2010 GREAT LAKES WATER RATE SURVEY

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Great Lakes Commission
des Grands Lacs

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The *2010 Survey* employs a methodology similar to that used in the national *Water and Wastewater Rate Survey* conducted by Raftelis Financial Consultants, Inc. (RFC) and published by the American Water Works Association (AWWA, Denver, CO). Dr. Beecher previously served as a consultant to RFC on a national water rate survey and has considerable experience in ratemaking for utilities, and water utilities in particular.

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Introduction

This *2010 Great Lakes Water Rates Survey* (2010 Survey) was conducted as part of a broader research initiative on the *Value of Great Lakes Water.* The purpose of the survey was to provide a clearer understanding of prevailing water rate practices in the Great Lakes region. Although water rate studies abound, few provide the detail and focus endeavored here.

The survey is not based on a random sample of all water systems and is therefore not representative of all systems. The focus instead is on the top ten systems, based on service population, in each of the eight states in the region: Illinois, Indiana, Michigan, Minnesota, New York, Ohio, Pennsylvania, and Wisconsin. The systems represented in the sample are reported in Exhibit 1.

Readers are also cautioned to use this and other rate surveys with much care. Water rate levels in particular can vary substantially and for many reasons, including but not limited to locational cost of service. Rates reflect only rates and cannot be used to draw conclusions about operational performance, including economic efficiency. Without much additional information, no inference can be made about whether rates reflect the true cost of service, that is, whether they are too low, too high, or just right for sending efficient price signals to water customers. Casual comparisons of or generalizations about rates are strongly discouraged.

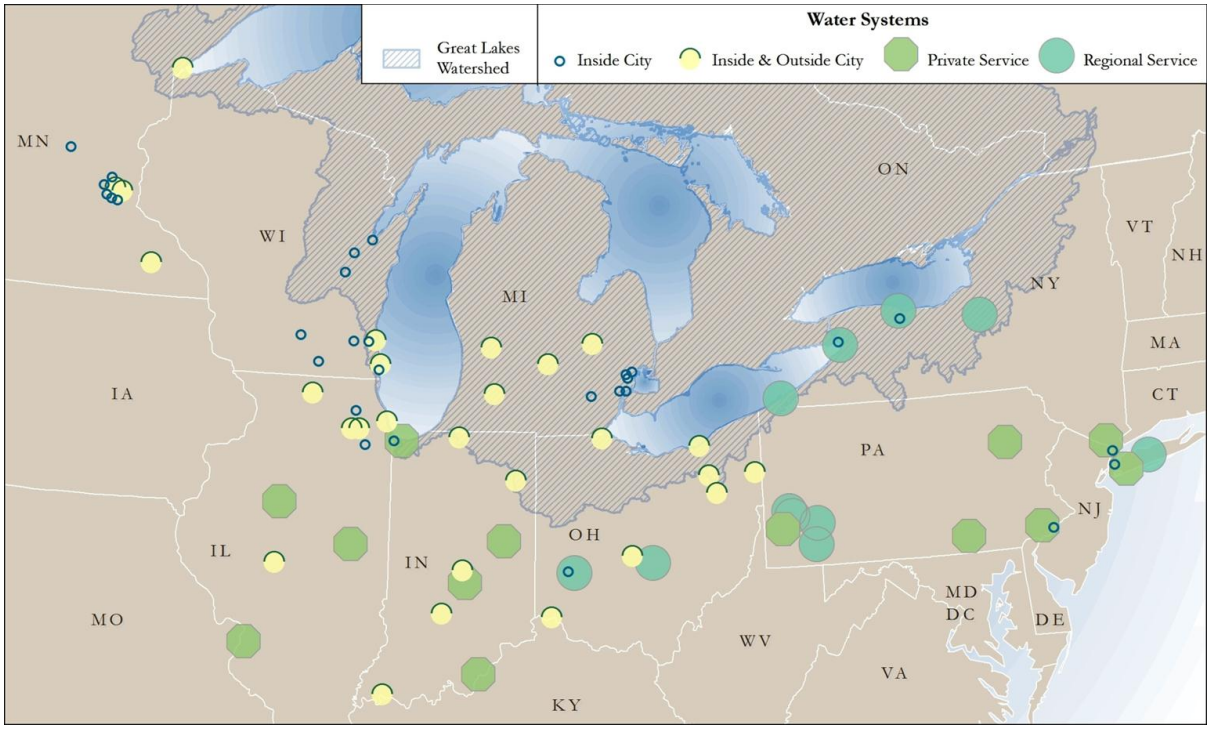

Exhibit 1. Water systems in the sample.

Illinois
American Water - Champaign District
American Water - East St. Louis
American Water – Peoria
Aurora
City of Chicago
Elgin
Joliet
Naperville
Rockford
Springfield

Indiana
American Water - Johnson County
American Water – Muncie
American Water – Northwest
American Water - Southern Indiana
Bloomington
Evansville
Fort Wayne
Hammond Water Works
Indianapolis Water
South Bend Water Works

Michigan
Ann Arbor
Clinton
Dearborn
Detroit
Flint
Grand Rapids
Kalamazoo
Lansing Board of Water & Light
Sterling Heights
Warren

Minnesota
Bloomington
Brooklyn Park
Duluth
Eagan
Eden Prairie
Minneapolis
Plymouth
Rochester
St. Cloud
St. Paul

New York
American Water - Long Island
Buffalo Water Authority
Erie County Water Authority
Monroe Co Water Authority - Shoremont TWP
New York
Onondaga County WA – Home
Rochester
Suffolk County Water Authority
United Water New York
Yonkers

Ohio
Akron
Canton
Greater Cincinnati Water Works
Cleveland Water
Columbus
Dayton
Del-Co Water Company
Montgomery County
Toledo
Youngstown

Pennsylvania
Aqua America
American Water - Pittsburgh
American Water - Scranton
Erie Water Works Authority
Philadelphia Water Department
Pittsburgh Water & Sewer Authority
West View Water Authority
Westmoreland Co Authority - Sweeney Plant
Westmoreland Co Authority - Yough Plant
York Water Company – Gravity

Wisconsin
Appleton Public Works
Green Bay Water Utility
Janesville
Kenosha Water Utility
Madison Water Utility
Milwaukee Water Works
Oshkosh
Racine
Waukesha Water Utility
West Allis Public Works

Indeed, rates (more accurately, charges) for water are only part of the story told by the survey. At least as interesting are the variations in rate structures, billing practices, and other ratemaking policies. These distinctions are highlighted throughout the following discussion and summarized graphically in the Appendix.

Methodology

The survey was conducted throughout the Spring, Summer, and early Fall of 2010 for the purpose of constructing a comprehensive "snapshot" of how the leading water systems in the Midwest serve their respective customers. Data were mined from published tariffs and websites, and supplemented with personal communications as needed. As noted previously, the survey sample focuses on the ten largest water systems in each state based on service population as reported by the United States Environmental Protection Agency's *Consumer Confidence Reports (CCRs)*.[1] The distribution of system service population in the sample is summarized in Exhibit 2. The smallest system in the sample serves Janesville, Wisconsin (service population of 62,720), while the largest services New York City (service population of 6,552,718).

Exhibit 2. Systems in the survey sample by state and population served.

	Smallest system	Service population	Largest system	Service population	Median
Illinois	Elgin	98,500	Chicago	2,896,016	143,000
Indiana	American Water Johnson County	66,868	Fort Wayne	250,000	98,232
Michigan	Dearborn	97,775	Detroit	899,387	133,624
Minnesota	Eden Prairie	65,000	St. Paul	416,759	79,080
New York	Yonkers	196,086	New York	6,552,718	263,000
Ohio	Canton	122,000	Cincinnati	813,000	268,358
Pennsylvania	Westmoreland County Authority	140,000	Philadelphia	1,600,000	190,960
Wisconsin	Janesville	62,720	Milwaukee	647,290	82,500
All systems	Janesville	62,720	New York	6,552,718	155,191

[1] Consumer Confidence Reports (CCRs) are available at http://safewater.tetratech-ffx.com/ccr/index.cfm.

The survey is based on data gathered from a mix of published sources. Information on service population and water source was available online from the CCR data. Data on each water system's structural and operational characteristics were derived from system websites and online water-quality reports, supplemented by email and phone contacts as necessary. These data are used to categorize systems according to a number of descriptive measures, including ownership, regulation, water source, and wholesale and retail service activities. It is important to note that a specific survey instrument was not utilized to collect any of the data presented here. By relying solely on published sources the survey reliably captures not only basic details about service delivery, but also how the water systems communicate service details to their respective customers.

For most of the systems, water pricing information (tariffs or their equivalent) were readily available. The selected indicators focused on billing practices, rate structures, and monthly water charges based on meter size. For a few water systems in the sample, online information about rates was very limited and for nine systems (in five states), no rate information could be acquired from online sources. In these cases, rate schedules were obtained from knowledgeable contacts at the water utilities.

Most of the tariffs collected can be considered reasonably current in terms of reported effective date, although a recent effective date does not necessarily mean that a rate revision was recently made. Prevailing rates may have been simply reauthorized for a new year. In some cases, new rates may become effective as part of a multi-year rate plan. Sixty-seven (84%) systems in the sample reported effective tariff dates of 2009 or 2010. The remaining tariffs were effective between 2003 and 2008, except for one system for which the tariff was effective in 1985 and one for which no effective date is known.

System demographics

Water systems in the U.S. can be differentiated according to a number of key structural characteristics, such as size and ownership. Several characteristics related to regionalization, including the scope of wholesale and retail services and the differentiation of prices based on area served. The eighty systems in the survey sample reveal a number of these key dimensions, as summarized in Exhibit 3 and discussed below:

System size. Each water system's service population was obtained from the EPA's Consumer Confidence Reports. The two largest water systems

were the City of New York serving 6.5 million people, and the City of Chicago providing water to almost 2.9 million people within the city and surrounding suburban area. The median service population across the sample was 155,191. This indicates the typical water system in the sample serves medium-sized communities such as Ann Arbor, MI (114,000), Madison, WI (226,050), and Dayton, OH (166,000). More modestly sized water systems are represented as well, including five Wisconsin systems serving populations under 72,000. Note that this variable represents service population, as compared to service or customer connections (most connections serve more than one person).

System ownership. Of the eighty water systems, sixty-six are operated by a governmental entity (that is, publicly owned). Specifically, fifty-six are owned by a municipality, nine by an authority, and one by a county. In addition, the sample includes one non-profit water system (Del-Co Water Company in Ohio). These systems may serve solely the population within their incorporated areas or extend service into surrounding areas. The remaining thirteen (three in Illinois, four in Indiana, two in New York, one in Ohio, and four in Pennsylvania) are operated by private companies, for which geopolitical boundaries are not applicable. The median service population of the private water systems is approximately 155,382. At least two of the municipally owned systems, Buffalo and Indianapolis, are operated by private companies.

Economic regulation. To varying degrees, all of the states in the region exert economic regulatory authority for the water sector, with the exception of Michigan and Minnesota. Regulatory authority is consistently applied to private (investor-owned) utilities that earn a profit on their investments, while economic regulation of non-private systems in the U.S. is more limited. Among the surveyed states, Wisconsin is unique nationally in having comprehensive economic regulatory jurisdiction for the public water sector. Pennsylvania regulates municipal systems that service outside of their boundaries. In Indiana, municipal water systems can voluntarily consent to state oversight. All of the Indiana water systems in the sample, both public and private, are regulated

Primary water source. Water utilities can draw water from surface or ground sources, although some systems rely on a combination of sources. Systems may also purchase some or all of their water supplies, usually in the form of “finished” or treated water, from other nearby systems. This information was available on the Environmental Protection Agency’s *Consumer Confidence Report* (CCR) website as well. A majority of the water systems (76%) primarily rely on surface water.

Purchased water. Eleven systems purchase surface water from other systems, including four in Michigan and three in New York. The

proportion of purchased water systems in the sample (14%) is comparable to national findings.[2]

Wholesale sales. Bulk or wholesale water sales potentially help utilities achieve regional economies of scale in supply and treatment. As all of the systems in the sample are relatively large, it is not surprising that forty-three systems (54%) supply water on a wholesale basis to other water systems. Conversely, 46% of the systems provide retail service only.

Retail sales. Another indicator of regional activity can be found in the nature of retail sales (sales to ultimate residential and nonresidential water customers). Twenty-nine (36%) of the systems in the sample are municipal utilities serving only inside their respective boundaries. Another twenty-seven (34%) of the systems are extended municipal utilities serving outside of municipal boundaries. The remaining systems are organized as regional utilities by virtue of ownership structure (that is, county utilities, nonprofit utilities, and regional authorities). The thirteen (16%) private systems are separately coded for the purpose of the analysis. In practical terms, "regionalization" is reflected in the retail service provided by regional utilities, but also in the operations of private utilities and extended municipal systems.

