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PPD069 Deregulation of Electricity

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Abstract

This project report studies and forms a conclusion on the benefit/drawbacks of the deregulation of electrical service. The focus was first directed to the State of Massachusetts, and then the nation as a whole. The authors of this project are of the opinion that the effects of deregulation will be positive in the long run. A more dynamic power industry will be created, able to make use of technological innovation, and do so more efficiently than the existing structure. More responsible power companies will supply cheaper power.

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We also thank Philip M. Cullin Jr, a WPI alumnus, for inspiring this project through his talks with us. He also steered us away from erroneous information, while giving us a real world insight we could not find in other references.

Executive summary

Following with the trend of deregulation of government-controlled industry, the electric power industry was looked at to see what could be opened up to competition. Upon investigation, the late breaking improvements in technology and infrastructure had changed operating parameters. These changes allowed for "Power Pooling", and the unbundling of Generation from the regulatory umbrella. The idea was simple, all generation facilities would feed into the grid. The "Grid" being the transmission lines and distribution centers will continue to be regulated. Consumers then feed off the grid, using electricity supplied by many generation facilities. The Consumer then has the choice to choose who they wish to pay for the electricity.

Deregulation of electricity has already worked in other countries. The United Kingdom has been deregulating their electrical industry since the late 1980's. In studying the U.K. we find that allowing large and medium consumers a choice of suppliers worked well. As for the residential population, they are in the process of deregulation, and data has yet to be collected on them. The U.K. found with careful management that deregulation is a benefit.

The process of deregulation in Massachusetts mainly started with release of the "rules of deregulation", in February 20, 1998. These were the set of instructions or guidelines that deregulation would follow. They were fairly similar to others passed through out the country. Massachusetts did take on the stranded cost issue head on; they offered electric companies "full recovery" of their stranded costs. On March 1, 1998 Generation of electricity was unbundled from its regulated counterparts.

As deregulation occurs, the hardware used to transmit and distribute electricity has become a concern. The "Grid", or the network of wires and substations, was never designed to work as one machine. Instead it is a patchwork of different companies, and different era's of technology. The short-term outcome of the deregulation of electricity may be directly affected by the actual hardware. Unforeseen problems may result in power failures, or worse inconsistent power capable of destroying equipment. The actual upgrade and management of the hardware is without a doubt the first major hurdle.

Other concerns have arisen since deregulation reached the Power Industry, notably the concept of "Stranded Costs", which is of much concern to many. The prognosis is good, however. Most areas, where deregulation has had time to have an effect, have found the results to be positive. The consumers have not suffered due to the change, neither have the Power companies, and that is in itself a positive outcome.

<u>Chapter 1:</u> Introduction

America's electricity market is massive. Its total assets are worth approximately \$500 billion and it has net revenues of over \$200 billion annually. In the past, the electric utility industry was considered one of the nation's most regulated industries, with states regulating utilities' retail and intrastate activities and the federal government regulating utilities interstate and wholesale activities. The foundation of federal regulation of electric utilities is the Public Utilities Holding Company Act of 1935 (PUHCA) and the Federal Power Act (FPA). The PUHCA and the FPA were enacted to eliminate unfair practices and other abuses by electricity and gas holding companies by requiring federal control in regulation of interstate public utility holding companies. Prior to PUHCA, electricity holding companies were characterized as having excessive consumer rates, high debt-to-equity ratios, and unreliable service. Under PUHCA, the Securities and Exchange Commission (SEC) regulates mergers and diversification proposals of holding companies whose subsidiaries engage in retail electricity or natural gas distribution. In addition, PUHCA requires that before purchasing securities or property from another company, a holding company is required to file for approval with the SEC. The SEC can exempt utilities from PUHCA if its business operations and those of its subsidiaries occur within one state or contiguous states.

The Federal Energy Regulatory Commission (FERC), under the Federal Power Act, is responsible for regulating other aspects of the electric utility industry. FERC regulates the terms, conditions and rates for the sale in transmission of interstate wholesale electricity. FERC is also responsible for regulating mergers, acquisitions, and dispositions of facilities used for interstate wholesale transactions. PUHCA remained

virtually unchanged for 50 years until enactment of the Public Utility Regulatory Policies Act of 1978 (PURPA).

PURPA was, in part, intended to augment electric utility generation with more efficiently produced electricity and to provide equitable rates to electric consumers. Utilities are required to buy all power produced by qualifying facilities (QFs) at avoided cost. QFs are exempt from regulation under PUHCA and the FPA.

Ironically, although the PURPA was meant to be an environmental statute, it had the more remarkable -- and entirely accidental -- effect of fostering increased competition within the field of electricity generation. As prices fell and supplier options multiplied, it became increasingly obvious to industry watchers that a viable free market might exist in the electric industry. And since 1990, IPPs have made over half of all new investment in new generating facilities.34

"Richard F. Hirsh, author of Technology and Transformation in the Electricity Industry, argues that perhaps the most important outcome of the PURPA is that it "has furthered moves for even more deregulation by stimulating discussions about the rationale for the utility industry's status as a natural monopoly" because independent power producers proved they could make better use of resources and also help reduce costs (which is not supposed to happen in a market thought to be naturally monopolistic)."2

Electricity regulation was changed again in 1992 with the passage of the Energy Policy Act (EPACT). The intent of Title 7 of EPACT is to increase competition in the electric generating sector by creating new entities called "exempt wholesale generators" (EWGs), that can generate and sell electricity at wholesale without being regulated as

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utilities under PUHCA. This title also provides EWGs with a way to assure transmission (wheeling) of their wholesale power to its purchasers.

In response to EPACT, on April 24, 1996, the Federal Energy Regulatory Commission (FERC) issued two final rules to encourage wholesale competition (Orders 888 and 889). FERC believes these rules on transmission access will remedy undue discrimination in transmission services in interstate commerce and provide an orderly and fair transition to competitive bulk power markets.

The PURPA, the EPAct of 1992, and the latest FERC orders seeking to open up the electricity marketplace to competition all build on the open access philosophy of deregulation. Complete open access within the electric market would require all vertically integrated utilities to open their transmission and distribution facilities to rivals so they could "wheel" their power across those lines to customers. Currently, under the PURPA, the EPAct, and FERC No. 888, only "wholesale wheeling" has been required; independent producers have been given only the ability to sell their power to other generating utilities who then make that power available for resale to customers along their lines. "Retail wheeling" would allow these independent generators to sell their power directly to any sort of final customer along the transmission/distribution lines, whether they are commercial, industrial, or residential consumers.

Comprehensive legislation to reduce electricity regulation and encourage the development of retail competition, currently under state jurisdiction, has been introduced in the 105th Congress. Proposals to increase competition in the electric utility industry involve separating three functions, generation, transmission and distribution.



Chapter 2: Background

Electricity is not just any industry. Economically, it is the largest industrial sector in America. It is one third of the cash economy. America's electricity market is massive. In the past, the electric utility industry was considered one of the nation's most regulated industries, with states regulating utilities' retail and intrastate activities and the federal government regulating utilities interstate and wholesale activities. This doesn't even compare to other already deregulated industries like the airlines and telecommunications with which it is most often mistakenly compared.

