An Overview of the "New Normal" and Water Rate Basics

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1 Introduction

Water is a rising cost industry as a result of deteriorating infrastructure, stricter regulations, and climate change. At the same time, total water use has plateaued in many areas of the country; in California, per capita water use is falling due to a variety of factors – from increased water conservation and efficiency to changes in the state's economy. Together, the twin pressures of increasing water costs and decreasing water demand is often described as the "new normal."

The new normal is altering water management. In particular, water system financing needs a new approach to ensure fiscal solvency. This white paper is the first in a series that will address some of the key challenges that water service providers face in setting water rates and will offer recommendations and lessons from other sectors. Within the context of the new normal, this paper provides an overview of the basics of water rate design, trends in water rates, and advantages and disadvantages of different rate structures. Throughout, we provide several short case studies to illustrate some contemporary, real-world challenges to water rate-setting.

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The New Normal

California is facing serious challenges to the long-term sustainability of the state's water resources, and water management strategies must not rely on prior conditions to predict the future. Many water managers are now talking about this "new normal," and how it will impact water system planning. The new normal is characterized by decreasing demand for water, along with increasing costs to provide a safe and reliable supply. Using case studies and survey data, we describe these trends below, and explore implications for water rate-setting.

Increasing Costs

The price customers pay for water has been on the rise in the United States, and California is no exception. In order to understand these price increases, this section will describe the factors that are contributing to increasing costs.

Deteriorating Infrastructure

Deteriorating infrastructure is a problem nation-wide, and California is no exception. As a result of these increasing costs, maintaining adequate revenue continues to be a challenge for many water service providers in California (Black & Veatch 2012). In a 2012 national survey by Black & Veatch, water service providers listed increasing operating costs among their top concerns; including, aging water and sewer infrastructure, capital costs, funding or availability of capital, and energy costs (Figure 1). The same survey found that almost three-quarters of survey respondents believed that funding would be inadequate to support future operating needs.

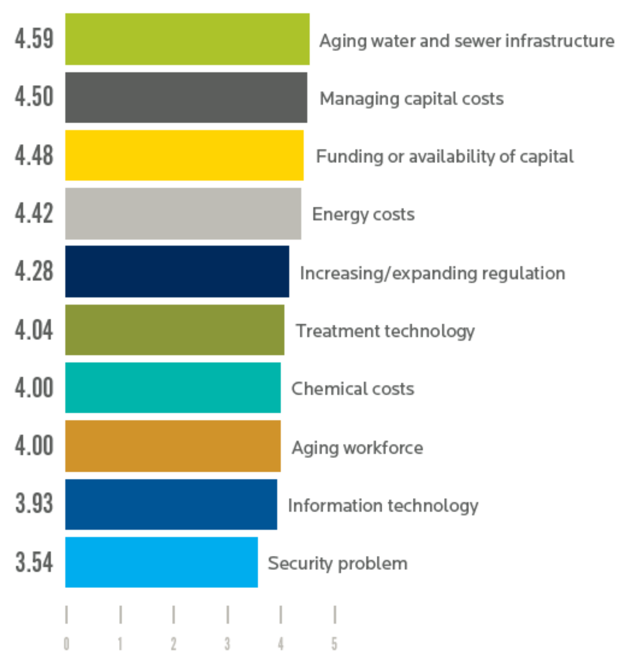

Figure 1. Importance of Industry Issues

Source: Black and Veatch 2012

Respondents were asked to rate the importance of each issue to the water industry based on a scale of 1 to 5, where 1 indicates "very unimportant" and 5 indicates "very important." The results above show the average response for each issue.

As water infrastructure deteriorates, political pressure to keep rates low has meant that there is little money to finance necessary upgrades. As these investments are continuously delayed, costs increase. The American Society of Civil Engineers 2012 Infrastructure Report Card estimates that, over the next 20 years, California will need a $39 billion investment in drinking water and nearly $30 billion in wastewater; in both categories, California represents more than 10% of the needs estimated for the entire U.S. (ASCE 2013).

Part of the increased cost for financing new infrastructure projects is a result of constrained access to capital. In the wake of the financial crisis, state and federal governments have decreased much of the grant and loan money that used to help pay for costly infrastructure (Emerson 2011). Historically, municipal bonds were a relatively inexpensive way to finance new infrastructure; today, credit rating agencies are increasingly downgrading municipal water systems. According to a 2012 report by Ceres, the most common cause for these downgrades was that water rate increases have not keep pace with spending on system maintenance or debt service coverage (Leurig 2012).

Case Study: City of South Pasadena

In 2009, the City of South Pasadena proposed a $40 million bond to make long-overdue improvements in water and wastewater infrastructure (Hong 2009a). The city took steps to educate their customers prior to floating the bond, including offering public tours of the aging infrastructure (Hong 2009b). "When people saw (the city's infrastructure) with their own eyes on our tour or heard the description, they knew there was really no more waiting on it," said City Councilmember Michael Cacciotti (quoted in Hong 2009c). That same year, the city raised rates by about 5%, to very little opposition, and issued a $43.3 million bond (City of South Pasadena 2011a, Hong 2009c).

