

RESIDENTIAL WATER AND SEWER RATES IN GEORGIA

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Abstract. Georgia utilities use many different rate structures and practices under an economic regulatory framework that has few rate setting standards. These different structures have financial impacts on utility revenue stability, customer expenditures, and water consumption. This paper describes the results of a survey of residential water and sewer utility rates in Georgia. This survey is far more comprehensive than past surveys which have had small sample sizes and represented only the largest systems in the State. Survey results comprise rate information for more than 95 percent of all customers served by public water systems in the State. A novel customer expenditure model developed by EFC was used to calculate water and sewer bills for any consumption amount. The development of the model represents a breakthrough in the methodology for carrying out large sample size utility rate surveys. The median monthly-equivalent bill for “inside” residential customers for 6,000 gallons for water was \$20.50 and \$20.97 for wastewater in 2006 and this value is reported across a range of consumption amounts. The impacts of particular rate structures on revenue stability, customer expenditures and pricing signals are discussed.

INTRODUCTION

Georgia’s public utilities use many different rate strategies under an economic regulatory framework that has few rate setting standards (O.C.G.A §36-34). Each strategy has particular financial impacts on revenue stability and customer expenditures. Different rate strategies influence resource use differently and, conversely, efforts to impact resource use (e.g., conservation pricing) have unique revenue impacts depending on a utility’s rate structure and customer base. An emerging issue for many utilities is how to mitigate the impacts of rates on low-income customers; a utility’s rate structure plays a fundamental role in determining the amount low-income customers must pay to meet their basic needs. Despite the importance of these relationships, little analytical work has been done to examine rate structures in the context of the impact they have on revenue stability, customer expenditures, and price signals. This research begins to address that knowledge gap.

The first stage in examining rate structures in Georgia is creating an inventory of structures across the State. To date, there have been no comprehensive surveys of rate

structures throughout Georgia. The few surveys which have been published contain relatively small sample sets that are biased towards the largest utilities in the State. One drawback of these data sets is that larger systems have distinct economies of scale in their operations and their rates do not necessarily represent smaller utilities’ rates. A predominance of large systems means that these surveys may not accurately reflect statewide statistics. A primary objective of this survey was to create a comprehensive database with rate structures pertaining to 80 percent of customers of public utilities in Georgia.

Another drawback of recent surveys is that they present metrics which are too simplistic to be used as a basis for rate structure comparisons. One such metric is the monthly equivalent bill for discreet consumption amounts, e.g. for 7,500 gallons. This metric is too simplistic because it neglects the remainder of the consumption spectrum. For example, two systems may have the same bill for 7,500 gallons, however if one system has an increasing and the other has a decreasing block structure, the two structures can send dramatically different price signals at higher or lower consumption levels. Past surveys have commonly presented rate structures aggregated by type, e.g. uniform or increasing block structures, however, this metric is also insufficient in the light of the many different rate strategies. For example, an increasing block structure with steep block design may do far more to encourage conservation than one with the first block increase at 30,000 gallons which is outside the typical range of household consumption. To address these deficient metrics, the Environmental Finance Center (EFC) has designed a model which is capable of calculating monthly equivalent bills as a function of consumption for all structures in the survey, a first for large sample size utility rate surveys. This paper documents the process of preparing an inventory of rate schedules for 2006. It also presents novel metrics for analyzing the impacts those structures have on customer expenditures, revenue stability and price signals. These results will assist rate makers in assessing the relative merits of their rate structures for promoting particular rate objectives.

METHODOLOGY

The first task of the research was to collect the rate structures for all public water and wastewater systems in

the State. To this end, EFC collaborated with the Georgia Environmental Facilities Authority (GEFA) to build a list of target utilities from a collection of existing databases, and to produce a survey mailing. Other partners in the survey effort included the Georgia Municipal Association, the Georgia Rural Water Association, the Georgia Association of Water Professionals, the Association County Commissioners of Georgia, the Department of Community Affairs and the Environmental Protection Division. To reach the target response rate, EFC staff called all of the systems that had not responded to the initial mailing within two weeks of the mailing. Two months after the mailing, EFC was able to collect, among other information, the rate schedules for 415 out of 531 utilities (78 percent response rate).

