

Moving Toward Monthly Billing: Measure of Improvements to Cost-of-Service Equity

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ABSTRACT

Many water utilities are considering moving from bi-monthly or quarterly billing cycles to a monthly billing cycle. Many factors influence these considerations. Examples of influencing factors include cost, customer service, and the impact on the utility's working capital. This paper looks at another aspect of the monthly vs. bi-monthly billing cycle question: cost-of-service equity.

As utilities adopt more aggressive conservation-oriented rate designs, the underlying goal is often to sharpen the pricing signal received by customers. If billing cycles are too long, the price signal can be diluted. That is, a longer billing cycle results in the customers' consumption being average over a longer period. The length of the billing cycle over which consumption is measured can affect customers' bills. That means, theoretically, that a utility can have two customers that consume the same quantity of water over the same time period receiving differing bills. If this theoretical possibility is commonly encountered for customers, a longer billing cycle might introduce inequities.

This study uses historical water utility billing information from actual utilities at the customer level to develop measures of customer equity on a cost-of-service basis. This type of analyses allows utilities to include the potential benefits of cost-of-service equity when considering the length of its billing cycles.

KEYWORDS

Billing frequency, bi-monthly billing.

INTRODUCTION

Many utilities are examining their billing practices to assess the benefits of billing customers more frequently. These examinations rightly include evaluations of the potential costs and benefits of more frequent bill preparation. Although critically important to any decision on changing the frequency of billing, this paper does not examine the costs or benefits of such an arrangement in detail. That effort is left to others. Rather, this paper examines the impact that the length of a billing cycle can have on equity of customer bills.

To examine the equity of customer bills, this paper looks at historical customer billing data from three water utilities located in the Western United States. These utilities are located in Southern California, Eastern Colorado, and central Texas. Each utility has unique water use characteristics.

THE ANALYSES

Overview of the Process

For each utility, we examined actual monthly customer water consumption for a random sample of 500 single-family residential accounts over a 5-year period. For the base case, we calculated mock water bills assuming various three-tier water rate structures. Each water rate structure was applied to all three utilities.

The accounts selected for the analyses had the following characteristics:

1. Single-family residential customers who were located within the jurisdiction of the utility.
2. Customers had the predominant meter size for single-family residential customers for that utility.
3. Customers had monthly bills for the entire 5-year period under observation.

For each selected customer, bills were calculated using a three-tier water rate structure. The bills were first calculated on a monthly basis using these mock rates and tier thresholds (i.e., amount of water a customer could purchase at each tier rate). The monthly bills were added together to determine a bi-monthly cost of water. In addition, we summed the water consumption for these customers for each two-month period before applying the tiered rate structure with double the tier thresholds. In this case, the mock water rates were the same for both the bills calculated monthly and bi-monthly and the amount of water available within each tier was adjusted for the length of the billing cycle. Summing the consumption over a 2-month period simulated the methodology used for bi-monthly billing frequencies.

The difference in the bills under each of the two billing approaches (i.e., summing the separate monthly water bills vs. summing the consumption before calculating the bills) is a measure of the loss in customer equity. Various mock rate and tier thresholds were applied to each utility's customers to test the impact that region and rate structure could have on the analyses.

Customer Use Characteristics

The utilities used in the analyses were assured by the authors that their identities would not be made public. However, to provide some context, the following information is available:

1. Central Texas utility:
 - a. Average annual monthly consumption for single-family residential customers in the sample equaled 12.1 hundred cubic feet (CCF) per month.
 - b. Peak-month average consumption of 18.5 CCF.
2. Southern California utility:
 - a. Average annual monthly consumption for single-family residential customers in the sample equaled 19.6 hundred cubic feet (CCF) per month.
 - b. Peak-month average consumption of 27.2 CCF.

3. Eastern Colorado utility:
 - a. Average annual monthly consumption for single-family residential customers in the sample equaled 13.3 hundred cubic feet (CCF) per month.
 - b. Peak-month average consumption of 25.1 CCF.

Rate Structures Tested

Appendix A resents detailed tables that show the percentage of mock customer bills that were affected by a change to bi-monthly reads for various tiered rate structures. In general, the three-tier rate structures priced water in the first tier at \$2.00 per CCF, the second tier at \$3.00 per CCF, and the third tier at \$4.00 per CCF.

For each utility, we prepared a sensitivity analyses that looked at the number of bills affected at various tier thresholds. The results varied by utility and are presented in Appendix A. The results demonstrated that a fair number of bills would be affected by the billing frequency. The affect varied by utility and by tier threshold. This variation seemed related to the peak-season and average-day demands of the utility’s customers.

Table 1 presents a sample of data from Appendix A. These results demonstrate the variation in the number of bill affected by the billing frequency and the specific utility.

