The Virtual Utility: Strategic Choices for Utilities in the Restructured Electric Industry

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ABSTRACT

This thesis describes the electric industry restructuring process caused by global deregulation and a strategic management approach to guide firms into the newly restructured industry (see Exhibit 1). First we examine the electric utility industry by analyzing industry specifics and geographic trends. Highlights from interviews of four firms provide examples and ideas regarding this dramatic transition, which the global utility industry is facing.

Drawing from the preceding analysis, we then predict the most likely outcome of the industry structure after deregulation; an unbundled, horizontal industry structure with strictly separated and highly competitive segments, analogous to the computer industry. Next, we present the concept of the "Virtual Utility" as a form of re-bundling portions of the disaggregated industry.

We then explore the potential strategic options available to firms for effectively competing in each industry segment, through the application of Arnoldo C. Hax's "Adaptive Management Process". Each strategic option, when considered with the corresponding internal alignment characteristics, can easily used by utilities in order to assess their own strategies in today's rapidly deregulating environment.

We hope to provide a contribution which helps to clarify the diffused discussion worldwide regarding the forthcoming transition into a new more competitive and less regulated utility industry, by focusing on a likely future scenario and presenting a framework of strategic options for firms to consider as they choose a course of action.

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Our interviewees were of great help in sharing their experiences in, knowledge of and predictions for the electric industry. Most notable were Robert Green, President and Chief Operating Officer of UtiliCorp United Inc, Harvey Padewer, Sr. Vice President of UtiliCorp Energy Resources, Professor Doctor Dietmar Winje, Chairman of the Board of Management of Berliner Karft-und Licht, Matthias Herzog of Bayernwerk AG, and Richard Owens, Vice President of the Caribbean Region for Southern Energy. Each of these gentlemen were good enough to take time out of their busy schedules to provide their insights.

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INTRODUCTION AND BACKGROUND

The purpose of this research paper is to explore possible outcomes of deregulation in the electric utility industry worldwide and offer, in our opinion, the most likely industry structure in the long run. This industry structure will then drive the strategy development for the various firms competing in the new, competitive market. To this end, we will present possible strategies to be deployed by the actors in this industry depending upon their core competencies.

Approach

We will begin with an overview of the industry as it exists today in most developed countries. We will then analyze the industry utilizing various strategic tools such as Porter's Five Forces Model and summarize the state of the industry in various markets. Finally, we will draw conclusions from this analysis and offer the most likely long-run structure the industry will evolve to and the most effective strategies to be deployed to ensure organizational success.

Before describing our hypothesis on the future of the electric industry structure and strategic choices, a little background information will be helpful relative to a comparison of this industry to other industries that have undergone deregulation.

Industry Comparison

Many people have compared the natural gas, telephone and electric power industries in an effort to draw parallels between the deregulation of the former two and the latter.

However, there are several key differences that make the deregulation of the electric power industry more difficult and risky. Following, is a summary of these key differences[1]:

Key Technology Attributes –

Natural Gas: Storable in large fields; can be directed down specific pipelines; network is less vulnerable to interruptions and imbalances between supply and demand.

Telephones: Network can "refuse" service temporarily (via busy signal); calls can be directed and rerouted.

Electric Power: Not economically storable; cannot be readily directed down specific routes; supply-demand imbalance must be maintained; low tolerance for interruption disturbances, and disturbances can instantly spread to larger and larger areas.

Industry Stages and Their Regulatory Status –

Natural Gas: Producers were deregulated in 1978; pipelines are federally regulated; local distributors are state-regulated.

Telephones: Content origination never regulated; "transmission" (long-distance) largely deregulated in 1983; local distribution recently deregulated under certain conditions.

Electric Power: All 3 stages regulated; federal government regulates sales between utilities and transmission rates; state regulators regulate plant construction, retail sales, distribution.

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[1] Penner-Fox, P. 1997. *Electric Utility Restructuring: A Guide to the Competitive Era.* Vienna, Virginia: Public Utilities Reports, Inc. p. 42.

A state-by-state summary of the currently regulatory status of electric power is provided below.

Other Regulatory Differences –

Natural Gas: Federal regulators can give interstate pipelines permission to build and exercise eminent domain.

Telephones: Federal regulators place extensive requirements on local and long-distance providers.

Electric Power: Only state governments give permission to build new power plants or line; no federal power of eminent domain.

Approximate Industry Size –

Natural Gas: $63.83 billion revenues; $138.1 billion assets (1994).

Telephones: $94.44 billion revenues; $210.5 billion assets (local carriers, 1994).

Electric Power: $202.7 billion revenues; $550 billion assets.

Peacetime Public Safety Aspects of Industry –

Natural Gas: Loss of service during periods of extreme weather can be life-threatening.

Telephones: Loss of service removes most immediate access to police and other emergency services.

Electric Power: Depending on the size of the area experiencing the disturbance, economic costs (spoiled food, ruined computers) can be very large. Public safety faces widespread threats if large areas remain dark for extended periods.

The preceding summary of differences makes it evident that specific analogies cannot be easily drawn between other utility systems and that of electric power when it comes to predicting deregulation or restructuring of the industry.

Unlike most other deregulated utilities, interdependence continues to be a central technical feature of the power industry. This will likely continue for as long as it is cheaper for people to get their electricity from the grid than to supply themselves, independent of the grid. The following table summarizes the value of interdependence to the entire industry as opposed to attempting to supply all the demand in a single area by a single utility:

Scenario	Cost of Operating A's Plant	Cost of Operating B's Plant	Total Cost of Operating System
Utility A and B try to match own loads.	$175	$225	$400
Utilities use least-cost "central dispatch" method.	$180	$210	$390
Savings from centralized least-cost dispatch	($5)	$15	$10

Source: Fox-Penner, P. 1997. *Electric Utility Restructuring: A Guide to the Competitive Era.* Vienna, Virginia: Public Utilities Reports, Inc. p. 46.

There are some situations in which hospitals, industrial plants and apartment buildings can own their own power plants and generate some or all of their power, but these are only economically viable in instances where they can use the waste heat from the plant rather than pay for it separately, or it can get fuel or captial more cheaply than the local utility. Even these generators ultimately become part of the grid because the area's control center has the right to turn them up, down, or off in order to keep the system in balance. Therefore, it is likely that power interdependence will be with us for decades to come. This is a key difference between other utilities such as telecommunications.

Current State of the Industry and Deregulation In Significant Markets

United States –

Every state in the US is approaching its deregulation efforts at different rates and approaches. Several pilot programs are being launched, but they do not appear to be large enough to be a viable test of the competitive market. Efforts to open cross-border electricity trading among the US, Canada and Mexico may be delayed by these very state deregulatory concerns[2].

At the federal level, the Federal Energy Regulatory Commission (FERC) is currently dealing with complaints by power marketers and other new entrants that the existing utilities are manipulating transmission systems to maintain market share and protect their stranded costs. Earlier the FERC mandated that electric utilities functionally unbundle their power marketing operations from those that operate and allocate transmission capacity. However, the Order does not appear to provide sufficient control to create a truly competitive environment for all the players[3].

On January 30, 1997, Senator Dale Bumpers introduced legislation that would federally mandate full competition in the electric industry by 2003. Bumpers' bill provides for full stranded cost recovery by the utilities, giving the FERC authority to hear appeals of utilities who have been denied stranded cost recovery by state regulators. In addition, Dan Schaefer reintroduced his bill on February 10, 1997, requiring full retail wheeling

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[2] " *FERC Chair: State Issues May Stall Cross Border Power Trade*", Dow Jones – October 24, 1997.
[3] "*FERC Addresses Power Marketer Issues*", Dow Jones – December 17, 1997.

for all customers throughout the US by the end of 2000. The key to this bill is satisfying the states rights issue by leaving implementation to them. If a retail wheeling plan is not developed by the states within six months of passage of the proposed bill, the FERC will impose their own plan. Conversely, Representative Frank Pallone introduced legislation that would halt all retail wheeling activity until the issue of "transported air pollution" due to reallocated generation resources is resolved. These conflicting efforts at legislation evidence the fact that states will continue to develop their own approaches for some time to come in the absence of coherent, acceptable federal guidelines.

Interviews with senior management at both UtiliCorp United and Southern Energy confirmed the fact that state-by-state approaches are dissimilar. Rick Owens, Vice President – Carribean Operations at Southern Energy believes that, at best, deregulatory efforts may create approximately six regions of similarity. Rick Green, CEO of UtiliCorp United refers to the deregulation process as a "patchwork" and will result in "lite competition".

A summary of state-by-state regulatory activity is provided in Exhibit 2.

European Union Overview –

The European Union has called for open access at least at the wholesale level in 1998. However, in conversations with sources described in the following section, it is evident that the necessary guidelines and infrastructure are not in place to facilitate this change.

Most utilities in the EU expect a rather slow process of deregulation. They view it as unstoppable and underestimated. The current German agreement for example will be in force for three years. If this arrangement does not effectively promote competition, then more liberal rules will be developed. The German utilities believe that deregulation will be driven more by national governments than by the EU.

If this is true, then the EU faces difficulties very similar to the US where each state is approaching regulatory reform in a different manner and pace. Right now is no clear strategy regarding liberalization and deregulation in the EU visible[4]. Too different are the interests of the countries and their major players.

UK and Scandinavia could be in parts an exemplary model but especially Germany and France are not quite ready yet to follow such models. We expect that the power market in the EU will be one of the very last markets, which will meet the requirements of a common EU market ("EU Binnenmarkt"). Following we briefly describe the utility industry in Germany, France, Norway, and UK as the key player countries in the EU liberalization and deregulation process.

Germany –

The electric power industry (EPI) is made up of nearly 1,000 companies in a hierarchy of national, regional, and local organizations.[5] Nine interconnected supra-regional utilities

[4] "*Wettbewerb in der Stromwirtschaft – ein neuer Weg fuer Deutchland und Europa*", StromDISKUSSION Nr. 185, 1994

[5] Gilbert, R. and Kahn, E. 1996. *International Comparisons of Electricity Regulation. Chapter 7: Regulation of the market for electricity in the Federal Republic of Germany.* J.Mueller pp.277-312

control the grid and a large portion of the overall generation. Among these companies are BEWAG and Bayernwerk AG, where we had the opportunity to conduct interviews about deregulation and strategy.

About 50 companies own and operate power plants that supply exclusively to other utilities.[6] Another 70 companies retain certain network operations responsibilities and handle some distribution, particularly in low-density areas. The largest portion of companies (approximately 850) is involved almost exclusively in distribution to end-users, buying electricity from generators. Five hundred of these companies are municipal systems and the rest are private electricity supply companies or rural associates. Utilities in Germany co-operate within a strong framework of several organizations. The most important are the "Vereinigung Deutscher Electrizitaetswerke (VDEW)" and the "Deutsche Verbundgesellschaft (DVG)". The VDEW groups (700 members strong) deal with the technical, economic, and organizational problems of public supply.[7] The DVG, the German association of interconnected transmission systems, groups the main utilities operating the high-voltage grid and deals with problems related to the national and international interconnected network.

A special situation has occurred in former Eastern Germany after the unification. A takeover race between large national and international energy suppliers has begun. As a result of which, the three dominant west German players (RWE, PreussenElektra, and

[6] *"Electricity Supply Industry: Structure, Ownership and Regulation in OECD Countries"* IEA/OECD report 1994 pp.208-218

[7] Internet home page of VDEW

Bayernwerk) agreed, in the so-called "Stromvertrag" in August 1990, to take over the majority of the East German electricity generation, transmission, and local distribution in a single venture. This agreement gave them a 75% share of "Vereinigte Energiewerke AG (VEAG)", the largest East German utility, which also controlled the region's high-voltage grid. In addition, is in this agreement mentioned, the regional distribution companies were required to purchase at least 70% of their demand from VEAG over the next 20 years.

Electric regulatory reform in Germany is under some pressure by the federal government and increasing international competition, as analyzed in a subsequent section of this paper.

France –

The EPI structure in France is very different to the one in Germany. One player, Electricite' de France (EDF), is responsible for over 93.8% of electricity generated in France (data as of 1991). Almost all transmission and distribution cables are owned and operated by EDF, which is run as a commercial company, but is supervised primarily by the Ministry of Industry energy directorate.[8,9] More then 60% of generation is based on nuclear energy.

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[8] *"Electricity Supply Industry: Structure, Ownership and Regulation in OECD Countries"* IEA/OECD report 1994 pp.200-208

[9] Gilbert, R. and Kahn, E. 1996. *International Comparisons of Electricity Regulation. Chapter 10: The French electricity industry.* J.-J. Laffont pp.406-457

France is a major player in electricity export and as of 1991, 13% was exported mainly to Germany.

France has a very regulated EPI where EDF has, in almost every sector, monopoly rights. In addition to transmission and generation, are EDF's electricity import and export capabilities, as well as a concession to distribute electricity in all 2,789 municipalities across France, covering 95% of total supply. The only competitor is Gaz de France (GDF), the other monopoly in the gas business, which leads to some threat of substitution. Even in France some efforts regarding deregulation are occurring, following the Mandil report from 1993. Currently, it is not foreseeable how France will contribute in the EU deregulation debate, but we expect a very strong defensive strategy to protect the EDF home market on the one hand and support their successful export business on the other.

United Kingdom -

The privatization of the Electric Power Industry (EPI) of England and Wales not only transferred ownership from the public to the private sector, but must rank as one of the most ambitious attempts anywhere in the world to introduce competition into a normally vertically intregated natural monopoly. The major player after the privatization is the private generators National Power and Power Gen. Electricity, which are distributed by 12 Regional Electricity Companies (REC). The REC's also supply electricity, though they do not have a monopoly in that function. The RECs together own the National Grid

Company (NGC), which manages the main transmission system. A public body, Nuclear Electric, runs the nuclear stations.[10]

At present the major generators dominate the industry, leading with some criticism of the effectiveness of the UK deregulation effort. National Power and Power Gen are still able to influence the pool prices. However, they cannot prevent new entries and over time their share of the generating market has been declining.

The NCG retains a monopoly of high-voltage transmission in England and Wales. The RECs manage the distribution systems, but do not have a monopoly on supply. Instead, as monopoly managers of the wires business at distribution level, they have an obligation to connect. The near future will show how the UK model will settle out. Following, are some of the questions still open for debate:

- How should stranded costs be dealt with?
- When will tools and methods to measure and account power delivery to end-users become available?
- What will happen with the obligation to connect and deliver, especially in rural areas?

Regardless of the answers to the questions posed above, the UK model is one of the most impressive efforts (and success) of industry transformation by Government deregulation.

[10] Gilbert, R. and Kahn, E. 1996. *International Comparisons of Electricity Regulation, Chapter 2: Regulation, public ownership and privatization of the English electricity industry*. R.Green pp. 25-82

Norway -

Norway is seen as perhaps the most liberalized/deregulated market for electricity supply in the OECD. The EPI is characterized by a large number of small generators and retail distributors. Norway is unique in the sense that more than 99% of its generation is based on hydroelectric power. About 670 generators and 230 distribution utilities are players on the electricity market.[11] The central feature of the Norwegian system has been its power pool, the Norwegian Power Pool (NPP), with more than 70 members.[12] The spot market for occasional power operated by the NPP has been the primary mechanism for short-run coordination and optimization of the system. This organizational setup greatly facilitated the deregulation of the Norwegian electricity market. While the generation and supply functions have been fully deregulated, and as such no longer have any monopoly rights or obligation to provide service, the transmission and distribution continue to serve franchise areas. The transmission function for the high-voltage network was given to a new state-owned company, Statnett (Norwegian Grid Company). In order to overcome some of the key issues after deregulation the Norwegian network owners/operators are required to provide open access according to the following principals[13]:

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[11] Gilbert, R. and Kahn, E. 1996. *International Comparisons of Electricity Regulation. Chapter 4: From club-regulation to market competition in the Scandinavian electricity supply industry.* L.Hjalmarsson pp.126-179

[12] *"Governance and Regulation of Power Pools and System Operators: An International Comparison"* J.Baker, B.Tenenbaum, F.Woolf, World Bank Technical Paper no.382, 1997.

[13] *"Electricity Supply Industry: Structure, Ownership and Regulation in OECD Countries"* IEA/OECD report 1994 pp.259-268

- Available capacity must be made available to system users on a non-discriminatory basis, upon request;
- Customers must be notified of expected costs/tariffs and the basis for their calculation;
- Separate businesses must be accounted for individually.

The Norwegian Water Resources and Energy Administration (NVE) plays an important role even under the new liberalized framework, and assumes responsibility for regulatory oversight of the transmission and distribution companies. A special feature of the deregulated Norwegian electricity market is the rapid entry of power brokers and traders into the market with almost no hard assets and few numbers of employees, but high sales volumes.

Japan -

The EPI is controlled by ten private, vertically integrated regional utilities and two main wholesale utilities, with a few production by smaller generation companies that also wholesale to the regional utilities and two wholesaler.[14] Responsibility for overall energy policy in Japan rests with the Ministry of International Trade and Industry (MITI). The policy and the private companies have a strong relationship and a high degree of regulation. Within the franchise areas, the regional utilities have the exclusive right to supply electricity. For reasons of "national security and public peace and order", no foreign direct investment in the EPI is permitted.[15] Japan is under some pressure for

[14] *"Electricity Supply Industry: Structure, Ownership and Regulation in OECD Countries"* IEA/OECD report 1994 pp.238-244

[15] Ibid.

more openness and deregulation. On the one hand, this forces the international trade community to more openness and on the other hand leads the current Asian crisis to increased pressure. Only deregulation as one major policy effort will help the Japanese economy to recover and increase competitive capabilities or opens some capital sources.

New Zealand -

The major player in the generation business is the Electricity Corporation of New Zealand (ECNZ) which accounts for 95% of the countries generating capacity.[16] ECMZ has been privatized since 1992 and public company. Trans Power New Zealand (TPNC), a former subsidiary of ECNZ, operates the national grid and is state owned. The government decision to turn TPNC into a state-owned enterprise is intended to promote competition by separating grid ownership from the dominant generator. Wholesale supply contracts are being unbundled into separate energy and transmission contracts. The electric companies own and operate the local distribution systems. Their monopoly of supply has been removed along with their obligation to supply.

Despite the dominant generator ECNZ, the New Zealand EPI has a lot of similarities to the Norwegian model.[17] The government is considering what further steps could be taken to encourage competition in generation, given the dominance of ECNZ. Even today, there are no restrictions on who can enter the generation market. The present

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[16] *"Electricity Supply Industry: Structure, Ownership and Regulation in OECD Countries"* IEA/OECD report 1994 pp.254-258

[17] *"Privatization of Utilities and Infrastructure: Methods and Constrains; Restructuring the New Zealand Electricity Industry"* J.Wilson, OECD Proceedings, 1997, pp.51-67

intention is to rely on market mechanisms – including a wholesale market – to signal the need for new capacity via spot pricing and information systems.

