THE IMPACTS OF ELECTRIC RESTRUCTURING ON THE WATER AND WASTEWATER INDUSTRY*

Scott J. Rubin
Attorney • Consultant
3 Lost Creek Drive
Selinsgrove, PA 17870

Janice A. Beecher, Ph.D.
Beecher Policy Research, Inc.
6225 Vancouver Court
Indianapolis, IN 46236

ABSTRACT

The electric utility industry is changing dramatically, with the generation of electricity moving away from nearly a century of economic regulation. In a new, competitive market for electricity supply, water and wastewater utilities of all shapes and sizes will need to change the way that they purchase electricity. They also will be called upon to provide different types of services to their customers. Compounding these concerns will be increased pressure on water resources from changes in the use of water for the generation of electricity. Finally, the trend toward consolidation in the water and wastewater industry, including the acquisition of water and wastewater systems by electric utilities, is expected to intensify.

1.0 OVERVIEW

As of October 1999, legislation has been enacted in 21 states to restructure the electric utility industry. Two other states have begun the process of restructuring through administrative action. Nearly every remaining state is considering legislation or administrative action that would have similar results. (Energy Information Administration, 1999) In addition, the U.S. Congress is considering legislation that would mandate some type of restructuring action by every state. (Energetics, 1999) As shown in Figure 1, by January 2000, essentially every commercial electricity user in 6 states will have the ability to purchase its supply of electricity from a supplier other than its local electric utility, while partial customer choice programs will be underway in 5 other states. (Rubin, 1999; Energy Information Administration, 1999)

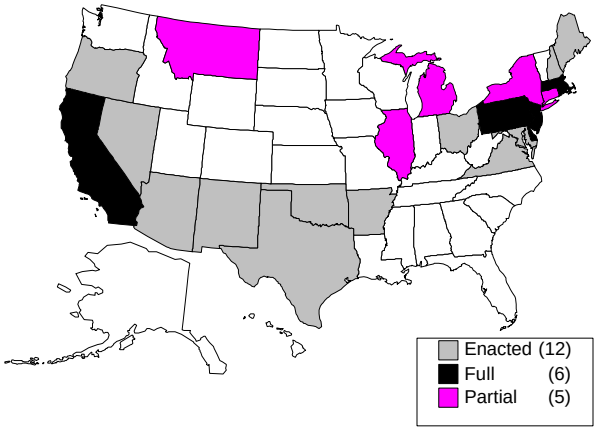

Figure 1: Status of Electric Restructuring for Commercial Customers as of January 1, 2000

Deregulation is occurring in the generation (or supply) of electricity. The transmission of electricity – moving electricity from the generating plant to the distribution system – continues to be regulated by the Federal Energy Regulatory Commission, but the form of that regulation has changed significantly since 1996. The local distribution of electricity to customers remains regulated at the state or local level, usually by public utility commissions.

This paper will highlight some of the effects on the water and wastewater industry from the dramatic changes that are taking place in the electricity supply industry.

---

* Presented at the Small Drinking Water and Wastewater Systems Conference, January 12-15, 2000, Phoenix, AZ. This paper is based on some preliminary findings of a forthcoming study, *Deregulation! Impacts on the Water Industry*, funded by the American Water Works Association Research Foundation. The authors appreciate the support of AWWARF for this paper.

2.0 DISTRIBUTIONAL CONSEQUENCES FROM ELECTRIC RESTRUCTURING

The electric utility industry is following in the footsteps of other network service industries that have restructured or partially deregulated. The telecommunications industry substantially deregulated long-distance service in 1985 and during much of the 1990s has seen the rise of competitive local service providers primarily serving business customers in large cities. The natural gas industry began the deregulation of the supply of natural gas in 1978, so that by 1984 there was no remaining price regulation of natural gas at the wellhead.

In addition, there have been several other formerly regulated industries that have undergone some type of economic deregulation or restructuring. These include several segments of the transportation industry (airlines, interstate trucking, railroads, and interstate buses) and the financial services industry (savings and loans, banks, and brokerage firms).