In 2010, the city established a citizen-based water council, which recommended implementing a three-tiered water rate structure, a suggestion that city staff had previously endorsed. The council noted that the current, uniform volumetric rate system provided little incentive to become more water efficient. The council also highlighted other financial challenges facing the city, including increasing overdraft fees, a lack of water efficiency planning, as well as minimal water efficiency education and incentive programs (City of South Pasadena Water Council 2010).

A new rate study recommended a 30% increase in rates per year for 2011 and 2012, followed by an 18% increase per year for 2013 and 2014 (Narang 2010). However, by that time, the city had acknowledged that costs had increased beyond what had been assumed in the rate study, and that the city was facing a $500,000 deficit if rates were not increased even further (Flores 2010). At a December council meeting, the Board voted in favor of a 30% rate increase and approved a new, tiered rate system. The city also had to pass an urgency ordinance to implement the new rates in order to avoid default on the city’s water bonds (City of South Pasadena 2011b).

Some residents, and even city officials, complained that the city was moving too fast, and that not enough information had been given to help customers reduce costs, such as through conservation. Part of the rate increase was necessary to finance increasing charges for using more water than had been allocated by South Pasadena’s wholesale supplier (Metropolitan Water District), a problem that could be assuaged through increased efficiency (Narang 2011). South Pasadena had not yet implemented basic conservation measures, and was out of compliance with AB 1881, a bill that requires cities and counties to adopt landscape water conservation ordinances. South Pasadena only began to discuss incorporating conservation measures into the municipal code in December

2011, after their code was given a “poor” rating in a Sierra Club report (de la Torre 2011). The city continued to experience financial difficulties into 2012 (Lepore 2012).

Stricter Standards

There are two primary federal laws that govern water quality: the Clean Water Act and the Safe Drinking Water Act. Together, they regulate water quality, including both the amount of pollution entering water ways as well as the maximum levels of pollutants in drinking water. Both are continually updated to ensure public safety. New chemicals, emerging contaminants, and their combined impacts are of particular concern to the water industry, and have resulted in stricter treatment standards. For example, a better understanding of the behavior of disinfection chemicals has resulted in stricter national standards for certain disinfection by-products that can be harmful to human health.

Case Study: Carmichael Water District

In the early 1990s, the Carmichael Water District had gone several years without raising water rates and did not have sufficient funds to pay for treatment system upgrades necessary to comply with new federal drinking water standards (McCarthy 1993). When the district announced a plan to purchase land for a new treatment facility, residents fought back, objecting to increasing water prices and questioning the need for the new treatment facility (Reyes 1994a). Some residents organized to form the Citizens Against Regulatory Exploitation (CARE), a group dedicated to opposing the new treatment plant. In that year’s water board election, an anti-treatment plant candidate that CARE supported was voted into office, replacing an existing board member (Reyes 1994b, Reyes 1994c).

Negative feelings about the Board, the treatment plant, and rising water prices continued over the next several years (Reyes 1995, Pitzer 1995, Pitzer 1996a). After delaying a final decision about the new plant, the Board issued a formal proposal for a $25 million treatment plant (Sacramento County Grand Jury 1997, Pitzer 1996b). Shortly thereafter, the district organized a rate committee, which recommended a new rate structure that included an overall increase in water rates as well as a change from a flat rate to a volumetric structure (Kennedy/Jenks Consulting 2003). Although the committee recommended these changes, they were not consistently applied to all customers, which resulted in charges of inequity in the rate-setting process (Duffy 1998a).

In 1998, a lawyer from Carmichael who had allegedly experienced a 400% rate increase led another citizens’ group in a suit against the water district, stating the utility “has created an arbitrary, unreasonable and irrational rate structure” (quoted in Duffy 1998b). The group also alleged the utility was keeping secret the test results that were believed to have triggered the need for the new treatment facility, and accused the utility of using the test results as a “scare tactic” against rate payers in order to gain public support for the treatment plant (Duffy 1998c).

Construction on the new plant began in 1999, with additional lawsuits, price hikes, and recall campaigns to follow (Peterson 1999, Peterson 2000, Sparks 2001). The district again ran into financial difficulties after a relatively cool season significantly reduced summertime water use (Lindelof 2005). Despite cutting costs, the district proposed additional price increases in 2011 (Kalb 2011). Although the board approved an 18% increase in 2012, it froze rates for the following three years while the district consulted with the public on a new rate structure (Kalb 2012). A new rate study will begin in 2014, with a citizens’ water rate study committee established to help guide the process.

Climate Change and Extreme Weather Events

Climate change impacts both water supply and demand. Climate Change is altering the timing, volume, and distribution of water supply through changes to precipitation and runoff, while rising temperatures are increasing overall demand. Moreover, increasing frequency and severity of droughts, floods, and other extreme weather events mean new, more resilient infrastructure must be built or existing infrastructure retrofitted to accommodate increased uncertainty.