Australia -

Australia is a federation of six states and responsibility for energy policy is divided between the Commonwealth and the state governments. The EPI is largely under the control of state governments and varies in their form from state to state. A very interesting example is the State of Victoria.[18] Victoria has the highest population density, with 25 % of the national population (4.5 million people) living on 3 % of the continent. Melbourne is the state's capital city and has a population of approximately three million, which is almost 70 % of the total population of Victoria. In 1993, the state government created three businesses to operate and reform generation, transmission, and distribution:

1. Generation Victoria, responsible for the production of power to meet the energy requirements of the system;
2. National Electricity, responsible for high-voltage transmission, balancing supply and demand, and security of supply across the system;
3. Electricity Services Victoria, managing the low-voltage distribution, and retail sales.

The government has further chosen the initial structure for a competitive EPI. It contains eight new companies, each with its own independent board:

[18] *"Privatization of Utilities and Infrastructure; Methods and Constrains; Private Sector Investment in Infrastructure Projects; The Case of Victoria"* P.Noble, OECD Proceedings 1997, pp.91-102

- An independent company monitors and controls the wholesale electricity market and ensures security of supply, and belongs ultimately to the market participants it serves.
- A transmission grid company owns, maintains, and operates the high-voltage grid. This function is a natural monopoly and the company is still state-owned.
- Generation Victoria as a interim generation holding company.
- Five regionally based distribution companies own the distribution assets of the former State Electricity Commission of Victoria and the 11 municipal electrical undertakings.

An independent regulator protects the consumer, monitors and maintains integrity of supply, and ensures that the market operates fairly. The model of the utilities industry in Victoria is one of the most cited examples for deregulation strategy and success.

Chile -

The Chilean model can be considered as the first deregulation of the EPI forced by government. A new regulatory framework for the electricity sector was established in the early 1980s. The National Energy Commission (NEC) was set up in 1978 and the Superintendency of Electricity and Fuels in 1985.[19] The Economic Load Dispatch Centre (ELDC), established in the 1982 law, co-ordinates the activities of generating companies and ensures equitable market access for all generating companies. The electricity legislation/deregulation distinguishes three separate activities: power

[19] Gilbert, R. and Kahn, E. 1996. *International Comparisons of Electricity Regulation, Chapter 3: How should it be done? Electricity regulation in Argentina, Brazil, Uruguay, and Chile.* P.T.Spiller and L.V.Martorell pp.82-125

generation, transmission, and distribution, and prohibits the vertical integration of these activities.[20] Competition is assumed both in power generation and in supplying large customers (more than 2 MW), while distribution (for small customers) and transmission are considered natural monopolies. As a result, the Chilean EPI operates more efficiently, closer to marginal costs, while still attracting private investment. So far the Chilean model for deregulation can be considered as success.

Difficulties In The Deregulation Process

There are three primary hurdles with must be overcome in order to ensure an effective, fair and truly competitive market place. First, the electric utility industry has long had in its culture an "obligation to serve". Electricity is seen as a necessity in the developed world and the local utility simply does not have the option of not providing power (with the extreme exception of failure by the customer to pay over an extended period of time). Therefore, if the industry's structure disaggregates in any way, it is not clear who owns the "obligation to serve" in the event of insufficient power supply to a market. Second, most vertically integrated utilities are heavily capitalized in generation, transmission and distribution assets. If the market place is suddenly opened to competition, such that any entity can move electricity across an existing utilities lines in order to sell to a customer of that existing utility, the issue of "stranded costs" surfaces. Every country or state currently in the process of deregulating is grappling with this issue in order to protect the current assets of the existing utility while creating a level playing field for all participants in the open market. Third, the mechanism for pricing electricity on the open market is

[20] *"Privatization of Utilities and Infrastructure; Methods and Constrains; Regulation of Privatized Utilities: Lessons from the Chilean Experience"* E.Bitran and P.Serra, OECD Proceedings 1997, pp.25-50

still far from perfect. Several models have been developed in countries such as Chile, Norway, and Australia, but none have been heralded as the final solution.

In developing our hypothesis, we will attempt to suggest an organizational framework that the industry should evolve to wherein these difficulties can be addressed to ensure a smooth transition to a competitive market place.

Our Hypothesis

Our hypothesis relative to long-run industry structure is one that mirrors that of the computer industry. The currently vertically integrated electric industry will disaggregate into functionally oriented companies in order to strive for best-in-class performance in one element of the value chain. These individual companies will then build a network of alliances and partnerships with other companies in the overall value chain. The total combination of these companies will form what we refer to as "the virtual utility". This virtual utility will drive technical innovation, maximize efficiency and ultimately lower cost of service and products to the customer, just as in the computer industry.

We have identified the following areas that will have the most significant impact on the industry:

- The pace of deregulation will accelerate over time as a result of learnings from the natural gas and telecommunications industries;
- Electric power will increasingly be seen as a commodity;

- Transmission and, ultimately, distribution assets are becoming common carriers open to competitor access;
- Profit margins will be squeezed;
- New entrants, including non-utilities, will invade the market;
- Different employee skill sets will be required.

Based on these observations, we believe the vertically integrated utility of today will not be able to effectively compete as other companies (both utility and non-utility) begin to exploit specific niches across state and even national geographic borders.

For example, the community of Falls Church, Virginia, which recently decided to seek an alternative to the perceived high electricity rates of Virginia Power, purchased a set of meters and applied to the Federal Energy Regulatory Commission to be considered a distribution company that could buy wholesale power from any other supplier.[21] In doing so, they were attempting to force Virginia Power to provide transmission access to their competitors in order to supply one of their customers! This type of scenario is played out regularly in the natural gas market and is occurring more and more frequently on the electric side.

There are five major determinants of the current industry structure (i.e. the number and type of firms, their degree of vertical integration, the regulatory environment influencing the electric industry, and the range of products these companies make):

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[21] *"Electric Utilities: The Argument for Radical Deregulation"* P. Navarro, Harvard Business Review, January – February 1996, pp. 112-125.

1) Economies of scale and scope – most observers believe that the power distribution element of the industry is a natural monopoly. Steve Henderson, an economist recently at the Federal Regulatory Commission, examined scale effects in transmission and distribution and concluded that "the average cost of transporting electricity is about 17.7% higher than the long-run marginal cost," which is equivalent to the old test of natural monopoly[22].

2) Scale economies continue to exist, but are no longer as a result of ever-larger individual units. Instead, these economies come from the cost advantages of owning and operating many large (but not overlarge) and diverse units and interconnecting them with transmission. If the industry begins to separate into firms that focus on generation, some economies of scale may be realized through geographic diversity, and operation and maintenance economies. However, if generation is separated from transmission the net influence on scale economies is uncertain.

3) Economies of vertical integration – The industry is specialized and immobile, is heavily interdependent (e.g. a single major power outage can impose costs on hundreds of other power plant operators and millions of customers). A high degree of information overload and difficulties in writing contracts that can specify who is responsible for what during unusual or emergency conditions currently exists. The preceding conditions would seem to suggest that in the current technological and regulatory environment it is cheaper for electric power

[22] Henderson, J.S. 1985. *"Cost Estimation for Vertically Integrated Firms: The Case for Electricity."* In *Analyzing the Impact of Regulatory Change in Public Utilities.* Michael Crew, ed. Lexington, MA: D.C. Heath & Co.

firms to vertically integrate rather than to operate generation, transmission and distribution as separate companies.

4) Legal and regulatory restrictions and processes – There are four major types of utility firms in the US: Investor-owned companies, non-profit coops owned by their customers, instrumentalities of state and municipal government units, and federal government-owned utilities. Each of these types of firms is subject to quite different regulation. The most common regulatory feature of the retail electric industry has been the concept of franchise territories. These franchises relate to the idea of natural monopolies. The awarding of franchises has been the means of controlling the industry. However, this means has been somewhat unsatisfactory. For one reason, the primary means of determining whether rates were appropriate was by benchmarking the utility in one franchise to those of adjacent franchises.

5) Voluntary contractural agreements – Both public and investor-owned utilities often enter into several types of agreements and contracts which are intended to be substitutes for owning their own capacity. The seller is typically required to supply all of the buyer's demand, not a specific number megawatts. The terms of these agreements are referred to as "firm" and "non-firm". "Firm" agreements lock in supply for periods of five years or more, while "non-firm" agreements are struck is a few hours or less of notice in order to match excess supply of one utility to excess demand of another.

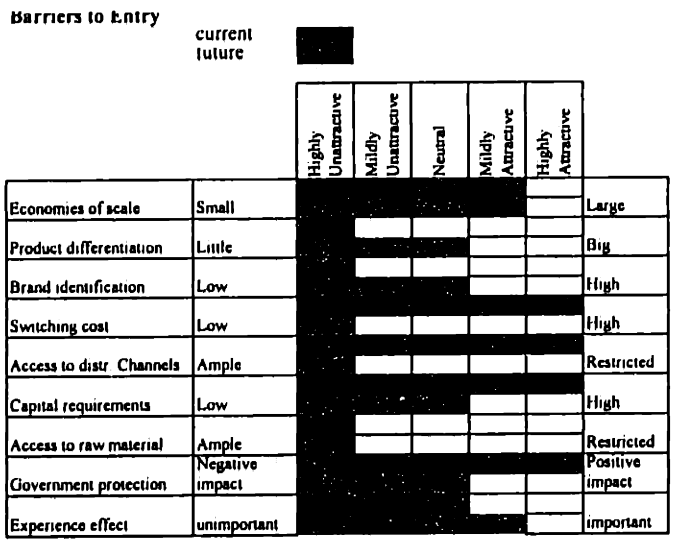
Given the preceding overview of the typical electric industry operating environment, a strategic assessment of the attractiveness of the industry will be important to understanding its current and future strengths and weaknesses.

Environmental Scan Of The Industry

Important in our analysis is the distinction between the current and future situation, because the industry is facing the transition from a regulated to a deregulated one.

Barriers to Entry -

In the current stage, the electric industry is highly attractive from the barriers to entry point of view. Switching cost is high, because most customers cannot change their energy supplier. The same is true regarding different distribution channels. This will dramatically change when government protection (regulation) ends and "normal" market competition becomes reality (deregulation). After deregulation, the barriers of entry will diminish and the industry will become mildly unattractive from the barrier of entry point of view.



Barriers to Exit -

In general the barriers to exit are low currently and will remain so after deregulation. Our assumption here is that the assets are highly attractive and relatively easy to sell. The only exceptions are nuclear power generation plants, because the disposal risk is tremendously high. However, we believe over time the generation assets will be more difficult to sell at a significant profit because margins on generated electricity will be greatly reduced.

Rivalry Among Competitors -

From the competition point of view the electric industry is currently highly attractive, because there is no competition. Even this will change dramatically after deregulation. The U.S. electric power market has a volume of $250 billion per year. The growth rate of electric power is moderate (approximately 2.5% per year). Industry growth in the traditional business is relatively small. The growth rate is linked with the real GDP growth rate and will decrease in the future. One reason is an increasing environmental attitude that leads to savings in power usage. There will be relatively strong growth in new services around, and complemented with, the traditional business. After deregulation the utility industry will become mildly unattractive from the competition point of view.

Rivarly among Competitors

current
future

		Highly Unattractive	Mildly Unattractive	Neutral	Mildly Attractive	Highly Attractive	
Number of equally balanced competitors	Large						Small
Relative industry growth	Slow						Fast
Fixed cost	High						Low
Capacity increases	Large increments						Small increments
Product features	Commodity						Speciality
Diversity of competitors	High						Low

Bargaining Power of Buyers -

In this portion of the analysis, we must distinguish between residential and industrial segments. The residential segment has no or very small bargaining power right now. This will change after deregulation in a manner similar to the telecommunication industry. The industrial buyer currently is in a much better position to negotiate price and supplier source. Overall, the power of buyers is small today. This power will increase in the future, especially with regard to large industrial customers. The situation for the residential consumer is not absolutely clear yet, but it is likely to increase significantly as well. The current score from this point of view is highly attractive and will change to almost neutral after deregulation.

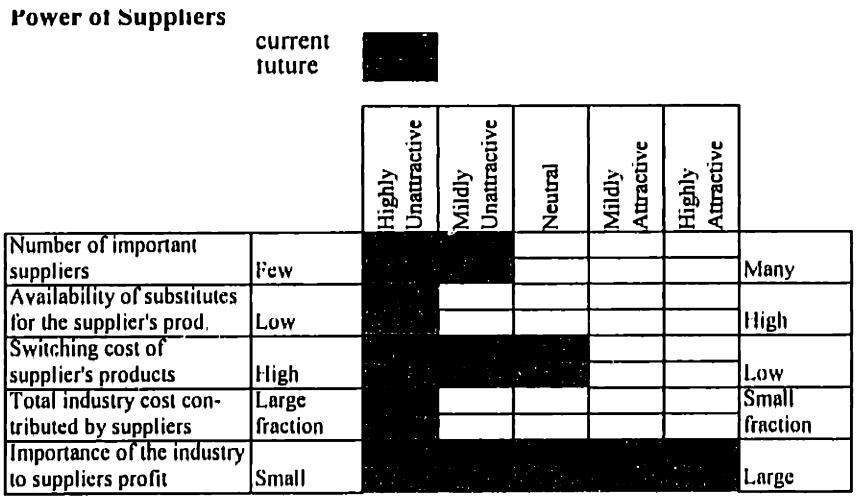
Power of Buyers

current
future

		Highly Unattractive	Mildly Unattractive	Neutral	Mildly Attractive	Highly Attractive	
Number of important buyers	Few						Many
Availability of substitutes for industry products	Many						Few
Buyer switching costs	Low						High
Total buyer's cost contributed by the industry	Large fraction						Small fraction

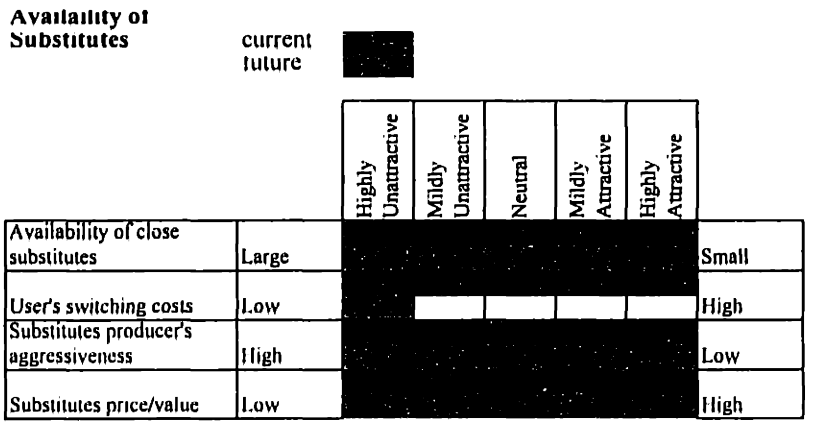
Bargaining Power of Suppliers -

Primary suppliers to the utility industry provide coal, oil and gas and they have a relatively large power-base. Oil and gas are commodities and utilities have easy access to this raw material, but the major reason for the relatively high power of the supplier is the small number of alternatives. There are not many coal suppliers in the U.S., which means that each of them has a relatively significant power over the utilities. This situation will change to some degree, but not as a direct result of deregulation. Many generators are focusing on the use of natural gas in combined cycle facilities. Natural gas is a much cheaper and cleaner burning fuel and is likely to grow in importance as a potential fuel source to new plants that are built. However, the number of new generating plants planned for the foreseeable future is small due to over-capacity in most developed countries. From this point of view the utilities industry is today and tomorrow mildly unattractive.



Threat of Substitutes -

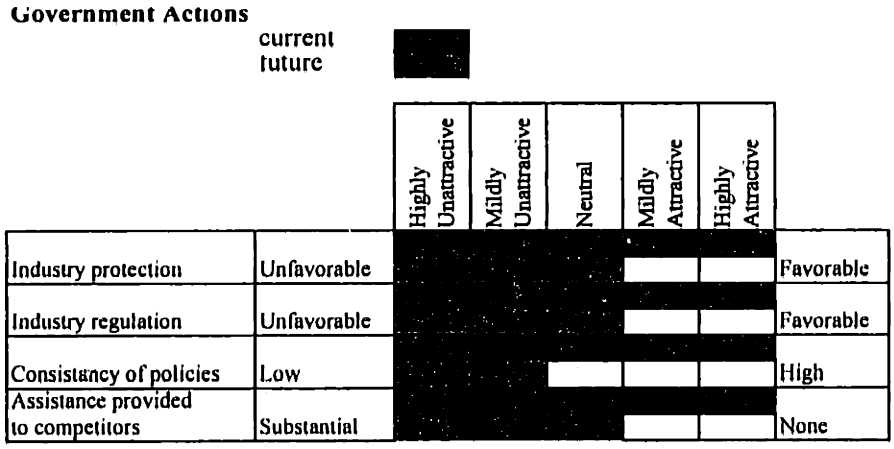
To a certain degree there are available substitutes for electric power. In some cases, the consumer (household or business) can produce electric power through transformation of oil, gas or solar energy into electricity. However, the economics of this transformation is not yet favorable, and therefore, the threat of substitution is currently low. This will not dramatically change in the near future (5-8 years) and is not significantly effected by the deregulation. The recent introduction of micro-turbines will be the most likely threat, but will not be economically viable in very small commercial or residential facilities.



Government Actions -

The major influence and driving force for the electric industry is the role of government, especially with respect to deregulation. Currently, state governments in the US all appear to be taking different tacks. This bears out the importance of federally-sponsored guidelines in order to drive some form of consistency in the competitive environment. In addition, the relationship between utilities and municipalities will undergo a radical change after deregulation. It is unlikely that municipalities will be able to effectively compete after deregulation.

Currently, the industry is highly attractive as a result of the regulatory environment, but this will turn to neutral after deregulation.



In addition to the preceding Porter's Five Forces analysis, we felt it necessary to include some dimensions from the **External Factors Analysis.**

Technological Factors -

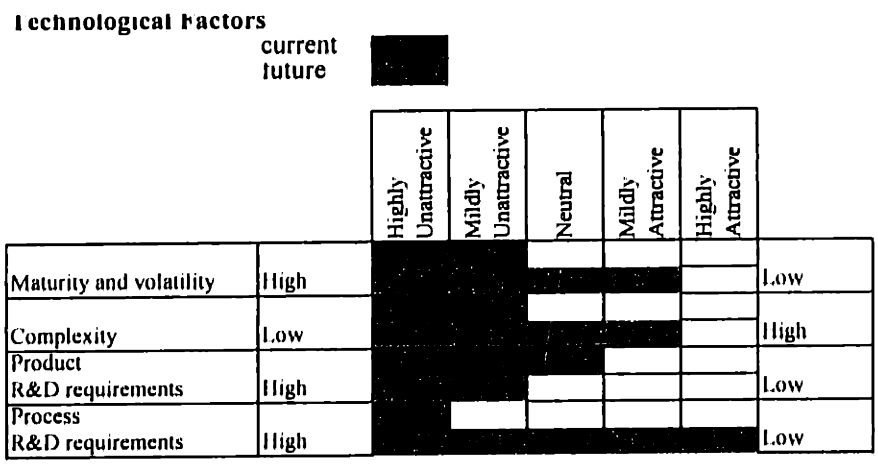
Technology is an important dimension in the electric industry. The areas which technology influences are:

- power generation or source of energy;
- networking and transportation of power (process);
- distribution or delivery to the end user (process).

In all three areas, technology and process improvement play a major role. The utility industry is a highly asset-intensive. However, this will change after deregulation when new players emerge who are service and knowledge focused and less dependent on "hard assets".

