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 preliminary 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. Final survey results will comprise rate information for 80 percent of all customers served by public and non-profit water and sewer 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 5,000 gallons for water was $18.12 and $19.74 for wastewater in 2006 and this value is reported across a range of consumption amounts. The impacts of particular rate structures on utility revenue stability, customer expenditures and pricing signals are discussed.

INTRODUCTION

Georgia utilities use many different rate strategies under an economic regulatory framework that has few rate setting standards (O.C.G.A §36-34-5). 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. Furthermore, different rate structures have a fundamental impact on how revenue requirements are allocated among customer classes and customers with different usage patterns. An emerging issue for many utilities is how to mitigate the impacts of rates on low-income customers; a utility's rate structure can play a major 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 greater economies of scale in their operations and their rates can be lower than smaller utilities can afford. 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; the goal was to collect rate structures pertaining to 80 percent of customers of public and non-profit systems 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 5,000 or 10,000 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 5,000 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.

METHODLOGY

The first task of the research was to collect the rate structures for all public and non-profit water and sewer systems in the State. In order to collect the necessary rate information, 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 Georgia 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 approximately xx utilities.

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 water or wastewater variable rate, block ranges and rates, constant or meter-based fixed charges, quantity-based minimum charges and their corresponding quantities, and the billing period. A database was designed to differentiate the fields for water and wastewater, as well as for rates being charged for customers residing within the city limits ("inside customers") or outside the limits ("outside customers"). EFC staff entered necessary information from each rate schedule into the database. 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 input variables such as the type of bill (water, wastewater or combined), the high or low season, bills for customers residing inside or outside the city limits, the meter size of the residential unit and the quantity of water billed per month for the household. Each input variable is categorical with a set of alternatives from which the user could make only one discrete choice, except for the quantity consumed which is set as a continuous variable. After the user enters the consumption amount and descriptive variables, the model generates results in output tables for all 344 utilities. The program hence automates the process of reading and understanding the rate structure for each utility and computing the residential customer 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. The first data cleaning step was included at the end of data entry into the database, using 62 queries, many of which contained several sub-queries, to check that data are entered only in the valid fields based on selections made in other fields. 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. The data cleaning step also helped in eliminating errors which would have caused the spreadsheet model to miscalculate the residential customer bills, since the model relies on the data in specific fields from the database in computing the bills. The quality check step included randomly selecting 20% of the utilities and manually computing their water and wastewater bills from their scanned rate schedules for four discrete quantities of water consumed per month (0 gallons, 3,000 gallons, 6,000 gallons and 12,000 gallons), for both inside and outside customers, and comparing the results with the output of the computer model. A 100% accuracy goal was targeted.

RESULTS AND DISCUSSION

The EFC was able to collect FY 2006-07 rate schedules for xx utilities. It is estimated that the participating xx utilities are responsible for serving over xx% of the water/sewer-served statewide municipal population and over xx% of the statewide population that are served by the non-municipal governmental and not-for-profit utilities identified for this study.

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 block format.

For example, a utility may charge a block rate of $2.50 per 1,000 gallons of consumption for all quantities up to 5,000 gallons, and a greater block rate of $4.00 per 1,000 gallons for quantities consumed above and beyond 5,000 gallons. A decreasing block rate structure, conversely, is one in which the rate of water and sewer is decreased as consumption is increased.

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 consumption-based 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, based on her level of consumption. The fundamental difference between fixed charges and minimum charges from the perspective of the customer is that with a minimum charge structure, she would not be billed any amount in addition to the minimum charge if her consumption is low enough, whereas with a fixed charge structure, the customer would pay the fixed charge as well as a commodity charge for consumption.

In Georgia, fixed charges and minimum charges are higher for small water and sewer utilities than for larger utilities. 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. Furthermore, larger municipalities charged lower fixed and minimum charges than smaller municipalities, probably due to lower average costs resulting from economies of scale being captured by the larger systems.

Monthly Charge for Water and Sewer

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 5,000 gallons of water for this survey is recorded in Table 3. The State median values for this survey could be slightly higher than reported in the 2005 survey because of rate increases between FY 04-05 and FY 05-06. 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.

