



Smart Management for
Small Water Systems

Managing Your Water System into the Future

Trenton, NJ
June 3, 2019



UNC
ENVIRONMENTAL
FINANCE CENTER



NADO
NATIONAL ASSOCIATION OF DEVELOPMENT ORGANIZATIONS
RESEARCH FOUNDATION



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Housekeeping



CEU Certificates

If you need a CEU certificate, you will need to confirm the following on the roster today before you leave:

- Is your name spelled correctly?
- Did you provide an email address UNIQUE TO YOU? A unique email address is required to receive your certificate.
- Did you mark the checkbox that you need a certificate?

Within 30 days of the training, you will receive an email with instructions to print your certificate. Emails from EFCN may be blocked or go to your Junk mail. To avoid this issue, add Smallsystem@syr.edu to your email Contacts or check your Junk mail frequently.

EFCN will apply to the water operator state licensing agency for CEU preapproval when applicable. You may be awarded CEUs by your agency. It is your responsibility to confirm with the agency that training meets relevancy criteria established for your license type as some agencies may not apply CEUs to your license if the training topic is not relevant to your position.

EFCN follows the IACET Standard of CEU calculation.

0.1 CEU = 1 Contact Hour or 1 Professional Development Hour

Questions? Please contact Smallsystem@syr.edu



Environmental Finance Center Network (EFCN)

The Environmental Finance Center Network (EFCN) is a university-based organization creating innovative solutions to the difficult how-to-pay issues of environmental protection and improvement. The EFCN works with the public and private sectors to promote sustainable environmental solutions while bolstering efforts to manage costs.



The Small Systems Program Team

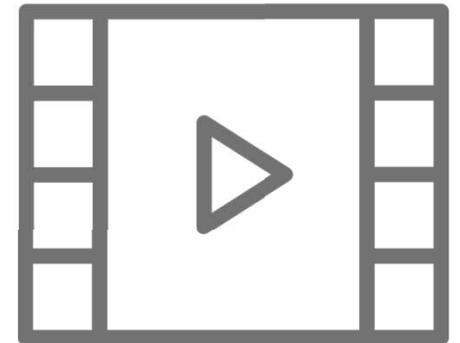
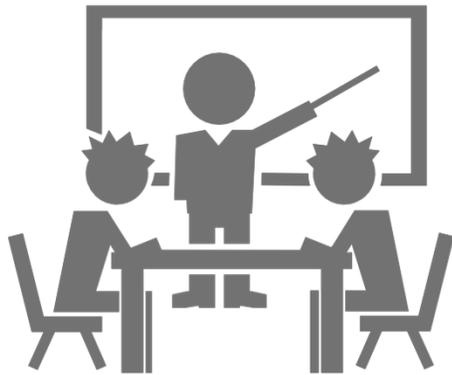
- Environmental Finance Center at The University of North Carolina at Chapel Hill
- Southwest Environmental Finance Center at the University of New Mexico
- Syracuse University Environmental Finance Center
- Environmental Finance Center at Wichita State University
- EFC West
- Environmental Finance Center at the University of Maryland
- New England Environmental Finance Center at the University of Southern Maine
- Great Lakes Environmental Infrastructure Center
- Government Finance Officers Association (GFOA)
- National Association of Development Organizations (NADO)





Smart Management for Small Water Systems Program

FREE





Areas of Expertise



Asset Management



Rate Setting and Fiscal Planning



Leadership Through Decision-making and Communication



Water Loss Reduction



Energy Management Planning



Accessing Infrastructure Financing Programs



Workforce Development



Water Conservation Finance and Management



Collaborating with Other Water Systems



Resiliency Planning



Managing Drought



Quick Introductions

1. Name?
2. Organization?
3. Responsibility?
4. Details on your water system
5. What are you most proud of at your water system?
6. What is your biggest issue?