California is already working to respond to these new conditions. For example, the Contra Costa Water District is now in the process of expanding the Los Vaqueros Reservoir in order to protect against future droughts. The reservoir enlargement will increase storage capacity by 60,000 acre-feet. The top two stated purposes for the dam enlargement are: 1) to improve water quality by storing higher-quality Delta water from wet seasons for blending with the Delta supply during dry periods and 2) to provide a 1-to-3 month supply of emergency water storage. The project cost a total of $120 million and was funded through local revenue bonds, which are to be repaid by water users over time. Projects to address these new environmental conditions will become more prevalent as California responds to the impacts of a changing climate.

Decreasing Demand

The Economy

The recent economic recession dramatically impacted water use in California. The crisis decreased the amount of water consumed in all sectors of the economy, and therefore decreased the amount of revenue generated by water sales. Income from new connection fees also decreased as new residential growth slowed during the foreclosure crisis and, in some cases, resulted in downgraded credit ratings (Leurig 2012).

Conservation and Efficiency

New legislation in California seeks to advance sustainable water management through water conservation and efficiency. In November 2009, the California Legislature passed The Water Conservation Act of 2009 (SBx7-7) which requires state-wide increases in conservation and efficiency efforts. In particular, water suppliers must achieve 20% reduction in per capita urban water use by 2020. In addition, a 2007 Assembly Bill (AB 1420) conditions eligibility for state grants and loans on implementation of Best Management Practices for urban water conservation and efficiency (California Water Code, Section 10631). California has also implemented robust building codes and appliance standards for water efficiency that have reduced water use statewide; these continue to be updated and strengthened.

What this Means for Water Rates

Water rate structures describe the way that total system costs are allocated among different customers (see Section 3). No matter which water rate structure is used, it should be effective at balancing total costs against total revenues. In other words, in order to maintain fiscal solvency, the total cost of providing water should be recovered through the prices customers pay to use water.

However, matching the price of water with the cost of water can be difficult, as costs and expected revenue are estimates; the price is set before the water is used, and so any change in water demand or water costs can create an unexpected revenue loss or gain. For example, revenue losses can occur if more expensive water is needed to meet high demand during a drought, or temporary drought conservation programs reduce demand below what was forecasted.

Increasing water costs alongside decreasing water demand can lead to a revenue gap, necessitating an increase in water rates. Unfortunately, the vast majority of water service providers believe that customers have little-to-no understanding of the gap between costs and prices (Figure 2).

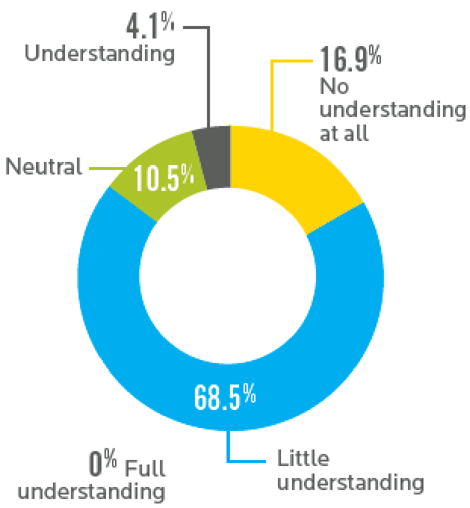

Figure 2. Customer Understanding of the Gap between Water Cost and Water Price
Source: Black and Veatch 2012

Between 1991 and 2006, California's average monthly charge for 1,500 cubic feet of water increased by more than $8.00, to $41.97 (in inflation adjusted dollars) (Table 1). As of 2006, the highest water charges in California have increased more significantly, from $102.78 in 1991 to $150.98 in 2006.

Table 1. Monthly Cost of Water in California

Year	Average Water Charge for 1,500 cubic feet (in 2013$)	Highest Water Charge for 1,500 cubic feet (in 2013$)
1991	$33.87	$102.78
2006	$41.97	$150.98

Source: Black & Veatch 1995 & 2006

While water rates have increased nationwide, California has required more communication around water rate changes and more opportunities for customers to lodge formal protests.[1]

As a result of these changing conditions and increasing attention to water prices, there is a need for a greater understanding of how water service providers price water and structure water rates to achieve certain objectives. The following section describes three common rate structures and the tradeoffs between them.

[1] In 1996, California voters passed Proposition 218, the "Right to Vote on Taxes Act," which changed the way local governments finance operations and collect revenue. The Act requires that any changes to property-related fees, such as water rates, go through a notification procedure that allows customers to submit protests. Proposed water rate changes can be rejected if a majority of affected customers submit formal protests. The Act also requires a "significant nexus" between the cost of service and the price of water. While this stipulation has yet to be tested in the courts, it has led to a perception of increased risk related to the water rate-setting process amongst many water service providers.

