TESTIMONY OF
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BEFORE THE
SUBCOMMITTEE ON WATER AND WILDLIFE
OF THE
SENATE COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS
ON
EPA'S ROLE IN PROMOTING WATER USE EFFICIENCY

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Mr. Chairman, Ranking Member and Members of this Subcommittee, I am G. Tracy Mehan, III, formerly Assistant Administrator for Water at the United States Environmental Protection Agency (EPA). I am presently a Principal with The Cadmus Group, Inc., an employee-owned environmental consulting firm.

I am testifying today in my individual capacity, and my views expressed here today are entirely my own and not those of my company, its clients or the EPA.

Good morning and thank you for the opportunity to discuss EPA's role in promoting water use efficiency.

In discussing public policy relating to water efficiency and conservation, we do well to recall the great Scottish economist, Adam Smith, who described the paradox of diamonds and water, in his classic book, *An Inquiry into the Nature and Causes of the Wealth of Nations* (1776) published the same year as the signing of America's Declaration of Independence:

> Nothing is more useful than water; but it will purchase scarce anything; scarce anything can be had in exchange for it. A diamond, on the contrary, has scarce any value in use; but a very great quantity of other goods may frequently be had in exchange for it.[2]

Thus, diamonds, which are for mere adornment, are valued more highly than water, which is essential for life on this planet. It is this paradox which we need to address in considering the range of policy options for better stewardship of our nation's water resources.

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[2] See Book 1, Chapter 4, paragraph 13, "Of the Origin and Use of Money."

My basic message today is that any research agenda for water efficiency and conservation would be enhanced by a focus on the *economics of water rates, pricing and their impacts on water use or consumption.* There are many ways to reduce water use or use it more efficiently. You can invest in sophisticated technologies or you can simply take a shorter shower, but you must have an incentive to do so. Effective pricing strategies can be a useful demand management technique, subject to many variables and issues which I will address in my testimony today. Well-designed water rates can provide the incentive for greater water efficiency and conservation.

EPA, water efficiency and infrastructure finance

In 2003 EPA's Office of Water released its Four Pillars of Sustainable Infrastructure which included better management (e.g., asset management, EMSs), full-cost pricing, efficient water use and the watershed approach.

This quartet was primarily driven by the Office's desire to identify cost-effective means of addressing America's infrastructure investment needs over time in order "to reduce the potential gap between funding needs and spending at the local and national level."[3] Saving water, or using it more efficiently, can avoid or defer major capital expenditures for a water utility. Certainly, protecting water resources and aquatic habitat for both human health and wildlife were important considerations, but the focus was primarily on sustainable infrastructure financing.

This is important to recall because the last thing the agency wanted was to become embroiled in arguments over state and federal roles relating to water supply and allocation. The Office of Water tethered its interest in water efficiency and conservation to water and wastewater utilities specifically, a sector very much a part of its statutory mandates.

Since that time the prevailing view of a truly sustainable water system or utility has expanded throughout the industry and EPA, going far beyond the Four Pillars of Sustainable Infrastructure. For instance, energy management is now a crucial issue, including the nexus between water and energy efficiency. I once referred to this as the Fifth Pillar.[4]

EPA's Office of Water, in collaboration with industry and professional associations, has now, quite properly, expanded its view of sustainable infrastructure to the "Ten Attributes of Effectively Managed Water Sector Utilities"[5] which comprise a framework

[3] See EPA's website on Sustainable Infrastructure for Water and Wastewater at http://www.epa.gov/waterinfrastructure/basicinformation.html.
[4] G. Tracy Mehan, III, "Energy Management: The Fifth Pillar of Sustainable Infrastructure?" Water Environment & Technology, August 2007, p. 10.
[5] See the document issued by EPA in collaboration with AMWA, APWA, NACWA, NAWC and WEF entitled, *Effective Utility Management: A Primer for Water and Wastewater Utilities* (June 2008), pp. 3-5.

encompassing operations, infrastructure, customer satisfaction, community welfare, natural resources stewardship and financial performance.

Returning to the matter of water efficiency and conservation, EPA's promotion of the new not-for-profit, the Alliance for Water Efficiency[6], based in Chicago and the development of its expanding WaterSense[7] initiative can trace their origins back to the Four Pillars of Sustainable Infrastructure.

