MEMORANDUM

EUGENE WATER & ELECTRIC BOARD

Rely on us.

TO: Commissioners Simpson, Brown, Helgeson, Manning and Mital

FROM: Sheila Crawford, Strategic Planning & Governance Coordinator; Roger Gray, General Manager

DATE: December 19, 2012

SUBJECT: Board General Discussion about EWEB Direction & Expectations for 2013 Strategic Planning

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Discussion

The following information has been provided to help prepare you for the Board meeting on January 2, 2013. During this Board meeting a discussion similar to an environmental scan of the utility industry and EWEB specifically, will be conducted. You will be asked to discuss and weigh in on external challenges and opportunities facing the utility and internal strengths and improvements that EWEB may need to take on in order to remain an effective organization. Given this context you will also be asked to share your thoughts and identify factors that are important to you as you serve in this Board of Director capacity.

To ready you for the discussion, a paper written by Jeff Tarbert, of American Public Power Association (APPA), titled Public Power's Business Model: A Primer that discusses potential emerging challenges that public utilities are facing for the future. To augment this paper, two other articles are also included, one on tax exempt financing repeal and fracking of natural gas. Hopefully this information will be insightful in introducing the public power business model that EWEB follows as well as familiarize you with some of the challenges, opportunities, transitions and risks facing the utility in the future.

Requested Board Action

None at this time.

THINKING ABOUT THE FUTURE

EWEB Board Meeting 1-2 1=2013

POTENTIAL EMERGING CHALLENGES

"Electric Power industry is facing some of the most significant challenges & evolutionary changes in its history", Jeff Tarbert, Public Power's Business Model, February/March 2012. (Attach A)

~AFFORDABILITY…..IMPACT ON FINANCIAL MARGINS~

- Regulatory control on carbon & other pollutants.
- Potential repeal of tax exempt financing (Attach B)
- Expensive renewable energy mandate policies.
- Management of generation cost recovery in restructured power markets.
- Slower economic growth – impact on sound financial metrics.

~GAME CHANGERS~

- Fracking – long term supplies & lower natural gas prices (Attach C)
  Moody's Investor Service, Industry Outlook, US Public Power Electric Utilities, June 6, 2012

~MAJOR INDUSTSRY TRANSITION….EVALUATION OF CURRENT BUSINESS MODEL~

- Public Ownership
  - ✓ Affording customers the rights of access and participation.
  - ✓ Contributions to local government general fund.
  - ✓ Keeping customers aware of the value of utility ownership.
- Local Control
  - ✓ Defines public power: governance, regulation, and decision making takes place closest to the people who are served by the customer.
  - ✓ Decisions on setting rates, budgets, capital expenditures, compensation systems, eminent domain are made at the local level.
  - ✓ Keep process open and customers informed about how to participate.
- Nonprofit Organization
  - ✓ Operates on a not for profit basis.
  - ✓ Focus on keeping costs competitive to assure customers have low cost access to electricity.
  - ✓ Surplus revenues used to improve systems, capital improvements, and emergencies.
- Low-cost Structure
  - ✓ Most important and identifiable attribute – deliver reliable power at lower costs than competitors.

- ✓ Enabling contributors: low-cost financing, access to federal hydro power, and priority on conservation to name a few.

- Customer Focused
  - ✓ Primary focus on interests and needs of customers and community.
  - ✓ Maximized service and value of utility as a community asset – **primary business model driver.**

~RISKS~

- **Financial Pressures on Local Governments** will continue to press policymakers to make enterprise transfers and asset sales, instead of service cuts and rate increases when dealing with revenue shortfalls….
- **The Skills and Knowledge of Local Government Policymakers** who do not fully honor their fiduciary duties to the enterprise activities of local government and fail to make sound business decisions….
- **Loss of Rate Competitiveness** as the once substantial rate differential narrows between public power and IOUs, rural cooperatives and in some communities disappears….
- **The Challenges of Economies of Scale** that happen when joint action agencies need to offer expanded services beyond power supply, water, and other traditional services.
- **Demands for New Services, High Technology** will be made by some commercial and industrial customers who will turn to non-utility power providers if public power can't offer sufficiently high reliability, cost savings options, and increased information and control of their energy use.
- **The Workforce Crisis** will finally hit public power due to job and pay freezes at the local government level….
- **New Rules, Regulations, Standards, and Other Requirements** pose threats to public power's competitive standing in the electric utility market.

Attachment A

Public Power's Business Model: A Primer

By Jeff Tarbert

"Pressures on Public Power's Business Model Warrant Monitoring"**

Although we do not expect a change in the business model, if not managed well, pressures from expanding regulatory control on carbon and other pollutants, expensive renewable energy mandate policies and the management of generation cost recovery in the restructured power markets could create affordability issues and impact financial margins. Slower economic growth too could test political willingness to maintain sound financial metrics. Impacts are wide-ranging across the U.S., depending on fuel mix and regulatory timetable. Lower natural gas prices are providing a mitigating effect on power supply costs.

**Moody's Investor Service, Industry Outlook, US Public Power Electric Utilities, June 6, 2012

Why are Moody's Investors Service and some industry leaders commenting on the future viability of public power's historic business model and examining whether its continued application is appropriate for the challenges ahead? This may be due to the fact that the electric power industry is facing some of the most significant challenges and evolutionary changes in its history. During periods of major transition, it is always good business to determine whether the assumptions and strategies of the past will succeed in the future.

One quick barometer of the perceived effectiveness of current business models is to examine whether many utilities have or are considering changing their basic structures. There are numerous current or recent examples of examinations of utility ownership models, for example:

- ✓ After years of discussion, the public power utility in Owensville, Mo. (1,300 meters) was sold in 2012 to Ameren.

- ✓ "Florida taxpayers could save hundreds of millions of dollars annually in utility costs if cities turned over their municipal electric systems to Florida Power and Light (FP&L)," claims a study reported on in summer 2012 in the Florida business publication *Sunshine State News.*

- ✓ In *2005*, the citizens of Winter Park, Fla., voted to establish their own public power utility, primarily due to poor service reliability by the incumbent investor-owned utility. And now, the city of South Daytona Beach, Fla. is studying whether establishing a municipally owned electric utility would be better than continued service by the local IOU.

- ✓ The mayor of Colorado Springs, Colo., wants to undertake a valuation study to determine the worth of the city's four-utility operation and also examine the best governance structure For the utility. The City Council, governing board for the utility, must approve funding for any such studies.

- ✓ Vero Beach, Fla., is studying whether to sell its public power utility to FP&L because rates charged by the investor-owned utility are 30 percent lower (recently, however, FP&L has asked the state Public Utility Commission to approve a 16 percent rate increase). Also, more than 50 percent of Vero Beach's utility customers reside outside the political boundaries of the city. Some object to having a portion of their utility rate payments transferred to the city general fund. Interestingly, Vero Beach decided to sell its utility to FP&L in the mid-1970s, but FP&L withdrew its purchase offer after the U.S. Justice Department began an investigation of possible antitrust violations.

- ✓ "Will Cities Defect from IOUs?," asks Phil Carson, editor-in–chief of *Intelligent Utility Daily,* in an article on the efforts of Boulder, Colo., (and cities in Connecticut and Massachusetts) to determine its own energy future by "no longer being under the control of IOUs." Instead, Boulder wants to rely on self-governance and local control, through municipalization of Xcel Energy's distribution facilities, to make decisions on the use of environmental resources and other issues of interest to the community.

- ✓ Montgomery County, Md., is studying municipal ownership of electric utility facilities due to Potomac Electric Power Co.'s continued poor record of power restoration following storms, and PEPCO's continued bottom-quartile ranking in reliability among IOUs nationally.

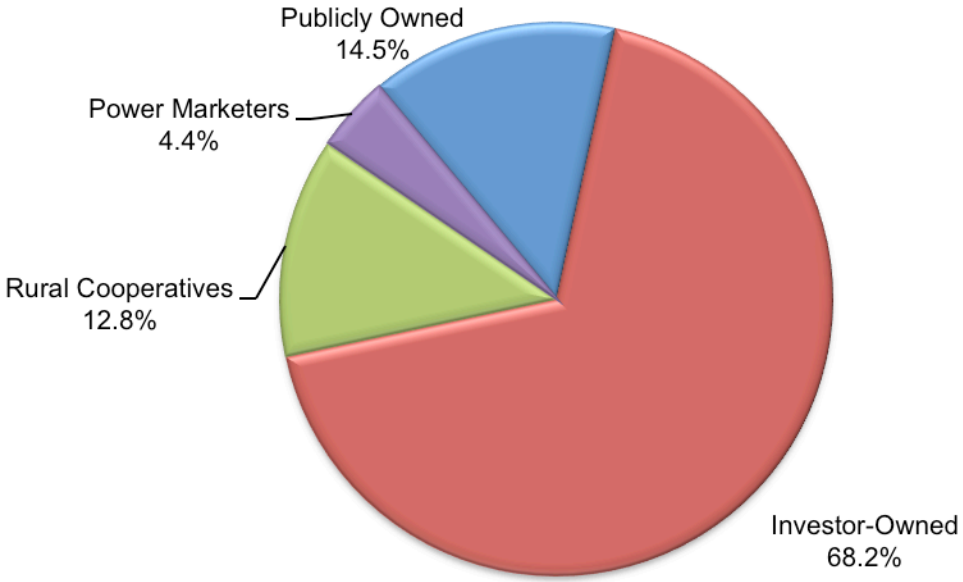
- ✓ Creating municipal electric utilities are also under study in Utica, N.Y.; Santa Fe, N.M.; and Thurston County, Wash. A public power utility will begin operations in Jefferson County, Wash, in 2013; and the city of Toledo, Ohio, has formed a municipal utility that so far serves one large customer.

- ✓ Duke Power and Progress Energy are seeking the potential advantages of economies of scale by merging to become the nation's largest electric utility.

