

ELECTRICITY INDUSTRY RESTRUCTURING:

A PRIMER

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OVERVIEW

The electricity industry has been served by regulated monopolies within franchised service territories.

Investor owned utilities with exclusive franchises make up 75 percent of the industry and publicly owned distribution companies serving specific municipal service areas make up the remaining 25 percent. Electricity generation companies are unable to directly serve retail customers except those in their service territories.

The retail monopoly and the related vertical integration of the generation, transmission, distribution and retail services functions have historically defined this industry. This industry structure is now changing as market competition begins in the generation and retail services functions. The restructured industry will have competitive generation companies (GENCOs), regulated transmission companies (TRANSCOs), regulated distribution companies (DISCOs) and competitive retail electricity service providers (ESPs). In the future a utility holding company may have subsidiary companies in all four functions. However, the dealings between the companies will be treated like business with any other external company.

The consequences of the restructuring and movement to competitive markets will be vast and far-ranging. Already some utilities are merging horizontally; mergers are occurring between one electricity utility and another, as well as between electricity and gas utilities. Others are disaggregating vertically, as generation assets are being sold. Competition will cause greater economic efficiency in the generation functions and an expanded range of products and services to meet customer needs.

The market, rather than regulation, will determine the what, where and how of generation. With competitive generation, the aversion by owners to environmental regulation will be much greater than with the past monopoly structures. Additional environmental emission controls and fuel costs cannot automatically be passed along to customers. Cleaner generation assets may increase in value. To the extent that traditional utilities leave the generation business, through disaggregation of formally

vertically integrated utility functions, their interest in such issues will be lessened. As some companies disappear new ones will emerge. Major changes are just around the corner for both the regulated energy industry and State regulators. One thing is certain — energy and environmental regulation as we know it today will change dramatically.

This primer describes an unfolding fundamental economic event — the creation of competitive markets in electricity — and seeks to assist the state energy and air offices in understanding this event and its likely consequences. The story is not what has happened to-date but rather what is likely to happen over the next few years. The likely consequences are by nature somewhat speculative; however, they are becoming clearer as markets begin to develop. To provide an insight into the new industry, the likely consequences are categorized by the players in the new electricity industry structure — generation owners, transmission owners, distribution owners, energy service providers and customers. Also, the likely consequences upon energy efficiency investments and renewable resource procurement are set forth, as are the likely electricity demand and environmental consequences.

The development of competitive electricity markets, especially at the retail level, is occurring and is likely to continue to occur at a different pace in high-cost states than in low-cost states unless Federal legislation mandating retail choice by a date certain is enacted. Even in the high-cost states the transition to full competition is likely to take a few years.

This primer is based upon the premise that full market competition will occur and addresses the likely consequences of the resulting restructured electricity industry. Since the future is inherently uncertain the likely consequences are forecasts not facts.

The audience for this primer, as well as its companion primers, are the state energy and air quality officials. These officials would benefit from a better insight into the likely consequences of electricity industry restructuring. The purpose of this primer is to provide some insights into the likely consequences and to stimulate the reader to think about resulting changes.

The primer is organized as follows: Overview; Introduction, discussing the what, why, how, when of restructuring; Chapter 1 contrasting the old and new eras of the electricity industry; Chapter 2 a discussion of the consequences to generation owners; Chapter 3 a discussion of the consequences to transmission utilities; Chapter 4 a discussion of the consequences to distribution utilities; Chapter 5 a discussion of the consequences to the retail services function; Chapter 6 a discussion of the consequences to customers; Chapter 7 the consequences to energy efficiency and renewable resources; Chapter 8 the electricity demand and environmental consequences and Chapter 9 a brief conclusion.

INTRODUCTION

What

The U.S. electricity industry is in the midst of fundamental change that will result in a totally restructured industry. This restructuring will end the current monopoly on retail sales within a government granted franchise area in many, if not most, states. This will result in the break-up of the vertically integrated functions of generation, transmission, distribution and retail sales. Competition will occur and become the norm in both the generation market and retail electricity services market. The transmission and distribution functions will remain regulated by government as common carrier monopolies. Retail competition will redirect the focus of the industry to the customer and meeting the customer's perceived needs. In the future, changes in the industry will most likely be customer and market-driven rather than the result of a regulatory proceeding.

Why

Restructuring is now driven by a number of interrelated economic, technological and political factors. First, markets, not regulations, are believed by most national and state officials to be the superior means to achieve not only a more economically efficient electricity industry, but also to better meet the needs of the customer. These beliefs are the results from recently deregulated monopolies experiences. Second, the disparity between customer electricity prices and the current and likely future cost of generating electricity due to technological innovations has created a backlash among customers, especially large customers in high price areas. Third, the price disparity among regions and the ability to transmit electricity between regions has brought the issue of long range transmission to customer attention. Fourth, technological innovations, including high efficiency gas turbines, and stable gas prices have altered the economics of the generation market; new generation can be developed at 3—4¢/kwhr causing more expensive existing generation to be economically obsolete. Fifth, emerging metering technology and reduced metering costs make possible an array of customized electricity services. This potential new service would provide customers with more detail

on their electricity use and could lead to changes in their purchase decisions. Large customers are demanding new products made possible, in part, by metering innovations.

Restructuring is occurring primarily because customers, especially large customers, are demanding lower electricity costs. In addition, low-cost electricity generation owners are seeking competitive markets for their electricity in order to expand markets and increase profits. Both of these objectives are fundamental factors in a market economy.

How

The Public Utility Regulatory Policies Act of 1978 (PURPA) opened the door to generation competition, to a degree, by requiring utilities to purchase generation from certain generation sources (Qualifying Facilities or QFs) at the utility's long run avoided costs. QFs include cogeneration and energy from renewable resources. The Energy Policy Act of 1992 (EPACT) created the opportunity for restructuring by 1) loosening rules to permit the expansion of independent power producers, known as exempt wholesale generators, and 2) authorizing the Federal Energy Regulatory Commission (FERC) to require utilities to open access to the transmission grid for wholesale transactions. FERC, via regulatory reform (Orders 888, 889,-1996), is in the process of transforming the transmission grid into a common carrier for wholesale electricity sales. Thus, the initial conditions for a competitive wholesale market in generation were established. Retail competition is left to the States so far.

