

# An Exploration of Alternative Business Models for the Beaufort-Jasper Water and Sewer Authority

The Beaufort-Jasper Water and Sewer Authority (BJWSA) is considering alternative rate structures for use in the future and engaged the Environmental Finance Center at the University of North Carolina (EFC) to explore the legal, financial and practical implementation of such a unique and sustainable business model. The following report defines the structure and potential challenges of each alternative business model explored in this project. Appendix A provides great detail on the alternative selected by BJWSA staff: the PeakSet Base Model. In addition, a financial model used to construct the slide deck in Appendix A has been provided to BJWSA along with this report.



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UNC  
ENVIRONMENTAL FINANCE CENTER

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The Environmental Finance Center (EFC) at the University of North Carolina at Chapel Hill is part of a network of university-based centers that work on environmental issues, including water resources, solid waste management, energy, and land conservation. The EFC at UNC partners with organizations across the United States to assist communities, provide training and policy analysis services, and disseminate tools and research on a variety of environmental finance and policy topics.

The Environmental Finance Center at the University of North Carolina at Chapel Hill is dedicated to enhancing the ability of governments to provide environmental programs and services in fair, effective, and financially sustainable ways.

## **Acknowledgements**

Written by Mary Tiger and Shadi Eskaf

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# An Exploration of Alternative Business Models for the Beaufort-Jasper Water and Sewer Authority

## PROJECT BACKGROUND

The Beaufort-Jasper Water and Sewer Authority (BJWSA) is considering alternative rate structures for use in the future and engaged the Environmental Finance Center at the University of North Carolina (EFC) to explore the legal, financial and practical implementation of such a unique and sustainable business model. The following report defines the structure and potential challenges of each alternative business model explored in this project. Appendix A provides great detail on the alternative selected by BJWSA staff: the PeakSet Base Model. In addition, a financial model used to construct the slide deck in Appendix A has been provided to BJWSA along with this report.

## RESEARCH BACKGROUND

Average residential water use is on the decline across the country due to factors outside of utility control, such as demographic and plumbing code changes<sup>1</sup>. In addition, as the environmental and collective impacts of energy and water use are realized, society is asking water utilities to implement conservation programs to reduce utility demand from their customers. Yet water and wastewater utilities most commonly generate revenue by charging rates for water usage. So when a utility promotes, or even passively experiences, customer conservation or efficiency, it is essentially eroding its sales base. Few viable businesses thrive by encouraging a decrease in customer use.

The problem is even more stubborn since utilities set these rates by allocating costs according to demand patterns. Since the majority of rates are based on volumetric demand, customer consumption has a direct link to utility revenues. As customer consumption decreases, so do utility revenues. This can become a sort of downward spiral: as customers respond to higher bills with decreased consumption, the utility needs to raise rates again to make up for the lost revenue.

Meanwhile, especially in the short-run, the cost of operating a utility remains fixed because of its capital intensive nature, and reductions in use do not reduce costs. Water and wastewater utilities are very capital intensive; the vast majority of the expenses for a utility are tied to capital and administrative costs. These *fixed costs* do not decrease in the short-run when customers demand less water. However,

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<sup>1</sup> Rockaway, T., P. Coomes, J. Rivard & B. Kornstein. Residential water use trends in North America. Journal AWWA, February 2011, 103:2, pages 76-89.

the majority of revenue comes from the amount of water sold. In other words, if customers conserve, revenues drop significantly, but not costs.

For example, in 2008 Charlotte-Mecklenburg Utilities in North Carolina estimated that 82% of their revenues were based on usage, while in the short-term only 6% of their expenses varied with usage. Thus, when customers reduce their consumption significantly (e.g. during mandatory watering restriction periods), revenues fall and overall costs do not. This is the reason that utilities frequently have to increase rates on the heels of water restriction periods.

A utility's rate structure has much to do with how conservation impacts its bottom line. A utility could mitigate this short-term impact by charging a higher non-variable base charge, but this method does little to promote responsible use of treated water. On the other hand, if a utility with an increasing block rate relies on its higher tiers of consumption for a significant portion of its revenues, restrictions and other conservation initiatives targeted at that highest level of consumption can seriously hurt the bottom line.

In the long-run, conservation can help decrease and/or delay some of the fixed costs, but it takes some planning on behalf of the utility to take advantage of this financial boon. Conservative finance models, multi-year finance plans, annual rate adjustments and customer analysis can help a utility mitigate the financial detriments of conservation and even take advantage of the financial benefits. However, these strategies are more reactive in nature. A successful and proactive rate structure must strike a balance between revenue stability and conservation.

This research with the Beaufort-Jasper Water and Sewer Authority explores alternatives to the aforementioned water business model that may better address the conservation conundrum.

## CONTEXT FOR EVALUATION

Beaufort-Jasper Water and Sewer Authority outlined the following goals for its rate structure in its "Statement of Policy and Program Direction: Water Use Efficiency and Demand Management" in July 2010.

*Rates and the way they are structured are the medium through which the utility sends the strongest message on its perspective concerning water conservation and efficiency. All the other ways of encouraging water efficiency can be in place and working well, but if the water is not priced so as to send the correct message on water use efficiency, the program will not be effective. Water must be priced to benefit the efficient user and to penalize the wasteful user.*

*However, if this was the only criteria rates had to meet; rate making would be relatively simple. Rates must also:*

- *Provide for adequate revenues across all volumetric sales conditions;*
- *Be reasonably affordable for the poorest customers;*
- *Be easy to administer;*
- *Stay relatively stable: and,*
- *Be easy to explain and justify to the customers.*

*Rate Structures are further complicated by the fact that as customers become more efficient, their usage drops and, to the extent that revenues are tied to volumetric sales, these drop as well.*

*The formation of a rate structure that meets all these often conflicting objectives is a complex and challenging task. BJWSA is scheduled to begin a new rate making effort in the early spring of 2011. It should develop a long term rate plan by which implementation is spread over a period of ten years (three rate cycles). This will avoid the perspective that customers are being punished for saving water (see Charlotte in 2008).*

## EXPLORATION OF ALTERNATIVES

The following sections briefly describe five alternatives to BJWSA's current pricing model, as selected by BJWSA management staff.

1. Consumption Allotment
2. Budget-Based Rates
3. CustomerSelect
4. PeakSet Base
5. WaterWise Dividend

For each model, we provide a basic description, structure examples, an assessment of use by other utilities and/or industries, context for implementation with BJWSA customers, as well as, potential benefits, drawbacks and implementation challenges.

# ALTERNATIVE 1: CONSUMPTION ALLOTMENT

## Basic description

The base charge includes a minimum amount of consumption (water and/or sewer) in the base charge.