The public power sector, in contrast, is comprised of approximately 2,000 individual utilities¸ whose median size is 2,200 meters; the largest being the Los Angeles Department of Water and Power, which serves 1.5 million meters, while the smallest public power utility seems to be Severance, Kan., with 53

meters. Studies by Professor John Kwoka at Northeastern University have shown that dis-economies of scale begin appearing when utilities become too large and bureaucratic to operate efficiently.[1]

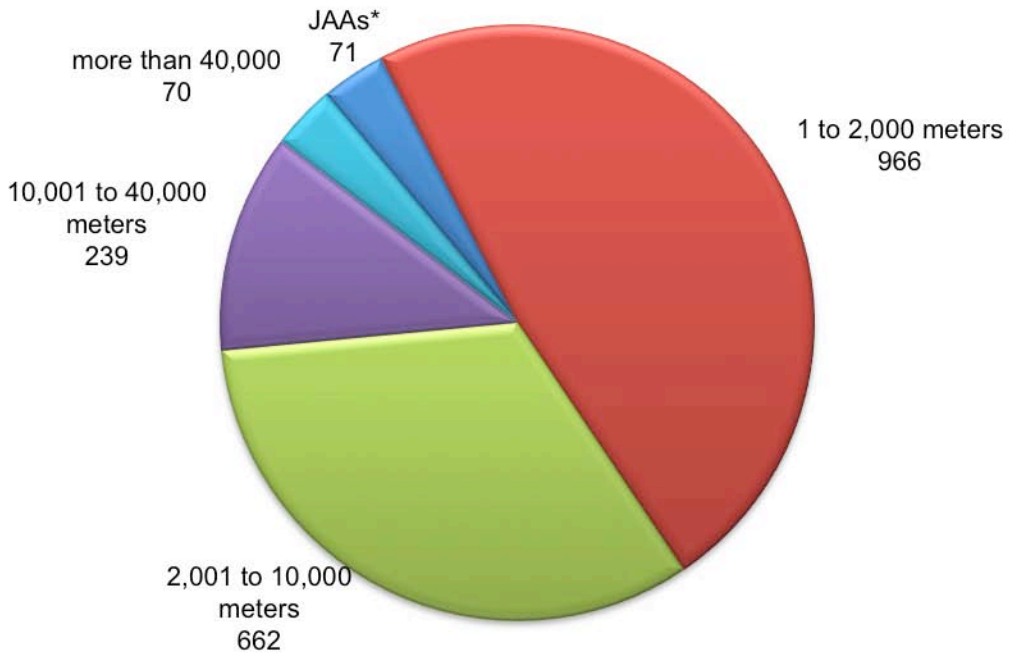
Figure 1: Industry Market Share



Source: Energy Information Administration, U.S. Department of Energy, 2012 (2010 data).

[1] See for example "Electric Power Distribution: Economies of Scale, Mergers, and Restructuring," *Applied Economics*, November 2005.

Figure 2: Size of Public Power Utilities



Includes Joint Action Agencies and other wholesale utilities.

Due to condensed service territories, a strong service ethic, and local governance, public power utilities generally score higher in customer satisfaction than IOUs, have faster response times restoring power after outages, demonstrate greater speed and agility in the rate-changing process, and therefore have a number of market advantages, in addition to their traditional rate competitiveness.

These conditions and structures are at least partially responsible for the fact that in the last 10 years there have been very few changes in the basic for-profit versus nonprofit business models in the electricity industry. The largest change in relatively recent history was in 1998 when Long Island Power Authority acquired the assets of Long Island Lighting Co. The IOU, LILCO, faced financial and public confidence problems related to its construction of the Shoreham nuclear power plant, the only fully constructed nuclear plant in the nation that never operated commercially. Today, the state-owned Long Island Power Authority supplies electricity to more than 1 million customers.

Governance

Investor-owned utilities are generally regulated by state public service (or utility) commissions and governed by corporate boards of directors comprised of inside (executive staff) and outside directors. Public power utilities are primarily regulated (except in six states) and governed by local elected city councils and/or elected or appointed utility boards, which have a statutorily delegated fiduciary

responsibility to act and make decisions in the long-term best interests of both the public power utility and its customer/owners.

The type of governance of public power utilities (city councils or quasi- to fully independent utility boards) also has changed little in the last 20 years. (See Figure 3.) Only a handful of utilities have transitioned from council to board or utility board to city council governing models, although there have been numerous studies and discussions of which governance model is most effective in the increasingly complex electricity business.

Figure 3: Type of Primary Public Power Governing Body

	Number of	Independent Utility Board		
Customer Size Class	**Responses**	**Elected**	**Appointed**	**City Council**
Less than 5,000 Customers	408	5%	23%	72%
5,000 to 20,000 Customers	161	20%	40%	40%
20,000 to 50,000 Customers	55	33%	34%	33%
Greater than 50,000 Customers	34	24%	44%	32%
TOTAL	**658**	**12%**	**29%**	**59%**

Source: American Public Power Association, Governance Survey, August 2010.

Electricity at a 'Tipping Point'

Descriptions of the revolution facing the electric power industry commonly identify increasing environmental regulations and costs, major changes in the nation's base-load fuel composition, demands for higher reliability and increasing levels of physical and cyber security, new challenges from a changing and shrinking work force, the introduction of new and costly technologies, and new federal legislation and regulations that will result in increasing industry-wide costs for years to come; and the potential for placing public power in a much less competitive posture than it is in today.

Combine these factors with instability in many local government financial operations and diverse and expanding customer service expectations, and you have an industry (and particularly the public power sector) at the tipping point of change; facing a series of complex and difficult decisions about its future, the potential for substantial change in its historic business operations, and risks that could prove fatal if not addressed quickly and adequately.

Dealing with this changing business environment will be particularly challenging for public power governing bodies, many of whose members lack in-depth knowledge of industry issues and experience with effective governance practices.

What Is a Business Model?

Business models are principals and structures upon which organizations base their strategies and

operations. Private corporation business models are designed to enrich owners through the sale of products or services to customers for a profit. Nonprofit and government enterprise business models are also designed to satisfy the needs of customers; however, excess revenues beyond expenses are used either to lower the cost of the product or service or be invested back into the organization. Margins or excess revenues are not paid out to stockholders.

Figure 4 depicts the business model and value proposition of investor-owned utilities (which in the United States serve approximately 70 percent of the electric energy market). This model is designed to provide a return on investment for its stockholders, by selling power to run electric devices (from refrigerators to iPads), in the form of dividends paid or share price appreciation.

Figure 4: The IOU Business Model

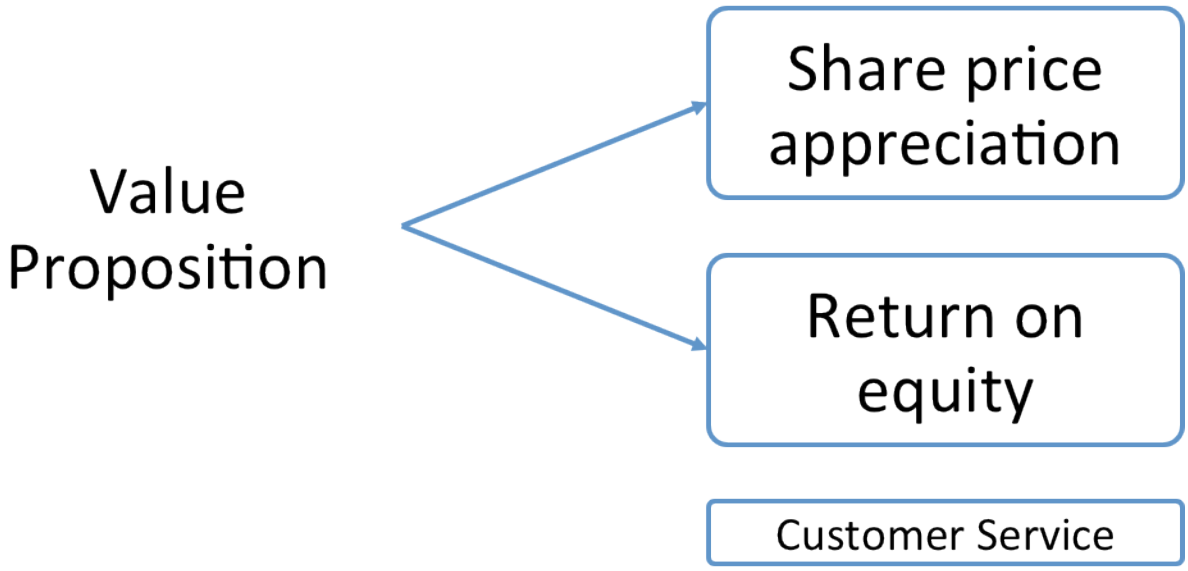
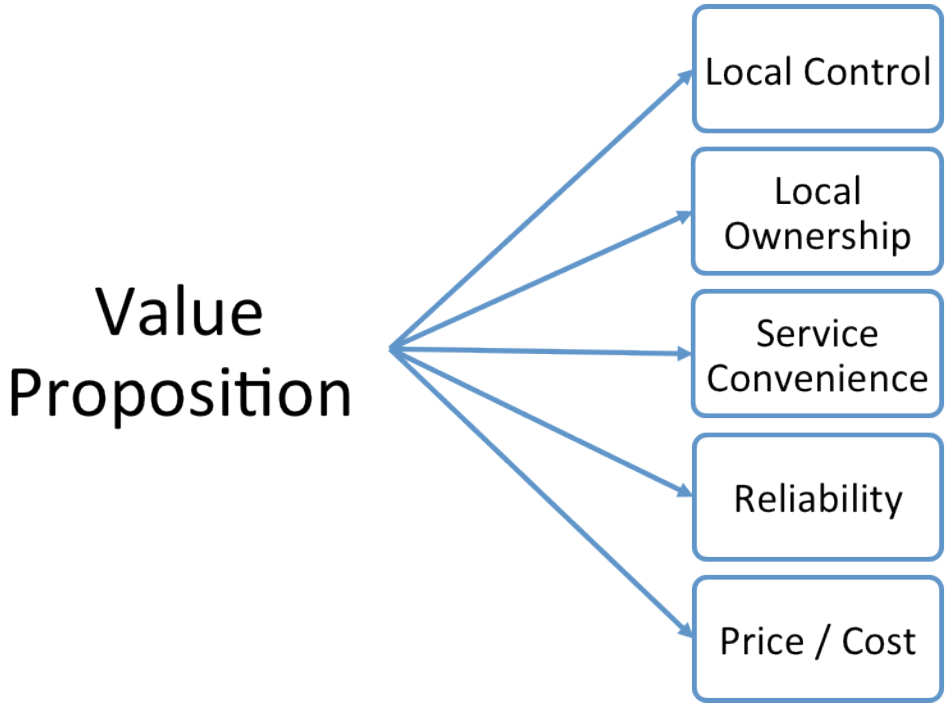


Figure 5 shows the public power business model. Here the value proposition is based on delivering tangible and intangible services to customers: lower rates, higher reliability, excellent customer service and the unique elements of local ownership and control. Excess revenues are returned to customers as lower rates, invested back into the utility for system improvements, contributed to reserve accounts for future needs or emergencies or transferred to the city general fund as payments in lieu of taxes or to cover the costs of shared services.