Table 1: Percent of Bills Affected by Billing Frequency

Bi-Monthly Tier 2 Threshold (CCF)	Central Texas Utility	Southern California Utility	Eastern Colorado Utility
20	20.3%	10.0%	22.7%
32	14.6%	15.1%	18.1%
40	10.9%	14.4%	14.5%

Of further importance to our analyses was the average impact on the bills affected by the changing in billing frequency. Appendix B presents the results of those analyses. For those customers with bills that were affected by the billing frequency, the variation was from 3.28% to 4.23%. As a starting point, we assumed the three-tier rate structure would have a rate of \$2.00 per hundred cubic feet (CCF) for the first tier, \$3.00 per CCF for the second tier, and \$4.00 per CCF for all consumption in the third tier.

FINDINGS

General Findings

Depending on the tiered thresholds considered, the length of a billing cycle does impact the bills to a utility’s customers. This finding is consistent with common sense. The average monthly consumption over a two-month period is equal to or less than the individual consumption for

those months. With a rate design that increases as consumption increases, the longer the averaging period the more likely the average consumption will stay below the higher tier thresholds.

Results Varied by Region

Although more work needs to be done on regional differences, our results indicated that the choice of tier threshold impact different utilities differently. This finding is likely closely correlated to each utility's individual customer characteristics. The differences encountered were greater for utilities when the tier thresholds were correlated to their average peak-season demands.

Bill Impacts

We examined the average percentage change in those bills that were affected by the change in billing cycle length. The impact depended on the rates selected for each tier examined. Appendix B presents the results by utility.

CONCLUSIONS

The length of the billing cycle does have an effect on the equity of a customer's water bill. Shortening a billing cycle from bi-monthly to monthly increases the amount of water sold at higher block thresholds (assuming the tier thresholds for bi-monthly bills are double the tier threshold applied to monthly bills). The selection of the tier thresholds and the tier rates directly affect the number of customers impacted by the billing cycle length and the percentage change in their bills.

The affects varied by utility examined and could be related to customer base, climatic condition, and other factors. The results for individual utilities is likely to vary. The authors suggest each utility examine its likely affects in detail.

The costs and benefits of moving from a bi-monthly billing cycle to a monthly billing cycle are outside the scope of this paper and should be considered carefully when considering changes to billing cycles.

The scope of this analysis was limited to three utilities with mock rate designs. Additional investigation of the impacts using actual adopted rate structures could provide valuable insight into the impacts billing frequency has on cost-of-service equity.

APPENDIX A

Percentage of Bills Affected by Changes in Billing Frequency for Various Block Thresholds

Central Texas Utility

Percent of Bills Affected by Change in Billing Frequency

		Bi-Monthly Tier 1 Threshold												
		2	4	6	8	10	12	14	16	18	20	22	24	26
4	7.2%													
6	11.1%													
8	14.2%			14.2%										
10	17.6%			17.6%	17.6%									
12	18.6%			18.6%	18.6%	18.6%								
14	20.0%			20.0%	20.0%	20.0%	20.0%							
16	21.1%			21.1%	21.1%	21.1%	21.1%	21.1%						
18	21.0%			21.0%	21.0%	21.0%	21.0%	21.0%	21.0%					
20	20.3%			20.3%	20.3%	20.3%	20.3%	20.3%	20.3%	20.3%				
22	19.5%			19.5%	19.5%	19.5%	19.5%	19.5%	19.5%	19.5%	19.5%			
24	18.5%			18.5%	18.5%	18.5%	18.5%	18.5%	18.5%	18.5%	18.5%	18.5%		
26	17.6%			17.6%	17.6%	17.6%	17.6%	17.6%	17.6%	17.6%	17.6%	17.6%	17.6%	
28	16.5%			16.5%	16.5%	16.5%	16.5%	16.5%	16.5%	16.5%	16.5%	16.5%	16.5%	16.5%
30	15.7%			15.7%	15.7%	15.7%	15.7%	15.7%	15.7%	15.7%	15.7%	15.7%	15.7%	15.7%
32	14.6%			14.6%	14.6%	14.6%	14.6%	14.6%	14.6%	14.6%	14.6%	14.6%	14.6%	14.6%
34	13.7%			13.7%	13.7%	13.7%	13.7%	13.7%	13.7%	13.7%	13.7%	13.7%	13.7%	13.7%
36	12.7%			12.7%	12.7%	12.7%	12.7%	12.7%	12.7%	12.7%	12.7%	12.7%	12.7%	12.7%
38	11.6%			11.6%	11.6%	11.6%	11.6%	11.6%	11.6%	11.6%	11.6%	11.6%	11.6%	11.6%
40	10.9%			10.9%	10.9%	10.9%	10.9%	10.9%	10.9%	10.9%	10.9%	10.9%	10.9%	10.9%
42	9.9%			9.9%	9.9%	9.9%	9.9%	9.9%	9.9%	9.9%	9.9%	9.9%	9.9%	9.9%
44	9.3%			9.3%	9.3%	9.3%	9.3%	9.3%	9.3%	9.3%	9.3%	9.3%	9.3%	9.3%
46	8.5%			8.5%	8.5%	8.5%	8.5%	8.5%	8.5%	8.5%	8.5%	8.5%	8.5%	8.5%
48	8.0%			8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
50	7.1%			7.1%	7.1%	7.1%	7.1%	7.1%	7.1%	7.1%	7.1%	7.1%	7.1%	7.1%
52	6.7%			6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%
54	6.1%			6.1%	6.1%	6.1%	6.1%	6.1%	6.1%	6.1%	6.1%	6.1%	6.1%	6.1%
56	5.7%			5.7%	5.7%	5.7%	5.7%	5.7%	5.7%	5.7%	5.7%	5.7%	5.7%	5.7%
58	5.2%			5.2%	5.2%	5.2%	5.2%	5.2%	5.2%	5.2%	5.2%	5.2%	5.2%	5.2%
60	4.8%			4.8%	4.8%	4.8%	4.8%	4.8%	4.8%	4.8%	4.8%	4.8%	4.8%	4.8%