Workshop Objectives

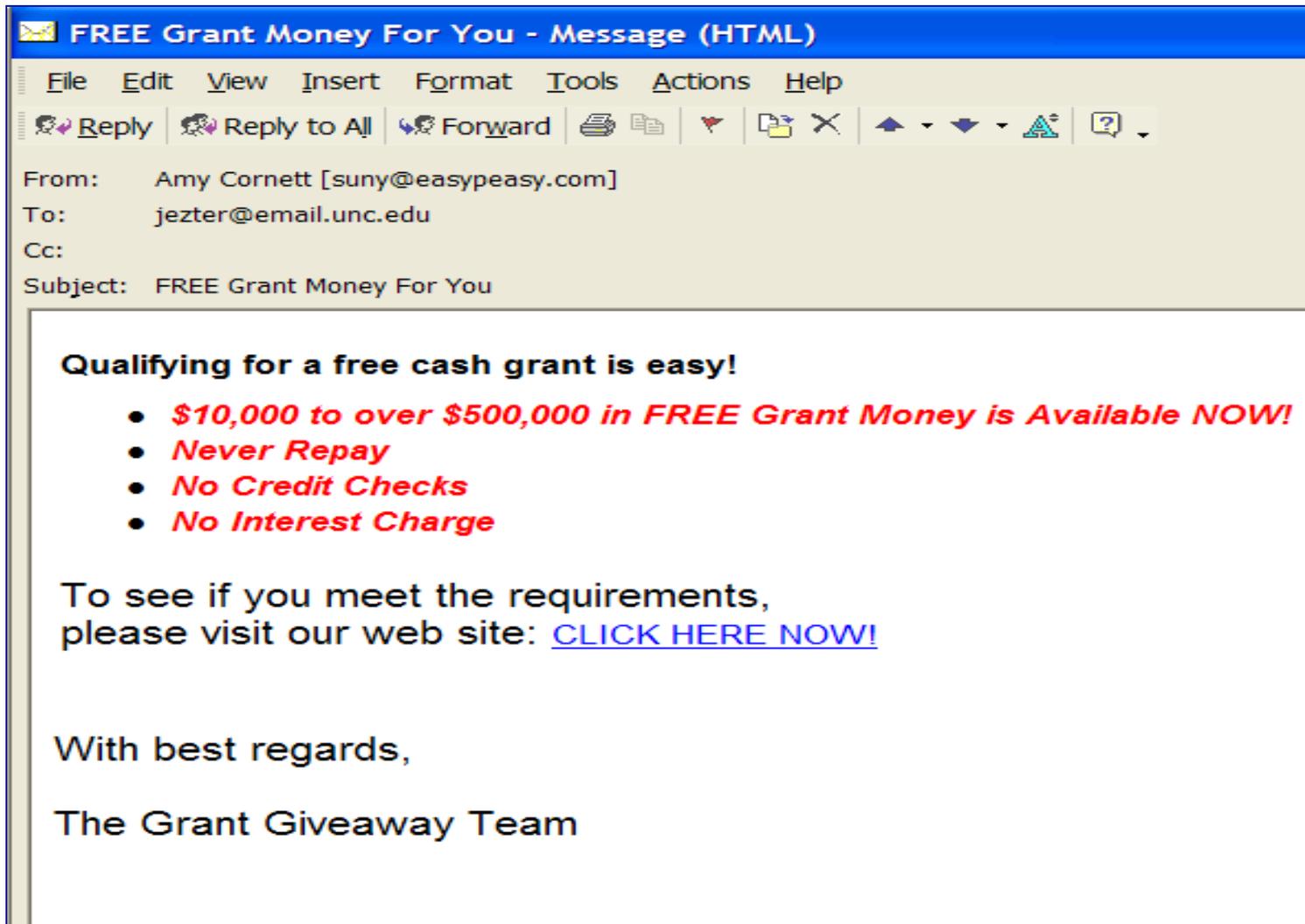
- Understand how your system is doing financially
- Learn how to plan for and finance your water system now and into the future
- Provide forum for sharing finance and management perspectives, ideas, and experiences



Agenda

- 9:00 AM Introductions
Revenues and Rate Setting
- 11:00 AM *Break**
- 11:15 AM Long Term System Planning Part I
- 12:00 PM *Lunch**
- 1:00 PM Long Term System Planning Part II
- 1:45 PM Available Funding Programs
- 2:30 PM *Break**
- 2:45 PM Workforce Planning
- 4:30 PM Evaluations and Adjourn

Topics Not Covered





Nigeria's anti-corruption unit finds \$43 million cash in Lagos apartment

By **Yemisi Adegoke, CNN**

Updated 10:03 AM ET, Fri April 14, 2017



Source: CNN

Watch: Millions seized from Nigerian apartment 01:14

Story highlights

Nigeria's anti-corruption agency discovered \$43 million in cash at a Lagos apartment

This is the latest in a string of busts thanks to a new whistleblowing policy

Lagos (CNN) — The Nigerian anti-corruption unit discovered more than \$43 million in US dollars at an upscale apartment in Lagos.

The anti-graft agency said in a statement it raided the apartment Tuesday after a tipoff about a "haggard"

Top stories



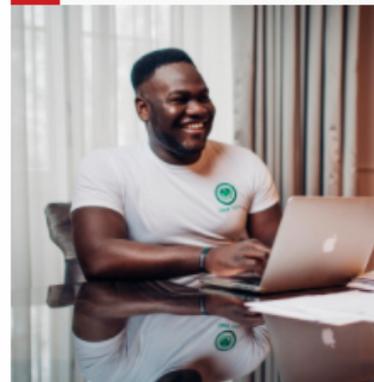
MLB team spent \$900M, still doesn't have a ring



Conservatives accuse the Pope of spreading heresy

Ad

WorldRemit



How to keep close to home

"I still love Nigeria and stay in touch with friends and family there." - Akin.



**A few questions for you before
we continue...**



What type of system are you?

- A. Local Government
- B. Non-Profit
- C. For-Profit
- D. Other
- E. Not a System



How many people do you serve?

- A. Up to 500
- B. 501 to 3,000
- C. 3,001 to 10,000
- D. More than 10,000
- E. Not a System



What is your background?

- A. Science/Engineering
- B. Law
- C. Finance
- D. Management
- E. South African Literature