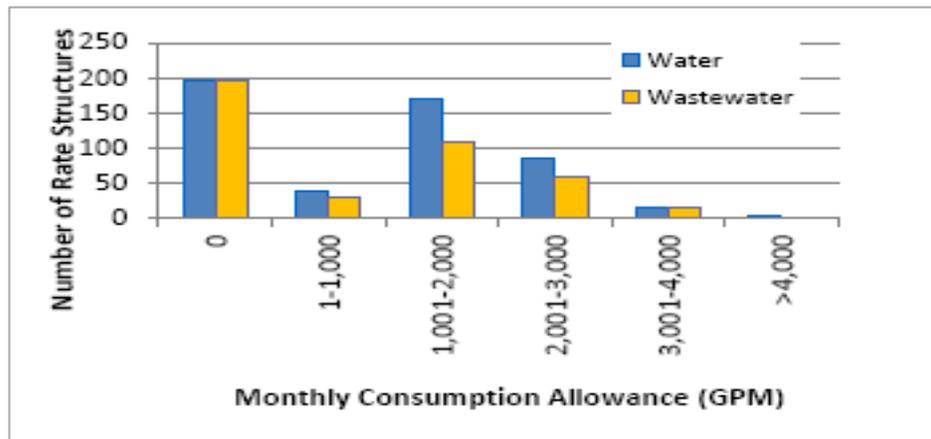
## Example residential structure

	Current Rate Structure	Consumption Allotment Example
Water: Residential	Base: \$6.00 \$3.46/kgal	Base: \$12.92 includes 2,000 gallons per month  \$3.46/kgal for all consumption over 2kgal/month
Sewer: Residential	Base: \$6.00 \$6.05/kgal (sewer cap for residential customers at 7 kgal)	Base: \$18.10  \$6.05/kgal for all consumption over 2 kgal/month

## Use by other utilities/industries

**Residential:** In 2011: 62% of water and 54% of wastewater rate structures in North Carolina included a minimum amount of water consumption or wastewater disposal with the base charge. Since 2007, we’ve seen a decreasing trend of utilities in the state with minimum allotments. For both water and wastewater utilities, the median amount of allotment included in base charge is 2,000 gallons per month; only 4% of water and 4% of wastewater utilities include more than 3,000 GPM with the base charge. We see very similar trends in Georgia. Most utilities with allotments (297) have both water and sewer.