Figure 5: The Public Power Business Model



The future viability of public power's business model hinges on customer perception of the advantages of lower costs, higher reliability, and the intangible elements of local ownership and control. Customers will continue to appreciate the value of local public ownership of their electric utility only if utilities keep customers informed about these values. Absent a focused effort to communicate the value of public power, customers will be indifferent to the advantages they enjoy and risk appreciating that value only after those benefits disappear when the local utility is sold to an investor-owned utility.

Public Power's Business Model

Public power's business model has five components all of which currently face some risk or change in circumstance. Public power governing boards and executives need to be aware of the risks facing the

key business model components, take steps to protect these core principles and maximize their advantages. The components of the public power business model are:

- **Public Ownership** – owned by and operated for the citizens of the community it serves.
- **Local Control** – local, independent regulation and governance designed to best serve customers/owners and protect the long-term viability of the utility.
- **Low-cost Structure** – elements that contribute to public power's cost advantage in the market (tax-exempt financing, higher credit ratings, lower operating costs, nonprofit model).
- **Nonprofit Operations** – serves only the interest of customers, and therefore avoids the need to distribute profits and the conflict of serving two masters (stockholders and customers).
- **Customer-Focused** – dedicated to the singular mission of delivering the highest level of service and value to customers/owners for the long term.

Challenges to the Business Model -- and What to Do

While the public power business model has been in place and effective for more than 100 years, the evolution of the electric power industry poses both risks and challenges to that model. Examining the meaning of each component, the risks present now and in the future, and suggested responses should help public power governing bodies and executives develop corrective strategies where needed.

1. Public Ownership

Public ownership embraces the concept that the delivery of electric power is of such significance to a community that local government should provide these services on behalf and for the benefit of its citizens. Community ownership means citizen ownership, affording customers/owners the rights of access and participation. These advantages include: influencing the direction and operations of the utility directly or through their elected or appointed representatives, participation in the selection of these representatives, receiving information about how the utility is performing and the value customers and the community are receiving, and the knowledge that due to local ownership local people are hired to work in local jobs. In turn, portions of their salaries stay in the community and the advantages of public power may mean lower taxes and higher economic health and quality of life.

Another benefit of local ownership is the practice followed by most municipal utilities of making contributions to the local government general fund. These may be in the form of property-like taxes, payments in lieu of taxes, transfers to the general fund, and other contributions of free or reduced-cost services. Citizen/owners may not be aware of this practice, as the common perception is that IOUs pay taxes and local public power utilities do not.

This component contributes to the success of the public power business model only if customers are aware of public ownership and appreciate the tangible and intangible benefits they receive from it. If

customers are unaware of the value of electric utility ownership and the pride that may accompany it, they may not understand the difference in public versus private business models and will be less loyal and supportive of public ownership should a suggestion or offer be made to privatize the utility.

What To Do--It is incumbent on the utility governing body and its executives to assure citizens are aware of the nature and benefits of public ownership, to inform and involve customers in the utility decision-making process, and to report regularly on how their utility is performing and the value they receive from it.

Some years ago, a California public power utility conducted a customer satisfaction survey just as industry restructuring was introducing customer choice to electricity customers statewide. More than 40 percent of that utility's customers thought they were served by Pacific Gas & Electric, an IOU, instead of by a public power utility. Being anonymous to your customers is not an effective strategy for assuring they know the value of local ownership.

Serving Customers Outside Your Political Boundaries

Issues are arising concerning the many public power utilities that serve customers beyond the political boundaries of their municipality. These customers do not live in the city and therefore technically are not owners of the utility, but they pay electric rates that may include payments in lieu of taxes or other transfers that become part of the city's general fund. Some claim these customers are, in fact, contributing to the tax base of the city without the rights of citizenship.

What To Do--Figure 6 shows examples of accommodations some municipal utilities have made to customers outside their political boundaries. This information came from the 2010 APPA Governance Survey, which showed that 64 percent of the public power utilities surveyed served at least some customers outside their political jurisdiction.

Figure 6: Utilities that Serve Customers Outside Municipal Boundaries

Customer Size Class	Number that Serve Outside Boundaries	Governing Body Includes a Representative from Outside Municipality	Utility Makes Payments in Lieu of Taxes to Outside Jurisdictions
Less than 5,000 Customers	245	1%	8%
5,000 to 20,000 Customers	101	4%	16%
20,000 to 50,000 Customers	30	3%	43%
Greater than 50,000 Customers	17	12%	29%
TOTAL	**393**	**2%**	**14%**

Source: American Public Power Association, Governance Survey, August 2010.

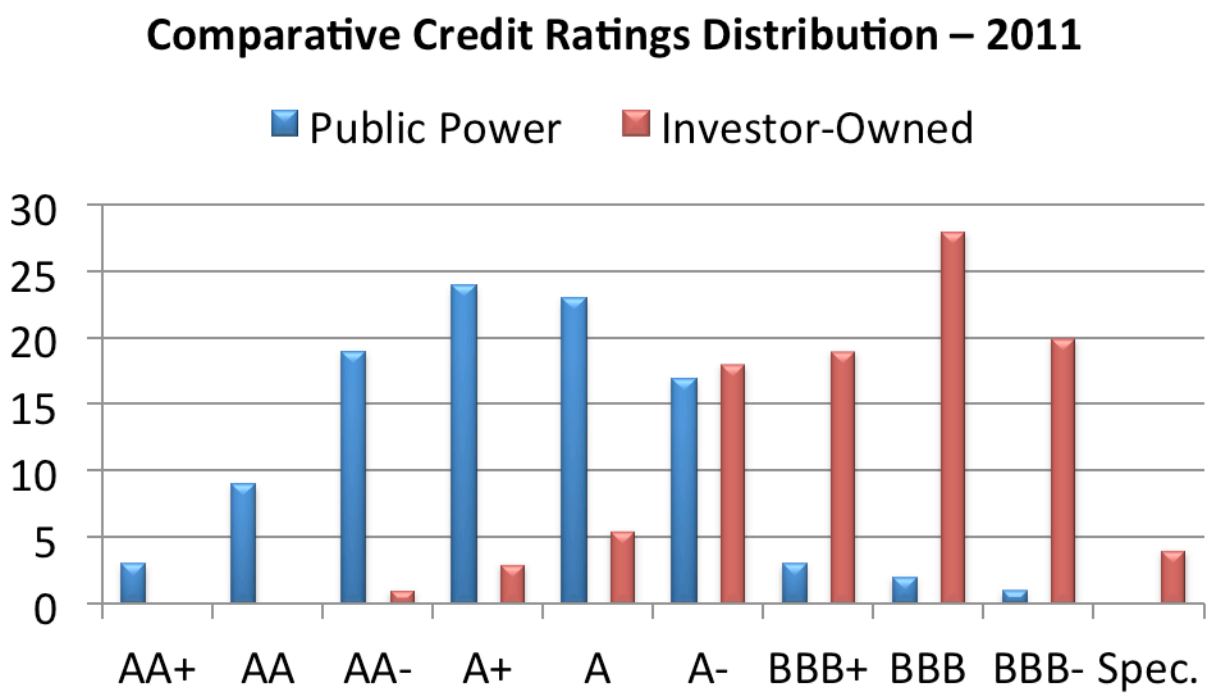
This may be a challenging issue for the governing bodies of the city/utility. In these situations, the utility's governing body may want to consider ways of involving these customers in utility activities.

Some public power utilities have made room on their governing boards for representatives of customers outside the city's political boundaries. Others have considered offering a partial return of these transfers to the cities or counties where these customers reside.

This issue seems to be a growing concern, particularly when a large percentage of customers are outside the city's political boundaries and the rates of the public power utility are not competitive with the neighboring utility. This issue should be addressed sooner rather than later, as these customers should be continually informed of the steps that are being taken to align rates more closely with those of potential competitors, to provide higher levels of service reliability, and by offering programs to help customers lower their bills, though conservation and efficiency, to help off-set the rate differential.

2. **Local Control--**Local control defines public power. It describes a system of governance, regulation and decision making that takes place closest to people who are served by the utility. In all but six states, governance and regulation of public power utilities are the responsibility of the local city council or an elected or appointed utility board. Decisions on setting rates, appropriating budgets, approving capital expenditures, establishing compensation systems, eminent domain, and hiring the chief executive are made by representatives of the people served by the utility. These important decisions are made in a setting that is local and open to participation, scrutiny and evaluation. This is quite different than the situation for IOUs, which are regulated by states, and whose strategic and operating decisions may be made in another state with little owner participation or oversight. Bond rating companies give public power utilities higher credit ratings than IOUs because local regulation is generally faster, more responsive to changing conditions, and more supportive of cost-recovery than the lengthy process IOUs experience before state commissions. See Figure 7.

Figure 7: Comparing Public Power and IOU Credit



Source: Standard & Poor's, 2012.

What to Do--Public power leaders need to ensure that the local decision-making process is open and its customers are informed about how they can participate in it. This transparency and responsiveness to changing financial needs give public power a credit advantage. Since decisions are made through the democratic process, citizens can be involved to the extent they desire. Ultimately actions should reflect the values of the community, whether they are to promote economic development, efficiency and conservation, environmental priorities or higher reliability.

Political Influence--Local control through the democratic process by nature suggests that political values may be involved in utility decision-making. This could mean that at times political interests may overrule sound business judgment concerning utility decisions. This political process is a natural element of local control. It may, however, place an added burden on members of city councils or utility boards to make decisions when the interests of the city and the utility seem to be at odds.

The current economy represents a particularly ripe climate for a conflict between the financial needs of the city and operational requirements of the public power utility. State and local governments are recovering much more slowly from the recent recession than other segments of the economy. While housing values may never return to their pre-2008 levels, unemployment is still high, and individuals and

corporations seem much more comfortable holding onto their assets than spending them. These factors, plus the pressures of unfunded pension liabilities, are squeezing local governments to their fiscal limits and forcing them to seek financial solutions that do not raise the tax burden on already stressed families and businesses.

Public power utilities often generate more revenues than the city's general fund, and therefore may become targets for local government funding problems. Payments in lieu of taxes, other transfers to the general fund, and utility payments for shared city services have become popular non-tax sources of revenue for financially troubled local governments.

What To Do--Public power policymakers must understand that for the utility, transferring an inappropriate amount of money to the general fund may mean lower utility reserve accounts, the need to increase rates, delays in funding capital projects or providing general maintenance, salary and hiring freezes, lower credit ratings, and more. Any and all of these actions could have the added impacts of lower reliability, degraded services, and less competitiveness when it comes to hiring and retaining key staff.

