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ALIGNING REVENUE STABILITY AND WATER CONSERVATION GOALS WITH NEW BUSINESS MODELS IN FOUR NORTH CAROLINA WATER UTILITIES

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Abstract

Under the current business model used by most water utilities in the U.S., there is inherent tension between the need to recover enough revenue to cover the costs of operating and investing in a water utility and customer’s promoting water efficiency through price. The following report is an in-depth investigation of alternative business models that better align these conflicting objectives with four North Carolina urban water utilities. Preliminary analysis of four alternative models was conducted for each of the utilities. Based on utility preferences and priorities, each chose a model for a more in-depth analysis into the utility financial and customer impacts. For each utility, the EFC modeled three to four different scenarios to test the financial sensitivity to some of these assumptions and design parameters. And while each model and each scenario, in preliminary and detailed analysis, greatly increases the revenue stability for each utility, the manner in which it does so is quite different. These alternatives warrant further consideration in how they are implemented by utilities and understood (and responded to) by customers.
Acknowledgements

This analysis is built on years of working with water utilities across the Southeast and the nation on analyzing customer-level billing records and modeling alternative rate structures that better align revenue stability and conservation objectives of utilities. This past work has been funded by the Royal Bank of Canada Blue Water Project, the Water Research Foundation, and the Urban Water Consortium. This report would not have been possible without the assistance of multiple staff members from each participating utilities. They were instrumental in pulling and describing their billing data. Additionally, each utility provided valuable feedback on the structure of the models and shaped the outcome of the analysis.

We are grateful to the North Carolina Urban Water Consortium for funding this project and seeing the value of exploring a better way to achieve financial sustainability.
1. Introduction

Water utilities consider much more than revenue recovery when setting the price of their product (e.g. customer affordability), and sometimes these considerations directly conflict with revenue stability and sufficiency objectives. One of the most notorious conflicts is between the goal of revenue stability and that of customer conservation and efficiency. The most prevalent retail pricing model in the industry relies on a modest base charge normally coupled with a much larger variable charge based on volumetric use. This highly variable structure provides an incentive for customer conservation and efficiency.

A utility that incorporates the majority of its predominantly fixed utility costs into variable customer charges will do fine as long as sales projections are met or exceeded. But when there is an unexpected decline in sales volume (due to drought restrictions, economic recession, wet weather, etc.) and the sharp drop in revenue does not correspond to a reduction in costs, utilities expecting the majority of their revenues from variable charges will struggle to recover costs. Furthermore, if in response to gradual declines in demand, a utility continually focuses on increasing the variable portion of its charges to meet shortfalls it may very well be increasing future revenue vulnerability due to price elasticity.

As part of this research project, four alternative pricing models were explored with four North Carolina water utilities. The models focused more on generating more reliable and predictable revenue streams over a fiscal year without sacrificing pricing signals to use less water in an effort to better align the goals of revenue stability, sufficiency, and customer conservation.

The first two models presented to each of the utilities (and explained below) did so by building more revenue recovery into fixed charges and tailoring that fixed charge based on individual historical customer demand patterns. These models can help to close the short-term revenue gap that can leave a utility financially short-changed during a budget year. The third and fourth models basically ensure that utility cost recovery takes precedence, but rewards customers that use water efficiently through either the rate structure charged throughout the year or in calculating the “reward” itself. Each of these models are based on cost-of-service and driven by individual customer water use. Customer-level consumption data from the utilities was required to accurately design these alternative rate structures and model their financial effects.

The goal of this research was to identify alternative pricing models that could generate the same long term expected revenue from water service sales as the existing rate structure, but in a way that is less sensitive to short term demand fluctuations. The Environmental Finance Center (EFC) analyze these models from the perspective of the utility, assessing shifts in fixed and variable revenues from water sales, and from the perspective of the customers, determining which customers and how many will face greater or lower monthly charges for their monthly water demands. All modeling was based on actual customers’ water use data, and the alternative price models were be simulated for these same real customers of the utility.
2. Methodology

The following analysis of alternative rate models was developed through a collaborative process with each of the participating utilities: the Orange Water and Sewer Authority (OWASA), Fayetteville Public Works Commission (PWC), Charlotte Water, and the Town of Cary.

The process began by collecting and compiling historical billing records for single-family dwelling units (residential) customers from each of the utilities. Given the retrospective nature of the PeakSet Base Model, at least four complete years were needed for the analysis. Each of the utilities provided the EFC with this data, and the EFC cleaned and standardized the data to ensure data accuracy. Part of the cleaning process involved combining the standard meter consumption and irrigation meter consumption (if applicable) into one total for water use. (The Simple Dividend Model is the exception. The add-on charge and dividend was divided by service. Water and irrigation were considered separate services.) Based on past research with the Urban Water Consortium, the EFC feels like this is a more accurate method to individually tailor rate structures. Unusually high spikes in water volume in standard meters (possibly due to erroneous meter readings and/or leaks) were excluded from those individual records. In some cases where the data were suspect, the EFC manually calculated charges from existing rates using customer consumption to compare against the modeled charges.

The EFC modeled the four alternatives described below using the customer data and provided preliminary results of the effects on utility revenues and customer charges to the utilities. Each alternative was modeled retrospectively on the most recent full year of data supplied by the utility (either fiscal year 2012 or 2013). Price elasticity was taken into account in response to how the total bill would change, but these rates of elasticity are based on different rate structure designs and can only scratch the surface on how customers would actually change their water use in response to each of these models.

The four models are briefly explained below and explained in more detail in the findings.

**PeakSet Base Model**
Under this rate structure, a customer’s base charge for water and irrigation is individually set based on a customer’s maximum month of consumption (peak). This allows the utility to build more cost recovery into the base charge while still promoting customer conservation and efficiency. This rate model particularly encourages steady water use. This model was chosen by the Town of Cary for in-depth analysis, in combination with the Simple Dividend Model described below.

**CustomerSelect Model**
Under this rate model, each customer chooses a “plan” for the year. Each plan has a progressively higher base charge and consumption allowance. On a monthly basis, the customer pays his/her base charge and the “overage” price for all water (and irrigation) use above the plan’s allowance, if applicable. This model was chosen by OWASA, PWC, and Charlotte Water for in-depth analysis.
Simple Dividend Model
Under this rate model, the utility would continue to charge against their existing rate structure and simply add a fixed fee to the base charges to generate a buffer for revenues. At the end of the year, the utility would return revenue from the additional fixed fee beyond the revenue it projected to need for the year based on the number of months and services a customer used over the previous year. This model was chosen by the Town of Cary for in-depth analysis, in combination with the PeakSet Base Model.

FlatBack Model
This is a different type of dividend-returning model. This time, the utility would abandon existing rates, and instead charge every customer a fixed monthly per household per service fee (water/sewer), regardless of water use or number or size of water or irrigation meters. The fee would be priced in order to achieve excess revenues at the end of the year. The utility would return actual excess revenues made to customers in the form of a dividend. The dividends will be calculated in a way to reward the customers who were more efficient in their water use than others, providing a price incentive for conservation and efficiency. This model was not chosen by any of the four utilities for in-depth analysis.

The rate structure designs and rules for each alternative rate model were developed first. The rates for the alternative models were then calculated to produce the same expected revenues in the latest year that each utility would have expected by modeling their existing rates on the previous year’s water use. The alternative rates were then applied to actual water use in the latest year and total revenues compared to actual revenues collected under existing charges. In other words, the alternative models were designed to be revenue-neutral in projecting over the last year of consumption. In application, however, they did not result in the same revenue that the existing rate structure produced, and those results are part of the results.

These results were presented to utility officials from each participating utility in an in-person meeting. The EFC facilitated a discussion on the merits and drawbacks of each model. In this meeting (or shortly thereafter), utility officials chose one model for the EFC to further develop and refine with a more comprehensive analysis.

The comprehensive analysis was framed in-part by the EFC and in-part by utility officials. As the attached documents show, there are many assumptions embedded in the design and implementation of each model. These were thoroughly explained with utility officials and their input sought on the application of the assumptions in the final modeling. For each utility, the EFC modeled three to four different scenarios to test the financial sensitivity to some of these assumptions and design parameters. The following reports for each utility describe in more detail the methodology used for each of the rate structures.
See Attached Documents for the Following Sections

3. Orange Water and Sewer Authority
   3.1 Preliminary Analysis of Four Alternative Residential Rate Models
   3.2 CustomerSelect In-Depth Analysis
4. Fayetteville Public Works Commission
   4.1 Preliminary Analysis of Four Alternative Residential Rate Models
   4.2 CustomerSelect In-Depth Analysis
5. Charlotte Water
   5.1 Preliminary Analysis of Four Alternative Residential Rate Models
   5.2 CustomerSelect In-Depth Analysis
6. Town of Cary
   6.1 Preliminary Analysis of Four Alternative Residential Rate Models
   6.2 PeakSet Base + Simple Dividend In-Depth Analysis
Executive Summary
The Environmental Finance Center has summarized its preliminary analysis of alternative rate models for the Orange Water and Sewer Authority in the following report. The purpose of this document is to compare the structures, financial impacts to the utility and its residential customers, benefits, and challenges of four alternative rate models. Based on feedback from OWASA staff, the Environmental Finance Center will generate a more detailed report on the structure, financial impacts, benefits, and challenges of one alternative rate model – taking into account adaptations suggested by OWASA.

Objectives of the Alternative Rate Models
- Increase the proportion of revenues obtained from fixed charges
- Fixed charges are partially linked to water use in order to encourage efficiency
- Produce revenue-neutral projections for revenues
- Increase revenue resiliency in the wake of declining demands

Methodology
Once a basic structure of each alternative rate model was designed under some preliminary rules and framework, the Environmental Finance Center used historical billing and rate data from OWASA’s rate years ’11 and ’12 (October – September) to (1) set rates and (2) compare rate models.

1. Setting Rates
   
   Actual FY12 rates x Adjusted FY11 use\(e_1\) = $15,729,953

   Alternative Rates x Adjusted FY11 use\(e_2\) =

   \(e_{1,2}\) Adjusted for elasticity (-0.2) in response to changed total charges

2. Comparing Rate Models
   
   FY12 actual rates x FY12 actual use = Actual FY12 Charges

   vs.

   Alternative Rates x FY12 actual use = Alternative FY12 Charges

The rate structure designs and rules for each alternative rate model were developed first. The rates for the alternative models were then calculated to produce the same expected revenues in FY2012 that OWASA would have expected by modeling FY2012 rates on FY2011 water use, adjusted for price elasticity ($15.7 million). The alternative rates are then applied to actual FY2012 use (currently not adjusted for price elasticity) and total revenues compared to actual revenues collected under FY2012 charges. The only exception to this methodology is the FlatBack Dividend Model, which returns any excess revenue compared to utility expenses to the customers.

Only single-family residential dwelling units were analyzed. Water and irrigation water use were totaled and used as a single total volume for each premise. Alternative rate models applied primarily to water and irrigation rates, not to sewer rates.

Four alternative rate models are described below. These models are very different from commonly-used rate structures. There are several preliminary rules for the design of each model, but once a single model is selected by OWASA for more in-depth analysis, these rules can be changed to meet the utility’s rate structure objectives.
Comparing Rate Models

The following graph summarizes and compares the financial impact of each rate model.

- The alternative rate models were priced to generate expected total revenues of $15.7 million, just as much as the FY2012 rate structure was expected to produce.
- Under the currently-used prices and examples, all of the alternative rate models would have produced more revenue for the utility than the actual rates charged during FY2012.
- In addition, all of the alternative rate models would have achieved a greater portion of their revenues through fixed charges, which are immune to changes in water use. This builds revenue resiliency for the utility.
- Thus, even if customers used less water than they did in FY2012 because of changes to rate structure, the majority of the revenues would have been protected.
- The month-to-month revenue generation of the alternative rate models was also more stable than under the existing rate structure.
Alternative 1: PeakSet Base

Under this rate structure, a customer’s base charge for water and irrigation is individually set based on the three-year rolling average\(^1\) of that customer’s highest month of water use. This allows the utility to build more cost recovery into the base charge while still promoting customer conservation and efficiency. This rate model particularly encourages steady water use.

Design Details
- Does not apply to sewer. Only applies to SFDU and associated irrigation meters.
- Each premise gets only one fixed monthly charge, regardless of number or size of water and irrigation meters.
- If rolling average peak cannot be determined, the system-wide median in that year applies to the customer.
- Monthly fixed charge is set first, and the uniform volumetric rate is then calculated from that for revenue neutrality.

Modeled Structure
Monthly fixed charge = $4.00/1,000 gallons of historical average peak demand
Uniform volumetric rate = $1.72/1,000 gallons of monthly water use

Modeled Customer Impact

Under this hypothetical model, total FY12 charges would have decreased for 39% of OWASA residential customers by more than 5%, increased for 35% of residential customers by more than 5%, and stayed relatively the same for 26% of residential customers.

Potential benefits
- Increased revenue stability: There would be a larger percentage of revenue coming from base charge.
- Promotes steady customer water use: A high peaking ratio would be costly to a customer all year long.
- Customers can expect more steady bills: This might also mean reduced customer cutoffs.
- Would not require metering upgrades

Potential challenges
- Requires methodology for determining base charges for new customers
- Potentially requires billing software upgrade
- OWASA may expect more meter re-reads and high bill disputes because of the long-term impact of a high meter read.
- A customer that is planning moving will not have a large incentive to conserve.

\(^1\) We used two-year rolling averages instead of three in this analysis because of data availability at this time.
Alternative 2: CustomerSelect

Under this rate model, each customer chooses between one of four “plans.” Each plan has a progressively higher base charge and consumption allowance. The customer pays his/her base charge and the “overage” price for all water+irrigation use above the plan’s allowance, if applicable.

Design Details

- Does not apply to sewer. Only applies to SFDU and associated irrigation meters.
- The blocks are structured to have equal unit price at the highest end of consumption.
- The “overage” price is higher than the largest difference between two plans’ monthly charges.
- Each premise gets only one fixed monthly charge, regardless of number or size of water and irrigation meters.
- Since choices of plans are unknown, customers were initially placed in the plan that best matches their average water + irrigation monthly volume from the previous fiscal year. If average monthly volume cannot be determined, the customer is automatically placed in Plan 1.

Modeled Structure

<table>
<thead>
<tr>
<th>Plan</th>
<th>Usage Allowance (based on OWASA’s current block structure)</th>
<th>Monthly Access (= allowance * $4.93/1000 unit price)</th>
<th>Overage Charge</th>
<th>Predicted Plan Participation (% SFDU Premises)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2,000 gallons/month</td>
<td>$9.86</td>
<td>$25.65/1000 gallons</td>
<td>22%</td>
</tr>
<tr>
<td>2</td>
<td>5,000 gallons/month</td>
<td>$24.65</td>
<td></td>
<td>51%</td>
</tr>
<tr>
<td>3</td>
<td>10,000 gallons/month</td>
<td>$49.30</td>
<td></td>
<td>23%</td>
</tr>
<tr>
<td>4</td>
<td>15,000 gallons/month</td>
<td>$73.95</td>
<td></td>
<td>4%</td>
</tr>
</tbody>
</table>

Modeled Customer Impact

Under this hypothetical model, total FY12 charges would have decreased for 35% of OWASA residents by more than 5%, increased for 35% of residents by more than 5%, and stayed relatively the same for 30% of residents.

Potential benefits

- Increased revenue stability: Customers annually commit to plans
- Gives customer a choice: This means less administrative burden than budget-based rates of utility determining block rate for customers
- Moves more to a model of water and sewer service, rather than a commodity
- Promotes conservation, especially around the “break points”
- Relatively easy to add ancillary services (like service line protection) a la carte

Potential challenges

- Complicates budgeting process: How do you predict what plan customers will choose? When will they commit? Can they change plans? How often? What is the optimal length of the contract?
- Does not fit with seasonal use of water: Water use is not as consistent month-to-month as cell phone use. Allowing roll-overs could help this, but would dissuade conservation.
- Customers will likely request real-time water use information: In order to provide this service, metering upgrades will be required.
Alternative 3: Simple Dividend Model

Under this rate model, OWASA would continue to charge against their existing rate structure and simply add an additional fixed fee to the base charges to generate a buffer for revenues. At the end of the year, OWASA would return revenue from the additional fixed fee beyond the revenue it projected to need for the year.