States are the regulators of the distribution and retail sales functions of the electricity industry. Fifteen States, under pressure from large customers and low-cost suppliers, have established by law and/or regulatory reform schedules and processes leading to full retail competition. California, Pennsylvania, Maine, New Hampshire, Rhode Island, Massachusetts, Illinois, Montana, Oklahoma and Nevada have enacted retail competition by law. New Jersey, Michigan and New York are attempting to achieve retail competition through regulatory reforms. State actions are well underway in most high-cost states to implement retail choice by 2000 or shortly thereafter. Federal legislation

which will mandate or greatly encourage retail competition is under discussion.

When

Prior to the actual beginning of full retail competition the restructuring of the industry is already well underway. Generation is offered for sale; independent system operators to manage the transmission grid are being established; utilities are merging; retail choice phase-in programs are attracting national electricity marketers; customers are aggregating to establish better negotiating positions; and PUC staff are working overtime to meet implementation schedules often established by legislation. High-cost States and regions — California, New England, Pennsylvania, New York and New Jersey are in the forefront. California (4/1/98), New Hampshire (7/1/98), Massachusetts (3/1/98) and Rhode Island (3/1/98) will implement full retail competition this year. Major pilots are underway in Pennsylvania, and New Jersey will begin major pilots this year.

The beginning of the competitive retail markets in several states is signaling the end of vertically integrated utility industry. California and New England utilities are selling some or all of their generation assets. New York and New Jersey utilities are making plans to sell some or all of their generation. New facilities in the form of merchant generation plants (i.e., those without long term purchase contracts) are being developed. Nuclear plants are being retired for economic reasons long before the end of their operating licenses.

The final stage of restructuring, full retail competition for all customers in a state, will occur on a state-by-state basis, unless Federal legislation mandating retail choice by a date certain is enacted. Some states may choose not to enact full retail competition. Many of the states that have enacted legislation are scheduled to reach full retail competition by 2000; others are phasing in retail competition by 2001 or 2002. A majority of Americans are likely to have full retail competition within the next five years. Therefore, much of the industry should be restructured within this time frame.

CHAPTER 1

RESTRUCTURED INDUSTRY

Old Era

The vast abuses by utility holding companies in the 1920's, and the crisis of the Great Depression, lead to a tightly regulated electricity industry in the 1930's which has continued to the present. The Federal Power Act (FPA) passed in 1935 as did the Public Utility Holding Company Act (PUHCA). This legislation established the method of federal regulation over wholesale transactions, holding companies and transmission companies. This tightly regulated monopoly model features exclusive retail franchise areas and a requirement to serve all customers within the franchise area. This model also includes close scrutiny of decisions by state PUC regulatory staff, regulatory allowed utility revenues based upon expenses and a reasonable rate of return on investments, and electricity tariff rates set to enable allowed revenues to be collected. The structure is general tariff classes (i.e., residential, commercial, and industrial by size) and the vertical integration of the basic industry functions (generation, transmission, distribution and retail sales). Also, the monopoly utility often was used as a vehicle for public interest programs as determined by the regulating authority. This monopoly model presumed to use regulatory processes to simulate the workings of the market to try to create an efficient industry serving the perceived needs of the customers.

However this model has not created an efficient industry. For instance this model did not encourage interaction with the customers to determine their needs, which resulted in a lack of innovation in customer products. The focus under this model was on producing capacity to generate electricity rather than selling it. The guaranteed recovery of expenses and investments plus a reasonable profit nature of this regulatory model (i.e., cost-plus) encouraged over-investment in infrastructure in terms of type, quality and price per unit. Once regulators agreed the infrastructure was needed, the return from the investment was assured. For example, rounds of "end of smoke stack" environmental controls were deemed necessary by government regulators and hence these "investments" were recovered through higher rates. Large capital budgets actually tended to benefit the utility industry

because utility profits were based on an economic return on physical assets. Utility bonds became a major low-risk investment vehicle since returns appeared to be assured.

New Era

The electricity industry is changing from one based on vertically integrated monopolies to one based on competition. The expectation is that the industry will be subject to the discipline of the market place in both generation and retail sales and services. Generation investment decisions will be based upon views of the future market conditions rather than regulatory processes. Market shares of specific retailers will be determined by how customers respond to competing choices.

The advent of competition means new businesses offering new products and services to customers. Eventually this will lead to a customer-defined industry in terms of products and services.

The vertical integration of the industry is breaking down gradually as all generation companies sell in a competitive wholesale market and all customers have the opportunity to buy from a competitive retail market.

The views of the Ontario Energy Minister explaining the need to radically change the Ontario electricity industry to the citizens of Ontario are a common view of the new era.

"There is consensus among observers on where the electricity industry is headed. Industry analysts believe that within the years, monopoly franchises will have been replaced by competitive supply. Large bureaucratic organizations will have given way to leaner, more accountable, more efficient business rivals. Electricity will be traded in a market much like other commodities; convergence will have occurred among the electricity, gas and other businesses; and new organizational arrangements will have emerged. Small scale, local generation will have a larger share of the market. At the same time, electricity is likely to be traded over much longer distances as market

integration gradually takes place. These trends are underway because of technological changes, notably more cost-efficient generation using natural gas, and policy changes introduced by governments to open markets, improve industry performance, and achieve lower prices for customers."

Another view, based upon observing the evolution of the airline and telecommunications industries following their deregulation, is that an initial period of many new market entrants will be followed by a consolidation of companies performing similar functions. Already the utility industry is experiencing a disaggregation of the vertically integrated functions (i.e., selling off generation functions) and a consolidation of similar functions (i.e., mergers and generation purchases). Some industry observers are predicting less than 10 major national generation companies and less than 10 major national marketing companies selling retail electricity.

CHAPTER 2

GENERATION OWNERS CONSEQUENCES

New Markets

The generation market is undergoing deregulation now, and hence, becoming more competitive. Generation owners in the future will recover costs and make a profit only through electricity sales and not through a regulated return on investments. Thus, the value of a specific generation unit is determined by its current and likely future availability to generate electricity and the competitive market value of such electricity. A critical element to long-term value is the location of such generating plants on the transmission system. Obviously, low production cost units have greater value than high production cost units. High availability units have greater value than low availability units. Units that can vary their output, hence are capable of following the demand curve, have greater value than those that cannot. The generation market will determine the value of a specific unit, not the past investment in the unit.