Observing the experience of other industries with economic deregulation shows a clear pattern. Without exception, deregulating prices leads to winners and losers. Obviously, if there is deregulation in an industry, it means that rates and the other terms of service will no longer be regulated. This has meant increased choices and lower prices for large-volume consumers and larger communities. But in some cases, it also has meant decreased choices and higher prices – or even the complete elimination of the service – from small communities and small or low-income consumers.[*]

One of the major forces behind electricity restructuring is the advocacy of very large electricity users – primarily producers in energy-intensive industries (steel, glass, paper, and others) and large chains of retail stores. These large users of electricity are likely to benefit from electric deregulation. They can be expected to receive enhanced services (such as consolidated billing that combines energy demands and usage from multiple locations on a single bill and state-of-the-art energy management services) and lower prices from competitive suppliers.

Residential consumers, particularly low-income households, are likely to be the least desirable customers to energy suppliers. Attracting and retaining small consumers can be expensive, time-consuming, and often not very profitable for large energy marketing firms.

Falling in the middle are small to mid-sized commercial and industrial customers. These are energy users that use significantly more electricity than an individual household, but that don't have the multi-million dollar electricity accounts of the largest users. This category includes many water and wastewater utilities that may spend thousands or tens of thousands of dollars per year on electricity.

One study that examined the potential effect of restructuring on relatively small businesses concludes: "Small and emerging businesses could be left in a position where they neither get the benefits of a competitive market (because they are not big enough) nor the protections that residential consumers enjoy (because they do not represent the voting majority)." (Xenergy 1998)

Similar concerns exist with the ability of consumers in rural areas to achieve the benefits from competition that are expected to be available in many urban areas. Several factors work together to make it less desirable for large energy marketers to serve rural areas. These include the relatively high cost per customer of marketing via mass media in rural areas, the small customer base of most rural electric cooperatives (meaning that the loss of a large customer could result in significant rate increases for the remaining customers), the lack of a major customer to lure marketers to the area, the high cost per customer of direct contact with customers (for example, through trade shows, door-to-door solicitation, presentations to community organizations, etc.), among others.

---

[*] A more detailed exposition of these issues can be found in Scott J. Rubin, *The Challenges and Changing Mission of Utility Consumer Advocates* (AARP 1999).

Indeed, as a result of just one of these factors – the potential effects of losing large customers, or having to give discounts to keep large customers – the U.S. Department of Agriculture (USDA) estimates that "electric rates will increase for consumers in 19 states as a result of competitive pricing. … Electric rates may fall for consumers in 26 states as a result of competitive pricing. … Price discounting of 30 percent for industrial customers by RECs [rural electric cooperatives] attempting to retain those customers could result in increases to residential rates of from three one-hundredths of a cent to 5.2 cents per kilowatt hour, depending on the state …" (USDA, 1999) Subsequently, the USDA's chief economist characterized this study as being a worst-case scenario, but the U.S. Department of Energy's more optimistic scenario still concluded that rural consumers in at least three states would see electricity prices increase if competition were implemented. (Brasher, 1999)

Whether any of these estimates is precisely accurate is difficult to know and, frankly, not very relevant. What is important is the virtual certainty that there will be those who benefit from restructuring the electricity industry and those who will not benefit. It is likely that smaller consumers will fare less well than larger consumers and that rural consumers will fare less well than urban consumers. Water and wastewater systems need to recognize the risks, challenges, and changes that they face from electric restructuring.

3.0 IMPACTS ON WATER AND WASTEWATER SYSTEMS

Water and wastewater systems will face numerous challenges and opportunities as a result of the restructuring of the electric industry. This paper can only briefly explain a few of the impacts that are likely to occur. For this paper, we have limited our discussion to an overview of two impacts in each of five impact areas. A more complete treatment of these, and many other, issues can be found in the authors' forthcoming study for AWWARF.