I would like to discuss an area for further research and study which might otherwise escape the Subcommittee's attention given that it does not relate to technology or engineering.

I believe that further research in *economics and other social sciences* will shed more light on drivers or incentives for water use efficiency, thereby encouraging the adoption of both low-tech and high-tech approaches, by individuals, households, businesses and water utilities.

At the most basic level, the impetus for water efficiency and conservation comes from either scarcity of supply in the real world or pricing structures which do more than simply recover infrastructure investments, replacement costs and ongoing operations and maintenance (O&M). Full-cost or cost-recovery pricing can be viewed as complementary to conservation or demand-side pricing.

Scarcity is usually experienced as a human need. However, ecological functions might suffer while human needs are being satisfied through unsustainable water management in any given watershed or basin. Thus, conservation or demand-management pricing can serve to encourage better stewardship in such cases where basic drinking water and economic demands are being met.

However, many water managers view water management "as an engineering problem, rather than an economic one."[8] They tend to resort to non-price options to reduce water use rather than price increases. This professional preference may also contribute to the challenge of establishing adequate rate structures to allow both for financial sustainability and efficient or reduced use of water. In truth, both approaches are necessary.

One barrier to conservation pricing is the fact that the United States water sector has not optimized or attained full-cost pricing for purposes of basic infrastructure support, including replacement costs and O&M.

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[6] www.allianceforwaterefficiency.org

[7] http://www.epa.gov/WaterSense

[8] Sheila M. Olmstead and Robert N. Stavins, "Managing Water Demand: Price v. Non-Price Conservation Programs." White Paper No. 39 (Pioneer Institute, July 2007), p.4

An August 2002 General Accountability Office (GAO) report[9] on its survey of several thousand drinking water and wastewater utilities indicated that 29 percent and 41 percent, respectively, were not generating enough revenue from user rates and other local revenue sources to cover their full cost of service. Roughly one-third of the utilities deferred maintenance because of insufficient funding, had 20 percent or more of their pipelines nearing the end of their useful life, and lacked the basic plans for managing their capital assets.

During my tenure as Assistant Administrator for Water at EPA, we calculated that American households spent an average of $707 annually on soft drinks (carbonated) and other non-carbonated beverages compared to an average of $474 per year on water and wastewater charges.[10] Basically, American households are paying only 0.5-0.6 percent of income, on average, for water and sewer bills.[11]

The U.S. has experienced an average water pricing increase of 6.1 percent in 2007, one of the largest in recent memory. Nevertheless, *the U.S. average cost is the lowest price per unit (cubic meter) of all 14 countries recently surveyed* in Europe, Africa, America and Australasia by the International Water Report and the NUS Consulting Group in New Jersey.[12]

We would not be engaged in our current public dialogue over an investment "gap" for water infrastructure if water and wastewater utilities were recovering all their costs, including replacement costs and O&M, in their rates.

Conservation pricing

Traditionally, demand management focused on restrictions on water uses, rationing, and promotion of water-efficient technologies or fixtures (e.g., low-flow toilets) to conserve water. These "non-price" demand management actions were favored because many managers did not believe that consumers change their water consumption in response to changing water prices.[13]

Sometimes non-price approaches are sometimes disappointing in their results. Customers may take longer showers with low-flow showerheads, flush twice with low-flow toilets,

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[9] U.S. General Accounting Office, *Water Infrastructure: Information on Financing, Capital Planning, and Privatization*, GAO-02-764 (August 2002), available at http://www.gao.gov/new.items/d02764.pdf.
[10] For detailed calculations, see footnotes 3 and 4, G. Tracy Mehan, III, Assistant Administrator for Water, U.S. Environmental Protection Agency, "Investing in America's Water Infrastructure," Keynote Address to the Schwab Capital Markets' Global Water Conference, Washington, D.C., April 15, 2003, viewed at http://www.epa.gov/water/speeches/041503tm.html on January 8, 2008.
[11] Congressional Budget Office, *Future Investments in Drinking Water and Wastewater Infrastructure*, November 2002, ISBM 0-16-01243-3.
[12] Laura Hodges, "Rising prices reflect increasing awareness of global water shortages," World Water and Environmental Engineering, January/February 2008, p. 21-22.
[13] Olmstead, S.M., W.M.Haneman, and R.N. Stavins, "Water Demand Under Alternative Price Structures." Journal of Environmental Economics and Management 54 (200&), pp. 181-198.

and water lawns longer under day-of-the week or time-of-day restrictions, observe Olmstead and Stavins.