Pricing Water to Achieve Full Cost Recovery

Carol Rosenfeld

Environmental Finance Center

The University of North Carolina at Chapel Hill

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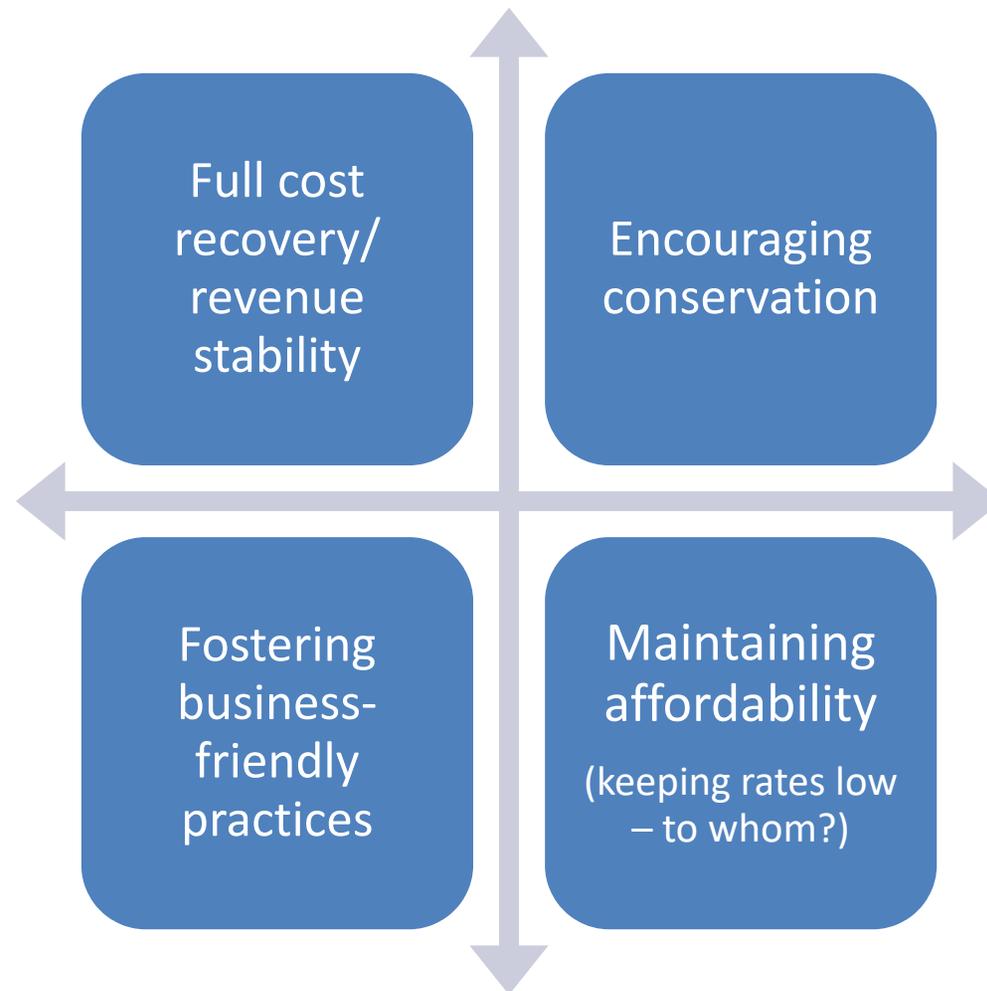


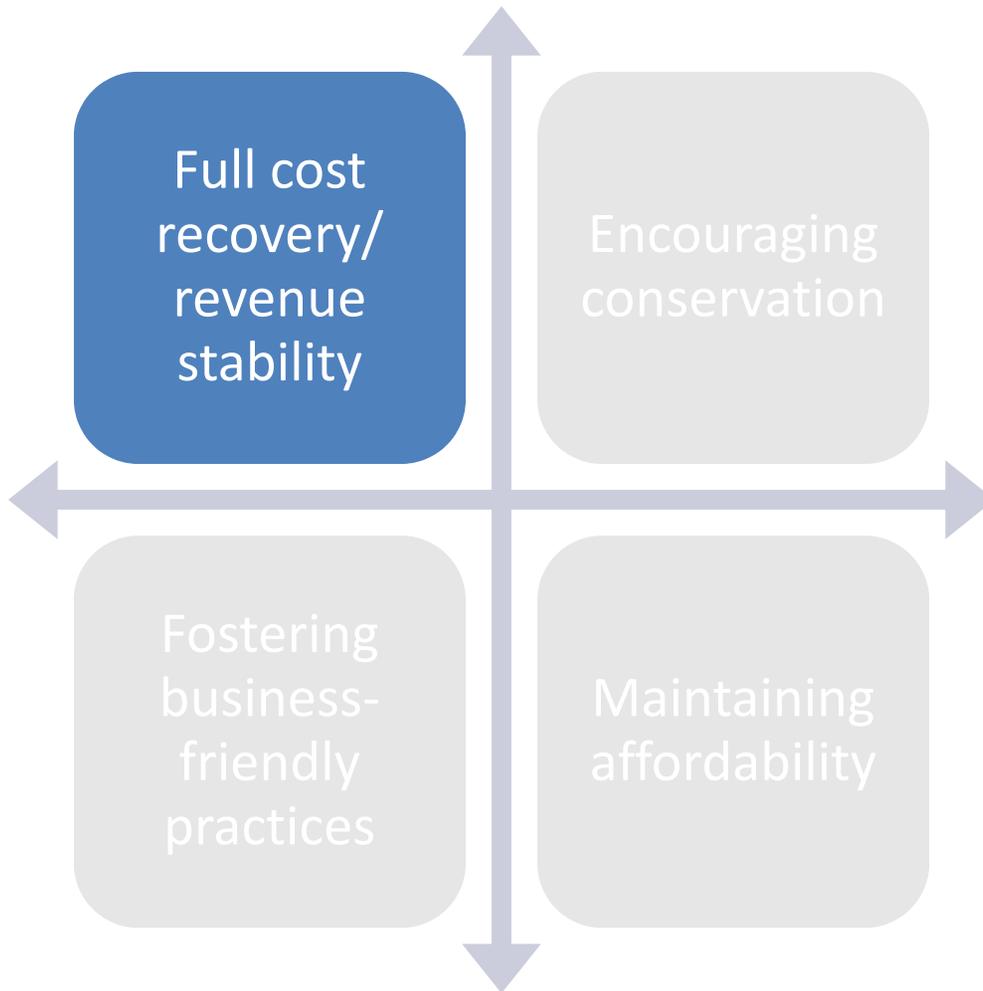
Session Objectives

- Understand how to calculate the base charges and volumetric charges to cover the full cost of providing water service
- Demonstrate the impact of different pricing structures on different customers
- Discuss what factors can impact your pricing assumptions