The electric industry is the largest cause of Global Warming, air pollution, and radioactive waste. The electric industry is the life support of the modern world, without which the society would probably collapse. The electric industry is one of America's most powerful special interests. It influences every level of government, the business community, and even the non-profit sector.

The electric industry is very complicated. To some peoples surprise not all of the electric industry is being deregulated. There are 4 main categories that pertain to the electric industry. Mainly the generating side of the electric industry is being deregulated. Generation consist of the power plants that create the electricity. There are three other sides of the industry. The next side of the industry is transmission. Transmission includes the wires and facilities that transport the electricity from power plants (at high voltage levels) to distribution substations. That gives us the next section, which is distribution. This is the wires and facilities that transport the electricity (at lower voltage levels) from distribution substations to customers' homes and facilities. Our last category is customer services. This covers metering, billing, and information services. In the

electric industry as it previously existed, these four components were one whole service provided as a monopoly by electric companies, at prices fully regulated by the government.

The reason for deregulating is because our electric utility industry is inefficient and it has stranded assets. Stranded assets means that when the industry was regulated it didn't invest in the best of facilities. This meant prices didn't reflect the cost of producing energy going forward. This also means that the industry was inefficient. The goal of deregulating was to reduce rates for electricity and to become more efficient. To do this, the Department of Telecommunications and Energy wanted to create competition between generation companies. Hopefully lowering prices by these private generators becoming more efficient. As of March 1, 1998, the generation component has been unbundled from the other components of electric service. This means as stated above that the generation aspect of the electric industry has been deregulated. Customers are now able to purchase generation services from generators other than their usual electric companies. The prices the suppliers of generation service may charge customers will be determined by the competitive market. These prices will not be regulated by the DTE, although the suppliers will be licensed by the DTE.

The other components of electric service (transmission, distribution and customer services) have not been opened to competition. These components will still be provided as monopoly services by the electric companies. The DTE will investigate whether or not these services should be unwrapped and provided through a competitive market. This investigation will commence no sooner than January 1, 2000.

Customers' bills currently are presented in an unbundled format that shows the various components of electric service. The cost of distribution, transmission, and customer service will not change because it is still regulated. The only price that will change not according to hourly usage is the generation. This depends on what generation company you are getting your electricity from.

The federal government needed to start the process of deregulation. Its existing laws were still made for a regulated electric industry. These regulations included the Public Utility Holding Company Act and the Public Utilities Regulatory Policies Act. These were the two major regulations on the industry. Currently there is much talk about repealing these acts. The federal government wanted mostly for states to decide what was best for each particular state. They also wanted to get the process started. Here is what the federal government did.

2.1 History of Electricity Deregulation on a Federal Level

America's electricity market is massive. Its assets are worth around \$500 billion and it has revenues of over \$200 billion each year. In the past, the electric industry was considered one of the nation's most regulated industries. States regulated utilities' retail and intrastate activities. The federal government regulated utilities' interstate and wholesale activities. The basis of federal regulation of the electric utilities was the Public Utilities Holding Company Act of 1935 (PUHCA) and the Federal Power Act (FPA). The PUHCA and the FPA were designed to eliminate unfair practices and other abuses by electric holding companies. They required federal control in regulation of interstate public utility holding companies. Prior to

the Public Utilities Holding Company Act, electricity holding companies had excessive consumer rates, high debt-to-equity ratios, and unreliable service. The PUHCA required that before purchasing securities or property from another company, a holding company be required to file for approval with the Securities and Exchange Commission (SEC). The SEC can exclude utilities from PUHCA if its business operations occur within one state or between adjacent states.

The Federal Power Act created the Federal Energy Regulatory Commission (FERC). Under the Federal Power Act, FERC was responsible for regulating other aspects of the electric utility industry. FERC regulates the terms, conditions and rates for the sale in transmission of interstate wholesale electricity. FERC was also in charge of regulating mergers, acquisitions, and dispositions of facilities used for interstate wholesale transactions. The PUHCA remained unchanged for 50 years until the enactment of the Public Utility Regulatory Policies Act of 1978 (PURPA).

PURPA was intended to increase electric utility generation with more efficiently produced electricity and to provide more fair rates to consumers. Utilities are required to buy all power produced by qualifying facilities (QFs) at avoided cost. QFs are exempt from regulation under PUHCA and the FPA. Although the PURPA was meant to help the environment, it had an accidental effect of advancing increased competition in the field of electricity generation. As prices fell and supplier options multiplied, it became obvious to industry watchers that a potential free market might exist in the electric industry. Since 1990, Independent Power Producers have made over half of all new investments in new generating facilities. The most important outcome of the PURPA is that it furthered moves for even more deregulation. It did this by stimulating discussions about the utility industry's status as a natural monopoly. Independent power producers proved they could make better use of resources and also help reduce costs. This is not supposed to happen in a market thought to be a monopoly.

Electricity regulation was changed again in 1992 with the passage of the Energy Policy Act (EPACT). The intent of EPACT was to increase competition in the electric generating section by creating new companies called Exempt Wholesale Generators (EWGs). These Exempt Wholesale Generators were made so they could generate and sell electricity at wholesale without being regulated as utilities under PUHCA. This title also provided EWGs with a way to guarantee transmission (wheeling) of their wholesale power to its purchasers.

In response to EPACT, on April 24, 1996, the Federal Energy Regulatory Commission (FERC) issued two final rules to encourage wholesale competition. These are known as Orders 888 and 889. FERC believes these rules on transmission access will remedy discrimination in transmission services between interstates commerce and provide a fair transition to competitive power markets.

The PURPA, the EPACT of 1992, and the latest FERC orders that are seeking to open up the electricity market to competition all build on the philosophy of deregulation. A few years ago, under the PURPA, the EPACT, and FERC No. 888, only "wholesale wheeling" was required. Independent producers were only given the ability to sell their power to other generating utilities who then made that power available for resale to customers along their lines.

These are the laws the federal government used to start the process of the deregulation of electricity. The federal government wants the states to impose further regulations as needed by each individual state.

The local government of Massachusetts has started the process of deregulating. The federal government led the way for the states to deregulate. Here is what Massachusetts has currently done.

2.2 History of Electricity Deregulation in Massachusetts

On February 20, 1998, the Massachusetts Department of Telecommunications and Energy ("Department") issued its "Rules Governing the Restructuring of the Electric Industry. This was the final step in a three-year process during which the Department, along with the Legislature, other state agencies (for example, the Attorney General and the Division of Energy Resources), and industry participants, developed the guidelines for the restructuring of the industry. Important dates and events leading to the issuance of the Department's rules are listed below:

February 10, 1995

The Department issued its "Notice of Inquiry and Order Seeking Comments on Electric Industry Restructuring" ("NOI"). The purpose of the NOI was to "investigate and determine:

 How a restructuring of the electric industry in Massachusetts would promote competition and economic efficiency and expand opportunities that would benefit consumers.