Spatial pricing. The concept of spatial pricing focuses on whether systems differentiate service rates by spatial areas or zones (the term "zonal pricing" is also used). Areas or zones may be defined on the basis of geopolitical boundaries ("inside-outside" rates) or cost-of-service distinctions. Higher outside-city rates may be justified on the basis of risk and debt burdens that are borne by inside-city customers, who are also taxpayers. Distant or elevated areas may present higher pumping costs and these costs may be reflected in rates. Among the systems in the sample, twenty-eight (35%) differentiate prices spatially. Service charges to customers outside of a core area may be higher by only a few percentage points or as much as double normal rates. For instance, outside rates charged by Minneapolis Water Works is an additional $0.15 per 100 cf. By contrast, the Rockford Water Division (IL) charges double ($3.90 compared to $1.95 per ccf) for outside customers.

[2] US Environmental Protection Agency, *Community Water System Survey 2006.*

Consolidated pricing. Consolidated or single-tariff pricing (also called rate equalization) is a technique used by some water systems to smooth rate differentials across multiple water systems that are commonly managed, particularly but not exclusively in the private sector. Consolidated pricing ignores system cost differences but is rationalized on the basis of promoting cost-effective regionalization. For the survey sample, seven (9%) of the systems were found to use consolidated pricing. Indiana American Water Company, for example, provides water to three territories in the sample under a consolidated tariff that disregards location with respect to rates.

Exhibit 3. Structural characteristics of the sample.

		N	%
System size	Service population equal to or less than 155,000	40	50%
	Service population greater than 155,000	40	50%
System ownership	Municipality	56	70%
	Private company	13	16%
	Water authority (governmental)	9	11%
	County government	1	1%
	Not-for-profit	1	1%
Economic regulation	Commission regulated (state PSC or PUC)	29	38%
	Not commission regulated	51	63%
Primary water source	Ground water	19	24%
	Surface water (includes purchased water)	61	63%
Purchased water	Water purchased from another system (surface)	11	14%
	Water is primarily self-supplied	69	86%
Wholesale sales	Water sold on a wholesale basis to other systems	43	54%
	No wholesale water sales	37	46%
Retail sales	Retail service inside city only (municipal)	29	36%
	Retail service inside and outside city (municipal)	27	34%
	Regional water authority, county, and not-for-profit	11	14%
	Private company	13	16%
Spatial pricing	Prices are differentiated by spatial or zonal criteria	28	35%
	Prices are not spatially differentiated	52	65%
Consolidated pricing	Prices are consolidated for commonly owned systems	7	9%
	Prices are not consolidated across systems	73	91%

Billing practices

As noted, information on billing cycles was collected from system websites and tariffs, with phone or email verification as needed. For each water system, billing practices and rate structures were examined by standard customer classes: residential, commercial, and industrial. Exhibit 4 shows the usage levels associated with each customer class and meter size for the purpose of calculating monthly charges. As indicated, the sample size is slightly reduced for the industrial class because some systems do not serve very large-volume users.

Exhibit 4. Customer class, meter size, and water consumption.

	Meter size	Water consumption	Sample size
Residential	5/8”	0 cf (0 gal.)	80
	5/8”	500 cf (3,740 gal.)	80
	5/8”	1,000 cf (7,480 gal.)	80
Commercial	5/8”	3,000 cf (22,480 gal.)	80
	2”	50,000 cf (374,000 gal.)	80
Industrial	4”	1,000,000 cf (7.48 mil. gal.)	79
	8”	2,000,000 cf (14.96 mil. gal.)	78

The usage levels indicated in Exhibit 4 reflect the service dimensions of a relatively large-scale water system, although local service requirements will dictate tariff particulars. These categories are consistent with other water ratemaking surveys and provide for reasonable comparison of charges. In some cases, water tariffs may not contemplate very large-volume usage based on the area’s service profile. Del-Co Water Company, for example, reports that customers do not require meters greater than 3 inches (their most demanding users are the local schools). For some industrialized locations (for example, Columbus, OH and Philadelphia, PA), however, tariffs are designed to cover usage levels beyond two-million cubic feet for the billing period.

Exhibit 5 summarizes billing practices for the sample systems in terms of what services are included on customer bills. Some systems bill for water only, while many bill for water and wastewater or water, wastewater, and stormwater services. It is not unusual for water systems to bill for wastewater service, which is often based on metered water usage, even when the water and wastewater systems are independently owned or operated. In Cleveland, OH, the public water system collects fees for the regional sewer district.

Exhibit 5. Services billed.

	Number of systems	%
Water only	20	25%
Water and wastewater	25	31%
Water, wastewater, and stormwater	8	10%
Water and other services	27	34%

Other discrete public services that might be combined with the water bill include street light charges (for example, four systems in Minnesota), snow removal (for example, Milwaukee, WI), yard waste removal (for example, Evansville, IN), and clean air charges (for example, South Bend, IN). Billing combinations may affect the economic behavior of customers. The inclusion of more services may accentuate aggregate price effects (such as the combined effects of water and wastewater costs), but mute the price signal for individual services.

Water systems distribute bills according to a variety of billing periods or cycles. For the systems in the sample, residential customers generally receive their billing statements either monthly or quarterly (summarized in Exhibit 6). Some geographic patterns are noticeable in the findings. Illinois and Indiana residents are primarily billed monthly, with only two water systems billing bimonthly. Wisconsin customers, on the other hand, are primarily billed quarterly – although two of the systems in the sample bill their non-residential class customers more frequently. A few providers (for example, Yonkers, NY and West Allis, WI) divide the service territory into water zones or districts and cycle billing so that each district receives their periodic bills at different times.

Not surprisingly, monthly billing is generally more common for large-volume (commercial and industrial) customers. However, variations in practices limit conclusions about billing cycles for non-residential accounts. Some systems indicate that commercial and industrial accounts are billed on an alternative cycle, without specification. Commercial customers may be associated with residential or industrial customers for billing purposes. Alternative means of distinguishing customers for billing purposes include meter size (Green Bay, WI requires at least a 1-inch meter for monthly billing), water consumption (Monroe County Water Authority specifies 150,000 or more gallons per month for monthly billing), or geographic service area (for example, new residential developments in the Greater Cincinnati Water Works service area may be billed monthly along with their non-residential counterparts).

Exhibit 6. Billing cycles.

	Residential	%	Non-residential	%
Monthly	34	43%	48	60%
Bimonthly	9	11%	5	6%
Quarterly	33	42%	22	28%
Other	4	4%	5	6%

Rate structures

Various charges are authorized in water tariffs (Exhibit 7), including but not limited to account and set-up fees and connection charges. A small number of systems in the survey sample specify a minimum bill that may or may not vary by meter size or include a usage allowance. Two systems in the sample reported neither a fixed fee nor a minimum bill.

If multiple services are jointly billed, the administrative charge was divided by the total number of services appearing on the bill in order to capture water service's share of the total charge.[3]

Regular water bills typically reflect two primary rate components: a recurring fixed charge that typically varies by meter size and a variable (rate per unit) consumption charge. Fixed charges reflect customer charges and include any other regular fees or administrative charges pertaining specifically to water service. Some water systems in Minnesota, for example, itemize fees that support the state's drinking water testing laboratory. Some privately owned water companies in Illinois recover certain taxes and franchise fees through itemized monthly charges.[4] These various fixed charges are included in the bill calculations.

A distinguishing methodological choice for this survey was to include in the billing estimates any specified fees associated with providing public fire protection.[5] Although they varied, average monthly charges for public fire protection (among those systems in the sample specifying the charge) were $5.52 for a 5/8" meter.

[3] This method was only utilized for one system who charged a quarterly administrative fee. The fee was prorated to obtain the monthly charge and then divided by the number of services to produce the final amount incorporated into the bill calculation.
[4] For many systems, taxes and fees are embedded in the cost of service (revenue requirements) without itemization in tariffs.
[5] Water charge estimates included here may be higher than those reported in the 2008 AWWWA/Raftelis survey because the data are more current and because all known recurring fixed charges are included.

Exhibit 7. Charges and fees specified in tariff.

	Number of systems	%
Account set-up fees specified	32	40%
Connection charges specified	29	36%
Water included in minimum usage	19	24%
Fire protection specified as fixed charge	23	29%

	5/8"	2"	4"	8"
Average monthly fire protection charge	$5.52	$21.28	$58.93	$160.22

Several items were not included in the calculation of charges, even though they may be itemized in the tariff or on customer bills: (1) startup and connection fees, (2) charges for private fire protection, (3) other add-on charges for special services, (4) charges for private irrigation or sprinkler systems, (5) charges to public authorities for fire hydrants, and (6) state and local taxes expressed as a percentage of the bill.

Each tariff was independently evaluated in terms of how to incorporate various fixed fees charged by water systems.[6] The exclusion of certain taxes and fees means that the total bill burden may be underestimated for some water systems.

Regarding variable consumption charges, unit rates (the amount charged for a unit of usage) vary widely for the survey sample. Three common rate structures for water utilities are uniform rates (unit rates are constant with usage), decreasing-block rates (unit rates decline with usage), and increasing-block rates (unit rates rise with usage). A combination-block rate structure makes use of rising unit costs followed by declining unit costs. Rate structures in place for the sample utilities are summarized in Exhibit 8.

[6] In Rockford, Illinois, for example, residents are assessed a 9% quarterly surcharge in addition to a 5% municipal tax. In this case the 9% surcharge was included in the bill calculation and the 5% tax was excluded.

Exhibit 8. Rate structures and variations.

	Residential	%	Non-Residential	%
Basic rate structures				
Decreasing-block	35	44%	48	60%
Uniform	30	38%	25	31%
Increasing-block	14	18%	5	6%
Combined-block	1	1%	2	3%
Total	80		80	
Other differentials*				
Seasonal	6			
Inside-outside municipal rates			24	30%
Zonal rates within system			3	4%
Consolidated pricing			7	9%
Peaking factor rates			1	1%

* Included above and not mutually exclusive.

Exhibit 9. Rate structures by system ownership.

	Decreasing-block	Uniform	Increasing-block	Combined-block	Total
Residential					
Municipal	24	20	12	0	56
Private	4	7	2	0	13
Authority	5	3	0	1	9
County	1	0	0	0	1
Not-for-profit	1	0	0	0	1
Nonresidential					
Municipal	28	23	5	0	56
Private	12	0	0	1	13
Authority	6	2	0	1	9
County	1	0	0	0	1
Not-for-profit	1	0	0	0	1

Noticeably, decreasing-block rates are more common for nonresidential customers and increasing-block rates are more often used for residential customers. As reported in Exhibit 9, rate design does not appear to be closely tied to the structural character of water systems, particularly for residential customers. Declining-block rates, however, are common for nonresidential customers served by the private companies in the sample.

Block rates require utilities to set both rate blocks or tiers (the price per unit charged) and tier breakpoint (the usage levels at which rates change). The number of blocks (or breakpoints) embedded within the rate structure was recorded as part of the survey. To illustrate, a consumption rate that charges $2.00 per hundred cubic feet for the first 1,000 cf followed by $1.85 per hundred cubic feet for all consumption above 1,000 cf was coded as a DB(2) – a decreasing block rate with two distinct blocks. In recording the number of blocks, the survey records the number of effective blocks; that is, the actual number of distinct pricing tiers was recorded in the analysis, rather than the nominal blocks that might have been presented in the tariff.[7] Also, a water allowance included in the minimum fixed charge was counted as an effective first tier of water usage for the purpose of specifying the total number of blocks. For example, South Bend Water Works charges a minimum amount that is followed by six additional block rates, so the number of total effective blocks was recorded as seven.

Most water systems deploy relatively uncomplicated block structures. Uniform rates aside, three-block structures are common. Close to one quarter of the residential rates adopt a decreasing structure with three blocks. No other rate structures are represented by more than 10% of the systems in the survey. For non-residential customers, a similar pattern is found, with substantial use of uniform and decreasing two-block structures. Complex seven-block structures, as in the case of South Bend Water Works, are relatively rare.

Only a handful of water systems in the sample impose seasonal rates, which can be used to allocate more system costs to high-use customers in the summer or peak-use months. Two systems in the survey sample tie the seasonal summer rate to usage above the customer's winter consumption level (for example, a higher rate applies when summer usage exceeds 150% of winter usage). Somewhat surprisingly, one system in the sample was found to provide a summer rate discount. These latter rate structures did not lend themselves to averaging for bill estimation, so the primary (off-season) rate was used for the analysis.

A unique finding in the survey was the use of peaking-factor rates for commercial customers in Ann Arbor, MI. Under the rate structure, the commercial class is refined by dividing customers in three groups based on peaking factors that measure the ratio of peak to average usage.[8] The rate is a sophisticated yet practical application of engineering-economics to rate design.