Examples of Four Rate Setting Objectives

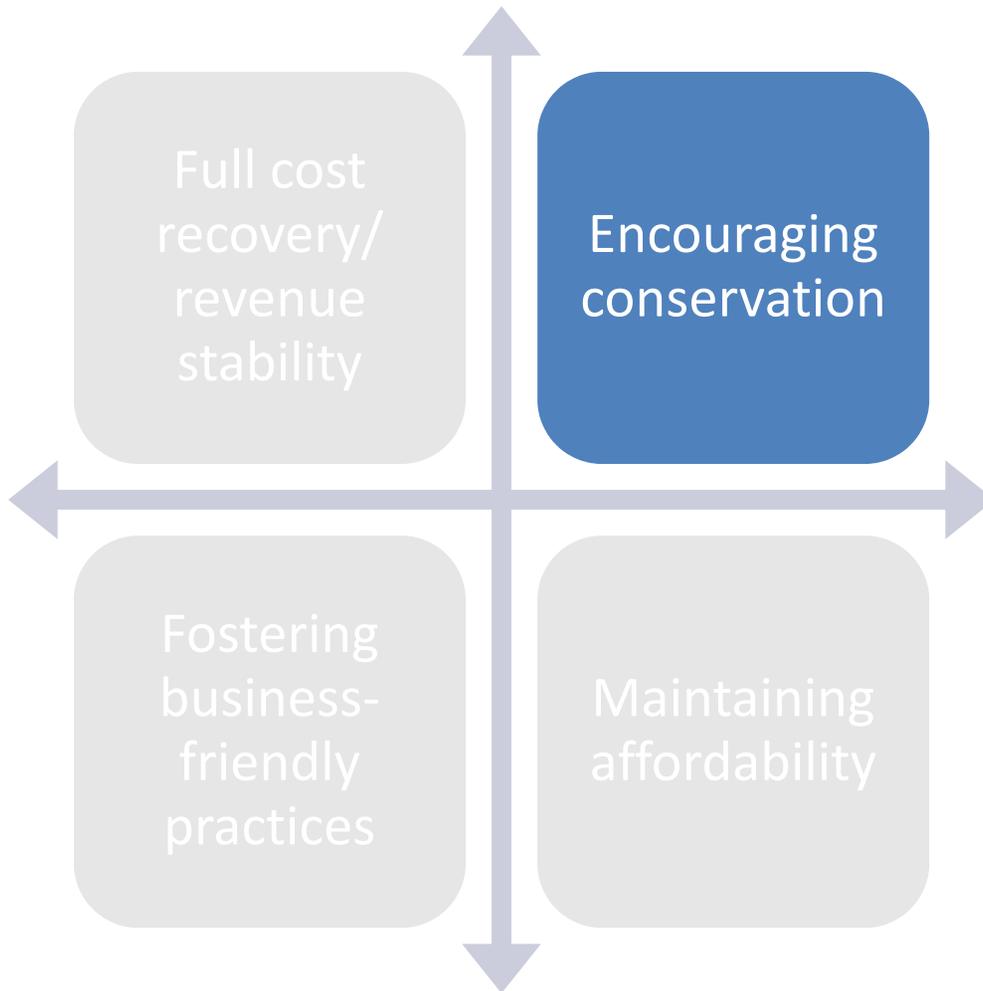




Bring in enough revenue to cover the full cost of running the water system:

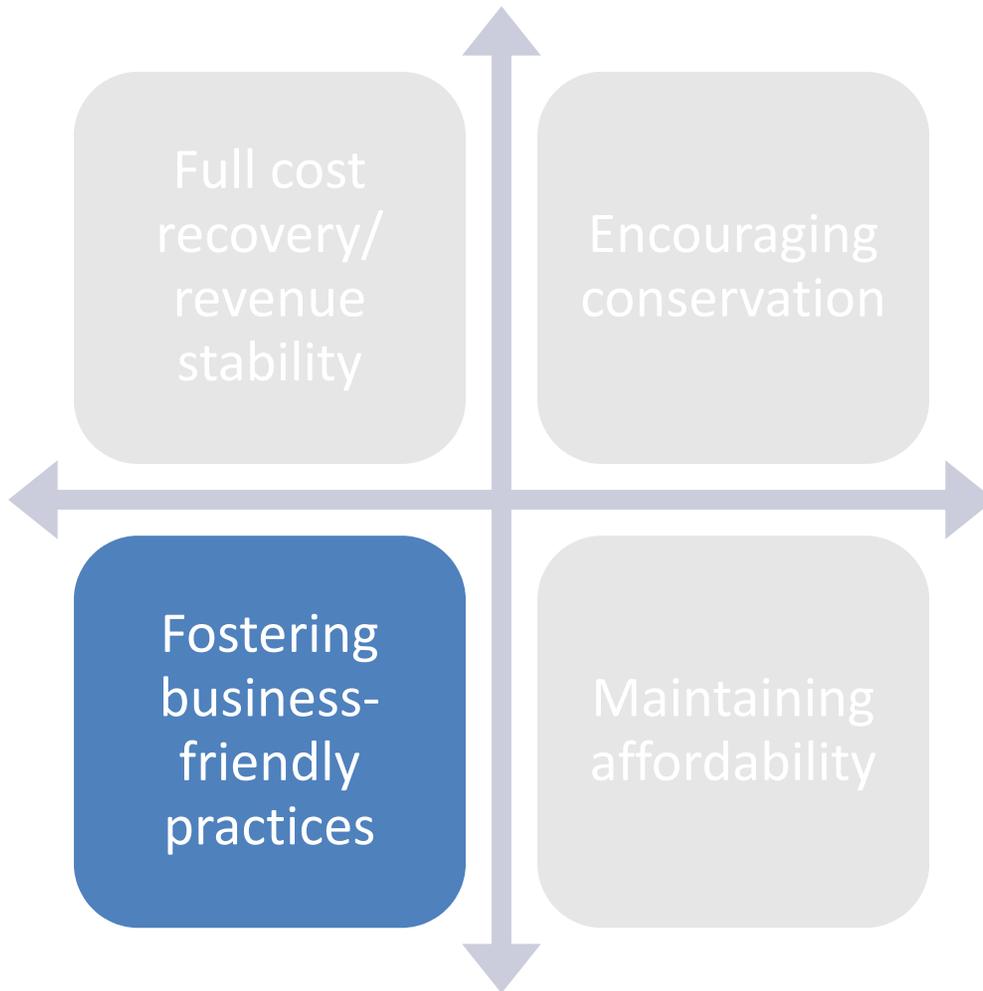
- O&M
- Capital needs
- Debt service

Why do this?



Use pricing to encourage customers to reduce their water consumption

Why do this?

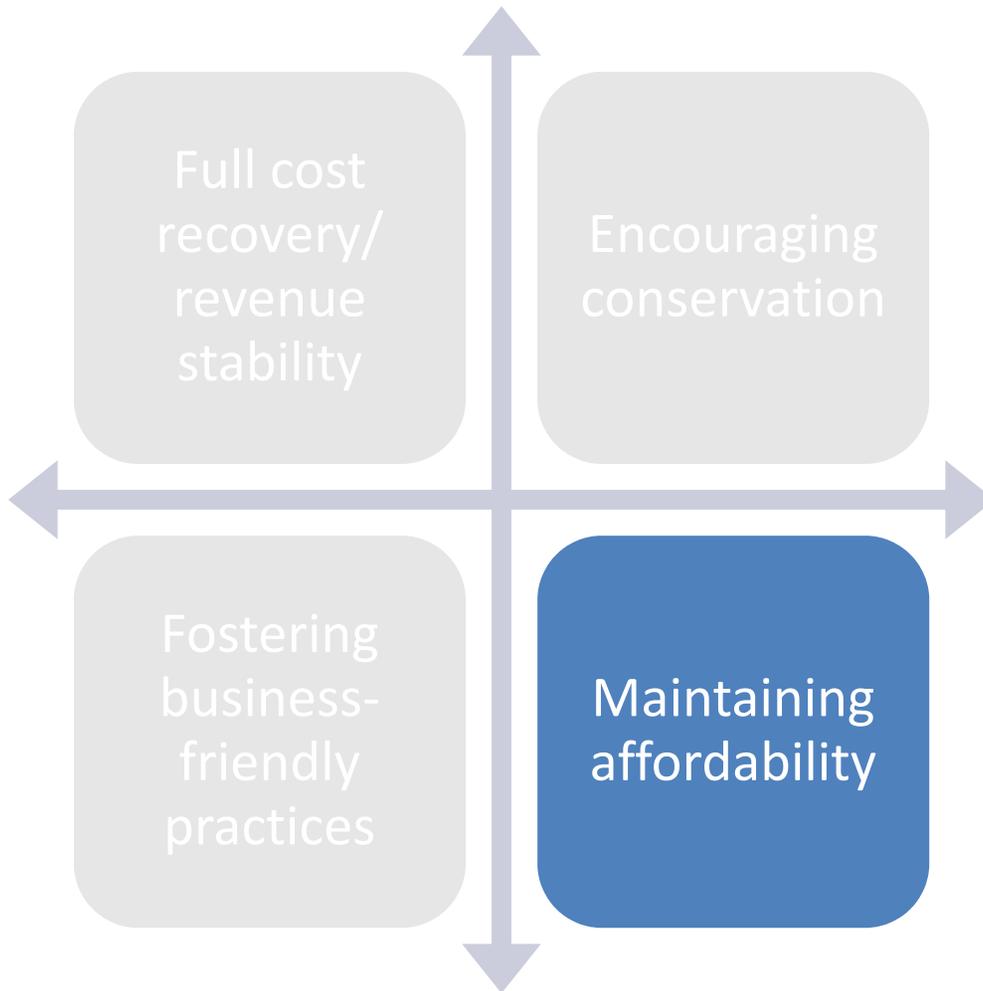


Use pricing to encourage businesses and agriculture to locate in your community or stay in your community

Why do this?



Ensure that all customers in your water system are able to afford enough water to live on



Why do this?



What is your #1 objective?

- A. Full cost recovery
- B. Encouraging conservation
- C. Business friendly
- D. Affordability
- E. Something else