Design Details

- Applies to water, sewer and irrigation. Determined at the meter level, not premise level.
- The method used to determine “profit” at the end of the year can vary. In this example, profit is calculated as the difference between the actual total charges (water+irrigation+sewer) system-wide at the end of FY2012 under the new rate structure and the predicted total charges for FY2012 that was estimated at the end of FY2011 ($15.7 million).
- The method used to determine how much each customer would receive in dividends can vary. In this example, the profits are divided equally among all base charges, refunding a fixed portion of the “add-on” fee.
- Additional fixed fee calculated to provide OWASA with 25% more than the predicted total charges and divided across all meters. Water, sewer, and irrigation are all separate.

Modeled Structure

To achieve 25% greater revenues than the predicted total charges (target) of $15,729,953, **an add-on fee of $9.58 was added to every base charge in FY2012.** The $3,022,769 (additional revenue after elasticity) profit was divided by the 417,373 base charges that were charged in FY2012 equaling a dividend of $7.24 per base charge. This would be returned to all customers. **Most customers will have received a dividend for the amount of $173.76 at the end of the year.** Effectively, the utility would have raised their base charges by $2.34 in order to ensure that revenues reached the $15.7 million target, despite the reduction in use that occurred in FY2012. The actual FY2012 charges equaled $15.2 million (a 3.1% reduction from the target).

Modeled Customer Impact

Under this hypothetical model, total FY12 charges would have decreased for 0% of OWASA residents by more than 5%, increased for 33% of residents by more than 5%, and stayed relatively the same for 67% of residents.

<table>
<thead>
<tr>
<th>Increased by more than 5%</th>
<th>Stayed within +/- 5%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Potential benefits</strong></td>
<td><strong>Potential challenges</strong></td>
</tr>
</tbody>
</table>
| • This model drives the fact that OWASA is a not-for-profit entity: profits are returned to customers  
• Increased revenue stability  
• Provides a method for OWASA to positively interact with customers by cutting them a check  
• Partners well with any type of rate structure | • The ‘rebate’ aspect of the model can make things complicated. Other utilities, such as the Austin Water Utility, have opted to make such a charge intermittent – as needed.  
• As modeled here, the rebate has nothing to do with being “water-wise.” This can change. |
Alternative 4: FlatBack Model

A different type of dividend-returning model. This time, the utility would abandon existing rates, and instead charge every customer a fixed monthly per household per service fee (water/sewer), regardless of water use or number or size of water or irrigation meters. The fee would be priced in order to achieve a “25% profit” at the end of the year. The utility would return “profits” made to customers in the form of a dividend. The dividends will be calculated in a way to reward the customers who were more efficient in their water use than others, providing a price incentive for conservation and efficiency.

Design Details

- Under this model, every customer gets one monthly flat charge for water service (water+irrigation), and double the amount if they also have sewer service.
- The method used to determine “profit” at the end of the year can vary. In this example, we attempted to model the utility’s costs at the end of FY12 by using the audited financial statement for FY12. The portion of expenses we estimated to be allocable to SFDUs was subtracted from the total charges under the new rate model and deemed “profit”.
- The method used to determine how much each customer would receive in dividends can vary. In this example, 25% of the “profit” is shared among all customers, based on the number of services and bills they received during FY12. The remaining 75% of the “profit” is shared only among customers that exhibited water-wise behavior.
- “Water-wise” behavior can be defined in any number of ways. In this example, only customers that reduced their average water use from FY11 to FY12 received any dividend under this portion, which is allocated proportional to the relative reduction in average water use compared to other customers.

Modeled Structure

To achieve 25% greater revenues than the predicted total charges (target) of $15,729,953, residential customers are charged $47.97/month/service which would have totaled $19,991,594 in revenue, exceeding the target $13.1 million for SFDU expenses by $6,851,013. 25% of this “profit” would be split among all residential customers at $4.11/month/service. Most customers would have received a dividend of $98.63. The remaining 75% of the “profit” would be split only among the 68% of residential customers who reduced their average non-zero water use from FY11 to FY 12. The total FY12 “water-wise” dividends would have ranged from $8.22 to $996.76 per customer (median: $307.00).

Modeled Customer Impact

Under this hypothetical model, 52% of customers will have decreased their total FY2012 charges by more than 5%, 39% of customers will have increased their charges by more than 5%, and 9% of customers will not have seen a significant change to their total charges.

Potential challenges

- The ‘rebate’ aspect of the model can make things complicated.
- Fixed charge would do little to promote “water-wise” behavior throughout the year.
- The more people that act as water stewards, the less money there is to go around more customers. This could be discouraging to customers.
3.2 OWASA CustomerSelect In-Depth Analysis

In 2014, the Environmental Finance Center presented OWASA with preliminary analysis of four business models completely different from the one currently in-place. Based on this discussion, OWASA staff selected the rate model coined “CustomerSelect” for a more in-depth analysis. The following report is a summary of that in-depth analysis.

Description of CustomerSelect

Under the CustomerSelect rate model, each customer chooses one plan to commit to for the entire rate year. Each plan has a progressively higher base charge and consumption allowance. The customer pays his/her base charge for all water use within that plan and the “overage” price for all water+irrigation use above the plan’s allowance, if applicable.

Ultimately, OWASA staff liked this model because it gives customers the choice. OWASA staff also felt that this rate model aligned well with their pending Advanced Metering Infrastructure (AMI) because customers would be able to monitor their water use and its approach to their plans’ limit. OWASA staff believed that their customers would likely understand it better than the other models presented.

Although, this report answers questions about what customers are impacted and by how much, it does not answer other critical questions like, “which plans will customers choose?” Will they choose based on their average or based on their peak demand? This question is an important one to answer because it will influence the rate setting and budgeting process. Furthermore, it is unknown how the implementation of a model like CustomerSelect would influence customer demand in a given year and over the long-term. More extensive qualitative and quantitative analysis is needed to better estimate customers’ response to CustomerSelect.

Summary of Analysis

The following CustomerSelect analysis was conducted for individually-metered, water-using single family residential customers. Water and irrigation volumes are aggregated and just called “water” for simplicity’s sake, even though irrigation water is also included. Although we included wastewater charges in calculating the revenue-neutral projections of the CustomerSelect prices, under the assumption that wastewater rates would NOT change when switching to CustomerSelect water rates, this report ignores wastewater charges in order to focus analysis on changes to the water charges.

Price elasticity was used in making projections, adjusting customers’ projected water use based on how the total (water+irrigation+wastewater) charge would increase or decrease in the next year under the different rate structures being modeled. Otherwise, the analysis does not adjust demand in response to any of the models. The rates charged under each CustomerSelect model
were specifically computed to provide **revenue-neutral projections** of charges for the next year, compared with projections of charges using the increasing block rates that the utility would implement in that year.

The analysis compares the effects of switching to four different CustomerSelect scenarios based on actual water use in 2012. The following report compares utility revenue and customer bills under CustomerSelect (Scenario A) to what they actually were in Rate Year 2012 (October 2011 – September 2012) under an increasing block rate structure. After describing the effects on customers’ water charges under the Scenario A, the design of the CustomerSelect rate structure itself was slightly modified in one key aspect to create a new Scenario. The effects on customers’ water charges under the new scenario of CustomerSelect is then compared to the effects under the base Scenario A in order to highlight how changing one aspect of the CustomerSelect rate structure would impact the utility’s revenues, the customers, and their charges. This step would repeated several times, creating multiple scenarios, each time only changing one aspect of the Scenario A CustomerSelect model.

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Number of Plans</th>
<th>Size of Plans (in thousand gallon increments)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>4</td>
<td>2 / 5 / 10 / 15</td>
</tr>
<tr>
<td>B</td>
<td>4</td>
<td>3 / 7 / 12 / 20</td>
</tr>
<tr>
<td>C</td>
<td>8</td>
<td>2 / 4 / 6 / 8 / 10 / 12 / 14 / 16</td>
</tr>
<tr>
<td>D</td>
<td>2</td>
<td>5 / 15</td>
</tr>
</tbody>
</table>

The model holds basic parameters constant between scenarios. For each scenario, customers are placed in a plan based on their average water use the previous year. Within each scenario, the unit rate for the base charge is the same for each plan (computed as the unit rate times the plan allowance). Additionally, within each scenario, the overage volumetric rate is the same for each plan. It is computed as the largest difference between the CustomerSelect base charges plus $1.00. This will incentivize customers to choose the smallest plan possible.

The presentation of each Scenario begins with a description of the construct of the rate structure. It then analyzes the impact on utility charges. Scenario A compares annual and monthly utility charges to those collected under the actual RY12 increasing block rate structure. The rest of the Scenarios compare to Scenario A. Because of the challenges that fluctuations in customer demand present to utility revenue stability, the utility financial analysis focuses on the percent of base charge versus volumetric charge revenue.

The rest of the analysis is focused on the customer impact. The analysis summarizes participation in each plan based on the customers RY11 average water use, as well as the number of customers that would exceed that plan based on their RY12 water use. The report then analyzes the customers that would pay more on an annual basis, those that would pay virtually
the same amount (within 5%), and those that would pay less. This analysis was conducted on an annual basis because the monthly variation would be expected to be quite great and not quite fair to compare. Although, the “winners” and “losers” are presented for the overall customer base, the analysis also organizes customers based on different water use parameters, including plan participation, average water use in FY12, peaking ratio in RY12, and by zip code.

Scenario A

Results

Customer Select Rates

<table>
<thead>
<tr>
<th>Plan</th>
<th>Allowance (Gallons)</th>
<th>Monthly Base Charge</th>
<th>Overage Charge (/1000 gallons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plan 1</td>
<td>2,000</td>
<td>$9.86</td>
<td>$25.65</td>
</tr>
<tr>
<td>Plan 2</td>
<td>5,000</td>
<td>$24.65</td>
<td>$25.65</td>
</tr>
<tr>
<td>Plan 3</td>
<td>10,000</td>
<td>$49.30</td>
<td>$25.65</td>
</tr>
<tr>
<td>Plan 4</td>
<td>15,000</td>
<td>$73.95</td>
<td>$25.65</td>
</tr>
</tbody>
</table>

Customer Select Charges vs. Actual Water Charges in 2012

![Graph showing the comparison between Customer Select Charges and Actual Water Charges in 2012.](image)
Utility Revenues and Projections

### Utility Charges for SFDUs in 2012

<table>
<thead>
<tr>
<th></th>
<th>Water &amp; Irrigation Base Charges</th>
<th>Water &amp; Irrigation Volumetric Charges</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sold in 2011</td>
<td></td>
<td>$0 - $5</td>
</tr>
<tr>
<td>Predicting 2012 at the end of 2011</td>
<td></td>
<td></td>
</tr>
<tr>
<td>With Utility’s Planned 2012 Rates</td>
<td></td>
<td>$5 - $10</td>
</tr>
<tr>
<td>With CustomerSelect</td>
<td></td>
<td>$0 - $5</td>
</tr>
</tbody>
</table>

**In this scenario, monthly water revenues would be higher and slightly less seasonal (in the winter) under CustomerSelect than using the utility’s existing rate structure.**
How many are in each plan?

In this scenario, most SFDUs would have been in Plan 2

How many in each plan would exceed their allowance at least once during the year and pay overage charges?

Nearly half of the SFDUs in Plans 1 and 4 would have exceeded their plan's allowance at least once throughout the year.

56% of SFDUs would have always remained within their plan's allowance.
How charges changed for customers: utility-wide

Approximately the same number of SFDUs would have decreased or increased their total annual water charges under CustomerSelect.

The % increases to some customers' water bills were generally larger than the % decreases to other customers' water bills.

Overall, water bills would increase on average by 3.3% under CustomerSelect.
How charges changed for customers: base on their plan participation

Larger proportions of SFDUs in the high plans were likely to increase their water bills under CustomerSelect than in the low plans

The average water bill for customers in Plan 1 would decrease under CustomerSelect
How charges changed for customers: grouped by average water use in 2012

Low water users are more likely to decrease their water bills and high water users are more likely to increase their water bills under CustomerSelect

The average water bill for low-water using customers would decrease under CustomerSelect
How charges changed for customers with high discretionary use

**CustomerSelect increases** the bills for customers that have high discretionary water use (high peaking ratio) and **decreases** the bills for customers who use the same volume of water consistently.

### Chart 1: Percent of SFDUs in the Peaking Ratio Group

<table>
<thead>
<tr>
<th>Customer's Peaking Ratio in 2012</th>
<th>Decreased bills</th>
<th>Increased bills</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - 1.5</td>
<td>60%</td>
<td>29%</td>
</tr>
<tr>
<td>1.6 - 2.0</td>
<td>53%</td>
<td>31%</td>
</tr>
<tr>
<td>2.1 - 2.5</td>
<td>37%</td>
<td>41%</td>
</tr>
<tr>
<td>2.6 - 3.0</td>
<td>30%</td>
<td>52%</td>
</tr>
<tr>
<td>&gt;3.0</td>
<td>8%</td>
<td>78%</td>
</tr>
</tbody>
</table>

### Chart 2: Average % Change to Water Bills under CustomerSelect

- 1 - 1.5: -6%
- 1.6 - 2.0: -3%
- 2.1 - 2.5: 4%
- 2.6 - 3.0: 9%
- >3.0: 25%

**CustomerSelect increases** the average bill for customers that have high discretionary water use (high peaking ratio) significantly, while reducing the average bill for customers with lower peaking ratios.
How charges changed for customers: grouped by zip code

CustomerSelect does not affect customers of one zip code substantially differently than customers in the other main zip code areas

The average water bill in zip code area 27515 would increase the most under CustomerSelect
### Scenario B

**CustomerSelect Rates**

<table>
<thead>
<tr>
<th>Plan</th>
<th>Allowance (Gallons)</th>
<th>Monthly Base Charge</th>
<th>Overage Charge (/1000 gallons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plan 1</td>
<td>3,000</td>
<td>$15.43</td>
<td>$21.57</td>
</tr>
<tr>
<td>Plan 2</td>
<td>7,000</td>
<td>$36.00</td>
<td>$21.57</td>
</tr>
<tr>
<td>Plan 3</td>
<td>12,000</td>
<td>$61.72</td>
<td>$21.57</td>
</tr>
<tr>
<td>Plan 4</td>
<td>20,000</td>
<td>$102.86</td>
<td>$21.57</td>
</tr>
</tbody>
</table>

*CustomerSelect charges are higher in this scenario because the allocation tiers are larger*
Utility Revenues and Projections

**Scenario B** would result in about the same total water charges as in **Scenario A**, but with a greater proportion obtained from the base charges.

<table>
<thead>
<tr>
<th></th>
<th>Water &amp; Irrigation Base Charges</th>
<th>Water &amp; Irrigation Volumetric Charges</th>
</tr>
</thead>
<tbody>
<tr>
<td>Predicting 2012 at the</td>
<td>$6</td>
<td>$2</td>
</tr>
<tr>
<td>end of 2011</td>
<td></td>
<td></td>
</tr>
<tr>
<td>In Scenario A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>In Scenario B</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Based on actual 2012 water use:

<table>
<thead>
<tr>
<th></th>
<th>Water &amp; Irrigation Base Charges</th>
<th>Water &amp; Irrigation Volumetric Charges</th>
</tr>
</thead>
<tbody>
<tr>
<td>In Scenario A</td>
<td>$6</td>
<td>$2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>76%</strong></td>
<td></td>
</tr>
<tr>
<td>In Scenario B</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>82%</strong></td>
<td></td>
</tr>
</tbody>
</table>

In **this scenario**, monthly water revenues would be more stable than the revenues in **Scenario A** and under the utility's existing rate structure.
How many are in each plan?

