sharply. Corporate growth in the energy enterprise will reflect ideas, not things; quality, not quantity; packaging, not unbundling.

RETAILER COMPANY BUNDLES

The process in which retailers strive to develop new services and products in accordance with the new environment will mark a historic transition to a competitive, market-driven approach to the customer. However, since these new offerings have to be profitable, marketing methods well developed in other competitive industries, must be adopted by power retailing agents. Since electric utilities are no longer the only players in the electricity markets, many potential competitors are seeking the most profitable opportunities to enter these markets. Therefore, the successful 21st Century energy and services provider, will be radically different from its predecessors and focused on speedy innovation, economy and aggressive marketing to newly discerning customers in a highly competitive environment.

Power marketing managers indicate that the market segmentation goal of new retail companies should

be to provide the whole range of electrical services to their customers. The range of electricity products and services goes from technical services to pricing and billing and from information services to financing and logistics.

Retailers can provide assistance to their customers in consulting and installation of energy equipment; equipment service repairs and warranty programs; energy and environment audits; waste management solutions; cogeneration assessment and assistance; power quality investigations, and engineering diagnosis and solutions; plant operations and maintenance optimization; and energy management services.

Competitive provision of services will require a wide variety of pricing and billing options. Some of the concepts now being developed include consolidated billing for multiple meters and locations; custom billing and data analysis; reliability and power quality options; energy service package pricing; end-use billing and commodity bundling; electronic billing and collection, and real time pricing.

Retailers are well placed to offer data and information on process and appliance technology options, information on local economic conditions and related data, customer energy management data and support, real time pricing communications, home automation and related services, and telecommunications and computer-based network services.

Major innovations are expected in the area of financing as energy service providers try to identify and meet a wider range of customer needs. Examples of financial activities are equipment financing and leasing, buyout-sellback equipment options, build-own-operate contracts, and, service contracts. A number of energy service providers offer shared savings options. They secure the initial financing and get paid by the customer on the basis of energy savings generated by the new equipment and services.

One wonders whether today's utilities will survive information technology and how many truly national energy retailers will survive mass customization. Imaginative thinkers suggest transforming existing power retailing firms into entities that create alliances with various companies and broker supplies and services from a host of competitive providers, giving birth to the *virtual utility* (see Hirsch, 1997).

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Annexes

CALIFORNIA

The restructuring of California's electric sector represents an attempt at introducing both wholesale and retail competition at once. Evidence of large price differentials, as compared with other states, propelled demand for power sector reforms. In May 1995, after analysis of the changing electricity industry and many hearings around the state to get input from industry experts, utilities, consumer organizations and the public, the California Public Utilities Commission proposed a policy for introducing competition in the state's electric industry.

Legal and Regulatory Framework

In April 1996, the Federal Energy Regulatory Commission ordered electric utilities nationwide to allow other electricity providers to transmit electricity through utility transmission systems. Thus, utilities and other companies in areas where electricity is less costly to produce are able to sell cheaper electricity to areas where it is more expensive.

Assembly Bill 1890 passed by the California State Legislature in September 1996 provides the legal framework for a newly organized electric industry. This Bill establishes the following reforms. First, customer choice to all consumers should be in place by January 1, 1998, though later it was delayed to March 31. Second, a Power Exchange charged with providing an efficient competitive auction will be open on a nondiscriminatory basis to all electricity providers and loads customers. Third, an Independent System Operator with centralized control of the statewide transmission grid will ensure the efficient use and reliable operation of the transmission system. Fourth, a five-member board will oversee the two new institutions. Fourth, the Bill caps *stranded costs* and allows recovery through Competition Transition Charges. Fifth, consumer protection relies on registration of retailers, marketers and aggregators, on anti-slamming provisions and technical and financial requirements. California Public Utilities Commission would further develop these regulations.

Access to Distribution and Transmission Wires

Market participants have access to distribution and transmission wires. However, the scheme for gaining access to transmission facilities is different for the scheme for gaining access to distribution facilities. The main difference being that transmission facilities are offered by an independent company that does not offer power or retailing services, while distribution facilities are provided by the traditional utilities that offer power and retail services and compete for market share with generators, retailers and other market participants.