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[7] In some cases, unit prices were unchanged for different blocks of usage, that is, two blocks are effectively one if they are subject to the same unit price.

[8] Ann Arbor defines three commercial customer tiers based on peaking factors: Tier 1: peaking factor < = 5, Tier 2: peaking factor >5 <8; Tier 3: peaking factor > = 8.

As part of the survey, tariffs, websites, and other sources were also searched to determine whether the water systems in the sample had adopted any specific conservation and assistance policies (Exhibit 10). The findings indicate that the larger water systems in the region are placing some emphasis on providing conservation information and tips to the customers they serve.

Exhibit 10. Conservation and assistance policies.

	Number of systems	%
Conservation information/tips	57	71%
Payment assistance	21	26%
Sample bill or "how to read"	17	21%
Low-income discount	9	11%
Senior discount	8	10%

Water charges

Information from the tariff sheets and supplemental sources was used to calculate water charges for different levels of monthly usage. As already noted, bill comparison should be used with an abundance of caution, as many factors influence water costs and rates. Average charges are reported in Exhibit 11. Water charges were estimated for incremental water usage amounts within the meter categories, as previously described (Exhibit 4). Effective fixed charges are reflected in the bill estimates for a consumption level of 0 cubic feet or gallons.

Although comprehensive rate data were collected, the summary covers only the rates that apply to the core systems in the sample to avoid distortions in the averages. In other words, the summary does not include rate differentials within systems, as is the case for municipal systems serving outside of city limits under separate tariffs. An example is Columbus, OH, which maintains separate rates for two additional areas outside its core region (surrounding suburbs and the rural community).

Variations in the periodicity of water tariffs and billing cycles, as well as spatial and season rate differentiation, present another challenge for bill comparison. Procedures were used to estimate water charges under such circumstances:

Exhibit 11. Average charges for monthly water usage.

	5/8-inch meter				2-inch meter	4-inch meter	8-inch meter
	Residential			Commercial		Industrial	
Systems (n)	0 cf	500 cf (3,740 gal.)	1,000 cf (7,480 gal.)	3,000 cf (22,440 gal.)	50,000 cf (374,000 gal.)	1,000,000 cf (7,480,000 gal.)	2,000,000 cf (14,960,000 gal.)
Illinois (10)	$8.59	$21.88	$36.01	$94.35	$1,348.04	$23,234.01	$45,762.63
Indiana (10)	$10.34	$21.03	$32.37	$72.09	$910.34	$13,223.40	$24,108.79
Michigan (10)	$8.09	$15.80	$26.91	$69.04	$1,033.94	$19,274.61	$38,506.17
Minnesota (10)	$4.37	$11.26	$20.85	$56.22	$870.09	$16,871.37	$34,751.91
New York (10)	$8.02	$16.88	$28.57	$73.26	$1,054.08	$18,048.30	$35,394.80
Ohio (10)	$6.38	$15.93	$27.70	$76.26	$1,094.60	$17,018.45	$32,024.21
Pennsylvania (10)	$10.85	$29.73	$50.47	$126.98	$1,664.53	$28,308.77	$55,797.02
Wisconsin (10)	$6.81	$16.25	$26.44	$65.50	$927.40	$15,565.10	$30,949.62
All (80)	$7.93	$18.60	$31.16	$79.21	$1,112.88	$18,967.36	$37,258.66
Municipal (56)	$6.29	$14.58	$24.96	$65.40	$965.68	$17,086.95	$33,772.84
Private (13)	$14.66	$34.71	$55.13	$128.93	$1,612.69	$25,171.43	$47,849.45
Authority (9)	$8.64	$19.87	$33.96	$88.69	$1,198.70	$20,969.63	$41,714.70
County (1)	$4.33	$18.07	$30.85	$81.99	$1,287.03	$25,596.95	$51,194.05
Not-for-profit (1)	$9.90	$22.97	$42.05	$118.35	$1,911.43	na	na
Regulated (29)	$10.26	$23.79	$37.97	$90.08	$1,172.76	$18,578.60	$35,886.50
Not regulated (51)	$6.61	$15.64	$27.29	$73.04	$1,078.83	$19,192.84	$38,070.75
Surface water (61)	$8.00	$19.33	$32.50	$84.04	$1,191.69	$20,342.15	$39,783.68
Ground water (19)	$7.71	$16.21	$26.86	$63.73	$859.84	$14,625.92	$28,841.92
Purchase water (11)	$5.18	$12.60	$23.30	$67.47	$1,030.57	$19,113.11	$38,060.39
Self-supply (69)	$8.37	$19.55	$32.42	$81.09	$1,126.00	$18,943.78	$37,127.03
Wholesale sales (43)	$8.86	$19.92	$33.16	$83.56	$1,168.35	$19,745.20	$38,448.51
Retail sales only (37)	$6.85	$17.05	$28.84	$74.16	$1,048.40	$18,038.28	$35,796.85
Inside-city only (29)	$6.06	$14.06	$24.35	$64.19	$979.96	$17,989.39	$36,268.71
Inside-outside city (27)	$6.52	$15.14	$25.62	$66.70	$950.35	$16,117.67	$31,184.54
Regional (11)	$8.36	$19.99	$34.41	$90.78	$1,271.53	$21,432.36	$42,662.63
Private (13)	$14.66	$34.71	$55.13	$128.93	$1,612.69	$25,171.43	$47,849.45
Spatial pricing (28)	$6.93	$15.29	$25.36	$66.30	$918.48	$15,677.20	$30,329.88
No spatial pricing (52)	$8.47	$20.38	$34.29	$86.17	$1,217.55	$20,773.72	$41,138.78
Consolidated pricing (7)	$14.29	$33.92	$54.92	$129.64	$1,600.08	$25,015.99	$47,760.66
No consolidated pricing (73)	$7.32	$17.13	$28.89	$74.38	$1,066.16	$18,379.30	$36,223.25

Note: sample size is reduced for the industrial class (n = 79 for 4-inch meters; n = 78 for 8-inch meters).

- For systems that bill water on a non-monthly basis, charges were calculated for the length of the system's billing period and prorated to estimate monthly equivalents.[9]
- For water systems that differentiate rates by season, averages were weighted by the number of months the differing rates were in place.
- For publicly owned water systems that differentiate prices by spatial areas or zones, charges are reported only for the primary or central service area.

Detailed data on all rates for all systems in the sample are available online and by request.

Rate analysis

As part of the study, differences in means were analyzed along the key structural dimensions by which water systems can be characterized. Of course, causality cannot be inferred from simple bivariate analysis and other explanatory factors (including system age) may be more important than those considered here. Nonetheless, the findings are descriptive of how rates vary and suggestive of some potentially important relationships between structure and rates.

The key findings regarding water charges for the systems in the survey sample can be summarized as follows:

System size. Although economies of scale are generally anticipated for the water sector, they are not clearly apparent for the sample in general or for particular types of systems. The correlation of size to water bill for 1,000 cf usage is negative but weak and statistically insignificant. Scale economies are somewhat more apparent for nonprivate systems, but the sample size constrains any inference. These findings may be due to the sample's composition of larger systems. However, the findings are also suggestive of possible limits to scale at the larger end of the spectrum.

System ownership. Water bills are considerably lower for municipal water systems. Private systems in the sample invariably impose fixed charges (that is, charges are always imposed for usage at 0 cf or gallons). Comparatively higher charges overall for privately owned systems, are likely associated with taxes and profits, but also with a higher overall cost

[9] For example, to arrive at a bill for monthly usage specified at 1,000 cf monthly under a quarterly billing cycle, a total quarterly bill for 3,000 cf was calculated and divided by three. This methodological choice captures the full impact of block rate structures on water bills. Less water use over a billing period would lessen the influence of the tail block price on the bill.

of service and particular costing and ratemaking practices. Charges by regional authorities and counties fall between the municipal and private systems, although convergence between regional and private systems is seen at higher consumption levels. Because it relates to several other structural and operational characteristics of water systems, ownership exerts relevant influence throughout the analysis.

Economic regulation. Bills for regulated water systems are generally higher. Regulation's emphasis on cost-based ratemaking may play a role, but the prevalence of private ownership among regulated systems is clearly influential.

Primary water source. Water charges are less for systems relying on ground water. Costs associated with meeting surface water treatment requirements may play a role.

Purchased water. Systems that purchase their water on a wholesale basis report lower charges than self-supplied systems. This finding is consistent with expectations based on the potential for purchasing agreements to help systems avoid incurring their own infrastructure and operating costs.

Wholesale sales. Charges are higher for systems that sell water on a wholesale basis. This finding is somewhat counterintuitive, given that scale economies are anticipated for larger systems that would be more likely to provide wholesale services. However, this finding may reflect lost sales to purchased water systems that leave the wholesale to cover capacity fixed costs.

Retail sales. For municipal systems, charges are rather similar for systems that provide service only to inside customers and those that also provide systems to outside customers. Charges for other regionalized systems and private systems are substantially higher.

Spatial pricing. As might be expected, core charges for systems that differentiate prices spatially are lower than for systems that do not differentiate accordingly. However, these findings are affected by inclusion of the private systems in the group without spatial pricing.

Consolidated pricing. The charges for systems that use consolidated pricing are substantially higher than systems that do not use consolidated pricing. These findings are also influenced by ownership. Only seven systems in the sample have equalized rates; five are private systems and two are regional systems.

Cost analysis

A supplemental time-series analysis, focusing on larger water utilities operating in Wisconsin, provides some insight into the financial drivers affecting water utilities. The analysis takes advantage of the data available from the Wisconsin Public Service Commission, which has comprehensive jurisdiction for water industry rates and finances, regardless of system ownership. The database was constructed from statistical benchmark reports prepared by the commission based on annual utility financial reports; the data span 2000 through 2009 and represent 72 to 94 larger water systems (Class A and B based on service connections). [10]

The key findings for this analysis, provided graphically in the Appendix, can be summarized as follows:

Capital intensity. The capital intensity of the water industry, measured by ratios of utility plant to water sold and to sales revenues, is confirmed. Capital intensity means that water utilities must invest a substantial amount of capital relative to revenues received. An upward trend is apparent, particularly with respect to plant relative to sales. In terms of plant composition, the share for transmission and distribution has grown, while the shares for treatment, pumping, and general plant have declined. Source of supply plant has remained relative constant. Another analysis reveals the differential value of plant additions to replacements, particularly for services and mains, where the ratio of additions to replacements for 2009 was about 15:1 (that is, each dollar of retired plant was offset by 15 dollars in additions).

Expenses. Unsurprisingly, utility revenues and expenses climbed over the ten-year period in excess of general inflation (about 25%). For this particular sample, expenses per million gallons sold rose 69% for purchased water systems, 82% for surface water systems, and 142% for groundwater systems. Source expenses for groundwater systems rose particularly sharply. Other data indicate that unaccounted-for water and energy requirements have been relatively constant for the period.

Revenues. Revenues relative to water sold grew steadily over the period for each of the major customer classes (residential, commercial, public authority, and industrial), with somewhat more pressure apparent for residential customers. A more detailed analysis of the residential sector reveals that while the number of residential customers has grown, the aggregate amount of water sold to the class has remained steady. Thus, the number of gallons sold per customer has declined. The logical

[10] See Water Utility Statistical Benchmarks http://psc.wi.gov/utilityInfo/water/benchmark.htm.

consequence is seen in the upward pressure on revenue per customer and revenue per gallons sold. These findings validate a widely perceived challenge for the water industry. Rising costs associated with capital intensity and operations more than offset the costs avoided through reductions in water usage.

Observations

The Great Lakes Water Rate Survey provides insight into present ratemaking practices for larger systems in the region. Although not generalizable, the findings are suggestive along a variety of issues.

First, water rates in the region are somewhat conservative in terms of continued reliance on more traditional decreasing-block and uniform rate forms. This finding may be justified in part by the relative abundance of water in the region and other favorable cost conditions. Nonetheless, many systems in the region are providing information about conservation to their customers and some have introduced rates that are considered more efficiency-oriented. Seasonal rates present an opportunity for the region. The use of peaking-factor rates was an especially salient finding.

Second, what customers pay for water service is highly variable. Some customers pay relatively higher fixed charges, in many cases to support the cost of fire protection. Structural variables, particularly system ownership, influence rate structures and levels. Charges by private water companies are comparatively higher. Scale economies, although considered important at the lower end of the spectrum, may be less relevant to systems already large in size.

Third, the research process itself was revealing. While most tariffs were relatively easy to secure, much room for improvement can be found in the presentation and communication of tariff information to customers. Average water customers should be able to readily find and interpret the rates that determine their water bills. Sample bills and bill calculators are useful, as is an understandable narrative explaining costs, rates, and system intentions.