More customers would choose the lower plans if the allowances are larger in each plan (Scenario B) than in an alternative CustomerSelect model (Scenario A).

How many in each plan would exceed their allowance at least once during the year and pay overage charges?

Fewer customers in the lower plans would ever exceed their plan’s allowance, but overall exceedance rate is about the same whether allowances are large in each plan (Scenario B) or small (Scenario A). Overall, 60% of SFDUs would have always remained within their plan’s allowance in Scenario B, compared to 56% in Scenario A.
How charges changed for customers: utility-wide

There is very little difference between the scenarios in terms of the proportion of customers that would have increased or decreased their bills under CustomerSelect

**Scenario A**
- Decreased: 43%
- Stayed same: 15%
- Increased: 42%

**Scenario B**
- Decreased: 42%
- Stayed same: 15%
- Increased: 43%

The distributions of how customers' water bills would be affected are nearly identical in Scenario B and Scenario A.

Overall, water bills would increase on average by 6.5% in Scenario B and by 3.3% in Scenario A.

Change in customer's water bill in 2012 if CustomerSelect was used.
How charges changed for customers: base on their plan participation

Increasing the allowances in Scenario B benefits the largest water users (those selecting the highest plan) by lowering their base water bills more and increasing base bills for the middle plans.

The average water bill in the lower plans will decrease less in in Scenario B than in Scenario A.
How charges changed for customers: grouped by average water use in 2012

High water users and very low water users are more likely to decrease their water bills in Scenario B than in Scenario A

In Scenario B, the high water users would lower their average water bills and low water users would raise their bills, compared to Scenario A in which the low water users would lower their average water bills.
How charges changed for customers: grouped by peaking ratio in 2012

CustomerSelect will adjust the water bills of customers with different peaking ratios in similar ways under both Scenario B and Scenario A; the higher the peaking ratio, the greater the chance of increasing the water bill

In Scenario B, customers with very high peaking ratios will not increase their average water bills as much as with Scenario A, but overall the effects on average water bills are nearly the same in both scenarios.
How charges changed for customers: grouped by zip code

There are no major differences between Scenario B and Scenario A in terms of customers in which zip code are more likely to increase or decrease their water bills under CustomerSelect

The average water bill will increase in 27516 more in Scenario B than in Scenario A, and vice versa in 27515
### Scenario C

#### Customer Select Rates

<table>
<thead>
<tr>
<th>Plan</th>
<th>Allowance (Gallons)</th>
<th>Customer Select Monthly Base Charge</th>
<th>Overage Charge (/1000 gallons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plan 1</td>
<td>2,000</td>
<td>$12.69</td>
<td>$13.69</td>
</tr>
<tr>
<td>Plan 2</td>
<td>4,000</td>
<td>$25.38</td>
<td>$13.69</td>
</tr>
<tr>
<td>Plan 3</td>
<td>6,000</td>
<td>$38.07</td>
<td>$13.69</td>
</tr>
<tr>
<td>Plan 4</td>
<td>8,000</td>
<td>$50.76</td>
<td>$13.69</td>
</tr>
<tr>
<td>Plan 5</td>
<td>10,000</td>
<td>$63.45</td>
<td>$13.69</td>
</tr>
<tr>
<td>Plan 6</td>
<td>12,000</td>
<td>$76.14</td>
<td>$13.69</td>
</tr>
<tr>
<td>Plan 7</td>
<td>14,000</td>
<td>$88.83</td>
<td>$13.69</td>
</tr>
<tr>
<td>Plan 8</td>
<td>16,000</td>
<td>$101.52</td>
<td>$13.69</td>
</tr>
</tbody>
</table>

*Customer Select overage rate is lower in this scenario, and there are higher priced plans than if customers picked among four plans (Scenario A).*

![Graph showing monthly charge for water irrigation vs. total water and irrigation use (1,000 gallons)](image-url)
Utility Revenues and Projections

This scenario would result in about the same water charges as in Scenario A, but with a greater proportion obtained from the base charges.

<table>
<thead>
<tr>
<th></th>
<th>Water &amp; Irrigation Base Charges</th>
<th>Water &amp; Irrigation Volumetric Charges</th>
</tr>
</thead>
<tbody>
<tr>
<td>Predicting 2012 at the end of 2011</td>
<td>$0</td>
<td>$2</td>
</tr>
<tr>
<td>In Scenario A</td>
<td>$6</td>
<td>$4</td>
</tr>
<tr>
<td>In Scenario C</td>
<td>$8</td>
<td>$6</td>
</tr>
</tbody>
</table>

Based on actual water use:

<table>
<thead>
<tr>
<th></th>
<th>Water &amp; Irrigation Base Charges</th>
<th>Water &amp; Irrigation Volumetric Charges</th>
</tr>
</thead>
<tbody>
<tr>
<td>In Scenario A</td>
<td>$0</td>
<td>$2</td>
</tr>
<tr>
<td></td>
<td>$0.76</td>
<td>$76%</td>
</tr>
<tr>
<td>In Scenario C</td>
<td>$0.84</td>
<td>$84%</td>
</tr>
</tbody>
</table>

In this scenario, monthly water revenues would be more stable than the revenues in Scenario A and under the utility’s existing rate structure.
How many are in each plan?

Customers would be more spread out across the plans when given 8 to choose from (Scenario C) than when given only four (Scenario A).

Few customers would select plans 6, 7 and 8, arguing for a single plan for allowance of up to 12,000 gallons/month.

Scenario A's Plans 2, 3 & 4 are visually displayed next to Scenario C Plans with similar allowances (2, 5 & 7 respectively).
How many in each plan would exceed their allowance at least once during the year and pay overage charges?

More customers would exceed their plans' allowance if they select narrower plans (Scenario C) rather than selecting from broader but fewer plans (Scenario A).

Overall, 45% of SFDUs would have always remained within their plan's allowance in Scenario C, compared to 56% in Scenario A.

Scenario A’s Plans 2, 3 & 4 are visually displayed next to Scenario C Plans with similar allowances (2, 5 & 7 respectively).
How charges changed for customers: utility-wide

CustomerSelect with more options for plans (Scenario C) would raise the bills for more customers than CustomerSelect with fewer options (Scenario A)

<table>
<thead>
<tr>
<th>Scenario A</th>
<th>Decreased 43%</th>
<th>Stayed same 15%</th>
<th>Increased 42%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scenario D</td>
<td>Decreased 31%</td>
<td>Stayed same 21%</td>
<td>Increased 47%</td>
</tr>
</tbody>
</table>

In Scenario C, the range of changes on customers' water bills will be narrower and closer to 0% than the range in Scenario A

Overall, water bills would increase on average by 6.3% in Scenario C and by 3.3% in Scenario A
How charges changed for customers: base on their plan participation

The majority of customers in the mid-range plans in Scenario C will increase their water bills, while the majority of customers in the lowest and highest plans will decrease their bills; which is similar to Scenario A

Changes to the average water bill for customers across plans would be similar in Scenario C as in Scenario A
High water users are much more likely to decrease their water bills in Scenario C than in Scenario A.

In Scenario C, the average bill of the highest water users would remain the same, and increase for almost all other water use groups, compared to Scenario A in which the low water users would lower their average water bills.
How charges changed for customers: grouped by peaking ratio in 2012

CustomerSelect will decrease the water bills for fewer of the low-peaking customers and for more of the highest-peaking customers in Scenario C than in Scenario A.

In Scenario C, customers with very high peaking ratios will increase their average water bills to a lesser degree than in Scenario A, while customers with lower peaking ratios will decrease their bills.
How charges changed for customers: grouped by zip code

Fewer customers in all of the main zip codes would decrease their water bills under Scenario C than in Scenario A.

The effects on the average water bill by zip code do not vary significantly between Scenario C and Scenario A.
### Scenario D

#### Customer Select Rates

<table>
<thead>
<tr>
<th>Plan</th>
<th>Allowance (Gallons)</th>
<th>Monthly Base Charge</th>
<th>Overage Charge ($/1000 gallons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plan 1</td>
<td>5,000</td>
<td>$18.70</td>
<td>$38.40</td>
</tr>
<tr>
<td>Plan 2</td>
<td>15,000</td>
<td>$56.10</td>
<td>$38.40</td>
</tr>
</tbody>
</table>

Customer Select overage rate is higher in this scenario, while the base charges are lower if customers picked among four plans (Scenario A).
Utility Revenues and Projections

This scenario would result in almost identical water revenues for the utility as those resulting from Scenario A.

<table>
<thead>
<tr>
<th></th>
<th>Water &amp; Irrigation Base Charges</th>
<th>Water &amp; Irrigation Volumetric Charges</th>
</tr>
</thead>
<tbody>
<tr>
<td>Predicting 2012 at the end of 2011</td>
<td>$0</td>
<td>$2</td>
</tr>
<tr>
<td>In Scenario A</td>
<td>$4</td>
<td>$6</td>
</tr>
<tr>
<td>In Scenario D</td>
<td>$8</td>
<td>$10</td>
</tr>
</tbody>
</table>

Based on actual 2012 water use:

<table>
<thead>
<tr>
<th></th>
<th>Water &amp; Irrigation Base Charges</th>
<th>Water &amp; Irrigation Volumetric Charges</th>
</tr>
</thead>
<tbody>
<tr>
<td>In Scenario A</td>
<td>$0</td>
<td>$76%</td>
</tr>
<tr>
<td>In Scenario D</td>
<td>$0</td>
<td>$76%</td>
</tr>
</tbody>
</table>

In this scenario, monthly water revenues would be less stable than the revenues in Scenario A, but would still be greater than under the utility's existing rate structure.
How many are in each plan?

Customers in Scenario D plans just include the customers in preceding plans in Scenario A

Scenario D’s plans 1 & 2 are visually displayed next to Scenario A’s plans with similar allowances (2 & 4 respectively).
How many in each plan would exceed their allowance at least once during the year and pay overage charges?

**Fewer customers would exceed their plans' allowance if they select broader plans (Scenario D) rather than selecting from narrower plans (Scenario A)**

Overall, 71% of SFDUs would have always remained within their plan's allowance in Scenario D, compared to 56% in Scenario A.

![Bar chart showing percentage of customers exceeding allowance by plan and scenario]
How charges changed for customers: utility-wide

CustomerSelect with fewer options for plans (Scenario D) would lower the bills for more customers than CustomerSelect with more options (Scenario A)

Scenario A
- Decreased: 43%
- Stayed same: 15%
- Increased: 42%

Scenario D
- Decreased: 52%
- Stayed same: 13%
- Increased: 35%

The ranges of effects on customer bills are very similar under Scenario D and Scenario A

Overall, water bills would increase on average by 0.8% in Scenario D and by 3.3% in Scenario A
How charges changed for customers: base on their plan participation

Changes to the average water bill for customers across plans would be similar in Scenario D as in Scenario A

Customers in the low plan in Scenario D would decrease their average water bill under CustomerSelect, while customers in the high plan would increase their average bill substantially.
How charges changed for customers: grouped by average water use in 2012

Customers with average water use that neared Scenario D's allowances (i.e. 5,000 and 15,000 gallons) were more likely to decrease their water bill under CustomerSelect than in Scenario A.

In Scenario D, the average bill of the lowest and highest water users increased substantially, compared to Scenario A, but customers nearing Scenario D's 5,000 gallon allowance reduced their water bill.
How charges changed for customers: grouped by peaking ratio in 2012

In **Scenario D**, customers with high peaking ratios are not as likely to increase their water bills as they would under **Scenario A**

In **Scenario D**, customers with high peaking ratios will not increase their average water bill as much as they would in **Scenario A**, while customers with lower peaking ratios will decrease their bills more.
How charges changed for customers: grouped by zip code

The effects on the water bill by zip code do not vary significantly between Scenario D and Scenario A

Average water bills increased more in nearly all zip code areas in Scenario A than in Scenario D
Findings

The merits of each scenario presented in this report can be evaluated against a myriad of criteria. Given that this analysis looked at the impact to utility revenues and customer bills in a given year, the following discusses the design features of the model that address those.

Scenario C (8 small plans) provides the most revenue stability for the utility (i.e. more revenue from base charges). Because customers have more plan options, they are better able to “right-size” their plan to match their consumption, including increasing their plan and base charges. This also equates to more stable month-to-month revenues for the utility.

If minimizing customer plan exceedance is the primary goal, then the CustomerSelect rate structure does better with fewer plan options. In Scenario D (2 large plans), the plans are larger than in the other scenarios. Therefore, customers with a small amount of water use have to opt into a much higher plan than might have been necessary based on their average water use, but it also means that fewer customers exceed their plan.

There will be customers that pay more and customers that pay less on an annual basis, no matter which Scenario. There will also be a few customers that don’t see much of a change, on an annual basis. Under Scenario C (8 small plans), the fewest amount of customers (21%) see a drastic increase or decrease in their annual water bills. However, there would be more customers that pay more under Scenario C than in Scenario A (4 plans at 2, 5, 10, and 15 thousand gallons). Scenario D would decrease the annual bill for more customers overall than any other plan.

But it is important which customers would pay more and which would pay less. Based on the design parameters used for this analysis and OWASA water use trends, the more that a rate model (or Scenario) collects from base charges, the less the volumetric overage charge needs to be to achieve revenue neutrality. Given this, Scenarios A and D increases the average bill for water users with high water use.

Each Scenario reduces bills for low peaking customers and increases bills for high peaking customers. This makes sense since we assigned customers to plans based on their previous year’s average water use. However, this would also be the case if customers were choosing based on their previous year’s peak water use (i.e. they never wanted to exceed their plan) because they would be paying for that peak use all year long.
Executive Summary

The Environmental Finance Center has summarized its preliminary analysis of alternative rate models for the Fayetteville Public Works Commission (PWC) in the following report. The purpose of this document is to compare the structures, the financial impacts to the utility and its residential customers, the benefits, and the challenges of four alternative rate models. Based on feedback from PWC staff, the Environmental Finance Center will generate a more detailed report on the structure, financial impacts, benefits, and challenges of one alternative rate model – taking into account adaptations suggested by PWC.

Objectives of the Alternative Rate Models

- Increase the proportion of revenues obtained from fixed charges
- Link fixed charges to water use to better encourage efficiency
- Produce revenue-neutral projections for revenues
- Increase revenue resiliency in the wake of declining demands

Methodology

Once a basic structure of each alternative rate model was designed using some preliminary rules and framework, the EFC used historical billing and rate data from PWC’s rate years 2012 (May 2011-April 2012) and 2013 (May 2012-April 2013) to (1) set rates and (2) compare rate models.

1. Setting Rates

   Actual RY13 rates x Adjusted RY12 use\(^{e1}\) = Alternative Rates x Adjusted RY12 use\(^{e2}\) = Predicted Total Charges

\[ RY = \text{Rate Year} \]

$30,766,864

\(^{e1},^{e2}\) Adjusted for elasticity (-0.2) in response to changed total charges

2. Comparing Rate Models

   RY13 actual rates x RY13 actual use = Actual RY13 Charges
   vs.
   Alternative Rates x RY13 actual use = Alternative RY13 Charges

The rate structure designs and rules for each alternative rate model were developed first. The rates for the alternative models were then calculated to produce the same expected revenues in RY2013 that PWC would have expected by modeling RY2013 rates on RY2012 water use and adjusted for price elasticity ($30.8 million). The alternative rates are then applied to actual RY2013 use (currently not adjusted for price elasticity) and total revenues compared to actual revenues collected under RY2013 charges. The only exception to this methodology is the FlatBack Dividend Model, which returns any excess revenue compared to utility expenses to the customers.

Analysis included only: single-family residential dwelling units (SFDU) that were charged inside water rates or inside irrigation (no sewer-only or outside accounts). Anomalous spiked bills (perhaps due to leaks) were identified and discarded from analysis. Water and irrigation water use were totaled and used as a single total volume for each premise. Alternative rate models applied primarily to water and irrigation rates, not to sewer rates.