Although the California regulation establishes rules to prevent distribution companies from discriminating between full and partial service consumers, it seems that such discrimination, nevertheless, occurs. The time elapsed since retail competition was implemented is too short for evaluating the implications of the role of distribution companies as both wire and power providers

Since 1998, a new Independent System Operator manages the entire distance transmission grid, which is the structure of large power lines, towers and transformers connecting consumers and power generation sources across the state. Incumbent utilities maintain ownership of transmission facilities, but operation has been transferred to the Independent System Operator. This operator will manage the transmission system to ensure that electricity flowing into it reaches all customers when they need it and all generators have equal opportunity to send their electricity through the transmission system to their customers. The operator functions are designed to provide non discriminatory transmission access, in other words, to ensure that owners of the transmission system cannot favor their own generation facilities over non utility facilities, in providing access to the transmission lines. The independent operator also will ensure that the transmission system operates reliably and that electricity flows smoothly from electric service providers to customers, and will maintain a balance between energy demanded and energy supplied.

Whether the model is sustainable in the long run, given the tensions between the interests of transmission ownership (which remain with incumbent utilities), and the demands of a competitive market for disinterested operations, is an open question. Some believe the model can work over the long run, while others see it as a transitional mechanism toward divestiture and formation of a grid company.

Trade Mechanisms

The Power Exchange, an independent organization, operates a power pool that works like a public auction for electric power. Power producers can compete to sell their power through the exchange. The Power Exchange will match the sales bids with the purchase requests submitted by utilities, power marketers, brokers and retailers on behalf of customers. The Power Exchange is regulated by the California Public Utilities Commission to ensure that it is fair to all electric producers and users.

The Power Exchange provides an hourly price for electricity, which is published for consumers and other industry participants, such as investors or marketers. With visible price signals, consumers have the ability to make efficient purchasing decisions and to adjust their electric consumption by shifting usage to periods where demand is not as high and electricity is cheaper. Prices vary from hour to hour, day to day.

Market participants may trade outside the Power Exchange so both bilateral and pool trade coexists in the California power market. Nevertheless, the utility distribution companies (Pacific Gas and Electric, Southern California Edison and San Diego Gas and Electric) are required to use the Power Exchange as the market to sell the electricity they generate and to purchase electricity for their customers during the transition period. According to the California Public Utilities Commission, this measure will enable customers to obtain the cheapest electric service, avoid market power abuses and have a pool price as representative as feasible.

In addition to the Power Exchange, Scheduling Coordinators are also established. They schedule loads at the Independent System Operator for producers and retailers who do not wish to sell into or buy from the Power Exchange. Scheduling Coordinators act as stockbrokers. They represent the producers and retailers to the Independent System Operator in the same way that a stockbroker represents sellers and buyers to a stock exchange.

Retail Arrangements

After March 31st, 1998, the components of the electric service are separated into three distinct categories: generation, transmission and distribution. Consumers may choose to purchase the generation component from non utility electric service providers, or they may choose to purchase power from their current utility.

The consumer's ability to buy directly from non-utility electricity providers is known as *direct access*. A retailer is any electric service provider that enters into a direct transaction with an end-use consumer for providing electricity. Thus, a retailer may be a traditional utility providing distribution wire services or an independent company providing power to end consumers. However, utilities are not included in the definition of retailers used by California Public Utilities Commsision.

The local utility will be responsible for the reliability and maintenance of the power lines and poles that connect homes and businesses to the statewide transmission grid. Other responsibilities of the local distribution company are the following. The utility distribution will deliver electricity regardless of whom it is purchased from, will be the only entity that can connect or disconnect a customer from the service and will attend to consumer complaints in the event of a power outage. If a retailer does not live up to its obligation to provide electricity to customers, the utility distribution becomes the default provider, thus ensuring that consumers have uninterrupted access to the electricity service.

California regulations impose requirements on power retailers for protecting consumers. The most relevant are as follows. First, all non utilities offering electric service to residential and small commercial customers (maximum peak demand

less than 20kW) have to register with the California Public Utilities Commission.[21] Second, retailers must provide a brief description of the services to be offered, including types of customers and the area in which services are to be provided. Failure to provide this information would result in a suspension of the registration number.[22] Third, retailers should meet some financial and technical standards developed by the Commission. Fourth, retailers should disclose to consumers the sources of the electricity they are selling, using a standard format. System operators must make this information, as well as energy generated by each facility, available to the Commission for the purpose of verifying information disclosed to consumers. Fifth, a utility and its affiliates must fully separate their operations, personnel, identity and any advertising and promotions. These requirements aim to "level the playing field" for all energy providers regardless of their association with the present utility provider, and eliminate any benefits which affiliates may receive because of their ties with the existing utility.

Every retailer must provide customers and the California Public Utilities Commission with a notice of price, terms, and conditions of service. The Commission has suggested specific wording for the form to assure that it is uniform for all providers, and so that customers can easily compare prices, services and generation mix offered by various providers. In addition, retailers, both utilities and non utilities, will use a standard bill format so that the bill includes the same information, and customers can recalculate it to verify its accuracy.