Finally, the cost analysis reveals that water conservation is empirically associated with higher residential water bills, although these bills should be less than they would be without beneficial efficiency improvements and lesser still over the long run if avoided operating and capital costs are substantial.

Appendix

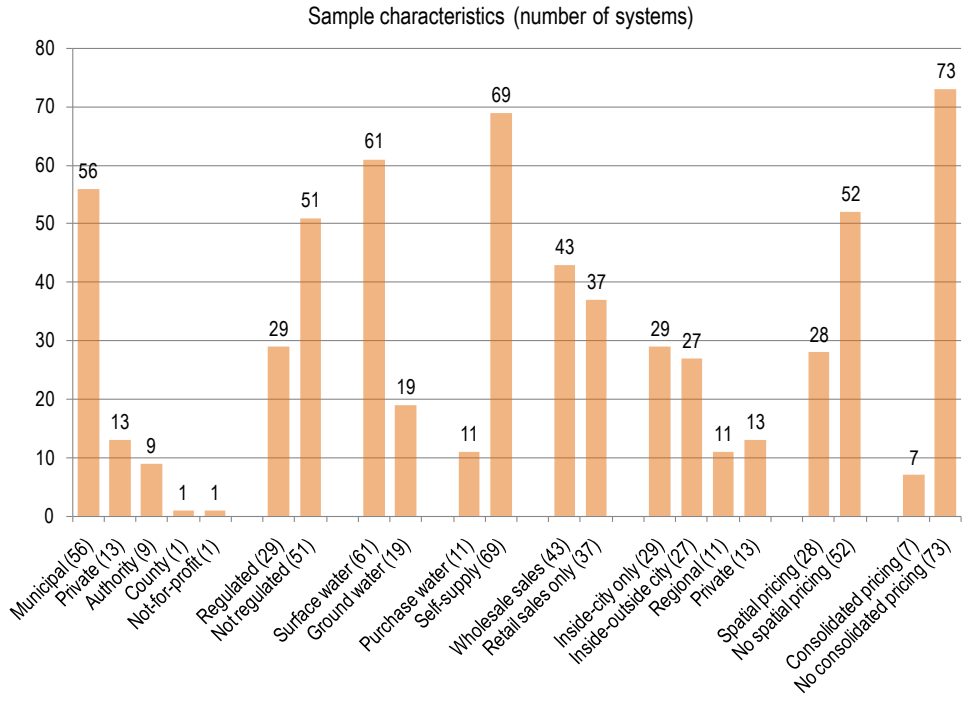

Exhibit A1. Sample characteristics.

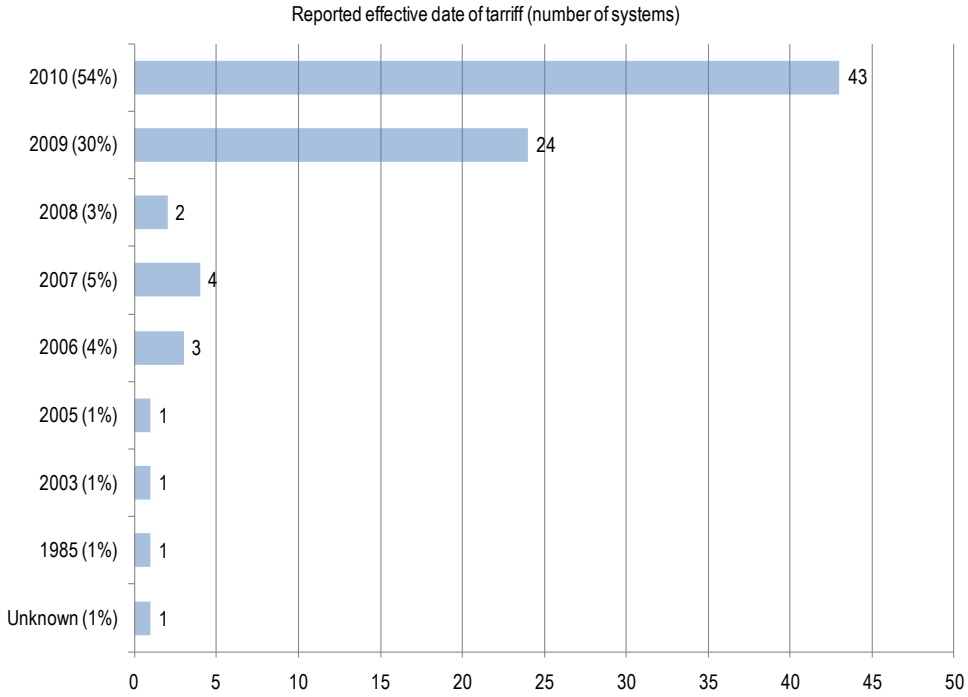

Exhibit A2. Effective date of water tariff.

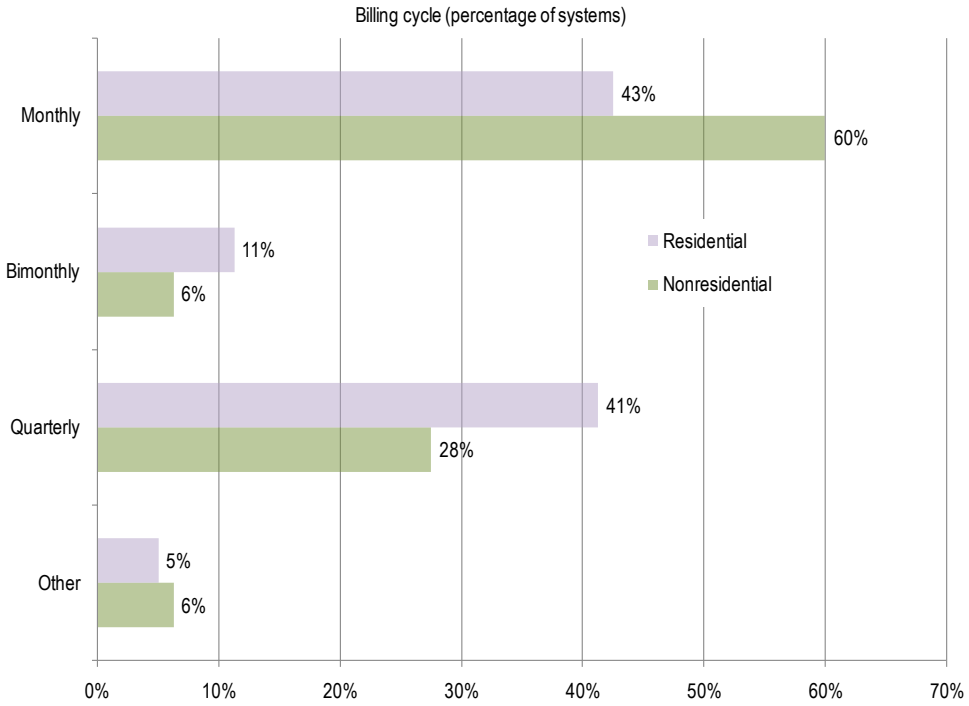

Exhibit A3. Billing cycle.

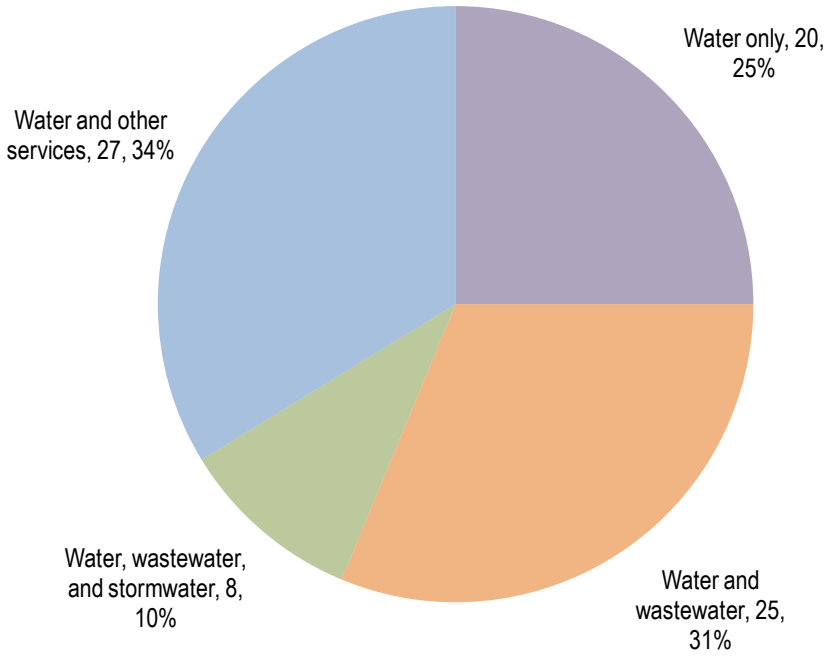

Exhibit A4. Services billed.

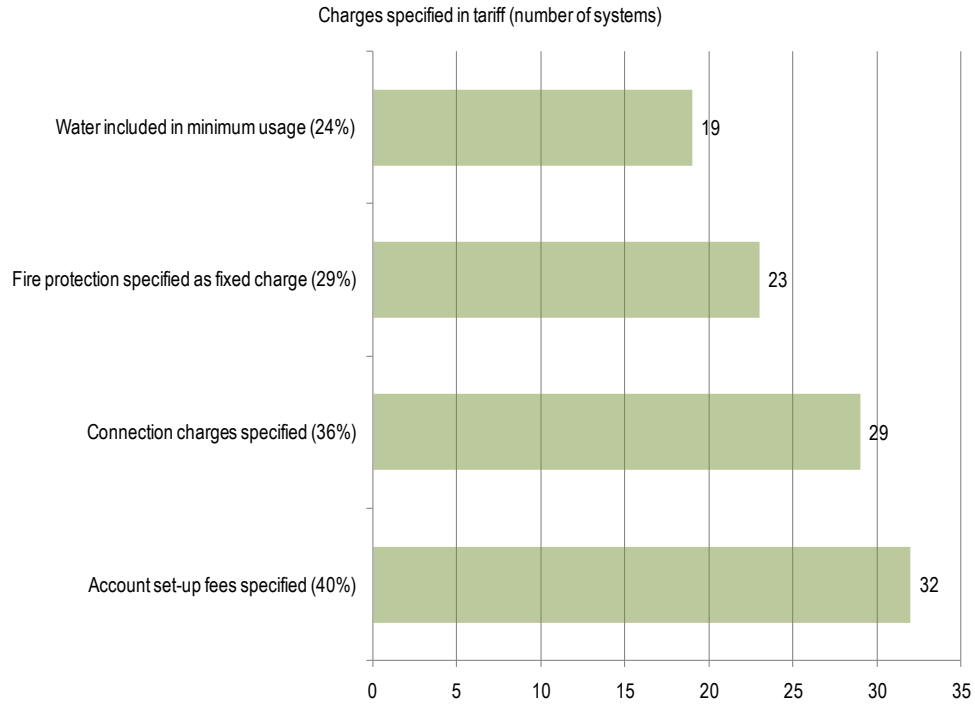

Exhibit A5. Charges specified in tariff.

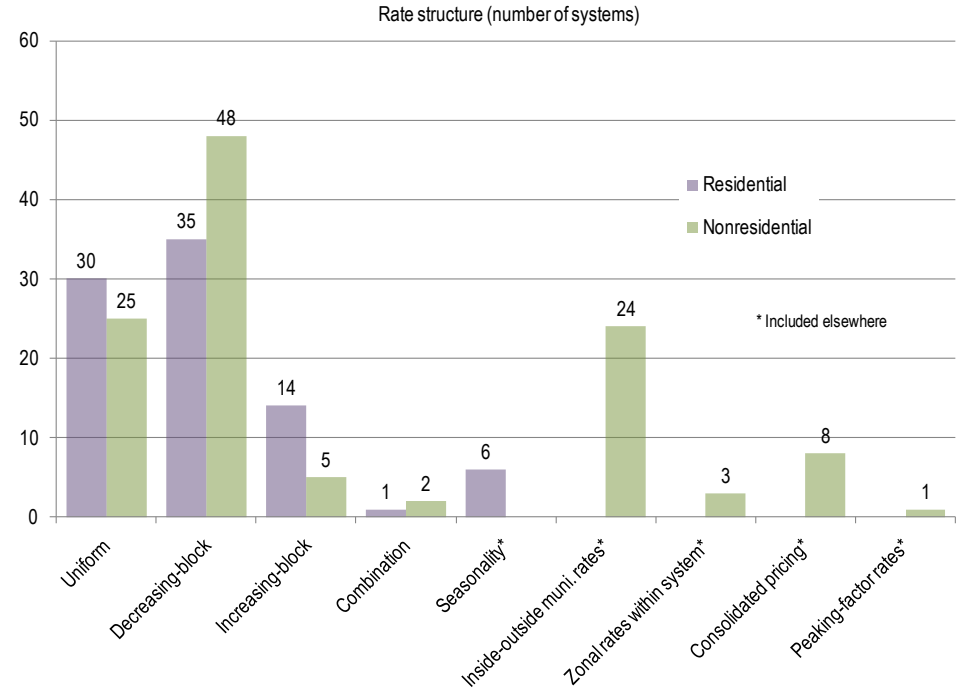

Exhibit A6. Rate structures.