The beginning of restructuring in California and New England has resulted in a massive divestiture of generation assets by vertically integrated utilities. Also, New York and New Jersey utilities are beginning to file plans to divest some or all of their generation. Such divestitures have been encouraged by both state governments and the wholesale generation market. The generation company of the future will likely be national or regional, in scope and will either be an independent generation companies (for example, American National Power, Sithé) or the unregulated generation subsidiary of large utility holding companies (for example, Southern Company, Florida Power and Light, Pacific Gas and Electric). The future generation company will operate in many states, and perhaps regions and will optimize unit operation of facilities to best serve their markets.

The generation market will be very competitive and far more complex than the current market. Both energy (i.e., kWhrs) and capacity (i.e., the electricity generated at peak period) will be purchased from generation companies, often in separate packages. Bilateral contracts between generation

companies and marketers are likely to be the norm, reinforced by spot purchases from the dispatch pool. Prices will be transparent with wide variation by time and location. Prices will respond instantly to tight or soft markets. Significant price swings will be common. A derivative market will rise to assist in managing the volatile price market.

Generation Mix

The competitive generation market will result in thin profit margins for marginal units, good profit margins for low cost units and no profits for high cost units, unless there are transmission constraints forcing prices up. The competitive generation market will render many units economically obsolete. New gas-fired merchant units (i.e., plants built on market speculation without long term contracts), built by generation companies located close to load centers are likely to set an upper limit on generation prices (3.5¢-4.0¢/kwhr). This upper price limit will quickly lead to retirement of any units that are unable to meet this competition. Merchant plant developers often base their project decisions on the opportunity to replace generation from an existing unit high-cost; thus forcing its retirement.

However low-cost coal units may not be facing retirement, regardless of the age of the facility. American Electric Power (AEP) and Southern Company, coal-based companies, appear to be intent upon remaining in the generation business and in selling electricity in other regions. Tradeable emission allowances provide one means for such low-cost units to meet existing and new emission requirements. However, uncertainty created by the EPA's new NO_x rules and other rules under the Clean Air Act could have a significant impact on future generation from coal units. Currently the market for such units is expanding as the export of electricity to high-cost regions increases and approaches the limits of the transmission system. The transmission transfer limits are being raised through technological and operational changes, thus allowing expanded exports. The opportunity to sell or buy 2¢/kwhr electricity in 3¢/kwhr electricity markets is increasing interest in raising current transmission transfer limits.

The generation owners in the competitive market will have a far different view of any health, safety

or environmental requirement government places upon them than was the case under the monopoly structure. The cost of such requirements cannot be automatically recovered from rate payers as was the case for a regulated monopoly. Such additional costs for a specific unit will directly lower the profitability of the unit to the owners by increasing the unit's cost of production. "If you require this addition we will close the plant; you talk to the union", will be a statement likely to be heard by state environmental regulators. To a much greater degree than in the past, new, tighter requirements will be resisted by the owners of low cost units since their profits are reduced. On the other hand, owners of new gas-fired units will likely be supportive of tighter uniform environmental standards that would raise the costs of their competitors.

New merchant plant development plans are likely to appear as existing generation is retired and/or demand growth is strong. For example, the decision to close the Maine Yankee nuclear unit was followed by a series of merchant plant development announcements. The developers of merchant plants seek opportunities to displace generation from existing plants by beating their costs of delivered power to the market. Merchant plant developers can encourage the early retirement of existing units by offering a lower cost alternative, often closer to the load center.

CHAPTER 3

TRANSMISSION UTILITY CONSEQUENCES

Common Carrier

The transmission function is in the process of being transformed into a "common carrier" by FERC's Orders 888 and 889 which required transmission owners to provide comparable transmission services to all generation owners (including their own generation). The necessary separation of generation and transmission functions is underway through utility generation divestiture and the creation of separate subsidiaries within holding companies for generation and transmission. The transmission companies (TRANSCOs) will be responsible for the maintenance and operation of the transmission systems and to provide a common carrier for electricity trade.

An additional separation is occurring to reinforce the common carrier status. Operation of the transmission system is being separated from system ownership. Independent System Operators (ISOs) are being created to insure comparable service is provided to all generation owners and that transmission owners cannot discriminate in favor of their generation. ISOs will schedule, dispatch and perform actions to insure a match between generation suppliers and customer demands is in balance. Also, ISOs can provide a spot market directly or in combination with a power exchange group (PX). An independent PX establishes and operates the spot market for electricity.

TRANSCOs and ISOs

TRANSCOs and ISOs are natural monopolies that are, and will be regulated by FERC. FERC has emphasized that the ISOs must be independent of transmission and/or generation owners to insure that non-discrimination of service occurs. Transmission pricing is an intense issue for generation owners and marketers.

The pricing structure must collect adequate revenues to cover all transmission costs and a reasonable

return; provide correct pricing signals to generation owners; and provide incentives to transmission owners to remove congestion constraints. Combining these objectives into a tariff structure is a complex task.

Transmission owners (once separated from generation ownership) have an incentive, especially with low-cost technology measures, to remove congestion bottlenecks which constrain the capacity of their transmission. Increased transmission capacity would allow more low-cost generation to be transmitted to high-cost regions. Also increased transmission demand could benefit the transmission owners, especially in the short term.

A consequence of restructuring could be greater attention to transmission technology by transmission owners than what has been the case under the vertically integrated utility structure. Technology advances, including system controls, will increase the ability to transmit electricity over a given set of transmission wires or right of ways. When transmission owners also owned generation, the first concern with a potential transmission upgrade was the impact of the upgrade upon the entity's ability to sell from company-owned generation units. Separation of TRANSCOs and GENCOs would eliminate this issue and perhaps lead to expansion of the transmission system; however, the siting of transmission lines has been difficult.

System Planning and Siting

Restructuring will end the integrated planning of generation and transmission as generation becomes competitive. Generation development should be a very competitive activity as owners race to seize temporal, transmission, and/or locational advantages; greatly complicating the upgrading of existing transmission lines and siting of new lines. Numerous Federal, State and local permits are required for both generation and transmission siting.

The need for new transmission capacity is a combination of load growth and change in generation location and use. If transmission pricing is significantly based upon congestion, the current capacity

problems will be demonstrated and the correct price signals given to eliminating the congestion through upgrades.