- (2) Whether and how to extend to some or all customers the option of choosing their own electricity supplier.
- (3) How such a restructuring could be implemented.
- (4) The appropriate regulatory mechanisms to apply to a restructured electric industry."

In the NOI, the Department invited all interested parties to comment on electric industry restructuring issues in general and in response to questions attached to the document.

<u>August 16, 1995</u>

The Department issued its Order in D.P.U. 95-30 in response to comments made following the NOI. In this Order, the Department listed seven principles that would "establish the essential underpinnings of an electric industry structure and regulatory framework designed to minimize long-term costs to customers while maintaining safe and reliable electric service with minimum impact on the environment."

The principles are as follows:

- (1) Provide the broadest possible customer choice.
- (2) Provide all customers with an opportunity to share in the benefits of increased competition.
- (3) Ensure full and fair competition in generation markets.
- (4) Functionally separate generation, transmission, and distribution service.
- (5) Provide universal service.

- (6) Support and further the goals of environmental regulation.
- (7) Rely on incentive regulation where a fully competitive market cannot exist, or does not yet exist.

In addition, the Department presented five principles that would guide the transition to a restructured electric industry:

- (1) Honor existing commitments.
- (2) Unbundle rates.
- (3) Seek near-term rate relief.
- (4) Maintain DSM programs.
- (5) Ensure that the transition is orderly and expeditious, and minimizes customer confusion.

<u>May 1, 1996</u>

The Department issued an Order in D.P.U. 96-100, which included an explanatory statement and proposed rules that were intended "to serve as reference points and to generate response and discussion" as the investigation into the restructuring industry proceeded. The Department solicited comments on the proposed rules and on the issues raised in the explanatory statement and announced that public hearings would be held on the proposed rules.

<u>December 30, 1996</u>

The Department issued its "Electric Industry Restructuring Plan: Model Rules and Legislative Proposal" (D.P.U. 96-100). The Model Rules laid out the Department's "vision of a restructured electric industry that can deliver on the promise of lower costs and increased choices for consumers" and presented a "framework to ensure full and fair competition in generation, and redefine our regulatory approach in a market-based electric industry."

The Department recognized that the restructuring of the electric industry required the support of, among other parties, the Massachusetts Legislature. The Department stated that we would modify our Model Rules as necessary to comply with any restructuring plan that was adopted by the Legislature.

<u>November 19, 1997</u>

The Massachusetts Legislature passed H 5117, "An Act Relative to Restructuring the Electric Utility Industry in the Commonwealth, Regulating the Provision of Electricity and Other Services, and Promoting Enhanced Consumer Protections Therein" ("Restructuring Act").

February 20, 1998

The Department issued its final Order in D.P.U./D.T.E 96-100 and its "Rules Governing the Restructuring of the Electric Industry" (220 C.M.R. 11.00). These Rules maintain many of the provisions included in the Department's Model Rules, while complying with the directives included in the Restructuring Act. The Rules govern the restructured electric industry in Massachusetts. Their purpose is to provide a regulatory framework for an efficient industry structure that will minimize long-term costs to consumers while maintaining the safety and reliability of electric services with minimum impact on the environment

Chapter 3: Methodology

The intent of this project was to study the deregulation of electricity, it's progress over time and it's current status. The New England area and more specifically Massachusetts will be the main focus.

The electric industry has slowly been undergoing restructuring over the past years. Changes have been made across the nation and the worldwide. The public awareness of this of these changes is almost nonexistent. There is an abundance of information on this topic available. With this project, some of the major concerns are sifted from the mass and summarized. A basic understanding is created.

The information gathered was found in publications available mostly on the Internet. Even though much has been written on the subject of the Power Industry deregulation in the past few years, it is difficult to find hard copies of anything. The publications that feature such articles are not readily available. Most are very technical and specialized magazines. The Internet, however, is an abundant source. Many websites have been dedicated to the subject.

A basic understanding of the subject matter was necessary at the outset. The Internet was browsed, and almost everything found on the topic of Deregulation was read. It became soon evident that many of the same themes were found in different articles. The difficulty was in staying on track, without digressing too much. Many articles talk extensively about deregulation without actually touching upon the basics of the topic. The goal here was to stick to basics, at least at first. Once a more expanded understanding of the Power Industry and its restructuring was reached, it was a matter of separating the useful and relevant information from the whole.

An attempt was made to form this report into a type of introduction to "Deregulation of Electricity". The more advanced information was left out. It was assumed that any reader would have limited knowledge of the topic. It was hoped that this report would be a first step into the very complex world of Deregulation and the Power Industry.

Chapter 4: Findings

4.1 Restructuring in the UK and California

The United States is not the first country to deregulate its electricity industry. Other countries have deregulated in years past. Some of these countries include the United Kingdom, Australia, and much of South America. To better understand what is going on in the United States we are going to take a look at what has previously happened elsewhere in the world.

<u>4.1.1 In the UK</u>

The United Kingdom was one of the first countries to privatize its electricity industries. The effort of the United Kingdom has been the most ambitious and path breaking. Several other countries have followed their example and used the example of the UK as a guide to their own regulatory reform efforts. Argentina and Australia have adopted variations of the UK model. The United States federal government and its state governments have not missed the opportunity to study a case so similar.

The first reform that encouraged any sort of electricity was the Electricity Act of 1983. This act let any company provide power to the national grid. But the main start of the deregulation of electricity or electricity privatization originated with the Electricity Act of 1989. The government's restructuring idea was that electricity generation and marketing could be made competitive industries, while transmission and distribution needed to stay as natural monopolies for the indefinite future. The regulation for the transmission and distribution would change to another type of

regulation based on a price cap. A new regulatory authority was formed called the Office of Energy Regulation (Offer).

Privatization of electricity in the United Kingdom did not occur all at once. It evolved over the past ten years. The first major reform was the Electricity Act of 1989. This involved one of the most important parts of restructuring the electricity industry. This was to split up the Central Electricity Generating Board. This is what controlled the electricity industry beforehand. It was divided into four organizations: two generation companies, a transmission company, and a distribution network consisting of the twelve Regional Electricity Companies (RECs) created out of the former regional area boards. These were not deregulated right away. The process to privatization would happen in steps. The Central Generating Board's non-nuclear power units were assigned to two companies, National Power and PowerGen, both planned to be privatized. These two companies accounted for 74 percent of electricity supplied in England and Wales in 1990 and 1991.

The twelve regional electricity distribution companies created out of the former Regional Area Boards underwent changes. There was to be a separation between the wires (distribution) side of the RECs' business (which was still going to be regulated) and the marketing side of the RECs (which was going to be gradually deregulated). The Regional Electricity Companies were the first organizations auctioned off to the public by the UK government. These were sold in December1990. In 1991, shares in the two power generation companies were sold to the public.