3

Water Rate Basics

To illustrate a common confusion when it comes to water rates, ask yourself two questions:

1) How much does it cost to provide water services?
2) How much do I pay for water?

These might seem repetitive, but they are actually very different questions with very different answers. The first question asks how much it costs to build, operate, and maintain a system that provides high-quality water to your tap, while the second question asks how much of that total system cost is passed on to you through your water bill.

There are a variety of ways water service providers allocate total cost to customers. The amount of revenue water service providers collect from customers is dictated by the rate structure, which can be designed in various ways to achieve specific goals. For example, water rate structures may divide costs equally amongst all customers, regardless of how much water a customer uses. Water rate structures may charge customers that use a large amount of water a higher rate than customers that only use a small amount of water. Rate structures can even develop a target water use (or water budget) for a particular type of customer and charge the customer more if they exceed the target usage.

This section describes three common water rate structures – flat rates, uniform volumetric rates, and block rates - what they can accomplish, and the advantages and disadvantages of each (see Table 2).

Flat Rate or Flat Fee

One simple way to charge customers for water is through a flat fee, where each customer or type of customer pays the same price. Although the charge may vary according to specific factors (such as meter size), this rate structure is characterized by a price that is ultimately independent of the amount of water used (see Figure 3). For example, a single-family residential home with a flat rate of $90 per month would be charged $90 per month regardless of how much water the household used.

This method of rate setting is easy to implement and understand. It provides a great deal of financial stability, as revenue is dependent on factors that are easy to predict and less variable than future water demand. However, flat rates are usually best used in conjunction with rates that vary based on the volume of water used in order to ensure customer charges more closely align with the actual cost to provide service.

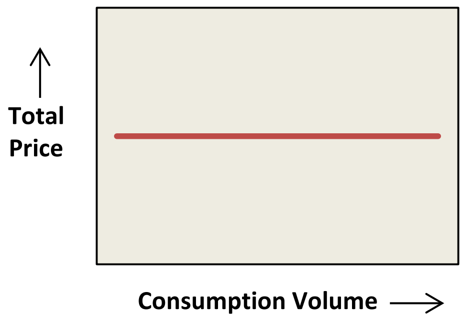

Figure 3. Total Price versus Consumption Volume for Flat Rates

Uniform Volumetric Rate

Uniform volumetric rates are the simplest way to price water based on a customer's level of use, by charging customers according to a fixed amount per unit of water consumed (Figure 4). While the *unit price* for water does not change according to use, the *total price* of water increases as a customer uses additional units of water (Figure 5). For example, the same single-family residential customer charged a fixed rate of $90 per month regardless of use, under a uniform volumetric rate of $0.01 per gallon would need to keep their household's use at 300 gallons per day in order to continue paying the same amount. If the household only used 200 gallons of water per day they could save $30/month. And, conversely, if they used 400 gallons per day, they would see their bill rise by $30/month.

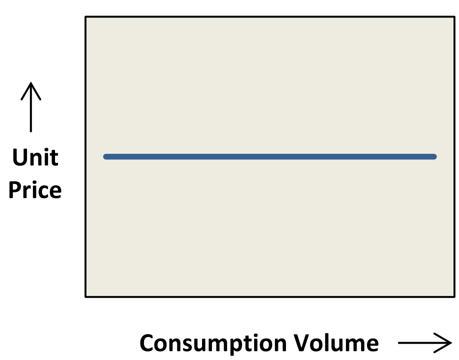

Figure 4. Unit Price versus Consumption Volume for Uniform Rates

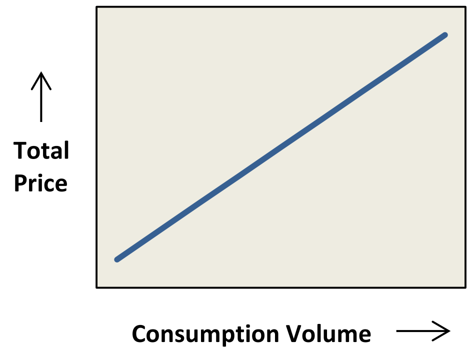

Figure 5: Total Price versus Consumption Volume for Uniform Rates

Uniform volumetric rates can be structured so that the unit price for water is low (sending a weak conservation signal) or high (sending a strong conservation signal but potentially risking affordability concerns for some customers). The unit price for water can also change throughout the year; "seasonal rates" reflect the annual variation in water costs by applying a higher price per unit for water used during certain times, usually the summer months.

Block or Tiered Rate

Block rates are designed so that the unit price of water changes according to the level of use (Figure 6). A decreasing block rate charges customers a lower unit price as their water use increases. This structure has been nearly phased out in California as decreasing block rates do not send a cost signal to the customer to conserve water. Increasing block rates, on the other hand, charge higher prices as a customer's water use increases. An interesting feature of block rates is that since the unit price of water changes based on the block, the slope of the total price changes, depending on the block (Figure 7).