Future transmission planning will be done by the TRANSCO owners and the ISO. However, they will have no control over the location of future generation and retirement of existing generation which will have a significant impact upon the capacity of the transmission system. This creates a large problem for system planning and budgeting. The likely consequence is for transmission capacity to be slow in responding to need; the decision to expand will likely be based upon a demonstrated bottleneck.

The siting of a new major transmission line was a difficult task in the integrated utility era. Acquisition of the necessary right-of-ways usually requires using the power of eminent domain. "Not in my backyard" opponents may be strengthened by "not at the expense of my generators" opponents in future siting proceedings. Also, electricity transmission siting is a state function. Regional transmission projects requiring approval in two or more states will have a more complicated approval process.

CHAPTER 4

DISTRIBUTION UTILITY CONSEQUENCES

Separation of Functions

Restructuring of the electricity industry is likely to result in increased attention to the distribution function. Integrated utilities tended to focus their attention on the generation function rather than the distribution function. The distribution company will have the distribution function as its main business and will not have the generation function to dwarf the distribution function.

The distribution function is a natural monopoly; due to the need for only one set of wires thus, distribution will remain regulated, probably by the states. Separating the distribution function from the retail services function is a necessary condition for a full competitive retail market. Without such a separation the distribution utility would have too great an advantage over other retail marketers.

This separation and the transition to the competitive retail market is being forged on a state-by-state basis in a series of legislative and/or regulatory actions. While the pace of this transition varies, the direction toward a more fully competitive retail market is certain, especially in high-cost states.

Much attention is now directed to separating the distribution function from the retail services function in the states implementing retail competition. The current integrated utility is likely to be involved in both functions in the future; hence a major effort is required to insure the distribution company (DISCO) provides equal service to all electricity service providers (ESPs) and does not favor its holding company's unregulated retail company.

Roles and Regulations

The role of the DISCO will be to provide and maintain access from the transmission grid to individual customers. The DISCO will transmit electricity for retailers to customers, maintain high quality service over the distribution system, provide metering services (unless customers and/or retailers

provide), and provide billing services where requested (perhaps out-sourced in the future). Maintaining the reliability of the distribution system, and expanding the system when and where needed, will be the principal role of the DISCO in the future.

The DISCO is likely to be the electricity provider of last resort in a competitive market. Customers who have not chosen an ESP or cannot find an ESP willing to serve them are likely to be served by the DISCO. The DISCO would purchase the necessary electricity in the wholesale market on a competitive basis and pass through the entire wholesale costs to these customers. An alternative to the DISCO as provider of last resort might be a competitive bidding approach among ESPs. The winning bidder would provide electricity through the DISCO to these customers.

The State PUCs will regulate the DISCOs by setting tariffs for their services. These tariffs will result in adequate revenues to cover the cost of the DISCO's integrated operating services plus a fair return. Also the DISCO must be given an incentive to expand the system in a cost-effective manner. States are likely to take great care to insure that the reliability of the distribution system is not reduced by restructuring.

The DISCOs will be indifferent to which ESP is providing electricity to which customers; the return to the DISCOs will be the same. The DISCOs are likely to be regulated on an incentive-based system in which the return will improve with improved performance. Higher use of the existing distribution system (i.e., more kilowatt hours transmitted) is likely to benefit the DISCOs at least in the short term through increased revenues.

Various charges such as competitive transition charges (i.e., funds for "stranded" utility assets) and systems benefits charges (i.e., funds for public programs such as low-income assistance, energy efficiency, renewable energy sources, universal service, and R&D) will be collected by the DISCO. Also, the DISCO, as a distribution monopoly regulated by the State, could be a vehicle for various public programs historically provided through the vertically integrated utility.

In some cases the distribution system expenditures were reduced by the integrated utility to save money needed to bolster the generation function. The DISCOs will focus solely on the distribution system and PUCs are likely to support greater reliability of that system. Power quality for all customers is critical, especially for residential customers and high technology industries.

A possible future activity of DISCOs might be encouraging distributed generation, especially for those interested in achieving optimal performance of the distribution system.

Such distributed generation would consist of locating small units (i.e., micro turbines, fuel cells, photovoltaic systems, etal.) close to load centers (i.e., customer sites or near substations) to provide voltage support, reactive power and reduced line losses. Such plants might be owned by third parties or DISCOs.

The DISCOs, with the possible exception of distributed generation, will not own generation. Therefore DISCOs will have no direct interest in generation or any environmental emissions program. They will not be a player in environmental issues where they once were a major player.

The DISCOs will have much to do to insure the system functions in a reliable manner in the restructured industry. As retail competition grows and the products offered by the ESPs expand in number and complexity, their tasks and regulations are likely to be more complex.

CHAPTER 5

RETAIL SERVICE FUNCTION - CONSEQUENCES

Expanded Role

The consequences of restructuring upon retail services will be to awaken a sleeping giant; the new products and services created will be limited only by the imagination of buyers and sellers. The transition to a truly competitive retail market is likely to require a few years. During this transition customers will be asking for new services and products. Competitive suppliers will be marketing new products and services.

Retail service was the least emphasized function of the vertically integrated utility under the monopoly structure. For example, electricity consumers were called rate payers instead of customers. The focus was on delivering a safe, reliable and affordable commodity — electricity. The local monopoly provided this essential commodity under strict regulation. Under the monopoly structure the environment for innovation in services was poor and the innovations were few.

Players

As retail competition begins, the retail services function is becoming the critical element of the electricity industry. The evolution of this function is likely to take many forms. The retail services function is so new that there is a lack of agreement on what its generic name should be. California proceedings refer to energy service providers (ESPs), New York proceedings refer to energy service companies (ESCOs), and Wisconsin proceedings and many academics refer to retail companies (Retail COs). Others refer to retailers as power marketers, aggregators, supply coordinators or marketco.

The retail services function will be very complex as many parties play various roles and fill a variety of niches. The contracts between the suppliers and the customers will become the transactions that

define the retail function. The transactions could be a simple deal between a generation company and a large customer or the DISCO could provide a small customer with electricity from the spot market (i.e., provider of last resort.) Conversely, the movement of electricity to a retail customer could involve a series of complex contracts (generator → marketer → broker → aggregator → customer). The evolution of this supply chain is likely to be determined by the profit margins available and the value added service desired. Complex terms and conditions are likely to be worked out by marketers negotiating with buyer's agents.