In the United Kingdom, generation was considered an area where regulation was needed the least and where competition could develop the most. The only restrictions placed on the private sector power companies were that National Power and PowerGen sell their electricity to a national wholesale pool. No specific price regulation was initially intended for generation, because this pool was supposed to produce market-based pricing. This didn't initially happen. There were concerns that the two power companies had a sort of duopoly. This caused OFFER to step in and change things a couple of times after privatization. 1

In contrast to generation, the UK's transmission system was considered a natural monopoly (as was distribution, which is discussed below). When the CEGB broke all transmission assets were taken over by a new company called the National Grid Company (NGC). The twelve Regional Electricity Companies assumed ownership of the NGC for a while, but safety measures were put in place to keep the RECs' influence over managing the grid to a minimum. The NGC provided electricity transportation services throughout England and Wales, and also controlled the aspect of which electricity supply and demand was balanced. This was called the England and Wales Electricity Pool.

The pool requires that electric power generators whose capacity exceeds 100 megawatts are required to submit their generation units to the NGC. The UK adopted price cap regulation for transmission services called RPI-X. RPI-X made price reviews and price caps based on changes in the rate of inflation. In the beginning of its existence the National Grid Company owned some generation capacity, but in 1995 it was required to sell off its two hydroelectric generation assets because there

were concerns that vertical integration in generation and transmission didn't promote competition. Concerns about competition forced the RECs to sell off their shares in the National Grid Company in December of 1995. This made the NGC a new company called the National Energy Group PLC.

Since privatization, electricity distribution in England and Wales had been managed by the twelve Regional Electricity Companies. The wires (distribution) side of the RECs' business was to be regulated indefinitely, but the marketing side of the industry was to be deregulated in steps. The distribution side of the RECs' business was also to be regulated through an RPI-X form of price regulation similar to the transmission company, now National Energy Group PLC. Though it was a little different in that the productivity factor and the time period for regulation was different.

As stated earlier, the marketing part of the electricity industry along with generation was considered to be potentially competitive. This is also being deregulated gradually. On Vesting Day, large users of electricity were allowed to choose their marketers. They use to be required to purchase electricity from their Regional Electricity Companies. The large users consisted mostly of a small number of industrial companies. The RECs were allowed to keep control of the mid-user market (the small industrial and commercial companies) until April 1994. The RECs must compete for the remaining consumers (primarily residential users) in April of 1998.

The Electricity Act of 1989 encouraged competition in marketing by opening the large-user portion of this end of the electricity business to newcomers. While the

RECs still had rights to all other consumers, large users were free to purchase electricity services from their local RECs' newly created marketing segment, or from a second marketing company, a marketing company unaffiliated with their local REC. In 1996, 39 other marketing companies have entered the market. Deregulation has led to greater competition in the marketing end of the electricity industry. Since the opening up of the industrial market to competition, the newly formed second line suppliers have made substantial advances into what had been a given market for the RECs.

Another area of continued regulation of the electricity industry in the United Kingdom was the service standards. Services were considered reliable before reform, but OFFER established higher quality of service standards on the industry throughout its years of existence. Service standards also were directed to bill payment, meter reading, and quick responses to complaints.

It is not clear whether the second line marketing companies will be as successful with the residential market as they were in the large-to-mid-level user market. Even though marketing costs to residential users account for a relatively large portion of their overall electricity bill, the residential market is expected to be a more difficult market to break into. This is because of the high estimated costs in advertising which would needed to encourage small consumers to switch suppliers.

The next issue was to balance the supply and demand of electricity. The UK government made the England and Wales Power Pool. This power pool to acts as a clearinghouse between generators of electricity and consumers of electricity. The pool is open to all generators and consumers. Power generators whose capacity

exceeds 100 megawatts are required to submit their generation units to the National Grid Company (NGC). The NGC manages the pool, independently, and attempts to balance the supply and demand. This power pool is needed because the demand of electricity changes so much from hour to hour, day to day, and season to season. The power pool changes the amount of electricity it buys from generators and the price it pays depending on the level of demand that is needed. It reevaluates the supply and demand every half hour and makes changes if necessary. Pool prices have still continued to be a source of controversy.

Rate-of-return regulation is the most common form of utility regulation in the United States. Price-cap regulation is the most common form of regulation in the UK. Both of these regulations try to accomplish the same thing. They both try to reduce the power of natural monopolies to restrain output, raise prices, and gain huge profits. Rate-of-return regulation is called cost-of-service regulation because it allows companies to go through a regulator that makes sure service to end-users is acceptable. During periodic regulatory reviews, all expenditures of a company are added to the rate base of prices only if they are considered necessary. These regulators then estimate appropriate rates of return base on cost of capital. The thing people don't like about rate of return regulation is that utilities don't get any benefits for reducing or restraining operating costs. The United Kingdom has used price-cap for the recently privatized industries in the United Kingdom. Rate-of-return regulation was rejected in the United Kingdom. The United Kingdom wanted the industry to want to work with the regulators rather than seeing regulators as a sort of

enemy like as rate-of-return regulation does. They also thought that it would cost them a lot of money to set up rate-of-return regulation.

The form of price cap used by the United Kingdom is called RPI-X. RPI-X allows individual utilities to make any investments or operation decisions it wants. It also gives all gains from efficiency back to the company. RPI-X regulation is also often called "performance-based regulation" in that it seeks to achieve economic efficiency by altering the incentive structure of the industry. They view this as a hands off less bureaucratic method of regulation.

In England and Wales, RPI-X regulation has been applied only to the parts of the industry still deemed natural monopolies. These parts are basically the wires (transmission and distribution) part of the business. RPI-X is not applied to the generation of electricity, a sector in which the price setting is up to the electricity pool. RPI-X is also currently being applied to electricity marketing for residential users. Prices in the other parts of the industry, generation and non-franchised marketing are in freely determined in the marketplace.

There have been some problems with RPI-X. One problem is calculation of the appropriate initial level of prices. It was hard to set a beginning level of prices. A second problem involves estimating future productivity gains. This is the X part of RPI-X. The regulator would still need detailed knowledge of the industry and future market developments in order to come up with a suitable initial price and projected future productivity gains. This is something the UK wanted to avoid and why they stayed away from rate-of-return regulation.

"Thus far, in terms of economic efficiency, RPI-X has been a clear success. In the United Kingdom, the RPI-X regulatory approach has induced cost reductions well beyond expectations. Electricity companies have been able to greatly reduce operating costs in large part through substantial work force reductions. As intended, the electricity industry has benefited financially because these cost reductions have made substantial contributions to the bottom line results. However, substantial controversy has surrounded the new form of electricity regulation. In particular, some dissatisfaction has arisen over whether the efficiency gains (the economic rents) have been equitably distributed between the industry's stakeholders, i.e., investors, labor, and consumers. As a result of this controversy, several of the basic tenets of RPI-X pricing have become suspect."2

In recent years, independent power producers (IPPs) have played an important role in electricity generation in the United Kingdom The independent power production industry owes its existence to the Electricity Act of 1983, which provided new electricity producers access to the national grid, and the 1989 Electricity Act which made that access non-discriminatory. The RECs' IPPs account for half of the additions to generation capacity in England and Wales. A favored form of generation for independent power-producing companies has been the combined cycle natural gas turbine electric facility. This is due to the improved economics of natural gas as an electric fuel. The improved efficiency of natural gas turbines and the short time needed to construct a combined cycle gas turbine facility have encouraged the IPP move into natural gas. By 1996 the IPPs increased their share of total UK generation capacity to 15 percent and are expected to account for 21 percent of the UK capacity

by 2000.In the seven years since privatization began, the UK electricity industry has clearly become more efficient. In 1995, the United Kingdom produced 8 percent more electricity than in 1988. Between the 1990 and 1996 employment in the UK electricity industry was reduced by approximately fifty percent Reductions in prices as a result of the periodically scheduled regulatory reviews clearly had an impact on later price reductions to electricity consumers. Although consumers have generally experienced lower inflation-adjusted electricity prices since privatization, indicates that gains to larger consumers have generally exceeded those to households.