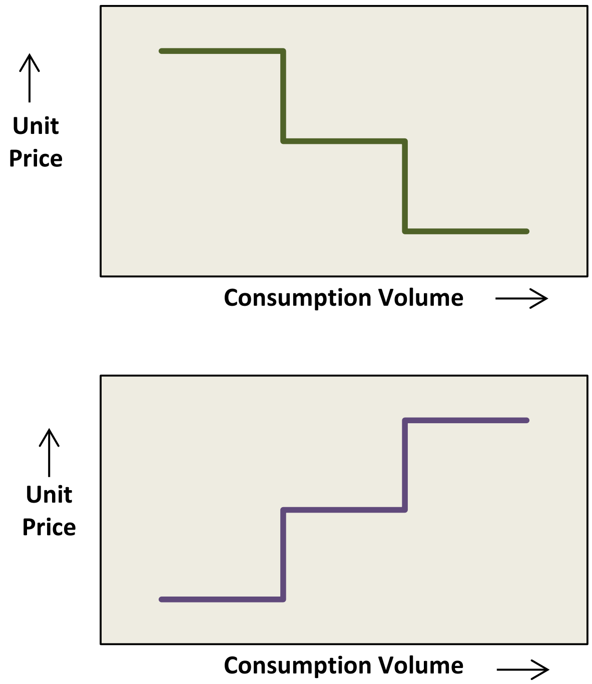

Figure 6. Unit Price versus Consumption Volume for Decreasing Blocks (above) and Increasing Blocks (below)

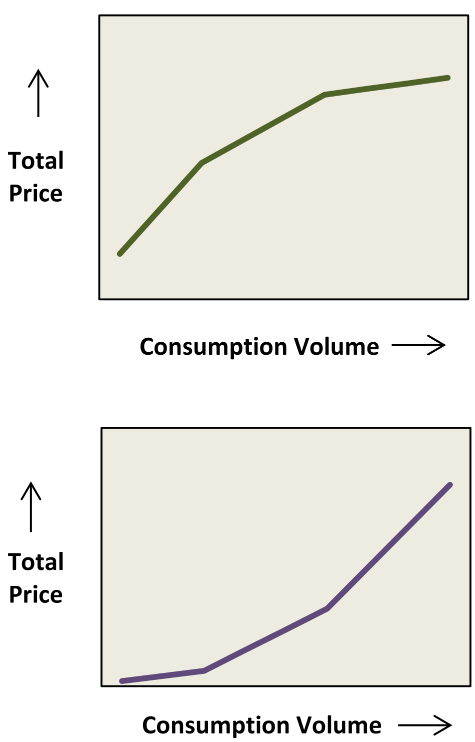

Figure 7. Total Price versus Consumption Volume for Decreasing Blocks (above) and Increasing Blocks (below)

For block rates, the size of the block and the price per unit in each block are important to ensure a clear and effective conservation signal. One relatively new way to set the size of the blocks is through water budgets. Budget-based rates use inclining block rates where the sizes of the blocks are unique to the individual customer. Each block is set according to a customer's expected needs, with larger, more expensive blocks set to encourage conservation. For example, the first block can be set to represent average indoor usage, and can be modified according to the number of people living in the household or the size of the house. The second block can then represent outdoor irrigation, and can be based on regional climatic conditions and the size of the property's landscaped area. Any additional blocks would then signal inefficient or "wasteful" uses, and are usually set according to a percent increase above the other blocks. Once the blocks are established, customers may be able to apply for variances so that a household with unique water needs – such as a swimming pool or specific medical needs – is not charged rates intended for inefficient use. As long as the customer is efficient in their use and communicates effectively with the utility, they will not be penalized for having needs beyond that of other customers.

Case Study: Moulton Niguel Water District

The Moulton Niguel Water District (MNWD) recently implemented a budget-based rate structure to send a stronger conservation signal to customers. MNWD began looking into budget-based rates as early as 2008, at the recommendation of an Orange County Grand Jury report that called on local water agencies to increase water conservation efforts during a multi-year drought (MNWD 2008). After conducting a rate study in September 2010, the district alerted residents that the water rate structure might soon be changing (MNWD 2010), and formally proposed a budget-based system in February 2011.

At a public meeting on the new structure, residents expressed concerns about the changes despite MNWD’s assurances that the new rates would be revenue-neutral for the district (Webb 2011a). MNWD had already approved a rate increase for that year, which caused some customer confusion, especially when combined with the utility’s online bill calculator; residents who used the calculator saw a jump in their water bills, which they thought had resulted from the new structure, rather than the already-scheduled rate increase (Webb 2011b). "It says in your literature that customers who use their water efficiently will be billed at lower rates, but by all calculations our bill is going up. You're lying to us," said one local resident (quoted in Tharp 2011). In addition, the online calculator used an equation for outdoor water budgets that was not accurate for all customers, which contributed to confusion about the allocations. One homeowner accused the board of “gaming the system” by setting unrealistically low water budgets that would result in customers being pushed into higher tiers, where water cost more (Tharp 2011). "We certainly missed the boat in communicating, so that we would all be in agreement of what the facts are," said one MNWD board member (quoted in Webb 2011a).