The role of retail energy service provider (ESP) could be filled by any number of players: the unregulated subsidiary of the local distribution company (i.e., Allenergy—New England Services); the unregulated subsidiary of a holding company retailing on a national basis (i.e., PG&E Services—PG&E); a national energy marketer (i.e., Enron Services—Enron); a broker (i.e., Wheeled Electric); a buyer's agent (i.e., New Energy Ventures); or an aggregator (i.e., municipality, buying cooperative, association of entities).

Products

An ESP might own generation (i.e., Enron) or have a close relationship with a GENCO (i.e., fellow subsidiary of a holding company such as U.S. Generating and PG&E Services). Many ESPs will not own generation; rather they will buy from GENCOs on a bilateral and/or pool exchange basis and sell to individual customers or an aggregator of customers.

The profit margin on electricity sold as a commodity is very likely to be thin. ESPs will offer a variety of electricity services, additional service and products and in some cases differentiate their electricity from the electricity of their competitors. The electricity services could include consolidated billing (i.e., one firm/many locations); interactive meters and control systems (i.e., managing customer load to avoid demand changes); increased power quality; backup power systems to insure reliability; sophisticated real time billing provided by sophisticated metering and billing systems; on site power generation; and guaranteed prices (i.e., ESP locks in price via futures market hedges). The additional

services could include leasing/sale of equipment; energy efficiency investments; production improvement investments; and total energy procurement (i.e., ESP manages fuels/electricity procurement).

The use of real time metering and communication systems could expand services into interactive lighting, appliances, home equipment and security systems in the residential sector. The integration of industrial processes with the electricity system is possible through such metering and communication systems.

An ESP will offer a variety of electricity products to differentiate its products from those of its competitors. "Green" and/or "clean" electricity will be offered by many ESPs. Environmental quality marketing could be a major ESP activity especially if an environmental emissions disclosure for all retail sales is required by individual states. If the fuel mix and resulting emissions profile is known for all potential purchases; spirited marketing campaigns are likely to follow.

ESPs are sellers of whatever products are desired. To a degree, ESPs will shape markets by innovation and advertising. Sellers of green and/or clean electricity will paint an evil picture of "dirty" and/or "dangerous" electricity. A concerned citizens would not buy that, is likely to be heard in the future. "Lowest price", will be another common theme of marketing.

ESPs will evolve as the retail market evolves on a state-by-state basis. Low "standards offers" (initial default electricity prices) by the existing utility early in the market transition will delay retail competition initially and the evolution of ESPs in specific state markets. As the transition is phased out, the competitive retail markets will emerge.

One possible evolution of some ESP services, encouraged by the trend for entities to out-source non-core activities, is to provide the management or ownership of the equipment serving the entity and provide all energy products. These projects could include heating, cooling, process heat, mechanical energy, compressed air — all the energy required by the entity. While this arrangement is not

common in the U.S., it is in Europe. The recent arrangement between Trigen and Coors at the Golden, Colorado brewery is an example of such an arrangement. Trigen purchased the boilerhouse at the brewery, is upgrading the boilerhouse to cogenerate more electricity, will sell electricity and thermal energy to Coors, and make energy efficiency improvements to lower energy use.

CHAPTER 6

CUSTOMER CONSEQUENCES

Choice

Customer choice of retail electricity service providers (ESPs) should result in a competitive retail market in terms of price and products offered. Customers, either individually or in aggregation pools, will be able to choose their electricity suppliers and switch suppliers based upon market information.

Profit margins on electricity as a commodity will likely be low due to the competition among future ESPs. A likely source of profits for ESPs will be new energy and non-energy services offered to the customer. High-tech meters, interacting with equipment controls, will provide a host of opportunities for new applications. These markets are currently far more vibrant among large industrial customers who can afford to evaluate options and have the highest interest in reducing cost. Residential services, while having great potential, are developing slowly.

Markets

The products desired by customers will be what the ESPs develop and market. For example, some specialized manufacturing processes require consistent high quality electricity; an ESP working with a manufacturing firm (such as a computer chip maker) could provide the equipment to assure electricity quality. An ESP might market home security systems to residential customers as an element of an energy-security package involving sophisticated meters. In the future, retail sales will be the electricity industry function undergoing the greatest innovation, rather than the least innovation as in the past. Selling more electricity and services will be the goal of the ESPs; meeting the perceived needs of their customers will be the means.

Differential marketing of electricity will occur. Green and/or clean electricity is a niche market that is developing for customers aware of and concerned about the differential environmental impact of generation sources. Required disclosure by all marketers of the emissions profile of all electricity

being offered is a direct means to create this awareness. Green electricity marketers will create the differential between green and dirty electricity through extensive advertising campaigns. How customers respond will determine the size of this niche market. Early programs have shown an interest by customers to pay a premium for clean/green electricity.

Bills

The future customer bill will differ significantly from the current bill. Currently, most customers are billed primarily on a kilowatt hour (kwhr) basis at a tariff rate established by the state PUC for specific classes. Thus, the current bill is a product of the hours of usage multiplied by the rate per hour plus a small service charge. Such a bundled bill masks many differences in service costs among customers.

The new unbundled bill will have a series of charges for a) the distribution system providing the connecting wires services, b) services charges for connection service, c) a series of charges for the provision of electricity, and d) any other services. The distribution services and ESP services might be billed separately. The prices varying with usage hours would include electric energy and any temporary wires charges to pay for stranded utility assets and public benefits. Once the temporary wires charges are removed; the current variable cost of 7-10¢/kwhr for a high-cost region is likely to decrease significantly. Transition to such a billing structure may require a few years; but the end result will be an unbundled bill with significantly different pricing factors.

Prices

The price of generation will likely be whatever the market will bear as a competitive market commodity. Retail services will be based on the value the customer attaches to the services; there will be competition in these services in terms of innovation, quality and price.

Transmission services will be based upon a regulated tariff overseen by FERC. Distribution services

will be based upon a tariff probably influenced by performance based return regulation by the State PUC.

One goal of restructuring is to lower the total cost of electricity to the customer by allowing market forces to make the electricity industry more efficient. Another is to provide a broader array of services by meet customer needs, Opinions differ on the effect of restructuring on electricity prices on customer class; however, there is general agreement upon the effect on generation prices.