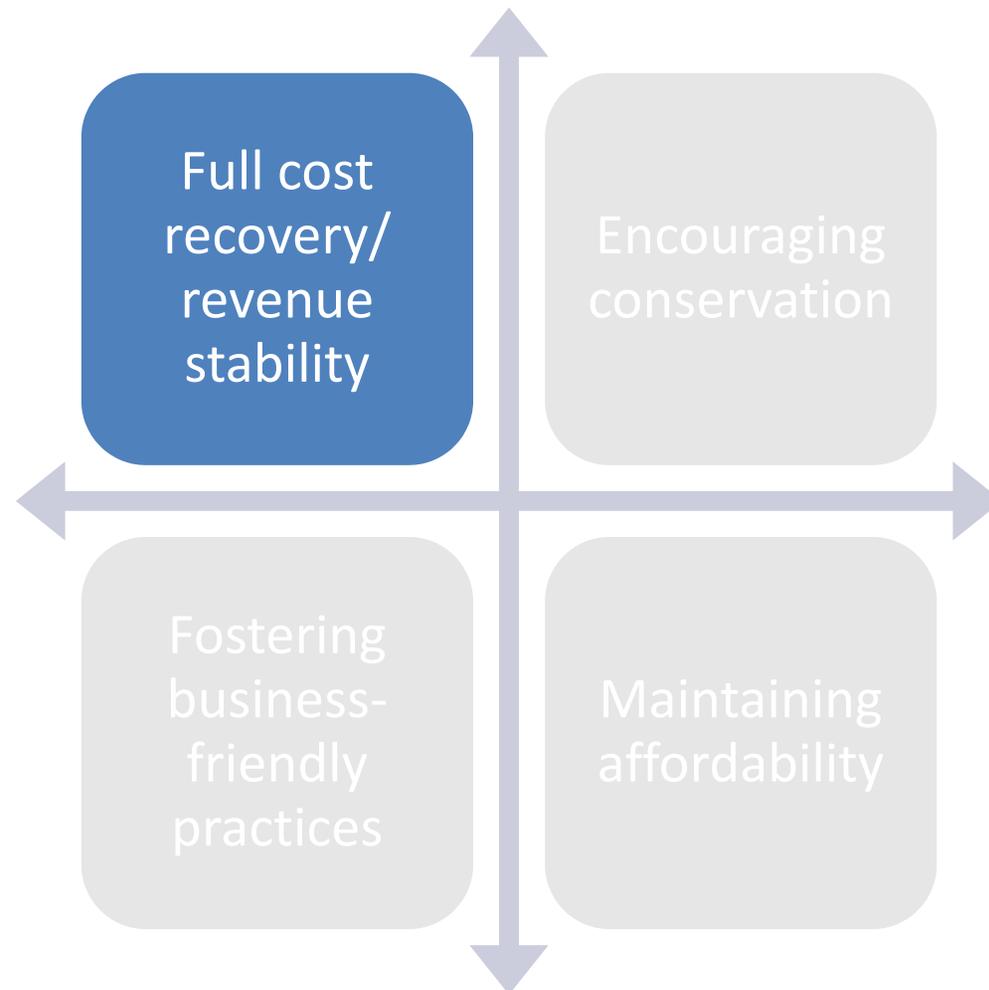


What is your #2 objective?

- A. Full cost recovery
- B. Encouraging conservation
- C. Business friendly
- D. Affordability
- E. Something else



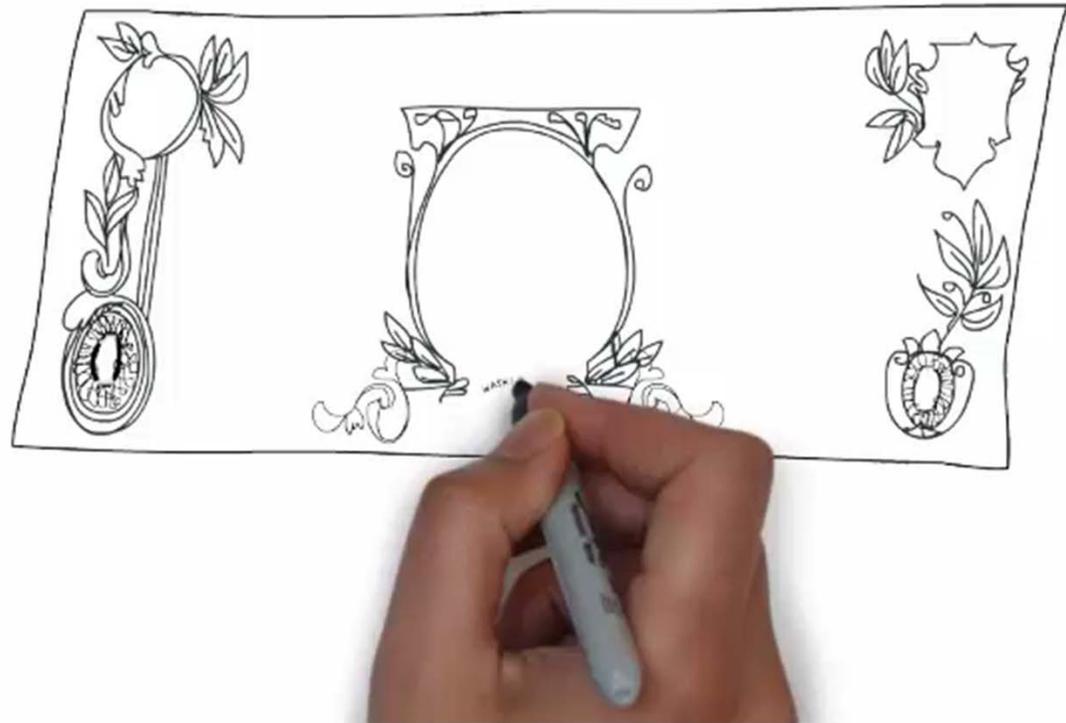
Water System Objectives





Understanding Water Revenues

**How
Utilities
Generate
Revenue**



<https://www.youtube.com/watch?v=0jf83mE0Lyk>



Full Cost Pricing

- The goal of full cost pricing is to have the charges for water cover the entire cost of running the water system today and into the future
- Of course, there are many ways in which you can get to the right dollar figure. Some of it comes down to your rate setting philosophy



Rate Setting Philosophies

- Payment for access vs. payment for volume of product received
- Fixed charges for fixed costs and variable charges for variable costs
- Some mix of the above ideas



Rate Setting Philosophies

Jeff Hughes

The Science of Setting Water and Sewer Rates

- *An increase in mergers and acquisitions*
- *Almost \$8 billion in assets and more than \$1 billion in annual revenues¹*
- *Changing regulations, affecting the bottom line*
- *A backlog in capital investment needs*
- *Interruptions in supplies that hurt revenues*
- *Loss of major customers*
- *Innovative pricing and customer-relations strategies*
- *Sagging revenues*

typically fall on governing boards that were chosen not as business or technical experts but as representatives of their constituents on a broad range of matters.