In response to the public’s reaction, the board delayed a vote on the new rate structure and scheduled additional public meetings. The district increased outreach, and augmented and improved their online materials; in particular, the district changed the way the online calculator computed the residential outdoor irrigation budget, and updated the output so customers could clearly see the different impacts of the rate increase as well as the budget-based structure (Webb 2011b). The MNWD board approved the new structure in April 2011 (Webb 2011c), and the rate structure was implemented in July 2011. After implementation, the district established a rebate program for water efficient appliances and a residential audit program to assist customers with saving water and money. The programs are used to educate customers about the benefits of water budgets and the need to save water for future water supply reliability.

Changing Rate Structures in California

While uniform volumetric rates remain common, increasing block rate structures are becoming much more prevalent in California. Black & Veatch conducted several surveys of urban water prices and rate structures in California between 1991 and 2006 (Black & Veatch 1991, 1995, 2006). During this period, water rate structures have shifted dramatically and a growing number of utilities are using increasing block rates (Figure 8). In 1991, 60% of California utilities used uniform volumetric rates. By 2006, this number had declined to 50%. On the other hand, increasing block rates were used by 27% of utilities in 1991 but had increased to 43% of utilities by 2006.

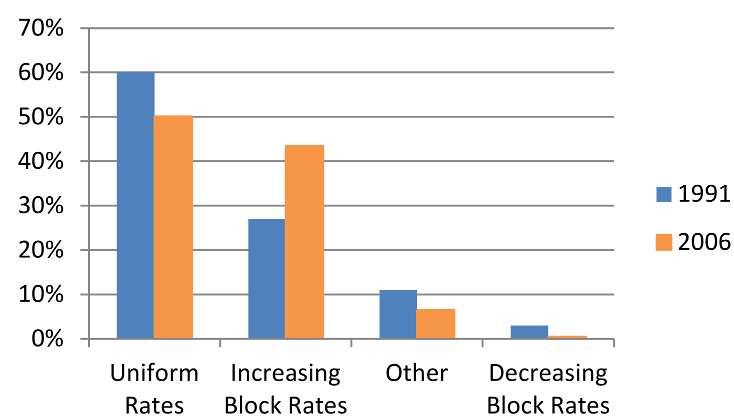

Figure 8. Trends in Water Rate Structures between 1991 and 2006
Source: Black & Veatch 1991, 2006
Note: “Other” charge methods include flat monthly charges, charges based on total square footage, number of rooms, and number of bedrooms, as well as a combination.

Rate Designs: Advantages and Disadvantages

The choice to implement a new rate structure must be considered in terms of its ability to help a water service provider and the larger community it serves to achieve clearly defined goals. There is no single rate structure that is appropriate for all utilities, and choosing between them begins with an understanding of the advantages and disadvantages of each.

Conservation-oriented water rates provide a price signal to customers to use water efficiently, and can be achieved through a variety of volumetric rate structures, including uniform volumetric rates and increasing block rates. In California, it is important that the rate structure send a signal to customers to conserve, but not every rate structure will send a strong signal. Although block rates can be an effective way to encourage water conservation, the price per unit as well as the size of the blocks can impact the strength of the price signal. For example, if a uniform rate structure has a higher unit price for water than the unit price for water in the last block of an increasing block rate structure (hypothetically set to only encompass excessive water uses) then the conservation signal will actually be much greater with the uniform rate than the block rate.

One important consideration for volumetric pricing is ensuring affordability. One way to manage this is by designing the rate structure to reflect certain customer use patterns. There is often a distinction made between “essential” water use (generally considered to be indoor water use) and “discretionary” water use (outdoor water use or inefficient use). Block rate structures can be crafted to establish essential and discretionary levels of water use so that meeting basic human water needs is affordable for all customers. Water budgets take this idea to the next level, by more closely aligning the size of the blocks to other customer use patterns. However, critics argue that budget-based structures may discourage conservation beyond the established budget.

Rate structures should also consider equity – there is an important distinction between equality and equity. Although flat rates charge all customers *equally*, the charge may not be *equitable*, if large users are responsible for a greater proportion of total system costs. In addition, customers with a higher than average peak water use may also be responsible for a greater portion of system costs than customers whose water use is uniform, as peak use may require operation of more expensive system facilities and, in some cases, more expensive water sources.

A utility must, of course, have the institutional and financial capacity to implement the rate structure. For example, any volumetric rate structure requires water metering as well as the ability to periodically read meters and bill accordingly. As noted previously, analyses must be done to set block sizes and unit prices in order to achieve certain objectives, such as water conservation or water affordability. These analyses become more complicated and expensive as water service providers try to optimize several objectives at once, such as water conservation, affordability, equity, and revenue stability.