### Consumption Included with Base Charge for Residential Customers Among 508 Water and 408 Wastewater Rate Structures

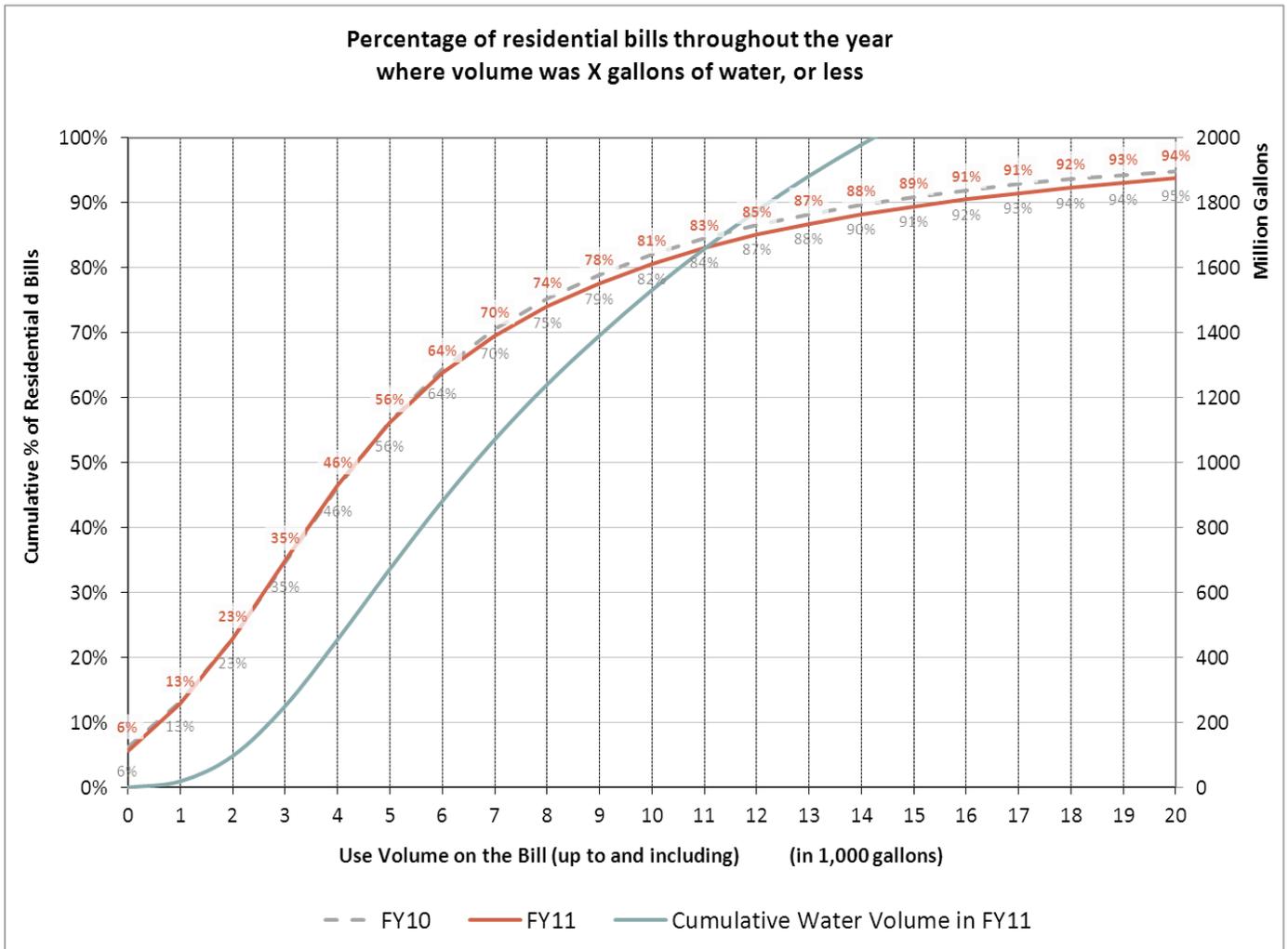


### Commercial:

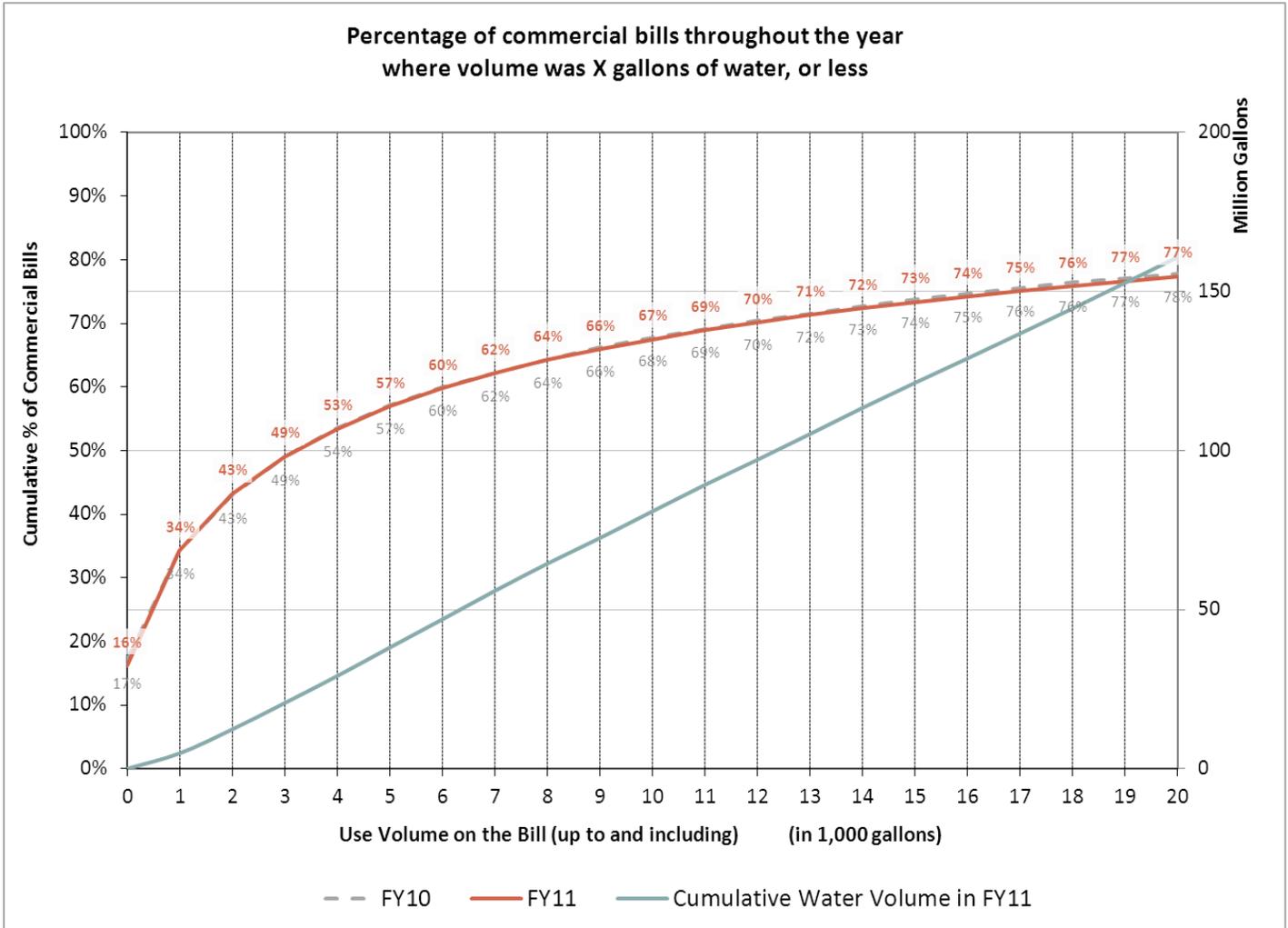
Minimum allotments for commercial customers are rarer in North Carolina than they are for residential customers. Those utilities that have minimum allotments base them on meter size and correspond with base charges that increase with meter size. There are 91 utilities out of 471 surveyed utilities that set base charges based on meter size; only 9 of those include allotments in those base charges.

### Application for BJWSA

The graphs below show the percentage of residential and commercial bills (and the corresponding water volume used) throughout FY10 and FY11 where volume was x gallons of water or less. If considering setting a minimum allotment at x gallons, the graphs show the percentage of bills and water volume that would be impacted. As structured in the example, a minimum allotment would only increase bills for customers that consume less than 2,000 gallons per month. The impact to those customers is discussed in the following text.



In FY11, 13% of residential bills were for less than 2,000 gallons of consumption. Those bills accounted for 19 million gallons of water in FY11, or 0.8% of water sold to residential customers. If BJWSA had a consumption allotment of 2,000 gallons as described above and water use remained the same, BJWSA would have collected \$541,500 more from the 28,470 “0 gallon” bills and \$607,768 more from the 63,908 “1 gallon” bills. And while the graph shows the % of bills, at the customer level, in FY11, 4% of residential customers never reached 2,000 gallons/month all year long.



In FY11, 34% of commercial bills were for less than 2,000 gallons of consumption. Those bills accounted for 5 million gallons of water in FY11, or 3% of water sold to commercial customers. If BJWSA had a consumption allotment of 2,000 gallons as described above and water use remained the same, BJWSA would have collected \$172,069 more from the 9,046 “0 gallon” bills and \$182,331 more from the 19,173 “1 gallon” bills. And while this is a calculation based on the % of bills, at the individual customer level, in FY11, 24% of commercial customers never exceeded 2,000 gallons/month all year long.

## Potential benefits

- Increased revenue stability: More revenue will be coming from base charge
- No major metering or billing system upgrade should be required

## Potential challenges

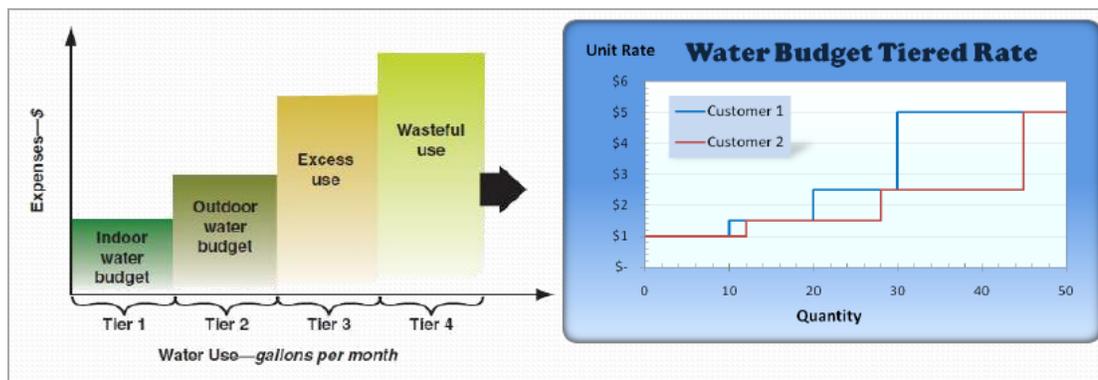
- Typically viewed as counter to water conservation objectives: For the 13% of residential bills that were less than 2,000 gallons/month in FY11, those customers would have no incentive to conserve. Likewise for the 34% of commercial bills that were less than 2,000 gallons/month in FY11.
- *In practice*, will probably not increase revenue stability a great deal: In FY11, 77% of residential bills would have paid the new minimum charge anyway. Elasticity of demand for water decreases at lower levels of consumption; this means that conservation and efficiency efforts are less likely to influence the bills that are for 2,000 gallons or less as they are for higher levels of consumption.

## ALTERNATIVE 2: WATER BUDGET-BASED RATES

### Basic description

In a general sense, water budget-based rates are block rates for which the block is defined by using one or more customer characteristics. Water budget-based rates can be thought of as increasing block rates in which the block definition for each customer is based on an “efficient” level of use for that customer.

### Example residential structure



Graphics source: Raftelis Financial Consultants presentation

### Use by other utilities/industries

Water budget-based rates are most common in California and are most commonly used for single-family residential and dedicated irrigation accounts.