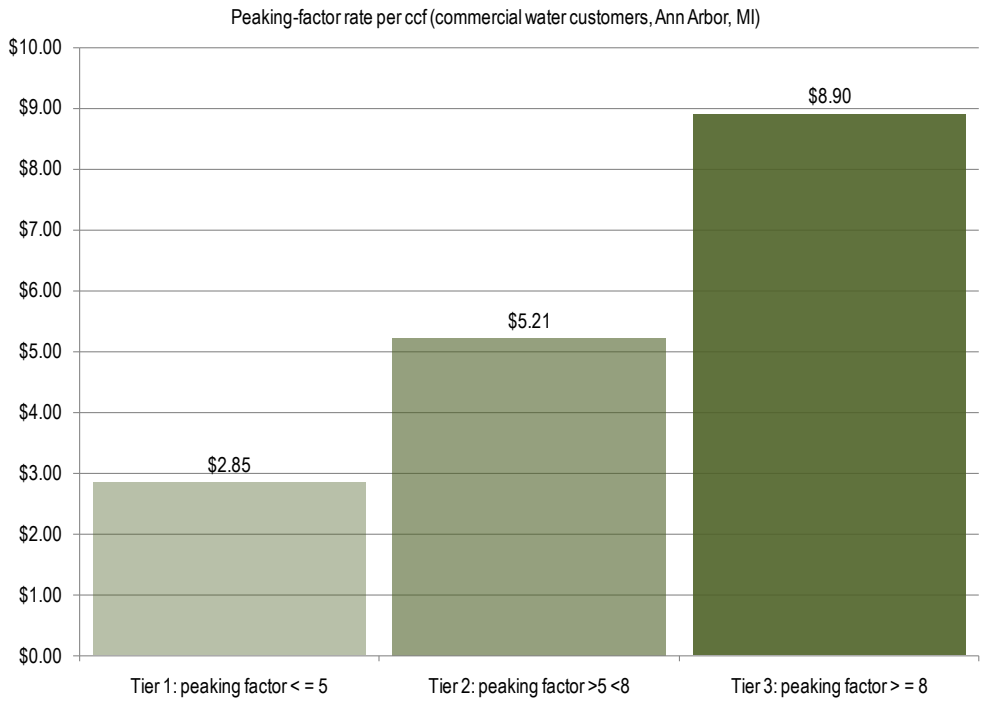

Exhibit A7. Peaking-factor rate (Ann Arbor, Michigan).

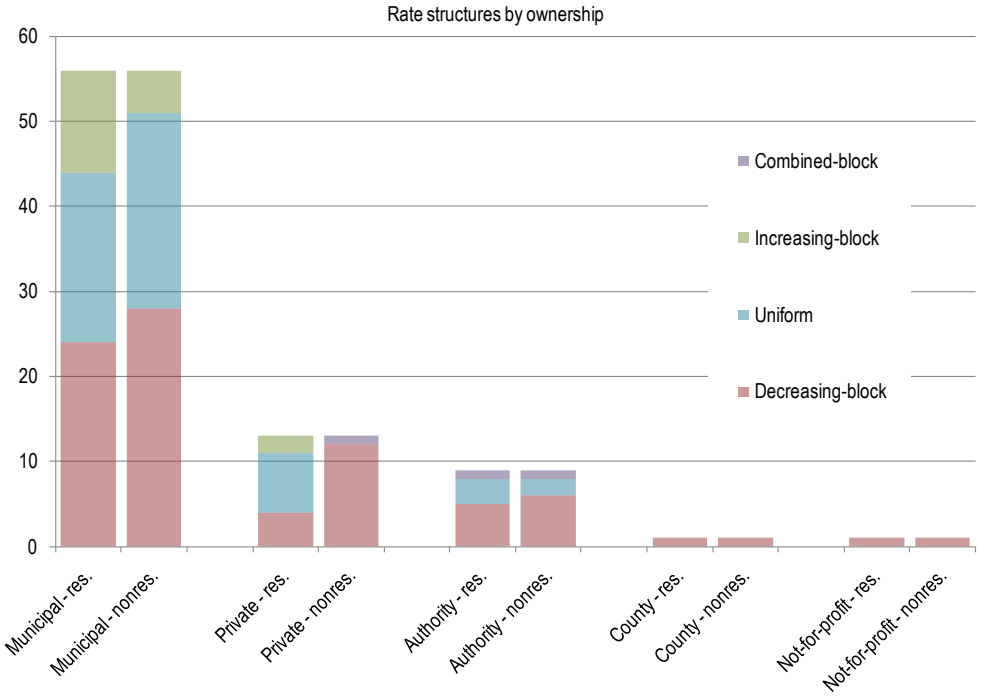

Exhibit A8. Rate structures by ownership.

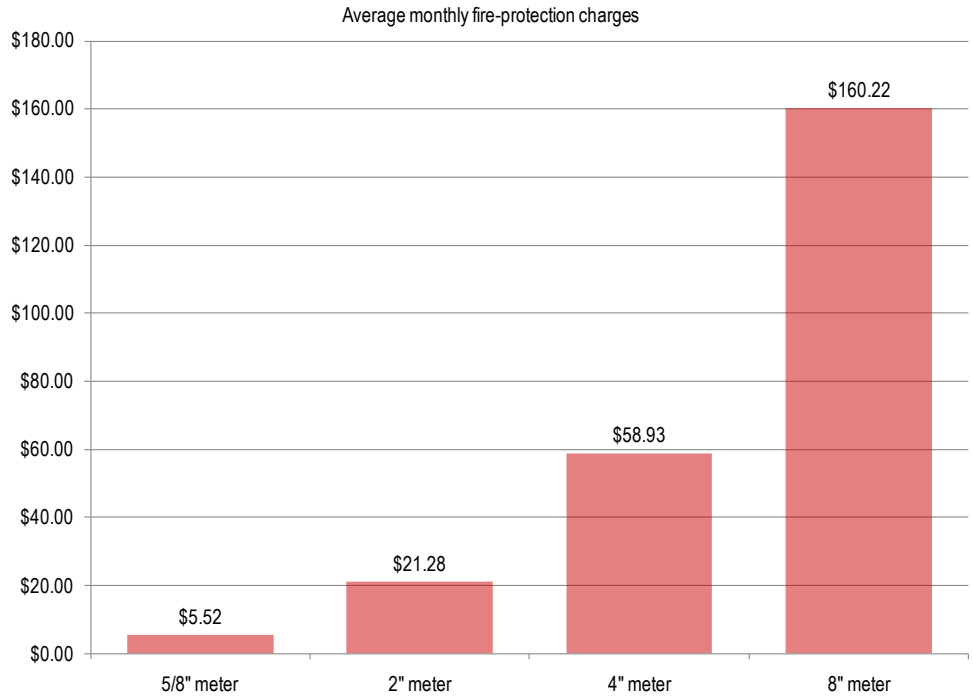

Exhibit A9. Average monthly charges for fire protection.

Exhibit A10. Fire-protection charges by meter size.

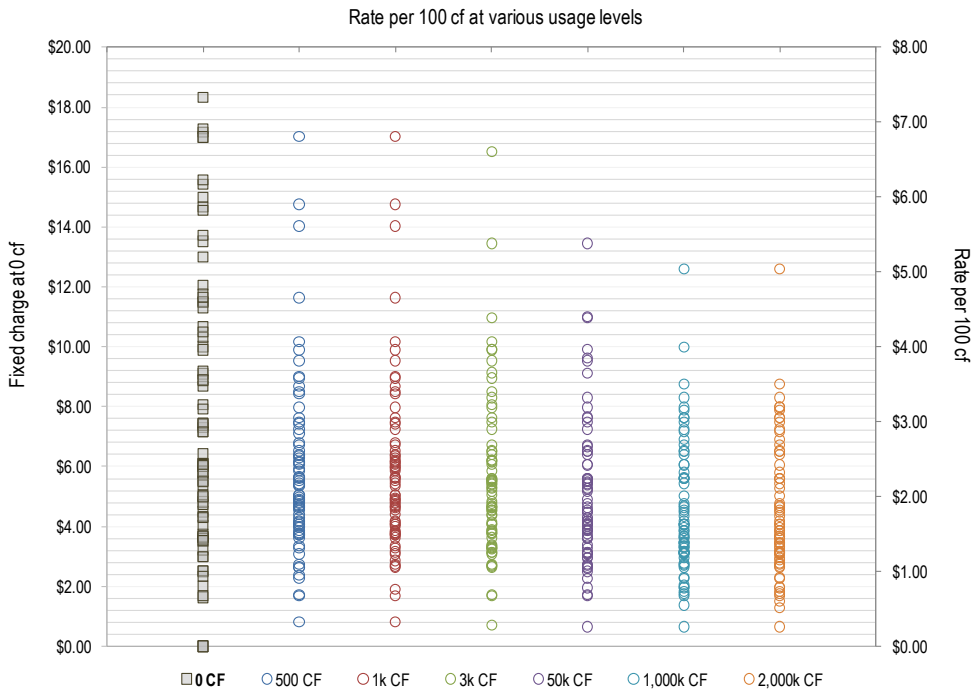

Exhibit A11. Fixed charges and rates per 100 cf usage.

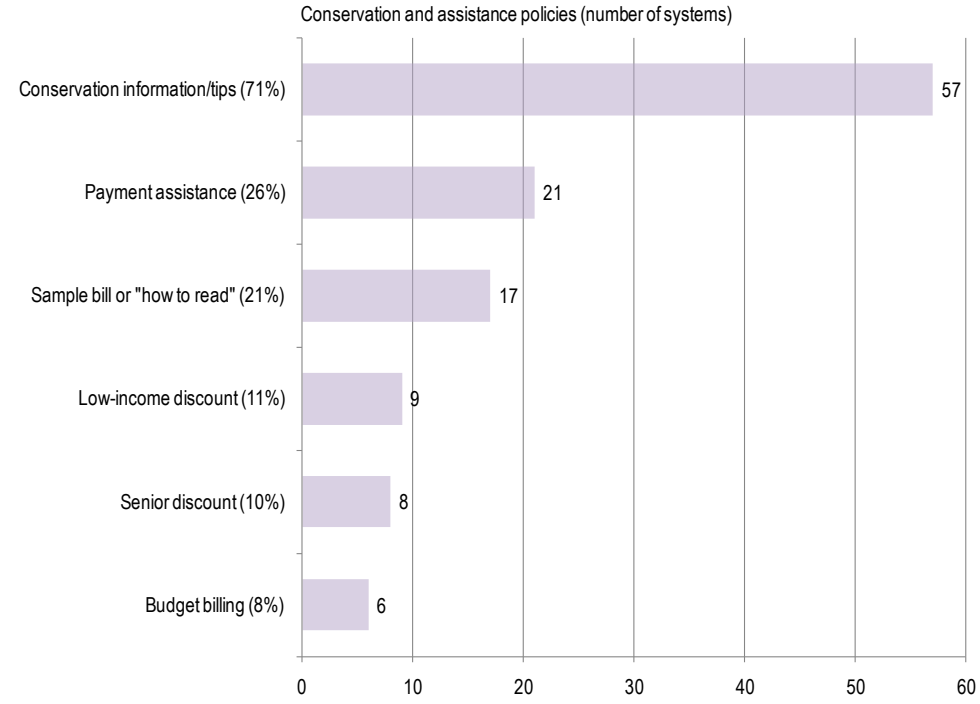

Exhibit A12. Conservation and assistance policies.