Any rate structure that charges by volume introduces some level of revenue uncertainty since forecasted sales are used to set rates and no forecast will perfectly match reality. Flat rates provide by far the most stable revenue as revenue does not reflect changes in water use.[2] However, survey data demonstrate that flat rates are uncommon in California; in 2006, flat rates were used in less than 10% of surveyed utilities.

[2] Revenue sufficiency differs from reliability, in that that costs are fully recovered through prices rather than being predictable from one year to the next. A forthcoming white paper on lessons from the energy sector will address pricing structures that ensure revenue sufficiency.

This suggests that other priorities, such as conservation and equity, have proven to be more important.

Several strategies exist that can address the increased revenue uncertainty associated with volumetric rate structures. These include accurate demand forecasting, robust reserve funds, established financial policies, and ongoing customer education and communication (see our *Conservation and Revenue Stability* Fact Sheet).

Choosing an appropriate rate structure will always entail tradeoffs and, therefore, there is no “one-size-fits-all” rate structure. Rather, each community must determine which structure is most appropriate based on customer water usage patterns, the need for long-term water supply reliability, and the ability of the structure to achieve the social and economic goals established by the community.

Table 2. Comparison of Rate Structures

Rate Type	Sends a conservation signal?	Easy to explain?	Easy to implement?	Addresses equity concerns?	Provides reliable revenue?
Flat Rate	No	Yes	Yes – does not require water metering.	No – water bill does not reflect the cost of service.	Yes – water revenue is independent of water use.
Uniform Volumetric Rate	Possibly - depends on the price per unit.	Yes	Yes – though it does require water metering.	Possibly - water bill is directly related to water use.	No – revenue depends on water use.
Decreasing Block Rate	No	Somewhat	Somewhat - requires analysis regarding number of blocks, size of blocks, and price per unit for each block. Requires water metering. Requires forecasting customer usage.	Possibly - water bill is directly related to water use.	No – revenue depends on water use.
Increasing Block Rate	Likely –depends on the size of the block and the price per unit.	Somewhat	Somewhat - requires analysis regarding number of blocks, size of blocks, and price per unit for each block. Requires water metering. Requires forecasting customer usage.	Possibly - water bill is directly related to water use.	No – revenue depends on water use.

4 Conclusion

California is facing new challenges to sustainable water management, particularly when it comes to water rate-setting. Increasing costs and decreasing demand mean that many water service providers are experiencing a revenue gap, which requires increasing water prices and/or changing water rate structures. Increased public scrutiny of water rate changes is not always informed by a comprehensive understanding of the challenges that water service providers face in terms of delivering safe drinking water while also balancing multiple societal objectives from water conservation to water affordability.

A well-designed water rate structures can help a water service provider to achieve particular objectives. However, there is no “one-size-fits-all” rate structure: each structure has its own advantages and disadvantages, and can be more or less effectively implemented. Choosing an appropriate rate structure means first clearly defining goals and objectives. Successful implementation requires adequate human, financial, and institutional capacity, and constraints must be considered up-front. Although the new normal will no doubt impact California water utilities, accurate analyses, thoughtful planning, and effective communication can foster resiliency in the face of changing conditions.

References

American Society of Civil Engineers (ASCE). 2013. 2013 Report Card for America’s Infrastructure – California. http://www.infrastructurereportcard.org/california/california-overview/

Black & Veatch. 1995. California Water Charge Survey.

Black & Veatch. 2006. California Water Rate Survey.

Black & Veatch 2012. Strategic Directions in the U.S. Water Utility Industry.

City of South Pasadena. 2011a. Comprehensive Annual Financial Report, Fiscal Year Ended June 30, 2011. http://www.cityofsouthpasadena.us/finance/PDFs/CAFR_063011/Cafr063011.pdf

City of South Pasadena. 2011b. Ordinance No. 2218 – An urgency ordinance of the City Council of the City of South Pasadena, California, establishing water rates pursuant to section 35.3, 35.4, 35.5, and 35.6 of chapter 35 of the South Pasadena Municipal Code. Ord. Vol. 24, pp 107-110. http://qcode.us/codes/southpasadena/revisions/2218.pdf

City of South Pasadena Water Council. 2010. Securing South Pasadena’s water supply: A cascade of strategies. http://www.ci.south-pasadena.ca.us/PDFs/Report%20Integration%20Committee%20Final%20Report.pdf

de la Torre, Cynthia. 2011. City Council to Discuss Water Conservation Wednesday, South Pasadena Patch, December 21. http://southpasadena.patch.com/articles/south-pasadena-rated-poor-in-water-conservation-survey

Duffy, Kelly. 1998a. Legality of Carmichael Water Rates Questioned. The Sacramento Bee, September 3.

Duffy, Kelly. 1998b. Legal challenge clouds status of water facility. The Sacramento Bee, October 29.