Utilities have used the following characteristics on which to base budgets:

#### Indoor

- A customer's most recent winter quarter average (Aurora, CO – rescinded due to customer backlash)
- Average water use for a customer
- # of residents, size of yard and month (Irvine Ranch Water District, CA)
- # of residents and large animals (Monterey District Tariff Area, CA)

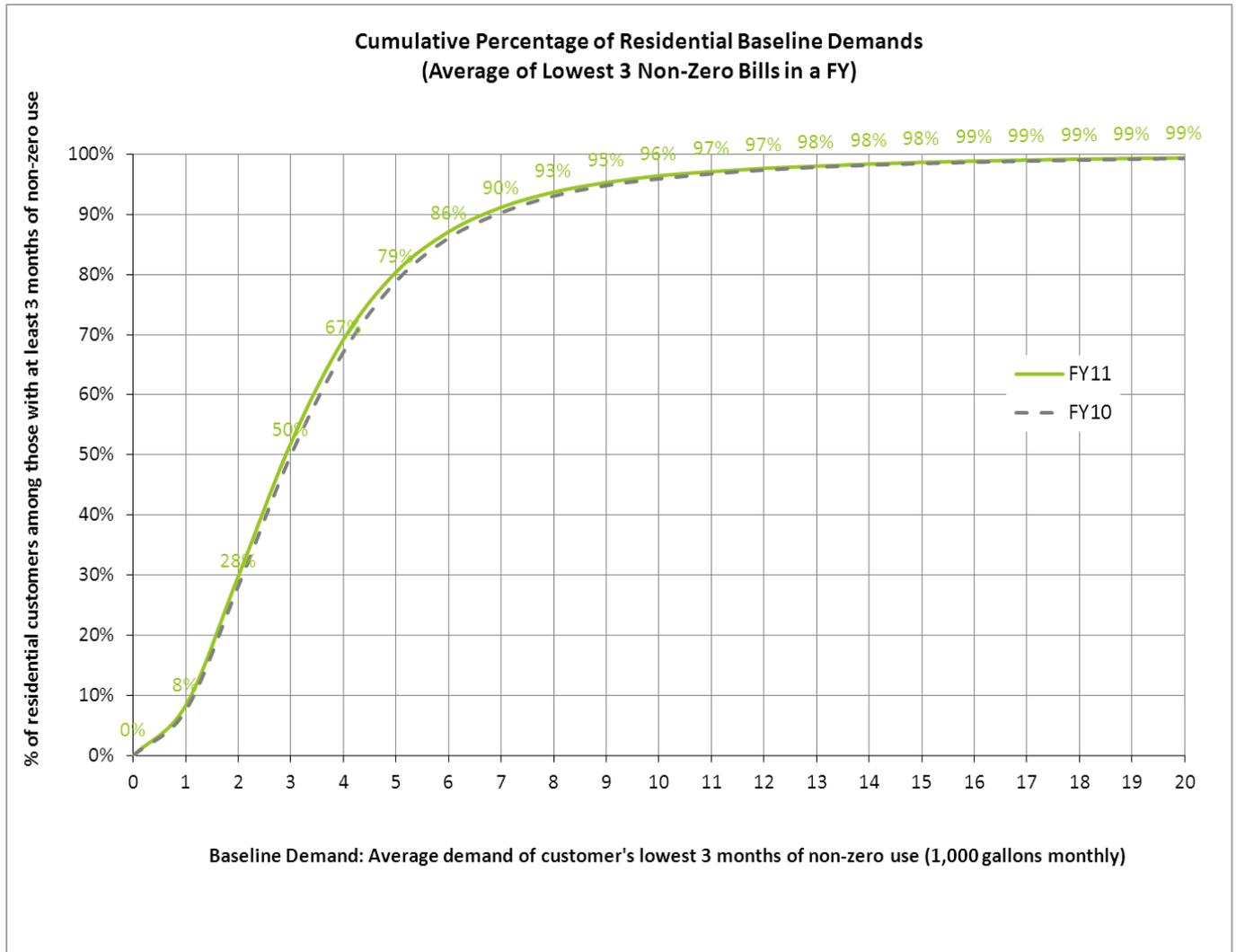
#### Outdoor

- Tiered for lot size (City of Boulder, CO)
- Irrigatable area, ET rate, crop coefficient and effective rainfall (Capistrano Valley Water District, CA)

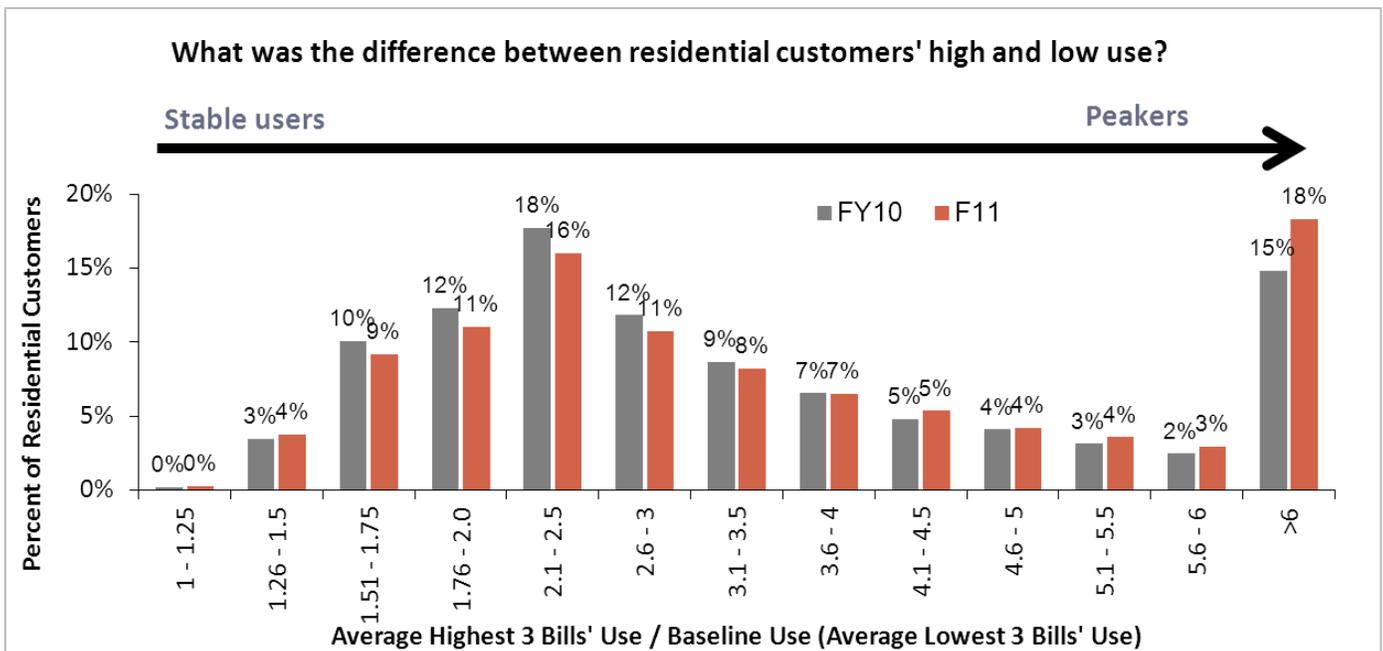
More: See “Water budgets and rate structures: Innovative management tools” JAWWA 2008

### Application for BJWSA (if using winter quarter average to establish budget)

Since we did not have tax parcel data, the following application analysis uses historical water use to analyze the impact of budget-based rates in BJWSA’s service area.



If using baseline average (average of 3 lowest non-zero bills) to establish a budget-based rate, the graph above shows the % of customers that would have indoor water budgets at each consumption point. Eight percent (8% - 0%) would have an indoor water budget of 1,000 gallons monthly. Seventeen percent (67%-50%) would have an indoor water budget of 4,000 gallons monthly. Two percent would have an indoor water budget of 9,000 gallons monthly.