A significant difference between the telecommunications industry and the electric industry is that there is no new technological replacement on the horizon for the current electric wires that are currently strung on poles or under ground. The telecommunications industry has seen the introduction of fiber-optics and wireless digital and analog communications. These technological advances have allowed new players to enter existing markets and construct entirely new infrastructures. Conversely, it makes no sense for a new player to enter an existing electric territory and string new wires.

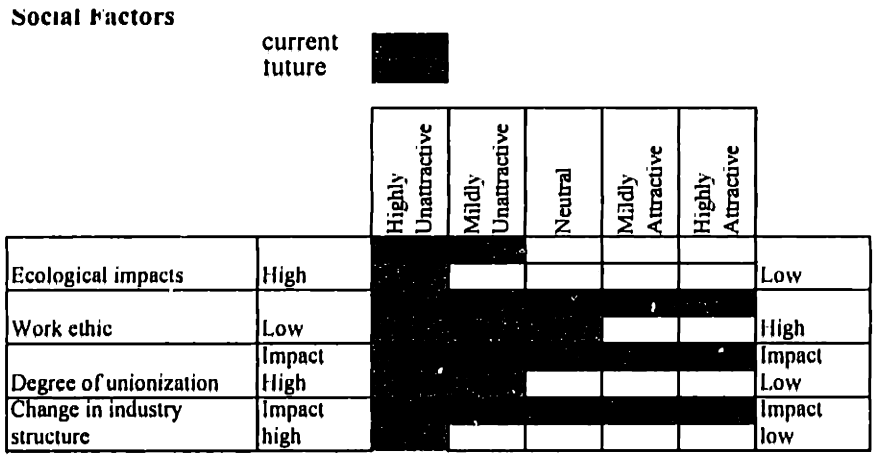
The greatest threat to interdependence of the power industry is the development of cheap local electrical storage. When such a technology becomes commercially viable, electricity will become a commodity much like fuel oil or gasoline. In addition, the grid will change from the immediate coordination and delivery link to a traditional storable commodity delivery role. Since, this kind of fundamental change in technology is not on the foreseeable horizon, is does not make sense ~~to try~~ to propose a restructuring of the industry that would support such technology. The key is to successfully restructure the industry to operate economically, efficiently and profitably during the interim.



Social Factors-

Energy is a very basic need for human beings as well as for businesses. This was the reason for regulation until today. Deregulation will effect the social system in the following ways:

- The structural change in the industry will effect unemployment and skills needed in the new business;
- International competition will occur;
- The questioning of nuclear power generation as a critical technology vis-à-vis factors related to security and environment.
- The household, as a user of power, will have opportunities for better service and lower prices, but also the risk of a lack of protection if economic factors dissuade providers from aggressively marketing energy to rural areas.

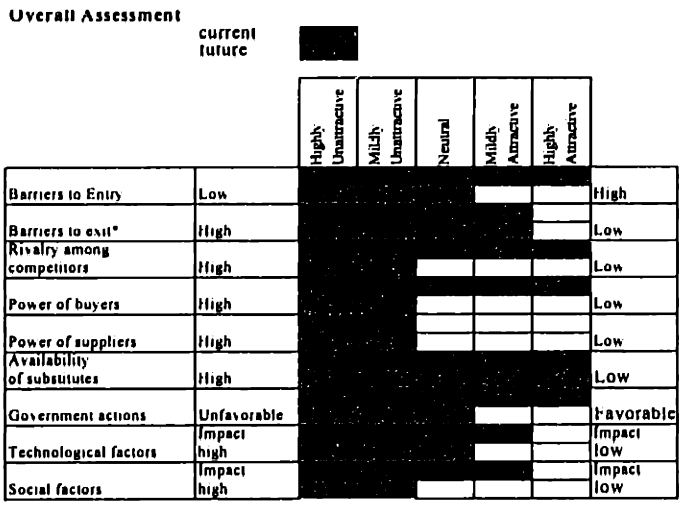


Overall Assessment -

In summary, we must confirm that the electric industry is, under the current circumstances (regulation), very attractive. The question is, "what happens after

deregulation?" We are convinced deregulation will deteriorate the industry attractiveness dramatically.

The industry in its current form is highly attractive (for current players) because the regulatory environment leads to tremendously high barriers of entry and the absence of competition. Whether it is an advantage or disadvantage to play right now or start from a green field position after the deregulation phase is introduced will be discussed later.



* True for utilities without Nuclear Power Plants

From the preceding analysis, it is evident that the attractiveness of the electric utility industry for current participants will drop significantly following deregulation. Among the most notable changes that can be expected are an increase in the rivalry among competitors as new entrants exploit niches within the industry, the power of the consumer (within all segments) increases through flexibility of suppliers and price competition, and the overall impact of various social factors thereby increasing pressure on the local providers relative to environmental issues and service quality.

Deregulation is progressing at various rates throughout the world. The following section provides an overview of some of the more significant markets as it relates to the pace and stage of change.

DATA COLLECTION METHODS

The sheer volume, complexity and disparity of information on the subject of electricity deregulation dictated an approach for data collection that enabled the authors to review as much information as possible in a relatively short period of time and then test our hypotheses and ideas with incumbents in the industry. Therefore, our initial data collection approach as through review of existing documentation from such sources as texts, periodicals, consulting practice publications and Internet web sites. Information gathered from these sources was categorized by geography and topic, as follows:

- Nation in which deregulation information is available (in the US, information was sorted by state);
- Technological innovations;
- Value-added product and service innovations;
- Strategic approaches by various companies;
- Significant mergers, alliances and joint ventures.

The authors then conducted on-site fact-finding reviews in four different utilities; namely UtiliCorp United Inc. (Kansas City, MO), Southern Company (Atlanta, GA), Bewag (Berlin, Germany), and Bayernwerk (Munich, Germany). During our reviews, we were able to meet with executives with roles ranging from CEO and COO, to strategic planning and regulatory affairs. Our discussions focused on the following topics:

- How will deregulation and market changes develop in Germany/Europe/US?
- What is the likelihood of international competition and when will it occur?
- What are your company's strategic plans in order to prepare for a deregulated market (e.g. diversification, specialization, the virtual utility)?
- What are you doing to prepare your company for deregulation?
- Other topics associated with deregulation and company operations.

These four companies operate in two of the largest electric utility markets. Both markets are preparing for open access, but with different challenges ahead of them. The aforementioned disparity in state regulatory reform in the US makes the development and consistent application of corporate strategy a challenge for UtiliCorp and Southern Company. While open access associated with the formation of the European Union will present completely new challenges for utilities used to operating in an essentially isolated manner within each of their own nations and, indeed, their own franchise territory.

Information gathered from the preceding meetings was analyzed and will be presented in the following section.

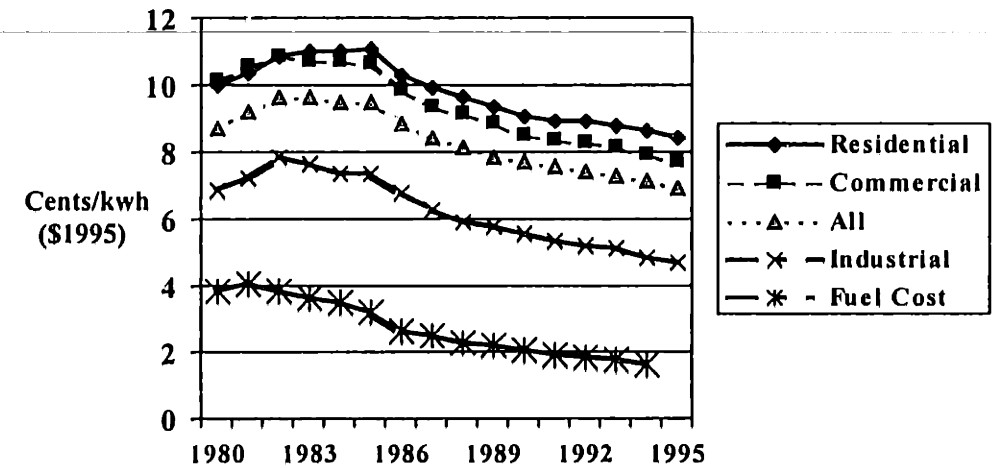
ANALYSIS OF INDUSTRY TRENDS

Regulatory Trends In The US

In the US, fifteen states have agreed to implement open access, beginning as early as 1998 and reaching full implementation by approximately 2003. This regulatory reform will cover approximately 38% of the US population. Fifteen other states have commenced proceedings on the subject (See Exhibit 2).

At the federal level, nine bills have been introduced, in an attempt to provide some level of consistency to what is happening at the state level. Nevertheless, it seems unavoidable that result of the current state actions will lead to a broad range of approaches and timing to deregulation of the electric industry. It also appears unlikely that the federal government will supercede state legislation on such a highly sensitive issue. For the sake of political survival, members of congress will not be so bold as to attempt to overrule what the states are doing.

Electric Revenues and Fuel Prices

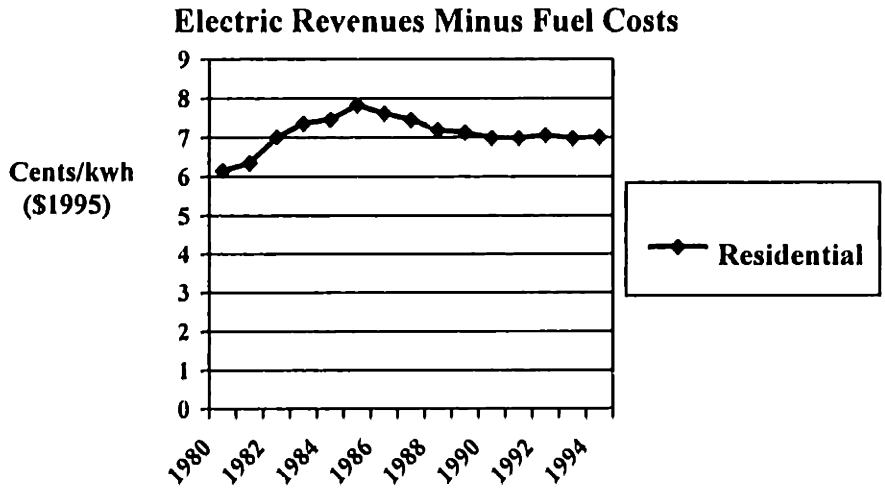


Source: Crandall, R. and Ellig, J 1997. "Economic Deregulation and Customer Choice: Lessons for the Electric Industry", *The Center for Market Processes, Inc.* p. 59.

Electricity rates, in nominal terms, have leveled or even dropped in many areas of the country. However, in real dollars the following figures bear out the fact that rates have not dropped for residential and some commercial customers. Until 1986, revenues of electric utilities, net of fuel costs, actually increased. Fuel costs were falling, but electric rates were not falling fast enough to pass the full savings through to customers. After

1986, the difference shrank somewhat, but the difference between fuel and other costs per kilowatt-hour in constant dollars was larger than it was at the beginning of the measured period.

The preceding chart seems to indicate that electric rates have dropped substantially, with industrial customers receiving the largest rate reductions. Residential consumers received somewhat smaller reductions. A closer analysis, however, shows that with fuel costs removed, residential customers actually have not benefited from the reduction in rates. The reduction in fuel costs appear to have been largely captured by industrial customers or the utility in the form of profits.



From the preceding analysis, it is apparent that the regulated monopoly in the US has not generated sufficient pressure for utility efficiency to be passed through, on an equitable basis, to all consumers. Prices may drop somewhat for commercial and residential consumers in the near future regardless of deregulation efforts because of lower interest rates and the lower likelihood of new power plant construction (because of the current over-capacity that exists) and its associated depreciation schedules. The pressure of wholesale competition will have some effect on retail pricing as utilities implement defensive schemes to retain current customers.

Current state pilot projects do no appear to be an economic, financial, or statistically viable test of the open market. An analysis by UtiliCorp United of the current Oregon pilot project indicates that to even have a chance of breaking even, the company would have had to capture virtually all the available customers. Richard Green, CEO of UtiliCorp United, in a panel discussion at the DOE-NARUC National Electricity Forum recently stated that The Cambridge Energy Research Associates have concluded in a survey of pilot projects that they reviewed, "The companies participating in the pilots have exhibited a willingness to "buy" customers at a price of $50 to $100 per customer in addition to guaranteeing savings of 5 to 15%. Although this approach may be justified as a 'learning experience,' it is not a sustainable strategy for success on a full scale."

Many participants in the various states attempting deregulation are complaining of improper unbundling of rates that leaves the incumbent utility able to include in the distribution charge certain items that should belong to the power marketing (or merchant) function. Charges associated with billing, customer service, and credit and collections are examples of the types of charges that should only be part of the firm who sold the power to the customer, not the distributor, according to critics. The result is that the consumer pays twice for certain items if they purchase their power from a power marketer rather than the local utility.

Regulatory Trends In Germany

In December 1997, the federal government passed a new law referred to as "Energiewirtschaftsgesetz", which introduced some deregulation rules and allows more competition.[23] Interesting, is the fact that the German government is far ahead of the deregulation effort in the EU. A key component of the new law is the free choice of every end-user and an open access to the grid. Currently, open access occurs through negotiated third party access. All wheeling must be negotiated. The electric industry just signed an agreement with the major industries in Germany to define a tariff system. The existing utilities obviously want to make it tough for competitors to access the grid, so the tariff system will likely favor them. The critical point for German utilities will be about three years from now when, if the current agreement does not effectively promote competition, the government will take a more active role in shaping regulatory reform.[24] According to one German utility executive, "It has to work, but not too much."

Currently in Germany, all third party access is negotiated on an ad hoc basis. An agreement has been signed by the German electric industry and the major industries to define a tariff system. However, this agreement still provides some level of protection for the incumbent utility for the time being.

Bewag, for example, is using this three-year period to prepare for a more open market, which is sure to come. Their belief is the level and complexity of change will increase over time. Their current strategy is to shift the company's culture from one of

[23] Internet home page of VDEW
[24] Interview from Jan 23rd, 1998 with Prof.Dr.D.Winje, CEO of BEWAG Inc., Berlin/Germany

"engineering-centric to customer-centric", according to Bewag's Chairman of the Board of Management, Dr. Dietmar Winje.

Many German (and EU) utilities are recognizing that they will be too small to survive in the competitive market and are beginning to develop alliances and partnerships to build scale. Bewag, for example, has developed a financial relationship with the Southern Company (a world-class player, in their view). The Southern Company has taken an ownership stake in Bewag with membership on their Management Board. The hope, on Bewag's part, is that they will survive the coming competitive era through increased financial and management strength that Southern brings to the relationship. Southern hopes to leverage this relationship into other business opportunities in Germany and the surrounding European Community.

Dr. Winje, however, is quick to admit that very few people in his organization are prepared for the coming changes and this represents his biggest challenge. Over the next several years he plans to devote a significant amount of time educating the existing workforce. In addition, he plans, within budgetary constraints, the current workforce with appropriate human resource competencies.

Pricing Issues

As mentioned in the Introduction, one of the major hurdles to overcome in moving to an open market is that of pricing. Pricing issues manifest themselves at both the wholesale and retail level.

Two popular models for how competition could work while preserving grid integrity have emerged at the wholesale level. Currently, any other models being considered are hybrids of these to polar opposites.

One model is referred to as a "poolco". In this model, the system operator of each tight power pool looks at the full range of units available to the pool every hour and performs economic or merit-order dispatch. Each generator bids a price and quantity of power for each hour of the following day. Based on the bids, the system operator runs simulation programs, decides for each hour on the combination of bid prices that stack up, and alters the simple ordering if needed for reliability. Once all estimated demand for the hour is satisfied, the price of the last generator to be dispatched becomes the system-wide pool price. The poolco operators then announce the "winners" of the auction (i.e. all plants they will dispatch). The results of this auction sets the price that all buyers who want power from the pool must pay for that hour of that day.

The advantages of such a model is that this process of establishing a price automatically enforces homogeneity in terms of what the pool buys and sells and what quantity variations are worth. There is also extensive and common information because the pool is operated as a regulated entity that must post its selling and buying prices, and then buy and sell without discrimination. A single market clearing price is established for each day, thus eliminating a large amount of the kind of volatility found in a pure trading environment, such as the natural gas market. Even so, the poolco model still does not

offer a way to guarantee a long-term price or supply for electricity. This represents a significant departure from the current regulated model. This model more closely approximates a competitive outcome as long as there is not collusion of buyers and sellers.

The second model for wholesale pricing is referred to as "the bilateral model". In this scenario, the buyers and sellers individually contract with each other for power at whatever price and under whatever terms and conditions they agree upon. In this model, all transactions have to be provided to the system controller, who then analyzes all of the trades in each forthcoming time period to determine which ones are feasible due to network constraints. In an emergency, the controller must retain extensive authority to abrogate contracts and shift power flows around in order to keep the grid up.

Unlike the poolco model, the bilateral model supports neither homogeneity nor a single market-clearing price. All trades are made between buyers, sellers and power marketers (middlemen). Because there is no poolco operator in this model, the market is truly completely deregulated and the system operator, who ensures necessary demand is met and balanced does not need to know the prices of the product moving along the lines. In this model and buyers all sellers will have to shop for prices as in all other unregulated markets.

The creation of an "Independent System Operator" (ISO) has gained acceptance in the restructuring debate in order to ensure integrity of the grid in either pricing model. ISO's

can perform the role of ensuring comparability and integrity of the transmission system (the wholesale level). ISO's would perform scheduling, dispatching, auctions, and other grid operations. However, several issues have yet to be dealt with relative to the formation of ISO's such as:

1. For-profit or not-for-profit status?
2. How should the ISO be organized and administered below the governing board level?
3. Who should be on the governing board?
4. How should the ISO's be regulated? And to what extent?

Both the United Kingdom and California are on the cutting edge of forming and operating variations of the preceding two models. Both have experienced significant difficulties in ensuring a truly competitive marketplace for the players attempting to operate and remain profitable.

It seems evident that if effective communications and control methods are developed for the power networks, this will enable new bilateral trading regimes, and the marketplace will evolve in this direction. If not, equitable allocation of the costs of transmission will not be possible, regulators will not be able to referee the trade disputes and a model resembling poolco's will evolve. Rick Owen, of Southern Energy, is seeing the trend toward poolco's in most markets. The primary reason for this is that as countries consider the process of deregulation and/or privatization, they are calling on consultants

to assist them with the design. Many of these consultants are recommending the adoption of the UK design (which is a poolco arrangement).

A helpful comparison that may influence the evolution of the electric model of the future is that of the current wholesale natural gas pricing model. Natural gas is priced using indexes. Industry trade magazines began compiling price data and averaging them in to an index several years ago. Once the trade magazine calculates the average price for the proceeding month based on all trades, they publish a price per thousand cubic feet of gas. That price, calculated near the end of the month, is then used by utilities to price their gas for the next month.

This process seemed appropriate until the New York Mercantile Exchange began trading futures contracts in natural gas, just as it did with other commodities. This allowed speculators to make millions in paper trades without ever intending to take the gas. These contracts are traded daily and their prices are easily available. As such, they indicate what the market price of gas might be in the months ahead. By the mid-90's demand of gas caught up with supply and prices became more volatile. At present, natural gas is the most volatile commodity in the world.