The four alternative rate models are described below. These models are very different from commonly-used rate structures. There are several preliminary assumptions made for the design of each model, but once a single model is selected by PWC for more in-depth analysis, these rules parameters can be adjusted to meet the utility’s rate structure objectives.
Comparing Rate Models
The figure below summarizes and compares the financial impact of each rate model.

- The alternative rate models were priced to generate expected total revenues of $30.8 million, just as much as the RY2013 rate structure was expected to produce.
- Under the currently-used prices and examples, all of the alternative rate models would have produced more revenue for the utility than the actual rates charged during RY2013.
- In addition, all of the alternative rate models would have achieved a greater portion of their revenues through fixed charges helping to increase revenue resiliency for PWC.
- Thus, even if customers used less water than they did in RY2013 because of changes to the rate structure, the majority of the revenues would have been protected.
- The month-to-month revenue generation of the alternative rate models was also more stable than under the existing rate structure.
**Alternative 1: PeakSet Base**

Under this rate structure, a customer’s base charge for water and irrigation is individually set based on the three-year rolling average of that customer’s highest month of water use. This allows the utility to build more cost recovery into the base charge while still promoting customer conservation and efficiency. This rate model particularly encourages steady water use.

**Design Details**

- Does not apply to sewer. Only applies to SFDU and associated irrigation meters.
- Each premise gets only one fixed monthly charge, regardless of number or size of water and irrigation meters.
- If rolling average peak cannot be determined, the system-wide median in that year applies to the customer.
- Monthly fixed charge is set first, and the uniform volumetric rate is then calculated from that for revenue neutrality.

**Modeled Structure**

Monthly fixed charge = $1.75/1,000 gallons of the 3-year historical average peak demand  
Uniform volumetric rate = $0.94/1,000 gallons of monthly water use

**Modeled Customer Impact**

The percentage of SFDUs that would have been charged lower or higher total RY13 charges under the modeled structure compared to their actual total RY13 charges are as follows:

- Increased 36%
- Decreased 40%
- Stayed within +/- 5% 24%

**Potential benefits**

- Increased revenue stability: There would be a larger percentage of revenue coming from base charges.
- Promotes steady customer water use: A high peaking ratio would be costly to a customer all year long.
- Customers can expect more steady bills: This might also mean reduced customer cutoffs.
- Would not require metering upgrades

**Potential challenges**

- Requires methodology for determining base charges for new customers
- Potentially requires billing software upgrade
- You may expect more meter re-reads and high bill disputes because of the long-term impact of a high meter read.
- A customer that is planning on moving will not have a large incentive to conserve.
Alternative 2: CustomerSelect

Under this rate model, each customer chooses between one of four “plans.” Each plan has a progressively higher base charge and consumption allowance. The customer pays his/her base charge and the “overage” price for all water+irrigation use above the plan’s allowance, if applicable.

Design Details
- Does not apply to sewer. Only applies to SFDU and associated irrigation meters.
- The blocks are structured to have equal unit price at the highest end of consumption.
- The “overage” price is higher than the largest difference between two plans’ monthly charges.
- Each premise gets only one fixed monthly charge, regardless of number or size of water and irrigation meters.
- Since choices of plans are unknown, customers were initially placed in the plan that best matches their average water + irrigation monthly volume from the previous fiscal year. If average monthly volume cannot be determined, the customer is automatically placed in Plan 2.

Modeled Structure

<table>
<thead>
<tr>
<th>Plan</th>
<th>Usage Allowance (based on OWASA’s current block structure)</th>
<th>Monthly Access (= allowance * $4.93/1000 unit price)</th>
<th>Overage Charge</th>
<th>Predicted Plan Participation (% SFDU Premises)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2,000 gallons/month</td>
<td>$4.47</td>
<td>$12.17/1000 gallons</td>
<td>23%</td>
</tr>
<tr>
<td>2</td>
<td>5,000 gallons/month</td>
<td>$11.17</td>
<td></td>
<td>44%</td>
</tr>
<tr>
<td>3</td>
<td>10,000 gallons/month</td>
<td>$22.35</td>
<td></td>
<td>26%</td>
</tr>
<tr>
<td>4</td>
<td>15,000 gallons/month</td>
<td>$33.52</td>
<td></td>
<td>7%</td>
</tr>
</tbody>
</table>

Modeled Customer Impact

The percentage of SFDUs that would have been charged lower or higher total RY13 charges under the modeled structure compared to their actual total RY13 charges are as follows:

<table>
<thead>
<tr>
<th>% Change to SFDU’s Annual RY2013 Bill Under CS Modeled Rates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tail is cut off. Graph excludes SFDUs that would have more than doubled charges (0.4%, or 255 SFDUs).</td>
</tr>
</tbody>
</table>

Potential benefits
- Increased revenue stability: Customers annually commit to plans
- Gives customer a choice: This means less administrative burden than budget-based rates of utility determining block rate for customers
- Moves more to a model of water and sewer service, rather than a commodity
- Promotes conservation, especially around the “break points”

Potential challenges
- Complicates budgeting process: How do you predict which people change plans? How often? What is the optimal length of contract?
- Does not fit with seasonal use of water: Water use is not as consistent month-to-month as cell phone use. Allowing roll-overs could help this, but would dissuade conservation.
- Customers will likely request real-time water usage information: In order to provide this service, metering upgrades will be required.
Alternative 3: Simple Dividend Model

Under this rate model, PWC would continue to charge against their existing rate structure and simply add an additional fixed fee to the base charges to generate a buffer for revenues. At the end of the year, PWC would return revenue from the additional fixed fee beyond the revenue it projected to need for the year.

Design Details

- Applies to water, sewer, and irrigation. Determined at the meter level, not premise level.
- The method used to determine “revenue stabilization guarantee” at the end of the year can vary. In this example, profit is calculated as the difference between the actual total charges (water+irrigation+sewer) system-wide at the end of RY2013 under the new rate structure and the predicted total charges for RY2013 that was estimated at the end of RY2012 ($30.8 million).
- The method used to determine how much each customer would receive in dividends can vary. In this example, the profits are divided equally among all base charges, refunding a fixed portion of the “add-on” fee.
- Additional fixed fee calculated to provide PWC with 25% more than the predicted total charges and divided across all meters. Water, sewer, and irrigation are all separate.

Modeled Structure

To achieve 25% greater revenues than the predicted total charges (target) of $30,766,864, an add-on fee of $ 5.58 was added to every base charge in RY2013. The $9,473,868 (additional revenue after elasticity) excess revenue was divided by the 1,407,523 base charges that were charged in RY2013 equaling a dividend of $6.73 per base charge. This would be returned to all customers. Most customers will have received a dividend for the amount of $161.52 at the end of the year. Because of the increases in meters in RY13, the utility would have effectively lowered their base charges by $1.15 in order to ensure that revenues reached the $30.8 million target (and not exceed it!), despite the reduction in use that occurred in RY2013. The actual RY2013 charges equaled $30.0 million (a 2.6% reduction from the target).

Modeled Customer Impact

Potential benefits

- This model drives the fact that utility is a not-for-profit entity: profits are returned to customers
- Increased revenue stability
- Provides a method for utility to positively interact with customers by cutting them a check
- Partners well with any type of rate structure

Potential challenges

- The ‘rebate’ aspect of the model can make things complicated. Other utilities, such as the Austin Water Utility, have opted to make such a charge intermittent – as needed.
- As modeled here, the rebate has nothing to do with being “water-wise.” This can change.
Alternative 4: FlatBack Model

This is a a different type of dividend-returning model. This time, the utility would abandon existing rates, and instead charge every customer a fixed monthly per household per service fee (water/sewer), regardless of water use or number or size of water or irrigation meters. The fee would be priced in order to achieve 25% in excess revenues at the end of the year. The utility would return actual excess revenues made to customers in the form of a dividend. The dividends will be calculated in a way to reward the customers who were more efficient in their water use than others, providing a price incentive for conservation and efficiency.

Design Details

• Under this model, every customer gets one monthly flat charge for water service (water+irrigation), and double the amount if they also have sewer service.
• The method used to determine “profit” at the end of the year can vary. In this example, we attempted to model the utility’s costs at the end of RY13 by using the audited financial statement for RY13. The portion of expenses we estimated to be allocable to SFDUs was subtracted from the total charges under the new rate model and deemed “profit”.
• The method used to determine how much each customer would receive in dividends can vary. In this example, 25% of the “profit” is shared among all customers, based on the number of services and bills they received during RY13. The remaining 75% of the “profit” is shared only among customers that exhibited water-wise behavior.
• “Water-wise” behavior can be defined in any number of ways. In this example, only customers that reduced their average water use from RY12 to RY13 received any dividend under this portion, which is allocated proportional to the relative reduction in average water use compared to other customers.

Modeled Structure

To achieve 25% greater revenues than the predicted total charges (target) of $30,766,864, residential customers are charged $29.02/month/service which would have totaled $38,312,048 in revenue, exceeding the target $28.9 million for SFDU expenses by $10,273,300. 25% of this “profit” would be split among all residential customers at $1.90/month/service. Most customers would have received a dividend of $45.61. The remaining 75% of the “profit” would be split only among the 63% of residential customers who reduced their average non-zero water use from RY12 to RY13. The total RY13 “water-wise” dividends would have ranged from $1.90 to $421.68 per customer (median: $126.09).

Modeled Customer Impact

Potential benefits
• This model drives the fact that utility is a not-for-profit entity: profits are returned to customers
• Provides a method for utility to positively interact with customers by cutting them a check
• Ensures that utility first-and-foremost meets financial goals; increased revenue stability.
• Depending on how this model was set up, it most likely would not require metering or billing upgrades. It wouldn’t even require monthly reads.

Potential challenges
• The ‘rebate’ aspect of the model can make things complicated.
• Fixed charge would do little to promote “water-wise” behavior throughout the year.
• The more people that act as water stewards, the less money there is to go around more customers. This could be discouraging to customers.
4.2 PWC CustomerSelect In-Depth Analysis

In 2014, the Environmental Finance Center presented the Fayetteville Public Works Commission (PWC) with preliminary analysis of three business models completely different from the one currently in-place. Based on this discussion, PWC staff selected the rate model coined “CustomerSelect” for a more in-depth analysis. The following report is a summary of that in-depth analysis.

Description of CustomerSelect
Under the CustomerSelect rate model, each customer chooses one plan to commit to for the entire rate year. Each plan has a progressively higher base charge and consumption allowance. The customer pays his/her base charge for all water use within that plan and the “overage” price for all water+irrigation use above the plan’s allowance, if applicable.

Ultimately, PWC staff liked this model because it gives customers the choice. PWC staff believed that this plan would be easier to explain and better for their transient demographics.

Although, this report answers questions about what customers are impacted and by how much, it does not answer other critical questions like, “which plans will customers choose?” Will they choose based on their average or based on their peak demand? This question is an important one to answer because it will influence the rate setting and budgeting process. Furthermore, it is unknown how the implementation of a model like CustomerSelect would influence customer demand in a given year and over the long-term. More extensive qualitative and quantitative analysis is needed to better estimate customers’ response to CustomerSelect.

Summary of Analysis
The following CustomerSelect analysis was conducted for individually-metered, water-using single family residential customers inside the City limits. Water and irrigation volumes are aggregated and just called “water” for simplicity’s sake, even though irrigation water is also included. Although we included wastewater charges in calculating the revenue-neutral projections of the CustomerSelect prices, under the assumption that wastewater rates would NOT change when switching to CustomerSelect water rates, this report ignores wastewater charges in order to focus analysis on changes to the water charges.

Price elasticity was used in making projections, adjusting customers’ projected water use based on how the total (water+irrigation+wastewater) charge would increase or decrease in the next year under the different rate structures being modeled. Otherwise, the analysis does not adjust demand in response to any of the models. The rates charged under each CustomerSelect model were specifically computed to provide revenue-neutral projections of charges for the next year, compared with projections of charges using the increasing block rates that the utility would implement in that year.

The analysis compares the effects of switching to four different CustomerSelect scenarios based on actual water use in Rate Year 2013 (May 2012-April 2013). The following report compares utility revenue and customer bills under CustomerSelect (Scenario A) to what they actually were in Rate Year 2013 under an increasing block rate structure. After describing the effects on

1: PWC CustomerSelect Analysis
customers’ water charges under the Scenario A, the design of the CustomerSelect rate structure itself was slightly modified in one key aspect to create a new Scenario. The effects on customers’ water charges under the new scenario of CustomerSelect is then compared to the effects under the base Scenario A in order to highlight how changing one aspect of the CustomerSelect rate structure would impact the utility’s revenues, the customers, and their charges. This step would repeated several times, creating multiple scenarios, each time only changing one aspect of the Scenario A CustomerSelect model.

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Number of Plans</th>
<th>Size of Plans (in thousand gallon increments)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>4</td>
<td>2 / 5 / 10 / 15</td>
</tr>
<tr>
<td>B</td>
<td>4</td>
<td>3 / 7 / 12 / 20</td>
</tr>
<tr>
<td>C</td>
<td>8</td>
<td>2 / 4 / 6 / 8 / 10 / 12 / 14 / 16</td>
</tr>
<tr>
<td>D</td>
<td>2</td>
<td>5 / 15</td>
</tr>
</tbody>
</table>

The model holds basic parameters constant between scenarios. For each scenario, customers are placed in a plan based on their average water use the previous year. Within each scenario, the unit rate for the base charge is the same for each plan (computed as the unit rate times the plan allowance). Additionally, within each scenario, the overage volumetric rate is the same for each plan. It is computed as the largest difference between the CustomerSelect base charges plus $1.00 with the idea that this will incentivize customers to choose the smallest plan possible.

The presentation of each Scenario begins with a description of the construct of the rate structure. It then analyzes the impact on utility charges. Scenario A compares annual and monthly utility charges to those collected under the actual RY13 increasing block rate structure. The rest of the Scenarios compare back to Scenario A. Because of the challenges that fluctuations in customer demand present to utility revenue stability, the utility financial analysis focuses on the percent of base charge versus volumetric charge revenue.

The rest of the analysis is focused on the customer impact. The analysis summarizes participation in each plan based on the customers RY12 average water use, as well as the number of customers that would exceed that plan based on their RY13 water use. The report then analyzes the customers that would pay more on an annual basis, those that would pay virtually the same amount (within 5%), and those that would pay less. This analysis was conducted on an annual basis because the monthly variation would be expected to be quite great and not quite fair to compare. Although, the “winners” and “losers” are presented for the overall customer base, the analysis also organizes customers based on different water use parameters, including plan participation, average water use in RY13, and by peaking ratio in RY13.
Scenario A

CustomerSelect Rates

<table>
<thead>
<tr>
<th>Plan</th>
<th>Allowance (Gallons)</th>
<th>Customer Select Monthly Base Charge</th>
<th>Overage Charge (/1000 gallons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plan 1</td>
<td>2,000</td>
<td>$4.47</td>
<td>$12.17</td>
</tr>
<tr>
<td>Plan 2</td>
<td>5,000</td>
<td>$11.18</td>
<td>$12.17</td>
</tr>
<tr>
<td>Plan 3</td>
<td>10,000</td>
<td>$22.35</td>
<td>$12.17</td>
</tr>
<tr>
<td>Plan 4</td>
<td>15,000</td>
<td>$33.53</td>
<td>$12.17</td>
</tr>
</tbody>
</table>

CustomerSelect Charges vs. Actual Water Charges in 2013

3: PWC CustomerSelect Analysis
Utility Revenues and Projections

Utility Charges for SFDUs in 2013

- Water & Irrigation Base Charges
- Water & Irrigation Volumetric Charges

<table>
<thead>
<tr>
<th>Predicting 2013 at the end of 2012</th>
<th>Millions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sold in 2012</td>
<td>$0</td>
</tr>
<tr>
<td>With Utility's Planned 2013 Rates</td>
<td>$10</td>
</tr>
<tr>
<td>With CustomerSelect</td>
<td>$20</td>
</tr>
</tbody>
</table>

| Based on actual 2013 water use    | 37%      |
| sold in 2013 with utility's 2013 rates |    |
| Modeled would have been sold in 2013 with CustomerSelect | 68%      |

In this scenario, monthly water revenues would be higher (but no less variable) under CustomerSelect than using the utility's existing rate structure.

