

# Defining a Resilient Business Model for Water Utilities



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WRF's mission is to advance the science of water to improve the quality of life. To achieve this mission, WRF sponsors studies on all aspects of drinking water, including resources, treatment, and distribution. Nearly 1,000 water utilities, consulting firms, and manufacturers in North America and abroad contribute subscription payments to support WRF's work. Additional funding comes from collaborative partnerships with other national and international organizations and the U.S. federal government, allowing for resources to be leveraged, expertise to be shared, and broad-based knowledge to be developed and disseminated.

From its headquarters in Denver, Colorado, WRF's staff directs and supports the efforts of more than 800 volunteers who serve on the board of trustees and various committees. These volunteers represent many facets of the water industry, and contribute their expertise to select and monitor research studies that benefit the entire drinking water community.

Research results are disseminated through a number of channels, including reports, the Website, Webcasts, workshops, and periodicals.

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# Defining a Resilient Business Model for Water Utilities

Prepared by:

**Jeff Hughes, Mary Tiger, Shadi Eskaf, Stacey Isaac Berahzer, Sarah Royster, Christine Boyle, and Dayne Batten**

Environmental Finance Center at the University of North Carolina at Chapel Hill, Chapel Hill, NC 27599-3330

**Peiffer Brandt and Catherine Noyes**

Raftelis Financial Consultants, Inc., 1031 South Caldwell St., Suite 100, Charlotte, NC 28203

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## FOREWORD

The Water Research Foundation (WRF) is a nonprofit corporation dedicated to the development and implementation of scientifically sound research designed to help drinking water utilities respond to regulatory requirements and address high-priority concerns. WRF's research agenda is developed through a process of consultation with WRF subscribers and other drinking water professionals. WRF's Board of Trustees and other professional volunteers help prioritize and select research projects for funding based upon current and future industry needs, applicability, and past work. WRF sponsors research projects through the Focus Area, Emerging Opportunities, and Tailored Collaboration programs, as well as various joint research efforts with organizations such as the U.S. Environmental Protection Agency and the U.S. Bureau of Reclamation.

This publication is a result of a research project fully funded or funded in part by WRF subscribers. WRF's subscription program provides a cost-effective and collaborative method for funding research in the public interest. The research investment that underpins this report will intrinsically increase in value as the findings are applied in communities throughout the world. WRF research projects are managed closely from their inception to the final report by the staff and a large cadre of volunteers who willingly contribute their time and expertise. WRF provides planning, management, and technical oversight and awards contracts to other institutions such as water utilities, universities, and engineering firms to conduct the research.

A broad spectrum of water supply issues is addressed by WRF's research agenda, including resources, treatment and operations, distribution and storage, water quality and analysis, toxicology, economics, and management. The ultimate purpose of the coordinated effort is to assist water suppliers to provide a reliable supply of safe and affordable drinking water to consumers. The true benefits of WRF's research are realized when the results are implemented at the utility level. WRF's staff and Board of Trustees are pleased to offer this publication as a contribution toward that end.

Denise L. Kruger  
Chair, Board of Trustees  
Water Research Foundation

Robert C. Renner, P.E.  
Executive Director  
Water Research Foundation

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- Metropolitan Water District of Southern California
- Nashville Metro Water Services
- Northeast Ohio Regional Sewer District
- Orange Water and Sewer Authority
- San Antonio Water System
- Town of Cary Public Works and Utilities Department
- Water District No.1 of Johnson County
- Yorba Linda Water District
- American Water Works Association
- Moody's Analytics
- Standard & Poor's
- Fitch Ratings
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- Georgia Department of Community Affairs
- Georgia Environmental Finance Authority
- North Carolina Urban Water Consortium
- Ohio Water Development Agency
- Ohio Environmental Protection Agency
- North Carolina Local Government Commission
- North Carolina League of Municipalities
- North Carolina Department of Environment and Natural Resources
- Texas Water Development Board
- Texas Municipal League
- Wisconsin Public Service Commission