3.1 IMPACTS ON OPERATIONS AND RELIABILITY

3.1.1 Aggregation

One of the biggest challenges for an electricity consumer is to find the best price on energy, along with the other services that the consumer requires. This is as true for water and wastewater utilities – both large and small – as it is for any other business. One solution to this challenge that is being tried in several states is aggregation. Aggregation, simply, is a buying group. Consumers with something in common (business, location, membership in an organization) get together and buy energy in bulk.

Anecdotal evidence suggests that some water and wastewater utilities, particularly smaller utilities, may find it difficult to obtain competitive bids for energy supply. By pooling their purchase of energy as part of a larger group, however, it is more likely that the size of the larger group will attract the attention of energy marketers and suppliers. This is already proving to be the case in Pennsylvania, where many municipally owned water and wastewater systems are purchasing electricity as part of a large statewide aggregation of municipalities and school districts.

In fact, electricity purchasing groups are being formed by groups of local governments, businesses, trade associations, and others. Goldfarb reports on successful aggregations in California, Massachusetts, and Pennsylvania. (Goldfarb, 1999) Brin notes that the largest aggregation in Pennsylvania is serving more than 300 school districts and local governments, saving them a combined $15 million (about 15% of the cost of electricity supply) in its first year. (Brin, 1999) Other states are expected to follow suit by encouraging aggregations for all types of consumers. For example, New Jersey's electricity restructuring legislation contains explicit provisions that outline the process for municipalities to form aggregations for the residents and businesses within the municipality, including the municipality's own energy usage. (New Jersey Division of Ratepayer Advocate, 1999)

Water utilities have aggregated their electricity purchases in California to achieve similar savings. Jacobs reports that members of the California Association of Water Agencies obtained a discount of 5% off of their total electric bill. This has amounted to savings of $3 million in just the first year. (Jacobs, 1998)

Aggregation doesn't even need to involve different entities. For example, a city might be able to aggregate all of its government buildings, street lights, traffic lights, water plant, and wastewater plant into a single energy purchase and reap substantial savings. That is exactly what Portland, Oregon, accomplished, saving an estimated $850,000 over five years. (Schoen, 1998)

In order to take advantage of electricity deregulation, water and wastewater utilities should investigate the availability of buying groups that are targeting the needs of governments or businesses with similar characteristics. Care should be shown when selecting an aggregation, though, to make certain that the characteristics of the water or wastewater utility are compatible with those of the other members of the group. For example, if the water or wastewater utility uses the bulk of its electricity primarily in the early morning or evening hours when electricity tends to be less expensive, it may be able to obtain a better price if it combines with other entities with similar characteristics. Conversely, if the utility uses electricity primarily during the electric supplier's peak demand periods (typically during the business day in the summer), then it should seek a group with consumers with opposite load characteristics, so that the group's demand is more level throughout the day. As Goldfarb notes, though, there is no single correct aggregation. Rather, the aggregation's load profile should match the supplier's electricity supply portfolio. Rather than assuming that a certain load profile is best, it is more important to find " a fit with a supplier that is 'right' for the group. … By 'right' we mean a supplier whose energy supply costs are compatible with the aggregation group's load." (Goldfarb, 1999)

3.1.2 Reliability

Water and wastewater utilities must have access to a reliable, uninterrupted source of electricity. In fact, a policy statement from the American Water Works Association (AWWA) recommends that water utilities should "determine the local probabilities of complete or partial electric utility power outages" and provide for suitable backup or emergency power sources. (AWWA, 1999)

Nearly everyone in the energy industry agrees that electric deregulation will affect the reliability of the electric system, but there is a wide divergence of views about the magnitude and direction of that change. Ultimately, it may turn out that a deregulated electricity supply industry will do a more efficient job of matching the supply and demand of electricity in a cost-effective manner. During the transition to a competitive market, however, there are growing signs of problems with the reliable supply of electricity. For example:

- A consulting firm estimated that there is a one-in-three chance of a significant power outage in Colorado during the summer of 1999. (No author, 1999f)
- The East Central Area Reliability Council estimated that portions of the Midwest might face serious electric supply problems during the summer of 1999, stating: "under extreme conditions related to either weather, random generator outages or a combination of these factors, the capability of the transmission system to import power may not be sufficient." (No author, 1999g)
- The first restructured electricity market in North America, Alberta, Canada, has had a serious supply deficiency. The supply shortage is not being addressed by the marketplace, and as of the winter of 1998-99 no new power plants were planned to be constructed in Alberta. (Carlisle, 1998)
- The Texas Public Utilities Commission has projected electric supply shortages by the summer of 2000, even before the state enacted restructuring legislation. (No author, 1999h)
- One of the founders of the North American Electric Reliability Council (NERC), the overseer of the continental power grid, has predicted that industry restructuring will result in an increased risk of outages and blackouts unless significant changes are made in the system of regulating and controlling the bulk power system. (Casazza, 1998)

Simply, there is growing uncertainty about the ability of the electric grid to deliver a highly reliable, uninterrupted supply of electricity. The U.S. Department of Energy and NERC have called for the creation of new institutional structures to monitor and oversee the reliability of the electric transmission network. (U.S. Department of Energy,

1998; NERC, 1999) Yet, in the meantime, the electricity market is in a transition to a competitive market and there are serious questions about the reliability of the grid during this transition period, and beyond.

The entire electric grid is under considerably more strain today than it was even one year ago, resulting in an increased risk of both prolonged and momentary outages. For example, the Federal Energy Regulatory Commission recently stated: "the transmission grid … is being used more intensively and in different ways than in the past. The Commission is concerned that the traditional approaches to operating the grid are showing signs of strain." (Notice of Proposed Rulemaking, 1999). Water and wastewater utilities should re-evaluate their backup and emergency sources of electricity in light of these new developments in the industry. It cannot be assumed that facilities that were adequate three or four years ago continue to be adequate today.

3.2 IMPACTS ON MANAGEMENT AND FINANCES

3.2.1 Operating Costs

The deregulation of the supply of electricity will lead to many different pricing and service options. Water and wastewater utilities will need to ensure that they are purchasing electricity under pricing terms and other conditions that make sense for their operations. Because electricity cannot be stored, its price varies significantly depending on the time of year and even the time of day when it is being used. The price paid by power suppliers and marketers may change every fifteen minutes. Under traditional forms of regulation for the electric utility industry, consumers pay prices based on annual averages. This may change, however, under deregulation.

With the advent of automated metering technology, electricity suppliers in many communities are able to track electricity consumption on an hourly basis. When this technology becomes more widespread, it is likely that suppliers will offer business customers real-time pricing options. If the consumer uses most of its electricity during non-peak periods (usually between 7 p.m. and 7 a.m.), real-time pricing could result in significant cost savings. In contrast, if most of the consumer's electricity is using during the business day, real-time pricing could result in steep price increases during certain times of the year.

Electricity suppliers also are offering interruptible rates that allow them to stop the flow of electricity to a customer when electricity prices are very high. Once again, this can be an attractive option for some customers – particularly those whose electricity needs are non-critical or tend to occur mostly during off-peak hours, or for customers with their own backup generators. Again, interruptible rates can offer a customer significant cost savings.

Both of these types of savings, though, come with significant risk, particularly for water and wastewater utilities. A utility must be careful to purchase a supply of energy that matches its own need for power. If the utility does most of its pumping at night, then real-time pricing could result in significant cost savings. Similarly, if the utility has its own backup generator, with a reliable fuel supply and adequate fuel storage, then an interruptible rate might be very beneficial. In evaluating the feasibility of these types of pricing and service plans, however, the utility should consider its requirements during the times when the electricity supplier is most likely to be peaking. In most parts of the country, that occurs during hot-dry spells in the summer. This is also the same time when the demand for water and wastewater services is likely to be peaking. It is important to recognize that the utility's *average* usage pattern is not the only relevant consideration; it is likely to be the utility's consumption during periods of stress on the electric grid that are the real cost drivers for these alternative pricing plans.