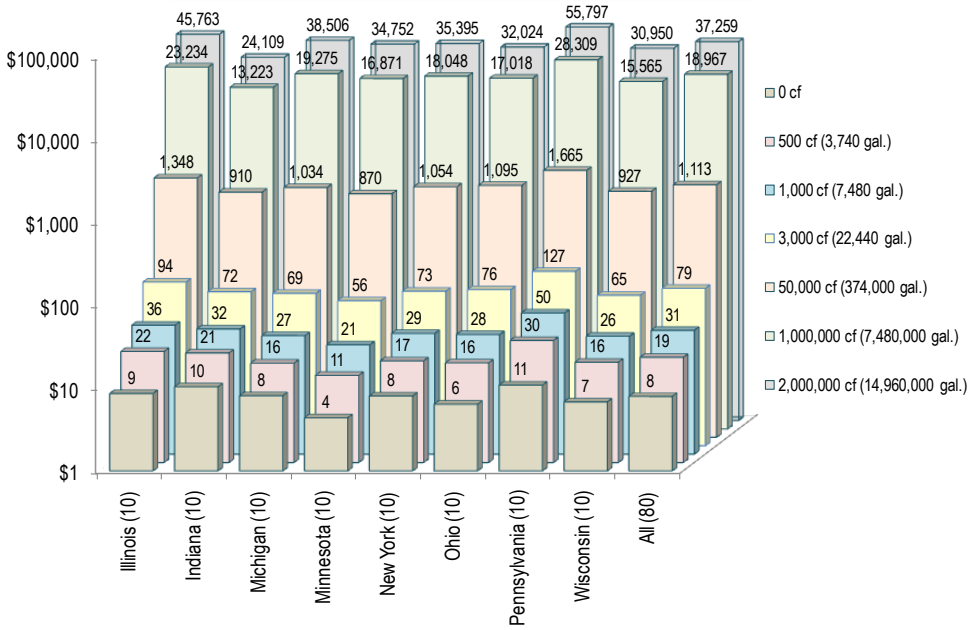

Exhibit A13. Monthly bills by state.

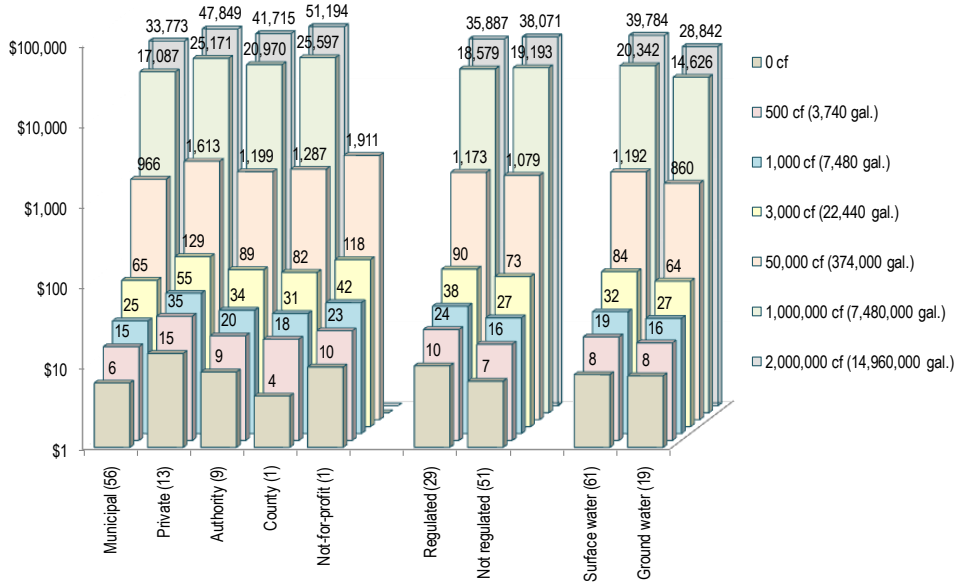

Exhibit A14. Monthly bills by system characteristic.

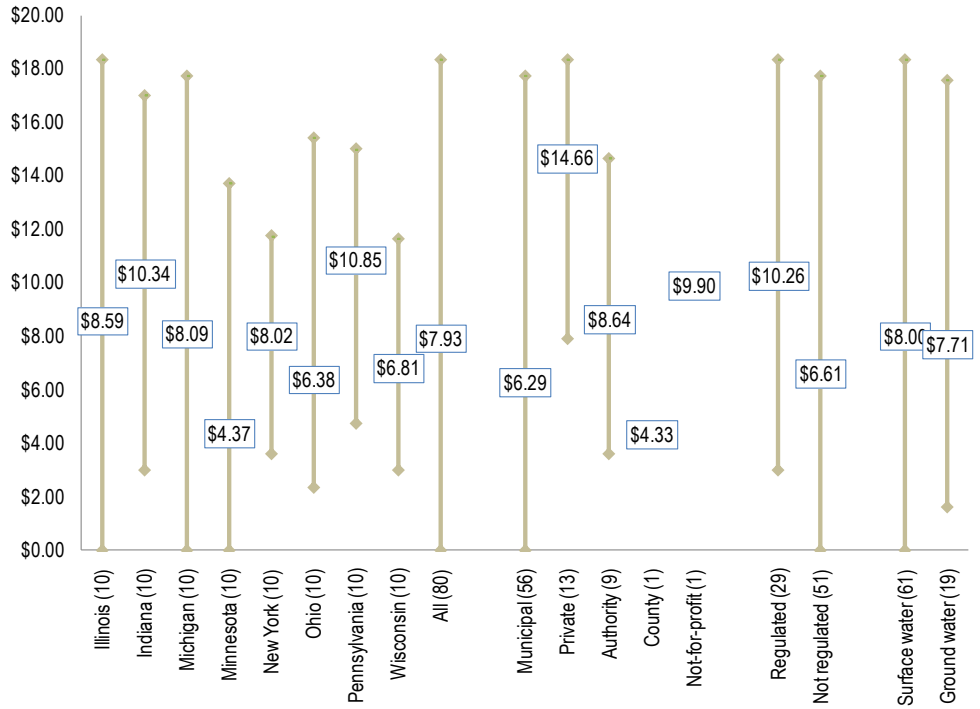

Exhibit A15. Average monthly bills and range at 0 cf usage.

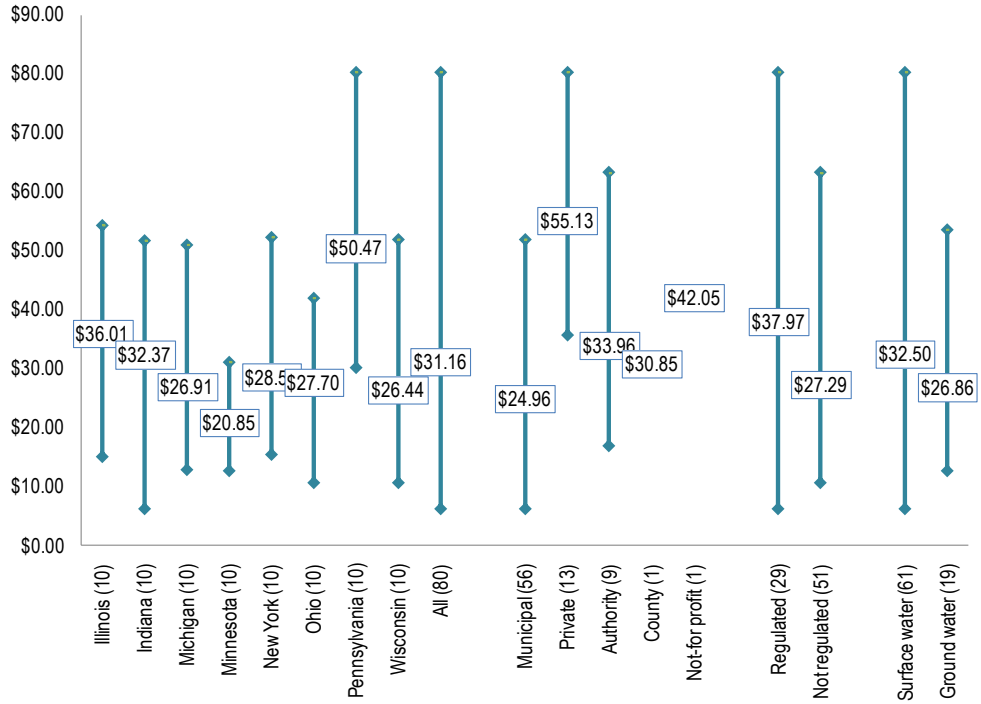

Exhibit A16. Average monthly bills and range at 1,000 cf usage.

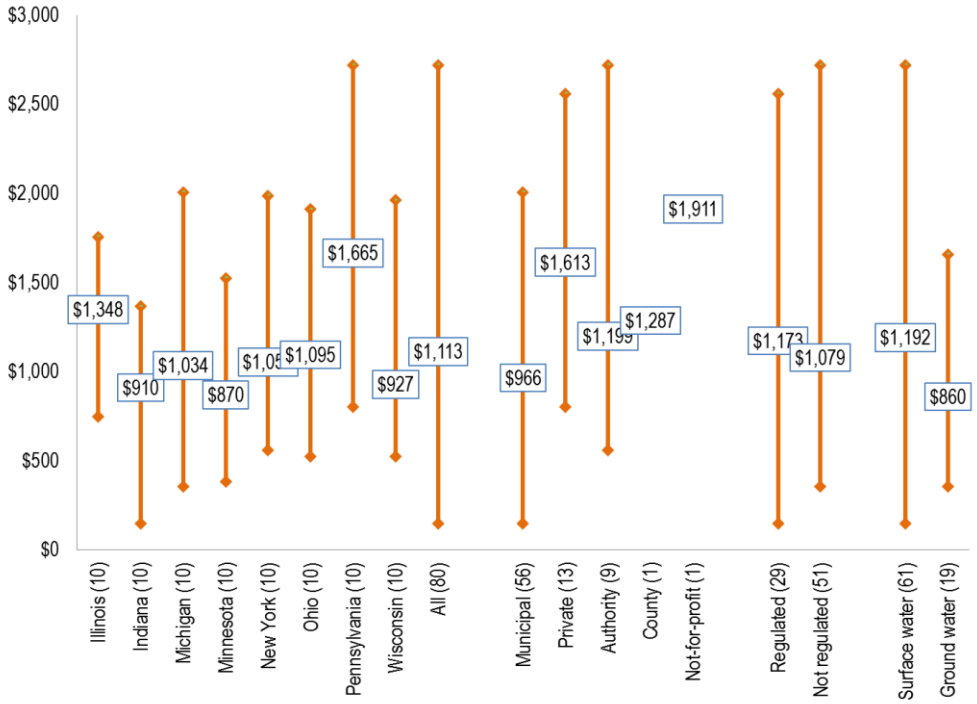

Exhibit A17. Average monthly bills and range at 50,000 cf usage.

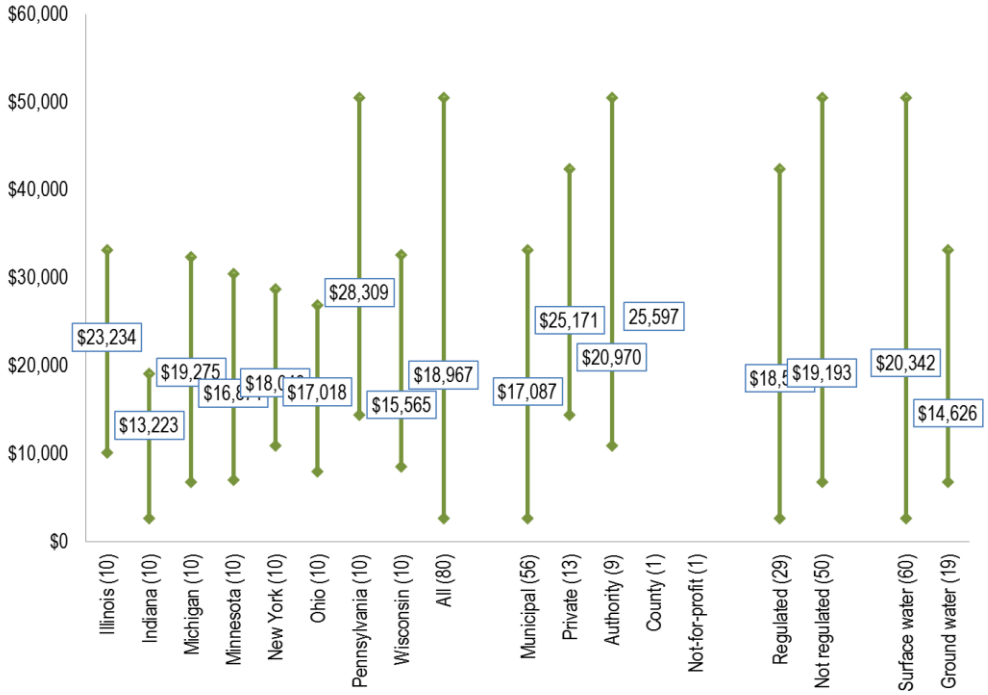

Exhibit A18. Average monthly bills and range at 1,000,000 cf usage.