Table 1. Distribution of Rate Structures Among 56 Water Utilities, by Population Served

Service Population	Uniform	Decreasing	Increasing	Seasonal	Tiered Flat Fee
<500	25%	0%	75%	0%	X
500-2,499	64%	8%	28%	0%	X
2,500-9,999	61%	17%	17%	6%	X
>10,000	25%	25%	38%	13%	X
Full Sample	55%	13%	29%	4%	X

Table 2. Fixed and Minimum Charges for 56 Water Utilities, by Population Served

Service Population	Number of Systems	Median Fixed Charge	Percent Using Fixed Charges	Median Minimum Charge	Percent Using Minimum Charges
<500	4	$13.00	50%	$17.50	50%
500-2,499	26	$5.32	8%	$10.00	92%
2,500-9,999	18	$5.50	22%	$9.25	78%
>10,000	8	$7.81	50%	$10.95	50%
Number of Systems with Charge		12		44	

Table 3. Monthly-Equivalent Residential Billing for 5,000 gallons of Water and Sewer by Population Served

	Water		Sewer	
Service Population	Number of Systems	Bill	Number of Systems	Bill
<500	4	$24.25	1	$48.00
500-2,499	21	$17.98	16	$18.92
2,500-9,999	13	$14.54	13	$20.75
>10,000	6	$20.18	7	$20.36
Full Sample	44	$18.12	37	$19.74

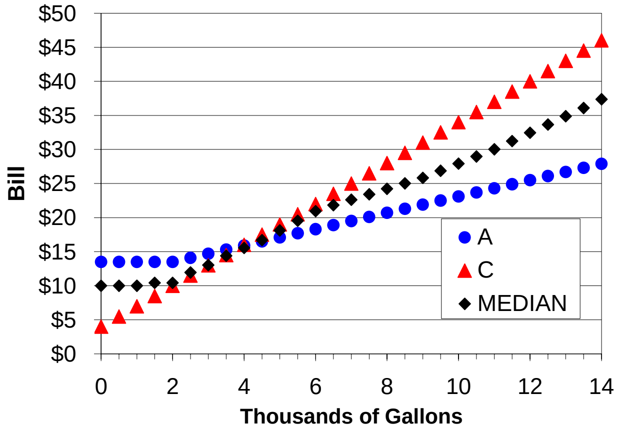

Figure 1. State (56 utility) median and two sample water utilitys' residential billing for zero to 14,000 gallons.

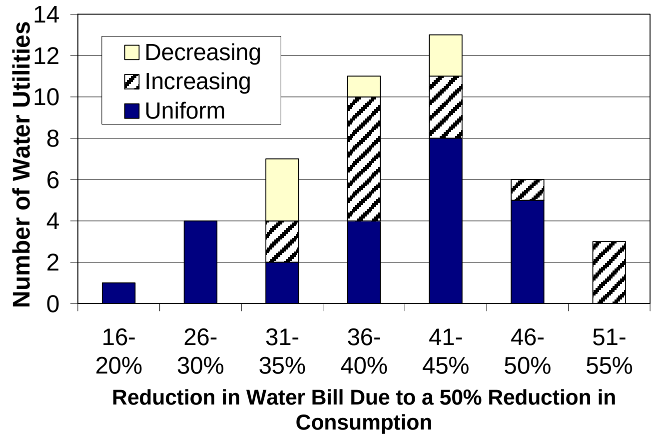

Figure 2. Reductions in Monthly-Equivalent Water Bills (Inside) for a 50-Percent Reduction in Residential Consumption, from 10,000 Gallons to 5,000 Gallons.

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 to the state 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 a 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 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 revenue changes. Simulating a large drop in consumption from 10,000 gallons/month to 5,000 gallons/month, as might be the 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 on the number of commercial, industrial and other non-residential accounts, this chart provides a rough estimate on the decrease of residential-attributable revenue for different utilities across the state.

In general, most utilities will experience a 41 – 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 however 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 are also apparent in Figure 2. As expected, an increasing block structure is the only type of structure that yields a greater proportional drop (51-55%) in residential billing than the proportional drop in consumption (50%). What is surprising is that a significant fraction of increasing block structures in Georgia are designed such that this 50% drop in consumption will only lower the customers bill 31-35%, sending a very weak conservation price signal. Simultaneously, some decreasing block structures in the State yield a 41-45% lower bill for the same drop in consumption, and thus have a stronger conservation message.

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.

LITERATURE CITED

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