The drought of 2002 brought two types of water stories to the headlines: (1) the struggles of many communities to maintain their water supplies and (2) the financial difficulties of many communities due to decreased sales. The response to the first type of circumstance was immediate and significant: an executive order requiring conservation, and statewide initiatives to examine current supplies. The response to the second type of circumstance has been less obvious and less pronounced.

Table 1). These numbers are impressive. However, the projected numbers are staggering. According to a study by the North Carolina Rural Economic Development Center, the state will need more than \$11 billion in investments to meet its capital needs for water and sewer infrastructure over the next twenty years.²

In North Carolina, as throughout the country, numerous water and sewer enterprises owned by local governments benefited from the federal government's ambitious construction grants program of the 1970s (for the patterns of federal wastewater funding from 1970 to 2000, see Figure 1). Many local government officials fondly remember those days of





Irvindale, USA Exercise

Small town with a water and wastewater system



Population: 1,100



Service Connections: 450



MHI: \$24,432



Exercise

Let's figure out some rates for Irvindale that cover the full cost of providing water service



Irvindale's Rates

	Account	Budget
1	30-329-00 W/S INTEREST EARNED DEPOS	\$0.00
2	30-334-00 CONTRIBUTIONS/DONATIONS	\$0.00
3	30-335-00 W/S MISC. REVENUE	\$700.00
4	30-336-00 FUND BALANCE APPROPRIATED	\$9,187.87
7	30-345-01 SALES TAX REFUND	\$0.00
9	30-371-01 W/S CHARGES	\$344,445.00
10	30-371-02 W/S ADJUSTMENTS	\$0.00
11	30-373-00 TAP CONNECTIONS	\$1,500.00
13	30-373-02 SERVICE CHARGES/CUT OFFS	\$12,500.00
14	30-373-04 IMPACT FEES	\$1,000.00
15	30-373-05 CAPITAL CONTRIBUTIONS	\$0.00
16	30-374-00 Online W/S Payment Fee	\$1,600.00
17	30-375-80 Contributed Capital - G.R.S.P.	\$0.00
18	30-375-81 Contributed Capital Fund	\$0.00
19	30-377-00 RBEG - Pump Station	\$0.00
20	30-378-00 I&I Study Grant - Commerce	\$12,000.00
22	30-385-00 SALE OF ASSETS	\$0.00
23	30-386-00 TRANSFER FROM OTHER FUND	\$0.00
		\$382,932.87



For the Exercise

Total Revenues:
\$382,932.87

Revenues from Rates:
\$344,445.00



Payment for Access

- In its pure form, everyone in the water system pays the same amount for access to the system, regardless of how much water they use



Payment for Access

We charge a flat rate of \$15.00 monthly

P.O. - BOX 133
JACKSONVILLE

WE ARE A SMALL TOWN WE DO NOT HAVE SEWERAGE

Jacksonville, GA



Payment for Access

- What information do we need to make this calculation?
- Total revenue needed from rates
- Total number of accounts