To further compound the problem, there is an inherent advantage for marketers to drive the price up. One marketer can buy gas and then sell it off to smaller marketers, thus driving the price up. Each of these increases then effects the price for the subsequent

month. Large industrial and commercial consumers have the capability to shop for lower prices, but the small consumer pays a far higher price that appropriate.

The preceding model closely approximates the bilateral model being considered for the electric industry. Therefore, it is likely that unless a more stable version of the gas model is developed, electric rates for the residential consumer will not fall as a result of opening the market. At the very least, the price per kwh would greatly increase in volatility.

At the retail level, there are three primary ways to price electricity. They are: time-of-use, which is the pricing of electricity based on the estimated cost of electricity during a particular time block; real-time pricing, which is the instantaneous pricing of electricity based on the cost of power available for use at the time it is demanded; and profiling, which involves looking at a consumer's consumption patterns to give a contracted price per kilowatt-hour.

Technological capability is the limiting factor for effective real-time or time-of-use pricing methodologies. Although the technology exists to facilitate such pricing schemes, they are not economically viable alternatives for utilities to install in every residential outlet.

Most time-of-use pricing methods can be emulated by profiling. Since time-of-use pricing is linked to demand (i.e. when it is hot, the price will be higher, and people should voluntarily cut their consumption), the same thing can be achieved by load management

techniques, such as giving price breaks to customers who have installed air conditioners that shut off at regular intervals. The typical residential consumer's usage patterns are relatively consistent day-to-day and annually. Therefore, volatility can be smoothed to some degree for the average consumer through profile pricing techniques. Further, this pricing mechanism closely links demand and prices to ensure economic efficiency.

The question is, is the average residential consumer both interested in and willing to tolerate daily or hourly fluctuations in electricity pricing based on time-of-use or real-time pricing models? The Frederick Schneiders Research Company recently completed a survey of the American public for The Partnership for Customer Choice focusing on Americans' Opinions on Electric Utility Deregulation. Following, are the key findings from this poll[25]:

- Regardless of whether they would switch, three-quarters of all Americans say it would be a good idea to have competition among electric companies to offer consumers a choice in residential electric service.
- Given the regional disparities in what consumers pay for electricity, three-quarters of the respondents say the system should be made more competitive, like long distance telephone service, so that all US homeowners can buy electricity at the same price.
- Three-fourths of all Americans believe that the electric rates US consumers pay should be set in the competitive marketplace.

[25] "*Americans' Opinion on Electric Utility Deregulation.* A survey prepared for The Partnership for Customer Choice" by Frederick Schneiders Research (December 1996).

Although the preceding results seem to indicate willingness on the part of Americans to accept a more competitive electric utility environment, the results of the survey do not verify that they would be willing to accept constant price fluctuations. In fact, the excerpt from the second conclusions, "...so that all US homeowners can buy electricity at the same price" would seem to indicate a preference for consistently, lower pricing across the nation rather than on-going fluctuations.

The "Obligation To Serve" Issue

Unlike most other products and services offered by various companies in the marketplace, electric power is seen more as a necessity of day-to-day life. Factors such as public health and safety, security and business operations are at risk if a constant, quality supply of electricity is not provided at all times. Over the years, utilities have developed a culture which embraced an "obligation to serve" the community which comprised their 'franchise territory'. For this reason, many stakeholders in the electric industry, including some customers, are concerned about what will happen to the reliability of the power supply in a fully competitive market.

As in every other industry, the demographics of the customer base include a wide range of profitability. Some customers will be more desirable to serve because of the potential for greater profits. Conversely, the players in a fully competitive market may wish to avoid certain other customers who don't offer an acceptable return. Yet, these customers require access to electricity as well. This then requires the advent of a provider-of-last-resort.

One approach to this dilemma is to place all customers who do not choose a new power supplier in the open market into a group whose power needs must be supplied by the incumbent distribution or utility company. If the incumbent utility is strictly a distribution company, it can then purchase power from the wholesale market (just like the power marketer) to supply the group of customers. The costs of transport and other services can then be added in such that the incumbent distribution company will remain a cost-of-service regulated retailer to this group of customers. However, its power will be purchased on the wholesale market.

In the case of the incumbent being an integrated utility, this group can be supplied (all or in part) by the local utility's own generation capacity. The main difference between these two approaches is that the first requires full disintegration of the industry, whereas the second allows for integrated supply.

If the second approach is adopted, regulators will be challenged with balancing the role of the local utility as a seller of power (as any other power marketer) and the role of providing open access to all other retailers who are "shippers" on the system. The key will be in ensuring a level playing field for all sellers to compete fairly against each other and against the incumbent utility.

A major concern about the coming of competition is the problem with local monopoly distribution. A buyer can contract with almost any producer to generate and supply

electricity, but that same buyer has to receive the power through a single, monopoly distributor. In the absence of effective local regulation, the distributor stands to be able to extract a monopoly charge eliminating all or most of the gains from competition that the consumer could have potentially realized.

The California Public Utility Commission has attempted to deal with this issue by allowing the utility to compete to retain direct access consumers based on disaggregated prices and services. In addition, they have proposed to allow the utility to freely negotiate prices with direct access customers as long as those prices do not exceed current tariffs or fall below the company's marginal cost.[26]

The Rhode Island legislature, which recently passed a retail competition bill under with the "residual supplier" role must be carried out by purchasing power from the wholesale market. In doing so, the electric distribution company must periodically solicit bids from non-regulated power producers for such service at market prices plus a fixed contribution from the electric distribution company. All fixed contributions and any reasonable costs incurred by the distribution company in arranging this service is to be included in the distribution rates charged to all other customers.[27]

Many other states are exploring other approaches to this issue. A consistent theme is that no legislation has been adopted that requires all customers to purchase their power from an entity other than the incumbent distribution company. Therefore, this segment of the

[26] California Public Utilities Commission Order Instituting Rulemaking and Investigation, R.94-04-031/I94-04-032, April 20,1994, p. 42-46.

existing industry will continue to play important role in the sales function of the value chain.

The "Stranded Costs" Issue

One of the most contentious issues in the deregulation process is that of stranded costs. Every utility has invested millions of dollars in constructing the generation capacity, transmission lines and distribution system to ensure the ability to provide power to every customer within their existing 'franchise territory'. If the market is suddenly thrown open to allow any power marketer (who often own no assets) to sell electricity across the incumbent utility's transmission and/or distribution lines, the utility will no longer able to cover the fixed costs of operating its system as a result of the loss of revenue. These costs are referred to as stranded costs. Experts estimate that United States investor-owned utilities own approximately $585 billion in assets.[28]

The FERC Order 888 states that "the recovery of legitimate, prudent and verifiable stranded costs should be allowed." Therefore, regulatory bodies at both the federal and state level are struggling to create effective strategies that deregulate the power market and create mechanisms to allow utilities to recoup their stranded cost losses. On August 31, 1996, California regulators unanimously passed an electricity restructuring bill codifying the deregulation of California's power markets. This bill includes a feature, known as "stranded-cost asset securitization," which allows utilities to recoup losses incurred due to stranded costs. States such as Pennsylvania, Michigan and New York are

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[27] Rhode Island Utility Restructuring Act of 1996, 96H8124, August 4, 1996, p.27.
[28] *"When Change is Total, Exciting – and Scary"* Stewart, Thomas A., *Fortune* (March 1997) p.169.

in the process of enacting cost recovery plans, which may be very similar to California's. California utilities will issue state-guaranteed bonds upon individual utilities' stranded costs. The plan dictates that the state will pledge a portion of every ratepayer's electricity bill to repay the purchasers of stranded-cost bonds, which the state of California and each utility will float. Since the state has taken joint responsibility for covering these bonds, the state is requiring the utilities to reduce consumer electricity bills by ten percent over a five-year period. In addition, California utilities will recover at least an additional $20 billion in stranded costs by taxing post-deregulation users of the utilities' wires.[29]

It is this very last element of the preceding plan that created significant controversy among power marketers attempting to penetrate the California market. It seems the tax levied by incumbent utilities for the use of their distribution system makes profitable acquisition of retail consumers impossible for new entrants to the market. The most commonly accepted modification to the current approach to recovering stranded costs is to lengthen the period over which these losses are recovered. In doing so, tax imposed on line usage can be lowered thereby improving the economics for new entrants in the market to compete.

Current Strategic Trends

An analysis of recent trends in the utility industry relative to strategic actions taken revealed a broad array of moves ranging from defensive cost-reduction activities to aggressive new product and service offerings.

[29] *"California Electric Utility Stocks Recover From Jolt"*, Wall Street Journal, Date Unknown.

In the United States, several utilities are auctioning off their fossil and hydroelectric generating assets so as to focus on distribution and transmission.[30] Similarly, several utilities in California have sold off their generating assets, many of which went to large independent power producers who are attempting to build scale in the generation segment of the industry. AES Corporation owns one hundred plants globally and will buy $781 million worth of the plants in California in order to exploit the low-cost power generation niche. These purchases will give them approximately seven percent of the California power generation capability.[31]

Many other utilities are attempting to exploit market niches. For example, Sithe Energies Inc. plans to become the dominant electric-generation company in New England through the purchase of other utilities' power plants, thereby exploiting a niche of being the low-cost producer.[32] It is interesting to note that many of these types of generation assets sales are occurring at multiples of the book value of the asset! With the seemingly uncontested view that margins of wholesale electricity will continue to shrink, the payback period on such as investment will likely be extremely long.

Another popular trend has been the formation of various strategic alliances in order to exploit certain niche markets in the energy industries. Engage Energy US, L.P. entered into a alliance with HEC Inc. to provide customized energy solutions to customers throughout North America. HEC is an energy service company with extensive expertise in engineering, facility enhancements, modifications and renovations of industrial

[30] *"Niagara Mohawk Files To Auction Off About $1B In Assets"*, Dow Jones – 12/01/97.
[31] *"Edison To Sell 10 Power Plants In California"*, Wall Street Journal – 11/25/97.

government facilities.[33] Cinergy, Florida Progress and New Century Energies got together to form Cadence, aimed at power sales to national accounts. Southern California Edison set a subsidiary called New Energy Ventures to aggregate many loads into fewer large loads, a niche that many have talked about, but few have actually accomplished. The electricity market is so large there are likely to be many profitable niches, most of which no one has even thought of today, according to Kennedy Maize, of Electricity Daily.[34]

A new survey suggests marketing bundles will prove difficult. The most affluent and best-educated customers are the least interested in purchasing bundled services from a single provider according to a survey by RKS Research & Consulting. In addition, the latest findings call into question the concept of cross-functional mergers. Residential customers are becoming increasingly aware of electricity deregulation and say they want more choices, not fewer, among their energy, telecommunications and home entertainment services.[35]

Conversely, on the international front, Australia utilities are looking at bundling a range of services, including phone and financial services, with their core energy supplies, which in the future could include tying a home mortgage discount or car loan to the power supply agreement.[36]

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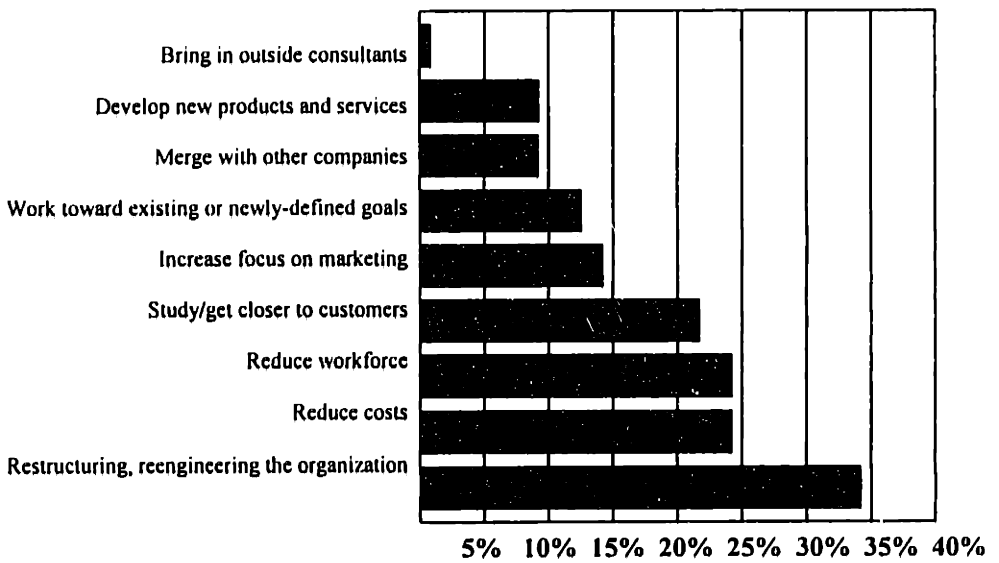
[32] *"Sithe To Purchase Boston Edison Generating Assets"*, Wall Street Journal – 12/11/97.
[33] *"Engage Energy and HEC Sign Strategic Alliance Agreement"*, PRNewswire – 12/03/97.
[34] *"The Importance of Having Niche Markets"*, Electricity Daily – 9/22/97.
[35] *"Not So Fast: Utility Service Bundles May Not Be Welcomed"*, Business Wire – 9/22/97.

Several US firms are augmenting stagnant domestic growth prospects with acquisitions and joint ventures internationally. UtiliCorp United has owned and operated operations in the United Kingdom, New Zealand, Australia and Canada. Southern Company has recently spent nearly $5 billion in order to buy into the ownership structure of utilities in Germany, the UK and Asia. Enron has constructed and owns several large generating facilities throughout the world.

The following table summarizes short-term action steps planned by utilities over the next year according to a recent survey conducted by the management consulting firm of Kepner-Tregoe, Inc. in 1995.[37]



Utility companies taking the listed courses of action

Product and Service Trends

The electric industry is already seeing a wide array of new product and service offerings. Many utilities are beginning to target distinct market niches in an effort to create

[36] *"Australia's United Energy Eyes Bundling"*, Reuters – 12/01/97.

additional "connections" with the customer. At the generation level, Southern Company is seeking to build a national identity with an advertising campaign that touts its standing as "America's leading generator of low-cost electricity". Enron is trying to sign up new customer in California by offering two free weeks of electricity and ten percent rate reductions.[38]

Load aggregation is another important play developing in the industry. The American Public Power Association, in partnership with Enserco Energy Inc., has created Hometown Connections™, a new company that will provide a variety of products and services that public power systems need to thrive in a more competitive electric utility arena. By aggregating the needs of the nation's 2,000 publicly owned electric utilities, Hometown Connections™ makes the public power market more attractive to vendors of goods and services, and can negotiate lower prices than individual systems can obtain on their own.[39]

At the retail level, the proliferation of products and services is even broader. Some utilities are attempting to establish themselves as energy management experts by offering facilities management and information services. The EQ Service Bureau, offered by Illinova Energy Partners, is a new energy information service that will enable businesses to better understand and control their utility expenses, identify billing errors, and optimize budgeting and forecasting. It represents a turnkey system designed to

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[37] *"Wide-eyed and Worried: Utility Execs Look Ahead"*, Edelman, Geoffrey M. and Gwinn, C. Richard Public Utilities Fortnightly, (July 1996) p.54.
[38] *"Enron Energetically Campains In Deregulated Age"*, Omaha World-Herald – 11/28/97.
[39] *"Providing Public Power With Lower Priced Products And Services"*, Business Wire – 01/20/98.

streamline accounting operations and management time.[40] Unicom Energy Services and Engage Networks, Inc., are offering a new energy tracking system that utilizes a unique open-protocol hardware/software system that allows customers to understand and track their real-time energy consumption at multiple sites through the internet.[41] This is a particularly important innovation in light of the potential emergence of bilateral electric trading regimes in many states.

Another growing trend is the alliance of electric utilities with telecommunications firms to offer combines services. Frontier Corporation has partnered with Wheeled Electric Power Company to provide long distance telephone services.[42] Another example is that of Conectiv Communications Inc. (a subsidiary of Delmarva Power & Light Company) which began offering local and long distance phone service to residential and business customers in Maryland and Pennsylvania.[43]

We are beginning to see a large number of new entrants into niches within the electric industry. Companies such as General Electric, AT&T (through their recent alliance with EnergyOne, in Kansas City) and ADT Security Services are finding new opportunities for access to consumers through their relationships with well-established utilities. The challenge will be for utilities to familiarize customers with their unique services in the wake of recent marketing bombardments by the telecommunications and cable industries.

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[40] *"Illinova Energy Partners To Help Department Stores Control Utility Costs"*, PRNewswire – 10/07/97.
[41] *"Unicom Energy Announces New Internet Energy Management System"*, PRNewswire – 11/12/97.
[42] *"Frontier/WEPCO To Offer Customers Telecom and Utility Services"*, PRNewswire – 12/01/97.
[43] *"Electric Utility Taps Into Phone Market"*, Star-Ledger (Newark, N.J.) – 11/18/97.

Comparison To Computer Industry Structural Evolution

The computer industry was, until the 1980's, a highly vertically integrated industry. The major players like IBM, DEC, and Unisys produced their own chips, developed their own operating system software and application software, and had their own distribution network[44] (See Exhibit 3).

A very close parallel can be draw with the utility industry today. Utilities, in general, produce their own power (generation), transport the power to the next layer of the value chain (transmission), and distribute the power to the end-user (distribution).

In the late 1980's, a new technology entered the scene in the computer industry, namely the personal computer. This new event affected the computer industry dramatically; Andy Grove named the event a Strategic Inflection Point (SIP)[45]. He pointed out that the computer industry was until the 1980's in a kind of equilibrium, in which all external six forces (he added one to Porter's Five Forces Model) are in balance. With introduction of the personal computer one of these forces, "the possibility that what your business is doing can be done in a different way", changed dramatically and became a "10X" force. The consequence was that the 'old' computer industry transitioned into the 'new' computer industry.

One major difference between the 'old' and 'new' computer industry was the structure, namely a horizontal industry structure. Each level of the industry still exists, but

[44] *"The Computer Industry"*, The Economist, February 17, 1993.
[45] Grove, Andrew S. 1996, *"Only the Paranoid Survive"*

competition took place on each of these levels. In addition, new players entered the industry such as Compaq, which had a specialized business model for this new industry structure that led to superior performance compared with the old players.

In the case of the computer industry, the "10X' force was new technology. However, Grove has pointed out that such forces and SIP's can have other causes. One example is in the telecommunications industry where deregulation and privatization led to a dramatic change with respect to a SIP[46].

It is not difficult to imagine the effect of deregulation and privatization on the utility industry. Our assumption is that deregulation will have a "10X" effect on the utility industry and lead to a SIP. After transition from the 'old' utility industry into the 'new' one we will see a horizontal industry structure as well. Competition will occur on each level in the value chain and the best player will succeed. We will also see new players with new adapted business models, which will become a major threat to the 'old' utilities. We expect significantly new and different competition in the generation level and within elements of the distribution segment of the value chain.

RESULTS OF ANALYSIS

The results of our analysis will yield certain predictions about the nature of the industry's impending disaggregation. As such, following is a brief description (or glossary) of each

[46] Grove, Andrew S. 1996, *"Only the Paranoid Survive"*

of the possible elements of the restructured industry that the reader will find helpful as we refer to them.