4: PWC CustomerSelect Analysis
How many are in each plan?

In this scenario, most SFDUs would have chosen **Plan 2**

![Bar chart showing distribution of plans]

How many in each plan would exceed their allowance at least once during the year and pay overage charges?

**More than half of the SFDUs in Plans 1 and 4 would have exceeded their plan's allowance at least once throughout the year.**

Overall, 48% of SFDUs would have always remained within their plan's allowance.

![Chart showing overage charges]

---

5: PWC CustomerSelect Analysis
How charges changed for customers: utility-wide

More SFDUs would have decreased than increased their total annual water charges under CustomerSelect.

The % increases to some customers' water bills were generally larger than the % decreases to other customers' water bills.

Overall, water bills would increase on average by 4.9% under CustomerSelect.
How charges changed for customers: base on their plan participation

Larger proportions of SFDUs in the high plans would increase their water bills under CustomerSelect than in the low plans

The average water bill for customers in Plan 1 would decrease under CustomerSelect and increase for the rest

7: PWC CustomerSelect Analysis
How charges changed for customers: grouped by average water use in 2012

Low water users are more likely to decrease their water bills and high water users are more likely to increase their water bills under CustomerSelect

The average water bill for low-water using customers would decrease under CustomerSelect
How charges changed for customers with high discretionary use

**CustomerSelect increases** the bills for customers that have high discretionary water use (high peaking ratio) and **decreases** the bills for customers who use the same volume of water consistently.

CustomerSelect increases the average bill for customers that have high discretionary water use (high peaking ratio) significantly, while reducing the average bill for customers with lower peaking ratios.
Scenario B

CustomerSelect Rates

<table>
<thead>
<tr>
<th>Plan</th>
<th>Allowance (Gallons)</th>
<th>Customer Select Monthly Base Charge</th>
<th>Overage Charge (/1000 gallons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plan 1</td>
<td>3,000</td>
<td>$5.97</td>
<td>$16.92</td>
</tr>
<tr>
<td>Plan 2</td>
<td>7,000</td>
<td>$13.93</td>
<td>$16.92</td>
</tr>
<tr>
<td>Plan 3</td>
<td>12,000</td>
<td>$23.88</td>
<td>$16.92</td>
</tr>
<tr>
<td>Plan 4</td>
<td>20,000</td>
<td>$39.80</td>
<td>$16.92</td>
</tr>
</tbody>
</table>

CustomerSelect charges are higher in this scenario than if the plan sizes were smaller (Scenario A)
Utility Revenues and Projections

**Scenario B** would result in greater total water charges than in **Scenario A**, but with a lower proportion obtained from the base charges.

- **Water & Irrigation Base Charges**
- **Water & Irrigation Volumetric Charges**

<table>
<thead>
<tr>
<th></th>
<th>Predicting 2013 at the end of 2012</th>
<th>Based on actual 2013 water use</th>
</tr>
</thead>
<tbody>
<tr>
<td>In Scenario A</td>
<td>![Bar chart showing 68%]</td>
<td>![Bar chart showing 62%]</td>
</tr>
<tr>
<td>In Scenario B</td>
<td>![Bar chart showing lower percentage]</td>
<td>![Bar chart showing lower percentage]</td>
</tr>
</tbody>
</table>

Millions

$0   $5   $10  $15  $20

**In this scenario, monthly water revenues would be less stable than the revenues in Scenario A and under the utility’s existing rate structure.**
How many are in each plan?

More customers would choose the lower plans if the allowances are larger in each plan (Scenario B) than in Scenario A

How many in each plan would exceed their allowance at least once during the year and pay overage charges?

Fewer customers in the lower plans would ever exceed their plan's allowance, but overall exceedance rate is about the same whether allowances are large in each plan (Scenario B) or small (Scenario A). Overall, 51% of SFDUs would have always remained within their plan's allowance in Scenario B, compared to 48% in Scenario A.
How charges changed for customers: utility-wide

More customers would have decreased their bills when plans' allowances are larger (Scenario B) than in Scenario A

Scenario A
- Decreased: 48%
- Stayed same: 12%
- Increased: 40%

Scenario B
- Decreased: 54%
- Stayed same: 11%
- Increased: 36%

Fewer customers would increase their bills in Scenario B than in Scenario A, but also fewer customers would decrease bills by significant amounts.

Overall, water bills would increase on average by 5.6% in Scenario B and by 4.9% in Scenario A.

Change in customer's water bill in 2013 if CustomerSelect was used

13: PWC CustomerSelect Analysis
How charges changed for customers: base on their plan participation

Increasing the allowances in Scenario B did not affect customers that picked the lowest or highest plans, and made little difference to those picking the middle plans compared to the model in Scenario A

The average water bill in the lower plans will decrease less in Scenario B than in Scenario A

14: PWC CustomerSelect Analysis
How charges changed for customers: grouped by average water use in 2012

Low water users and very high water users are less likely to increase their water bills in Scenario B than in Scenario A; no zero water-using customers would decrease their bill

In Scenario B, the average water bill for every water-using group would be higher than in Scenario A
How charges changed for customers: grouped by peaking ratio in 2012

CustomerSelect will adjust the water bills of customers with different peaking ratios in similar ways under both Scenario B and Scenario A; the higher the peaking ratio, the more customers with increased water bills.

In Scenario B, customers with very high peaking ratios will increase their average water bills more than in Scenario A, and lower peakers would reduce their bills more significantly.
### Scenario C

**CustomerSelect Rates**

<table>
<thead>
<tr>
<th>Plan</th>
<th>Allowance (Gallons)</th>
<th>Customer Select Monthly Base Charge</th>
<th>Overage Charge (/1000 gallons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plan 1</td>
<td>2,000</td>
<td>$5.81</td>
<td>$6.81</td>
</tr>
<tr>
<td>Plan 2</td>
<td>4,000</td>
<td>$11.62</td>
<td>$6.81</td>
</tr>
<tr>
<td>Plan 3</td>
<td>6,000</td>
<td>$17.43</td>
<td>$6.81</td>
</tr>
<tr>
<td>Plan 4</td>
<td>8,000</td>
<td>$23.24</td>
<td>$6.81</td>
</tr>
<tr>
<td>Plan 5</td>
<td>10,000</td>
<td>$29.05</td>
<td>$6.81</td>
</tr>
<tr>
<td>Plan 6</td>
<td>12,000</td>
<td>$34.86</td>
<td>$6.81</td>
</tr>
<tr>
<td>Plan 7</td>
<td>14,000</td>
<td>$40.67</td>
<td>$6.81</td>
</tr>
<tr>
<td>Plan 8</td>
<td>16,000</td>
<td>$46.48</td>
<td>$6.81</td>
</tr>
</tbody>
</table>

**CustomerSelect overage rate is lower in this scenario, and there are higher priced plans than if customers picked among four plans (Scenario A)**

![Graph showing monthly charge for water irrigation vs total water and irrigation use (1,000 gallons)]
Utility Revenues and Projections

**Scenario C** would result in slightly lower water charges than in **Scenario A**, but with a greater proportion obtained from the base charges.

<table>
<thead>
<tr>
<th></th>
<th>Water &amp; Irrigation Base Charges</th>
<th>Water &amp; Irrigation Volumetric Charges</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Predicting 2013 at the end of 2012</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In Scenario A</td>
<td>$10</td>
<td>$10</td>
</tr>
<tr>
<td>In Scenario C</td>
<td>$15</td>
<td>$15</td>
</tr>
<tr>
<td><strong>Based on actual water use</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In Scenario A</td>
<td>$68%</td>
<td></td>
</tr>
<tr>
<td>In Scenario C</td>
<td>$78%</td>
<td></td>
</tr>
</tbody>
</table>

**In this scenario**, monthly water revenues would be more stable than the revenues in **Scenario A** and under the utility's existing rate structure.
How many are in each plan?

Customers would be more spread out across the plans when given 8 to choose from (Scenario C) than when given only four (Scenario A)

Few customers would select plans 6, 7 and 8, arguing for a single plan for allowance of up to 12,000 gallons/month
How many in each plan would exceed their allowance at least once during the year and pay overage charges?

More customers would exceed their plans' allowance if they select narrower plans (Scenario C) rather than selecting from broader but fewer plans (Scenario A).

Overall, 36% of SFDUs would have always remained within their plan's allowance in Scenario C, compared to 48% in Scenario A.

Scenario A’s Plans 2, 3 & 4 are visually displayed next to Scenario C Plans with similar allowances (2, 5 & 7 respectively).
How charges changed for customers: utility-wide

CustomerSelect with more options for plans (Scenario C) would increase bills for more customers than CustomerSelect with fewer options (Scenario A)

<table>
<thead>
<tr>
<th>Scenario A</th>
<th>Decreased</th>
<th>Stayed same</th>
<th>Increased</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>48%</td>
<td>12%</td>
<td>40%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Scenario C</th>
<th>Decreased</th>
<th>Stayed same</th>
<th>Increased</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>37%</td>
<td>19%</td>
<td>44%</td>
</tr>
</tbody>
</table>

In Scenario C, the range of changes on customers' water bills will be narrower and closer to 0% than the range in Scenario A

Overall, water bills would increase on average by 6.8% in Scenario C and by 4.9% in Scenario A
How charges changed for customers: base on their plan participation

The majority of customers in the mid-range and high plans in Scenario C will increase their water bills, while the majority of customers in the lowest plans will decrease their bills; which is similar to Scenario A

Changes to the average water bill for customers across plans would be similar in Scenario C as in Scenario A

Scenario A's Plans 2, 3 & 4 are visually displayed next to Scenario C Plans with similar allowances (2, 5 & 7 respectively).
How charges changed for customers: grouped by average water use in 2012

High water users are less likely to increase their water bills in Scenario C than in Scenario A

In Scenario C, the average bill of the highest water users would increase only slightly and increase proportionally more for low water users, compared to Scenario A in which the low water users would lower their average water bills and high water users would pay a lot more.
How charges changed for customers: grouped by peaking ratio in 2012

**Scenario C** will decrease the water bills for fewer of the low-peaking customers and for about the same for high-peaking customers than in **Scenario A**

In **Scenario C**, customers with very high peaking ratios will increase their average water bills to a lesser extent than in **Scenario A**, while customers with lower peaking ratios will decrease to a lesser extent.
**Scenario D**

**CustomerSelect Rates**

<table>
<thead>
<tr>
<th>Plan</th>
<th>Allowance (Gallons)</th>
<th>Customer Select Monthly Base Charge</th>
<th>Overage Charge (/1000 gallons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plan 1</td>
<td>5,000</td>
<td>$8.29</td>
<td>$17.58</td>
</tr>
<tr>
<td>Plan 2</td>
<td>15,000</td>
<td>$24.87</td>
<td>$17.58</td>
</tr>
</tbody>
</table>

*CustomerSelect overage rate is higher in this scenario, while the base charges are lower than if customers picked among four plans (Scenario A)*
Utility Revenues and Projections

**Scenario D** would result in almost identical water revenues for the utility as those resulting from **Scenario A**.

![Graph showing water & irrigation base charges and volumetric charges for Scenarios A and D.]

**In this scenario, monthly water revenues would be less stable than the revenues in Scenario A.**

26: PWC CustomerSelect Analysis
How many are in each plan?

Customers in Scenario D plans include the customers in preceding plans in Scenario A.

How many in each plan would exceed their allowance at least once during the year and pay overage charges?

Fewer customers would exceed their plans' allowance if they select broader plans (Scenario D) rather than selecting from narrower plans (Scenario A). Overall, 64% of SFDUs would have always remained within their plan's allowance in Scenario D, compared to 48% in Scenario A.
How charges changed for customers: utility-wide

CustomerSelect with fewer options for plans (Scenario D) would lower the bills for more customers than CustomerSelect with more options (Scenario A)

**Scenario A**
- Decreased: 48%
- Stayed same: 12%
- Increased: 40%

**Scenario D**
- Decreased: 57%
- Stayed same: 9%
- Increased: 35%

More customers in Scenario D would lower their water bills substantially than in Scenario A

Overall, water bills would increase on average by 1.4% in Scenario D and by 4.9% in Scenario A.
How charges changed for customers: base on their plan participation

Customers in the lower plan in Scenario D will be more likely to lower their bills than customers in the lower plans in Scenario A.

Customers in the low plan in Scenario D would decrease their average water bill under CustomerSelect, while customers in the high plan would increase their average bill, but not as high as those in Scenario A.

Scenario D’s plans 1 & 2 are visually displayed next to Scenario A’s plans with similar allowances (2 & 4 respectively).

Scenario A’s Plans 2, 3 & 4 are visually displayed next to Scenario D Plans with similar allowances (2, 5 & 7 respectively).
How charges changed for customers: grouped by average water use in 2012

Customers with average water use that neared Scenario D's allowances (i.e., 5,000 and 15,000 gallons) were more likely to decrease their water bill under CustomerSelect than in Scenario A.

In Scenario D, the average bill of the lowest and highest water users increased more than in Scenario A, and customers nearing Scenario D's allowances reduced their average water bill (or increased slightly).
How charges changed for customers: grouped by peaking ratio in 2012

In Scenario D, customers with high peaking ratios are not as likely to increase their water bills as they would under Scenario A.

In Scenario D, customers with high peaking ratios will not increase their average water bill as much as they would in Scenario A, while customers with lower peaking ratios will decrease their bills more.
Findings
The merits of each scenario presented in this report can be evaluated against a myriad of criteria. Given that this analysis looked at the impact to utility revenues and customer bills in a given year, the following discusses the design features of the model that address those.

Scenario C (8 small plans) provides the most revenue stability for the utility (i.e. more revenue from base charges). Because customers have more plan options, they are better able to “right-size” their plan to match their consumption, including increasing their plan and base charges. This also equates to more stable month-to-month revenues for the utility.

If minimizing customer plan exceedance is the primary goal, then the CustomerSelect rate structure does better with fewer plan options. In Scenario D (2 large plans), the plans are larger than in the other scenarios. Therefore, customers with a small amount of water use have to opt into a much higher plan than might have been necessary based on their average water use, but it also means that fewer customers exceed their plan.

There will be customers that pay more and customers that pay less on an annual basis, no matter which Scenario. There will also be a few customers that don’t see much of a change, on an annual basis. Under Scenario C (8 small plans), the fewest amount of customers (19%) see a drastic increase or decrease in their annual water bills. However, there would be more customers that pay more under Scenario C than in Scenario A (4 plans at 2, 5, 10, and 15 thousand gallons). Scenario D would decrease the annual bill for more customers overall than any other plan.

But it is important which customers would pay more and which would pay less. Based on the design parameters used for this analysis and water use trends in PWC’s service area, the more that a rate model (or Scenario) collects from base charges, the less the volumetric overage charge needs to be to achieve revenue neutrality. Given this, Scenarios B and D increase the average bill for water users with high water use.

Each Scenario reduces bills for low peaking customers and increases bills for high peaking customers. This makes sense since we assigned customers to plans based on their previous year’s average water use. However, this would also be the case if customers were choosing based on their previous year’s peak water use (i.e. they never wanted to exceed their plan) because they would be paying for that peak use all year long.
Executive Summary

The Environmental Finance Center has summarized its preliminary analysis of alternative rate models for Charlotte Water in the following report. The purpose of this document is to compare the structures, the financial impacts to the utility and its residential customers, the benefits, and the challenges of four alternative rate models. Based on feedback from Charlotte Water staff, the Environmental Finance Center will generate a more detailed report on the structure, financial impacts, benefits, and challenges of one alternative rate model – taking into account adaptations suggested by Charlotte Water.