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## EXECUTIVE SUMMARY

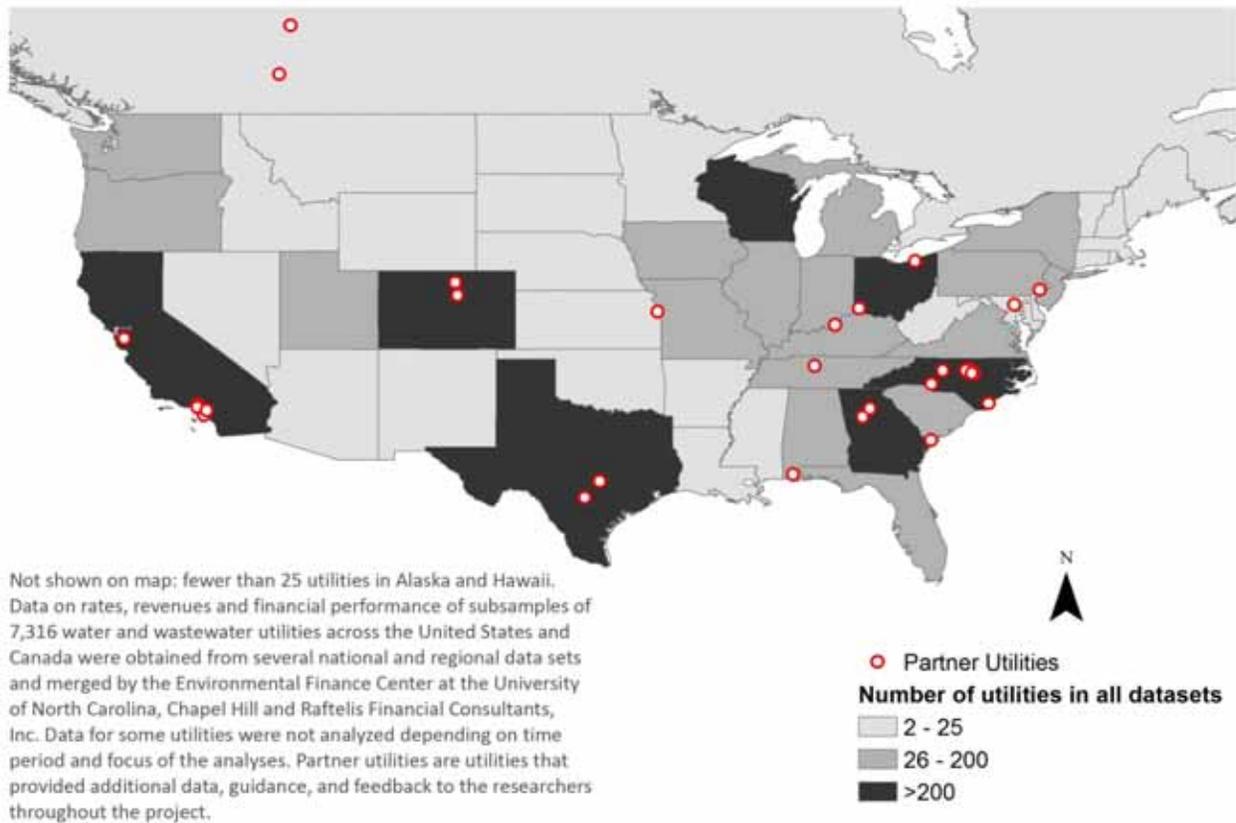
This report, developed in 2012 and 2013, provides an assessment of the revenue model and resulting financial condition of water utilities in North America (primarily the United States), considers factors influencing financial performance, and discusses practices that have the potential to improve financial resiliency. While it seems most research and high-profile policy papers today focus on the “cost” side of the financial balance utilities must navigate, this report primarily addresses the revenue and rates side of the equation. It first summarizes the financial condition and state of revenues in the water industry, goes on to consider trends in the context of the factors that influence a utility’s business model, and presents options for revenue resiliency strategy, policy, and practices. Additionally, the report presents a potential methodology and tool for assessing the risk of revenue losses.

This report provides a large-scale, quantitative analysis of the financial reality of water utilities. In its entirety, the report serves as a utility financial review, grounded in practical and applied approaches to securing revenue resiliency. It brings together a myriad of datasets and reports that, taken together, combine to reflect current trends and practices in revenue resiliency.