To develop a model that calculates customer bills as a function of the quantity consumed, EFC examined dozens of the rate schedules and identified the key common variables needed to design the model. Key information included the variable rate, block range design, fixed charges, consumption-included minimum charges, and the billing period. A database was designed to differentiate the fields for water and wastewater, as well as for customers residing within political boundaries (“inside customers”) or outside those boundaries (“outside customers”), and this information was entered for each rate schedule. In most cases, the information was clearly listed in the rate schedule, but in other cases EFC staff were required to make back-calculations or follow-up phone calls to interpret the rate schedules correctly and collect missing information.

A spreadsheet model developed by the EFC was used to compute the monthly-equivalent bill using the data exported from the database and discrete variables such as the type of bill (water, wastewater or combined), the high or low season, bills for inside or outside customers, the meter size of the residential unit and the quantity of water billed per month for the household. Each input variable is discrete, except for the quantity consumed which is set as a continuous variable. After the user enters the consumption amount and descriptive variables, the model calculates monthly-equivalent bills for all utilities. The program hence automates the process of reading and interpreting the rate structure for each utility and computing the residential bill for any quantity of water consumed for all utilities in the database. The use of a model to automate household expenditures for rate surveys has been used previously by the EFC for a similar survey in North Carolina, but to date, the authors are unaware of any other major rate survey that includes an automated household expenditure model.

Several important data cleaning steps were required for quality control. In the first step, 62 queries and subqueries were used to check that data were entered in fields that do not contradict other user selections. For example, there should not be any data in the fields for block rates if

the utility has a uniform rate structure, and consequently the uniform rate must be greater than zero in this case. This step was important in detecting transcription errors as well as systematic errors based on the data entrant’s misunderstanding, for which additional training was implemented. This step also ensured the elimination of errors which would have caused the spreadsheet model to miscalculate the residential customer bills, since the model relies on the data in coordinated fields to compute the bills. In additional data cleaning steps, water and wastewater bills were manually calculated for 6,000 and 51,000 gallons and compared to the output of the household expenditure model. A 100% accuracy goal was targeted.

RESULTS AND DISCUSSION

The EFC was able to collect FY 2006-07 rate schedules for 415 utilities. It is estimated that the participating utilities are responsible for serving 94.5% of the water/wastewater-served statewide municipal population and 95.3% of the statewide population that are served by the non-municipal, local governmental utilities.

Commodity Rate Structure

Most of the utilities employed a uniform rate structure in 2006 (see Table 1), while almost all of the other utilities employed an increasing block or decreasing block rate structure. A uniform rate structure is one in which the rate, or per-unit price, is constant for all quantities; for example, \$3.00 for each 1,000 gallons consumed. An increasing block rate structure increases the rate at which water and sewer is charged based on the level of consumption, designed in a tiered consumption-block format. A decreasing block rate structure, conversely, is one in which the rate of water and sewer is decreased as consumption is increased. Seasonal surcharge refers to rate structures that increase to encourage conservation during the summer months; these are only used by the largest utilities. Alternatively, only the smallest utilities use flat fees which are fixed, periodic fees. Flat fees are common when the utility does not meter consumption.

Table 1. Distribution of Rate Structures Among 409 Water Utilities, by Number of Accounts

Customer Accounts	Uniform	Decreasing	Increasing	Seasonal Surcharge	Flat Fee
1-499	67%	10%	19%	0%	5%
500-999	78%	6%	14%	0%	2%
1,000-2,999	61%	10%	27%	0%	2%
3,000-7,499	55%	16%	27%	2%	0%
7,500-15,000	33%	10%	52%	5%	0%
>15,000	30%	12%	52%	6%	0%
Full Sample	60%	10%	26%	1%	2%

Non-Variable Charge Component of Monthly Billings

In addition to the variable rates, utilities often include non-variable charges, which are non-consumption based fixed charges and/or minimum charges. Fixed charges are fees added directly to the water or sewer bill. Minimum charges are constant fees charged for any quantity consumed within a small initial block; for example, a customer would be charged \$12.00 if she uses any quantity between 0 and 2,000 gallons in a month, and all consumption above this quantity would be charged at the uniform or block rate, hence the customer would always be charged a “minimum” of \$12.00. The fundamental difference between fixed and minimum charges from the customer’s perspective is that with a minimum charge, they would not be billed any amount in addition to the minimum charge if their consumption is low enough, whereas with a fixed charge, the customer would pay the fixed charge as well as a commodity charge for consumption.