Objectives of the Alternative Rate Models

- Increase the proportion of revenues obtained from fixed charges
- Link fixed charges to water use to better encourage efficiency
- Produce revenue-neutral projections for revenues
- Increase revenue resiliency in the wake of declining demands

Methodology

Once a basic structure of each alternative rate model was designed using some preliminary rules and framework, the EFC used historical billing and rate data from Charlotte Water’s rate years 2011 (July 2010-June 2011) and 2012 (July 2011-June 2012) to (1) set rates and (2) compare rate models.

1. Setting Rates

Actual $\text{RY12 rates x Adjusted RY11 use}^{e1} =$

Alternative Rates $\text{x Adjusted RY11 use}^{e2}$=

$e1, e2$ Adjusted for elasticity (-0.2) in response to changed total charges

2. Comparing Rate Models

$\text{RY12 actual rates x RY12 actual use } = \text{Actual RY12 Charges (}$\$134,169,536$\text{)}$

vs.

Alternative Rates $\text{x RY12 actual use } = \text{Alternative RY12 Charges (} \text{varies by alternative} \text{)}$

The rate structure designs and rules for each alternative rate model were developed first. The rates for the alternative models were then calculated to produce the same expected revenues in RY2012 that Charlotte Water would have expected by modeling RY2012 rates on RY2011 water use and adjusted for price elasticity ($\$135.3$ million). The alternative rates were then applied to actual RY2012 use (currently not adjusted for price elasticity) and total revenues compared to actual revenues collected under RY2012 charges.

Analysis included only: single-family residential dwelling units (SFDU) with 5/8” or 3/4” meters (only) that were charged water rates or irrigation rates (no sewer-only accounts, and no 1” or larger metered customers). Anomalous spiked bills (perhaps due to leaks) were identified and discarded from analysis. Water and irrigation water use were totaled and used as a single total volume for each premise. Alternative rate models applied primarily to water and irrigation rates, not to sewer rates.

The four alternative rate models are described in the following report. These models are very different from commonly-used rate structures. There are several preliminary assumptions made for the design of each model, but once a single model is selected by Charlotte Water for more in-depth analysis, these rules and parameters can be adjusted to meet the utility’s rate structure objectives.
Comparing Rate Models

The figure below summarizes and compares the financial impact of each rate model.

The alternative rate models were priced to generate expected total revenues of $135.3 million, just as much as the RY2012 rate structure would have been expected to produce.

Under the currently-used prices and examples, all of the alternative rate models would have produced more revenue for the utility than the actual rates charged during RY2012.

In addition, all of the alternative rate models would have achieved a greater portion of their revenues through fixed charges helping to increase revenue resiliency for the utility.

Thus, even if customers used less water than they did in RY2012 because of changes to the rate structure, a much larger portion of the revenues would have been protected.

The month-to-month revenue generation of the alternative rate models was also more stable than under the existing rate structure.
**Alternative 1: PeakSet Base**

Under this rate structure, a customer’s base charge for water and irrigation is individually set based on the three-year rolling average of that customer’s highest month of water use. This allows the utility to build more cost recovery into the base charge while still promoting customer conservation and efficiency. This rate model particularly encourages steady water use.

**Design Details**
- Does not apply to sewer. Only applies to SFDU and associated irrigation meters.
- Each premise gets only one fixed monthly charge, regardless of number or size of water and irrigation meters.
- If rolling average peak cannot be determined, the system-wide median in that year applies to the customer.
- Monthly fixed charge is set first, and the uniform volumetric rate is then calculated from that for revenue neutrality.

**Modeled Structure**
- Monthly fixed charge = $1.25/ccf of the 3-year historical average peak demand
- Uniform volumetric rate = $0.50/ccf of monthly water use

**Modeled Customer Impact**
The percentage of SFDUs that would have been charged lower or higher total RY12 charges under the modeled structure compared to their actual total RY12 charges are as follows:

**Potential benefits**
- Increased revenue stability: There would be a larger percentage of revenue coming from base charges.
- Promotes steady customer water use: A high peaking would be costly to a customer all year long.
- Customers can expect more steady bills: This might mean reduced customer cutoffs.
- Would not require metering upgrades

**Potential challenges**
- Requires methodology for determining base charges for new customers
- Potentially requires billing software upgrade
- You may expect more meter re-reads and high bill disputes because of the long-term impact of a high meter read.
- A customer that is planning on moving will not have a large incentive to conserve.
Alternative 2: CustomerSelect

Under this rate model, each customer chooses between one of four “plans.” Each plan has a progressively higher base charge and consumption allowance. The customer pays his/her base charge and the “overage” price for all water + irrigation use above the plan’s allowance, if applicable.

Design Details
- Does not apply to sewer. Only applies to SFDU and associated irrigation meters.
- The blocks are structured to have equal unit price at the highest end of consumption.
- The “overage” price is higher than the largest difference between two plans’ monthly charges.
- Each premise gets only one fixed monthly charge, regardless of number or size of water and irrigation meters.
- Since choices of plans are unknown, customers were initially placed in the plan that best matches their average water + irrigation monthly volume from the previous fiscal year. If average monthly volume cannot be determined, the customer is automatically placed in Plan 2.

Modeled Structure

<table>
<thead>
<tr>
<th>Usage Allowance (based on current block structure)</th>
<th>Monthly Access (= allowance * $1.19/ccf unit price)</th>
<th>Overage Charge</th>
<th>Predicted Plan Participation (% SFDU Premises)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 4 ccf/month</td>
<td>$4.76</td>
<td></td>
<td>29%</td>
</tr>
<tr>
<td>2 8 ccf/month</td>
<td>$9.52</td>
<td>$10.52/ccf</td>
<td>39%</td>
</tr>
<tr>
<td>3 16 ccf/month</td>
<td>$19.04</td>
<td></td>
<td>26%</td>
</tr>
<tr>
<td>4 24 ccf/month</td>
<td>$28.56</td>
<td></td>
<td>6%</td>
</tr>
</tbody>
</table>

Modeled Customer Impact

The percentage of SFDUs that would have been charged lower or higher total RY12 charges under the modeled structure compared to their actual total RY12 charges are as follows:

- Increased revenue stability: Customers annually commit to plans
- Gives customer a choice: This means less administrative burden than budget-based rates of utility determining block rate for customers
- Moves more to a model of water and sewer service, rather than a commodity
- Promotes conservation, especially around the “break points”

Potential challenges
- Complicates budgeting process: How do you predict what plan customers will choose? When will they commit? Can they change plans? How often? What is the optimal length of the contract?
- Does not fit with seasonal use of water: Water use is not as consistent month-to-month as cell phone use. Allowing roll-overs could help this, but would dissuade conservation.
- Customers will likely request real-time water use information: In order to provide this service, metering upgrades will be required.

Alternative 3: Simple Dividend Model

Under this rate model, Charlotte Water would continue to charge against their existing rate structure and simply add an additional fixed fee to the base charges to generate a buffer for revenues. At the end of the year, Charlotte Water would return revenue from the additional fixed fee beyond the revenue it projected to need for the year.
Design Details
- Applies to water, sewer, and irrigation. Determined at the meter level, not premise level.
- The method used to determine “revenue stabilization guarantee” at the end of the year can vary. In this example, profit is calculated as the difference between the actual total charges (water+irrigation+sewer) system-wide at the end of RY2012 under the new rate structure and the predicted total charges for RY2012 that was estimated at the end of RY2012 ($135.3M).
- The method used to determine how much each customer would receive in dividends can vary. In this example, the profits are divided equally among all base charges, refunding a fixed portion of the “add-on” fee. The dividend is pro-rated by number of days of service (Charlotte-specific).
- Additional fixed fee calculated to provide Charlotte Water with 25% more than the predicted total charges and divided across all meters. Water, sewer, and irrigation are all separate.

Modeled Structure
To achieve 25% greater revenues than the predicted total charges (target) of $135,256,016, an add-on fee of $0.214/day of service per service was added to every base charge in RY2013 (equivalent to $6.42 for 30 days for each service). The $28,475,024 (additional revenue after elasticity) excess revenue was divided by the 162,226,208 total days of service for all SFDUs in RY2012 for water, sewer and irrigation, equating to a dividend of $0.176/day of service for each service. This would be returned to all customers. Most customers would have received a dividend for the amount of $128.48 at the end of the year ($64.24/service). The utility would have effectively increased the customers’ base charges by $0.038/day of service ($1.14/month) in order to ensure that revenues reached the $135.3 million target (and not exceed it!), despite the reduction in use that occurred in RY2012. The actual RY2012 charges equaled $134.2 million (0.8% below the target).

Modeled Customer Impact
Potential benefits
- This model drives the fact that utility is a not-for-profit entity: profits are returned to customers
- Increased revenue stability
- Provides a method for utility to positively interact with customers by cutting them a check
- Partners well with any type of rate structure

Potential challenges
- The ‘rebate’ aspect of the model can make things complicated. Other utilities, such as the Austin Water Utility, have opted to make such a charge intermittent – as needed.
- As modeled here, the rebate has nothing to do with being “water-wise.” This can change. See next model.

Alternative 4: FlatBack Model
This is a different type of dividend-returning model. This time, the utility would abandon existing rates, and instead charge every customer a fixed monthly per household per service fee (water/sewer), regardless of water use or number or size of water or irrigation meters. The fee would be priced in order to achieve 25% in excess revenues at the end of the year. The utility would return actual excess revenues made to customers in the form of a dividend. The dividends will be calculated in a way to reward the customers who were more efficient in their water use than others, providing a price incentive for conservation and efficiency.
Design Details

- Under this model, every customer gets one monthly flat charge for water service (water+irrigation), and double the amount if they also have sewer service.
- The method used to determine “revenue stabilization guarantee” at the end of the year can vary. In this example, profit is calculated as the difference between the actual total charges (water+irrigation+sewer) system-wide at the end of RY2012 under the new rate structure and the predicted total charges for RY2012 that was estimated at the end of RY2012 ($135.3M).
- The method used to determine how much each customer would receive in dividends can vary. In this example, 25% of the “profit” is shared among all customers, based on the number of services and bills they received during RY12. The remaining 75% of the “profit” is shared only among customers that exhibited water-wise behavior.
- “Water-wise” behavior can be defined in any number of ways. In this example, only customers that reduced their average water use from RY11 to RY12 received any dividend under this portion, which is allocated proportional to the relative reduction in average water use compared to other customers.

Modeled Structure

To achieve 25% greater revenues than the predicted total charges (target) of $135,256,016, residential customers are charged $33.46/month/service which would have totaled $171,840,896 in revenue, exceeding the revenue target of $135.3 by $36,606,880. 25% of this “profit” would be split among all residential customers at $1.78/month/service. Most customers would have received a first dividend of $42.76. The remaining 75% of the “profit” would be split only among the 66% of residential customers who reduced their average non-zero water use from RY11 to RY12. The total RY12 “water-wise” dividends would have ranged from $1.78 to $408.49 per customer (median: $126.88).

Potential benefits

- This model drives the fact that utility is a not-for-profit entity: profits are returned to customers
- Provides a method for utility to positively interact with customers by cutting them a check
- Ensures that utility first-and-foremost meets financial goals; increased revenue stability.
- Depending on how this model was set up, it most likely would not require metering or billing upgrades. It wouldn’t even require monthly reads.

Potential challenges

- The ‘rebate’ aspect of the model can make things complicated.
- Fixed charge would do little to promote “water-wise” behavior throughout the year.
- The more people that act as water stewards, the less money there is to go around more customers. This could be discouraging to customers.
5.2 Charlotte Water CustomerSelect In-Depth Analysis

In 2014, the Environmental Finance Center presented Charlotte Water with preliminary analysis of three business models completely different from the one currently in-place. Based on this discussion, Charlotte Water staff selected the rate model coined “CustomerSelect” for a more in-depth analysis. The following report is a summary of that in-depth analysis.

Description of CustomerSelect
Under the CustomerSelect rate model, each customer chooses one plan to commit to for the entire rate year. Each plan has a progressively higher base charge and consumption allowance. The customer pays his/her base charge for all water use within that plan and the “overage” price for all water+irrigation use above the plan’s allowance, if applicable.

Ultimately, Charlotte Water staff liked this model because it gives customers the choice. Charlotte Water Staff felt like the CustomerSelect model aligns better with a utility policy to build more cost recovery into the fixed component of customer’s water bill. Staff also felt like this model could best fit a capital finance model that pays for growth and expansion with debt and investments in existing infrastructure with cash. Staff was leery of the financially disastrous effects of leaks on customers under such a model.

Although, this report answers questions about what customers are impacted and by how much, it does not answer other critical questions like, “which plans will customers choose?” Will they choose based on their average or based on their peak demand? This question is an important one to answer because it will influence the rate setting and budgeting process. Furthermore, it is unknown how the implementation of a model like CustomerSelect would influence customer demand in a given year and over the long-term. More extensive qualitative and quantitative analysis is needed to better estimate customers’ response to CustomerSelect.

Summary of Analysis
The following CustomerSelect analysis was conducted for individually-metered, water-using single family residential customers. Water and irrigation volumes are aggregated and just called “water” for simplicity’s sake, even though irrigation water is also included. Although we included wastewater charges in calculating the revenue-neutral projections of the CustomerSelect prices, under the assumption that wastewater rates would NOT change when switching to CustomerSelect water rates, this report ignores wastewater charges in order to focus analysis on changes to the water charges.

Price elasticity was used in making projections, adjusting customers’ projected water use based on how the total (water+irrigation+wastewater) charge would increase or decrease in the next year under the different rate structures being modeled. Otherwise, the analysis does not adjust demand in response to any of the models. The rates charged under each CustomerSelect model were specifically computed to provide revenue-neutral projections of charges for the next year, compared with projections of charges using the increasing block rates that the utility would implement in that year.
The analysis compares the effects of switching to three different CustomerSelect scenarios based on actual water use in Rate Year 2012 (July 2011 – June 2012). The following report compares utility revenue and customer bills under CustomerSelect (Scenario A) to what they actually were in Rate Year 2012 under an increasing block rate structure. After describing the effects on customers’ water charges under the Scenario A, the design of the CustomerSelect rate structure itself was slightly modified in one key aspect to create a new Scenario. In particular, Charlotte Water staff asked for the specific parameters of Scenario C because it believed to be a more modest modification to the current rate structure. The effects on customers’ water charges under the new scenario of CustomerSelect is then compared to the effects under the base Scenario A in order to highlight how changing one aspect of the CustomerSelect rate structure would impact the utility’s revenues, the customers, and their charges. This step would repeated several times, creating multiple scenarios, each time only changing one aspect of the Scenario A CustomerSelect model.

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Number of Plans</th>
<th>Size of Plans (in ccf increments)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>4</td>
<td>4 / 8 / 16 / 24</td>
</tr>
<tr>
<td>B</td>
<td>4</td>
<td>6 / 12 / 20 / 30</td>
</tr>
<tr>
<td>C</td>
<td>2</td>
<td>3 / 7</td>
</tr>
</tbody>
</table>

The model holds basic parameters constant between scenarios. For each scenario, customers are placed in a plan based on their average water use the previous year. Within each scenario, the unit rate for the base charge is the same for each plan (computed as the unit rate times the plan allowance). Additionally, within each scenario, the overage volumetric rate is the same for each plan. It is computed as the largest difference between the CustomerSelect base charges plus $1.00 with the idea that this will incentivize customers to choose the smallest plan possible.

The presentation of each Scenario begins with a description of the construct of the rate structure. It then analyzes the impact on utility charges. Scenario A compares annual and monthly utility charges to those collected under the actual RY12 increasing block rate structure. The rest of the Scenarios compare back to Scenario A. Because of the challenges that fluctuations in customer demand present to utility revenue stability, the utility financial analysis focuses on the percent of base charge versus volumetric charge revenue.