The UK's experience with RPI-X has influenced regulatory reform in Argentina and Australia. It may have also influenced regulatory reform in the United States. Several public utility commissions in the United States have adopted a hybrid form of both price cap regulation and rate-of-return regulation, with the difference between price cap regulation and rate-of-return regulation becoming a matter of emphasis. Advocates of a "sliding scale" method of regulation feel it to be a more fair system because it shares a portion of the gain with consumers. Critics feel it reduces potential efficiency gains because it presents companies with fewer incentives to cut costs and in the end simply provides consumers with just a larger slice of a smaller cake. The California Public Utilities Commission employed a form of "sliding scale" regulation, which splits efficiency gains between electricity companies and consumers.

Although UK electricity reforms are not a decade old, some general assessments can be made of their performance. In terms of efficiency, the reform of the electric industry in the United Kingdom is generally viewed as a success. The

current industry is markedly more efficient than it was prior to privatization. But, issues of fairness and equity in the industry have been controversial. The new system has been criticized for unfairly benefiting industry shareholders and corporate executives over taxpayers, ratepayers, and electricity industry employees. Another problem was that a large share of the industry's efficiency gains was gained through massive amounts of layoffs. The heads of the new companies were given substantial pay raises because of these workforce reductions. Although electricity prices have trailed inflation in the recent years since electricity reforms were implemented in 1990, electricity consumers have often felt treated worse than industry shareholders, who have profited well beyond those reported for UK industry in general over the same period of time.

<u>4.1.2 In California</u>

On September 23, 1996, was signed the Assembly Bill 1890. This bill opened up the market for deregulating electricity. This bill was the first step towards the deregulation of electricity in the state of California. The bill did a number of things:

It authorized consumers to choose their electricity supplier beginning on March 31, 1998. It permitted business opportunities to develop in buying, selling or brokering electricity for individual customers or customer groups. It made a mandatory 10 percent rate reduction for residential and small commercial users. It also guarantees service from local utilities even if they do not use the competitive market. California's electricity was made up of three companies that produced 80 percent of that states power. The California Public Utilities Commission (CPUC) is in charge of the deregulation of electricity in California. This company is responsible for any regulation that is now put on the electricity market. The CPUC set the standards for electricity service, authorized utilities to invest in new facilities such as power plants, transmission lines or other equipment as necessary to meet their obligation to provide service to all customers, and set rates that different customers pay for electricity service. Assembly Bill 1890 split the market into four organizations; The generation of electricity, the transmission of electricity along high voltage lines, the distribution of electricity to customers with other customer services, and the metering and billing for electricity. This is much like what England has done.

Power plant owners will have the opportunity to sell electricity to customers with whom they have negotiated sales contracts or to "aggregators," which are firms that have signed contracts with many small customers to provide their electricity needs. The goal is for competition among potential generators of electricity to set the price for the electricity component of a customer's electricity bill. The role of regulators will be to make sure that competition is allowed to compete and that no firms can dominate the market and set prices. The distribution part of the electric industry, which takes care of moving electricity through a service area to customers, maintaining electricity lines, and providing metering and billing services, will remain a monopoly at this time. Some of the services now performed by the distribution companies may be provided by other private businesses in the future.

The marketing side of distribution is open for business. This means that separate companies can buy power from generators and sell it to consumers that this company has under contract. These companies have done well in England and are doing well now.

4.2 Description of Restructured Electrical Industry in Massachusetts

The best way to describe the electric industry is to think of it as being made up of four components:

- Generation: the power plants that create the electricity that is transported to homes and facilities in Massachusetts.
- (2) **Transmission:** The wires and associated facilities that transport the electricity (at high voltage levels) from power plants to distribution substations.
- (3) Distribution: The wires and associated facilities that transport the electricity (at lower voltage levels) from distribution substations to customers' facilities and homes.
- (4) **Customer services:** Which covers, among other things, metering, billing, and information services.

In the electric industry, prior to restructuring, these components were bundled and provided by electric companies as monopoly services, and at prices fully regulated by the Department.

As of March 1, 1998, the generation component has been unbundled from the other components of electric service. Customers are now able to buy generation

services from companies other than their usual electric companies. The competitive market will determine the prices that these "competitive suppliers" of generation service may charge customers. The Department will not regulate these prices, although the suppliers will be licensed by the Department.

The other components of electric service (transmission, distribution and customer services) have not been opened to competition; instead, these components will continue to be provided as monopoly services by the electric companies. With regard to metering, billing, and information services, the Legislature has directed the Department to investigate whether these services should be unbundled and provided through a competitive market. This investigation may start no sooner than January 1, 2000.

Customers' bills currently are presented in an unbundled format that shows the various components of electric service, as shown below. The rates and the format shown on the sample below are intended as an illustration only; they do not represent the format or charges for any particular Distribution Company's bill.

Delivery Services

Distribution service Customer charge \$7.00/month Energy charge \$0.035/kwh

Transmission service Energy charge \$0.003/kwh

Transition Costs Energy charge \$0.025/kwh DSM charge \$0.0031/kwh Renewables charge \$0.001/kwh

Supplier Services

Generation Service Energy charge \$0.035/kwh

Below is a brief description of each line item shown on the bill:

Distribution Service - Very little has changed in the way that distribution service is provided to customers. Distribution service remains a monopoly service provided exclusively to customers in a particular service territory by the local electric company (now referred to as a Distribution Company). Rates for distribution service continue to be fully regulated by the Department at levels that allow each Distribution Company a reasonable opportunity to recover the costs it incurs in providing this service to its customers.

Transmission Service - There is also little change in the way in which transmission service is provided to customers at the retail level. Retail transmission rates continue to be fully regulated by the Department at levels that allow each Distribution Company a reasonable opportunity to recover the costs it incurs in providing this service to its customers. But, there have been significant changes in the manner in which transmission service is provided at the wholesale level. In its Order 888, issued April 24, 1996, the Federal Energy Regulatory Commission ("FERC") established the principle that owners of transmission facilities must provide transmission services to third parties on the same (or comparable) basis, and under the same (or comparable) terms and conditions, as applies to the owners' uses of their systems.

Transition Costs - Transition charges are set at levels that allow each Distribution Company an opportunity to recover its stranded costs. The Restructuring Act established certain categories of costs that qualify as stranded costs.

For costs incurred prior to January 1, 1996, these categories are

- (1) Fixed generation-related costs.
- (2) Above-market purchased power contracts.
- (3) Generation-related regulatory assets.
- (4) Nuclear decommissioning costs.