Bi-Monthly Tier 2 Threshold

Southern California Utility

Percent of Bills Affected by Change in Billing Frequency

		Bi-Monthly Tier 1 Threshold												
		2	4	6	8	10	12	14	16	18	20	22	24	26
4	0.5%													
6	0.8%													
8	1.5%	1.5%												
10	2.4%	2.4%	2.4%											
12	3.7%	3.7%	3.7%	3.7%										
14	5.1%	5.1%	5.1%	5.1%	5.1%									
16	6.9%	6.9%	6.9%	6.9%	6.9%	6.9%								
18	8.6%	8.6%	8.6%	8.6%	8.6%	8.6%	8.6%							
20	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%						
22	11.5%	11.5%	11.5%	11.5%	11.5%	11.5%	11.5%	11.5%	11.5%					
24	12.7%	12.7%	12.7%	12.7%	12.7%	12.7%	12.7%	12.7%	12.7%	12.7%				
26	13.5%	13.5%	13.5%	13.5%	13.5%	13.5%	13.5%	13.5%	13.5%	13.5%	13.5%			
28	14.1%	14.1%	14.1%	14.1%	14.1%	14.1%	14.1%	14.1%	14.1%	14.1%	14.1%	14.1%		
30	14.8%	14.8%	14.8%	14.8%	14.8%	14.8%	14.8%	14.8%	14.8%	14.8%	14.8%	14.8%	14.8%	
32	15.1%	15.1%	15.1%	15.1%	15.1%	15.1%	15.1%	15.1%	15.1%	15.1%	15.1%	15.1%	15.1%	15.1%
34	14.9%	14.9%	14.9%	14.9%	14.9%	14.9%	14.9%	14.9%	14.9%	14.9%	14.9%	14.9%	14.9%	14.9%
36	15.1%	15.1%	15.1%	15.1%	15.1%	15.1%	15.1%	15.1%	15.1%	15.1%	15.1%	15.1%	15.1%	15.1%
38	14.8%	14.8%	14.8%	14.8%	14.8%	14.8%	14.8%	14.8%	14.8%	14.8%	14.8%	14.8%	14.8%	14.8%
40	14.4%	14.4%	14.4%	14.4%	14.4%	14.4%	14.4%	14.4%	14.4%	14.4%	14.4%	14.4%	14.4%	14.4%
42	13.6%	13.6%	13.6%	13.6%	13.6%	13.6%	13.6%	13.6%	13.6%	13.6%	13.6%	13.6%	13.6%	13.6%
44	13.3%	13.3%	13.3%	13.3%	13.3%	13.3%	13.3%	13.3%	13.3%	13.3%	13.3%	13.3%	13.3%	13.3%
46	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%
48	12.2%	12.2%	12.2%	12.2%	12.2%	12.2%	12.2%	12.2%	12.2%	12.2%	12.2%	12.2%	12.2%	12.2%
50	11.5%	11.5%	11.5%	11.5%	11.5%	11.5%	11.5%	11.5%	11.5%	11.5%	11.5%	11.5%	11.5%	11.5%
52	11.1%	11.1%	11.1%	11.1%	11.1%	11.1%	11.1%	11.1%	11.1%	11.1%	11.1%	11.1%	11.1%	11.1%
54	10.4%	10.4%	10.4%	10.4%	10.4%	10.4%	10.4%	10.4%	10.4%	10.4%	10.4%	10.4%	10.4%	10.4%
56	9.8%	9.8%	9.8%	9.8%	9.8%	9.8%	9.8%	9.8%	9.8%	9.8%	9.8%	9.8%	9.8%	9.8%
58	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%
60	8.4%	8.4%	8.4%	8.4%	8.4%	8.4%	8.4%	8.4%	8.4%	8.4%	8.4%	8.4%	8.4%	8.4%