Electric deregulation also can create new revenue opportunities for water and wastewater utilities. If the utility has a substantial backup generator, for example, it might be able to sell electricity to the market. Schoen reports that this is exactly what happened in Groton, Connecticut, where the electric utility approached the town's wastewater utility about using the latter's backup generator. (Schoen, 1998) As Schoen writes: "The utility negotiated a deal with the town in which the utility agreed to upgrade the plant's generator and connect it to the local grid in exchange for the right to purchase excess electricity. When the agreement has been finalized and the equipment

has been installed, Groton will have a new source of revenue, developed and installed at far lower cost than the town had thought possible."

In summary, electricity deregulation will change the way that managers and operators need think about purchasing and producing electricity and other energy services (including fuel for backup generators). They must learn how to evaluate different pricing plans and service options, and then change the operating conditions of the plant to maximize the benefits from such plans. For example, during peak-period market conditions, it could save a utility hundreds of even thousands of dollars to delay the start of a pump by an hour.

3.2.2 Taxes

Policy analysts often overlook the fact that the utility industry is a major taxpayer, particularly at the state and local levels. It is not unusual for utility property and revenue to be taxed at a different rate or under a completely different legal structure than non-utility property. One important consequence of electric deregulation is that it can change the basis for taxing power plants and other electric utility property.

Importantly, though, these tax changes also can have an effect on water and wastewater utilities. For example, Howe shows that some states are replacing utility property or income taxes with per-kilowatt-hour taxes. (Howe, 1999) While it has the expected consequence of equalizing taxation between in-state and out-of-state generators of electricity, it also has the unintentional consequence of shifting the burden of taxation to those consumers who use more electricity. This can negate some of the effects of utility rate reductions that can occur through deregulation.

Another important tax consequence for water and wastewater utilities is the shift in property tax burdens away from electric utilities. As Aschenbach describes, if a power plant is retired or sold for a small fraction of its original cost (both of which are occurring with some frequency with nuclear power plants), the property tax base in a state or community can erode very quickly. (Aschenbach, 1998) The remaining tax burden usually must be picked up by other taxpayers, which can include water and wastewater utilities (either as direct taxpayers where the utility is privately owned or through increased transfers from the water or wastewater department to the general fund of the municipality). As an example, when Pennsylvania restructured its electric industry, the state required that revenues from the state-administered utility property tax remain unchanged. The unexpected result has been that many power plants have been reclassified as non-utility property, meaning that the remaining utility taxpayers (including many water and wastewater utilities) have seen their tax rates increase significantly. In addition, the change in status of power plants from utility property to non-utility property has resulted in major shifts in tax revenue among municipalities in the state. (No author, 1999b; Pennsylvania, 1999)

3.3 IMPACTS ON CUSTOMER EXPECTATIONS AND SERVICES

3.3.1 Pricing and Prices

To many consumers, a utility is a utility, and that could create a special set of concerns for water and wastewater utilities. If the advocates of electric deregulation are correct, then the price of electricity will decline or at least remain the same for an extended period of time. If this leads to a public perception that utility prices are stable (or falling), it could make it increasingly difficult for water and wastewater utilities to justify rate increases to the public.

Another important part of the restructuring process in many states is the implementation of special universal service programs for low-income consumers and other consumers with special needs. These programs are designed to ensure that the deregulation process will not result in "red lining" or other forms of discrimination against low-income consumers, or otherwise have an adverse effect on the affordability of electric service. The increasing presence of these programs for electric utilities will put renewed pressure on water and wastewater utilities to adopt similar programs for their customers. While there may not be a logical nexus between the deregulation of electricity and programs for low-income water customers, it is likely that the expectations of consumers and policy makers will be heavily influenced by the presence of such programs in the energy sector.

3.3.2 Customer Service

As is the case with special pricing programs, when electric utilities change how they serve consumers, many consumers will expect similar changes from their water and wastewater utilities. One important example of this is the change in the electric industry from an industry that responds to customer requests to one that actively solicits customer purchases.