- Generation companies – These companies will build scale and scope by focusing on the production of electricity through various generation plants. They will have little, if any, ownership of assets further down the value chain.
- Transmission companies – These companies will own, maintain and operate the transmission lines that transport electricity from the generation plant to the substations that reduce the voltage from as high as 765,000 volts through a series of step-down transformers to the distribution substations at the "edge of town". In addition, the transmission companies will be responsible for load balancing across the grid, since electricity is not a storable commodity.
- Distribution companies – These companies own, maintain and operate the distribution substations and power lines that step-down the voltage from the transmission lines to level appropriate for the end-user (typically ranging from 4,000 volts to 120 volts).
- Power brokers – These companies will not necessarily own any tangible assets associated with the generation or delivery of electricity, but rather will operate sophisticated trading and intermediation systems that match supply of electricity with demand either on the spot market or through short and long term contracts. These systems will not only match buyers with seller, but will help buyers hedge against the volatility of electric prices due to external forces such as seasonality.

- "Servcos" – These companies will bundle the various non-regulated, independent value-added product and service companies into a complete service solution for the consumer. Examples of value-added products and services include billing, call center management, appliance repair, energy management and security companies.

Certain unavoidable stages emerge in almost every transitioning industry. Professor Arnaldo Hax, of the MIT Sloan School of Management, in material developed with his co-author, Dean Wilde, of a yet unpublished book, has summarized these stages as follows[47]:

1. Price and Cost Reduction – characterized by price level and structural changes, volume growth, industry-wide cost reductions, and pricing versus capacity gaming.
2. Deaveraging and Marketing Intensity – during which profits are concentrated, marketing is utilized as a strategic lever, customer targeting occurs and services are bundled.
3. Proliferation of New Products/Services – during which new features and services are offered and additional bundling may occur.
4. Disaggregation – characterized by fragmentation and innovation, formation of industry "architectures", development of new channels of delivery, development of standards, and shared risk management.

[47] Hax, Arnoldo and D. Wilde, from unpublished manuscript provided in Sloan School of Management Strategic Management course, 15.931.

Our research has uncovered examples of all of these stages within the electric industry. In stage 1, the drive for cost reduction in many utilities has been going on for several years. Many have initiated or have completed reengineering projects whose goal was to streamline processes and drive out redundant and/or unnecessary costs. In some cases, this has even resulted in the perversity of forced rate reductions within some utilities, as forced by the local regulators. The only exception of the typical characteristics of stage 1 that we found was that of volume growth. The volume growth in electric utility industry in most developed countries is relatively flat with no prospect for a major upturn.

Stage 2 has seen utilities and consortiums attempting to develop brand recognition by bundling services and products under a single brand name such as EnergyOne™, introduced by UtiliCorp United and PECO. Many utilities have begun to target certain customer classes in an effort to build stronger relationships through preferred pricing arrangements or by providing certain ancillary services such as energy management services.

The proliferation of value-added services and products continues today as delineated in the previous section of this paper. Therefore, it appears that Stage 3 is gaining momentum.

Our conclusion is that Stage 4 is inevitable. The restructuring of the electric utility industry, which is now underway, is driving the formation of a universal wholesale power marketplace in which vertical integration will be effectively eliminated. All distribution

systems, whether integrated or not, will have to buy from the marketplace. All generators will have to compete to sell their power (internally and externally if they are part of an integrated utility).

The North American power industry, for example, is increasingly viewed from a geographic perspective, as a group of regional markets rather than state entities or franchise territories. The difficulty with this regional viewpoint is that the regions do not fit every segment of the industry. For example, regions associated with generating companies are quite different from those of the distribution companies or transmission companies. Nevertheless, the regions for bulk power markets will become increasingly important with regard to industry structure and the state boundaries less so. Bulk power brokers and generating companies will have to become more and more expert in the variances of regulation within each state if state-by-state deregulation is not homogenized.

Studies that simulated or studied the impact of relaxing the present patchwork of regulations, incentives, and institutions found consistent and significant benefits, generally within regions. Greater integration of rival public and private systems, increased transmission access, and regional rather that state regulation of both short- and long-term functions could provide net cost reductions of several percent or more.[48]

[48] Penner-Fox, P. 1997. *Electric Utility Restructuring: A Guide to the Competitive Era.* Vienna, Virginia: Public Utilities Reports, Inc. p. 136.

The problem with the preceding simulations is that each state regulator has a vested interest in protecting his/her turf (and job!) and will be very reticent about destroying the state regulatory system in favor of a regional one.

The second part of electric industry change will allow the retail customer to begin selecting and purchasing their power from different generation sources. California is beginning to move to this model this year. This will lead to the elimination of "franchise territories" and allow retail customers to choose their generation supplier from a variety of sources. This step is merely an extension of the preceding opening of the wholesale market.

Under a retail choice model, the distribution company is potentially relegated to the role of ensuring delivery of electricity over its set of lines, but not to purchase it or ensure adequacy. The distribution company, therefore, is the transporter only. However, in such a model it is not clear what entity has the "responsibility to serve".

This then, will lead to opportunities for niche players to fill roles in value-added services. The leap to retail choice may take several years in some areas, particularly those in which it is just not cost effective for the power broker to work with individual, small accounts. As a result, the role of power/electricity aggregator will evolve, one in which the aggregator will work with many smaller customers to build up a load sizeable enough for a power broker to want to sell electricity. The end-use customer will also benefit from lower rates associated with larger loads being purchased by his aggregated group.

With the proceeding conclusions as a backdrop, we believe the electric industry is destined to evolve into a virtual utility, much as the computer industry has done. The illustrations in Exhibits 4 through 7 depict how this evolution will unfold. The remainder of this section will be devoted to a more detailed description of the virtual utility and the various requirements of the marketplace that must be in place in order for this structure to become a reality.

Initial Internal Restructuring of Vertically Integrated Utilities

In preparation for a disaggregation of the industry, we believe it prudent for vertically integrated utilities to restructure themselves as indicated in Exhibit 5. Companies that focus on power generation in the future deregulated market, for example, will face tremendous cost pressures. By forming subsidiaries around each major element of the value chain, the utility is positioned to focus its efforts on further driving out current costs and selling off those portions of the business which are either non-value adding or in which they do not want to compete in the future. This restructuring is not unlike that of the computer industry.

Generation -

As indicated in the preceding Analysis section, several companies have already begun the process of focusing or "de-focusing" on generation in states such as California and Massachusetts. These companies have already, or are in the process of, selling off their generation assets in order to direct their efforts and resources more thoroughly on

downstream activities such as distribution and other value added services. Conversely, companies such as Enron and several large independent power producers are buying these generation assets in order to build scale in certain regions.

We believe the era of individual plant economies is waning. Legitimate cost savings may be realized by expanding and diversifying a single owner's portfolio of generation assets over many geographic areas and, especially, unit types. For example, when economic growth and electricity sales are strong in one area, they may be weaker in another. In addition, when the cost of certain fuels are higher than normal, the generation company may be able to procure other fuels for far less (i.e. coal versus natural gas), thereby leveraging their geographic and unit-type diversity through blended earnings. Finally, there will be certain management, mass purchasing, and technical synergies derived when companies focus and build their core competence in generation.

The primary question that remains relative to the generation segment of the disaggregated electric industry is what pricing model will evolve as the dominant mechanism for wholesale transactions. California, the UK, and Norway have all adopted a poolco approach primarily because an effective bi-lateral system has not been developed. As long as this technological inhibitor remains, we believe the electric wholesale market will be forced to accept this approach. However, the pressure to enable one-to-one selling will be great and the development of a bi-lateral pricing system is inevitable. There is another reason we believe the poolco approach will be adopted initially in all emerging wholesale markets. We believe that early in the deregulation process consumers will be

more concerned with creating contracts that specify prices and supplies in advance in order to minimize risk. The poolco market can provide these contracts in the form of financial instruments (spot and long-term power contracts), rather than power transactions.

Transmission -

The transmission system in any electric market is the backbone of the entire industry. All electricity generated must flow over this portion of the system in order to travel to the distribution networks. Therefore, the owner of this system is in an extremely powerful position. Owners of the transmission system are in a position to charge tariffs to all users at a level that could effectively wipe out the positive effects of a competitive market place.

The question then becomes, what is the best ownership and regulatory framework (if any) to ensure transmission system owners do not exploit their unique position to the detriment of all other players in the industry. There are really only two potential forms of ownership: Public or private.

We believe private ownership of the grid would necessitate some form of regulation. The options here include the traditional cost-of-service regulation, in which the rates and terms of service for transmission would be set much as they are by today's regulators. A second option is that of incentive or performance-based regulation. The most popular form of performance-based regulation is that of price-capped regulation, in which a

utility is given a maximum price that it can charge for specific groups of services as well as minimum terms, conditions, and quality standards that it must meet.

Public ownership could potentially replace regulation such that transmission price control would occur via the exercise of political control over the public owner. We believe that a publicly owned grid would not be permitted to exploit transmission scarcity for its own gain, giving it little incentive not to expand when necessary. There is always the concern that a public owned and operated grid would be far less efficient. However, the empirical research to-date does not support this belief, nor does it support the view that a privately owned grid would be more efficiently operated.[49,50,51]

In light of the proceeding, we believe that little change will occur in the ownership structure while the competitive market place evolves. Even though private ownership will have to be heavily regulated in order to ensure no exploitation, we believe for-profit entities that currently own these assets will retain ownership because of the relatively stable, albeit low, returns provided from this segment of the value chain. Further, government will have little incentive to assume the management and operational control of the transmission system when the expertise already resides in the private sector.

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[49] Kaufman, A. and Dulchino, D.P. "*The Federal Power Marketing Administration: To Privatize Or Not To Privatize.*" Federal Report 1986 pp. 86-90

[50] Ridley, S. "*Seeing the Forest From the Trees: Emergence of the Competitive Franchise.*" The Electricity Journal (May 1995).

[51] Shepherd, W.G. and Gies, T.G. 1974." *Regulation in Further Perspective: The Little Engine that Might.*" Published by J.B. Lippincott Company.

Distribution -

The change at the distribution level of the value chain will be potentially the most dramatic and least easy to predict. The distribution segment's evolution will be determined on the one hand by how the existing wires to the end-user will be regulated and on the other hand by the creativity of the existing distribution companies and new entrants to retain or attract customers after the market opens. However, even very creative efforts by new entrants will not be enough to overcome such issues as stranded cost allocation if these issues are not legislated equitably. Therefore, our predictions should be divided into two aspects, that of the core business of electricity distribution and that of ancillary, value-added services typically provided in the past by the local utility.

Relative to the first aspect, we believe the core business of distributing electricity to the customer will remain regulated for many of the same reasons as the transmission segment. Specifically, without some from of control over the local distribution company, tariffs can be placed on the electricity being wheeled by competitors of the indigenous utility to the extent that new entrants would not be able to profitably compete based on price of the commodity. In short, the core distribution business represents a natural monopoly that must be controlled in order to maintain the benefits of competition. This regulation will set a fixed tariff to be applied to <u>all</u> electricity transported over the distribution lines regardless of the supplier, with no advantage provided to the local utility from this standpoint.

Two issues must be dealt with in order to ensure the preceding mechanism works to the benefit of consumers. First the issue of obligation to serve. We believe that a provider of last resort must be designated for every customer. As was the case in the telecommunications industry, there will be many customers who simply will not switch from the existing utility either because it is too much trouble, the benefits of switching are not great enough or they believe the risks are too great to switch. In these cases, the former provider became the "default provider". We believe the current local utility should play this role such that the onus is placed on the customer to initiate a switch in providers, not on the electric industry. In addition, in the event of a failure on the part of the new power marketer to effectively supply the agreed upon electricity to the customer, the local utility would become the default provider and charge the power marketer a premium for the delivery.

The second issue is that of stranded costs. We believe stranded costs of the existing utilities can not be avoided and must be allocated to all players in the new market place equitably. The effective allocation of stranded costs becomes the linchpin to the development of a truly competitive marketplace. The following oversimplified example illustrates how inequitable allocation of stranded costs places new entrants into the market at an unfair advantage.

In the following table, generation costs represent the cost of power in a poolco wholesale market, transmission costs represent the regulated tariff to be paid by all power brokers who wheel electricity across the grid, "backroom" infrastructure represent costs

associated with time-of-use metering, billing and other customer interfaces necessary to support the sales operations, and distribution costs represent the regulated tariff to be paid to the owner of the local distribution assets. The fixed costs line represents those costs that are potentially stranded as a result of customers migrating to new providers. These costs include generating plants that are more expensive than today's power plants, long-term fuel or purchased-power contracts that are more expensive than today's prices and other assorted regulator-approved extended payment plans for certain large expenses.

	CURRENT STATE	FUTURE STATE			
	Current Local Utility	Current Local Utility	New Power Brokering Companies		
Description of Cost	$/MWh	$/MWh	$/MWh	$/MWh	$/MWh
Generation	0.005	0.005	0.005	0.005	0.005
Transmission	0.0025	0.0025	0.0025	0.0025	0.0025
"Backroom" Infrastructure	0.006	0.006	0.008	0.008	0.008
Distribution	0.008	0.008	0.008	0.008	0.008
Fixed	0.01	0.0019	0.0027	0.0027	0.0027
Total	0.0315	0.0234	0.0262	0.0262	0.0262
Retail Price	0.04	0.0305	0.0305	0.0305	0.0305
Profit Margin	21.25%	23.28%	14.10%	14.10%	14.10%

In the preceding table, note that the backroom infrastructure costs of the new power brokering companies is slightly higher than the existing utility as a result of initial start up costs such as those associated with time-of-use metering and call center technology. The single largest complaint being lodged by new market entrants to-date is an inequitable charge-back of stranded costs (as illustrated above). The allegation is that the local utility is lumping several improper costs into this "stranded cost" category to the extent that not only is the new market entrant bearing an unfair burden, but the overall

cost structure of the local utility is lower than it was before the market opened up to competition. As a result, new market entrants can not effectively compete.

Therefore, we believe the following policies must be adopted in order to ensure a "level playing field".

- Utilities should mitigate stranded costs to the greatest extent possible by selling off non-value added assets and renegotiating contracts;
- Stranded costs must be recalculated on a regular basis as circumstances in the market change (such as changes in the number of power bokers or significant changes in customer demographics and population);
- Ensure all customers pay their fair share of system costs regardless of their provider;
- Manage recovery over a fixed period of time of not less than 5 years; and
- Place the burden of proof on utilities seeking recovery to reduce oversight workloads of regulatory commissions and limit the ability of the utility to over-estimate these costs.[52]

The second aspect of the changes to be expected in the distribution segment of the value chain is related to the other value-added services typically provided by the local utility. We expect that the industry will unfold in a way where the business model of the players has to focus strictly on the customer. We foresee a combination of horizontal and vertical bundling at the distribution level. Parallels can be drawn to the computer industry and

[52] Rose, K. 1996. "*An Economic and Legal Perspective on Electric Utility Transition Costs.*" The National Regulatory Research Institute (July).

telecommunications industry when considering companies like EDS and WorldCom. We can imagine that the 'new' (distribution) utility will function as a kind of "gateway function" to the residential customer. The scope of their product offerings will expand to services like broadcast cable, telecommunications, Internet access, security services and so on. This horizontal integration or bundling and is similar to the WorldCom approach in the telecommunications industry. At the large customer level (i.e. industry and government) the 'new' utility will expand their offerings into such areas as energy consulting, running the electricity processes for the customer and optimization of energy budgeting and forecasting.

As illustrated in Exhibit 7, this unbundling and virtual "rebundling" of services will cover such services as billing wherein new entrants to the market can consolidate billing from all "utilities" (e.g. electric, gas, cable, water and telephone) into one bill for the customer. In addition, such a company could audit bills to minimize over-billing by companies and assist the customer with customized payment plans. Call center management affords another opportunity for companies outside the electric industry to enter the market. Such companies as AmeriTech have built their core competence in the area of call center operations and management. Such a company could assume call center management for a wide array of utilities so as to create a single point of contact for the customer with regard to hook-ups, disconnects or service calls.

In both the horizontal and vertical "rebundling" of services each company must attempt to develop a point-of-difference from the competition through superior product and/or

service offerings. This approach is quite different from one focusing strictly on price or product differentiation.

Power Brokering –

As a direct result of deregulation, a new segment of the value chain has emerged which will continue to play a vital role in the new competitive market. Power brokering is analogous to natural gas trading operations in that this player in the overall value chain need not necessarily own assets associated with the traditional industry, but rather through extensive knowledge of supply sources and needs, acts as a intermediary in matching the two. In addition, precisely because of this knowledge of supply sources, the power broker is able to access the lowest cost power to satisfy customer needs as opposed to the local, vertically integrated utility that is typically using its own power generation assets as the primary supply source. Several companies have grown significantly in the recent past by exploiting their unique knowledge in this area and/or by acquiring knowledge-workers who bring with them this expertise. Many of these power brokers have entered the electric industry by leveraging their expertise gained through natural gas trading. The top 10 energy brokers in 1997 were Enron (1), NGC-Chevron/Electric Clearinghouse (2), PG&E Energy (3), El Paso Energy (4), Aquila Energy (5), Coral Energy (6), Duke Energy (7), Engage Energy (8), Amoco (9), and TransCanada Energy (10).[53]

[53] *"Natural Gas Volumes Still Dominate U.S. Energy Market"*, PRNewswire - 02/20/98

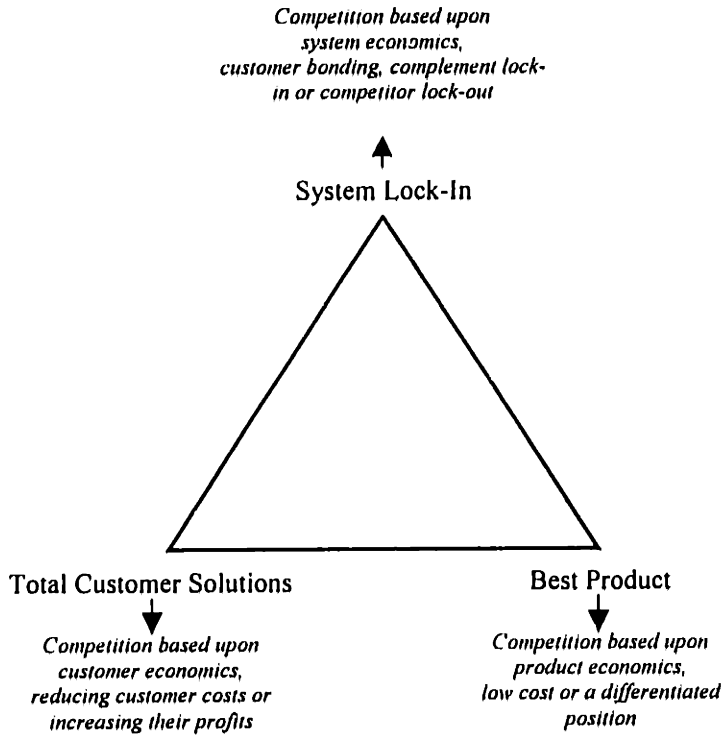
These companies are uniquely positioned to exploit the growing competitive environment of the future. First of all, in the short run they will be able to take advantage of the somewhat imperfect information currently available at the wholesale level to lock in customers in large, sometimes lengthy contracts, and profitable supply contracts. Second, they will be in a position to sell directly to the end-use customer rather than the local distribution company as technology improvements solve the bilateral sales difficulties discussed earlier. It should be noted that in the long run margins will continue to be squeezed as information becomes more "perfect" to all players in the industry and customers (particularly at the industrial level) continue to exert pressure on suppliers for lower prices. In preparation for this margin reduction some companies have begun to offer other products within their trading portfolio such as a set of weather-related derivatives recently launched by UtiliCorp's Aquila Energy subsidiary. Called "Guaranteed Weather," these products can limit risk to extremes of either too much or too little hot or cold weather, when purchases of gas and power can either exceed or be less than contractural commitments.[54]

Focusing the Segments of the Value Chain for Strategic Advantage

The impending disaggregation of the electric industry will require utilities to focus their resources and efforts on specific segments of the value chain in an effort to build best-in-class skills, products and service. Individual companies will not be able to effectively compete within every segment of the value chain. We have embraced a view of creating distinct strategic positions through the use of The Adaptive Management business model

[54] "*UtiliCorp Chief Sees 'Muddle' If Patchwork reform Persists*", Natural Gas Week - 02/16/98

developed by Arnoldo C. Hax and Dean L. Wilde II. This model offers three strategic options for companies: Best Product, Total Solutions, and System Lock-In.[55] The following figure (developed by Hax and Wilde) illustrates this model and the options available to companies in an industry.