Billing and Metering Policy

Regulations[23] establish the unbundled provision of *Revenue Cycle Services*, separating them into *Usage Measurement Activities* and Billing *and Customer Services* activities. However, the Commission was urged by many interested parties, in an effort to promote retail competition, to allow different competitive firms to provide consolidated billing of power, metering and other related services. The regulations also establish that retailers that utilize consolidated billing, are responsible for all payments, including payments of the Competition Transition Charge and the Public Goods Charge, regardless of whether they receive payment from their end-use customer.

Regulations allow non-utility retailers to provide meters, other than those commonly furnished by the utility distribution company. Meters provided by retailers must be consistent with reasonable standards of open architecture and satisfy the distribution company need for accurate calibration, appropriate installation, and the provision of reliable information. By the same token, the distribution company will have to adhere to the same standards if it decides to adapt or replace its existing meters.

Utilities will be permitted to modify their existing meters, on a system-wide scale, with automated meter reading technology. This provides customers, if they choose, with information about their hourly consumption patterns, and allows them to use that information, in conjunction with the hourly energy prices and an hourly-rate tariff, to lower their bills. However, since 1997, customers with loads over 20kW are required to install hourly metering equipment at their own expense if they wish to choose providers. End-users with loads under 20kW will be able to rely on load profiling instead of advanced metering. A more recent decision that will allow customers with loads between 20 kW and 50kW to rely on load profiling as well has subsequently amended the 20kW threshold.

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[21] Registration began July 1, 1997 and by June 1998 the number of retailers register was over 250.

[22] According to the information available at June 1998, 25% of the newly registered retailers have been suspended.

[23] Decision 97/05/039.

COLOMBIA

Colombia's regulatory framework represents a pioneering attempt at introducing retail competition in the electricity sector. The 1994 Act already allowed for the establishment of electricity retailers. Consumer choice and free entry are allowed for all activities that are not explicitly restricted by the Colombia Constitution. The 1994 Act and related Regulatory Commission[24] resolutions ratify and develop that principle. Nevertheless, for the time being, independent retailing firms have not been established. Reforms underway since 1997 may considerably improve the chances for the profitable operation of retailing companies.

Legal and Regulatory Framework

The 1994 Electricity Act. This Act embodies the full modernization of Colombia's power system. The main aspects of the Act are the liberalization of generation and retailing, which are considered competitive activities and regulation of transmission and distribution, which are treated as monopolies, although competitive opportunities are not overlooked. The Act establishes two kinds of consumers or users: regulated and unregulated. Regulated users are charged regulated tariffs. Unregulated users are allowed to enter into freely agreed price contracts. The eligibility threshold between the two categories was initially set at 2MW consumption per month. The Act awarded the Regulatory Commission the power to further amend the 1994 Act.

Access to Distribution and Transmission Wires

Regulations establish open access to distribution and transmission wires. However, the access scheme is different from transmission and distribution. Although, transmission is not legally a monopoly, the transmission network is managed through an unique state owned enterprise. Regulations establish economic and legal separation between transmission activities and other electrical activities. Thus, transmission companies are not allowed any other activity. In addition, the transmission companies are restricted to 25 percent equity limit on their ownership in other electricity companies. The same applies for the participation of generation and retailing companies in transmission activities.

User Rights ruling specifically establishes the possibility for the retailing activity being undertaken by a firm different from the one in charge of distribution. Retailers have to back their obligations towards users by means of entering into contracts with the distribution company. The distribution company cannot discriminate among network users, even when there is more than one retailer with users connected to the network.

Trade Mechanisms

The wholesale market is organized around a spot market pool where energy is traded with hourly settlements. The transmission company manages the wholesale market. The Code of Trading Rules[25] establishes that retailers and generators (not distribution companies), are the market agents, together with the transmission company which is neither a buyer or a seller of energy.

Participation in the wholesale market is compulsory for generators with over 20MW installed capacity. Generators, whose installed capacity ranges between 10MW and 20MW, are free to participate. Fewer than 10MW generators are excluded from participating in the wholesale market.

Retailers supplying final customers connected to the interconnected system have an obligation to purchase the required energy through the wholesale market. Retailers are allowed to participate in the wholesale market by means of bilateral contracts or through the pool. Nevertheless, regulations deal specifically with retailer operation in the regulated market, by means of setting up rules aimed at ensuring effective competition. For instance, regulations mandate public tenders or purchases at the pool for the power required to supply regulated consumers. Vertically integrated utilities can use 60 percent of their own power if their price is lower than the pool price; using their own power is forbidden for the remaining 40 percent.