It does not seek to identify a single threat to utility revenues, but rather explores and highlights variation among utility performance and operating environment. The analysis clearly shows that there is not one generalizable “new normal” or inevitable pre-ordained financial outcome for the industry. There are clearly differences between regions, states, and utilities. The analysis shows that although the prevailing revenue model has posed significant problems for many utilities, it continues to serve many utilities relatively well.

### Research Approach

The research uses a combination of quantitative and qualitative analysis, bracketed by the existing literature on utility pricing, revenues, and financial management. The research was made possible due to the collaboration of a large group of utility partners from across the continent that represented a wide range of sizes, governance models, pricing strategies, climates, and demographic trends ([Figure ES.1](#)).



**Figure ES.1 Map of utilities included in all utility financial and rates data sets**

The analyses were conducted at the following four levels, as shown below:

1. **Nationwide**, using data sets from the national American Water Works Association-Raftelis Financial Consultants, Inc. Water & Wastewater Rates Surveys, and national data sets of utilities from credit rating agency, Moody's Analytics.
2. **Regional**, using statewide data sets from several state agencies and organizations, focusing on seven geographically disparate states: California, Colorado, Georgia, Ohio, North Carolina, Texas, and Wisconsin.
3. **Utility-level**, using data provided by a cohort of 29 utilities across 13 states and one province in Canada that partnered on this project during the course of this project.
4. **Case studies**, conducted from among a subset of the utility partners and beyond.

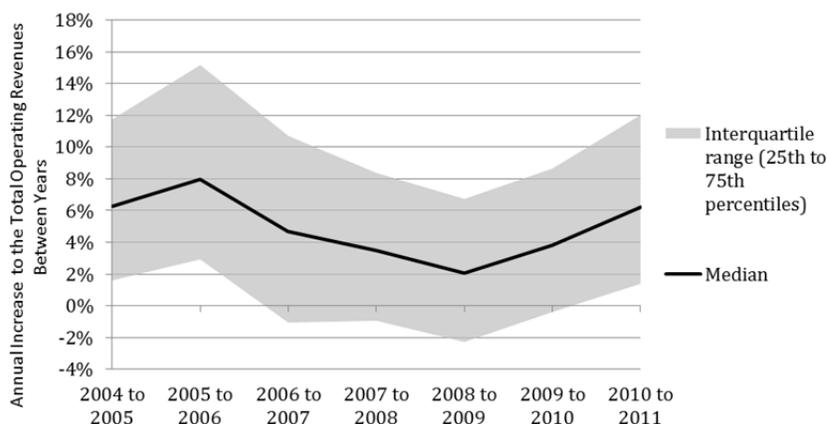
### **Assessing the Revenue Resilience of the Industry's Business Model**

Chapter 2 summarizes the financial condition and state of revenues in the water industry over the recent past. The chapter is broken into two primary sections: trends in financial performance and trends in pricing. The chapter concludes with a brief look into the relationship between rates and revenue.

## Trends in Financial Performance

This section analyzes how utilities across North America have fared financially over the last decade with a focus on the robustness of utility business models in generating stable and adequate revenue streams. Key findings include:

- For the majority of utilities, the largest component of utility revenues comes from customer sales (base and variable charges). Generally, variable revenues from a utility’s commodity charges comprise the largest portion of those sales.
- As such, operating revenues for many utilities are “bumpy.” Many utilities experience significant year-to-year revenue variability ([Figure ES.2](#)).



Data analyzed by the Environmental Finance Center at the University of North Carolina, Chapel Hill and Raftelis Financial Consultants, Inc. Data Source: Moody's Water and Sewer Municipal Financial Ratio Analysis. The cohort of 485 utilities is consistent across all years.

**Figure ES.2 Annual changes to total operating revenues among the same 485 utilities nationwide**

- Between any given consecutive years between FY2004 and FY2011, revenues decreased for 14% to 37% for a cohort of 485 utilities from across the country.
- On a national level and state level, the fastest rise in total operating revenues occurred in the years immediately preceding the 2008 economic downturn. After the economic downturn, revenues continued to rise for the majority of the utilities but at a much slower pace ([Table ES.1](#)).