For costs incurred after January 1, 1996, transition cost categories are

- (1) Employee-related costs related to restructuring.
- (2) Payments in lieu of taxes.
- (3) Removal and decommissioning costs for fossil-fuel generators.

Demand Side Management ("DSM") and Renewable Charges - The

Restructuring Act established the following rate schedules for DSM and renewable energy activities.

	DSM	Renewables
1998	0.33 cents/kwh	0.075 cents/kwh
1999	0.31	0.1
2000	0.285	0.125
2001	. 027	0.1
2002	0.25	0.075
2003		0.05

Table 1: Rate Schedule for DSM

Revenue from the DSM charges will be collected by each Distribution Company and will be used to fund DSM programs and activities that will be individually administered by each Distribution Company, consistent with the manner in which DSM programs have previously been administered in Massachusetts.

Revenue from the renewable charges will be collected by each Distribution Company, which will transfer the revenue to the Renewable Energy Trust Fund, a fund that will be administered by the Massachusetts Technology Park Corporation (Website address: <u>www.mtpc.org</u>). *Generation Service* - There are three generation service options available to consumers:

- (1) Standard Offer Service, provided by Distribution Companies.
- (2) Default Service, provided by Distribution Companies.
- (3) Competitive generation service, provided by competitive suppliers.

It is important to remember that a customer that is connected to a Distribution Company's system will receive electric service, regardless of the option under which the customer is receiving generation service. However, the price that the customer pays for generation service is dependent on the type of service the customer is receiving.

Standard Offer Service is a transition generation service that will be available to customers of record of each Distribution Company through 2004. A customer that did not select a competitive supplier as of March 1, 1998 automatically was placed on Standard Offer Service (customers who move into a Distribution Company's service territory after March 1, 1998 are not eligible to receive Standard Offer - these customers are placed on Default Service until they select a competitive supplier). In general, once customers select a competitive supplier, they are no longer eligible to return to Standard Offer Service, except that

(1) Low-income customers can return at any time.

- (2) Residential and small commercial and industrial customers can return within120 days of selecting a supplier (this option is available only until March 1,1999).
- (3) Customers participating in a municipal aggregation program can return within180 days of joining the program.

The rates for Standard Offer Service are regulated by the Department and are set at levels that provide a 10 percent overall bill reduction to customers receiving Standard Offer Service; the level of the overall bill reduction for Standard Offer customers will increase to 15 percent on September 1, 1999.

Default Service is the generation service that is provided by Distribution Companies to those customers who are not receiving either competitive generation or Standard Offer Service. Customers who move into a Distribution Company's service territory after March 1, 1998 will receive Default Service until they select a competitive supplier. Prices for Default Service are regulated by the Department and may not exceed the average market price for electricity in New England.

Competitive suppliers and electricity brokers that have been licensed by the Department will provide competitive Generation Service. A Competitive Supplier is an entity that is licensed by the Department to sell electricity and related services to customers. An Electricity Broker is an entity that is licensed to facilitate or otherwise arrange for the purchase and sale of electricity and related services to customers, but is not licensed to sell electricity to customers. An applicant for a competitive supplier or electricity broker license must demonstrate, among other things, the financial and technical capability to provide the applicable services. The competitive electricity marketplace will set prices for Competitive Generation Service; the Department will not regulate these prices.

Before initiating generation service to a customer, a competitive supplier must complete a three-step process. First, the supplier must obtain authorization from the customer either through

(1) A letter of authorization.

- (2) Third-party telephone verification.
- (3) The completion of a toll-free telephone call initiated by the customer.

Second, once customer authorization is obtained, the competitive supplier must send an information disclosure packet to the customer, describing, among other things, the contractual terms the customer has agreed to, and the fuel mix and environmental characteristics associated with the supplier's generating resource portfolio. Third, the competitive supplier must allow for a three-day recession period to elapse before initiating generation service to a customer (the recession period beings upon the customer's receipt of the information packet). Once these steps are completed, the competitive supplier may initiate generation service to the customer by informing the customer's Distribution Company that, upon the customer's next meter read date, the supplier will be providing generation service to the customer. Customers receiving generation service from a competitive supplier will have two billing options:

- Complete billing, under which a customer would receive a single bill from the Distribution Company, including charges for generation service.
- (2) Pass-through billing, under which a customer would receive two bills, one from the Distribution Company for non-generation charges and a second bill from the competitive supplier for generation service charges.

Figure 2:



4.3 Technological Concerns

4.3.1 Intro to Hardware

With the deregulation of generation one concern that has been voiced by both experts and those in the industry is reliability. Without government regulation, electric companies will be forced to look at much shorter return on money invested in capital projects. This will cause cost cuts company wide, hardware in need of replacement or upgrade will be overlooked. All department will be operating on less people and resources. Mass. Electric for example is implementing 15 percent reduction of employees. The argument that advocates for the deregulation of electricity are using is that the electric companies have become inefficient and complacent. Once deregulated competition will force companies to be more innovative and cost effective.

4.3.2 Hardware

Hardware can be grouped into three types, generation, transmission, and distribution. In the deregulation of electricity, the concern is mainly in transmission and distribution. Generation will be effected, but not to the degree of the other two. Before the days of deregulation electrical energy consumption was primarily linear. The generating station made electricity, it was transported over wires to distribution stations. Where it was converted to lower voltages, and then piped into homes and businesses. This is can be understood more easily in the diagram below.



Figure 3: Hardware

The whole system was owned, operated, and maintained by one company. The system was regulated because there was no way (short of running new power lines) for power companies to compete for the same customer. This created a stagnant relationship between supply and demand.

In the past few years power companies began connecting there power lines. These "Tie Lines" were originally intended to be used for, power outages and down time for service. The Idea was to have a back up or alternate power source to draw on. What power companies soon discovered is, they could buy power from other companies during peak demand. This was the birth of power marketing.

With the separate electric transmission systems tied together, the system looks less like a straight line. The system takes on the appearance of a web, or as it is commonly referred to the "Grid". The idea of a grid is centered around the idea of "Power pooling". Power Pooling is where all generation facilities feed there electricity into the grid. Consumers then pull off the grid as they need, (refer to diagram 1.2). In theory the idea of power pooling is the ideal set up. Most customers have redundant suppliers, or more than one generation facility feeding into there power grid. This allows for line or generation failures, without necessarily power loss at the customer. This is also how generation can be unbundled, and deregulated. Consumers do not have the choice of where there power comes from. They do however have the choice now of whom they pay for their power.

Figure 4: The "Grid"



<u>4.3.3 System constraints</u>

The North American electric grid has been called the world's largest machine. It can be described by comparing it to a huge plumbing system. The volume of water in the pipes is the electric current, the water pressure is the voltage. We can extend this analogy by comparing the generators to water pumps, switches are valves, and appliances are water driven equipment. Users can draw on or draw from the system as long as the system remains balanced. Not unlike a large plumbing system, you can begin to have bottlenecks in areas of increased demand. As demand grows in one area it can create a bottleneck somewhere back down the line. This is analogous to flushing the toilet, and scalding your roommate in the shower. John Hauer leader of power dynamics research at Pacific Northeast National Lab notes, "I can measure the effect that a motor starting up in Arizona has on a generator in British Columbia." He also says, "You can imagine how hard it is to understand the system, nonetheless control, this system." (GRID,Jill K. Cliburn, Rural Electrification Magazine)

The biggest problem with the existing electrical grid is it is under-built. It was never designed to be used as a single system. The age of the equipment can range from the late 1940's to only a few months old.