The rest of the analysis is focused on the customer impact. The analysis summarizes participation in each plan based on the customers RY11 average water use, as well as the number of customers that would exceed that plan based on their RY12 water use. The report then analyzes the customers that would pay more on an annual basis, those that would pay virtually the same amount (within 5%), and those that would pay less. This analysis was conducted on an annual basis because the monthly variation would be expected to be quite great and not quite fair to compare. Although, the “winners” and “losers” are presented for the overall customer base, the analysis also organizes customers based on different water use parameters, including plan participation, average water use in RY12, and by peaking ratio in RY12.
Scenario A (the base scenario against which all other scenarios will be compared)

CustomerSelect Rates

<table>
<thead>
<tr>
<th>Plan</th>
<th>Allowance (cubic feet)</th>
<th>Customer Select Monthly Base Charge</th>
<th>Overage Charge (/1000 gallons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plan 1</td>
<td>400</td>
<td>$4.15</td>
<td>$9.30</td>
</tr>
<tr>
<td>Plan 2</td>
<td>800</td>
<td>$8.30</td>
<td>$9.30</td>
</tr>
<tr>
<td>Plan 3</td>
<td>1,600</td>
<td>$16.60</td>
<td>$9.30</td>
</tr>
<tr>
<td>Plan 4</td>
<td>2,400</td>
<td>$24.90</td>
<td>$9.30</td>
</tr>
</tbody>
</table>

CustomerSelect Charges vs. Actual Water Charges in 2012
Utility Revenues and Projections

Utility Charges for SFDUs in 2012

Water & Irrigation Base Charges
Water & Irrigation Volumetric Charges

<table>
<thead>
<tr>
<th>Millions</th>
</tr>
</thead>
<tbody>
<tr>
<td>$0</td>
</tr>
<tr>
<td>$20</td>
</tr>
<tr>
<td>$40</td>
</tr>
<tr>
<td>$60</td>
</tr>
<tr>
<td>$80</td>
</tr>
</tbody>
</table>

Sold in 2011

Predicting 2012 at the end of 2011

With Utility's Planned 2012 Rates
With CustomerSelect

Based on actual water use

Sold in 2012 with Utility's 2012 Rates
Modeled Would Have Been Sold in 2012 with CustomerSelect

21%
43%

In this scenario, monthly water revenues would be higher and more seasonal (in the summer) under CustomerSelect than using the utility's existing rate structure.

4 : Charlotte Water CustomerSelect Analysis
How many are in each plan?

In this scenario, most SFDUs would have been in Plan 2

How many in each plan would exceed their allowance at least once during the year and pay overage charges?

Nearly half of the SFDUs in Plans 1, 2 and 3, and 80% in Plan 4 would have exceeded their plan's allowance at least once throughout the year.

Overall, 49% of SFDUs would have always remained within their plan's allowance.

5 : Charlotte Water CustomerSelect Analysis
How charges changed for customers: utility-wide

Many more SFDUs would have decreased than increased their total annual water charges under CustomerSelect.

The % increases to some customers' water bills were generally larger than the % decreases to other customers' water bills.

Overall, water bills would increase on average by 3.3% under CustomerSelect.
How charges changed for customers: base on their plan participation

Slightly larger proportions of SFDUs in the highest and lowest plans were likely to *increase* their water bills under CustomerSelect than in the middle plans.

<table>
<thead>
<tr>
<th>Plan</th>
<th>Decreased bills</th>
<th>Increased bills</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plan 1</td>
<td>68%</td>
<td>28%</td>
</tr>
<tr>
<td>Plan 2</td>
<td>65%</td>
<td>24%</td>
</tr>
<tr>
<td>Plan 3</td>
<td>62%</td>
<td>25%</td>
</tr>
<tr>
<td>Plan 4</td>
<td>62%</td>
<td>29%</td>
</tr>
</tbody>
</table>

The average water bill for customers in Plan 2 (the most common plan) would increase significantly under CustomerSelect.
How charges changed for customers: grouped by average water use in 2012

Low water users are more likely to decrease their water bills and high water users are more likely to increase their water bills under CustomerSelect

The average water bill for zero users and very high water users would increase significantly under CustomerSelect
How charges changed for customers with high discretionary use

**CustomerSelect increases** the bills for customers that have high discretionary water use (high peaking ratio) and **decreases** the bills for customers who use the same volume of water consistently.

---

### Customer's Peaking Ratio in 2012

<table>
<thead>
<tr>
<th>Peaking Ratio Group</th>
<th>Decreased Bills</th>
<th>Increased Bills</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0 - 1.5</td>
<td>84%</td>
<td>10%</td>
</tr>
<tr>
<td>1.6 - 2.0</td>
<td>78%</td>
<td>14%</td>
</tr>
<tr>
<td>2.1 - 2.5</td>
<td>65%</td>
<td>22%</td>
</tr>
<tr>
<td>2.6 - 3.0</td>
<td>55%</td>
<td>31%</td>
</tr>
<tr>
<td>&gt;3.0</td>
<td>36%</td>
<td>50%</td>
</tr>
</tbody>
</table>

---

**CustomerSelect increases the average bill for customers that have high discretionary water use (high peaking ratio) significantly, while reducing the average bill for customers with lower peaking ratios.**

---

### Average % Change to Water Bills under CustomerSelect

<table>
<thead>
<tr>
<th>Peaking Ratio Group</th>
<th>Average % Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0 - 1.5</td>
<td>-22%</td>
</tr>
<tr>
<td>1.6 - 2.0</td>
<td>-15%</td>
</tr>
<tr>
<td>2.1 - 2.5</td>
<td>-7%</td>
</tr>
<tr>
<td>2.6 - 3.0</td>
<td>-2%</td>
</tr>
<tr>
<td>&gt;3.0</td>
<td>12%</td>
</tr>
</tbody>
</table>
Scenario B

CustomerSelect Rates

<table>
<thead>
<tr>
<th>Plan</th>
<th>Allowance (Cubic Feet)</th>
<th>Customer Select Monthly Base Charge</th>
<th>Overage Charge (/ccf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plan 1</td>
<td>600</td>
<td>$5.66</td>
<td>$10.43</td>
</tr>
<tr>
<td>Plan 2</td>
<td>1,200</td>
<td>$11.32</td>
<td>$10.43</td>
</tr>
<tr>
<td>Plan 3</td>
<td>2,000</td>
<td>$18.87</td>
<td>$10.43</td>
</tr>
<tr>
<td>Plan 4</td>
<td>3,000</td>
<td>$28.30</td>
<td>$10.43</td>
</tr>
</tbody>
</table>

CustomerSelect charges are higher in this scenario than if the plan sizes were smaller (Scenario A)
Utility Revenues and Projections

Scenario B would result in about as much revenue (total and from base charges) as that created in Scenario A.

![Graph showing revenue comparison between Scenario A and Scenario B.]

In this scenario, monthly water revenues would be slightly less stable than the revenues in Scenario A and under the utility’s existing rate structure.
How many are in each plan?

More customers would choose the lower plans if the allowances are larger in each plan (Scenario B) than in an alternative CustomerSelect model (Scenario A).

How many in each plan would exceed their allowance at least once during the year and pay overage charges?

Fewer customers in the lower plans would ever exceed their plan's allowance, but overall exceedance rate is about the same whether allowances are large in each plan (Scenario B) or small (Scenario A). Overall, 53% of SFDUs would have always remained within their plan's allowance in Scenario B, compared to 49% in Scenario A.
How charges changed for customers: utility-wide

More customers would have decreased their bills when plans' allowances are larger (Scenario B) than in Scenario A

Scenario A
- Decreased: 65%
- Stayed same: 10%
- Increased: 25%

Scenario B
- Decreased: 69%
- Stayed same: 8%
- Increased: 23%

Fewer customers would increase their bills in Scenario B than in Scenario A, and more customers would decrease bills by significant amounts

Overall, water bills would increase on average by 3.2% in Scenario B and by 3.3% in Scenario A.
How charges changed for customers: base on their plan participation

Increasing the allowances in Scenario B did not affect customers that picked the lowest or highest plans, and made little difference to those picking the middle plans compared to the model in Scenario A

The average water bill in the lower plans will increase more or decrease more in Scenario B than in Scenario A
How charges changed for customers: grouped by average water use in 2012

Zero water users are likely to increase their water bills in Scenario B and in Scenario A; the rest are very similar

In Scenario B, the average water bill for every water-using group would be less than in Scenario A, except for the very low water-using customers
How charges changed for customers: grouped by peaking ratio in 2012

CustomerSelect will adjust the water bills of customers with different peaking ratios in similar ways under both Scenario B and Scenario A; the higher the peaking ratio, the greater the chance of increasing the water bill.

In Scenario B, customers with very high peaking ratios will increase their average water bills less than in Scenario A, and lower peakers would reduce their bills more.
Scenario C

CustomerSelect Rates

<table>
<thead>
<tr>
<th>Plan</th>
<th>Allowance (cubic feet)</th>
<th>Customer Select Monthly Base Charge</th>
<th>Overage Charge (/1000 gallons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plan 1</td>
<td>300</td>
<td>$3.34</td>
<td>$5.45</td>
</tr>
<tr>
<td>Plan 2</td>
<td>700</td>
<td>$7.79</td>
<td>$5.45</td>
</tr>
</tbody>
</table>

CustomerSelect overage rate is higher in this scenario, while the base charges are lower than if customers picked among four plans (Scenario A)
**Utility Revenues and Projections**

This scenario would result in less revenues and less base charges for the utility as those resulting from Scenario A.

- Water & Irrigation Base Charges
- Water & Irrigation Volumetric Charges

### Predicting 2012 at the end of 2011
- In Scenario A: $40 Million
- In Scenario C: $60 Million

### Based on actual 2012 water use
- In Scenario A: 43%
- In Scenario C: 30%

In this scenario, monthly revenues would be lower in summer months than in Scenario A.
How many are in each plan?

Customers in Scenario E have fewer plans to choose from; the overwhelming majority will choose Plan 2

![Bar chart showing percentage of customers in each plan and scenario.]

How many in each plan would exceed their allowance at least once during the year and pay overage charges?

More customers would exceed their plans' allowance if they select narrower plans (Scenario C) rather than selecting from broader plans (Scenario A)

Overall, 29% of SFDUs would have always remained within their plan's allowance in Scenario C, compared to 49% in Scenario A

![Bar chart showing percentage of customers in each plan and scenario.]

19 : Charlotte Water CustomerSelect Analysis
How charges changed for customers: utility-wide

CustomerSelect with fewer, narrower plans (Scenario C) would lower the bills for fewer customers than CustomerSelect with more options (Scenario A)

Scenario A

- Decreased: 65%
- Stayed same: 10%
- Increased: 26%

Scenario C

- Decreased: 57%
- Stayed same: 15%
- Increased: 28%

Fewer customers in Scenario C would increase their water bills as substantially as in Scenario A

Overall, water bills would decrease on average by 4.4% in Scenario C and would increase by 3.3% in Scenario A

Change in customer’s water bill in 2012 if CustomerSelect was used
How charges changed for customers: base on their plan participation

Customers in Scenario C will be as likely to increase or decrease bills as customers in the corresponding plans in Scenario A

Customers in Plan 2 (most common plan) in Scenario C would decrease their average water bill under CustomerSelect, while those customers would increase their average water bill in the corresponding plan in Scenario A
How charges changed for customers: grouped by average water use in 2012

Customers with high average water use were almost guaranteed to pay more in Scenario C than in Scenario A.

In Scenario C, the average bill of the highest water users increased more than in Scenario A, while the lowest water users would have decreased their water bills more in Scenario C.
How charges changed for customers: grouped by peaking ratio in 2012

In Scenario C, customers with high peaking ratios are slightly more likely to increase their water bills than in Scenario A.

In Scenario C, customers with high peaking ratios will not increase their average water bill as much as they would in Scenario A, while customers with lower peaking ratios will decrease their bills less.
Findings

The merits of each scenario presented in this report can be evaluated against a myriad of criteria. Given that this analysis looked at the impact to utility revenues and customer bills in a given year, the following discusses the design features of the model that address those.

Scenario A (4 small plans) provides slightly more revenue stability for the utility (i.e. more revenue from base charges) than Scenario B (4 larger plans) and much more than Scenario C (2 very small plans). Although base charges in Scenario B are higher and the plans are bigger, Scenario A provides more revenue stability because those customers that are on the brink of Scenario B plans have to opt into a higher plan and pay a higher base charge. Scenario C provides the least amount of base charge revenue at 30% but still nine percentage points more than Charlotte Water’s actual rate in 2012.

If minimizing customer plan exceedance is the primary goal, then the CustomerSelect rate structure does better with larger plans. The larger plans of Scenario B minimize plan exceedance in lower level plans. Although it looks like more customers exceed Plans 3 and 4, there are significantly less customers in these plans to begin with. Those exceeding the plans are really big users.

There will be customers that pay more and customers that pay less on an annual basis, no matter which Scenario. There will also be a few customers that don’t see much of a change, on an annual basis. Under Scenario C (2 very small plans), the fewest amount of customers (15%) see a drastic increase or decrease in their annual water bills. However, there would be more customers that pay more under Scenario C than in Scenario A (4 plans at 4, 8, 16, and 24 ccf). Scenario B would decrease the annual bill for more customers overall than any other plan (69%).

But it is important which customers would pay more and which would pay less. Based on the design parameters used for this analysis, water use trends in Charlotte Water’s service area and Charlotte Water’s current base charges, the lowest water users (1-3 ccf) get the largest price break and the zero water using customers have a very significant percentage increase in each Scenario. Scenario A increases charges for the highest water using customers (>20 ccf) the most. When high water using customers use more than Plan 4’s 24 ccf, they start accumulating relatively high over charges. Scenario B’s Plan 4 doesn’t start those overage charges until customers exceed 30 ccf, and Scenario C’s overage charge is much lower.

Each Scenario reduces bills for low peaking customers and increases bills for high peaking customers. This makes sense since we assigned customers to plans based on their previous year’s average water use. However, this would also be the case if customers were choosing based on their previous year’s peak water use (i.e. they never wanted to exceed their plan) because they would be paying for that peak use all year long.
Executive Summary
The Environmental Finance Center has summarized its preliminary analysis of alternative rate models for the Town of Cary Utilities Department (Cary) in the following report. The purpose of this document is to compare (at a high level) the structures, the financial impacts to the utility and its residential customers, the benefits, and the challenges of four alternative rate models. Based on feedback from Cary staff, the Environmental Finance Center will generate a more detailed report on the structure, financial impacts, benefits, and challenges of one alternative rate model – taking into account adaptations suggested by Cary.

Objectives of the Alternative Rate Models
- Increase the proportion of revenues obtained from fixed charges
- Link fixed charges to water use to better encourage efficiency
- Produce revenue-neutral projections for revenues
- Increase revenue resiliency in the wake of declining demands

Methodology
Once a basic structure of each alternative rate model was designed using some preliminary rules and framework, the EFC used historical billing and rate data from Cary’s rate years 2012 (July 2011-June 2012) and 2013 (July 2012-June 2013) to (1) set rates and (2) compare rate models.

1. Setting Rates
Actual RY13 rates x Adjusted RY12 use\( e_1 \) =
Alternative Rates x Adjusted RY12 use\( e_2 \) =
\[ e_1, e_2 \text{ Adjusted for elasticity (-0.2) in response to changed total charges} \]

2. Comparing Rate Models
RY13 actual rates x RY13 actual use = Actual RY13 Charges ($33,722,828)

vs.
Alternative Rates x RY13 actual use = Alternative RY13 Charges (varies by alternative)

The rate structure designs and rules for each alternative rate model were developed first. The rates for the alternative models were then calculated to produce the same expected revenues in RY2013 that Cary would have expected by modeling RY2013 rates on RY2012 water use and adjusted for price elasticity ($41.3 million). The alternative rates were then applied to actual RY2013 use (currently not adjusted for price elasticity) and total revenues compared to actual revenues collected under RY2013 charges.

Analysis included only: single-family residential dwelling units (SFDU), which were classified as “Customer Class A” with 5/8” meters that were charged water rates or irrigation rates (no sewer-only accounts, and no 1” or larger metered customers). Anomalous spiked bills (perhaps due to leaks) were identified and discarded from analysis. Water and irrigation water use were totaled and used as a single total volume for each premise. Alternative rate models applied primarily to water and irrigation rates, not to sewer rates.