Utility governing bodies must understand their fiduciary responsibility to act in the long-term best interest of the utility and its customer/owners when considering decisions that could have negative long-term repercussions. These may be difficult decisions, but a reluctance to raise taxes or make cuts in general fund operations, and instead make up for shortfalls by transferring resources from the utility, may result in long-term damage to the enterprise activity and a violation of a policy official's fiduciary responsibility.

Staffing and Board Membership Challenges

These financial pressures and the growing complexity of the electricity business make serving on utility boards or city councils more difficult and time-consuming. Thus, finding individuals interested and qualified to serve on public power governing bodies is more challenging than ever. Some city council members, who also serve on utility governing boards, are finding it difficult to balance the demands of both. Some cities where the council also oversees utility policy are looking at the possibility of establishing independent utility boards, appointed by the mayor and council, that would be charged with the singular oversight of the complex planning and operations of the public power utility.

What To Do--Keeping up with new regulations and technology, assuring service reliability is maintained and utility operations are efficient are demanding jobs. If the utility has not kept up with market wages and benefits for the type of talented staff needed to run an effective electric utility, it will be difficult to hire individuals with the appropriate skills and talent. These are local decisions but they must be made in the context of national competitiveness and regional compensation requirements.

Local control is the key component of the public power business model. The fiduciary responsibility of public power policymakers to protect and enhance the asset they oversee must be clear and adhered to; the long-term implications of not investing in people and equipment risks the future viability of the public power business model.

3. Nonprofit Operation

The public power business model is based on the delivery of electricity on a not-for-profit basis. Corporate utilities are focused on keeping costs low in order to return a profit to shareholders. Public power utilities are focused on keeping costs competitive to assure customers have low-cost access to vital electricity service. But even nonprofit organizations must bring in more revenues than they pay out in expenses. In the public power business model, these surplus revenues are used to establish reserves for system improvements, for future capital requirements or emergencies, or to lower rates.

Payments in Lieu of Taxes

City councils in public power cities often look to payments in lieu of taxes, returns on investment, or other financial transfers from utility coffers to the general fund as a means of repaying the locality for the original risk it took in establishing the utility, as a replacement for what a taxable utility would pay, or as a means of paying for services shared by both the city and the utility. With lower, post-recession tax revenues and increasing pension liabilities, cities today are often seeking additional revenues to make up for these shortfalls, without raising taxes.

This problem may worsen considerably as credit rating companies and the Government Accounting Standards Board (GASB) are tightening rules about how cities report pension obligations. These changes could "triple the gap between what states and municipalities report they have in their funds and what they are promising to pay out to retirees."[2] Forty states are implementing these new rules, resulting in pension cuts for new hires and increased contributions from taxpayers and beneficiaries. These new rules also limit the rate of return that pension funds can assume for future investments (traditionally 7 to 8 percent). Privatizing municipal assets, severe cuts in staff and services, and municipal bankruptcy are just some of the actions likely to be considered once the implications of these changes are fully realized.

If city decision-makers look to their public power utility to solve some of these problems, public power governing bodies need to be aware of the impact that diverting excessive utility funds to city coffers can have. Electric rates may need to be increased, appropriations for maintaining the utility may slip, bond reserves could be endangered, compensation and benefits may not keep pace with the market and the utility could become financially unstable. And, the potential sale of the utility or other municipal assets could be a very shortsighted and financially inappropriate solution, except in only the most egregious situations.

When these conditions arise, appropriations often are diverted from system maintenance, then reliability and service suffer, rates may go up and the value of the utility as a community asset

[2] "New Rules Expose Huge Funding Gaps for Public Pensions," *The Washington Post*, August 17, 2012, page A12.)

decreases. These conditions can lead to significant customer dissatisfaction, loss of loyalty to the utility and the utility becoming a candidate for sale.

Tax-exempt financing is another area where the financial stability of the public power utility is critical. Credit ratings and bond covenants specify the amount of reserves and debt service coverage a utility needs to maintain. If revenues are too low or too much money is removed from utility coffers for city purposes, the utility risks a credit rating downgrade, significant capital cost increases or even default.

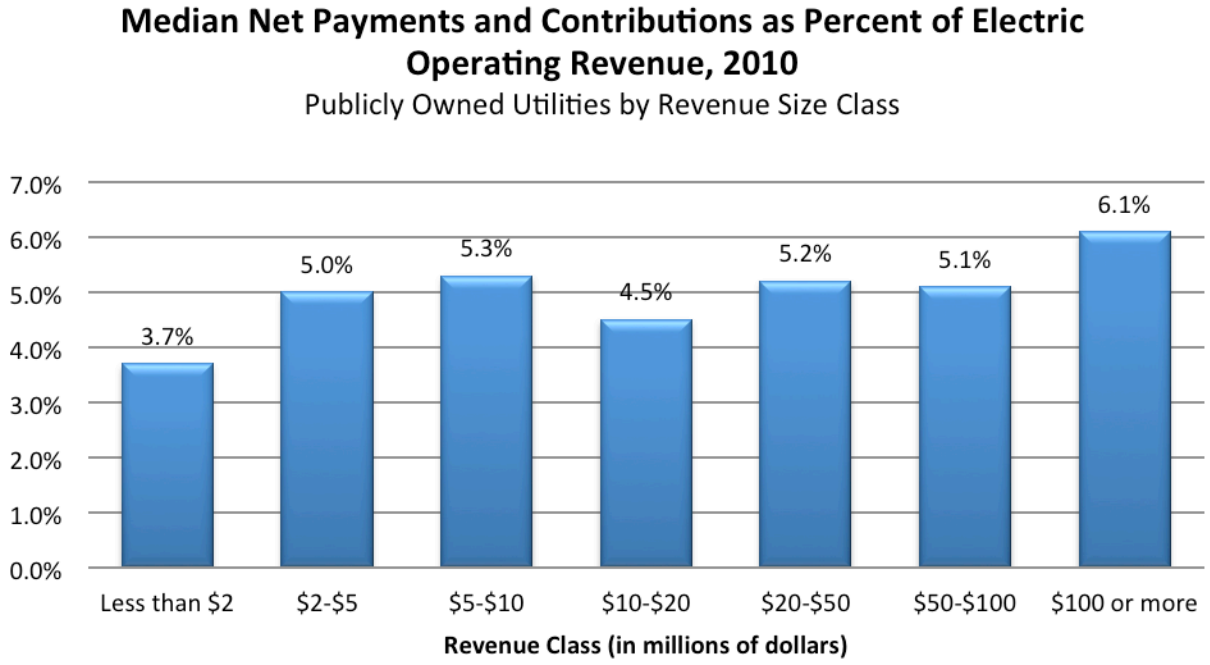
What To Do--While utility revenues (and sale of the asset itself) may seem attractive to city managers and city councils who find that tax revenues are not meeting general fund and pension requirements, policy officials also need to remember that just because there are excess utility revenues, a higher transfer to the general fund should not be automatic. And, the sale of assets should be considered only after conducting a comprehensive valuation of the public power utility, the citizen/owners have been well informed of the utility's value and tradeoffs of selling, and a referendum has been held, where a regular or super majority of all eligible voters/owners have approved the sale.

Utility transfers to the general fund should be recorded as expenses on the utility income statement, before any net utility revenue is determined. More importantly, transfers should be transparent and predictable; set by formula or a percentage or some other means that is stable and predictable. Rating companies generally are not concerned so much about the amount of the general fund transfer as long as it is set by formula and predictable and does not push rates into an uncompetitive position. When cities arbitrarily move utility funds to fill shortfalls or unexpected needs on the general fund side; credit ratings may suffer, capital costs can increase (as the utility's balance sheet and income statement are not viewed as stable), and the utility is viewed as less creditworthy.

For nonprofit utilities, an additional benefit of not having to provide a return on investment (ROI) to stockholders is the absence of pressure to make a profit. Energy conservation and efficiency measures may be the best strategy for a utility and its customers, as costly capital investments can be delayed, utility operations may have less environmental impact and customers can actually lower their energy bills. Without the conflict of serving both customers and shareholders, public power leaders can develop strategies where the not-for-profit component of the business model permits lower costs and less energy use to align without damage to the utility. A nonprofit business model means saving energy is just as, if not more, effective than spending money.

Figure 8 shows PILOT contributions by region, from a recent APPA survey, based on a percentage of gross electric operating revenues. While the amount of these transfers is a local policy decision, governing boards should be aware of the harmful impact of transfers that are too high.

Figure 8: Median Net Payments and Contributions to General Funds as Percentage of Electric Operating Revenues



Source: American Public Power Association, "Payments and Contributions by Public Power Distribution Systems to State and Local Governments, 2010 Data," February 2012.

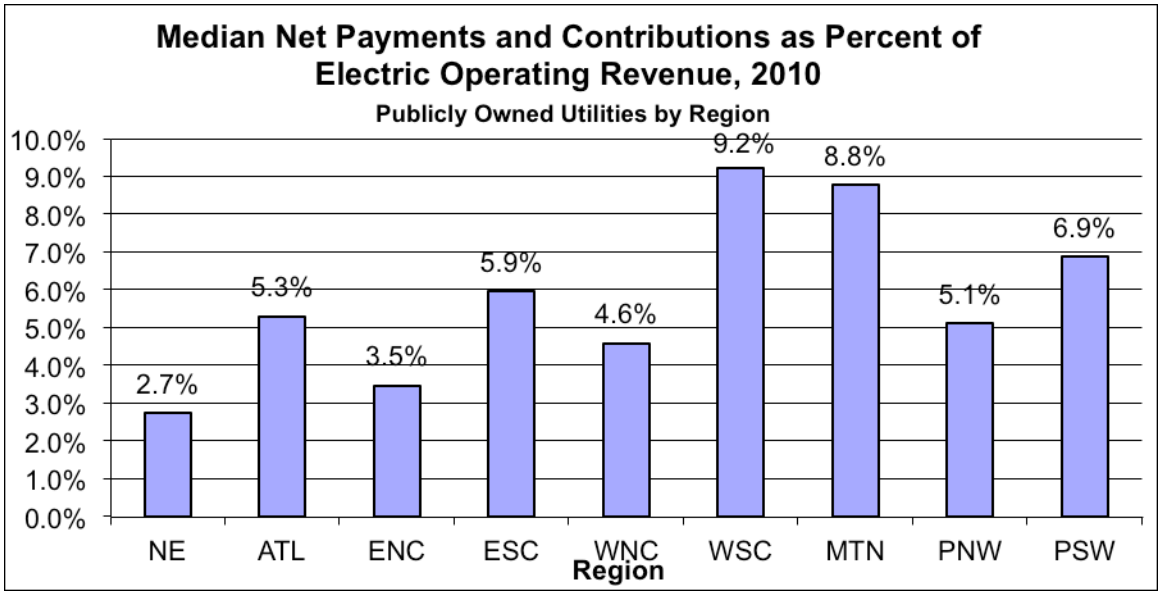
Figure 9 and Figure 10 depict median national comparisons between all public power utility payments in lieu of taxes and other contributions to their city's general fund versus the median of all state and city taxes paid by Investor-owned utilities. On average, nationally, public power utilities pay more tax equivalents than IOUs pay in actual taxes.