4.4 Immediate Effects

<u>4.4.1 Stranded Costs</u>

Many industry observers expect that lower prices that result from the pressure of competition will reduce the ability of utilities to recover their investments. The

inability to recover these investments is what we call stranded costs. The implementation of a policy for stranded costs requires someone to determine who is responsible for paying the difference between the cost of production from power plants that were built when costs were high and today's lower prices. This makes it come down to utility shareholders, ratepayers, or both. These are not new costs. Customers are paying them right now, and they must be addressed as part of the transition to competition. They are one of the most important and debated issues of the deregulating electric industry. If we didn't do something about stranded costs, numerous utilities could go bankrupt. The federal government endorses the fact that utilities should be able to recover legitimate and verifiable retail stranded costs that arose from the transition to retail competition. Though the federal government left it for the states to decide, many think that federal policy should encourage states to provide for recovery of stranded costs. Many think that this issue is one of the key stumbling blocks, which must be overcome in order to provide choice to the consumer. Also the authority of States to address this issue should be preserved. Recovery of investments in generating, was usually regulated by State public utility commissions. So far all States that plan to implement retail competition have provided for stranded cost recovery in some way.

An important impediment to reform exists. The problem of stranded costs or the investments regulated utilities made over time that may become uneconomical with the onset of competition. For example, if competitors with superior generating facilities enter the market and offer power directly to customers, the assets and

facilities owned by the regulated utilities quickly may become obsolete or uneconomical to operate.

Historically, deregulation often has been followed by the shake-out of inefficient services and facilities, whether it occurred in the telecommunications, transportation, or natural gas industries. A large number of utilities already have absorbed their losses by gradually writing off a large number of assets they feel may prove to be uneconomical in the future. Utilities that waited to make such sound business decisions hardly should be rewarded when other firms absorbed these losses for years. Institutional investors write off such losses by downgrading utility stocks that appear risky in a competitive future. Because of these facts, further stranded cost recovery is difficult to justify. The monopolistic utilities that stand to lose the most if stranded investments are not recoverable argue that a regulatory compact existing among legislators, the public, electric companies, and their shareholders must be honored. They argue that they have made investments in good faith, believing that their companies would always have a safety net if things went wrong.

Monopolistic utilities also argue that they have been unfairly required by policymakers and regulators to make numerous investments that may prove uneconomic in the competitive future. When utilities can show that they invested in certain facilities or projects as a result of a direct written order or the strict request of a regulator or legislative official, then they have grounds for recovery. Claims currently being made by such utilities exceed such reasonable judgments. In fact, aggregate stranded cost estimates that are frequently tossed around in industry discussions and trade journals range from a low of \$50 billion to an amazing \$500

billion. Most utilities that stand to gain the most use an approximate figure of \$200 billion. Even this figure is absurd when it is compared with annual industry revenues that are approximately the same. If monopolistic utilities argue that their past investments were so ill-considered that their potential losses in a competitive market are roughly equal to the amount of money they now earn collectively each year, then this is a serious indictment of the current monopolistic system. It is difficult to imagine that a free electricity market would produce inefficiencies of this extent.

If recovery of stranded investments of the magnitude the industry estimates is mandated by policymakers, then any savings that America's electricity consumers expect as a result of deregulation would be negated by increased payments to large monopolies. If large utilities successfully make easy for stranded cost recovery for competitive entry, not only will electricity users have to foot the hefty bill in the form of higher prices, but they will also have fewer options and less sophisticated service. This certainly will be true if the potential new industry entrants are discouraged from tapping the new markets because they will face such a high entry fee.

The big question that comes up is who should pay stranded costs? Stranded investments will be the responsibility of either utility shareholders or utility customers. An argument can be made that electric utility shareholders have been compensated for investments through the allowed cost of capital under regulation. Advocates for this position assert that utility shares have often sold at prices that suggest that shareholders have been compensated for the risk that regulatory rules might change. A counter-argument suggests that a regulatory contract exists between utility companies and industry regulators. In return for utilities' obligation to serve

and to charge fair and reasonable prices on a non-discriminatory basis, utilities have historically enjoyed a protected franchise with the opportunity to earn a competitive rate on invested capital. If this regulatory contract is breached, the financial credibility of electric utilities may be jeopardized. Industry advocates say failure to recover stranded investments will result in short-term rate reductions benefiting consumers but may prevent electric utilities from recovering their cost of capital with the long-term consequence being a deterioration of utility services. They argue that when market funding is denied for maintenance, asset replacement, modernization, and service area growth, the industry will deteriorate. And, neither regulators nor the courts can force investors to fund an industry that does not adequately compensate for the use of capital.

Massachusetts and a number of other states have adopted electric utility restructuring legislation related to retail deregulation. Several states have developed financial plans and introduced legislation that allow utilities to recover stranded investments. For instance, the Pennsylvania legislature approved a plan authorizing utilities to issue transition bonds. The bond structure allows a utility to secure stranded investments. Under this scheme, the utility, with the approval of a state's regulatory agency, identifies recoverable stranded investments. These investments are deemed to be an intangible asset and pledged as property rights in a secured financing. The regulatory authority would then issue a rate order allowing the utility to service the transition bonds through an intangible transition charge to consumers. This accomplishes increasing rates to cover stranded investments as a shift of the risk of recovery from current shareholders to a new class of bondholders. It also allows

the utility to recover stranded investments immediately from bond issue proceeds. A number of states have already enacted legislation to permit utilities to use this method of structured financing and a number of other states are considering this type of system.

Other approaches to the stranded cost problem include divesting generating assets in a rate-base spin-off, where the utility retains only that portion of its generation needed to serve its retail customers and sells the remainder. Accelerating depreciation beyond traditional straight-line rates is another approach.

Measuring stranded investments through historical cost data and other financial statement information and developing a fair policy for the treatment of stranded cost under retail deregulation (are they recoverable or not from customers or stockholders) has significant implications to both companies and consumers. The cost and pricing issues surrounding the generation of power will take on importance as most electric utilities begin competing freely for customers based on price, and accountants clearly have an important role in this industry transition to a deregulated market.

As electric utilities have entered the transition period from regulation to competition, industry analysts and others have predicted that stranded investments will be a threat to the credit quality of investor owned electric utilities. There is also speculation that the stranded cost problem would lead to less efficient suppliers, unnecessary resource use, future deterioration in service and interference with the long term interests of consumers.