**Table ES.1**

**Average trends in median increases to operating revenues in cohorts of utilities in six states**

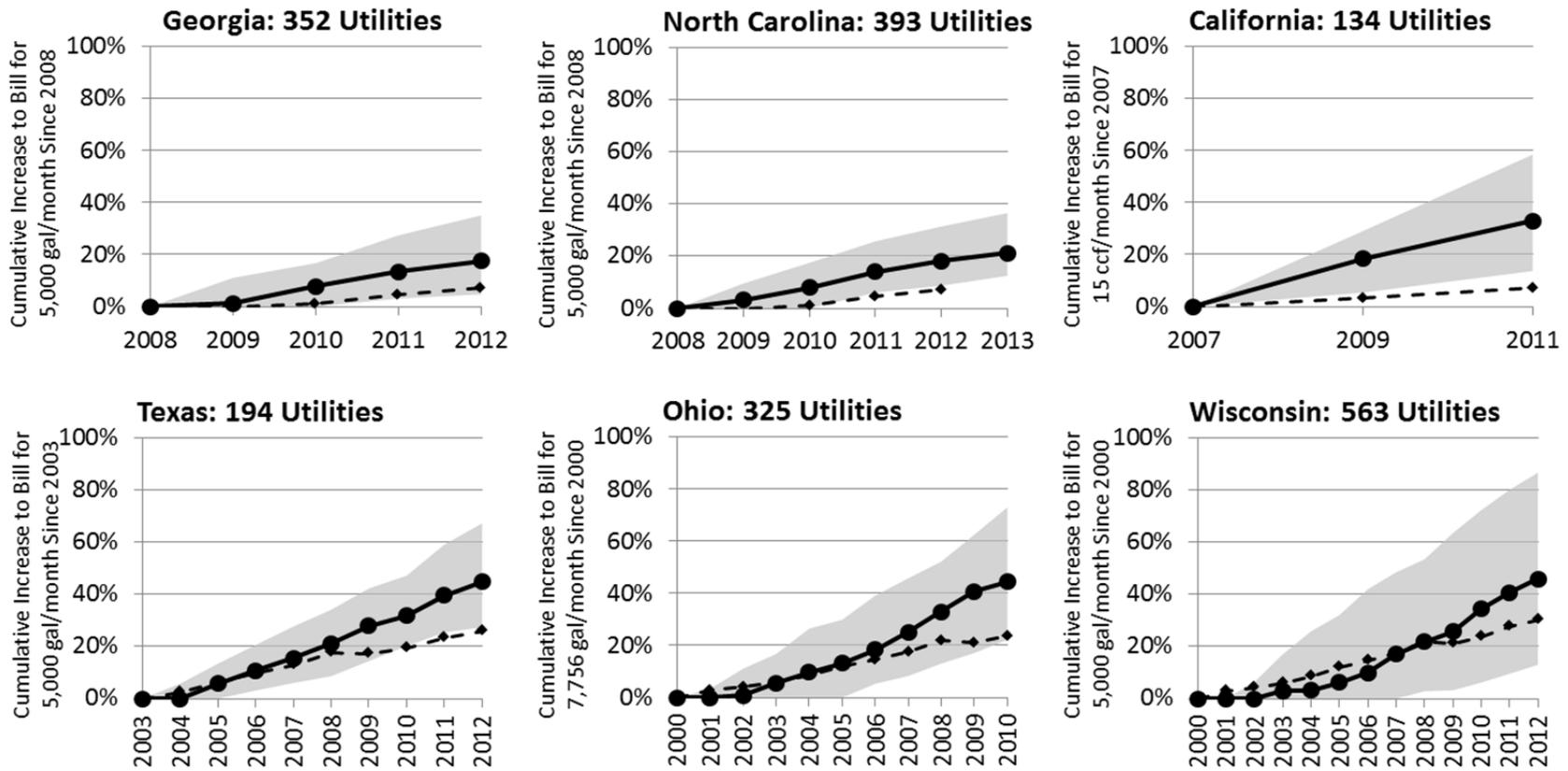
Fiscal Year:	'01	'02	'03	'04	'05	'06	'07	'08	'09	'10	'11	'12
California (n=946)		4.5%/year					2.2%/year					
Georgia (n=333)							6.2%	0.1%/year	3.9%/year			
North Carolina (n=306)		3.6%/year			5.7%/year			2.8%/year				
Ohio (n=400)								1.2%/year				
Texas (n=286)							4.7%/year		2.1%/year			
Wisconsin (n=567)			2.1%/year				0.8%/year					