Figure 9: Public Power vs. IOU Tax and Tax Equivalent Payments

	Investor-Owned	**Publicly Owned**
Large Utilities (over $100 Million)	4.0 percent	6.1 percent
Small Utilities (under $100 Million)	3.2 percent	5.0 percent

Source: American Public Power Association, "Payments and Contributions by Public Power Distribution Systems to State and Local Governments, 2010 Data," February 2012.

Figure 10: Payments and Contributions by Region



Source: American Public Power Association, "Payments and Contributions by Public Power Distribution Systems to State and Local Governments, 2010 Data," February 2012.

Tax-Exempt Financing and the Power Marketing Administrations

The advantages of nonprofit utility operations face other major risks. The national debt has grown to such a high level that major changes will be needed to return our country to financial stability. Among the many suggestions for reducing this debt is doing away with tax-exempt financing.

Another issue deals with the federal power marketing administrations (Bonneville, Western Area, Southeastern and Southwestern power administrations) and recommendations by President Obama's National Commission on Fiscal Responsibility and Reform (the Simpson-Boles Commission) to privatize these agencies or raise their wholesale rates to market levels. Recent communications from U.S. Energy Secretary Steven Chu also suggest there will be continued attempts to change the traditional roles of these agencies, with the prospect of higher costs and fewer benefits to the many public power utilities that purchase wholesale power from federal power agencies.

What To Do--Should public power lose its ability to raise capital using tax-exempt financing, the costs of large projects could increase significantly. This would mean IOUs and public power utilities would have

approximately the same cost of capital[3] and public power customers would lose a significant cost advantage. It is unknown whether this will happen, and while public power has many allies who also support preservation of tax-exempt financing, public power leaders must make their congressional representatives aware of the impact this change would have on their constituents' energy costs; and reinforce the fact that raising electricity rates during a difficult economic time would make matters worse, not better.

These same actions are necessary with regard to the federal power agencies.

4. Low-cost Structure

Over the years, public power's most important and identifiable attribute has been its ability to deliver reliable electricity at lower costs than competitors. This differential is the result of a number of factors already discussed: lower-cost financing, access to federal hydro power, efficient operations, lower salaries, a priority on conservation and participation in joint action.

Figure 11 shows the rate differentials between public power utilities and investor-owned utilities from 1946 (when Public Power magazine first started publishing them) to 2010, the most recent figures available from the U.S. Energy Information Administration (EIA).

[3] An alternate consequence could occur where IOUs would actually have a lower cost of capital due to special tax rules like accelerated depreciation and production tax credits.

Figure 11: Rate Differential of Public Power vs. Investor-Owned Utility Rates, Average Revenue per kWh, in cents

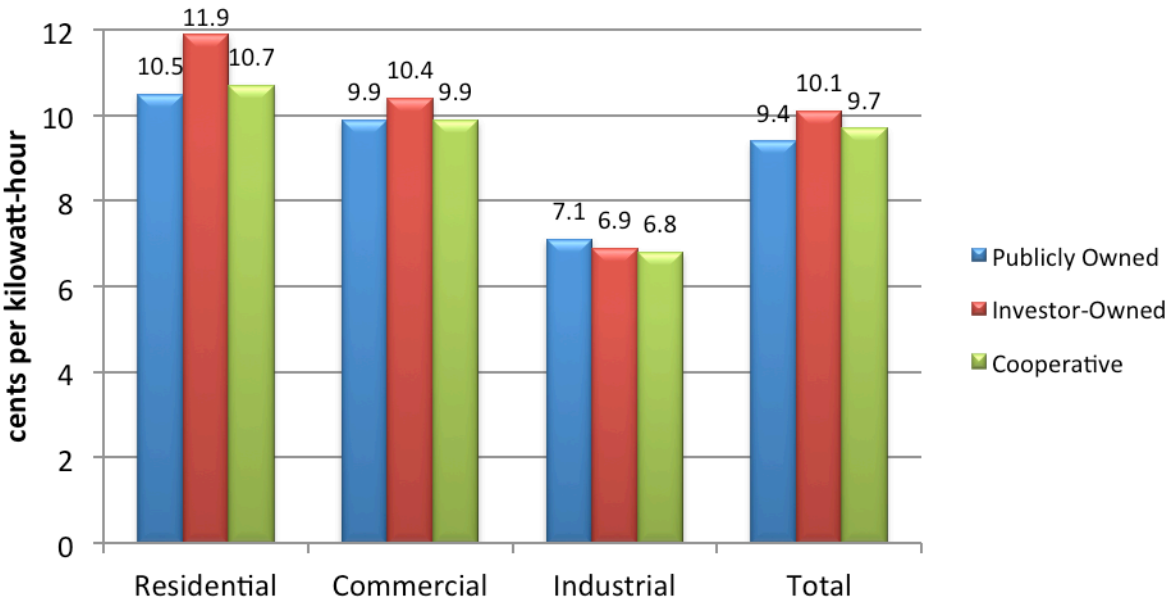
	Residential			Commercial/Industrial					
Year	Public Power	Investor Owned	% Higher IOU rate versus Public Power	Public Power		Investor Owned		% Higher IOU rate versus Public Power	
2010	10.5	11.9	13.3%	9.9	7.1	10.4	6.9	5.1%	-2.8%
2006	9.2	10.5	14.1%	8.5	6	9.3	5.9	9.4%	-1.7%
1996	6.7	8.9	32.8%	6.6	4.7	7.8	4.7	18.2%	0%
1986	5.8	7.8	34.%	6	4.5	7.4	5	23.3%	11.1%
1976	2.79	3.78	35.5%	2.38		2.82		18.5%	
1966	1.5	2.34	56.0%	1.16		1.37		18.1%	
1956	1.65	2.71	64.2%	1.18		1.43		21.2%	
1946	2.32	3.29	41.8%	1.29		1.5		16.3%	

* Commercial and Industrial rates were tracked together until 1986.

Source: 1986 – 2010: Energy Information Administration, U.S. Department of Energy. 1946-1980: Public – FPC, Statistics of Publicly Owned Electric Utilities; Private – FPC, Class A&B Private Electric Utilities.

Where the rate differential comparing public power to IOUs showed that IOU residential rates were between 30 and 60 percent higher than public power from 1946 to 1996, now the chart shows IOU and public power rates are significantly closer. See figure 12.

Figure 12: Retail Electric Rates 2010



Source: Energy Information Administration, U.S. Department of Energy, 2012 (2010 data).

For industrial customers, IOU rates were approximately 17 percent higher than public power between 1946 and 1986. The latest EIA figures show IOU industrial rates are now on average approximately 3 percent below public power rates. These figures also show that IOU commercial rates are roughly 5 percent higher than public power rates on average, nationwide.

What To Do--With the commercial sector still feeling the effects of the recession and four years of more than 8 percent unemployment nationally, electricity customers may be more open than ever to being seduced by offers of lower rates by IOUs and rural electric cooperatives.

Public power can no longer differentiate its value solely on the basis of lower rates. Customers need to know the additional reasons for owning a public power utility, the value of local ownership, be shown the financial impact of higher reliability and faster service, understand the economic value to their city of the multiple services that many public power utilities offer, and personally realize the difference in service provided by a locally owned utility versus that of an IOU. Customers also need to be offered ways to lower their bills to offset the impact of higher rates, even at a time of lower electric load growth.

Public power utilities must do all they can to assure an efficient, low-cost operation, but also deliver value in a variety of other ways that are meaningful to their customers.

Joint Action

Economies of scale are available for smaller public power utilities through affiliation with joint action agencies (JAAs) and sometimes state and regional associations. JAAs have traditionally served as vehicles to consolidate power purchasing, rate negotiation, and facilities construction of many smaller utilities into a larger unit, thereby leveraging their combined size to gain added market advantage. The growth of these activities and agencies should help keep power rates competitive and provide an avenue for offering advanced services through the economies of joint purchasing.

Figure 13 lists the numbers of public power utilities (approximately 1,300) affiliated with JAAs by size of utility. Figure 14 lists the number (approximately 700) of public power utilities by size, that are not affiliated with JAAs. The smaller utilities in this second group are particularly at risk of being unable to continue efficient, cost-effective operations because they do not have the economies of scale to permit them to compete in an increasingly complex, regulated, high-tech and changing industry.