[24] Comisión Reguladora de Electricidad y Gas (CREG).

[25] Resolución de la Comisión Reguladora de Electricidad 24, 1995.

Retail Arrangements

The Act establishes two kinds of consumers or users: regulated and unregulated. Regulated users are charged regulated tariffs set by regulatory authorities. Unregulated users are allowed to enter into freely agreed price contracts. The eligibility threshold between the two categories, which was initially set by the Act at 2MW consumption, is currently set at 0.5MW. The elimination of the existing 0.5MW consumption threshold will complete the process of retail competition from the consumer perspective. However, from the perspective of retail firms, the process needs further advances.

Electricity retailing is regulated as a separate activity since 1994.[26] This activity can be performed separately or in a joint fashion, with other electricity sector activities. Although distribution companies may perform retailing activities, accounting separation of both activities is required[27] and a method to separately audit the firm finances is established. Contract clauses limiting user ability to choose suppliers are forbidden. To change retailers, users can cancel the existing contract if it has lasted, at least twelve months and there are no debts outstanding, or if sound enough guarantees of payment are provided.

The Regulatory Commission mandates all retailers operating in markets different from their own, to offer their service to the entire market segment. That segment is equivalent to a zone of the distribution system. The purpose of that provision is to avoid the cream-off effect that might derive from new retailers trying to cater only to high consumption regulated users, which are the most profitable customer segment. This requirement represents an entry barrier for new retailers. In practice, the cream-off risk is counteracted by an explicit subsidy system, which is financed with tax resources. Consumption by lower level users is partially subsidized by means of a 20% surcharge levied on the largest users. The retailing firms act as mere tax collectors and a Government Fund settles surpluses and deficits among retailers. Therefore, a retailer supplying exclusively largest users, will have an obligation to transfer the amounts received as overprice to the retailer supplying only subsidized users in the same zone. In an extreme assumption, if a retailer does not cater to any of the big users, it will appeal to the Fund or to the Budget.

Other provisions may constitute obstacles to new retailing activity. One concerns the metering of losses, which should be performed over different points within the network, in order to allow the new retailer to avoid being liable for the entire distribution system losses. A second one has to do with the fact that the degree of accuracy required when metering non regulated users is higher for new retailers than it is for traditional retailers.

Pricing Policy

The tariff system specifies a price component for each activity: generation, retailing, transmission and distribution. The tariff system also detail prices and operating rules for retailers operating within the area of a distribution company with retailing functions. The specific retailing component is calculated in terms of price per bill. Regulators set an upper limit to cap the price of retailing activities. Actual prices are fixed by competition retail. The cap is calculated through the evaluation of retailing efficient cost. The market density is the most important variable to fixing the cap.

[26] Electricity retailing is defined as the activity of purchasing power in the wholesale market and its selling to final users.

[27] Resoluciones de la Comisión Reguladora de Electricidad 54 and 56, 1994.

NEW ZEALAND

New Zealand in engaged economic reforms following the 1984 foreign exchange crisis. The reforms encompassed both macroeconomic stabilization and structural changes. A major goal was to deepen the role of markets, establish commercial mechanisms, and eliminate administrative regulation as much as possible. Particular attention was paid to public sector reforms that reduced administrative control and economic intervention. New Zealand accomplished a mayor restructuring of the electricity sector as a part of the general structural reforms. The keystones of that reform are wholesale and retail competition, free entry in the generation and retailing segments, and light-handed regulations.

The Electricity Sector Before Reform

Before reform, electricity assets were managed and financed by the public sector through an administrative department depending on central or local governments, prices did not cover the cost of service and there was a lack of competition in all stages (generation, transmission and distribution). However, unlike other countries, vertically integrated companies did not provide electricity. The distribution and retailing segments were managed through electricity boards and municipal electricity departments, while the generation and high-voltage transmission capacity were managed and owned by central government administrative entities.

Legal and Regulatory Framework

The first step took place in 1987 with the formation of the Electricity Corporation of New Zealand Limited (ECNZ) a state-owned enterprise that owned all generation and transmission assets. This firm was the sole supplier with the obligation of providing electricity to distribution entities. A year later, generation was deregulated and ECNZ obligation to supply distributors was rescinded.

Electricity regulation has changed from norms aiming to substitute for markets to regulations aimed at promoting them. Specific sector regulations formed the basis of the old regulatory framework, while information disclosure and common law are the base of the new regulatory model. Electricity distribution or generation are not subject to specific electricity regulations other than supply standards and safety regulations. However, electrical companies are subject to anti-trust and commercial legislation. In addition, they must disclose audited financial statements, which distinguish monopoly activities from competitive activities, contract information, information on pricing policies, and other relevant information.