We believe the preceding model can be effectively applied to the electric industry as actors in this industry attempt to sort out their strategic options.

The generation segment of the industry will be driven by efficiency, price and power quality. Those players who are most effective at reducing generation costs, maximizing inter-unit synergies and providing reliable, quality power will be best positioned to compete. These players should clearly focus on a strategy of Best Product. In the short term, generation companies will primarily sell their product at the wholesale level

[55] Hax, Arnoldo C. and Dean L. Wilde II, from unpublished manuscript provided in Sloan School of Management Strategic Management course, 15.931.

through the power pools that are established in each region. A key to growth within this segment will be through increasing scale and scope. Generation companies can not expect to grow through naturally increasing customer demand. For this reason, we expect the generation segment to consolidate into far fewer, much larger players in the US, for example. Utilities such as the Southern Company have already begun an attempt to build scale and geographic scope in this segment of the business through the acquisition and construction of power plants around the world. However, they are also acquiring more fully integrated utilities around the world as well. We believe these utilities should be aligned internally as suggested in the prior section of this paper so that non-strategic segments of the value chain can be "spun-off" in order to allow for greater focus on other segments.

We believe the transmission segment of the business will remain heavily regulated. Regardless of the form of ownership assumed over the assets, such a regulatory framework creates a System Lock-In for the owners. Such a regulated monopoly essentially locks out competitors since it is highly unlikely another company would build parallel transmission lines in an effort to by-pass the existing lines. In addition, no new technology is on the horizon to replace the transmission line as the backbone of the industry and, therefore, any entity wishing to wheel their electricity to a given location must move it across the established transmission lines. Although profitability within this segment will be limited, ownership of these assets can create a stable and predictable revenue and income flow from year-to-year. The primary focus of this segment will be to ensure appropriate levels of capacity are available as the industry becomes more

competitive and to manage the load balancing requirements of the system. Therefore, operational effectiveness is of paramount importance as opposed to innovation.

The distribution segment of the industry, as indicated earlier, will focus on two broad elements of the business. First, the core business of transporting electricity from the substation to the end-use customer is likely to remain regulated. This then, parallels the transmission segment of the industry in that this portion of the business will be in a position of System Lock-In with customers within its "territory". Operational effectiveness will be of greatest importance with a significant amount of effort in greater automation, system reliability and cost reduction. Although growth from increasing customer demand will be low, as with transmission asset ownership, this segment can potentially provide a stable, predictable platform of revenue and income.

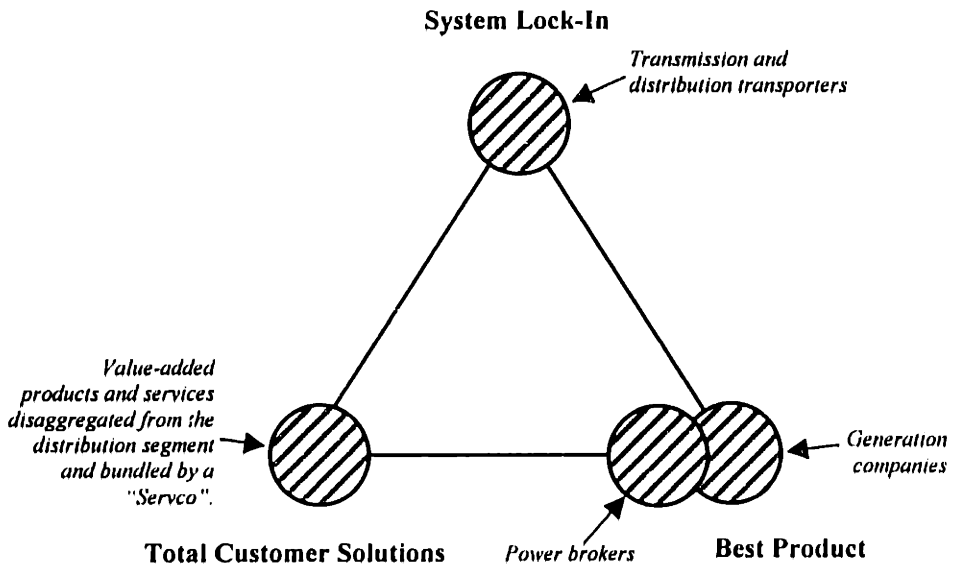
The second element of the current distribution segment will involve ancillary, value-added products and services. This element of the business will be much more dynamic for several years to come. This segment must focus their strategy on Total Customer Solutions in order to survive. Critical aspects of this strategy will be building larger shares of customers, joint development of new product and service offering, outsourcing other non-value-added activities and bundling of some services and products in order to offer a more complete solution to the customer. Maintaining customer share through well thought out retention programs will be a significant challenge to this segment.

It is evident that these two elements of the distribution segment are quite different in strategic focus. For this reason, we believe the two elements must divorce themselves in order to focus effectively. Structure, process, competencies and cultures will be very different in these aspects of the business and will not make compatible joint efforts. It will be more conceivable for distribution companies focusing strictly on transportation of the commodity to join with the transmission segment of the industry than for these companies to attempt to create a core competence in value-added products and services.

The emerging power brokering segment of the industry is currently building scale through a Best Product strategic position based on "first-to-market", low cost, high volume activities. Barriers to entry in this segment are relatively low (with the possible exception of acquiring competent human resources) and therefore, as more entrants emerge margins will continue to be squeezed. Growth options at this point for the power brokers appear to be limited to continued new and innovative product introductions (e.g. new types of trading products) and/or the acquisition of new customers through either mergers and acquisitions or intensified marketing and sales efforts. However, there is another potential opportunity. As mentioned earlier, the technology has yet to be developed that can effectively facilitate bi-lateral trading regimes to be established in the system while still maintaining the balancing requirements of the grid. One of the features described in Hax and Wilde's System Lock-In strategic positioning is "complementor lock-in". An example of this kind of complementor relationship seems to be emerging between Microsoft and Intel in the computer industry. Should a power marketer, by forming a relationship with an information technology company, successfully develop

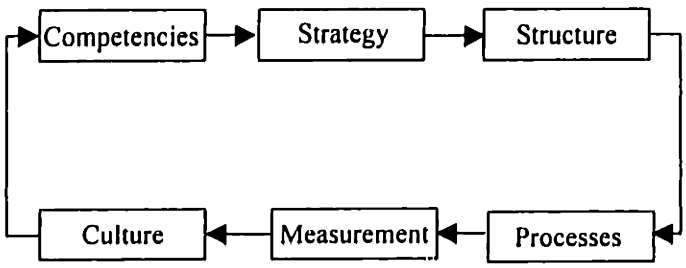
such a bi-lateral trading system, the potential for system lock-in could be established. Such a development would mirror the development of American Airlines' SABRE system, which became the standard for airline reservation systems many years ago and thus was actually a very profitable segment of their business in addition to flying airplanes! The successful development of this trading system would allow the power broker and information technology complementor to move to the strategic position of System Lock-In. At this point, however, it would appear the likelihood of such a proprietary standard being developed without almost immediate imitation, is very small. Therefore, we believe the appropriate strategic position for the power broker for the foreseeable future is that of Best Product.

Based on the preceding analysis, we believe the most appropriate strategic positioning options for the electric industry, post-deregulation, as applied to The Adaptive Management business model is as follows.



Internal Alignment as a Key Success Factor

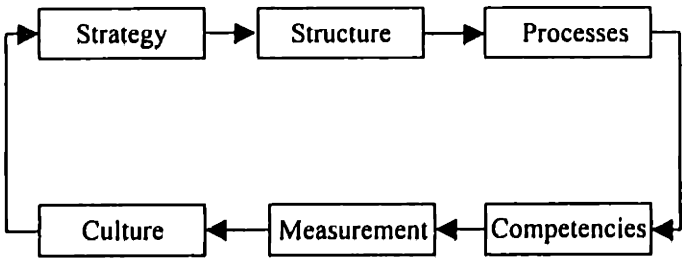
Aligning the organization to effectively execute the selected strategy is a key success factor. It is commonly accepted that the following factors must be considered within the firm in order to ensure full alignment of resources: Structure, processes, competencies and culture. The following illustration is one version of how these various elements of the organization must be aligned in order to ensure an effective implementation of the business strategy.



Source: Adapted from - Hax, Arnoldo C. and Dean L. Wilde II, from unpublished manuscript provided in Sloan School of Management Strategic Management course, 15.931.

The preceding illustration has been modified from the original source to include the element of human resources competencies, which we believe key to effectively supporting the strategy of the organization. For example, an organization seeking to shift its strategy significantly from generation, transmission and distribution operations to that of sales and marketing of "downstream" value-added products and services should first assess its existing human resources competencies before considering the adoption of such a strategy. Once this strategy has been fully developed, the structure the firm chooses will dictate many of the processes developed. Each key process must be measured to ensure operational effectiveness and competitiveness. The sum of all of these elements will thereby drive the culture of the organization.

An alternative view of the relationships described above would be as follows.



This view suggests that once the organization adopts its strategy, its structure, processes and competencies must be aligned to support the strategy. Moving the assessment, and potential shifting of human resource competencies, to a stage subsequent to the adoption of the strategy is an approach that might be adopted by an organization seeking to continuously upgrade or make minor modifications in employee skill sets associated with minor changes in the strategy of the organization.

Our conclusions in the following section prescribe the key characteristics associated with each of the strategic options available to actors in the electric industry today. In addition, we will then extrapolate the strategic characteristics of each option into descriptions of the structure, processes, and human resource competencies necessary for successful execution of the strategy. We will then define some of the key measures associated with the strategic options that the firm must understand and manage in order to maximize its competitiveness. Finally, we will predict what cultures must be present in each firm as a result of the installation of the preceding elements.

CONCLUSIONS

Strategic Positioning

Exhibit 8 summarizes the options available to the vertically integrated electric utility relative to strategic positioning as the industry disaggregates. The format for this summarization is adapted from Hax and Wilde's view that there are essentially three fundamental processes which are always present in the firm and are the focus of key strategic tasks.[56] These three tasks are operational effectiveness, customer targeting and innovation. As is illustrated in Exhibit 8, the strategic characteristics of each new business unit within the disaggregated electric industry varies widely.

The most significant differences can be seen when comparing generation companies with power brokers. Despite the fact that both types of firms will be focused on Best Product positions in the market, generation companies will strive for operational efficiencies and cost minimization, while power brokers strive for profit maximization and innovation. This is not surprising given that market share and volume throughput are key factors of competitiveness for the power broker. While the generators are somewhat geographically constrained by the distance they can reasonably wheel their electricity, the power broker is capable of building trading networks across an entire country. The generator looks to optimize the use of the capital-intensive assets it owns, while the power broker looks to move as much volume as possible with as great a margin of profitability in a market where margins are very thin. Certainly generation companies will be working with tight margins as well, but their best opportunity to widen those margins are through innovative

[56] Hax, Arnoldo C. and Dean L. Wilde II, from unpublished manuscript provided in Sloan School of Management Strategic Management course, 15.931, pg. 58.

mechanisms for cost reduction. The power broker is in a position to work both the cost and revenue sides of the equation through the quality of the trades it is able to contract.

As noted earlier, it is likely the transmission and power distribution companies will remain regulated. As such their returns will be mandated to fall within certain ranges. Therefore, these companies must focus on system reliability, through cost-effective maintenance programs and well-planned capacity management. Transmission companies' customer base will be more or less limited to the generation companies that are contiguous (or at most, once removed) from their transmission lines and the distribution companies that draw from the same lines. They must also develop relationships with the power brokers that will be a major force in matching supply and demand. The primary interaction with these power brokers will be developing pricing for the coming transaction period and ensuring the grid is balanced once all demand and supply "contracts" are consolidated.

"Servcos" will be unique in their strategic positioning by focusing on Best Customer Solution. These firms will strive to either assume the outsourcing duties of "backroom" activities currently associated with the vertically integrated utility, or they will bundle various services and products to offer to end-use customers. Regardless of which tact the "Servco" takes, operational effectiveness will be driven by customer economics. For the distribution companies that outsource activities to the "Servco", cost per transaction will be a key factor. Therefore, the "Servco" must ensure their cost to perform these activities is below that of the client's and the quality of the service is higher. The "Servco" which

chooses to bundle services and products for delivery to the end-user must ensure the total cost of these bundles are lower than the sum of the individual services that could be acquired by the customer on his own. In addition, the integration of these various services and products must form a cohesive, customized solution for each customer to meet their individual needs. This customization process will force "Servcos" to carefully consider customer segmentation strategies so that the best total solution is offered to each segment, rather than a "one size fits all" approach. Being first-to-market with new, innovative products will be an important competitive advantage for the "Servco". These firms will seek to create linkages of joint development efforts with customers to further lock-in long term relationships. The "Servco's" goal should be to become the recognized expert of each of their customers' service needs by learning as much as possible about the customers' operations. In this way, the "Servco" will be in a position to recognize new service opportunities even before the customer does.

Internal Alignment Characteristics

Structure -

Exhibit 9 summarizes some of the key characteristics associated with each type of firm's internal alignment dimensions. The structure of each type of firm will vary significantly as a direct result of the strategy they choose to pursue. Structure of the firm will be driven by such factors as the required proximity to customers, the homogeneity of products and services produced, and the degree of regulation imposed by government actors. For example, the typical generation company produces an extremely homogenous product regardless of where their operations are located. In addition, because of

limitations to electric wheeling distances, they will be required to locate relatively close to the primary customers. Therefore, each of these firms must organize in a decentralized manner, within each generating plant. The firm will not require a large central staff other than for leveraging certain synergies such as fuel purchasing and capital allocation.

Conversely, power brokers, because of their heavy reliance on information technology will be able to highly integrate and centralize their operations. There is some degree of variation in the brokered products these firms will offer to each customer segment and, therefore, power brokers will organize around key these segments. The highly dynamic, competitive environment within which power brokers operate dictates a flexible, ever-changing organization structure, in stark contrast to the generation companies.

"Servcos", by virtue of the fact that they must develop tight linkages to the customers they serve, must organize in a fashion that meets the customer's needs. In some cases, proximity to the customer and the high degree of service customization required will drive an organization structure that is decentralized and adapts to customer needs rather than a formal corporate standard of the firm. In other cases, such as call center management, the "Servco" will be able to centralize operations and leverage information technology to maintain appropriate linkages to the customer. As with power brokers, flexibility and adaptability will be key elements of structural design.

Transmission and distribution company structures will be relatively static and homogenous from territory to territory. Proximity to the customer is an absolute

necessity. Because of the relatively wide variety of skills sets required in these firms, they must be organized functionally. For example, dispatching and load balancing functions will tend to be centralized into a single site, while line construction and maintenance will be located strategically to ensure minimal response times. In response to certain governmental reporting requirements, these firms must organize their accounting and regulatory functions accordingly. System reliability, consistent cost management and regulatory reporting will force a more static, less flexible organization structure.

Processes -

Each of the different types of firms forming the Virtual Utility will develop processes that support their chosen organization structure and are customized to varying degrees to meet customer requirements. Generation companies must develop processes that focus on cost minimization and plant efficiency. Because generators' version of Best Product will be based on price, processes will be developed that maximize efficiency and plant capacity.

Power brokers will also be working with extremely thin margins on each trade and, therefore, must develop processes that leverage information technology capabilities. Individual traders will assume have responsibility for several tasks within a given process in order to minimize response time to trading opportunities. Unlike generation companies where processes are primarily constrained within individual plants, the power broker's processes will be highly integrated across the firm between the trading, accounting and marketing functions, for example.

Process design within the typical "Servco" will be radically different from the more traditional segments of the industry. In particular, "Servcos" will build processes that are highly integrated with their customers and between services so as to smooth the flow of information and create a complete solution. In addition, they will emphasize product/service innovation processes in order to ensure a steady stream of new offerings and thereby maintain a point of difference from the competition. Therefore, the processes within the "Servco" will cut across many functions as opposed to residing within one function.

Transmission company processes will be somewhat bifurcated. The system operations functions will be heavily reliant on information technology. Consolidating supply offerings with demand requirements so that the grid is balanced from moment to moment requires sophisticated systems support. Line construction and maintenance processes will be built around the more traditional, functionally oriented structure. These processes will be designed to ensure maximum system reliability and integrity within limits prescribed by regulatory requirements.

Distribution companies will have process designs similar in some respects to transmission companies, in that system reliability is a paramount importance. Rather than developing systems that must interface with a relatively finite set of customers and suppliers, however, distribution companies will be networked with a multitude of customers. In addition, most distribution companies will outsource certain "backroom"

functions such as billing or meter reading and this will require the development of processes that integrate internal functions with external suppliers.

Human Resource Competencies –

Each firm's structure and processes will require very different sets of human resource competencies in order to operate effectively. Generators will seek to attract engineers, purchasing experts, safety professionals and environmental management personnel. These skill sets vary widely from those required by the power broker, that will seek information technology expertise, financial management support and risk management experts. Of primary importance to the power broker will be the attraction and retention of talented traders, many of whom may bring with them relationships with established customers. "Servcos" will require competence in such areas as selling, marketing and product innovation. While transmission companies will seek individuals with experience in construction and maintenance of high-voltage lines. Safety and load balancing logistics will be important skill sets to the transmission company as well. Similar to generation companies, power distributors will have a heavily reliance on engineering and mechanical skills. One important difference between the two will be the likelihood of end-use customer interface that the power distributor will have, thereby requiring customer service skills of a more refined nature than generation or transmission companies.

Performance Measures -

Exhibit 10 summarizes several of the key performance measures that each firm within the virtual utility will manage by. Firms such as power distributors and transmission companies will manage to metrics associated with reliability, capacity utilization, and construction and maintenance costs. These companies' returns will be regulated and, therefore, it will be important to ensure profitability falls within established ranges so as to avoid future rate cases or "show cause" investigations.