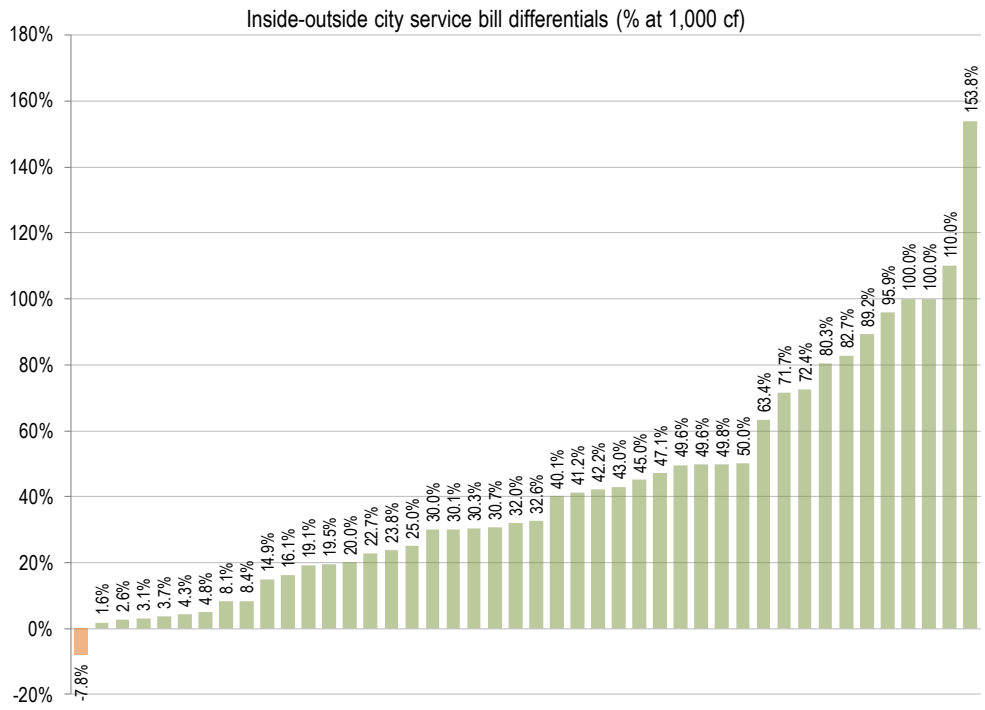

Exhibit A19. Inside-outside city service bill differential.

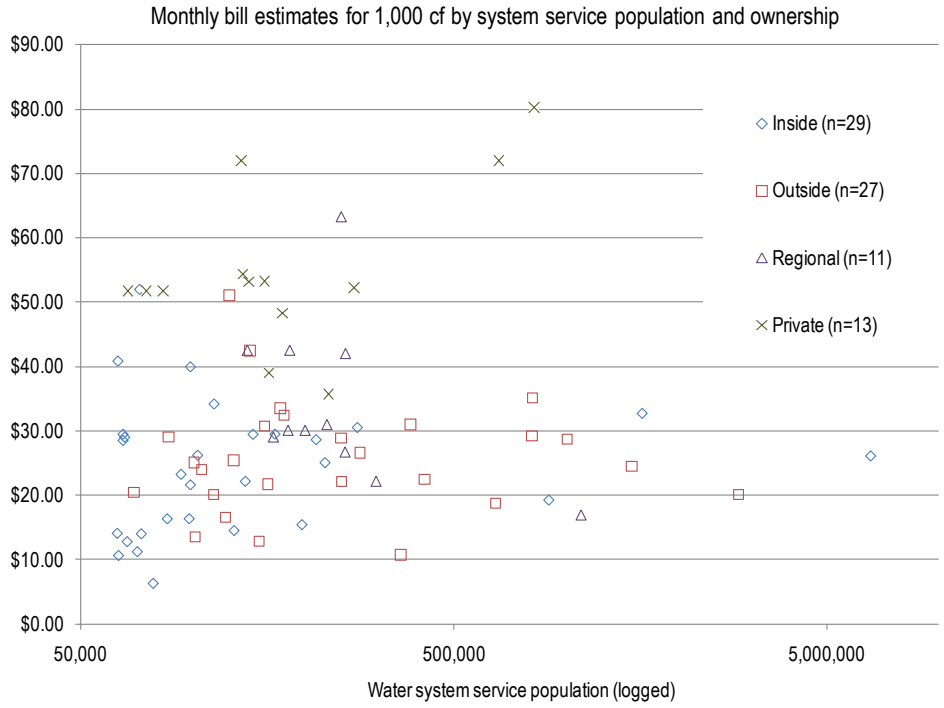

Exhibit A20. Monthly bill estimates for 1,000 cf by service population and ownership.

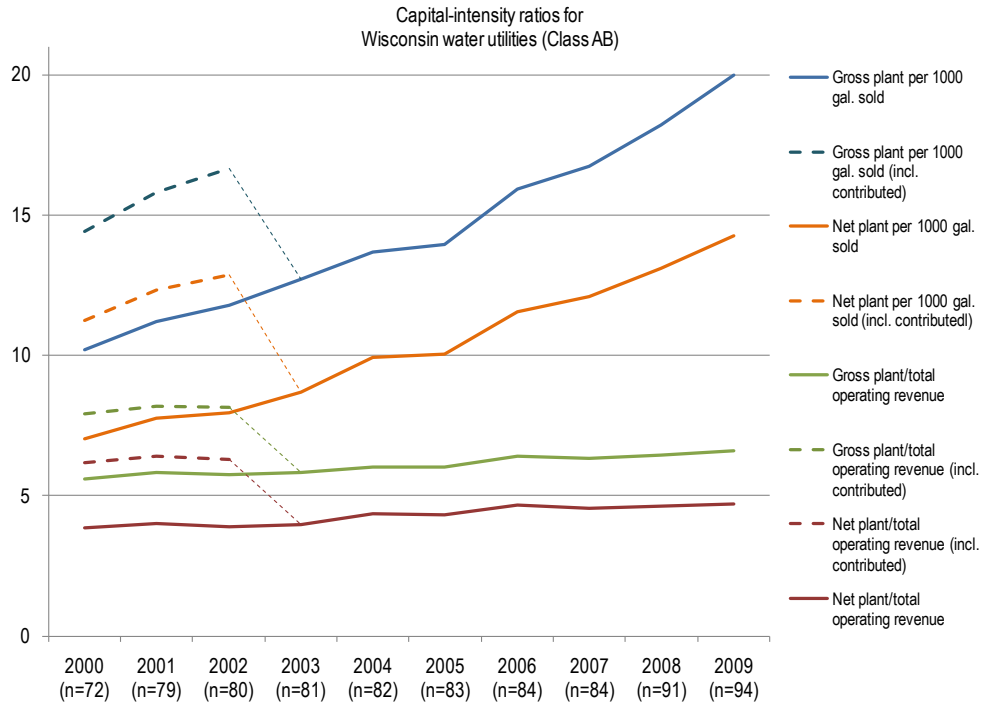

Exhibit A21. Utility plant to revenue (capital intensity) ratios (Wisconsin data).

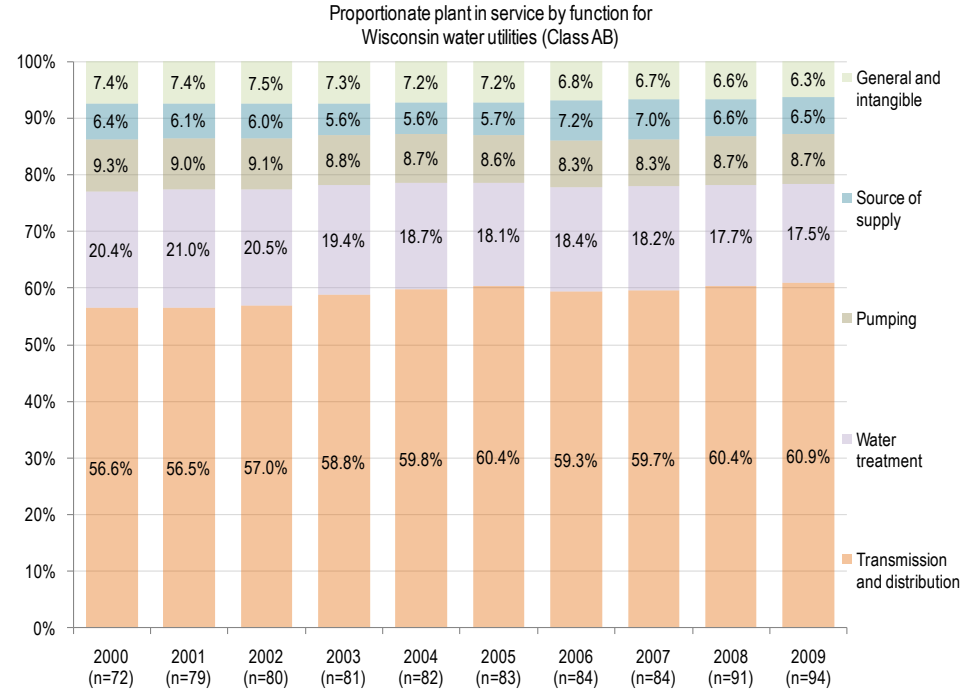

Exhibit A22. Plant in service (Wisconsin data).

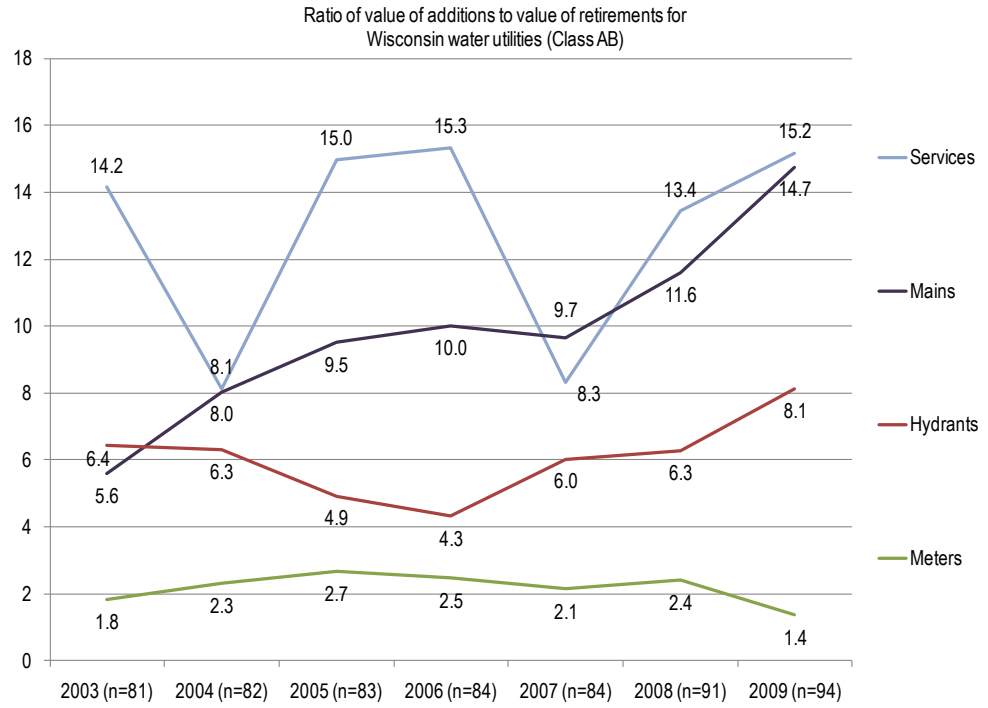

Exhibit A23. Plant in service (Wisconsin data).

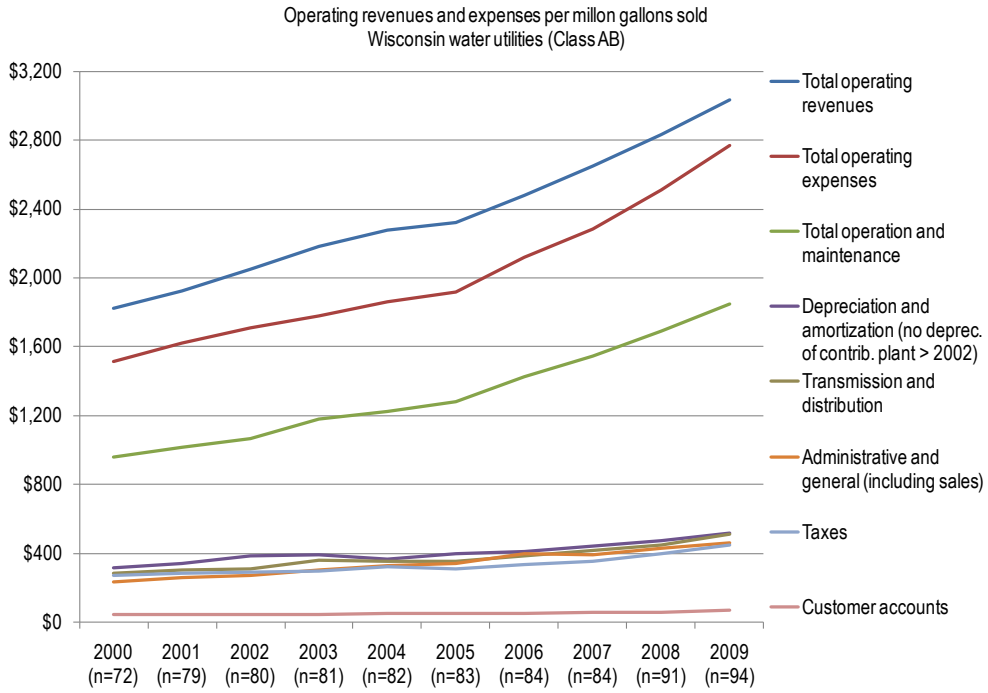

Exhibit A24. Operating revenues and expenses (Wisconsin data).