The increased efficiency in the generation market will eventually reduce the wholesale price of electricity significantly in the high cost regions (i.e., $6\text{¢}/\text{kwhr} \rightarrow 3^+\text{¢}/\text{kwhr}$). New low cost generation technologies will cap the market clearing prices, lower cost generating will flow into higher cost regions, and a general movement to reduce production prices will result in lower cost generation. Initially, this reduction in generation costs will be offset to a significant degree in high-cost states by a legislated and/or regulated charge (i.e., $3^+\text{¢}/\text{kwhr}$) to all customers to pay the current utilities for their above market generation assets and/or purchase power contracts. The amount of "stranded costs" can be set by the market through an auction of the generation assets and a settlement of the purchase power contracts.

The initial cost reductions have tended to be set by settlement agreements rather than the market in order to secure cost reductions for all customers. For example, California and Massachusetts have set initial reductions of 10 percent for all customers. In some cases, the initial required cost reductions coupled with the stranded cost recovery requirement by the state authorities has resulted in limited retail competition since the transitional price offered by the current utility is a low price and stranded charges are non-by-passable.

Once a truly competitive retail market develops, the price impacts are likely to vary significantly by customer size and profile. Large customers with a constant load would receive the best price offers. Also, currently high-cost regions would experience the greatest reductions.

In addition to the overall decline in electricity price to customers the variable prices will fall

significantly, except in the short-run until the stranded cost burden is removed. The variable price declines will occur as bills are unbundled and decline more as the temporary wires charges phase out.

The significant decline in variable price (i.e., 10¢ → 4¢ kilowatt hour in high cost regions) will increase demand for electricity and provide electricity marketers a means to gain new markets. Greater retail electricity sales will be aggressively pursued by ESPs in a manner not seen in the era of retail monopoly. New and broader applications of electricity in industrial, commercial buildings and residential life will be developed by ESPs and their trade allies. For example gas to electricity application switching will be marketed.

Variation in electricity service price by time of day, day of week and season will be offered to those customers with time of use meters. As the cost of meters decline and time of use pricing incentives become attractive, more customers will desire such meters. The variable time of day rates will discourage peak period use and encourage off-peak use. Those customers able to manager their demand and shift their load profile from peak to off-peak will benefit.

ESPs will encourage greater off-peak use by aggressively marketing load shifting and greater off-peak applications. Means to store the products of electricity-heating, cooling, and mechanical energy will be encouraged. The total number of kilowatt hours of demand is likely to increase, due to generally lower prices while the peak period share of the total demand is likely to decline. These marketing approaches will be targeted to industrial and large commercial customers.

The ESPs will offer the best terms to large customers with favorable load profiles (i.e., an ideal customer would be a steel mill with a constant load occurring each day of the year). The way for small customers to negotiate better terms is to aggregate into a "buying pool"; thus becoming elements of a large customer. For example, several large homeowners associations can join to form one large customer. Aggregation can occur through customer associations or through marketers. National firms will aggregate their facilities into one or more contracts with competing ESPs. The goal of any customers joining an aggregation pool is to lower cost and/or expand available services. Aggregation into buying pools is becoming common for government associations, education

associations, health care groups, large commercial businesses, industrial groups, and hotel chains. Aggregation into a buying pool less common for residential customers, which is why many observers are concerned that the benefits of competitive markets will be more difficult for the residential customer.

CHAPTER 7

ENERGY EFFICIENCY — RENEWABLE ENERGY SOURCES CONSEQUENCES

Efficiency

Restructuring of the electricity industry is already having a significant negative impact upon both utility efficiency programs and utility procurement of renewable resources. If New York's experience is any indication, these programs are in jeopardy. The New York State Energy Research and Development Authority reports that utility investments in energy efficiency demand-side management programs (DSM) since competitive discussions started has dropped 80 percent. Unless an interested public through government action adopts mitigating measures, these programs will continue to be curtailed. The necessary transition to a customer-based energy efficiency market will require considerable assistance from public policy. The development of customer demand for electricity from renewable sources will require careful labeling and public education programs. Suppliers of renewable energy resources must press for such labeling and public education programs if they are to be implemented.

As the era of integrated monopoly utilities regulated on a cost plus basis comes to an end, utilities are curtailing efficiency programs and/or transforming such programs to sales programs. The reasons for disengaging from energy efficiency and a renewed focus upon expanding sales are: realization that they will be competing (if they remain in the retail sales function) with others for customers; realization that any long term DSM costs, especially "lost revenue" costs, are unlikely to be recovered in the future through the regulatory process; and, a belief that selling, not saving kilowatt hours is at the core of a retail sales business.

Utility DSM has two components: a) increased energy efficiency of end uses (i.e., saved kilowatt hours), and b) load management (i.e., reduce peak demand by either clipping or moving demand). Traditionally the focus of the utility industry has been on load management programs which make the integrated utility system more economically efficient in meeting user requirements. Reducing

peak demand and increasing off-peak demand would reduce the integrated utility's costs. Environmental advocates and those concerned about total economic efficiency have focused on reducing the total demand for electricity in a cost effective manner. Future end-use efficiency activities must be customer-based if they are to be effective.

The unbundling of the customer bill into a hookup service fee, kW demand charge distribution fee, and kilowatt hour charge will influence the interest of customers in energy efficiency and load management. A current 10¢/kwhr tariff may become \$30/month of service fees, a \$10/month demand charge, and 4¢/kwh variable fee for electricity. Large customers will have time of day rates for the variable electricity prices and demand charges. As meters become less expensive, smaller customers will have time of day rates. The unbundled bill will provide less economic incentive for the customer to upgrade their energy efficiency and more incentive to manage their demand and perhaps substitute electricity for other energy sources.

The break-up of the integrated utility into separate generation, transmission, distribution and retail sales functions will have a profound impact upon how each of these functions view increased efficiency and load management. GENCOs want increased total demand both peak and off-peak. GENCOs want increased wholesale sales to raise both unit prices and volume.

TRANSCOs will want increased sales, especially off-peak. If congestion pricing of services is the norm (as economists preach should be the case) high-peak demand would not be a problem eventually for the TRANSCOs. Rising transmission demand would increase the probability of recovering the reasonable revenues. In a similar manner DISCOs would benefit from rising demand. The State PUCs might encourage DISCOs to evaluate load management incentives against distribution system upgrades; however, since the DISCOs are distributing not selling electricity, these incentives are problematical.