Chapter 5: Conclusions

5.1 General conclusions

The federal government saw the need to deregulate after the United Kingdom did. The United Kingdom's results have recently been coming in. One of the goals of the deregulation of electricity was to become more efficient. The electric industry in the United Kingdom did become more efficient. The price was extremely high. The work force in the electric industry in the United Kingdom was cut by close to 50 percent. This is a huge cut. This was one of the ways the industry became more efficient. The cause of this was the industry had no benefit to be efficient until recent years. This made the government have no problems in hiring extra people and keeping electricity rates high. With deregulation in the United Kingdom, most of these extra jobs that were not necessary were cut. This is also the way the industry is now in the United States. This is one of the major drawbacks of deregulating. The deregulation of electricity is not mainly to blame. The government hired these extra people and in some way all these job cuts are their fault. The United States will have to deal with this. The people who benefited most was large consumers of electricity in the United Kingdom. In the future residents may benefit a little more too.

The federal government started deregulation but did not make many rules. They gave the opportunity to states to deregulate at their leisure. They also gave states the advantage of making their own laws. This allowed for states to make laws according to their location and their needs. This gave the option for variations like cost of living

and renewable resources. This is a huge bonus for the deregulation of electricity all across the country.

The issue of stranded costs is a very big issue. Stranded costs must be fully recoverable for full competition. Massachusetts has approved law for stranded costs to be 100 percent recoverable. Without this, this would cripple electric companies that made investments before they new the electric industry was deregulating. Laws must be set forth so all these stranded costs are real. These stranded costs must be recoverable in a long amount of time, say 5-10 years. If the proper laws are made stranded costs can and will benefit the electric industry. With the 10 percent mandatory decrease in electricity prices, stranded costs may hide this price reduction. After stranded costs are recovered fully the price of electricity should decline even more and competition can begin in full.

The deregulation of electricity will be beneficial to all in the long run for everybody. The short-term losses could be a large portion of job cuts and a lack of any immediate decrease in electricity prices for residential consumers. The larger, bulk consumers of electricity will greatly benefit. Also if residential consumers can group together like Coops and buy in bulk they will benefit from it greatly. Another bonus to deregulation of electricity is the efficiency of producing electricity will sky rocket. This will drive prices down and also keep the environment a little cleaner. This will take some time though. As more electric companies gain power, competition will flourish and increase the need to be more efficient. This will also increase the desire for more efficient technology, in turn creating breakthroughs for an almost new science. Another benefit is the possibility of renewable resources. If a

company can market renewable resources for a fair price, some consumers may pay a little extra for renewable energy. So if you can tolerate another 5 to 10 years and some more telemarketers calling you, The deregulation of electricity will be beneficial to all of society.

5.2 Renewable Energies in Massachusetts

After learning more about the different sources of electricity available, it has become apparent that none are very beneficial to the environment. Some, however, are less harmful then others. Renewable sources (see Appendix A for description) are generally the less harmful of the bunch. It would be beneficial, from an environmentalist's point of view, to utilize these more often, despite the added costs they require. In Massachusetts, the use of "Renewables" is not widespread, but it does exist.

5.2.1 Windpower in Massachusetts

One might wonder if Massachusetts is a good place to generate electricity using windpower? The short answer is "yes". Windpower sites must have strong winds, and one does not always associate Massachusetts with high winds. The best locations in the state are on exposed mountainsides and hilltops in central and western Massachusetts, and along the coast, especially on Cape Cod.

Wind turbines usually have two or three blades. The blades of modern turbines can be over 80 feet long. When the wind blows over the blade, the "lift" that is created causes the blades to turn. This in turn drives a generator that produces

electricity. Longer blades and faster wind speeds cause the turbine to generate more electricity. Wind turbines are placed on towers because the wind blows faster and more steadily above the ground.

Massachusetts has several operating windpower installations.

Princeton

The Princeton Municipal Light Plant operates the oldest wind power plant in Massachusetts. Princeton is a rural town in central Massachusetts. Eight wind turbines were installed on a hilltop near Mt. Wachusett in 1984. Each turbine has a rated power of 40 kilowatts and is placed on an 80-foot tower. The entire facility produces approximately 250,000 kilowatt-hours a year, enough to supply electricity for over 40 households. From the time of its installation until 1996, the power plant has replaced the need to use thousands of gallons of fuel oil. It also has avoided hundreds of tons of carbon dioxide emissions. The cost of installing and operating the turbines is paid by the people of Princeton.

Hull

The Town of Hull is on a narrow strip of land that reaches almost the middle of Boston Harbor. Because it is surrounded by water, the town is pretty windy. In 1984, the Hull School Department received a grant from the Division of Energy Resources in order to install a wind turbine. The 40-kilowatt wind turbine was put in operation at the Hull High School in the spring of 1985. Even though the turbine has experienced some problems, it is still in operation. In fact, 1995 was the best year

ever in terms of electricity production. The turbine produced over 80,000 kilowatthours in 1995, saving the school department over \$8,500. And 1996 was an even better year.

Due to weather damage, the Hull facility is currently out of service.

Mount Tom

The largest operating wind turbine in Massachusetts sits on top of Mount Tom in Holyoke. The 250-kilowatt turbine is owned by the University of Massachusetts and is used for research and education. The University's Renewable Energy Research laboratory (RERL) purchased the turbine from a wind farm in California. The turbine got a complete overhaul and was modified for cold weather before installation on Mount Tom in late 1994.

5.2.2 Biomass in Massachusetts

Biomass is a type of renewable fuel that includes wood byproducts and grasslike crops and residues, solid waste, sewage, and liquid fuels (such as alcohol) obtained from agricultural products.

Biomass obtained from wood byproducts comes from the thinning of forests and residues. For example, the forest at the Quabbin Reservoir is routinely thinned to promote healthy growth. The logs are then sent to wood burning power plants in Maine, Vermont and Massachusetts.

Some good examples of wood burning power plants are the 58-megawatt McNeil Station of the Burlington (VT) Electric Department and the 18-megawatt Pinetree Resources plant in Westminster, MA. For this purpose, obtaining supplies in this area is actually very practical. For example, today, more than two-thirds of Massachusetts is covered with forests, a 30% increase from 150 years ago.

Agricultural biomass, like soybeans and rapeseed, provide the resource for the manufacture of biodiesel fuels. A replacement for conventional diesel fuel, biodiesel reduces particle emissions from diesel-fuel vehicles. Research has also shown that biodiesel can be manufactured from food wastes such as frying oils and animal fats.

Another agricultural product, corn, has become useful in the production of ethanol and ETBE, an additive used in reformulated gasoline, reducing the carbon monoxide content.

Methane, a natural by-product of wastewater treatment and landfill decomposition processes, can be used to generate electricity. Woody biomass and methane emissions, when used to replace fossil fuels, can counteract the production of greenhouse gases.

The Division of Energy Resources (DOER) is working with Massachusetts Bay Transportation Authority and private industry to study the introduction of biodiesel as a fuel additive to conventional diesel fuels in older urban buses. The goal is to reduce the black smoke emissions that are characteristic of buses.

DOER is also working with the Massachusetts Bureau of Waste Prevention, and the U.S. Environmental Protection Agency to develop programs to capture and use methane from landfills and to plant fast growing trees on landfills; two processes that counteract greenhouse gas emissions.

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