Proposals for increasing competition were introduced in 1998. The most relevant proposal consists of splitting the larger generation company to avoid monopolistic market control, reducing fees and metering requirement for access to the wholesale market, and economic and financial separation between distribution and retailing companies.

Access to Distribution and Transmission Wires

Since 1994, consumers, generators, retailers and other intermediaries have open access to distribution and transmission networks and consumers have the right to choose their supplier. However, while complete separation between transmission and other electrical activities was established in 1994, it does not occur in distribution, retailing and generation companies.

A state-owned enterprise, TransPower, manages and owns the high-voltage transmission network. This company has the responsibility of carrying the electricity of any potential client from an entry point to its destination on the main grid. The regulations establish that all generation and distribution entities, whether existing or new, have non-discriminatory access to the network.

Distribution companies with transmission facilities have to offer transmission contracts to any individual wishing to transport electricity. In addition, open competition for construction and ownership of distribution network assets is established.

Trade Mechanism

The Electricity Market Company was established in 1993 for organizing and coordinating the electricity market. Its shareholders are ECNZ, TransPower, and the Electricity Supply Association of New Zealand. The company has estab-

lished an electricity exchange, including a physical spot market and forward markets for short and long-term tradable contracts for electricity. The market commenced trading in 1995.

Final consumers, retailers, and distribution companies, independently of their size, may buy power in the wholesale market. However, in practice, only residential consumers can buy power at the wholesale market using retail power merchants. Large fees and metering requirements prevent residential consumers entry into the wholesale market. The government is pushing the restructuring of fees and metering practices to favor the participation of small consumers in the wholesale market.

Problems in achieving wholesale competition are a result of ECNZ's control of the market. Thus, the core of the 1988 generation reforms consists of splitting ECNZ into three companies and setting restrictions on shareholder dominance.

Retail Arrangements

All consumers, regardless of their size, are free to buy power under a contract with the local distribution company, on the spot market, or a contract with a power retailer. Power retailers have no restriction for going to the wholesale market. They pay the local rental rate on wires, and go into the power marketing business in competition with local distributors. Consumers and retailers are free to enter into retailing arrangements.

Distribution and retailing activities are legally unbundled. Distributors must itemize bills to distinguish clearly the capital rental charge for the lines part of the business (both transmission and local), from the charge for metered energy. Itemizing bills attempt to ensure that power merchants and consumers who split from the traditional distribution company will not face discriminatory treatment. Distributors must charge retailers the same price for using distribution assets that they charge their own retail customers. Retailers must pass the price for the wires through to final consumers.

However, there is no economic separation between both services so that they may be provided by a single company. In practice, all companies providing distribution services also provide retailing services and few companies without distribution assets provide retailing services.

In spite of the competitive regulatory framework, retail competition is limited and the actual electricity price reductions to final consumers have been small. The authorities have pointed out that owners of local distribution companies may deter competition in retailing by, for instance, failing to provide low cost systems to enable customers to switch retailers; restricting access network to competing retailers; and implementing cross-subsidize schemes.

Several measures have been proposed recently to increase retail efficiency. Some measures will ensure complete separation between retailing, generation and distribution. Electricity companies have a choice on how they implement ownership separation. They can either set up a separate trust by 1 April 1999 to own and run whichever business they do not wish to keep; or sell whichever business they do not wish to keep by 31 December 2003. Other measures will ensure the disclosure of transparent and user-friendly information on prices, costs and efficiency. Thus, companies will disclose information to enable better comparisons of the performance of power companies. The government has also recommended measures to promote low cost switching arrangements to enable customers to change retailers. If the industry fails to enact these measures by April 1999, the government will introduce a mandatory default system by regulation. The Electricity Act of 1992 will be amended to give the government the power to issue regulations.

SPAIN

In November 1997, a new Electric Power Act was enacted by Parliament. This Act sets the stage for the modernization of Spain's power sector, in accordance with leading international experience and going well beyond the guidelines of the European Directive on the Internal Electricity Market. The 1997 Electric Power Act opens up the power sector to free competition and modifies the sector's business and organizational structure, requiring the legal unbundling of regulated and competitive activities and promoting the entry of new players. All these changes will be phased in gradually during a ten-year transition period.