Selling electricity is the core business of the ESPs. Many of these companies, however, are likely to offer value-added services, including energy efficiency and load management to a customer desiring

such services. The profit margin of an ESP dealing in electricity and services is not necessarily tied to kwhr sales; however, an ESP acting as a simple commodity retailer is concerned with increasing kwhrs. Eventually, as the restructuring transition moves towards full retail competition, there is hope for the development of a vigorous energy efficiency services market pursued by ESPs and/or energy service companies. Also, the ESPs will be promoting the expanded use of electric use technologies, as a means to improve the system load factor (i.e., raise off-peak demand). The degree to which energy efficiency is offered by ESPs will be a function of customer demand and the marketing of these services. Early public measures, funded by systems benefit charges, to transform this end use efficiency market will be critical to these services being sought and provided.

Renewables

The future demand of renewable generation resources will be determined by relative price, customer demand and willingness to pay a premium, ability and willingness to identify electricity from renewable sources, and government mandates for inclusion of renewable sources into retail sales portfolios. If renewable resources are to grow (perhaps even remain static) in use; public action is required either to disclose the "environmental profile" of all electricity and/or establish renewable resources portfolio standards.

The fully competitive generating market is leading to increasing dependence upon the spot market in the near-term for additional generation demand and curtailment, to the degree possible, of existing above market price generation resources. Renewable resources, if priced above the spot market, are included in the curtailed resources. The generation market will be predominately based upon price as a result of wholesale competition; transition to retail competition will further increase this price focus. Generation that produces electricity above the market price will not be purchased, unless it offers some distinguishing characteristics desired by customers. The availability of data on all generation sources, both from utility generation and independent producers is under assault. If this data is limited, then green offerings will be difficult to verify; which may lessen the perceived value of this niche product.

Increased customer demand for electricity from renewable sources will result in greater renewable resource procurement. This green marketing approach requires the truthful labeling of green electricity products and probably the labeling of all electricity products regarding their fuel mix and emissions profile. This disclosure label is the first step toward green marketing. (See energy efficiency and renewable resources primer for more detail.)

Government Policies

Another means to increase renewables resource procurement is to have government mandate that a fraction of all retail sales be procured from renewable resources. This renewable portfolio standard is envisioned to grow in market share over time. A market-based means for generation companies without renewable resources to purchase renewable credits from those with such generation would ease the implementation of this mandate. (See energy efficiency and renewable resources primer for more detail.)

The government action that would encourage both energy efficiency and renewable resources would be a system benefit charge on all distributed electricity (see energy efficiency and renewable resources primer for more detail). The funds from this charge could support market transformation programs for energy efficiency and procurement incentives for renewable resources, as well as continued low-income assistance programs.

Targeting market transformation funding to encourage greater customer-based efficiency services and renewable resource procurement is a means to expand the energy efficiency and renewables industry, thus, leading to expanded marketing of energy efficiency services and renewables to customers.

CHAPTER 8

ELECTRICITY DEMAND AND ENVIRONMENTAL CONSEQUENCES

Demand

The U.S. demand for electricity is likely to rise due to lower real prices, much lower variable electricity prices, increased marketing of high electricity use technology much lower energy efficiency investments by utilities and a growing economy. The electricity intensity of the U.S. economy has been nearly flat for the past 10 years. The recent falling real price of electricity is forecast to continue due to greater market competition. These events will happen to a greater degree in current high retail cost states where transition to competition is underway.

The unbundled retail electricity bill coupled with sales promotions are likely to increase the impact of lower prices upon demand. Anticipated utility-based energy efficiency scenarios built into many current forecasts of electricity demand will not occur. "Business as usual" will not occur; the business has changed. The additional increase demand could be on the order of 1% per year (i.e., a current 1.5 percent/year growth rate would increase to 2.5 percent/year). EIA has begun to hedge on their electricity demand forecasts based upon possible restructuring impacts on price. Other simply have increased expected demand within their forecasts.

An additional 10 percent of electricity demand in the next decade over the current forecasts would result in an additional 10+ percent (demand plus line losses) of electricity generation and an associated increase in emissions unless mitigated. In situations where emissions are capped, the price of a given level of compliance will rise. For uncapped pollutants, such as CO₂, emissions will rise unless the generation mix changes significantly to green or high efficient gas units.

Fuel Mix

Fuel mix will change due to restructuring. High capital cost new generation, such as nuclear and

large hydro, will have a very difficult time being financed in a competitive generation market. Potentially high maintenance cost existing generation such as nuclear units may have a difficult time finding a new owner or being continued by the existing owner. Nuclear units with high decommissioning costs have an added burden. Utilities offered full recovery of its stranded asset costs may have a tendency to retire any nuclear units early under the rules of stranded cost recovery. For example, Commonwealth Edison recently announced the permanent closing of its Zion nuclear unit (2080 mws) in northern Illinois because its management believed it would not remain competitive in a competitive market. Gas-fired merchant plants are being developed on the premise that they can produce electricity at $3.5\text{¢/kwhr} \pm$. Such merchant plants are causing more expensive generation to be economically obsolete and hence retired. Conversely, older fossil plants (coal, oil and gas) that are competitive in today's generation market have been selling at a premium (i.e., New England Electric System, Central Maine, Boston Edison, Pacific Gas and Electric) at generation auctions.

Emissions

Whether generation from low-cost coal plants will be increased significantly to serve an out-of-state market has been a hotly debated topic. Clearly the interest to move 2¢/kwh generation from low cost coal units into a 3¢/kwh generation market is high. However, during some peak period, transmission constraints limit imports to and through high-cost regions. Under such transmission constraint conditions, coal generation imports are limited to off-peak hours. Such transmission constraints are likely to be overcome, to a degree, by initial operational changes and technology upgrades later to increase transfer limits; if a significant price differential remains. Increase coal generation, unless mitigated, would increase SO_2 and NO_x emissions and increase CO_2 emissions.

The revision of clean air requirements, especially ozone and particulate standards, and the restructuring of the electricity industry are occurring in parallel. Each will have an impact upon the other. Ozone compliance is a major multi-state unresolved issue requiring a significant reduction of the NO_x emissions from existing power plants. Also, a greater than one-for-one offset of NO_x

emissions will be required for many new plants.

SO₂ emissions are capped with a vigorous emissions credit trading program in place and maturing.

To date, use of lower sulfur fuels, plant retirements and some sulfur scrubbing equipment have provided adequate SO₂ emission credits.