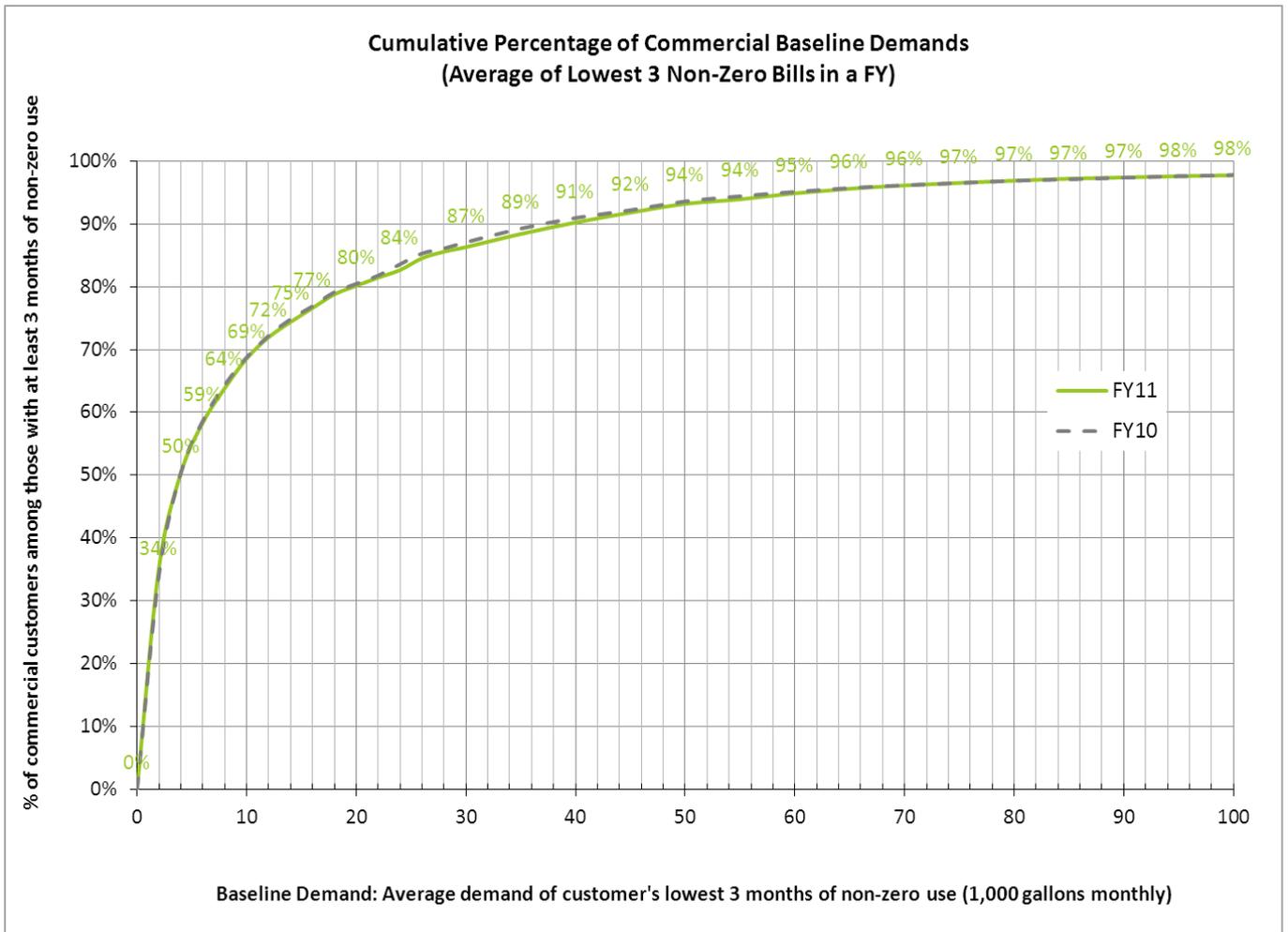


The graph above shows the peaking ratio of residential customers in FY10 and FY11. The peaking ratio is calculated as a household’s average highest 3 months’ use divided by the same household’s baseline (average of 3 lowest non-zero bills). If the blocks for increasing block rates were relative to a household’s baseline water use, the chart above shows the number of residential customers that would reach higher tiers. The following table shows one way that budget-based rate structures could be established relative to residential customers’ baseline average and the % of customers that would be impacted.

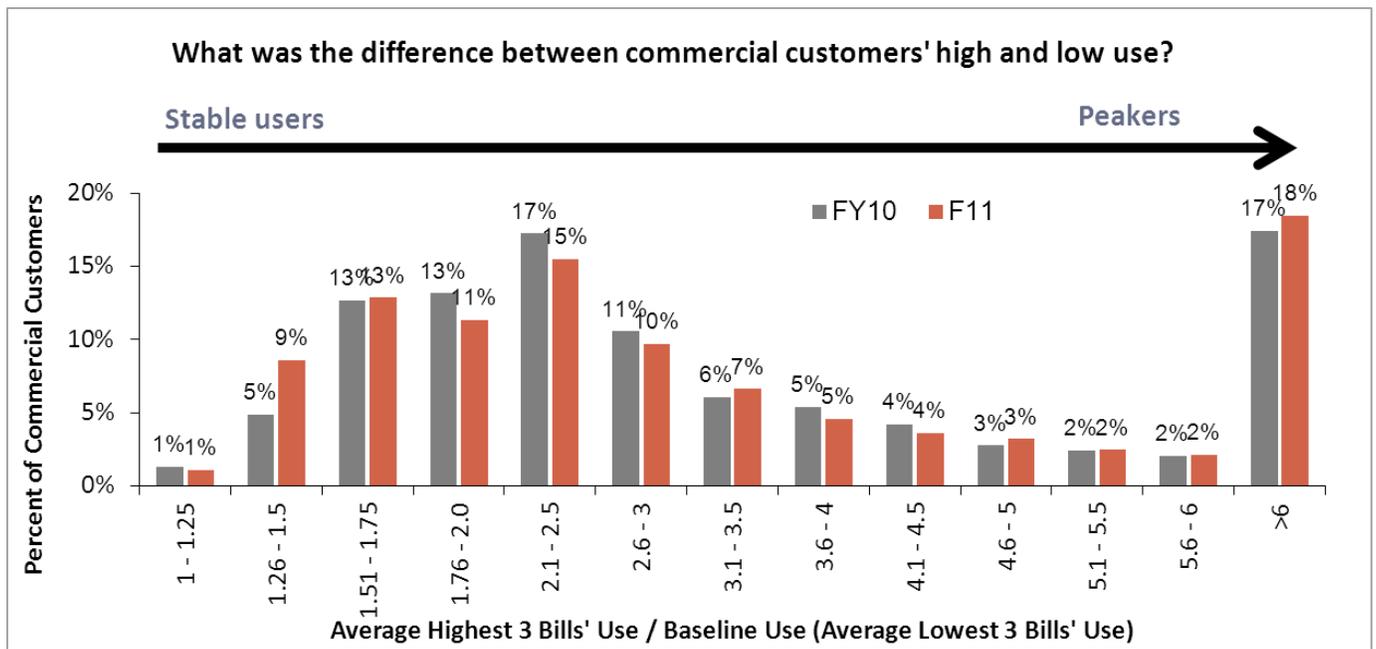
<b>Tier Definition</b>	<b>% of residential customers whose highest bills would fall in the tier’s rates (FY11)</b>
Tier 1: Baseline Use	24%
Tier 2: 2x baseline use	27%
Tier 3: 3x baseline use	15%
Tier 4: 4x baseline use	9%
Tier 5: >5x baseline use	25%

The average peaking ratio for residential customers in FY was 4.32; the median was 2.96.

Note: The graph above includes residential irrigation meters. This is most likely contributing to the high amount of “peakers.”