Legal and Regulatory Framework

The new Electric Power Act provides for the unbundling of regulated and nonregulated activities. Regulated activities include transmission, distribution, market operation, system operation and supply to franchised customers. Nonregulated functions are generation and retail. The new Act involves turning generation and retail into competitive activities, and allowing free access to transmission and distribution networks, even if transmission and distribution remain regulated. Qualified consumers will be given the right to choose their electricity supplier and to access the networks in order to purchase electricity.

The 1997 Act provides for generation and distribution to be legally unbundled before the year 2000, going beyond mere accounting separation. Nonetheless, the government could require companies to advance such unbundling to 1999. In any event, generation and distribution accounts are to be kept separately, although ownership rules allow shareholders to have joint interests in both activities. Transmission was unbundled in 1985, a separate company (REE) owns and manages transmission assets since that date.

The Act creates two new independent agencies: the Market Operator and the System Operator. The Market Operator is responsible for the economic management of the system, matching supply and demand in the bidding market; while the System Operator is responsible for the technical management of the system, maintaining quality and safety standards. The Act requires that these two institutions be independent from utilities. Any entity may be shareholder of the Market or System Operator, provided that it does not own more than 10 percent of share capital (no more than 40 percent in the case of electricity companies).

Transmission and system operations are activities clearly separated by the Act. However, a transitory clause allows temporally the company owner of most of the high voltage grid to perform the system operation functions and manage the transmission grid temporarily. The Act does not provide for any changes in the horizontal structure of the electric sector, despite the fact that the Spanish power sector is highly concentrated at both generation and distribution ends (two companies control 76 percent of the generation and 79 percent of the distribution businesses).

The reform aimed to reduce the role of the State in the power sector. In order to achieve that objective, 25 percent of the capital of the largest generating company (Endesa) was sold in the stock exchange; the remaining 25 percent was sold in 1998. State presence in transmission and system operations will also be reduced during 1998 and 1999. However, government privatization plans do not provide for any reduction in concentration.

Trade Mechanisms

Under the new Act, generation activities will be completely liberalized and new players will be allowed into the market. Trade mechanisms allow for transactions to be conducted through organized markets and bilateral contracts. The Market Operator and the System Operator manage the organized markets.

The Market Operator is responsible for the daily organized market, where electricity is exchanged by means of an auction procedure in which sellers and buyers send in their bids to sell and buy electricity for each of the next day 24 hours. The Market Operator matches selling and buying bids. The System Operator guarantees quality and safety and coordinates generation and transmission. In order to allow for deviations between new forecasts and agreed transactions in the bidding market to be efficiently managed, an Intradaily Market is

established, where in, adjustments between generation and demand are performed on the basis of specific bidding from agents. After closure of the Intradaily Market, the System Operator manages differences between real and programmed flows.

The Act allows for different types of bilateral trading, although in practice, there are two basic types: financial and physical contracts. The Act also envisages setting a standardized futures market, once the new system is in full operation. Transactions subject to bilateral trading contracts will not have to go through the pool, although the Market and System Operator must be notified of the amounts involved, to be taken into account in the schedule.

Producers and qualified final consumers will be allowed to be party to physical bilateral contracts or they may buy electricity through the pool. However, distribution companies are not allowed to engage in bilateral contracts, but must buy electricity in the organized market. Market players are free to perform international electricity transactions, either through the pool, or by means of bilateral contracts. International agents wishing to operate in the Spanish power market are free to do so prior authorization from the Ministry of Industry, which can only be denied on reciprocity grounds.

Access to Transmission and Distribution Wires

Transmission and distribution will remain regulated within the new legal environment. Regulation governing these activities establishes remuneration that allows operators to recover their investment costs, as well as the costs of operating and maintaining the facilities. However, the main new regulatory development concerning transmission and distribution is that the Act guarantees all authorized agents third party access to the grids. In accordance with the provisions of the European Directive, the Act provides for free access to the grid on payment of a government approved fee, which will be the same throughout the country, only differing in terms of voltage levels.

Retail Arrangements

Consumers will be allowed to choose the suppliers gradually, starting with the largest consumers, i.e., those with an annual consumption over 15 GWh. By the beginning of the year 2007 (see table 1), all consumers will be entitled to choose their supplier. Until 2007, distribution companies will continue to supply power to small customers at regulated tariffs, whereas qualified customers may buy power through the pools or through contracts with generators or retailers.

The Act differentiates the activity of retailing as a separate function, whereas under the previous regulatory frameworks, retailing was a part of distribution. Retailers will, therefore, be the newcomers to the power sector. Retailers are defined as corporate entities that have access to the transmission and distribution networks and whose function is to sell electricity to qualified customers or to other system agents. Retailers require an authorization in order to enter the market and they should specify the geographical area where they intend to operate.