The coal-fired generation owners could reduce their SO₂, NO_x and particulate emissions with control equipment at a higher cost including lower efficiency (and higher CO₂ emissions per kilowatt hour generated). Whether the generation owners choose to comply or close will be determined by the generation market. Any future CO₂ reduction program would greatly influence this choice, since greater efficiency or lower carbon fuels are the means to reduce CO₂. The price advantage of low cost but dirty coal plants in a competitive generation market might bear increased controls and/or purchase of emissions reduction credits if the market for their power is strong. However, a carbon reduction program would make coal less competitive, the degree would depend upon the magnitude of the carbon reduction required.

The sellers of electricity are likely to package generation in clever way to capture market share. For example, a marketer might purchase via a long term contract, baseload generation from an out-of-region GENCO and purchase peak period generation and capacity from an in-region GENCO with peaking gas turbines. Thus, the marketer could guarantee capacity and peak period electricity from in-region gas turbine units, while providing most of the electricity from out-of-region coal plants. Such an approach in the near term would increase the use of low cost coal plants, and potentially increase air pollution in other regions.

The short-term impact of restructuring on power trading, export of electricity from coal-based regions, capacity of the transmission grid, use of coal-fired plants and emissions from the utilities all show a significant increase according to a recent study by Northeast States for Coordinated Air Use Management (NESCAUM). The NESCAUM study showed that production at low-cost, less stringently regulated coal-fired power plants is higher because the existing transmission system is

capable of supporting a significant transfer of electricity and because the price differential is significant.

The differential in NO_x emissions requirements between a new and an old generation unit or an out-of-region and in-region unit may influence the production cost enough to effect the generation market. If all generation units were required to meet a uniform standard of x lbs. NO_x/kwhr, the "environmental compliance playing field" would be level, according to the owners of new generation units. Such a requirement would have a significant impact upon the generation markets.

The merchant plants currently planned and developed in the Northeast and California are gas-fired high efficiency gas turbines, usually coupled with steam turbines to create a combined-cycle unit. These units will provide a ceiling on the price of generation in a region. The developers of the merchant plants (U.S. Generating, Sithe, American National Power, Duke Power, FLP) are the emerging national GENCOs. Such merchant plants will have very low emissions of NO_x, SO₂, and CO₂ on an output basis.

Siting

In the monopoly era, state power plant siting laws were enacted to ensure that "just enough" generation was built and its environmental emissions were mitigated. Now new plants are being sought to lower prices, retire old plants and reduce environmental emissions. The siting laws are being changed to accommodate the realities of the new competitive markets.

Gas-fired units are more likely to be sited close to load centers (i.e., in or near major metropolitan areas). New natural gas pipeline and expansion of existing pipelines may be less of a siting problem than new transmission lines or the expansion of existing transmission lines. In essence, coal electricity by wire will compete with gas electricity by pipe on a coal and wires vs. gas and pipes basis in the future. The relative price of delivered coal and delivered gas will be a major competitive factor.

"Brownfield" sites located in cities that are considered load pockets (areas with concentrated electricity demand and limited access to generation sources due to inadequate transmission capacity) could be encouraged by State governments who try to reduce generation "market power" concerns. These plants would reduce emissions relatively because they would be highly efficient, gas-fired, and would in many regions require a 1.x offset of their NO_x emissions.

Initially, restructuring could cause additional stress in achieving environmental compliance and result in increased CO₂ emissions because of higher electricity demand and a shift in generation fuel mix towards more fossil fuels. The future generating fuel sources are likely to be predominately coal and gas. The contest between these fuels will be intense and complex and its outcome will have a major impact upon environmental compliance.

CHAPTER 9

CONCLUSIONS

The restructuring of the electricity industry is underway; the era of the utility monopoly serving an exclusive franchise territory is ending. Competitive markets in generation are being established. Trade in generation is accelerating. The transition to competitive markets in retail services is underway in the high cost states. The vertically integrated utility functions of generation, transmission distribution and retail services are breaking into separate functions to be carried out by separate companies; GENCOs, TRANCOs, DISCOs and EPSs.

The concept of an electricity retail customer is becoming a reality as is the concept of electricity marketer. Electricity sales are beginning to be aggressively marketed. The variable price of electricity is falling as the bill becomes unbundled. Customers are beginning to aggregate into purchasing pools to obtain better terms.

Many consequences of restructuring and the resulting markets are foreseeable. The generation markets will be very competitive; many high cost generation units will be retired. New generation units will be built when and where their developers believe they can be competitive in the new markets. These new units are likely to be predominately gas fired with relatively low capital costs. Low cost coal units are likely to run as long as their output can be sold.

The transmission systems will be used to move low cost electricity to high cost regions up to the allowable transmission capacity. Operation of the transmission systems will balance the objectives of system reliability and development of regional electricity markets. Pressure to unclog transmission bottlenecks will rise especially if transmission pricing encourages transmission expansion.

The distribution systems will remain monopolies regulated by state PUCs. The DISCOs are likely to be the service providers of last resort to customers electing not to choose an ESP. The spot market prices for electricity would be passed on to such customers.

New entities, the EPSs, will provide energy services to customers and whatever other products are desired by the customer and profitable to the supplier. These EPSs will range from national marketers to the competitive retail marketers of former utility monopolies. These EPSs will aggressively pursue expanded markets for electricity. Some ESPs will offer green electricity often as a means to enter a new market.

The customer will begin shaping the electricity industry through their purchase of products. If a significant number of customers purchase green electricity there will be an expansion of renewable source generation. If customers tend to choose to purchase gas and electricity from one supplier, mergers will increase. If customers choose to purchase energy efficiency services from their energy supplier, greater energy efficiency is likely to occur. The GENCOs have no interest in reducing electricity demand or in producing electricity at costs beyond its market value; EPSs have an interest in reducing electricity demand if their profits are greater than from sales.

Restructuring will reduce the variable price of electricity significantly as the bill is unbundled into fixed and variable prices. This factor combined with aggressive marketing is likely to lead to additional growth in electricity demand and greater potential emissions to control.

The future fuel mix to meet future electricity demand will be driven by customer choice and lowest cost. Three patterns are emerging, new units tend to gas fired, nuclear units are being retired, and existing low cost coal units are increasing their production. Also, transmission constraints have been avoided by locating gas fired units close to load centers in high cost regions; this trend could continue.

Finally, the future of a restructured industry and its consequence are inherently uncertain; however, a very significant change from the monopoly era is certain.