- While it is clear that operation and maintenance expenses have risen over the past decade, it is important to compare this trend to changes in operating revenues. In 2007 through 2009, operating and maintenance expenses rose faster than operating revenues for more utilities than not. However, that trend reversed itself in 2010, with more utilities experiencing greater increases in operating revenues than in operating and maintenance expenses.

### ***Pricing Trends and Financial Resilience***

This section highlights national and statewide trends in water and wastewater rates and rate adjustments, within the context of financial stability. The analysis focuses on trends in rate adjustment frequency and the extent of rate adjustments across regions, over time, and at different consumption levels. It analyzes the trends around fixed versus variable charges and explores what this means for revenue resiliency. The section concludes with a brief look into the relationship between rates and revenue. Key findings include:

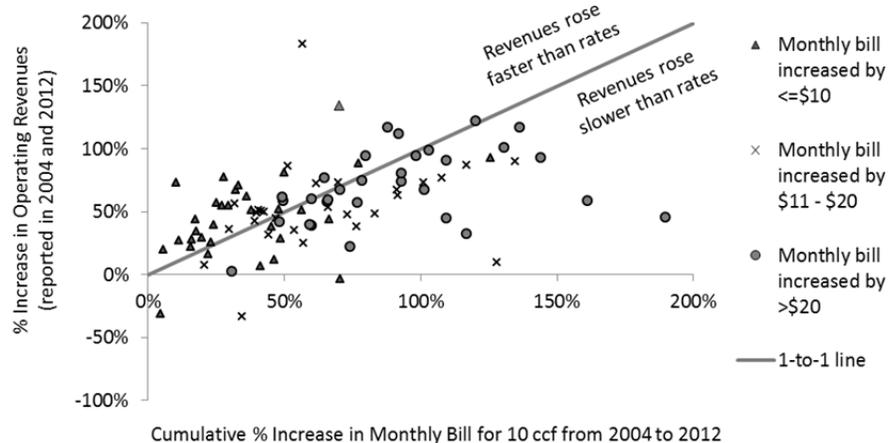
- Smaller and regular rate increases are associated with higher credit ratings.
- Though the exact size of the cumulative rate increases over time varied from state to state, most utilities increased rates at a pace slightly faster than regional Consumer Price Index (CPI) inflation, particularly after the financial crisis ([Figure ES.3](#)). In some states, however, there were also many utilities whose rates failed to keep pace with inflation.
- Larger utilities across the country adjusted water rates fairly frequently over the last ten years at levels that outstripped inflation.
- Many utilities have seen revenue generation track behind, and in some cases significantly behind, the percentage they have increased their customers' rates ([Figure ES.4](#)).



Data analyzed by the Environmental Finance Center at the University of North Carolina, Chapel Hill and Raftelis Financial Consultants, Inc. Rates data for all utilities in this analysis were known for all consecutive years and the cohort of utilities is the same for all years. Inflation of the regional Consumer Price Index is shown for the region each state is located in: South for GA, NC, TX; West for CA; Midwest for OH, WI. Data sources: Annual and biennial statewide rates surveys conducted by Raftelis Financial Consultants (CA), Georgia Environmental Finance Authority/Environmental Finance Center, North Carolina League of Municipalities/Environmental Finance Center, Ohio EPA, Texas Municipal League, and Wisconsin Public Service Commission; Regional Consumer Price Indices by the U.S. Bureau of Labor Statistics.

- Interquartile range (middle 50% of utilities)
- Median
- ◆ - Cumulative regional CPI inflation since reference year

**Figure ES.3 Cumulative bill increases for 1,961 utilities in six states compared to regional CPI**



Cumulative % Increase in Monthly Bill for 10 ccf from 2004 to 2012

Data analyzed by the Environmental Finance Center at the University of North Carolina, Chapel Hill and Raftelis Financial Consultants, Inc. Data sources: 2004 and 2012 AWWA-RFC Water & Wastewater Rates Surveys. Data reflect either water, wastewater or water & wastewater combined rates and operating revenues. Rate increases are assessed on 10 ccf/month wintertime (low season) residential bills.