Generation companies will drive for greater and greater efficiency and cost reduction methods. Their performance measures will be very focused on product cost and plant utilization with the goal of maximizing the use of capacity without over-committing. By achieving the position of lowest cost producer within their regions, the generation company can ensure maximum use of its assets.

Power brokers are concerned with both sides of the profitability equation. It is important to minimize the cost of supply through intelligent buying and low overhead costs. In addition, the broker's goal is to sell the commodity at the highest possible price. Therefore, the indices they manage by will measure these two important dimensions. Power brokers will also measure the number of new customers acquired and push for new, innovative contracts that are customized to meet individual customer needs. All of these metrics are designed to measure volume, profitability and share of the total market.

"Servcos" will focus not only on internal cost and revenue metrics, but also key metrics of their customers. The "Servco" is only competitive when their service and product offering are below those of their customer's ability to perform the service internally or purchase the service through a different supplier. Therefore, "Servcos" must track their costs against the competition and understand the customer's costs. In addition, "Servcos" must measure their ability to innovate new service offerings and measure customer satisfaction with current offerings.

Culture -

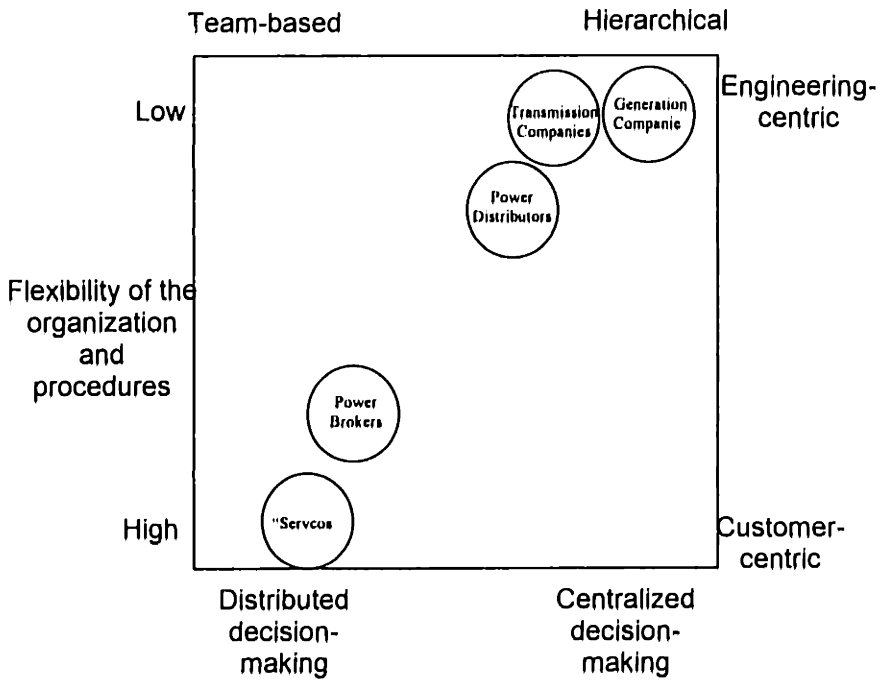
There is no question that the culture of each type of firm within the Virtual Utility will be vastly different as a direct result of the structure, processes, competencies and performance measures it chooses. We have chosen to summarize the differences the foregoing dimensions create in four categories:

1. Flexibility of the organization and procedures – Does the organization possess the capacity to adapt to ever-changing external stimuli and are procedures well-developed and rigid, or are they more informal and adjustable to the given situation?
2. Team-based versus hierarchical – Is work accomplished through cross-functional teams that change regularly based on the demands on the firm, or is it accomplished through established hierarchical structures aligned around key functions in the organization?
3. "Engineering-centric" versus "Customer-centric" – Is the organization primarily motivated by engineering interests in an effort to steadily improve

the technology associated with producing and delivering the product, or is it driven by the needs of the customer?

4. Decision-making – Are decisions driven down to the level closest to the customer or are most important decisions made at the top of the organization?

The diagram below depicts how the culture in each type of firm in the virtual utility arrays itself around the categories described above.



It is evident that such influencers as working in a regulated environment, producing a homogenous product and providing a service upon which a high-degree of reliability is of greatest importance will drive a culture that tends to be relatively inflexible to change and risk averse. Conversely, the dynamic, competitive, unregulated environment of the

power brokers and "Servcos" will drive a culture that must be more responsive to change and willing to take significant risks.

SUMMARY COMMENTS

In the preceding conclusions, we have attempted to depict the utility of the future, which will be characterized by the disaggregation of the electric industry into firms of very diverse strategic positioning, structures, processes, competencies and cultures. One of the most important lessons to be drawn from these conclusions is that the current vertically integrated utility can not hope to compete effectively in all of these arenas. To build a best-in-class position in any strategic position will require significant focus of management talent, employee competence and capital. The Virtual Utility of the future will represent a vast, integrated network of firms specializing in particular elements of the value chain, the sum of which will provide better quality products and services, linked to cheaper, more reliable electric power for the consumer.

AUTHOR BIOGRAPHIES

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Mr. Browning is currently employed with UtiliCorp United Inc. headquartered in Kansas City, Missouri. The company is a provider of energy and energy solutions with gas and electric operations throughout the United States, British Columbia, Canada, Melbourne, Australia, Jamaica, and the United Kingdom. Prior to attending the Sloan School of Management at MIT, he was responsible for business process reengineering of the company's financial systems, customer information systems and customer service centers. He has over 14 years experience in the Human Resources field including, but not limited to, organization development/design, human resources development, compensation and benefits administration, labor relations management and safety. In addition, he is experienced in corporate strategic planning. Prior to joining UtiliCorp United, Mr. Browning held various Human Resources and Sales Management positions with Coca-Cola Enterprises.

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Prior to attending the Sloan Fellows Program at MIT, Mr. Holz was the head of the Utilities Division, which was responsible for the solution business in the international utilities market. Prior positions included Systems Engineer, Sales Representative, Sales Director and Unit Manager.

In 1984, he finished his studies at the Technical University of Berlin, Germany, with the final examination in Economics and Engineering.

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ELECTRIC INDUSTRY RESTRUCTURING PROCESS and STRATEGIC MANAGEMENT APPROACH

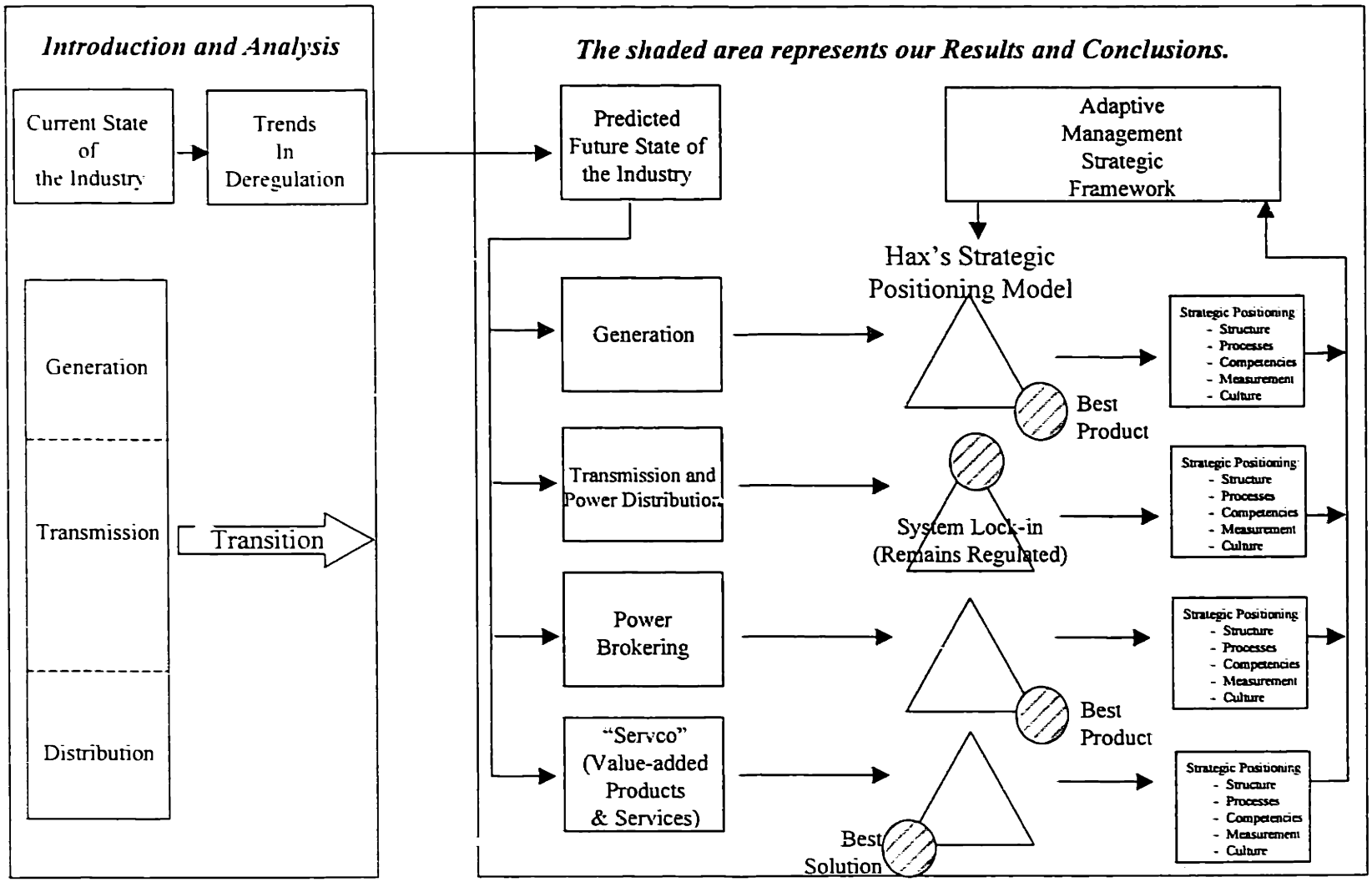


Exhibit 1

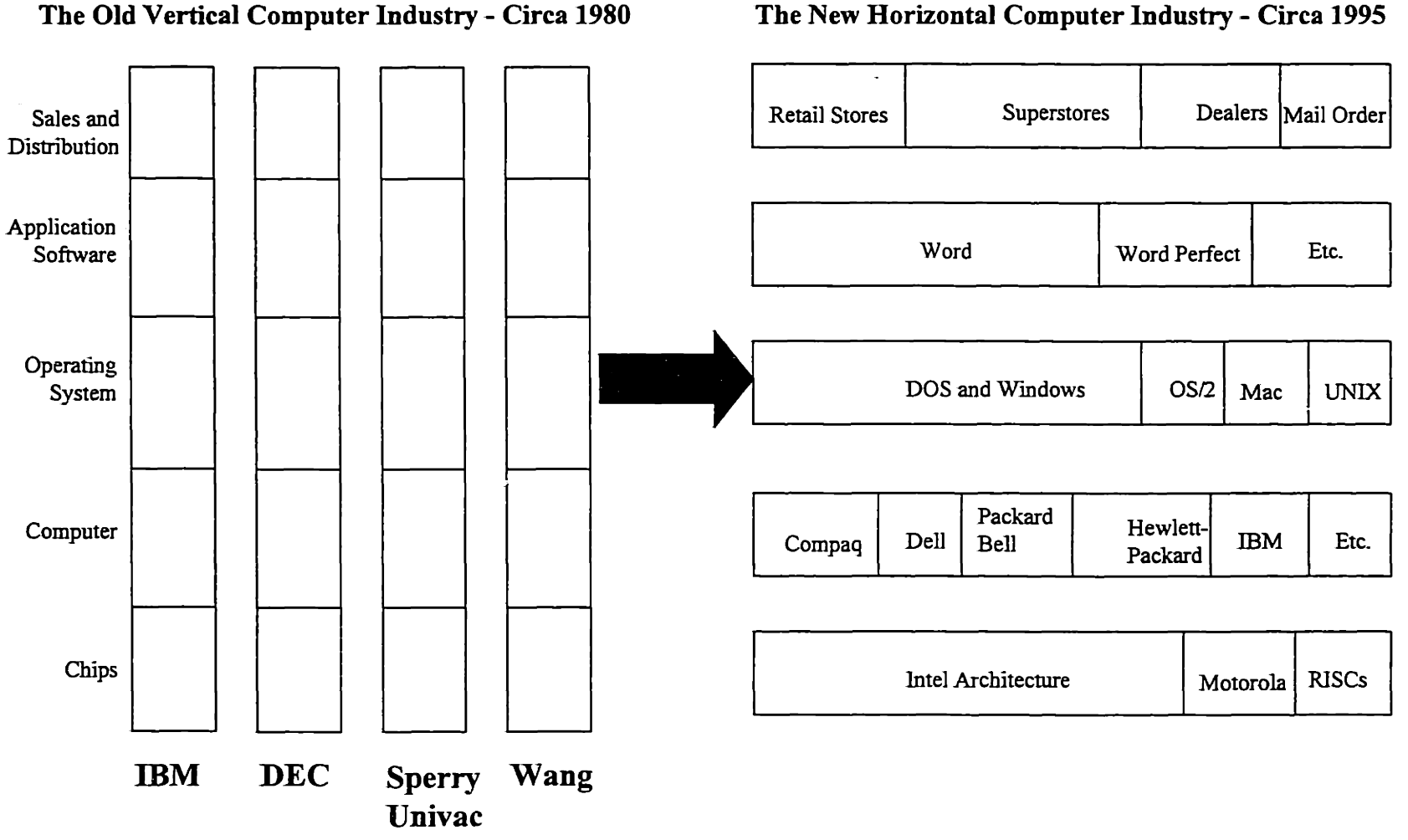
US Electric Industry Regulatory Activity Summary

State	No Activity	Discuss. Forum	Staff Reports	Guidelines	Draft Order	Commission Hearings	Final Order	Trial or Experiment	Utility Plan	Legislative Study	Bill Introduced	Bill Passed	Failed or Vetoed	Court Litigation
AL		●									●			●
AK		●				●								
AZ		●	●		●		●		●	●	●		●	●
AR		●							●					
CA		●					●		●		●	●		
CO		●	●								●		●	
CT				●						●				
DC									●					
DE						●			●	●				
FL		●								●				
GA		●									●			
HI											●			
ID		●		●	●	●		●		●				
IL		●	●					●		●	●		●	
IN		●	●						●	●			●	
IA		●	●	●		●			●					
KS		●								●	●			
KY		●									●			
LA			●	●	●	●			●					
ME		●	●	●	●	●			●	●	●			
MD		●	●	●		●	●							
MA					●	●	●	●	●	●	●			
MI		●	●		●	●		●	●					●
MN		●	●	●						●	●		●	
MS		●				●			●	●				
MO		●				●			●	●				
MT		●		●						●				
NE										●				
NV				●						●			●	
NH				●	●	●	●	●			●	●		●
NJ		●	●				●	●	●					
NM		●							●	●	●			
NY		●		●		●	●	●	●	●	●			●
NC		●								●				
ND		●			●					●	●			
OH		●		●	●			●	●	●	●			
OK		●		●		●				●	●			
OR		●						●	●	●				
PA			●	●		●		●	●		●	●		
RI			●	●					●		●	●		
SC		●	●											
SD		●												
TN	●													
TX			●	●	●		●		●		●			
UT		●	●	●						●	●			
VT		●		●	●	●	●		●					
VA		●	●							●	●			
WA				●				●	●					
WV		●												
WI		●	●	●	●	●			●	●				
WY		●	●	●										
Total	1	37	19	21	11	15	9	11	24	26	23	4	8	5

Source: SmithBarney Utilities Report, July 11, 1997, *Electric Industry Deregulation: Opportunity Knocks for the Natural Gas Industry*, Pg. 31.

Exhibit 2

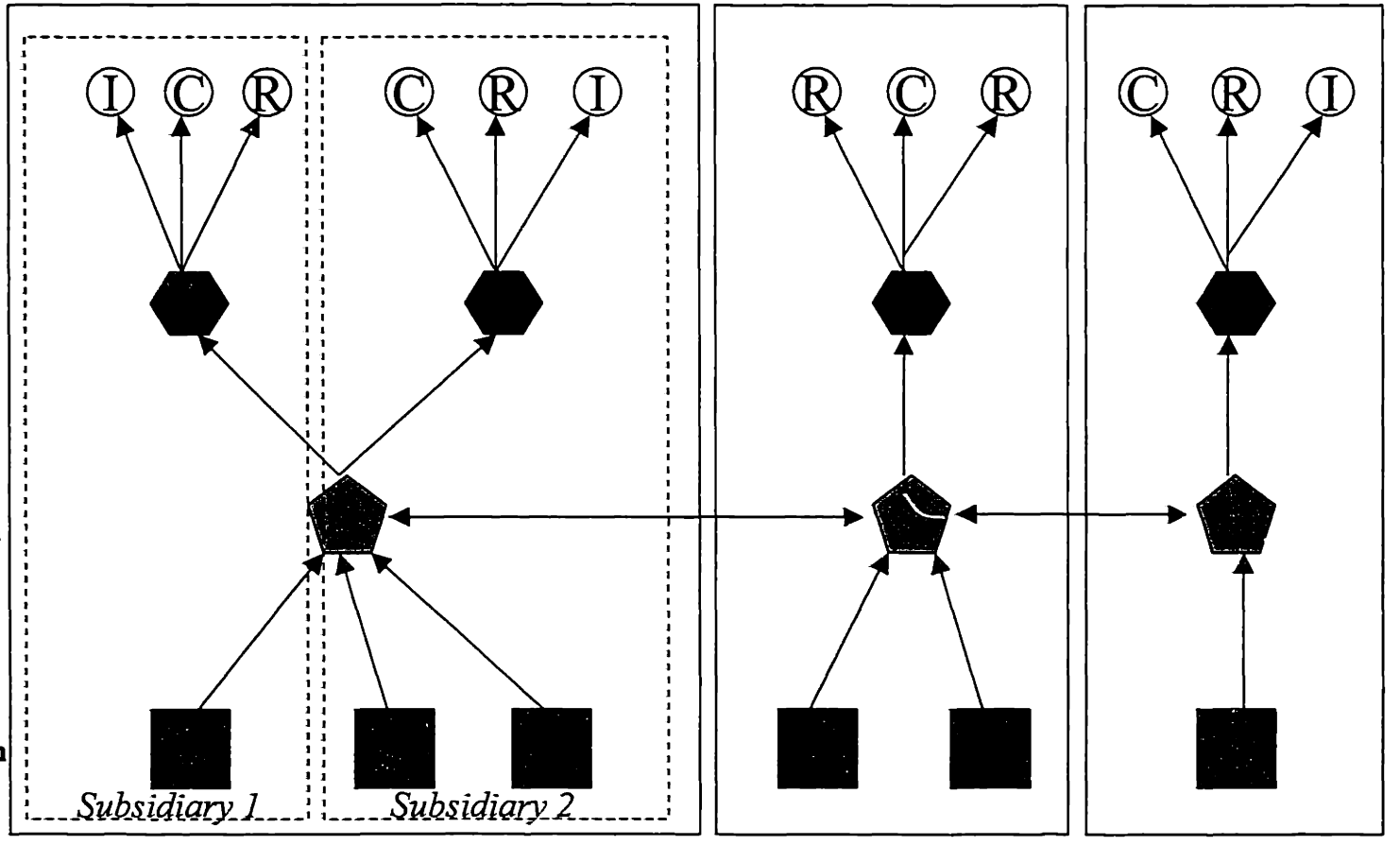
The Transformation of the Computer Industry