Figure 13: Public Power Utilities that are Members of Joint Action Agencies

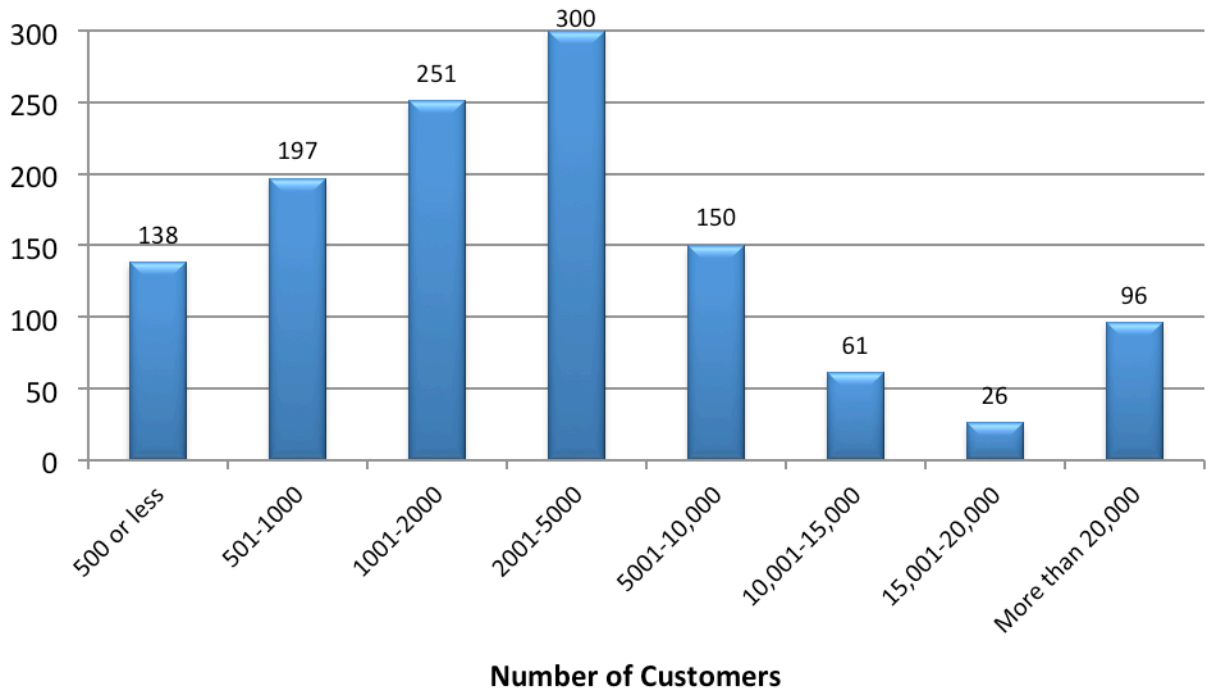
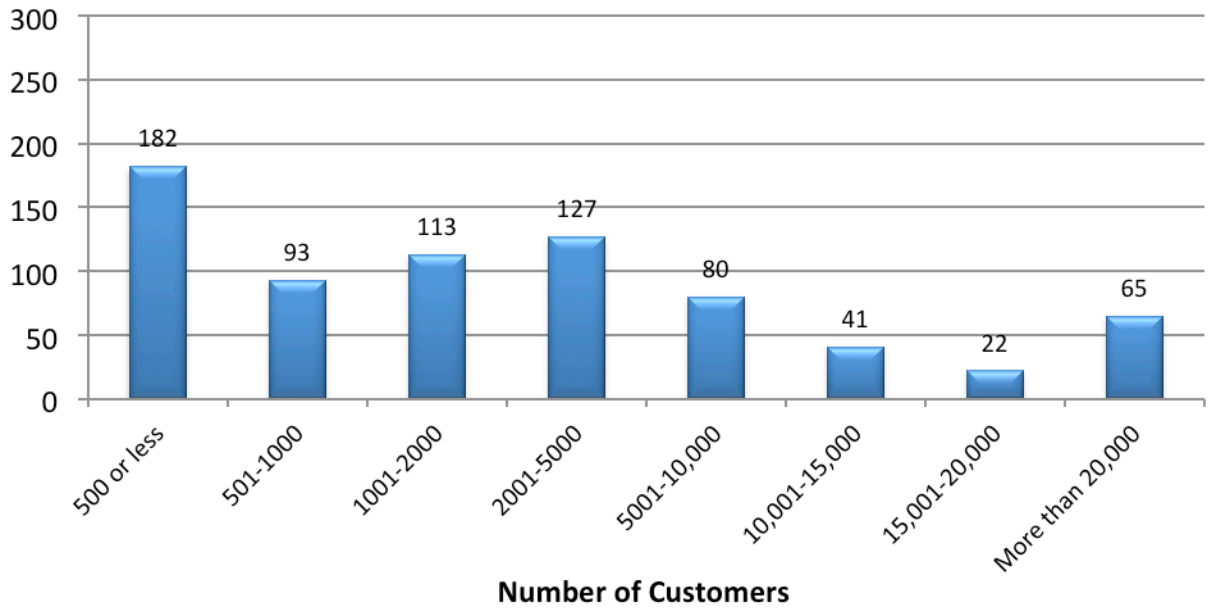


Figure 14: Public Power Utilities that are Not Members of Joint Action Agencies



What To Do--Joint action agencies may need to examine their original charter and purpose and broaden their mission to reach out to these smaller, non-affiliated public power utilities to offer services, management, power supply, operations and other programs that will preserve these small, at-risk utilities. It would be a significant blow to the public power movement if a large number of even these smaller utilities could no longer conduct business and therefore changed models and ownership.

Another approach to providing economies of scale to smaller utilities is being studied. Larger, well-run public power utilities are offering to lease and operate or purchase smaller systems on a friendly basis to maintain public ownership through a business model where separate utility operations and possible ownership are combined.

5. Customer-Focused

The cornerstone of the public power business model is its primary focus on the interests and needs of the customers and communities where they reside. Serving customer and community needs were the

reasons public power utilities were formed. Maximizing this service and the value of the public power utility as a community asset remains the business model's primary driver.

Excellent service is a perceived value calculation by customers combining the cost of a product or service, and the value or benefit received, plus other intangibles that come from conducting business with a particular organization.

While IOU rates are currently 13 percent higher than those of public power utilities on a national average basis, this difference has narrowed considerably over the past 20 years and may continue to do so. As indicated earlier, the national average of IOU and public power commercial rates are about even, and IOUs have a small advantage in industrial rates. If rates become too close to represent a differentiating factor, or public power rates are higher than IOU rates, public power utilities must deliver value to customers in other ways.

Public power has a well-earned reputation and is in fact envied by other industry segments for being close to its customers and providing excellent reliability. This attribute was evidenced the last few years when comparing service restoration following major storms on the East Coast.

However, customer satisfaction and meeting their demands for various services have become increasingly challenging. Some customers focus only on cost, desiring the lowest kilowatt-hour charge possible, and view electric service as a commodity with price the only consideration. Others are concerned about reliability and understand that superior reliability requires investments in distribution and operations, and exploring and implementing the latest technology, where appropriate. Still others want a balance between cost, reliability and added services: convenience, information and control (the ability to influence their own energy use, and make environmental and other choices about how electricity is generated).

What To Do--Public power governing bodies and executives need to do all they can to keep costs and rates as competitive as possible, assure resources are available to maintain high levels of reliability, and examine and invest in new technology that enhances customer convenience and control, and keeps up with competitors.

JD Power and Associates released a recent report on technology applications used during outages to reduce customer frustration and improve satisfaction. IOUs (FP&L, Entergy, Portland General Electric and Idaho Power) were listed as best in class for speed in locating the outage, ability to inform customers of the outage, its potential duration, tips on what to do, and notification and follow-up with each customer affected once power was restored. These technologies took time, money and skilled technical staff to install and operate, but resulted in both a more organized response by the utilities and considerably higher customer satisfaction during a difficult period.

To retain its customer service advantage, public power needs to meet and exceed these newly raised bars of service delivery.

Land mines

As has been stressed throughout this report, the historical public power business model faces many challenges, but if governing bodies and executives understand the underlying philosophy and application of the five business model components, and maximize their implementation, the public power business model should remain strong and provide just as significant an advantage to its communities as it has done for the past 100 years.

A public power utility is a long-term investment in the prosperity and health of a community and its electricity customers. The utility provides an opportunity for public participation in some of the most important decisions communities face: Where will residents get their energy? How much will it cost? How reliable it will be? What technologies will be used? What other services can the utility offer? What impact will the utility have on the environment, now and in the future?

A community-owned electric utility can distinguish a city as a place where energy costs and taxes are lower, business is healthy, customers choose the direction of energy use and savings and the citizens are more united and participatory in the effectiveness and success of their local government. These qualities are not achieved without civic understanding, hard work, and time commitments by governing bodies, staff and citizens participating in the democratic process that is necessary for public power to be successful.

There are, however, significant risks ahead for public power: landmines that public power leaders must identify and address if our segment of the industry is to be successful for the next 100 years.

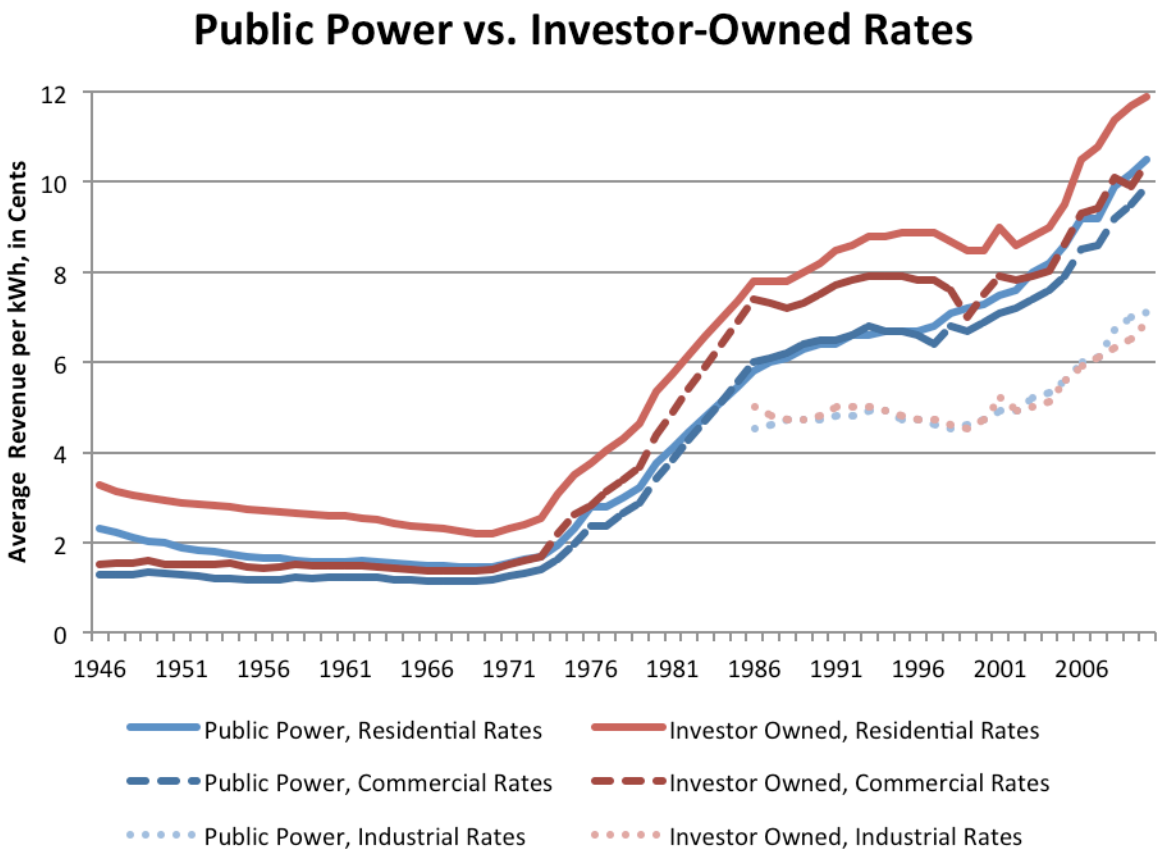
Here are the risks that seem most important to address if public power's business model is to continue to be successful in the near and long term.