Bi-Monthly Tier 2 Threshold

Eastern Colorado Utility

Percent of Bills Affected by Change in Billing Frequency

		Bi-Monthly Tier 1 Threshold												
		2	4	6	8	10	12	14	16	18	20	22	24	26
4	6.4%													
6	10.5%													
8	13.9%			13.9%										
10	17.9%			17.9%	17.9%									
12	19.9%			19.9%	19.9%	19.9%								
14	21.7%			21.7%	21.7%	21.7%	21.7%							
16	23.0%			23.0%	23.0%	23.0%	23.0%	23.0%						
18	23.5%			23.5%	23.5%	23.5%	23.5%	23.5%	23.5%					
20	22.7%			22.7%	22.7%	22.7%	22.7%	22.7%	22.7%	22.7%				
22	22.0%			22.0%	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%			
24	21.1%			21.1%	21.1%	21.1%	21.1%	21.1%	21.1%	21.1%	21.1%	21.1%		
26	20.3%			20.3%	20.3%	20.3%	20.3%	20.3%	20.3%	20.3%	20.3%	20.3%	20.3%	
28	19.6%			19.6%	19.6%	19.6%	19.6%	19.6%	19.6%	19.6%	19.6%	19.6%	19.6%	19.6%
30	18.9%			18.9%	18.9%	18.9%	18.9%	18.9%	18.9%	18.9%	18.9%	18.9%	18.9%	18.9%
32	18.1%			18.1%	18.1%	18.1%	18.1%	18.1%	18.1%	18.1%	18.1%	18.1%	18.1%	18.1%
34	17.2%			17.2%	17.2%	17.2%	17.2%	17.2%	17.2%	17.2%	17.2%	17.2%	17.2%	17.2%
36	16.2%			16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%	16.2%
38	15.2%			15.2%	15.2%	15.2%	15.2%	15.2%	15.2%	15.2%	15.2%	15.2%	15.2%	15.2%
40	14.5%			14.5%	14.5%	14.5%	14.5%	14.5%	14.5%	14.5%	14.5%	14.5%	14.5%	14.5%
42	13.5%			13.5%	13.5%	13.5%	13.5%	13.5%	13.5%	13.5%	13.5%	13.5%	13.5%	13.5%
44	12.8%			12.8%	12.8%	12.8%	12.8%	12.8%	12.8%	12.8%	12.8%	12.8%	12.8%	12.8%
46	12.0%			12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%
48	11.3%			11.3%	11.3%	11.3%	11.3%	11.3%	11.3%	11.3%	11.3%	11.3%	11.3%	11.3%
50	10.3%			10.3%	10.3%	10.3%	10.3%	10.3%	10.3%	10.3%	10.3%	10.3%	10.3%	10.3%
52	9.8%			9.8%	9.8%	9.8%	9.8%	9.8%	9.8%	9.8%	9.8%	9.8%	9.8%	9.8%
54	9.1%			9.1%	9.1%	9.1%	9.1%	9.1%	9.1%	9.1%	9.1%	9.1%	9.1%	9.1%
56	8.5%			8.5%	8.5%	8.5%	8.5%	8.5%	8.5%	8.5%	8.5%	8.5%	8.5%	8.5%
58	7.8%			7.8%	7.8%	7.8%	7.8%	7.8%	7.8%	7.8%	7.8%	7.8%	7.8%	7.8%
60	7.2%			7.2%	7.2%	7.2%	7.2%	7.2%	7.2%	7.2%	7.2%	7.2%	7.2%	7.2%

Bi-Monthly Tier 2 Threshold

APPENDIX B

Average Percent Change in Bills Affected by Billing Frequency

Central Texas Utility			
Tier	Bi-Monthly Threshold (CCF)	Rate (per CCF)	Average % Bill Impact
1	22	\$2.00	
2	32	\$3.00	
3	>32	\$4.00	
Total Bill			4.23%

Southern California Utility			
Tier	Bi-Monthly Threshold (CCF)	Rate (per CCF)	Average % Bill Impact
1	16	\$2.00	
2	32	\$3.00	
3	>32	\$4.00	
Total Bill			3.73%

Eastern Colorado Utility			
Tier	Bi-Monthly Threshold (CCF)	Rate (per CCF)	Average % Bill Impact
1	10	\$2.00	
2	20	\$3.00	
3	>20	\$4.00	
Total Bill			3.28%