The four alternative rate models are described in the following report. These models are very different from commonly-used rate structures. There are several preliminary assumptions made for the design of each model, but once a single model is selected by Cary for more in-depth analysis, these rules and parameters can be adjusted to meet the utility’s rate structure objectives.
Comparing Rate Models

The figure below summarizes and compares the financial impact of each rate model.

- The alternative rate models were priced to generate expected total revenues of $41.3 million, just as much as the RY2013 rate structure would have been expected to produce.
- Under the modeled prices and examples, all but one of the alternative rate models would have produced more revenue for the utility than the actual rates charged during RY2013. The exception is the CustomerSelect model, because based on the design parameters used in this preliminary analysis, the volumetric rates are very high and would have taken a huge hit due to the very significant reduction in water use that occurred in RY2013. The CustomerSelect model’s parameters can be changed in a way to shift even more towards the fixed charges and less on volumetric rates (but will require input from Cary on how this rate structure should be designed).
- In addition, all of the alternative rate models would have achieved a greater portion of their revenues through fixed charges helping to increase revenue resiliency for the utility.
- Thus, even if customers used less water than they did in RY2013 because of changes to the rate structure, a larger portion of the revenues would have been protected.
- The month-to-month revenue generation of the alternative rate models was also more stable than under the existing rate structure.
Alternative 1: PeakSet Base

Under this rate structure, a customer’s base charge for water and irrigation is individually set based on the three-year rolling average of that customer’s highest month of water use. This allows the utility to build more cost recovery into the base charge while still promoting customer conservation and efficiency. This rate model particularly encourages steady water use.

Design Details
- Does not apply to sewer. Only applies to SFDU and associated irrigation meters.
- Each premise gets only one fixed monthly charge, regardless of number or size of water and irrigation meters.
- If rolling average peak cannot be determined, the system-wide median in that year applies to the customer.
- Monthly fixed charge is set first, and the uniform volumetric rate is then calculated from that for revenue neutrality.

Modeled Structure
Monthly fixed charge = $2.50/1,000 gallons of the 3-year historical average peak demand
Uniform volumetric rate = $0.36/1,000 gallons of monthly water use

Modeled Customer Impact
The percentage of SFDUs that would have been charged lower or higher total RY13 charges under the modeled structure compared to their actual total RY13 charges are as follows:

Potential benefits
- Increased revenue stability: There would be a larger percentage of revenue coming from base charges.
- Promotes steady customer water use: A high peaking ratio would be costly to a customer all year long.
- Customers can expect more steady bills: This might also mean reduced customer cutoffs.
- Would not require metering upgrades.

Potential challenges
- Requires methodology for determining base charges for new customers
- Potentially requires billing software upgrade
- You may expect more meter re-reads and high bill disputes because of the long-term impact of a high meter read.
- A customer that is planning on moving will not have a large incentive to conserve.
Alternative 2: CustomerSelect

Under this rate model, each customer chooses between one of four “plans.” Each plan has a progressively higher base charge and consumption allowance. The customer pays his/her base charge and the “overage” price for all water+irrigation use above the plan’s allowance, if applicable.

Design Details
- Does not apply to sewer. Only applies to SFDU and associated irrigation meters.
- The blocks are structured to have equal unit price at the highest end of consumption and “inspired” by Cary’s current block structure.
- The “overage” price is higher than the largest difference between two plans’ monthly charges.
- Each premise gets only one fixed monthly charge, regardless of number or size of water and irrigation meters.
- Since choices of plans are unknown, customers were initially placed in the plan that best matches their average water + irrigation monthly volume from the previous fiscal year. If average monthly volume cannot be determined, the customer is automatically placed in Plan 2.

Modeled Structure

<table>
<thead>
<tr>
<th>Usage Allowance (based on Cary’s current block structure)</th>
<th>Monthly Access (= allowance * $2.00/kgal unit price)</th>
<th>Overage Charge</th>
<th>Predicted Plan Participation (% SFDU Premises)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 5 kgal/month</td>
<td>$10.00</td>
<td>$17.00/kgal</td>
<td>55%</td>
</tr>
<tr>
<td>2 8 kgal/month</td>
<td>$16.00</td>
<td></td>
<td>28%</td>
</tr>
<tr>
<td>3 15 kgal/month</td>
<td>$30.00</td>
<td></td>
<td>15%</td>
</tr>
<tr>
<td>4 23 kgal/month</td>
<td>$46.00</td>
<td></td>
<td>2%</td>
</tr>
</tbody>
</table>

Modeled Customer Impact

The percentage of SFDUs that would have been charged lower or higher total RY13 charges under the modeled structure compared to their actual total RY13 charges are as follows:

- Increased revenue stability: Customers annually commit to plans
- Gives customer a choice: This means less administrative burden than budget-based rates of utility determining block rate for customers
- Moves more to a model of water and sewer service, rather than a commodity
- Promotes conservation, especially around the “break points”

Potential challenges
- Complicates budgeting process: How do you predict what plan customers will choose? When will they commit? Can they change plans? How often? What is the optimal length of the contract?
- Does not fit with seasonal use of water: Water use is not as consistent month-to-month as cell phone use. Allowing roll-overs could help this, but would dissuade conservation.
- Customers may use right up to the breakpoint using AMI data.
Alternative 3: Simple Dividend Model

Under this rate model, Cary would continue to charge against their existing rate structure and simply add an additional fixed fee to the base charges to generate a buffer for revenues. At the end of the year, Cary would return revenue from the additional fixed fee beyond the revenue it projected to need for the year.

Design Details

- Applies to water, sewer, and irrigation. Determined at the meter level, not premise level.
- The method used to determine “revenue stabilization guarantee” at the end of the year can vary. In this example, profit is calculated as the difference between the actual total charges (water+irrigation+sewer) system-wide at the end of RY2013 under the new rate structure and the predicted total charges for RY2013 that was estimated at the end of RY2012 ($41.3M).
- The method used to determine how much each customer would receive in dividends can vary. In this example, the profits are divided equally among all base charges, refunding a fixed portion of the “add-on” fee.
- Additional fixed fee calculated to provide Cary with 25% more than the predicted total charges and divided across all meters. Water, sewer, and irrigation are all separate.

Modeled Structure

To achieve 25% greater revenues than the predicted total charges (target) of $41,315,888, an add-on fee of $6.42/month per service was added to every base charge in RY2013. The $557,548 (additional revenue after elasticity) excess revenue was divided by the 1,243,205 number of services for all SFDUs in RY2013 for water, sewer and irrigation, equating to a dividend of $0.45/month for each service. This would be returned to all customers. Most customers would have received a dividend for the amount of $10.80 at the end of the year ($5.40/service). The utility would have effectively increased the customers’ base charges by $5.97/month/base charge in order to ensure that revenues reached the $41.3 million target (and not exceed it!), despite the reduction in use that occurred in RY2013. The actual RY2013 charges equaled $33.7 million (18% below the target).

Modeled Customer Impact

The percentage of SFDUs that would have been charged lower or higher total RY13 charges under the modeled structure compared to their actual total RY13 charges are as follows:

<table>
<thead>
<tr>
<th>% Change to SFDU’s Annual RY2013 Bill Under DIV Modeled Rates</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1</td>
</tr>
<tr>
<td>Graph excludes SFDUs that would have more than doubled charges (1.16%, or 574 SFDUs).</td>
</tr>
</tbody>
</table>

Potential benefits

- This model drives the fact that utility is a not-for-profit entity: profits are returned to customers
- Increased revenue stability
- Provides a method for utility to positively interact with customers by cutting them a check
- Partners well with any type of rate structure

Potential challenges

- The ‘rebate’ aspect of the model can make things complicated. Other utilities, such as the Austin Water Utility, have opted to make such a charge intermittent – as needed.
- As modeled here, the rebate has nothing to do with being “water-wise.” This can change.
Alternative 4: FlatBack Model

This is a different type of dividend-returning model. This time, the utility would abandon existing rates, and instead charge every customer a fixed monthly per household per service fee (water/sewer), regardless of water use or number or size of water or irrigation meters. The fee would be priced in order to achieve 25% in excess revenues at the end of the year. The utility would return actual excess revenues made to customers in the form of a dividend. The dividends will be calculated in a way to reward the customers who were more efficient in their water use than others, providing a price incentive for conservation and efficiency.

Design Details

- Under this model, every customer gets one monthly flat charge for water service (water+irrigation), and double the amount if they also have sewer service.
- The method used to determine “revenue stabilization guarantee” at the end of the year can vary. In this example, profit is calculated as the difference between the actual total charges (water+irrigation+sewer) system-wide at the end of RY2013 under the new rate structure and the predicted total charges for RY2013 that was estimated at the end of RY2012 ($41.3M).
- The method used to determine how much each customer would receive in dividends can vary. In this example, 25% of the “profit” is shared among all customers, based on the number of services and bills they received during RY13. The remaining 75% of the “profit” is shared only among customers that exhibited water-wise behavior.
- “Water-wise” behavior can be defined in any number of ways. In this example, only customers that reduced their average water use from RY12 to RY13 received any dividend under this portion, which is allocated proportional to the relative reduction in average water use compared to other customers.

Modeled Structure

To achieve 25% greater revenues than the predicted total charges (target) of $41,315,888, residential customers are charged $45.99/month/service which would have totaled $53,302,596 in revenue, exceeding the revenue target of $41.3M by $11,986,708. 25% of this “profit” would be split among all residential customers at $2.59/month/service. Most customers would have received a first dividend of $62.16. The remaining 75% of the “profit” would be split only among the 84% of residential customers who reduced their average non-zero water use from RY12 to RY13. The total RY13 “water-wise” dividends would have ranged from $2.59 to $392.31 per customer (median: $254.92).

Modeled Customer Impact

Potential benefits

- This model drives the fact that utility is a not-for-profit entity: profits are returned to customers
- Provides a method for utility to positively interact with customers by cutting them a check
- Ensures that utility first-and-foremost meets financial goals; increased revenue stability.

Potential challenges

- The ‘rebate’ aspect of the model can make things complicated.
- Fixed charge would do little to promote “water-wise” behavior throughout the year.
- The more people that act as water stewards, the less money there is to go around more customers. This could be discouraging to customers.
- Misses an opportunity to use Cary’s AMI.
Example of PeakSet Base with Simple Dividend Model (under Scenario A) on two customers
Modeled for July 2012 – June 2013 rates and water use

Using the example of two customers that use the same amount of water in one year, but with different water use patterns.

<table>
<thead>
<tr>
<th>Water use by customer (gallons/month)</th>
<th>Peak monthly use 25-36 months ago</th>
<th>Peak monthly use 13-24 months ago</th>
<th>Peak monthly use 1-12 months ago</th>
<th>3-year average peak (this is used to calculate PeakSet Base charges)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low-Peak Customer</td>
<td>4,000</td>
<td>4,200</td>
<td>4,800</td>
<td>4,333</td>
</tr>
<tr>
<td>High-Peak Customer</td>
<td>15,000</td>
<td>16,000</td>
<td>9,500</td>
<td>13,500</td>
</tr>
</tbody>
</table>

Water Use in July 2012 through June 2013 (the modeled year). Both customers used 62,200 gallons in those 12 months.

Water Use for Low-Peaking Customer
Gallons/Month

Water Use for High-Peaking Customer
Gallons/Month
The low-peaking customer would pay less in alternative rate structure (compared to existing increasing block rates), and the high-peaking customer would pay a lot more in the alternative rate structure than under the existing block rates.

Both customers used the same amount of water in 12 months, but PeakSet Base charges more for historically high-peaking customers.

The alternative rate structure levels the monthly charges for the customer, compared to the increasing block rates. The dividends are modeled as if they are paid every month, whereas in reality they would be paid in lump sum at the end of the year.

**Monthly Water Bill for Low-Peaking Customer**

**Monthly Water Bill for High-Peaking Customer**
Low-peak customer

**Base charges** make up a tiny portion of customer's monthly water bill under existing increasing block rates

<table>
<thead>
<tr>
<th>Month</th>
<th>Total Water Bill</th>
<th>Base Charges</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jul-12</td>
<td>$20</td>
<td>$0</td>
</tr>
<tr>
<td>Aug-12</td>
<td>$25</td>
<td>$5</td>
</tr>
<tr>
<td>Sep-12</td>
<td>$28</td>
<td>$12</td>
</tr>
<tr>
<td>Oct-12</td>
<td>$30</td>
<td>$18</td>
</tr>
<tr>
<td>Nov-12</td>
<td>$32</td>
<td>$24</td>
</tr>
<tr>
<td>Dec-12</td>
<td>$34</td>
<td>$30</td>
</tr>
<tr>
<td>Jan-13</td>
<td>$36</td>
<td>$36</td>
</tr>
<tr>
<td>Feb-13</td>
<td>$38</td>
<td>$42</td>
</tr>
<tr>
<td>Mar-13</td>
<td>$40</td>
<td>$48</td>
</tr>
<tr>
<td>Apr-13</td>
<td>$42</td>
<td>$54</td>
</tr>
<tr>
<td>May-13</td>
<td>$44</td>
<td>$60</td>
</tr>
<tr>
<td>Jun-13</td>
<td>$46</td>
<td>$66</td>
</tr>
</tbody>
</table>

High-peak customer

**Base charges** make up a tiny portion of customer's monthly water bill under existing increasing block rates

<table>
<thead>
<tr>
<th>Month</th>
<th>Total Water Bill</th>
<th>Base Charges</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jul-12</td>
<td>$80</td>
<td>$0</td>
</tr>
<tr>
<td>Aug-12</td>
<td>$50</td>
<td>$25</td>
</tr>
<tr>
<td>Sep-12</td>
<td>$40</td>
<td>$20</td>
</tr>
<tr>
<td>Oct-12</td>
<td>$30</td>
<td>$15</td>
</tr>
<tr>
<td>Nov-12</td>
<td>$20</td>
<td>$10</td>
</tr>
<tr>
<td>Dec-12</td>
<td>$10</td>
<td>$5</td>
</tr>
<tr>
<td>Jan-13</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Feb-13</td>
<td>$10</td>
<td>$5</td>
</tr>
<tr>
<td>Mar-13</td>
<td>$20</td>
<td>$10</td>
</tr>
<tr>
<td>Apr-13</td>
<td>$30</td>
<td>$15</td>
</tr>
<tr>
<td>May-13</td>
<td>$40</td>
<td>$20</td>
</tr>
<tr>
<td>Jun-13</td>
<td>$50</td>
<td>$25</td>
</tr>
</tbody>
</table>

Net base charges make up a larger portion of customer's monthly water bill under alternative rate structure

<table>
<thead>
<tr>
<th>Month</th>
<th>Total Water Bill</th>
<th>Peakset Base Charges + Add-on Minus Monthly Dividend</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jul-12</td>
<td>$80</td>
<td>$25</td>
</tr>
<tr>
<td>Aug-12</td>
<td>$50</td>
<td>$20</td>
</tr>
<tr>
<td>Sep-12</td>
<td>$40</td>
<td>$15</td>
</tr>
<tr>
<td>Oct-12</td>
<td>$30</td>
<td>$10</td>
</tr>
<tr>
<td>Nov-12</td>
<td>$20</td>
<td>$5</td>
</tr>
<tr>
<td>Dec-12</td>
<td>$10</td>
<td>$0</td>
</tr>
<tr>
<td>Jan-13</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Feb-13</td>
<td>$10</td>
<td>$5</td>
</tr>
<tr>
<td>Mar-13</td>
<td>$20</td>
<td>$10</td>
</tr>
<tr>
<td>Apr-13</td>
<td>$30</td>
<td>$15</td>
</tr>
<tr>
<td>May-13</td>
<td>$40</td>
<td>$20</td>
</tr>
<tr>
<td>Jun-13</td>
<td>$50</td>
<td>$25</td>
</tr>
</tbody>
</table>

27: Cary PeakSet Base + Simple Dividend Analysis