Source: Andrew. S. Grove, 1996, "Only the Paranoid Survive", page 44

Exhibit 3

CURRENT, VERTICALLY-ALIGNED INDUSTRY STRUCTURE



Ⓘ= Industrial Ⓒ= Commercial Ⓡ= Residential

Exhibit 4

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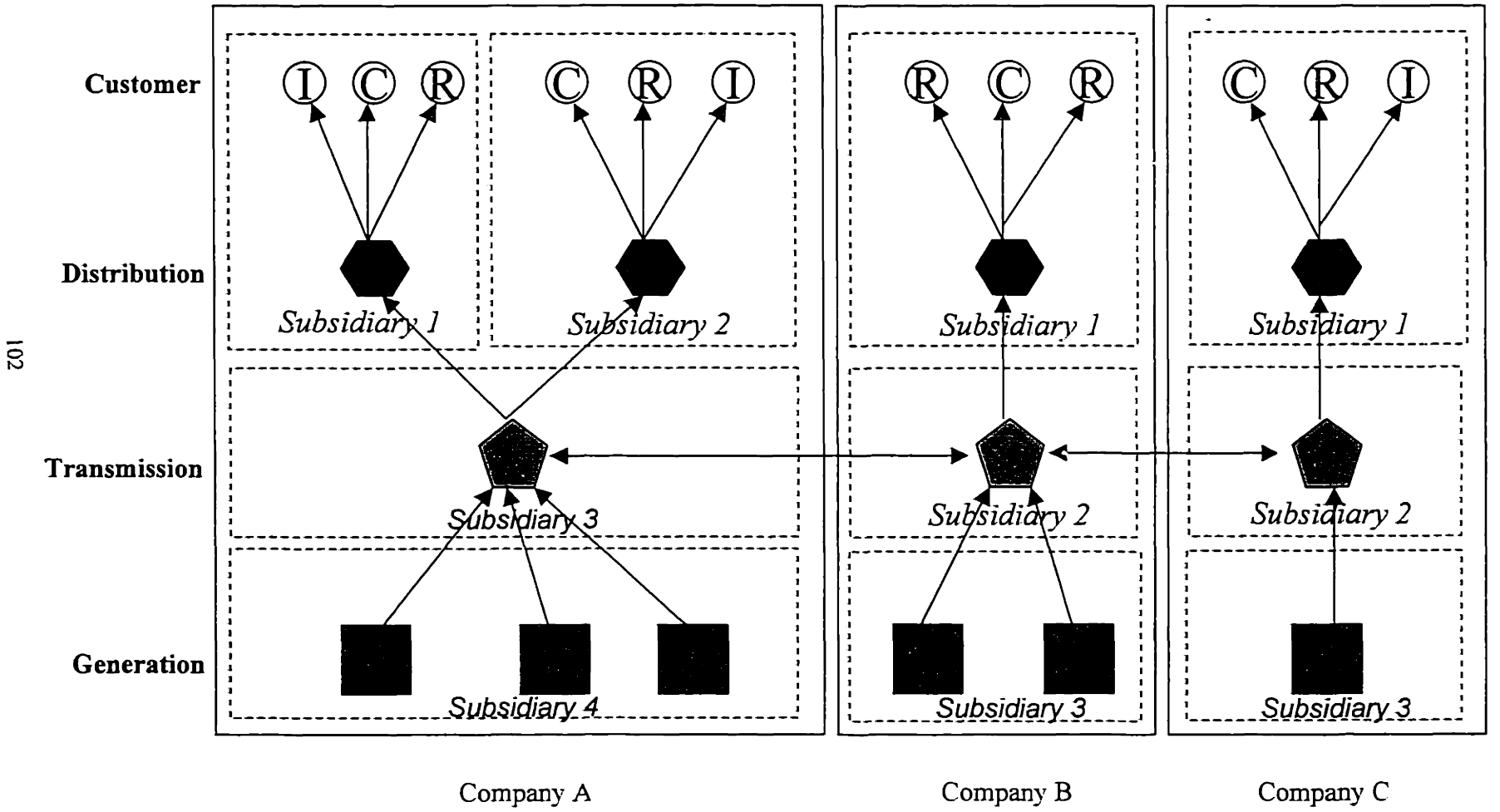
INDUSTRY STRUCTURE ALIGNED AROUND DISCRETE SEGMENTS



102

Exhibit 5

INDUSTRY CONSOLIDATES AROUND SEGMENTS IN ORDER TO BUILD SCALE AND FOCUS ON EXPERTISE

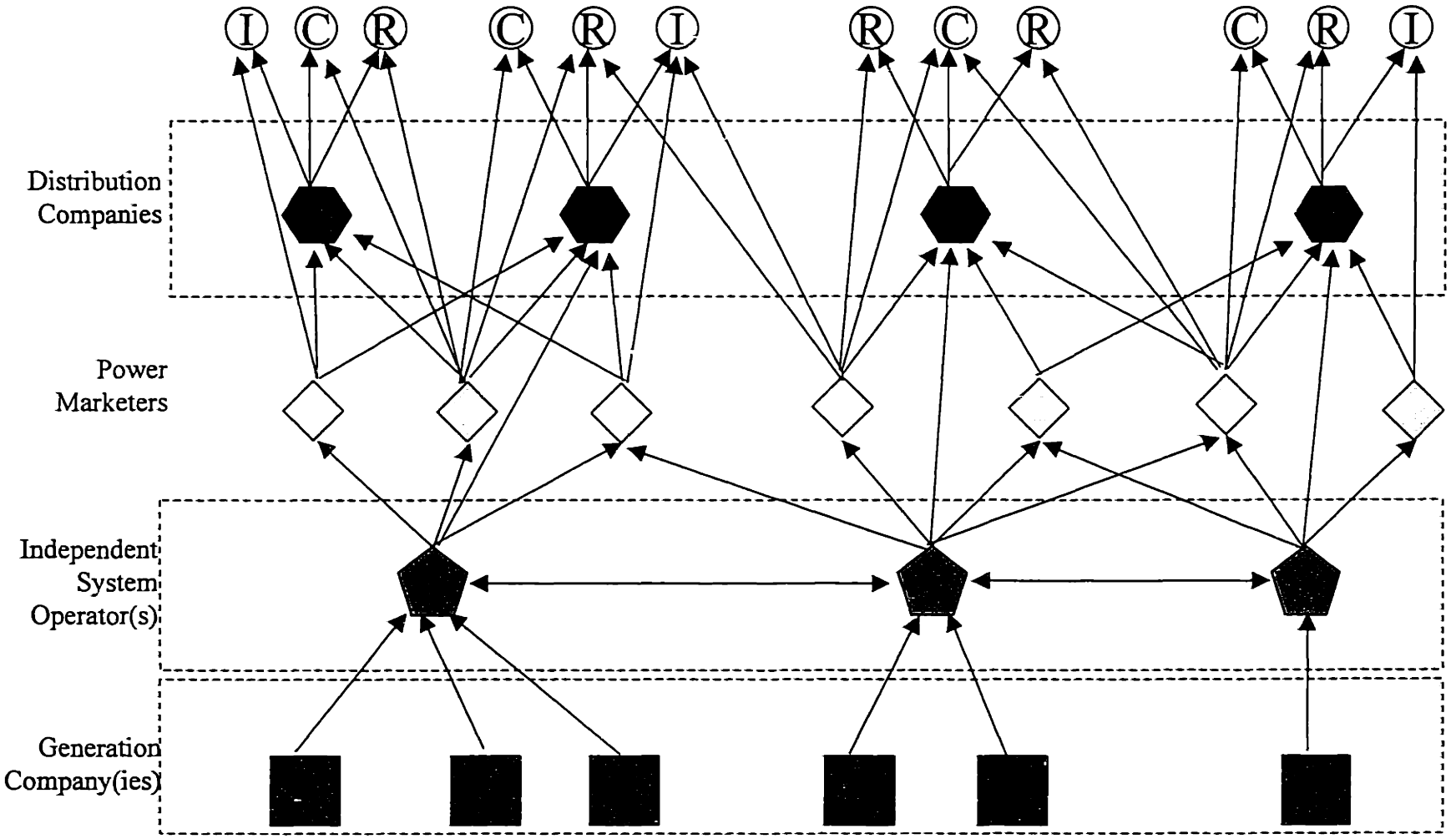


Exhibit 6

VALUE-ADDED PRODUCTS/SERVICES ARE UNBUNDLED FROM DISTRIBUTION AND REBUNDLED BY "SERVCOS"

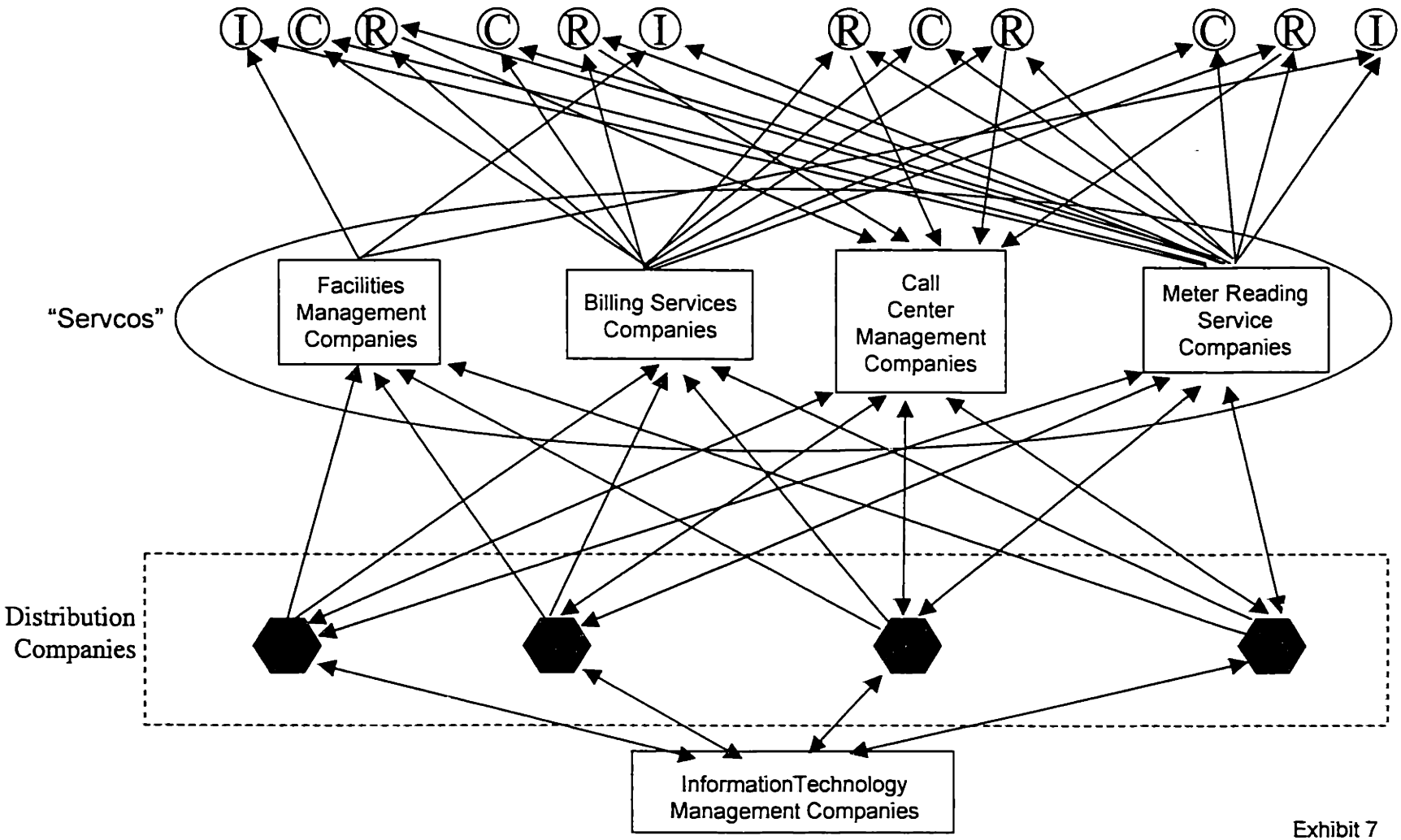


Exhibit 7

	STRATEGIC POSITIONING				
	BEST PRODUCT		TOTAL CUSTOMER SOLUTION	SYSTEM LOCK-IN	
	Generation Companies	Power Brokers	"Servcos"	Transmission Companies	Power Distribution Companies
Operational Effectiveness	• Minimize fuel costs • Minimize labor costs • Maximize plant utilization of capacity • Maximize efficiency • Maximize power quality	• Minimize supply costs through effective "buying" • Minimize overhead costs associated with "backroom" • Link profitability and volume to employee incentives	• Improve customer economics through service re-bundling • Networking with suppliers and other service companies • Effective billing and accounting • Flexible "gateway" function for all kind of services	• Control operating and maintenance costs to within allowable limits • Maximize profitability within allowable range • Maximize reliability of system • Ensure adequate capacity without over-building • Ensure effectiveness of load/system balancing	• Effective meter and connection service • Control operating and maintenance costs to within allowable limits • Maximize profitability within allowable range • Maximize reliability of system • Ensure adequate capacity without over-building
Customer Targeting	• Defeature product attributes • Maximize flow of power to immediate and surrounding territories • Develop tight linkages with transmission companies and ISO's	• Customize product offerings to individual customers and customer segments • Aggregate loads for smaller customer groups • Maximize profitability of trades by customer segment	• Customer targeting either for horizontal bundling of services ("WorldCom"-approach) or vertical bundling ("EDS"-approach) • Customer segmentation	• Build linkages with power brokers for effective information flow on pricing and volumes • Build linkages with power distributors for effective pricing and demand information	• Effective dealing with Servco's • Emphasize end-customer relations (resident or industry) • Build linkages to transition companies for effective pricing and demand information
Innovation	• Develop new techniques to improve power quality • Develop new fuel mixtures to lower costs, improve capacity and lower environmental impact • Develop information technology linkages with ISO's for real-time data exchange of pricing	• Be the first to develop new trading products and services to minimize risks to customers • Develop innovative risk management systems for internal financial protection • Maximize connectivity to all trading regions	• Joint creation of added value to the customer value chain • Outsourcing of customer energy-related processes • Skill and project database for effective organizational learning	• Improve transmission technology to reduce line-loss • Innovate new mechanisms to enhance system capacity • Develop/enhance load balancing systems to tie with pricing systems (e.g. poolco or bi-lateral)	• Improve distribution technology (e.g. wires, meters or data connectivity) • Innovate measurement systems for power supply • Stay close to breakthrough technologies like "power line carrier" or "resident generation equipment"

Exhibit 8

	INTERNAL ALIGNMENT CHARACTERISTICS				
INTERNAL ALIGNMENT DIMENSIONS	Generation Companies	Power Brokers	"Servcos"	Transmission Companies	Power Distribution Companies
Structure	• Functionally oriented • Hierarchical • Small headquarters staff • Line organization decentralized into plants	• Organized around customer segments • Strong individual orientation • Highly centralized operations	• Organization is aligned around market segments and customer requirements. • Network organization • Flexible	• Geographically compact • Functionally oriented • System operations highly centralized • Maintenance decentralized for proximity to lines	• People are dispersed in small, regulated territories. • Functionally oriented • System operations centralized
Processes	• Focused on cost minimization and reliability • Purchasing, capital approval and financial consolidation centralized • Tasks somewhat compartmentalized/ specialized	• Information technology intensive • Many tasks are consolidated into individual traders to minimize "hand-offs" • Highly networked	• Customer targeting • Innovative problem solving • Creation of new services • "Gateway" function to customers • Re-bundling of utility value chain elements	• Focused on system reliability • Growing reliance on information technology • Oriented around maintenance of lines or system operations	• Cost reduction and system reliability of primary importance. • Focused on system reliability • Growing reliance on information technology
Key HR Competencies	• Engineering • Logistics • Purchasing • Safety • Environmental management	• Financial management • Trading • Information Technology • Risk management	• Marketing & Sales • Product development • Customer relationship • Entrepreneurial skills • Networking and team capabilities • Information technology (i.e. billing)	• High-voltage line maintenance • Safety • Information technology • Load balancing logistics	• Great emphasis on engineering and mechanical skills. • Knowledge of health and safety is critical. • Customer service • Information technology

Exhibit 9

	PERFORMANCE MEASURES				
	BEST PRODUCT		TOTAL CUSTOMER SOLUTION	SYSTEM LOCK-IN	
	Generation Companies	Power Brokers	"Servcos"	Transmission Companies	Power Distribution Companies
Operational Effectiveness	• Cost/KWH produced • Plant generation capacity factor = avg. output by plant/capacity rating of plant • Availability = number of hours of operation/total hours possible • Dollars returned on assets • Cost of purchased power contracts • O&M/unit of capacity • Inventory turns (fuel)	• Cost per KWH traded • O&M per KWH traded • Total KWH sold per day, month, year • Degree of risk/exposure of daily trades • Balancing of trades (daily) • MW of electricity contracted for office system	• Customer savings through service offerings • Profitability by product/service • Cost to deliver each product/service • S,G & A cost per product/service • Competitive product/service costs • Switching cost to new suppliers/partner • Customer satisfaction indices	• Cost per unit transmitted • System reliability indices • Dollars scheduled maintenance/dollars of unscheduled maintenance • Time spent on scheduled versus unscheduled maintenance • Line loss • Percent maintenance completed versus plan	• Cost per KWh distributed • System reliability indices • System capacity versus utilization • Dollars scheduled maintenance/dollars of unscheduled maintenance • Time spent on scheduled versus unscheduled maintenance • Percent maintenance completed versus plan • S,G & A costs per KWh
Customer Targeting	• Load forecasting accuracy • KWH's wheeled to contiguous and non-contiguous distributors • Net income per KWH per day (assumes daily poolco pricing method)	• Number of new leads generated • Number of new customer contracts developed/wheeled • Total customers/by segment • Profitability by segment • Total number/volume of contracts	• Customer share • Share per customer • Tie services to customer profitability • Number of new customers won	• Actual versus allowable return on investment • System responsiveness factors based on demand and pricing	• Actual versus allowable return on investment • Customer segment demographics (e.g. industrial, commercial, residential) • Number of customer (meter); customer share
Innovation	• Electricity quality • Electricity reliability • Alternative low-cost fuel utilization	• Number of power contract packages developed and successfully marketed to lock-in customers • Number of new product offerings developed	• Customer intimacy measured through volume per customer • Customer switching cost to other servco's • Number of new product and service offerings	• Cost per mile of new construction/upgrades • Load balancing indices	• Cost per meter • Switching cost for customer • Relationship of maintenance to investment • Delivery technology upgrades

Exhibit 10