In Georgia, fixed charges are higher for small water utilities than for larger utilities; there is no apparent trend for minimum charges. The utility-median fixed and minimum charges for inside water customers are shown in Table 2, based on the population the utility serves. Small utilities more frequently employed minimum charges than larger utilities, which more often added fixed charges.

Monthly Charge for Water and Wastewater

Most rate surveys focus on what an average customer pays for service a month. When data are available, average consumption is used to calculate the monthly bill, otherwise a value is assumed that is commonly between 4,500 and 7,500 gallons per month. In a 2004 survey of 51 utilities (Zieburtz, 2004), the median bill for 7,500 gallons of water was \$22.65. In a later survey, (GMA, 2005) the median monthly-equivalent bill for 5,000 gallons for 92 utilities was \$16.26 for water and \$17.05 for sewer inside city limits. The median monthly equivalent bill for 6,000 gallons of water for this survey is recorded in Table 3 by utility size. Surprisingly, economies-of-scale were not reflected on the water side. One possible explanation is that smaller utilities more frequently use groundwater,

Table 3. Monthly-Equivalent Residential Billing for 6,000 gallons of Water and Wastewater by Population Served

Customer Accounts	Water		Wastewater	
	Number of Systems	Bill	Number of Systems	Bill
1-499	153	\$20.50	66	\$17.45
500-999	51	\$20.25	46	\$19.84
1,000-2,999	107	\$20.02	96	\$20.00
3,000-7,499	44	\$21.26	41	\$21.40
7,500-15,000	21	\$16.40	18	\$22.60
>15,000	33	\$20.73	30	\$24.95
Full Sample	409	\$20.50	297	\$20.97

which is cheaper to purify, and this balances economies-of-scale captured by larger systems. The median water bill for 6,000 gallons for groundwater systems in this survey was \$18.18 versus \$23.80 for surface water systems. Notably, there also appears to be a dis-economy of scale on the wastewater side. It is not clear why this would be.

While these figures may serve as useful benchmarks for a particular consumption level, they do not describe the price of service for the rest of the consumption spectrum. The wide array of rate structures used throughout the state lead to important variations in the relative amount charged by individual utilities at different consumption points. This is apparent in Figure 1, where example rate structures for two individual systems are compared to the survey median for a range of consumption levels between zero and 14,000 gallons. While utility A and C charge more than and less than the state median at lower consumption levels, respectively, their rate structures are set in such a way that their billings at higher consumption levels are less than and more than the state median, respectively. Furthermore, this chart emphasizes the danger of setting one utility’s rates simply by comparing their billing charges at one or two consumption levels; utility A, utility C and the State median bills are nearly indistinguishable between 3,000 and 5,000 gallons. With incomplete information on how a utility’s billings range over the full consumption spectrum, inaccurate conclusions may be generalized that its rates are relatively “too high” or “too low” when compared statewide or other utilities at particular consumption levels.

Another advantage to plotting bills across the consumption spectrum is that rate strategies become more apparent in this presentation. It is apparent in Figure 1 that utility C, at one extreme, has a relatively small fixed charge, which may be set in consideration of the amount low-income customers have to pay to meet their basic needs. However, the variable rate component is relatively steep and the price signal for conservation is stronger at higher consumption amounts. At the other extreme, utility A has a relatively large minimum charge, which may be designed to promote utility revenue stability, and a low uniform rate which suggests that conservation pricing is

Table 2. Fixed and Minimum Charges for 409 Water Utilities, by Population Served

Customer Accounts	Number of Systems	Median Minimum Charge	Percent Using Minimum Charges	Median Fixed Charge	Percent Using Fixed Charges
1-499	153	\$12.00	82%	\$10.00	14%
500-999	51	\$10.50	82%	\$10.25	20%
1,000-2,999	107	\$9.88	79%	\$8.00	20%
3,000-7,499	44	\$12.00	57%	\$7.00	43%
7,500-15,000	21	\$10.25	57%	\$6.00	43%
>15,000	33	\$10.61	39%	\$6.00	61%
Number of Systems with Charge		303		100	