- **Financial pressures on local governments** will continue to press policymakers to make enterprise transfers and asset sales, instead of service cuts and tax increases when dealing with revenue shortfall and underfunded pensions, as a means of survival.
- **The skills and knowledge of local government policymakers** who do not fully honor their fiduciary duties to the enterprise activities of local government and fail to make sound business decisions, place upward pressure on rates by making transfers to the general fund that are inappropriately high, do not maintain adequate reserves and investments in system operations, fall behind on new customer service and reliability technology, and fail to convey the nature and value of public ownership to customer/owners.
- **Loss of rate competitiveness** -- as the once substantial rate differential narrows between public power and IOUs and rural electric cooperatives, and in some communities disappears; or public power rates inch higher than IOUs (as is true in several states and regions already), public power will have to find new ways to be competitive and/or offer new and enhanced services that assure a substantial value proposition to customers.
- **The challenges of economies of scale**--Joint action agencies, potentially with the assistance of Hometown Connections, will likely need to offer expanded services, beyond power supply and other traditional services, to assure their members keep reliability high, meet growing compliance requirements, and are competitive in their service offerings. The 700 public power

utilities not affiliated with joint action agencies will need to consider consolidation and other options. Joint action agencies must reach out and find new ways to service this at-risk group.

- **Demands for new services, high technology** will be made by some commercial and industrial customers, who will turn to non-utility power providers if public power cannot offer sufficiently high reliability, cost-saving options (such as demand response), and increased information and control of their energy use. For those residential customers who also seek greater energy information and control, and other options, public power may well fall behind the telecom, cable and computer companies, and other third parties, if their high-tech needs are not met.
- **The work force crisis** will finally hit public power due to job and pay freezes at the local government level, new demands for high-tech employees and public power corporate cultures that in some cases are not welcoming to women, minorities, retirees and others.
- **New rules, regulations, standards and other requirements** – Many regulatory factors pose threats to public power's competitive standing in the electric utility market. These include cyber security, reliability, environmental regulations, federal legislation that disadvantages public power, new pension and accounting requirements, tighter standards from rating agencies, limited hedging opportunities, cost issues and asset ownership in organized markets. Any one or more of these challenges could do significant damage to public power's competitive standing in the electricity market of the future.

Figure 15: Public Power vs. Investor-Owned Rates Over Time



Attachment B

American Public Power Association

FACT SHEET August 2011

The Importance of Preserving Tax-Exempt Financing to Customers of Public Power Utilities

Background

In 1895, the Supreme Court decided that the federal government could not tax interest on municipal bonds under the U.S. Constitution. The Supreme Court later ruled, in 1988, that subsequent cases had proven that the federal government could, in fact, tax interest on municipal bonds, if it desired. This underlying "federalism" principle embodied in the original 1895 court case is based in the idea that one level of government should not tax another. For example, state and local governments do not assess property taxes on all the federal property within their jurisdictions. Upsetting the "federalism balance" could lead to unintended consequences, which is why, despite the 1988 Supreme Court ruling, the federal government has continued to give municipal governments the freedom to issue tax-exempt financing. **Any repeal of tax-exempt financing would be a direct tax on customers of public power electric utilities and state and local tax-payers, and would result in decreased job creation.**

Benefits of Tax-Exempt Financing

- Results in lower capital costs to public power utilities, which they can then pass along to electricity customers. In addition, tax-exempt bonds result in lower taxes and user fees for states, counties and cities overall—resulting in a lower cost burden for communities. Given the lower cost burden, community services are less likely to be interrupted due to budgetary constraints.
- Creates an economic incentive for government units and public power utilities to continue to make timely investments in infrastructure, thereby keeping the community safe, and keeping electricity distribution efficient.
- Allows government units and public power utilities' consistent access to a financing tool instead of having to rely on the annual federal appropriations process.
- The legal and regulatory process for tax-exempt bonds is well established, and ensures that states and localities cannot abuse the tax-exemption.
- Provides a natural project viability test. If issuers cannot convince investors of viability, projects are unable to move forward.
- Efficient way for the federal government to provide assistance to states, counties and cities while still leaving the decision-making and project details to local governments.

Payments in Lieu of Taxes

It is a common misconception that because public power utilities do not pay taxes, they do not provide as much financial benefit to their communities as do investor-owned utilities (IOUs). To the contrary, public power utilities make property-like tax payments, payments in lieu of taxes and transfers to cities' general funds, which often result in greater payments than those made by IOUs. For example, for fiscal year 2008, the American Public Power Asoosication (APPA) calculated the net payments and contributions of 340 public power utilities to their communities. The median amount of these payments was 4.7 percent of electric operating revenues, while IOUs paid a median of 3.7 percent of electric operating revenues in taxes and fees to state and local governments.

Is Shale Gas Shallow or the Real Deal?

The de facto U.S. energy policy is to burn more gas, much of it produced using "fracking" technology. Huge volumes of low-priced natural gas have caused coal plant shutdowns, slowed renewable development, and undercut new nuclear plant development. Using more gas has also sent the nation's carbon dioxide emissions into a downward spiral. Is the glut of natural gas too good to be true?

By Kennedy Maize

Now that an abundance of natural gas has become a seeming fact of everyday life, it's time for the contrarian view to appear. Is the optimism over shale gas cockeyed and bound for a crash? Or is the methane ebullience an accurate reflection of new energy realities? There are no simple answers.

Recently, an arcane dispute among geologists became public, revealing an important rift over views about the future of natural gas. The geological flap raises questions about just how durable the shale gas boom will be and whether a long regime of low-cost gas can continue to fuel a dash to gas among electric generators that is clobbering coal, wrecking renewables, and negating the long-awaited nuclear renaissance. Unlike the earlier disputes over environmental issues related to hydraulic fracturing or "fracking," which largely proved marginal and manageable, the current kerfuffle is over the performance of the wells themselves in delivering natural gas. Experienced geologists are wrangling over the rate at which wells in shale formations, created by horizontal drilling and fracking the gas-rich strata, run out of methane.

Some experts argue that shale gas wells decline rapidly, producing copious amounts of natural gas early and then quickly drying out, suggesting that the current glut of gas will decline just as steeply as it rose (Figure 1). Others respond that shale gas wells' decline rates are nothing special and that fears of the gas running out are overblown. There is so much gas available, they argue, and the horizontal wells deliver for so long, that low-cost fossil fuel is guaranteed far into the future.

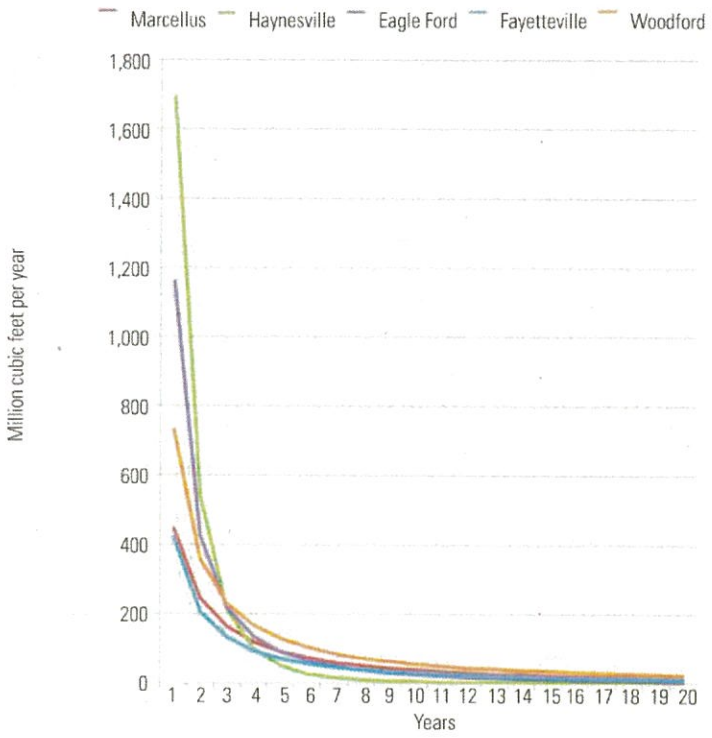
Gas Skeptic

One major voice on the skeptical side of the emerging debate is that of Arthur Berman, a Houston-based petroleum geologist who is also a leading figure in the "Peak Oil" posse, a group of analysts who argue the U.S. has reached the bottom of its crude oil bucket and the rest of the world will soon follow. Berman writes frequently for "The Oil Drum," a leading peak oil publication. Looking at U.S. shale gas, Berman says he sees a precipitous production decline coming as the need to drill new gas wells to replace rapidly declining production vastly outpaces the capacity of industry to deploy the rigs needed to drill.

In an interview with *POWER*, Berman argued that the boom in drilling shale gas wells has obscured a long-term decline in conventional gas supply. But a coming rapid decline in shale production, he said, will soon reveal the overall limits to the gas boom, and volatility and upward pressure could return to natural gas prices. "It's not a problem for today or tomorrow," Berman said, "but it is coming. Once we work through the current oversupply, if capital is not forthcoming," prices will spike. The gas supply bubble will burst.

Because of the current gas glut, with long prices in the range of $3 per million cubic feet (mcf), drilling shale gas wells has tanked, noted Berman. Chesapeake Energy, the most bullish of the shale gas players, is selling assets and shifting rigs to drilling for oil because the company just can't make money on $3 gas. "I can see a time not too many months away when we could see gas supply in rather serious decline," Ber-

1. Steep well decline rates. Average production profiles for shale gas wells in major U.S. shale plays by years of operation. *Source: Fig 54 EIA Annual Energy Outlook 2012, released June 25, 2012*



man said, noting that "there is plenty of gas, but it takes a long time to shift momentum back" to gas drilling. At a 2010 meeting in Washington, as low gas prices were resulting in a decline in new drilling, Berman commented, "Shale plays are marginally commercial at best."

Greatly complicating the supply equation, said Berman, is the nature of shale gas wells. "Shale wells decline 30 to 40% per year," he said. "Conventional wells decline 20 to 25%. What most don't grasp is how many wells it takes just to keep supply flat."

In the Barnett Shale in Texas, where Berman is most familiar with the geology, he calculates that the annual decline in the gas resource is 1.7 bcf/day. In order to add to the net Barnett production, Berman says, companies would have to drill 3,880 wells, at a cost of $12 billion.