**Figure ES.4 Increases in rates and operating revenues for 94 utilities nationwide, 2004 to 2012**

### Factors Influencing Revenue Resiliency

Chapter 3 considers these trends in the context of factors that influence a utility’s current business model and their ability to implement new practices. Major factors and associated trends include:

- **Service Area Size & Diversity:** Utilities serving a larger customer base tend to have lower rates and stronger financial performance metrics than their smaller counterparts.
- **Water Use & Weather:** Water use for many utilities is the defining characteristic in revenue health under current pricing and finance models. National trends indicate that average water use per capita and per account is generally decreasing over time.
- **Economic Conditions:** A bad economy, so far, has not resulted in a drastic decline in aggregate revenues across the industry, but has appeared to slow revenue growth from pre-downturn conditions, potentially resulting in increasing affordability pressure for many utilities.
- **Capacity Utilization:** Utility capacity varies significantly among individual utilities with many using a relatively small fraction of their system’s capacity during average periods.
- **Economic Regulation & Governance:** The economic regulatory framework over a utility can have a major influence on the types of financial practices it can implement, but economic regulation alone does not necessarily guarantee financial strength or resilience.
- **Financial Management Strategies:** Water and wastewater utilities use a number of integrated management theories that can be used alone or in concert to further utility financial and management goals.

- **Credit Rating Agencies:** Credit rating agencies serve as both a reflection and driver of utility's financial performance. Credit rating agencies are analyzing a utility's preparation and response to the factors outside of its control, with a focus on flexibility, capacity, and predictability (Figure ES.5).

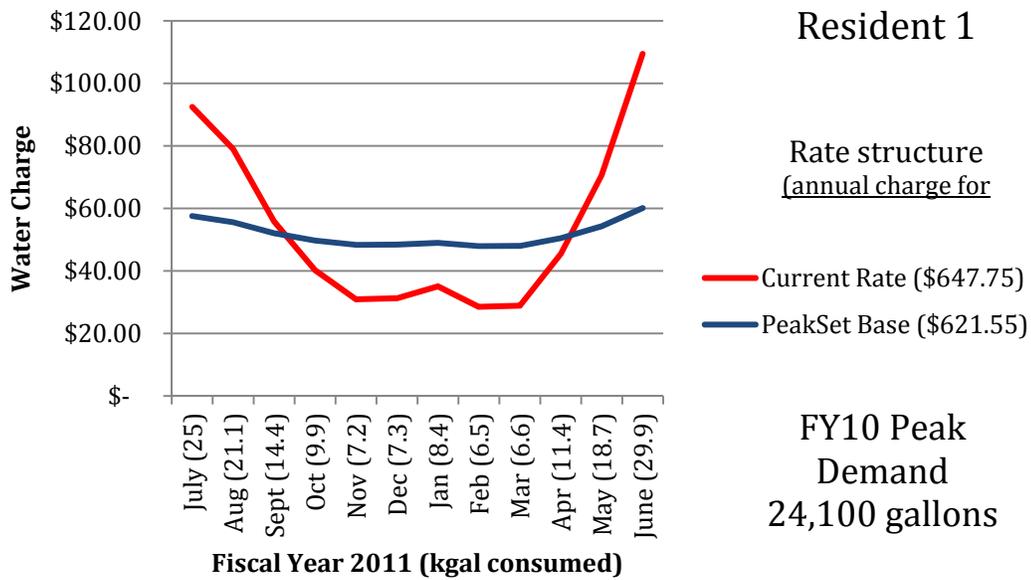


**Figure ES.5 Key credit rating considerations of S&P for 18 drinking water utilities from 2010-2012**

### Strategies and Practices for Revenue Resiliency

Chapter 4 presents a suite of revenue resiliency strategies, policy, and practice options, including:

- **Demand Projections:** Detailed, integrated, and updated, demand forecasting can help water resource managers and finance officers make plans with more confidence and less financial risk.
- **Rethinking Utility Services:** Many utility managers have begun looking at options beyond selling traditional services to diversify revenues, including the sale of fire protection services.
- **Alternative Rate Designs:** The industry has an opportunity to adopt pricing models that better align cost-of-water to the cost-of-service (Figure ES.6). The report explores the financial impact of three models on utilities and their customers.