"Conservation pricing"—the increase in water rates to promote decreased or more efficient water usage—is an important tool of water management. There is some evidence that it is best used in combination with non-price demand-management actions for optimal results.[14]

Setting conservation prices is a critical task given its inherent relationship with questions of affordability, full-cost recovery, potential revenue loss due to decreased water demand, and the no-profit constraints on many utilities. Yet, carefully setting water rates can actually decrease customer water bills (rate increases offset by decreased consumption) and also reduce long-term utility costs since water efficiency and conservation can become the low-cost alternative to supply augmentation.

Critical to the proper setting of water rates, for the purposes of efficiency or conservation, is the concept of *price elasticity of demand*, i.e., how water consumption responds to changes in water pricing.

Certainly, numerous empirical studies have shown that residential water demand is relatively *price inelastic*. Because there is no substitute for water, this inelastic response is characterized by relatively small changes in the amount of water purchased and used given an increase in its price.

Yet, *inelastic is not the same thing as unresponsive*. Rather, it means that the degree of demand response is less than proportionate to the price change. For instance, a 10 percent increase in price, water demand can be expected to decrease by 3 percent.

Olmstead and Stavins note that, all else being equal, price elasticity can be expected to be greater under higher prices.

Although difficult to estimate, elasticities are higher with non-linear, increasing block prices or pricing (IBP) than under linear, uniform prices.[15]

It has been estimated that, as of 2000, one-third of residential water customers were under an IBP regime.[16]

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[14] Georgia Environmental Protection Division, "Conservation-Oriented Rate Structures." EPD Guidance Document, August 2007.

[15] The Georgia EPD describes an Increasing or Inclining Block Rate Structure as follows: "This option targets conservation at peaking and average use within customer classes. All customers in the same class (residential, commercial, industrial, etc.) pay a base rate per unit of water used, under a certain threshold of water use. For any use above the set threshold, a higher rate per unit of water used is charged. Additional volume blocks can be defined where higher rates are charged…Three or more pricing tiers are recommended." Some communities will offer decreasing block prices (DBPs) for the benefit of industry.

[16] Olmstead, Hanemann, and Stavins cite the OECD and Raftelis Environmental Consulting for this statistic.

IBPs may simply make prices more salient to consumers. Improvements in the presentation of water price information on water bills has been shown to increase consumers' price responsiveness, and IBPs seem to provide a similar signal.

That said, price structure, income, demographics, rainfall/weather, and seasonal factors (including evapotranspiration rates) appear to influence price responsiveness (elasticity of demand). Thus, when setting conservation prices or rates, it is important to use background elasticity information from local studies, or from regional studies with similar demographic, geographic, and price if possible.

Conservation pricing may be more effective and efficient if winter and summer demands are addressed separately. Epsy, Epsy, and Shaw found in their study that summer demand was more elastic. Therefore, imposing water conservation pricing at that time would be more effective. Prices would not have to be raised as much to achieve a given percentage reduction in water use. Other researchers have noted that aggregate demand was 25 percent more price responsive in summer months, reflecting the more discretionary nature of outdoor water use.[17] Households can exercise greater discretion at that time relative to activities such as filling swimming pools, washing cars, and watering lawns. This is especially significant in light of present and predicted impacts from a variable climate on flow regimes, i.e., less water available in reservoirs in summertime due to a decrease in snow pack and an increase in precipitation in the spring.

Price policies appear to be effective during periods of drought, changing behavior and reducing consumption when used with other non-market policies.

The impact of conservation pricing on revenues

A utility manager looking to implement conservation pricing must recognize the likelihood of short-term declines in revenue. Moreover, short-term or emergency responses to scarcity or conservation programs may result in revenue declines for which there is no compensation and may not result in permanent or long-term changes in customer water use patterns.