Separation between the retail function and the distribution function is not established. The retailer will compete with traditional distribution companies in providing retailing services to qualified consumers. However, this arrangement gives competitive advantages to the distribution companies. The reasons are that distribution companies will continue to be the monopoly providers of wires to all consumers and will provide wires and retailing services to non qualified consumers. In exchange for these market advantages, distributors will have to meet all new supply needs in the geographical area in which they operate.

Table 1

Year	Eligibility Threshold	Number of consumers	Energy %
1998	> 15 GWH year	600	27
2000	> 9 GWH year	1000	31
2002	> 5 GWH year	2000	35
2004	> 1 GWH year	9000	42

UNITED KINGDOM

Over the last decade, the electricity industry in the United Kingdom has undergone two radical changes: the privatization of almost all the electricity companies and the introduction of competition. The change in ownership in itself has had a major impact on an industry that was owned for 40 years by the public sector.

The previous structure of the nationalized industry in England and Wales was dominated by one large generating and transmission company, the Central Electricity Generating Board, which sold electricity in bulk to 12 area distribution boards, each of which served a franchise area. A coordinating body, the Electricity Council, dealt with overall policy matters. In Scotland and Northern Ireland there were vertically integrated boards which also exercised regional monopolies. This monopolistic system was characterized by centrally planned investment, an engineering-led approach and a cost- plus pricing mechanism.

The Regulatory Framework

The 1989 Electricity Act establishes the legislative foundations for the restructuring and privatization of the industry. The Act lead to a change in ownership from the state to private investors, including employees of the successor companies, as well as to the introduction of competition into electricity generation and retail.

The generating facilities of the state-owned Central Electricity Generating Board were separated into three large companies, two of them took over existing fossil fuel power stations, whereas nuclear power plants remained state-owned. Free entry in the generation segment was also established. An independent company owns and manages transmission assets. The twelve Area Boards were transformed into private companies providing distribution and retail services. Distribution companies are monopolists in the franchise area.

Market participants have access to distribution and transmission wires. However, the scheme for accessing transmission facilities is different from the scheme for accessing distribution facilities. The main difference being that transmission facilities are offered by an independent company that does not offer power or retailing services, while distribution facilities are provided by the traditional utilities that do offer these services.

The Electricity Act created a regulatory system headed by a Director General of Electricity Supply who is responsible for ensuring an efficient and competitive electricity market and protecting the interests of customers.

Access to Transmission and Distribution

The National Grid Company owns and operates the high voltage transmission system. This company is independent of generation and supply, in order to operate a level playing field both in the day-to-day running of the system, and in providing access to the transmission network. The company has other businesses covering interconnectors, ancillary services and a separate settlement business, undertaken to facilitate payments between generators and suppliers.

The National Grid Company provides open access to the grid, whose specific technical requirements for access are defined in a grid code. The terms for access are non discriminatory. Charges for use of the transmission system are split into two elements: connection and use of the system. The connection charge is levied on any user directly connected to the transmission system and is based on the net asset value of the user connection. The suppliers and generators who connect with and use the grid system pay the use charges.

Open access to distribution facilities is also established. The distribution system was divided into twelve electric companies in England and Wales, whereas in Scotland, distribution is the responsibility of Scottish Power and Scottish Hydro. The distribution business operates and maintains the assets, which carry power from grid supply points to individual customers within each authorized area. The charges made for the use of the distribution network are kept down by regulatory price controls. The price formula requires that the average use of the system charge per unit distributed should not increase year on year by more than a given percentage.

Trade Mechanisms

All the major generating companies are required to sell the electricity they produce into an open commodity market, known as the Pool. The trading mechanism works as follows: Essentially, each generating unit has to declare each day its availability to the market, together with the price at which it is prepared to generate, for each and every half hour of the following day. The units are then called to generate in an ascending order of price. The most expensive unit used establishes the system marginal energy price that all others receive for that half-hour. There is an additional separate pricing mechanism designed to provide an incentive for the provision of generating capacity.

This form of virtual real-time pricing tends to produce volatility in prices. To overcome this, market participants use both short-term and long-term contracts to make capacity and energy prices more predictable for both customers and generators. These so-called contracts for differences typically involve an agreed *strike price* for a specified quantity of electricity and a specified period of time. If the Pool price for electricity is below the agreed strike price for any half-hour, the supplier will pay the generator the difference between the two prices. Similarly, if the strike price is below the Pool price, the generator will pay the difference to the supplier. These contracts are essentially financial instruments that hedge risk. About 90% of the electricity sold by the major generating companies is covered by contracts, and around 10% of the electricity sold is paid for at Pool prices.