If using baseline average to establish a budget-based rate, the graph above shows the percentage of commercial customers that would have indoor water budgets at each consumption point. Thirty-four percent (34% - 0%) would have an indoor water budget between 0 and 2,000 gallons monthly. Another sixteen percent (50%-34%) would have an indoor water budget between 2,000 and 4,000 gallons monthly. Five percent (64% - 50%) would have an indoor water budget between 8,000 and 10,000 gallons monthly.



The graph above shows the peaking ratio of commercial customers in FY10 and FY11. The peaking ratio is calculated as a business’ average highest 3 months’ use divided by the same business’ baseline (average of 3 lowest non-zero months). If the blocks for increasing block rates were relative to a business’ baseline water use, the chart above shows the number of commercial customers that would reach higher tiers. The following table shows one way that budget-based rate structures could be established relative to commercial customers’ baseline average and the % of customers that would be impacted.

<b>Tier Definition</b>	<b>% of commercial customers whose highest bills would fall in the tier’s rates (FY11)</b>
Tier 1: Baseline Use	34%
Tier 2: 2x baseline use	25%
Tier 3: 3x baseline use	12%
Tier 4: 4x baseline use	7%
Tier 5: >5x baseline use	22%

The average peaking ratio for commercial customers in FY was 5.11; the median was 2.53. Note: The graph above includes commercial irrigation meters. This is most likely contributing to the high amount of “peakers.”

## Potential benefits

- Promotes water efficiency: “Many of the utilities that have implemented water budget-based rate structures have experienced substantial conservation savings attributable to the rate structure and accompanying customer outreach programs. Analysis by Irvine Ranch Water District in California staff concluded that the program increased outdoor efficiency by 60%.”<sup>2</sup>
- Equitable/Perceived fairness: Addresses the “large family issue” with increasing block rates
- Maintains affordability for essential uses
- Promotes communication between utility and customers
- Revenue stability: “IRWD found that the water budget rate structure has improved revenue stability – customers have adjusted to their allocations and demand has stabilized, making it easier for the utility to set rates and meet revenue requirements.”

## Potential challenges

- High administrative costs: Would most likely require a billing system upgrade, data collection and integration
- Difficult for customers to understand
- Inequitable: Large homes or water wasters (depending on how the budget is established) may be granted higher budgets.
- If the utility still counts on the higher levels of consumption to comprise a significant amount of cost recovery, budget- based rate structures still leave utility revenues vulnerable to sharp declines in consumption.

## Considerations for implementation

- Methodology for how budgets are developed will take significant utility thought and analysis.
- Early and consistent customer communication is important for customer service.

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<sup>2</sup> Mayer, P., W. DeOreo, T. Chesnutt, & L. Summers. Water budgets and rate structures: Innovative management tools. Journal AWWA, May 2008, 100:5, Pages 117-131.

## ALTERNATIVE 3: CUSTOMERSELECT MODEL

### Basic description

This model is based on the plans offered by the majority of cell phone service providers, in which an allotment of use is included in one fixed charge. The customer chooses a plan and pays an overage fee if he/she uses more.

### Example residential structure

<b>Plan name</b>	<b>Monthly water allotment</b>	<b>Cost for w&amp;s under current rate structure</b>	<b>Customerselect cost (w&amp;s)</b>	<b>Overage</b>
Lifeline	2,000 gallons	\$12.00-\$31.02	\$25.99	\$12.00/kgal
Basic service/Small family	6,000 gallons	\$40.53-\$69.06	\$59.99	\$12.00/kgal
Light irrigation/Large family	10,000 gallons	\$78.57-\$88.95	\$79.99	\$12.00/kgal
Heavy irrigation	15,000 gallons	\$92.41-\$106.25	\$99.99	\$12.00/kgal
Water waster	Unlimited	>\$106.25	\$139.99*	NA

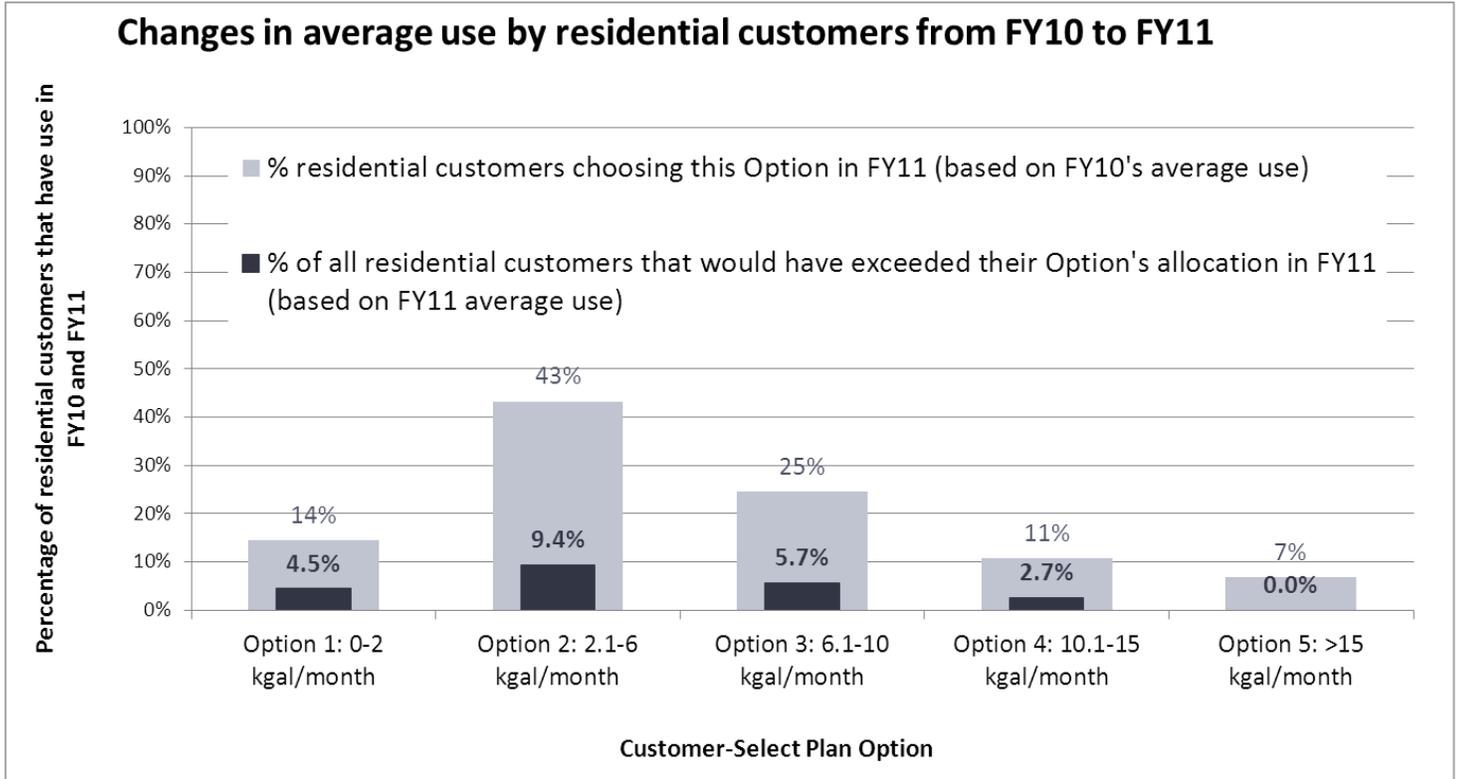
\*To put this number in context, the cost of 25,000 gallons for a residential customer is \$140.85.