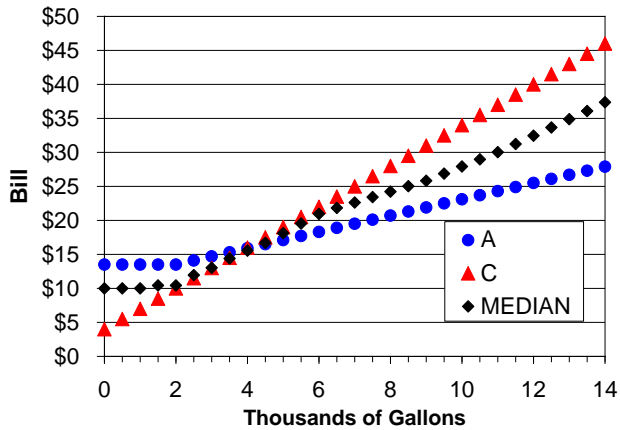


Figure 1. State (409 utility) median and two sample water utilities' residential billing for zero to 14,000 gallons.

not a priority for this system. The State median lies between these two opposing designs.

Revenue Sensitivity and Price Signals to Consumption Declines – the Impact of Rate Structures

One of the benefits of being able to compute utilities' billings for any quantity is the ability to study the utilities' sensitivity to changes in consumption patterns and analyze the effects of different rate structures on the magnitude of potential revenue changes. Simulating a large drop in consumption from 10,000 gallons/month to 5,000 gallons/month, as might be the extreme case during drought years when conservation mandates are enforced in the summer, the percentage decrease in the billing amount is shown in Figure 2. Although actual revenue decline depends on the number of residential customers who would be affected by the conservation mandates and their usage, as well as the number of commercial, industrial and other non-residential accounts, this chart provides an estimate of the potential decrease of residential-attributable revenue for different utilities across the state. In general, most utilities can experience a 36 – 45% drop in revenue for this 50% drop in consumption. However, in some instances, utilities may experience a greater drop in revenue, while many more have a rate structure in place that provides a buffer to this change in consumption patterns.

The impact that different types of rate structures have on pricing signals for this drop in consumption is also apparent in Figure 2. There is some disagreement as to whether absolute or relative decrease in bill amounts (percentage) sends a stronger price signal. For example, it is not clear whether a bill that drops from \$30 to \$15 (\$15, 50% of bill) sends a stronger signal than a bill that drops from \$70 to \$50 (\$20, 28% of bill). Nevertheless, this analysis provides a novel tool for examining one aspect of pricing signals that rate structures send. Surprisingly, increasing block, decreasing block and uniform structures can all yield a greater proportional drop (>50%) in billing

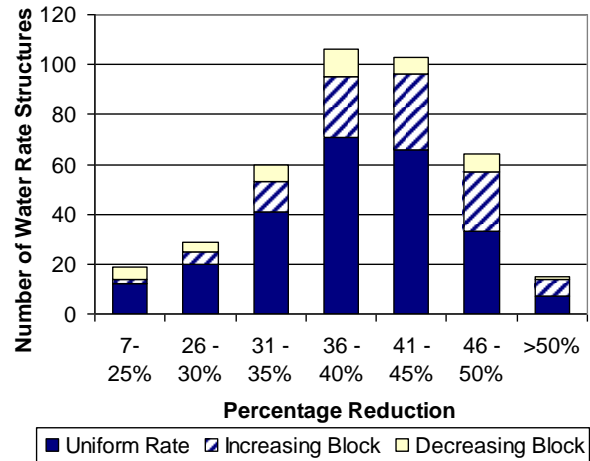


Figure 2. Reductions in Monthly-Equivalent Water Bills (Inside) for a Reduction in Residential Consumption, from 10,000 to 5,000 Gallons.

than the proportional drop in consumption (50%). In addition, a significant fraction of increasing block structures are designed such that this 50% drop in consumption will only lower the customers' bill by less than 35%, sending a relatively weak conservation price signal for this particular decline in consumption. This can happen when an increasing block structure has a large minimum charge and block increases are small. Simultaneously, some decreasing block structures in the State yield more than 46% lower bill for the same drop in consumption, and thus may have a stronger conservation message for some customers. This can happen when a decreasing block structure is designed with a low minimum or fixed charge and relatively high variable charges within each block.

CONCLUSIONS

In this paper, the methodology behind the survey and residential water and sewer rate structures in Georgia for 2006, was presented. In addition, novel metrics were presented that allow more sophisticated analysis of what is done and what can be done with rate structures in the State.

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