Duffy, Kelly. 1998c. Scare tactics charged in water district rate hike. The Sacramento Bee, December 17.

Emerson, Sandra. 2011. Water rate hikes tied to aging infrastructure. San Jose Mercury News, December 10. http://www.mercurynews.com/california/ci_19516462

Flores, Adolfo. 2010. South Pasadena city officials consider raising water rates. Pasadena Star-News, December 9.

Hong, Robert S. 2009a. Pasadena rate hikes needed to fix streets, sewers. Pasadena Star-News, January 11.

Hong, Robert S. 2009b. City taking residents on tours of aging water system. Pasadena Star-News, April 7.

Hong, Robert S. 2009c Water rate increase approved in South Pasadena. Pasadena Star-News, May 7.

Kalb, Loretta. 2011. Carmichael - Use less water? OK, pay more – Conservation called ‘Catch-22.’ The Sacramento Bee, November 2.

Kalb, Loretta. 2012. Carmichael board OKs water rate hike deal. The Sacramento Bee, January 25.

Kennedy/Jenks Consulting. 2003. Carmichael Water District. District Master Plan 2003-2013. Project No. 022510.00. http://www.carmichaelwd.org/documents/masterPlan/CWD%20Master%20Plan%202003-2103.pdf

Lepore, Kristen. 2012a. Why Your Water Bill Must Go Up. South Pasadena Patch, January 11. http://southpasadena.patch.com/articles/sewer-rates-water-rates-south-pasadena#photo-8654069

Lindelof, Bill. 2005. Mark 2014 as big year - Carmichael plans to have all of its water customers hooked to meters by then. The Sacramento Bee, December 29.

Leurig, Sharlene. 2012. Water Ripples: Expanding Risks for U.S. Water Providers. A Ceres Report, December.

McCarthy, Ryan. 1993. More water rate increases considered. The Sacramento Bee, October 7.

Moulton Niguel Water District (MNWD). 2008. Response to 2007-2008 Grand Jury Report "Water Budgets, Not Water Rationing," Letter from General Manager John V. Foley to The Honorable Nancy Weiben Stock. http://www.ocgrandjury.org/pdfs/waterreport/moultonniguelwater.pdf

Moulton Niguel Water District (MNWD). 2010. District Evaluating New Ways to Conserve – Newly proposed rate model would encourage efficiency. http://www.mnwd.com/uploads/documents/News%20Article-%20District%20Evaluating_New%20Ways%20to%20Conserve%209-10.pdf

Narang, Sonia. 2010. Water Council to Discuss Proposed Tiered Water Rates Tuesday. South Pasadena Patch, November 30. http://southpasadena.patch.com/articles/water-council-to-discuss-proposed-tiered-water-rates-tonight#c

Narang, Sonia. 2011. Water Rate Increase Takes Effect in March Despite Public Opposition. South Pasadena Patch, February 17. http://southpasadena.patch.com/articles/water-rate-increase-takes-effect-in-march-despite-public-opposition

Peterson, Carey. 1999. Recall drive against water agency directors fails. The Sacramento Bee, December 9.

Peterson, Carey. 2000. Water district settles group's two lawsuits. The Sacramento Bee, April 16.

Pitzer, Gary. 1995. Carmichael Water Rates Slated for 20 Percent Jump. The Sacramento Bee, September 21.

Pitzer, Gary. 1996a. Rising commercial water rates stir complaints. The Sacramento Bee, December 19.

Pitzer, Gary. 1996b. Carmichael Water District advances plans for new plant. The Sacramento Bee, February 29.

Reyes, Patty. 1994a. Carmichael Residents Boil at Water Plant Cost. The Sacramento Bee, July 14.

Reyes, Patty. 1994b. Carmichael Residents to Fight Federal Water Rules. The Sacramento Bee, October 27.

Reyes, Patty. 1994c. Changes on Tap for Water Panel. Sacramento Bee. November 17.

Reyes, Patty. 1995. Residents allege water district board meeting was illegal. The Sacramento Bee, August 17.

Sacramento County Grand Jury. 1997. Carmichael Water District, Final Report, June 30. http://www.sacgrandjury.org/reports/96-97/gjury96-97-05.asp

Sparks, J.D. 2001. Residents air concerns about water. The Sacramento Bee, June 14.

Tharp, Debbie. 2011. Citizens Gather to Express Anger over New Water Rate Plan. Laguna Niguel-Dana Point Patch. February 24. http://lagunaniguel.patch.com/articles/citizens-gather-to-express-anger-over-new-water-rate-plan

Webb, Claire. 2011a. Rate changes prompt outrage from water district customers. The Orange County Register, February 23. http://www.ocregister.com/articles/rate-289607-customers-district.html

Webb, Claire. 2011b. Water district seeks to clear rates confusion. The Orange County Register, March 11.

Webb, Claire. 2011c. Rate hike coming to Moulton Niguel customers. The Orange County Register, April 22. http://www.ocregister.com/articles/water-297532-customers-district.html