### Use by other utilities/industries

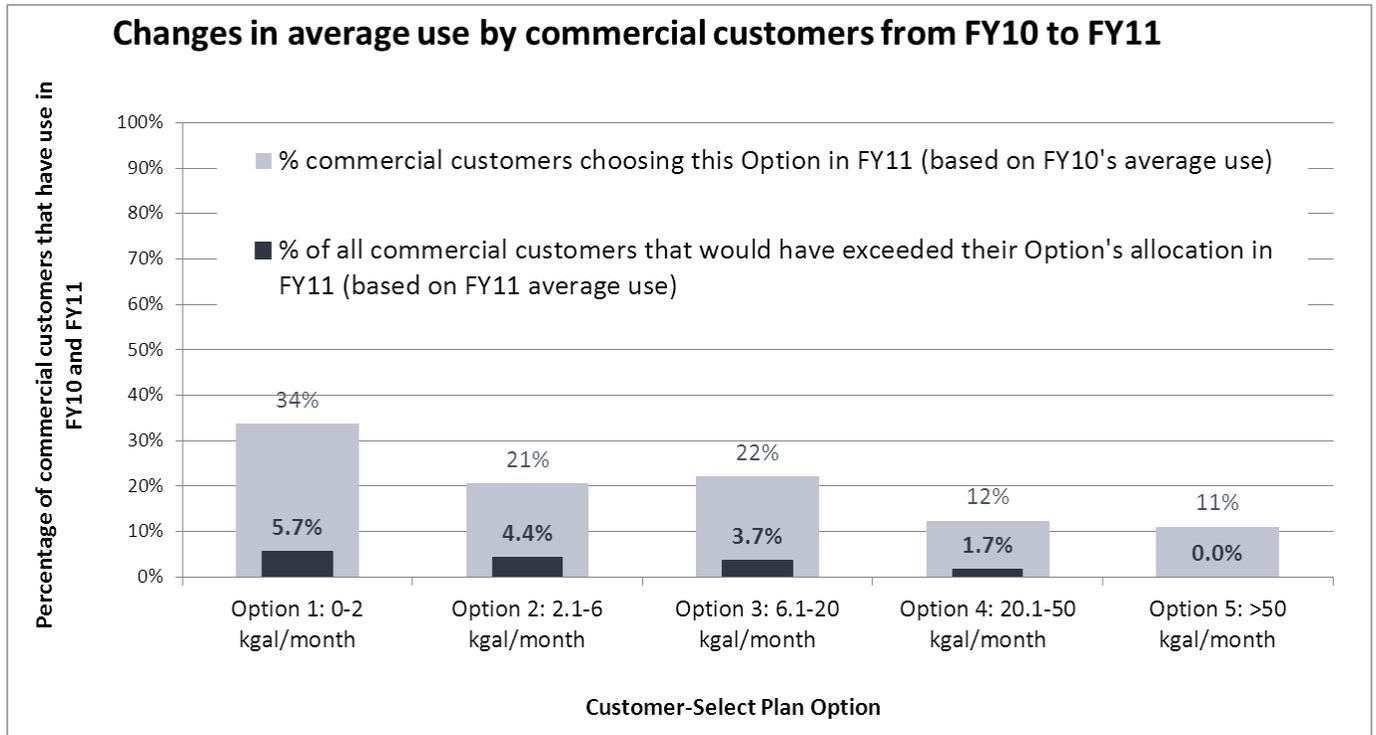
See your local Verizon Wireless store

## Application for BJWSA

Under the Customersselect plan, most customers would probably look to their previous year’s use to determine what plan to select. The graph below shows how many residential customers would have, on average, exceeded their plan (as hypothetically laid out above) in FY11 as determined by FY10 average water use. If residential customers selected their FY11 Customer-Select Plan Option purely based on their own average in FY10, 22% would have exceeded their Plan's allotment on average (based on their actual FY11 use).



Under a slightly different plan structure, the following graph shows how many commercial customers would have, on average, exceeded their plan (as hypothetically laid out above) in FY11 as determined by FY10 average water use. If commercial customers selected their FY11 Customer-Select Plan Option purely based on their own average in FY10, 15% would have exceeded their Plan's allotment on average (based on their actual FY11 use).



## Potential benefits

- Increased revenue stability: Customers “lock into” 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 “lock in”?
  - 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 request real-time water use information: In order to provide this service, metering upgrades will be required.

## Considerations for implementation

- Given the questions above and the lack of knowledge on a cell model application in with water, this would be a good candidate for a pilot project to test psychology and actual impact of model on customer demand.
- Important to keep the blocks and overall rate structure as simple as possible to reduce risk of customer cognitive overload (i.e. heavy customer service calls).

## ALTERNATIVE 4: PEAKSET BASE MODEL (SEE APPENDIX A FOR AN IN-DEPTH ANALYSIS OF THIS RATE STRUCTURE FOR BJWSA)

### Basic description

Under this rate structure, a customer's base charge would be individually set based on their three-year rolling average peak. This would allow BJWSA to build more of their cost recovery into the base charge while still promoting customer conservation and efficiency. It would particularly encourage steady water use.

### Example residential structure

Residential Peak-set base rate structure				Base Charge	Variable rate			
		Water		\$1.50/ peak kgal	\$2.00/kgal			
		Sewer		\$6.00	\$6.05/kgal (sewer cap at 7,000 gallons)			
Example application								
Household	Peak monthly use			Average monthly water use (gallons)	3-year average peak	Base charge for 2012	Total bill on average bill under current rate structure	Total bill on average month under new rate structure
	2009	2010	2011					
1	15,000	13,200	16,800	5,821	15,000	\$28.50	\$67.36	\$75.36
2	4,450	4,600	4,300	2,921	4,450	\$12.68	\$39.78	\$36.19
3	20,450	18,100	22,800	7,942	20,450	\$36.68	\$81.48	\$94.56

### Use by other utilities/industries

Energy utilities use a similar pricing model with demand charges. Demand charges are based on the highest rate of electrical flow (or current) during a billing period. The demand charge will be a large part of the bill if the customer uses a lot of power over short period of time, and a smaller part of the bill if the customer uses power at a more or less constant rate throughout the month.

Most water meters are not capable of capturing the highest rate of flow over a billing period. However, with relative ease, water utilities could adopt an inspired model by basing a year's base charge on the previous three year's rolling average.

### Application for BJWSA

See attached PowerPoint for detailed application exploration

### 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
- BJWSA 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 5: WATERWISE DIVIDEND MODEL

### Basic description

At the end of the fiscal year, BJWSA would return “profit” to customers in the form of a dividend; the dividend would be based on the water “stewardship” of that customer. A dividend model could be combined with existing or any other pricing model. BJWSA could define water “stewardship” in any number of ways: budget-based, customer-select, or relative to customer use (average water use or peaking factor).