**Figure ES.6 Comparison of monthly and annual charges for a customer under a utility’s current rate structure to an alternative rate (PeakSet Base) modeled rates for the same amount of water use**

- **Financial Performance Targets:** Financial policies can be used as yardsticks for financial performance; by monitoring financial performance against specified targets, a utility can hold itself accountable for financial stability while maintaining flexibility.
- **Rate Stabilization Reserves:** The types of reserve funds and levels at which utilities keep their reserve funds vary widely, but there are some discernible trends among the project’s partner utilities (Table ES.2). Rate stabilization reserves can mitigate variations in rate increases; and utilities with lower reserve levels (relative to operating expenses and debt service) had more volatile rate increases than those with larger reserve fund ratios.

**Table ES.2 Utility Reserve Fund Targets**

Utility	Reserve Fund Targets
City of Minneapolis	15% of revenue budget for the next year
Orange Water and Sewer Authority	The greater of 33% of O&M budget or 20% of the total estimated cost of the succeeding 3 years of the CIP budget
Baltimore Dept. of Public Works	Minimum of 90 days cash on hand
Alameda County Water District	Sufficient to meet operating, capital, and debt service obligations
Charlotte-Mecklenburg Utilities	100% of operating expenses for the current budget
Water District No.1 of Johnson County	The Board will be notified when the rate stabilization reserve reaches a minimum level of \$2 million

- **Customer Affordability & Assistance Programs:** Keeping rates unsustainably low for all customers at the cost of water and wastewater infrastructure investment benefits no one in the long term. Affordability programs provide flexibility to utilities seeking revenue resiliency.

- **Rate Adjustment Approaches:** Alternative processes for raising rates, such as cost-indexed rates, multi-year increases, and pass-through charges, incrementally help quell some of the political and public adversity to rate increases.

## Tools to Assist with Revenue Resiliency

This project generated two tools to assist utilities in exploring pricing and program strategies for revenue resiliency. Each tool is explained in more detail below:

- **Revenue Risk Assessment Tool:** This tool allows utilities to quickly determine the proportion of residential revenues from water sales at risk of loss when demand patterns change, based on the utility's own rate structure, customer demand profile, and weather conditions. The tool requires only minimal data and uses simplifying assumptions based on actual customer behavior. It focuses exclusively on revenue projections and assessments and allows the user to compare two different rate structures and assess which one offers greater revenue resiliency. The [Revenue Risk Assessment Tool and accompanying tutorial video](#) are available on the WRF Website on the 4366 project page under Project Resources/Web Tools.
- **Customer Assistance Program Cost Estimation Tool (CAPCET):** This tool was developed to help utilities assess the costs and benefits of implementing a customer affordability program in their service area. Using information from the U.S. Census Bureau and water and wastewater rates inputted by the user, this interactive instrument incorporates information about the eligibility threshold to qualify for an affordability program, annual assistance offered per customer, percent of customers responsible for bad debt, among other fields. By adjusting the appropriate fields, the results provide insight into design considerations and program costs. The [CAPCET and accompanying tutorial video](#) are available on the WRF Website on the 4366 project page under Project Resources/Web Tools.

## Conclusions and Recommendations

This research reinforces the growing sentiment among many in the industry that the general water utility business and pricing model is not as robust and resilient as once thought. Most water utilities rely on the sale of one essential product, and historically, many utilities have raised sufficient and predictable revenue through small rate modifications. While this approach has never been foolproof, the quantitative analyses throughout this report offer additional evidence that the last five years has been a particularly trying time for this business model.

A resilient business model for the water industry is one that is strategic and deft. Specifically, utilities should:

- Understand their business risk for disruptive revenue fluctuations.
- Adopt basic policies and performance targets to drive financial decisions.
- Re-examine sales projection methodologies.
- Consider the repercussions of the message that customers are buying gallons of water when the cost side of the business model suggests they are buying access to water.
- Consider new pricing models.