Five years ago, it was unheard of to receive a call from your electric utility. It had nothing to sell you that you didn't already know you needed. With the coming of competition, however, that is changing. Electric suppliers are engaging in telemarketing, sending direct mail, advertising in print and broadcast media, and constructing web sites – all designed to attract new customers and to sell additional services to existing customers. Simply, communication with the energy utility has changed from being one-way (always initiated by the customer) to being two-way.

Electric suppliers are developing new services that they hope will be attractive to consumers, such as selling packages of energy, appliances, and energy management services. If a consumer is looking for a new appliance, it is possible that its energy company will be able to offer a package deal with a new appliance and a discount on electricity, all payable through the monthly electric bill.

As these changes occur in the energy industry, they will trickle down to the water industry, too. If a consumer is used to purchasing energy and appliances and related services from one source, then the consumer might expect similar treatment for its water-related needs. For example, a consumer might look to its water utility to provide and service hot water heaters, plumbing fixtures, and related services. It might sound far-fetched now, but fifteen years ago no one seriously thought that electric companies would be selling advanced light bulbs, providing energy management services, recommending new drives and motors for factories, or selling other customer services.

Simply, as consumer expectations of "the utility" change, it will likely raise the standards and expectations for service that is provided by water and wastewater utilities.

3.4 IMPACTS ON WATER RESOURCE MANAGEMENT

3.4.1 Hydroelectric Resources

One of the fiercest battles in deregulating California's electric industry hasn't involved money or nuclear power or the rates that will be charged to large users. Instead, it has been what will happen to the hundreds of dams that Pacific Gas and Electric Co. (PG&E) uses to produce hydroelectric power. PG&E has a network of "68 power houses, 99 reservoirs, 174 dams, 19 miles of pipe, and 136,000 acres" in eastern California. Importantly, more than 3.5 trillion gallons of water flow through PG&E's network of dams and reservoirs each year, but just a small fraction of this is consumed or sold by PG&E. The rest flows to other users and water agencies in northern California. Those other users are very concerned about how PG&E will manage this water resource in a deregulated energy market. Will the water be used to maximize production of hydroelectric power or will it be used to maximize the value of the water resource to other users? As one local official put it, "The fight is over water and not power because 'the water behind the dams is far more valuable.'" (No author, 1999c)

Similar battles over hydroelectric facilities and their associated water resources are likely to occur in numerous other jurisdictions. There already are signs of similar concerns being raised in the Pacific Northwest, Maine, and Idaho. (No author, 1999a, 1999i, 1998a)

3.4.2 Water for the Generation of Electricity

Water and wastewater utilities also need to recognize that water is one of the major raw materials that is needed to produce electricity, even when the plant is not a hydroelectric plant. As the demand for power increases, it can be expected that the pressure on, and cost of, water resources and water rights also will increase. A startling example

of this comes from Idaho, where the local electric utility, Avista Corp. "owns rights to much of the water that flows in and out of Lake Coeur d'Alene … rights that supersede nearly everyone else's water rights. In fact, Avista … has rights to far more water than flows in the Spokane River at anything but the highest seasonal flows. Technically, that means the company could 'call' the rights of everyone upstream whose rights were established later than its own, and leave everyone else dry." (No author, 1999e).

A similar problem is occurring even in water-rich areas. Outside of Chicago, local government officials are opposing a new power plant because of concerns that it would deplete a groundwater supply. The proposed power plant would be built by an out-of-state company that wants to sell power into Illinois's deregulated electricity market. The plant is reported to use between 2.0 and 3.8 million gallons of water per day and local officials fear that it would deplete at least one well in the community. (No author, 1999d)

The lesson for water utilities is clear. Deregulation of the electric industry will increase the construction of new power plants (and increase the utilization of existing plants). This, in turn, will put increased strain on water resources and water rights. Water utilities must be certain to monitor the impact of such changes on their own water resources.

3.5 IMPACTS ON WATER INDUSTRY STRUCTURE

3.5.1 Electric Company Acquisitions of Water and Wastewater Utilities

Some energy companies believe that what they really provide are network services; that is, the distribution of a product or service to the customer through a fixed, physical network. Telecommunications and electric utilities have provided the service through wires, while natural gas and water utilities have used pipes. The concept, according to this thesis, is the same and its proponents believe that there are large economies of scale and scope to be realized by combining these operations.