### Example structure

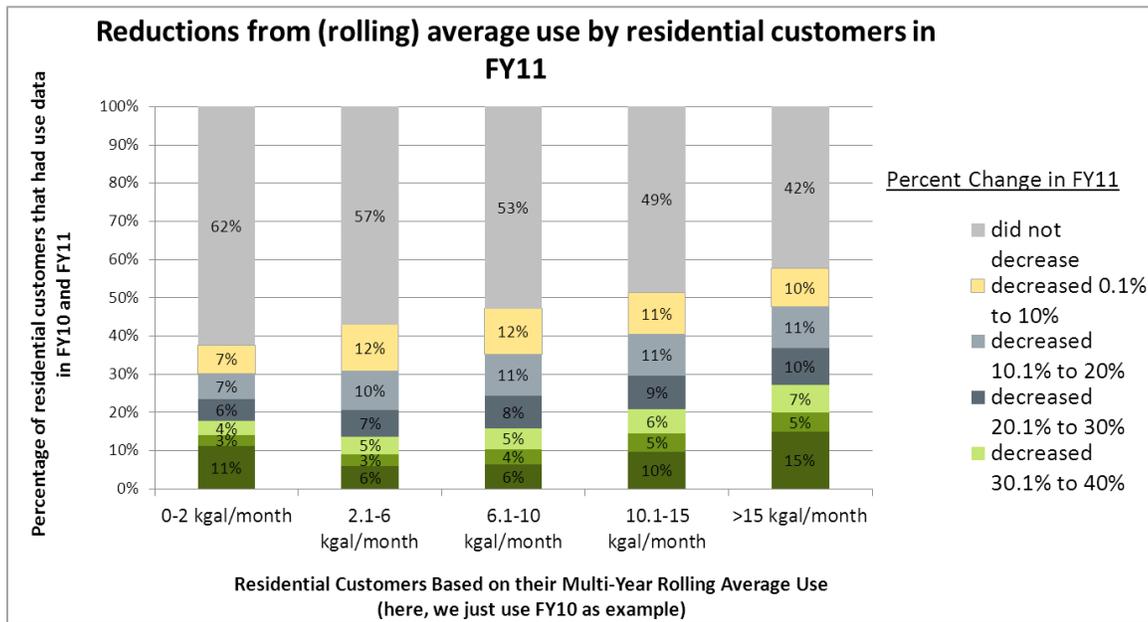
The following example shows a method for calculating dividends based on a customer’s recent water use compared to the rolling average of the past three years. After a third party audit, it is deemed that BJSWA earned \$500 profit. In the following sample, there are six customers that reduced their average water use this year compared to the past three years. Their portion of the profits is calculated based on each “steward’s” share of the reduction. The following table shows how BJWSA might provide water stewardship dividends to their customers.

	<b>3-year rolling average (2008-2010)</b>	<b>2011 average water use</b>	<b>Reduction (1 – 2011 average water use/3-year rolling average)</b>	<b>Portion of Reduction (Customer reduction x total reduction)</b>	<b>Portion of Profit (% of total reduction x utility profit)</b>
<b>Household A</b>	3,000	2,500	17% reduction	14% of total reduction	\$70
<b>Household B</b>	8,000	4,000	50% reduction	41% of total reduction	\$205
<b>Household C</b>	5,500	5,350	3% reduction	2%	\$10
<b>Household D</b>	4,000	4,200	No reduction	0%	\$0
<b>Business A</b>	2,500	2,450	2% reduction	2%	\$10
<b>Business B</b>	10,000	8,000	20% reduction	16%	\$80
<b>Business C</b>	500,000	350,000	30% reduction	25%	\$125
			122%	100%	\$500

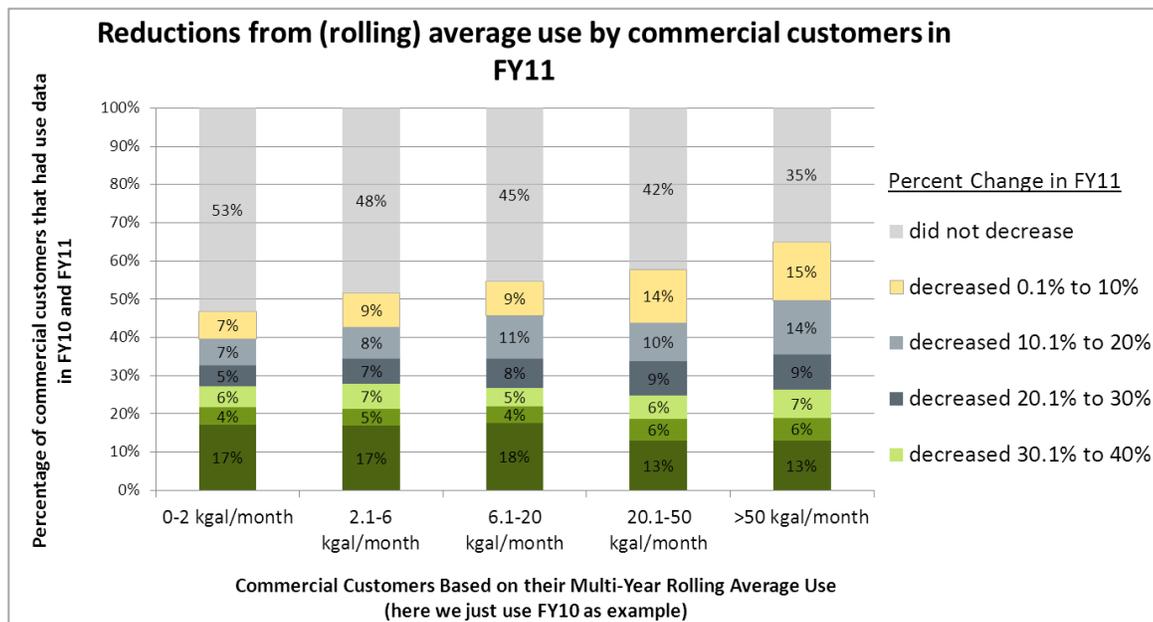
### Use by other utilities/industries

Ironically, Palmetto Electric Cooperative (power utility that serves BJWSA customers) has a Capital Credit program that returns profits to owners. In some ways, this would make it easier for BJWSA to market the program. On the other hand, customers may get confused because the Palmetto Capital Credit program pays larger dividends to customers that use more.

## Application for BJWSA



If the dividend was calculated based on how much a residential customer reduced average water use from one year to the next, the charge above gives an indication of how many customers would receive a dividend. For this example, we chose to classify customers based on their average water use in FY10 (we did not have enough data to calculate a rolling average) into the categories used for the Customersselect Plan. Interestingly, it shows that dividends would be divided fairly evenly across the range of water use, with larger users receiving dividends. The commercial graph below shows a similar trend. By calculating the dividend relative to a customer's water use (and not on absolute water savings), the utility would avoid disproportionately rewarding large users that made marginal adjustments.



## Potential benefits

- This model drives the message that BJWSA is not a for-profit entity, as “profits” are returned to customers.
- Provides a positive way for BJWSA to interact with customers: Palmetto Electric issues checks on December 1.
- Ensures that utility first-and-foremost meets financial goals
- Depending on how this model was set up, it most likely would not require metering or billing upgrades.

## Potential challenges

- Added administrative costs of calculating and cutting checks
- Disincentive to conserve during first years as a customer establishes a baseline
- The more people that act as water stewards, the less money there is to go around more customers. This could be discouraging.

## Considerations for implementation

- It will be important to have a conservative and comprehensive utility financial policy in place that ensures that the utility is meeting financial targets and transferring a baseline into reserves.
- In practice, there will be a tendency to over-estimate revenue needs to better assure some level of dividend.
- A third-party audit will be important to confirm profit projections.
- If BJWSA starts a dividend program by writing checks for nominal amounts, it will be difficult to transition away from checks to a bill credit-type program. Palmetto Electric Cooperative has recently struggled with this.

# APPENDIX A: MODELING PEAKSET BASE RATE MODEL FOR BEAUFORT JASPER WATER AND SEWER AUTHORITY: A SLIDE DECK