Retail Arrangements

The retail side of the market is divided into franchise and non franchise customers. Non franchise customers are given the option of choosing their supplier from any of the twelve as well as from the pool or from retailers.

Non-franchise Customers

Initially, non-franchise customers, were those with peak demands greater than 1MW. There are approximately 5200 such sites in Britain, predominantly major manufacturing plants and hospitals, and they account for around 26% of total electricity sales. In 1994, the 1MW peak demand limit was reduced to 100KW. Customers who conform to this requirement will normally have an electricity bill of US$2300 per month or more, premises larger than 1800m3 and /or 500 employees. By March 1996 about 23,000 sites had chosen to be supplied by a company other than their host REC. Size restrictions on customer peak demand were supposed to end on March 31st, 1998, when all customers would become non-franchise.

The April 1st date has been postponed to September 1998. The process will be phased as follows: In September 1998, full competition should be introduced in four areas, with four further areas opening in October, and the remaining six areas opening in December.

Retailers

Separation between distribution and retail services is not mandatory. Thus retail services may be offered by distribution companies that own wires and also by independent companies. Nevertheless, retailer companies need a *supply license*. The local monopoly distribution company needs a *first-tier supply license* for selling retail services in its area. Other companies, generating companies, brokers, or distribution companies from other locations need a *second-tier supply license*. Thus, an electricity user supplied by a company other than their host distribution company is defined as a second-tier customer. Those who are still supplied by their host distribution company are defined as first-tier customers.

There are 30 companies which have a second-tier supply license for England and Wales and 21 which have a second-tier license covering Scotland, most having a license to supply both regions. Of these, there are 17 major electricity suppliers, including the 12 distribution companies and five large generating companies. The other suppliers are independent companies.

Consumer Process

A non franchise customers wishing to change suppliers needs to perform a number of tasks prior to

buying power from a new retailer. A three-month period is required from the decision to the starting date.

First, the user will need to ask its current supplier, usually its local distribution company for the connection agreement. It will then have to collate information relating to its supply voltage (which is contained in the connection agreement), its maximum demand, annual consumption, annual expenditure, supply capacity and power factor.

Second, a meter operator has to be appointed, usually two months prior to the start of the supply contract. About two months prior to the beginning of the contract, the user will need to begin the process of selecting a supplier, for which it may want to put its contract out to tender to all the electricity suppliers with second-tier licenses. Meter operating is no longer monopolized by the distribution company. Since May 1992, customers are able to appoint a registered meter operator, other than their distribution company. In addition to obtaining a suitable meter and contracting with a meter operator, it is also necessary to have suitable communications equipment installed, enabling remote readings of the meter on a daily basis for pool settlement purposes.

Third, once a new supplier has been selected, three contracts need to be signed 28 days prior to the supply start date: the supply contract between the customer and the new supplier, a connection agreement between the customer and the host distribution company and a use-of-system agreement between the new supplier and the host distribution company.

New Developments

In May 1998, The Office of Electricity Regulation issued a consultation paper on the separation of distribution and supply businesses for public electricity suppliers, and the future treatment of metering and meter reading. According to Professor Littlechild:

> *The different experiences where separation has and has not taken place, the increasing convergence between the electricity and gas markets, the desirability of facilitating competition, and the importance of ensuring effective customer protection all point to the need for greater separation of monopoly activities and competitive activities, particularly of transmission, distribution and supply.*

The main points of the consultation paper are the following:

- Full separation of ownership of the supply and distribution businesses would be desirable. Appropriate interim arrangements should be made for separate distribution and supply companies, each operating independently of the other. This would include placing distribution and supply activities in separate subsidiaries.

- The distribution company should be responsible for the maintenance and operation of the distribution network. It should have a statutory duty to develop and maintain an efficient, coordinated and economical system of electricity distribution, and to facilitate competition in generation and supply. It should be obliged to connect any person to the network on reasonable terms.

- The present distinctions between distribution companies that have a first-tier license and second-tier suppliers should be removed and all suppliers placed on the same legislative footing.

- Given the dominant position of distribution companies in their own areas, additional provisions, including non discrimination, will be required in the licenses of the supply businesses in order to protect customers and competitors.

- Suppliers should be responsible for meter reading but the distributor will provide a "last resort" meter reading service, bought from meter reading companies, for those suppliers who do not wish to provide the service themselves.

- Metering services should be open to competition. A range of metering service providers, including independent providers, will compete to offer services to suppliers. This includes prepayment meter services. Safeguards will be put in place to ensure providers of metering services do not distort competition.