In order to assure revenue neutrality or stability, the effects of conservation pricing must be factored into the rate-making process. Attaining the same level of revenue entails imposition of a higher rate per unit of water on the anticipated sales volume, taking conservation into effect.

Yet, it is imperative that a utility manager not focus too narrowly on short-term revenue effects of conservation pricing. Otherwise, he or she will overlook the lessening of the variability of costs in the short-term and a reduction of fixed costs in the long run.

[1717] Renwick, M., and R.D. Green, "Do Residential Water Demand Side Management Policies Measure Up? An Analysis of Eight California Water Agencies." Journal of Environmental Economics and Management 40, pp. 37-55 (2000).

Revenue instability imposes direct costs of its own on water suppliers through increased cost of borrowing and more complicated planning to ensure adequate supply for current and future customers.

There is clearly a premium on being able to model the seasonal fluctuation in demand with as much precision and accuracy as possible in order to minimize uncertainty about water utility revenues in the near-term. Since the different rate structures can have very significant impacts on revenue stability, there is a serious need for empirically-based research that maps out the extent of the instability and investigates managerial techniques to cope with the increase uncertainty in revenue. It is critically important to develop the quantitative tools needed to explicitly depict the tradeoffs between revenue sufficiency, revenue stability, equity, and the incentives necessary for efficient resource use.

Water efficiency and conservation can help reduce the variable costs of operations, particularly in the areas of energy and chemicals. And the same approaches can allow the utility to avoid both fixed capital and variable operating cost resulting from inappropriate investments in unnecessary capacity to meet inflated demand for water services. The aim is to lower a utility's long-term cost structure and thereby reduce its revenue requirements. This will result in lower utility bills over time. The challenge is an educational one—to educate customers about the long-term benefits of water conservation.[18]

Decoupling revenue from volume sales of water

Traditional rate design ties utility revenue directly to the volume of the commodity, i.e., water, which it sells. Obviously, this can directly conflict with the goal of water efficiency or conservation. Ideally, rate structures need to change to reward utilities for making more economically and environmentally efficient resources decisions.[19]

Decoupling revenue or profits from delivery of the commodity will make the utility "financially indifferent to its volume of sales" while encouraging it to focus on policy goals.[20]

For investor-owned utilities (IOUs), and even public utilities in a few states, this matter of decoupling will be within the jurisdiction of state public utility commissions (PUCs) which would also benefit from further study of and research on this concept as applied to the water sector.

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[18] Thomas Chesnutt and Jan Beecher, "Revenue Effects of Conservation Programs: The Case of Lost Revenue." White Paper, A&N Technical Services (October 2004), p. 3.
[19] S. Carter, "Breaking the Consumption Habit: Ratemaking for Efficient Resource Decisions." The Electricity Journal, Vol. 14, Issue 10 (2001), pp. 66-74.
[20] Rutgers Center for Energy, Economic and Environmental Policy. Strategic Issues Forum, Decoupling Whitepaper #1, October 25, 2005.

Decoupling is also referred to as a revenue cap or revenue-per-customer mechanism, revenue-indexing, and statistical recoupling. The concept was pioneered in the gas and electric utility sector which can, no doubt, provides some lessons for the water sector.

Decoupling may apply to all or only some rate classes. Revenues might also be linked to something other than sales on a class-specific or system-wide basis. Adjustments could be made at regular intervals or through periodic regulatory proceedings.

Conclusion

Since the issue of conservation pricing requires, in the majority of cases, a political decision by a utility or local community, issues of effective communication, civic education and public outreach are critical in the quest to address America's infrastructure investment "gap." Explaining long-term benefits (both economic and environmental) versus short-term costs is always a difficult task.

Finally, issues of social and environmental justice, and the fair treatment of low-income customers, or those on fixed incomes, must be addressed in order to maintain the equity and political legitimacy of full-cost and conservation programs. Carefully designed IBPs, rebates, and other creative techniques, which assure that basic household needs are met, must be investigated and implemented to keep faith with those who merit our help and concern.

Thank you for your attention to what is, admittedly, very dense material on matters of pricing and water rates. I hope this overview of the many and diverse issues relating to conservation or demand-management pricing gives you a sense of the importance of further research, study and evaluation of the critical functions these concepts can play in our quest for water efficiency, conservation and stewardship.