In recent years, energy companies have become major investors in the water business. In addition, some of the large, multinational water and wastewater companies are becoming more interested in the energy business. Examples of the cross-over between water and energy are becoming more common (Byrne, 1999; No author, 1998b):

- DQE created AquaSource to purchase hundreds of small water and wastewater utilities throughout the United States, particularly in Texas where AquaSource is the largest investor-owned utility.
- NiSource has purchased Indianapolis Water Company.
- Minnesota Power owns Southern States Utilities, the largest investor-owned water utility in Florida.
- Enron has formed Azurix to purchase water systems throughout the world. So far, it has acquired major water systems in Great Britain and Latin America.
- Suez Lyonnaise des Eaux, a multinational company with substantial water and wastewater holdings in the United States and Europe, has announced plans to expand into the energy business.

Deregulation in the energy industry, particularly as electric utilities sell their power plants, is putting money and idle expertise in the hands of energy utilities. Some of the companies intend to use those resources to enter the water and wastewater business. This can create opportunities for water and wastewater utilities to sell their operations, but it also can put additional pressure on utilities to improve their efficiency, improve customer service, and mitigate price increases.

3.5.2 Consolidation of Water and Wastewater Systems

Large water companies also are interested in becoming larger, often through purchasing other water and wastewater utilities. In order to provide enhanced services that consumers expect and capture some of the efficiencies of size in billing and customer service operations, many larger U.S. water companies are actively acquiring more water and wastewater companies. (Byrne, 1999)

This trend is likely to continue, as smaller water and wastewater systems find it more difficult to justify their independence against much larger companies that can capture economies of scale in providing various services to customers. Further, with energy companies coming into the market for water systems, the prices paid for water and wastewater systems will increase, leading more systems to consider a sale or long-term contract to be a feasible option.

4.0 CONCLUSIONS

Water and wastewater systems will face many challenges and opportunities from the restructuring of the electric industry. They will need to re-examine the ways in which they purchase and use energy. Rather than being a captive customer of one electric utility, customer choice will require water and wastewater systems to shop for the best combination of price and energy service. This may include changing the way in which energy is used, when it is used, and even what type of energy is used.

Water and wastewater systems will face increased pressure from their customers, boards, and regulators to provide high-quality customer service and a wider diversity of products and services. They also will need to evaluate and continually monitor the risks of power outages, fluctuations in power quality (such as voltage reductions or surges), and other reliability issues.

In addition, water systems need to be vigilant in monitoring the effects of changes in power generation on local and regional water resources. Changes in the operations of hydroelectric plants or the construction of new power plants within the watershed could have a significant effect on the quality and availability of water resources.

Finally, it appears likely that there will continue to be increased acquisition and consolidation activity in the water and wastewater industry. Systems that want to remain independent will need to improve their ability to use energy and other resources more efficiently, enhance the level of customer service, and provide new services to consumers.

5.0 REFERENCES

American Water Works Association, "AWWA Policy Statement on Electric Power Reliability for Public Water Supply and Wastewater Utilities, revised January 1999," *AWWA Mainstream* (Mar. 1999).

Aschenbach, Dan and Christina Couret, "Deregulation Issues Challenge Local Government," *American City and County* (June 1998), 113:6:58-68.

Brasher, Philip, "Power Deregulation Plan Under Fire," *AP Online* (May 26, 1999).

Brin, Dinah Wisenberg, "Groups Wield Buying Power in Pa.'s Electricity Market," *Dow Jones Newswires* (June 21, 1999).

Byrne, Harlan S., "American Water Works is Riding Industry's Consolidation Wave," *Barron's* (Aug. 16, 1999).

Carlisle, Tamsin, "Electricity Deregulation Lengthens Alberta Nights," *Wall Street Journal* (Dec. 3, 1998).

Casazza, John, "Blackouts: Is the risk increasing?" *Electrical World* (Apr. 1998), 62-64.