"We are setting ourselves up for a potential reduction in supply and price will go up," said Berman. "I don't know how much it will go up, and there is a check-and-balance with coal. There will be gas-coal switching if prices do go much higher than now."

Meet Dr. Marcellus

Nobody knows the Marcellus Shale—potentially the second-largest natural gas field in the world—better than Terry Engelder (Figure 2). The energetic Penn State geology professor has been studying the massive black shale formation that stretches across Appalachia for 35 years.

2. Terry Engelder. *Courtesy: Department of Geosciences, Penn State*

As a young structural geologist (Texas A&M PhD '73) working at Columbia University's Lamont-Doherty Geological Observatory in New York in the mid-1970s, Engelder came to the attention of the U.S. Nuclear Regulatory Commission (NRC). The nuclear agency was looking at earthquake risks at U.S. atomic power plants. With an NRC grant in hand, Engelder began studying earth stresses and fracture development in rock strata in the Mid-Atlantic region.

In 1978, Engelder recalled in an interview with *POWER*, he organized a field expedition to the Indian Point reactor site, some 40 miles north of New York City on the Hudson River. "Among the rock units we studied were the black shales of the Appalachian basin," he said, "because they were so beautifully fractured." In the mid-1980s, having returned to his undergraduate alma mater, Penn State (BS '68), Engelder began detailed examinations of Devonian shales, publishing a number of important papers on stresses and fractures in shale formations, including natural hydraulic fractures.

In the 1990s, Engelder said, he realized that the natural fractures he was seeing in the dense Devonian black shales (Figure 3) were driven by very high pressures from methane during the formation of the sedimentary rocks. "That's what makes the Marcellus what it is," he said. Engelder added that he soon was following what petroleum pioneer George Mitchell was doing in the Barnett Shale in Texas. Engelder also followed the work of Range Resources, a Texas oil and gas company with Pennsylvania connections, which drilled its first Marcellus well in 2004. By 2007, Range Resources combined two known technologies, hydraulic fracturing and horizontal drilling, in the Marcellus and got results that tracked what Devon Energy, which had acquired George Mitchell's company, was getting in the Barnett formation in Texas.

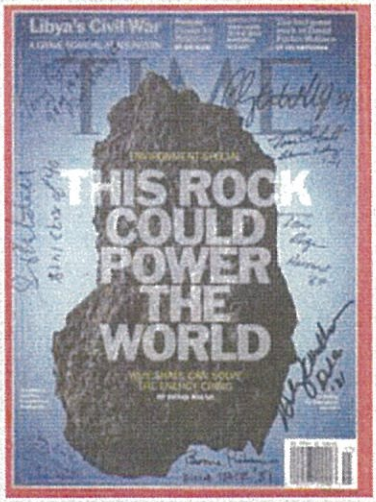
"In the fall of 2007," Engelder recalled, "I asked myself, Just how much gas is there, anyway?" He worked with Gary Lash, then a geoscientist at the State University of New York Fredonia and now at Lehigh University, to make the first estimate of the gas resources in the Marcellus Shale. "It was almost an out-of-body experience to realize that there may be something here that was a real game changer in terms of America's energy portfolio," Engelder told the *Pittsburgh Post-Gazette* in an article last year.

In January 2008, Penn State put out a press release disclosing the estimates of Engelder and Lash. The numbers were mind-boggling: conservatively at 168 trillion cubic feet (tcf) and optimistically as high as 516 tcf. The U.S. could recover 50 tcf a year from just the Marcellus formation, compared to total U.S. gas production of 30 tcf.

The shale gas boom was on. A sign of how the shale revolution gripped the U.S. was the April 11, 2011, cover of *Time* magazine, featuring a photo of a shard of Marcellus shale and a headline reading "This Rock Could Power the World." One of Terry Engelder's prized possessions is a copy of that issue, with the cover autographed by some of the giants in the shale gas boom (Figure 4). In its December 2011 issue, *Foreign Policy* magazine named Engelder, Lash, and Mitchell among its "top 100 global thinkers." The citation read, "For upending the geopolitics of energy."

3. Broken shale. Shale is cracked using principally water plus chemicals and additives to release trapped natural gas. *Courtesy: Terry Engelder*

4. Shale gas giants. Signatures, clockwise from top left: Terry Engelder, former Texas Gov. Clayton Williams, current Pennsylvania Gov. Tom Corbett, former Pennsylvania Gov. Tom Ridge, Chesapeake Energy executive Aubrey McClendon, natural gas guru T. Boone Pickens, geologist Gary Lash, fracking pioneer George Mitchell. *Courtesy: Terry Engelder*



Bullish on Gas

But Penn State geologist Terry Engelder, the major domo of Marcellus Shale (see sidebar), doesn't share Berman's pessimism about gas supply and prices, or Berman's assessment of the production decline of shale gas wells. "All wells decline," Engelder said in an interview. "What distinguishes shale wells from conventional reservoirs is the percentage of gas delivered over a long period of time." Shale wells, Engelder said, start producing at very high volumes, decrease considerably during the first year, but continue producing much longer than conventional gas wells, because the tight rock formations slow the release of the gas.

With shale gas, Engelder said, "You have a steeper decline curve initially, but a much longer period of production." That's a function of the tight shale reservoirs, "with inherent low permeability," he said. "The gas takes longer to get" to the well head "but remains economic over a longer period of time."

Here is where it can get pretty wonky. Engelder notes that the dispute with Berman and others in his camp who say shale wells decline too rapidly is a matter of hyperbolic production curves versus exponential curves. Engelder is in the hyperbolic school and Berman is one of the exponential advocates. If a well's decline is hyperbolic, Engelder explained, you get a decreasing rate of decline year after year. The best data for eastern shale wells available, he said, shows a general hyperbolic decline over a 40-year period, versus a 25-year lifespan for conventional gas wells.

The advocates of exponential decline—including Berman and retired Canadian geologist J. David Hughes—argue that shale wells decline quickly after their initial high production, then level out quickly. Hughes puts the issue in the classic terms of resource depletion that environmentalists frequently use: "[O]il and gas are finite resources that are being consumed at unprecedented and growing rates," and "the U.S. is the worst offender and is highly vulnerable to future energy price and supply shocks."

The shape of the decline curve for horizontal gas wells can be very important for the economics of the well, notes an article ("Debate Over Shale Gas Decline Flares Up") in the Oct. 10, 2010, *Financial Times:* "[I]f the pessimists/exponentials are right, then the ultimately recovered gas reserves from, say, the Haynesville deposits in Louisiana and Texas could be closer to 2 billion cubic feet (bcf) for the average well, rather than the 6 bcf some operators project." This implies a market price two or three times the current level in order for producers to see a profit.

Balancing Opinions

Could Berman and Engelder both be right? "Art Berman and I agree on a lot," Engelder told *POWER*. "Where we get into a difference of opinion is whether horizontal wells convert from hyperbolic to exponential. When that happens, you would get the same decline rate year after year, and the well would drain more rapidly." The physical reason for hyperbolic decline, said Engelder, is that the wells do not interfere with each other, so the impermeability of the shale formations governs the decline rate. When the drainage area of the well reaches out to adjacent wells, and the well is not just draining virgin territory, he said, the decline rate might switch to exponential.

The dispute . . . is a matter of hyperbolic production curves versus exponential curves.

That's not in the future for most of the giant black shale Marcellus formation, Engelder says. Drillers in the Mid-Atlantic region are well positioned to ramp up production rapidly and cheaply should natural gas prices go up even slightly. In Pennsylvania alone, says Engelder, more than a thousand wells have been drilled but not put into production. Of the wells in production, many are on drilling pads designed for six to eight wells each, but only two or three are producing. With this infrastructure in place, "it only takes a day or two to start drilling again."

So Engelder sees little chance of the kind of price spikes that characterized the bursting of the conventional gas bubble of the 1980s and 1990s. "The reality is that the supply of gas in North America is so large it will take years for the price to recover," he said. Producers and consumers both want stability, although consumers prefer lower prices and the industry higher. Engelder says the industry can live with $4 gas, while many are losing money or shutting in production at $3/mcf.

Today, Engelder and the optimists appear to be winning the argument over the future role of shale gas. Berman, Hughes, and the pessimists are a distinct minority among geologists. Skip Horvath, who for many years has run the Natural Gas Supply Association, representing the largest gas producers in Washington, says, "Art Berman clearly has the best intentions. He's just out of step with the rest of the geological community." (Read "Meet the Man the Shale Gas Industry Hates" at http://tinyurl.com/Art-Berman.)

Engelder is even more charitable. "Berman is not beloved by industry," he says, "but he has things well worth thinking about in evaluating shale gas."

Ultimately, the questions about shale gas supply and demand offer a good illustration of the basics of mineral resources economics, notes British science writer Matt Ridley in a paper titled "The Shale Gas Shock" (www.marcellus.psu.edu/resources/PDFs/shalegas_GWPF.pdf). Taking square aim at Berman and his concern about investors losing money on shale gas plays, Ridley comments: "It is quite possible that investment in shale gas firms will indeed prove risky as their very success drives gas prices down. But that will only happen if volumes of gas produced are high; and it does not mean that exploration and drilling will cease, for if they did, prices would rise again and exploitation would resume. After all, this has been the experience of the coal industry, the oil industry, and many other industries throughout history: success drives down prices, leading to business failures, but over the long term this does not prevent continuing expansion of production because low prices stimulate expanding consumption."

New World Order

Devonian shale, and its now-accessible supplies of natural gas and crude oil, has been a revolutionary force in the U.S., and one that may be duplicated in Europe. While other factors—a slowly growing U.S. economy and a plethora of new Environmental Protection Agency rules regulating coal generation are two—are contributors, cheap methane is driving fundamental changes in the way America uses energy. The U.S. carbon footprint is making a smaller impact on the global environment, while bigger feet in China, India, and even Europe have emerged. Gas is pushing out coal, nuclear, and solar and wind power, purely on the basis of the cost of generating electricity. U.S. oil imports have declined substantially. The U.S. may soon be exporting significant amounts of natural gas to consumers in Europe and Japan.

Wall Street Journal columnist John Bussey wrote in the Sept. 20 edition, "During America's Age of Imperialism, Henry Cabot Lodge famously said that 'commerce follows the flag.' Send over U.S. gunships, and U.S. business will be right behind. These days it may be the reverse. America's shale oil and gas revolution—one of the biggest commercial bonanzas in generations—is itself shaking up the world order. As oil and gas flood into U.S. pipelines, relationships that defined how energy moved around the globe are shifting. How far that will go is open to debate." ■

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