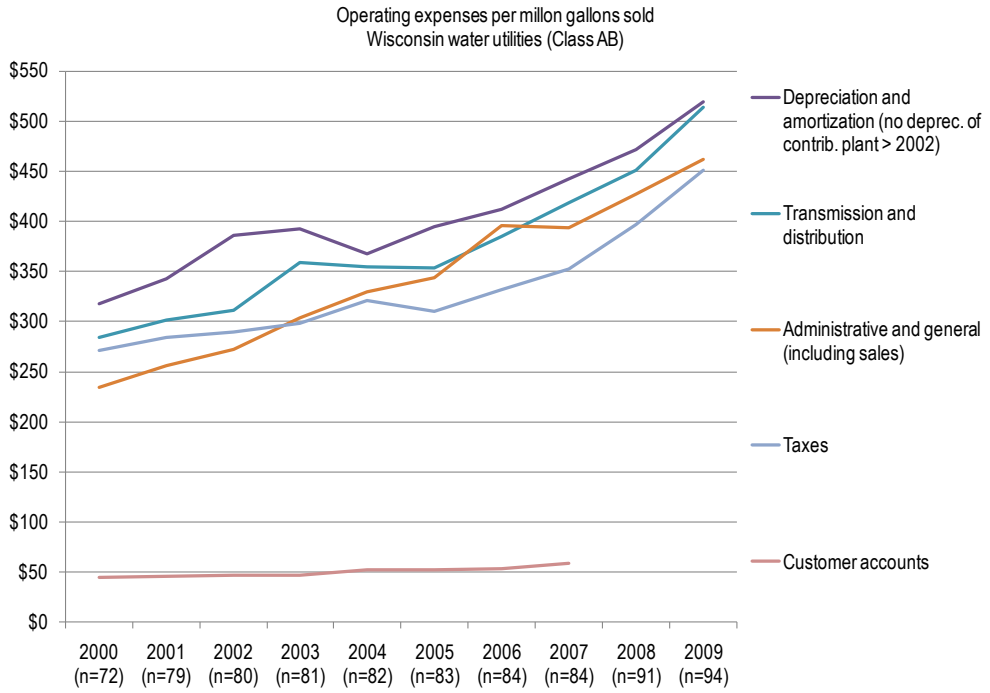

Exhibit A25. Operating revenues and expenses (Wisconsin data).

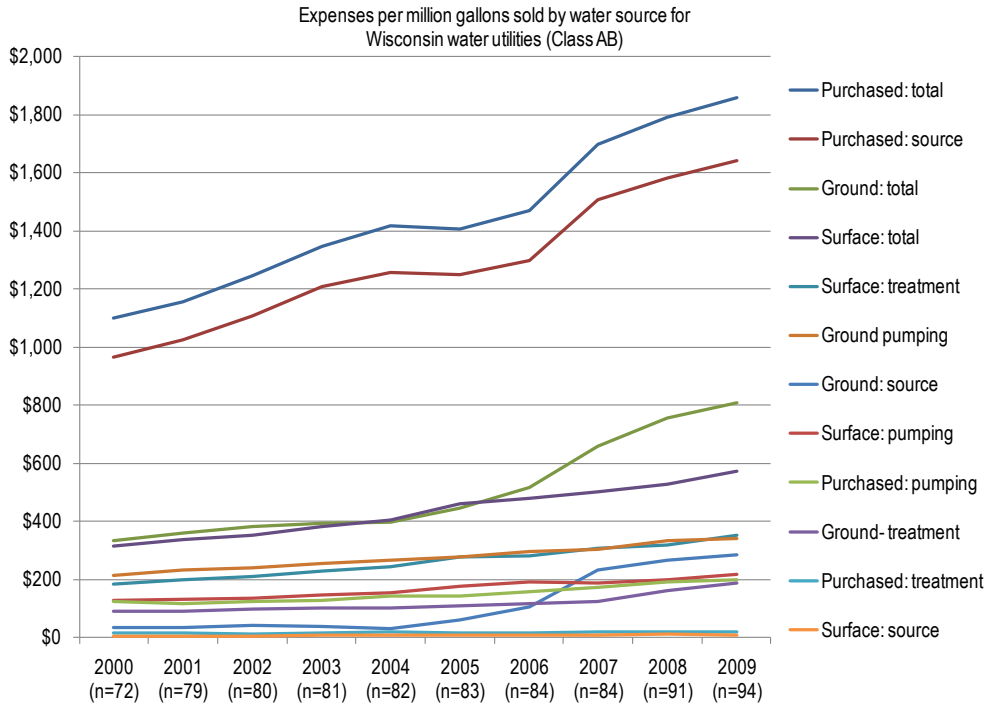

Exhibit A26. Expenses by water source (Wisconsin data).

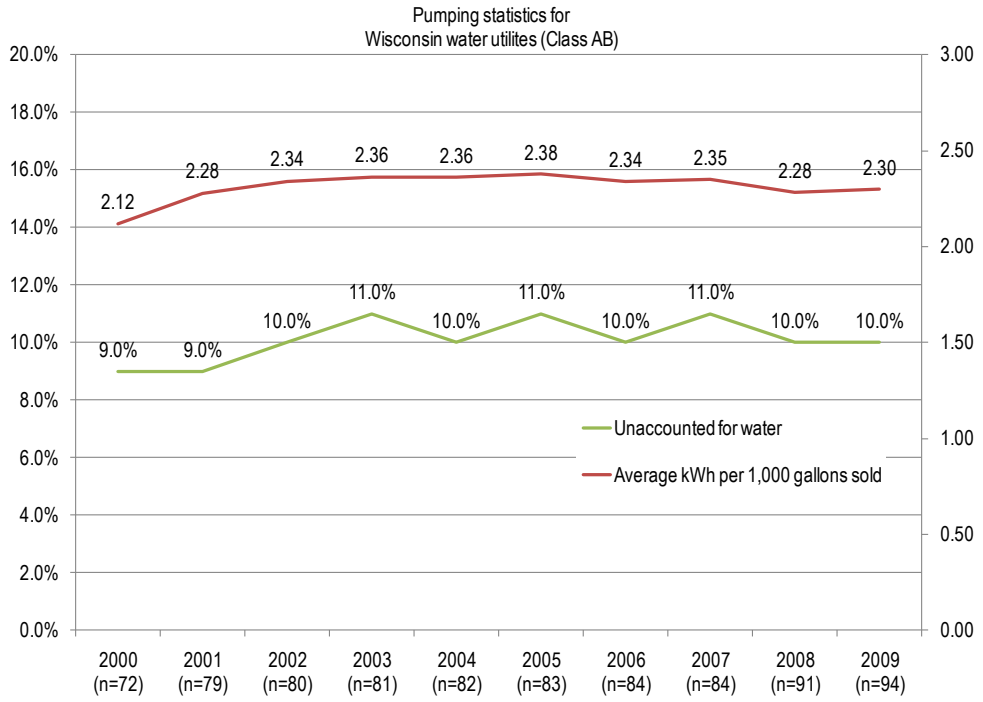

Exhibit A27. Pumping statistics (Wisconsin data).

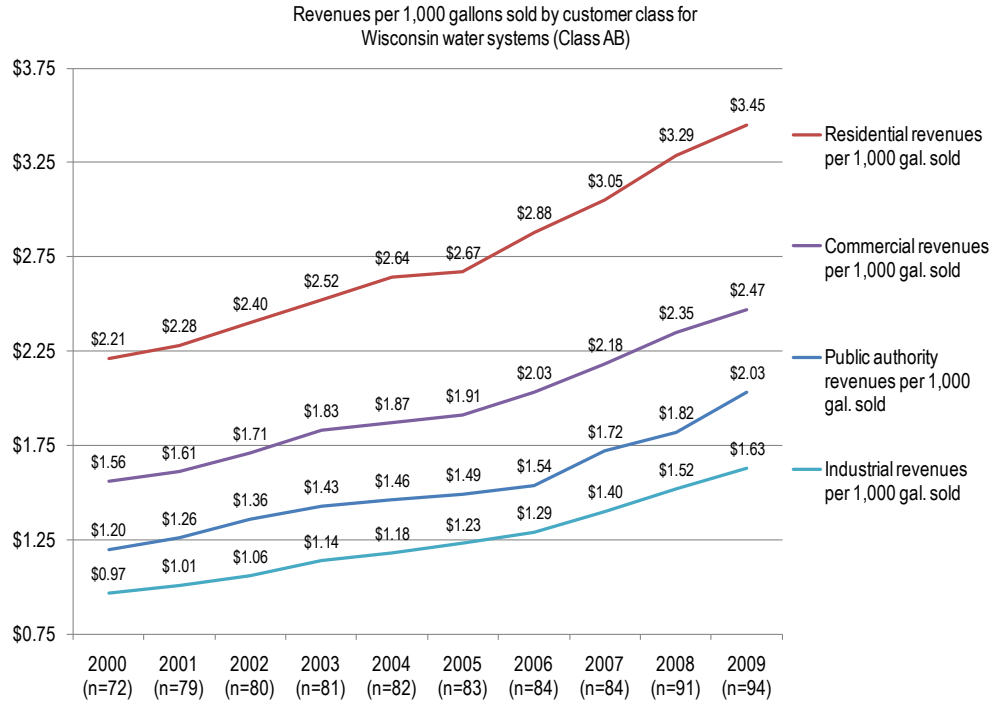

Exhibit A28. Revenues by customer class (Wisconsin data).

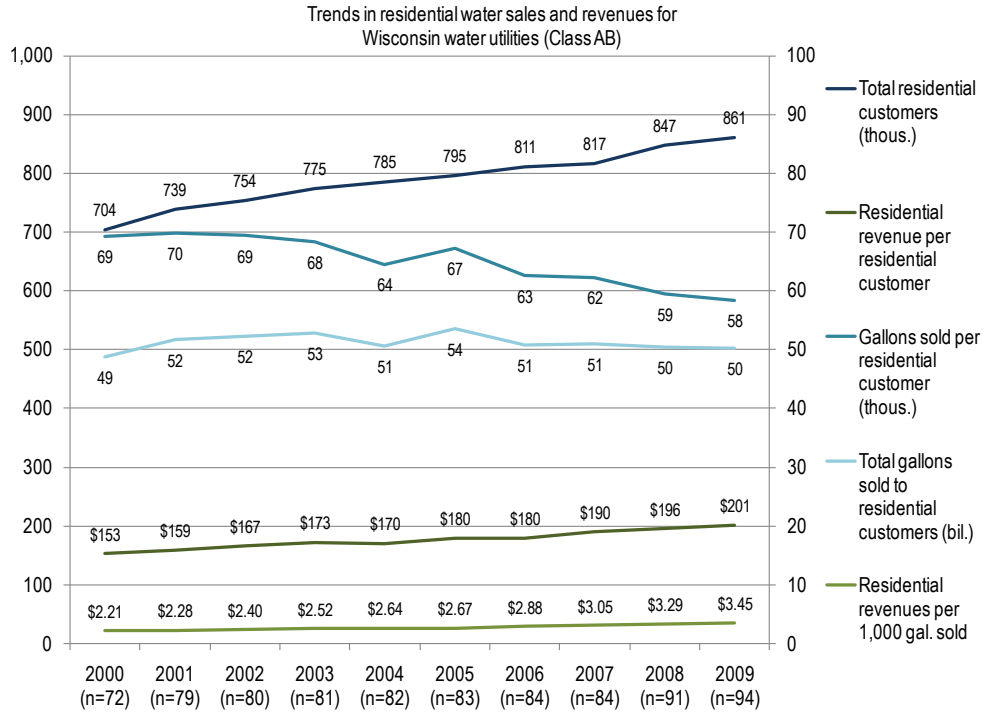

Exhibit A29. Trends in residential water sales and revenues (Wisconsin data).