Energetics, Inc., Electric Utility Restructuring Weekly Update, Oct. 15, 1999, <http://www.eren.doe.gov/electricity_restructuring/weekly/oct15_99.html>.

Energy Information Administration, U.S. Department of Energy, *Status of State Electric Industry Restructuring Activity as of September 1, 1999*, <http://www.eia.doe.gov/cneaf/electricity/chg_str/tab5rev.html>, as of October 19, 1999.

Goldfarb, Lynn K. and Douglas Stevenson, "Aggregation: An Anti-Aggravation Pill for New-Millennium Consumers," *Electricity Journal* (July 1999), Vol. 12, No. 6.

Howe, Edward T. and Donald J. Reeb, "State and Local Electric Utility Taxes: Evolutionary Taxation of a Deregulating Monopoly," *American Journal of Economics and Sociology* (Jan. 1999), 58:1:115-128.

Jacobs, Karen, "United They Save," *Wall Street Journal* (Sept. 14, 1998), R10.

New Jersey Division of Ratepayer Advocate, *Manual for Government Aggregators* (Sept. 1999).

No author, 1999a, "Conservation Group Appeals FERC Ruling," *Bangor Daily News* (Mar. 18, 1999).

————, 1999b, "Pa. Pulls Plug on Power Plant Tax Loss that Means a Windfall for Some Areas, Losses for Others," *Allentown Morning Call* (Apr. 12, 1999).

————, 1999c, "PG&E Hydropower Plan Making Waves In State," *San Diego Union and Tribune* (Apr. 12, 1999).

————, 1999d, "Power Plant Plan Sparks Call for Water Regulators," *Chicago Daily Herald* (Jan. 20, 1999).

————, 1999e, "Power Play Could Leave Some Dry: N. Idaho Vulnerable to Avista's Vast Water Rights," *Spokesman Review* (Feb. 28, 1999).

————, 1999f, "Power Woes Predicted; Chance of Brownouts this Summer is 1-in-3, Electricity Study Says," *Rocky Mountain News* (June 9, 1999).

————, 1999g, "Summer power shortage feared: Utilities say they'll meet consumer demand for electricity, but others foresee trouble," *Detroit News* (May 31, 1999)

————, 1999h, "Texas restructuring report argues state must maintain system reliability," *The Energy Report* (Jan. 25, 1999).

————, 1999i, "20 Idaho Dams Need New Licenses by 2010," *Idaho Statesman* (May 26, 1999).

————, 1998a, "Changes to Columbia River Power System," *Water Power & Dam Construction* (Aug. 31, 1998), 10.

————, 1998b, "Mergers Pour Over Water Utilities: Electric Players are Seeing the Light and Acquiring Water Companies," *Mergers Acquisitions Report* (Dec. 7, 1998).

North American Electric Reliability Council, Prepared Remarks of David R. Nevius, Vice President, Hearing Before the Energy and Power Subcommittee of the House of Representatives Commerce Committee (Apr. 22, 1999).

Pennsylvania, House Finance Committee Briefing, "Current Issues in the Public Utility Realty Tax" (Mar. 10, 1999).

Rubin, Scott, Electric Restructuring Timetable, Public Utility Home Page <http://home.ptd.net/~sjrubin/restru.htm>, as of October 19, 1999.

Schoen, Mary, and Shelley Cohen, "Taking Charge in a Restructured Electricity Industry," *PM. Public Management* (Sep. 1998), 80:9:17-28.

U.S. Department of Agriculture, Office of the Chief Economist, *Electric Utility Deregulation: Rural Effects, Briefing to Senior USDA Policy Officials* (Jan. 1999).

U.S. Department of Energy, Secretary of Energy Advisory Board, *Maintaining Reliability in a Competitive U.S. Electricity Industry* (Sept. 29, 1998).

Xenergy Consulting, *The Policy Implications of Electric Industry Restructuring on Small and Emerging Businesses*, as quoted in "Small Businesses Face Unique Risks With Competition," *Megawatt Daily* (July 22, 1998).