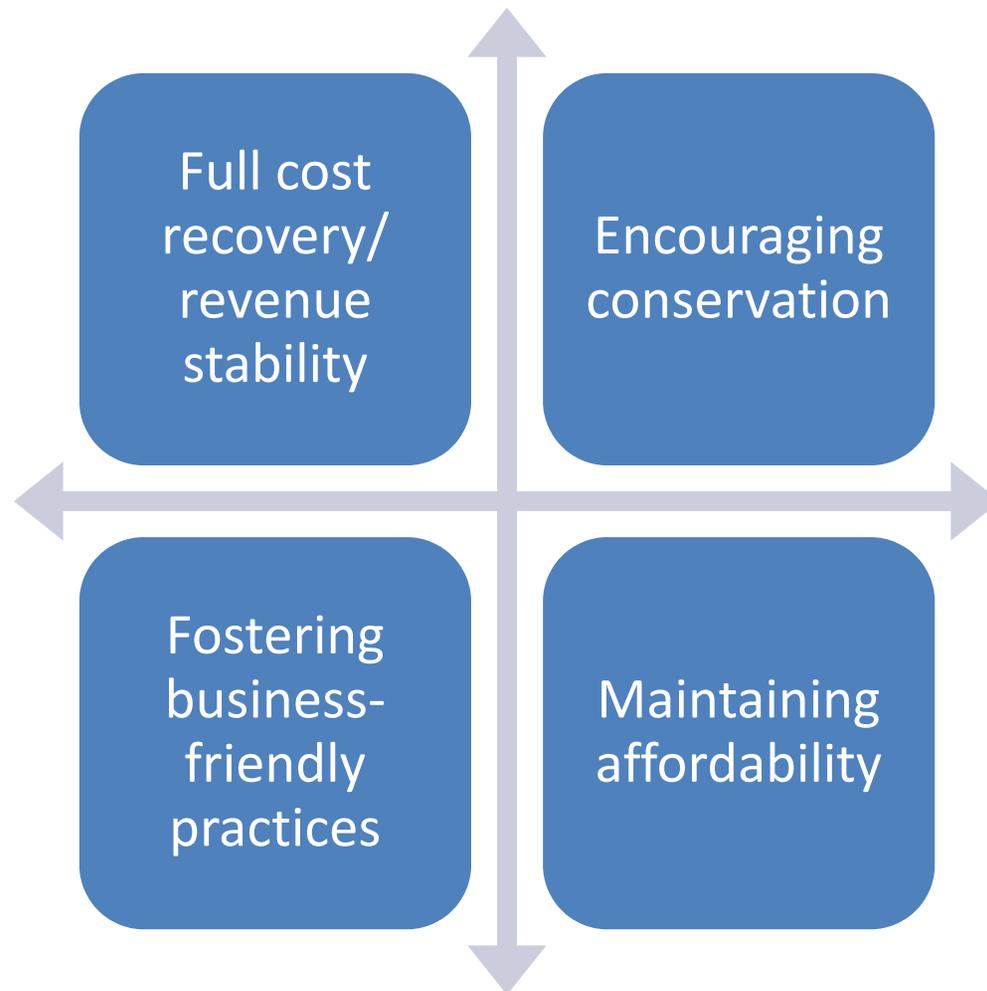


Payment for Access

$$\frac{\boxed{\$344,445}}{\text{Total Needed Revenue}} \div \frac{\boxed{\$765.43}}{\text{Total Annual Bill}} = \frac{\boxed{450}}{\text{Total Accounts}} \div \frac{\mathbf{12}}{\text{Monthly Bill}} = \boxed{\$63.79}$$



Which Water System Objectives?





Payment for volume of product received

- In its pure form, everyone in the water system pays for the volume of water received and only for the volume of water received



Payment for volume of product received

WATER & SEWER RATES

In Town

Water	\$ 7.72 per 1000 gallons
Sewer	\$ 10.73 per 1000 gallons

Out of Town

Water	\$ 15.44 per 1000 gallons
Sewer	\$ 21.46 per 1000 gallons

Troutman, NC



Payment for volume of product received

- What information do we need to make this calculation?
- Total revenue needed from rates
- Total gallons sold



Payment for volume of product received

$$\frac{\$344,445}{32,877,590} \times 1,000 = \$10.48$$

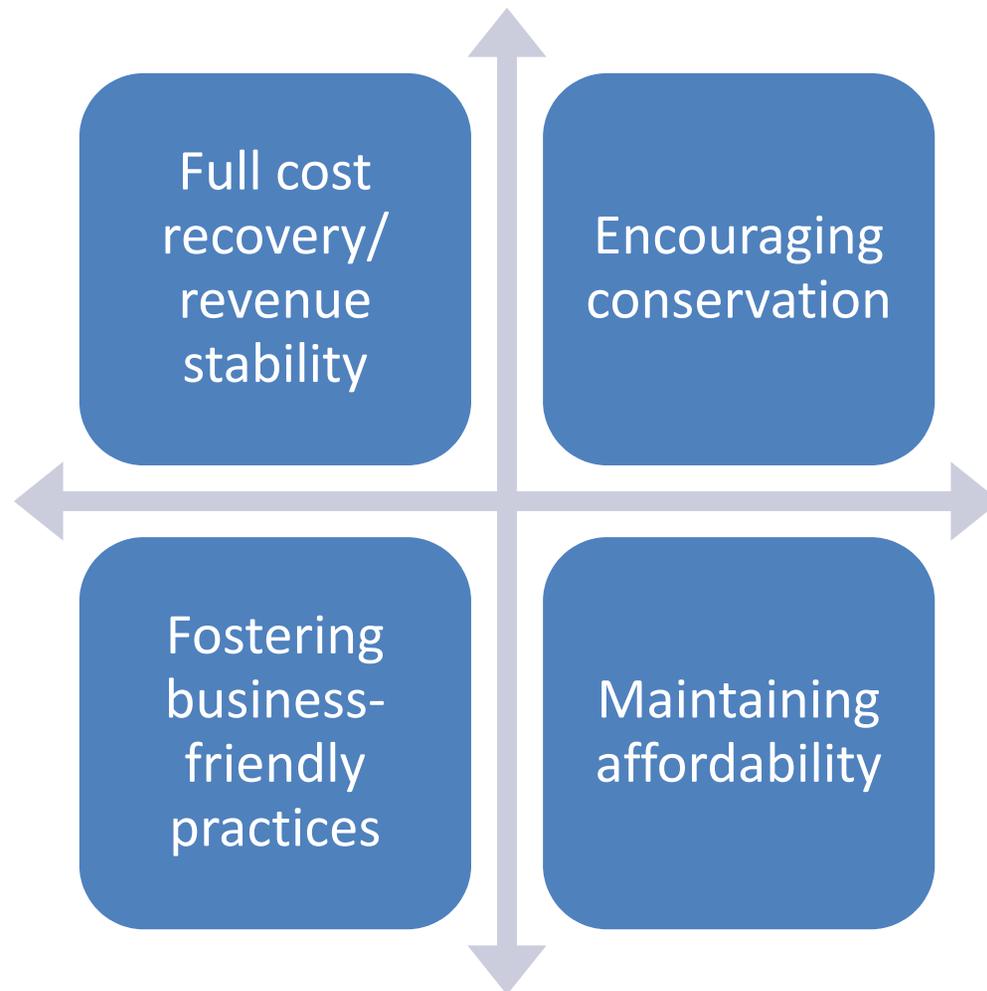
Total Needed Revenue

Total Gallons Sold

Price per 1,000 Gallons



Which Water System Objectives?





Base Charge for **Fixed Costs**; Volumetric Charge for **Variable Costs**

- In its pure form, all of the fixed costs of the water system would be covered by the base charge, and all of the variable costs would be covered by the volumetric rate



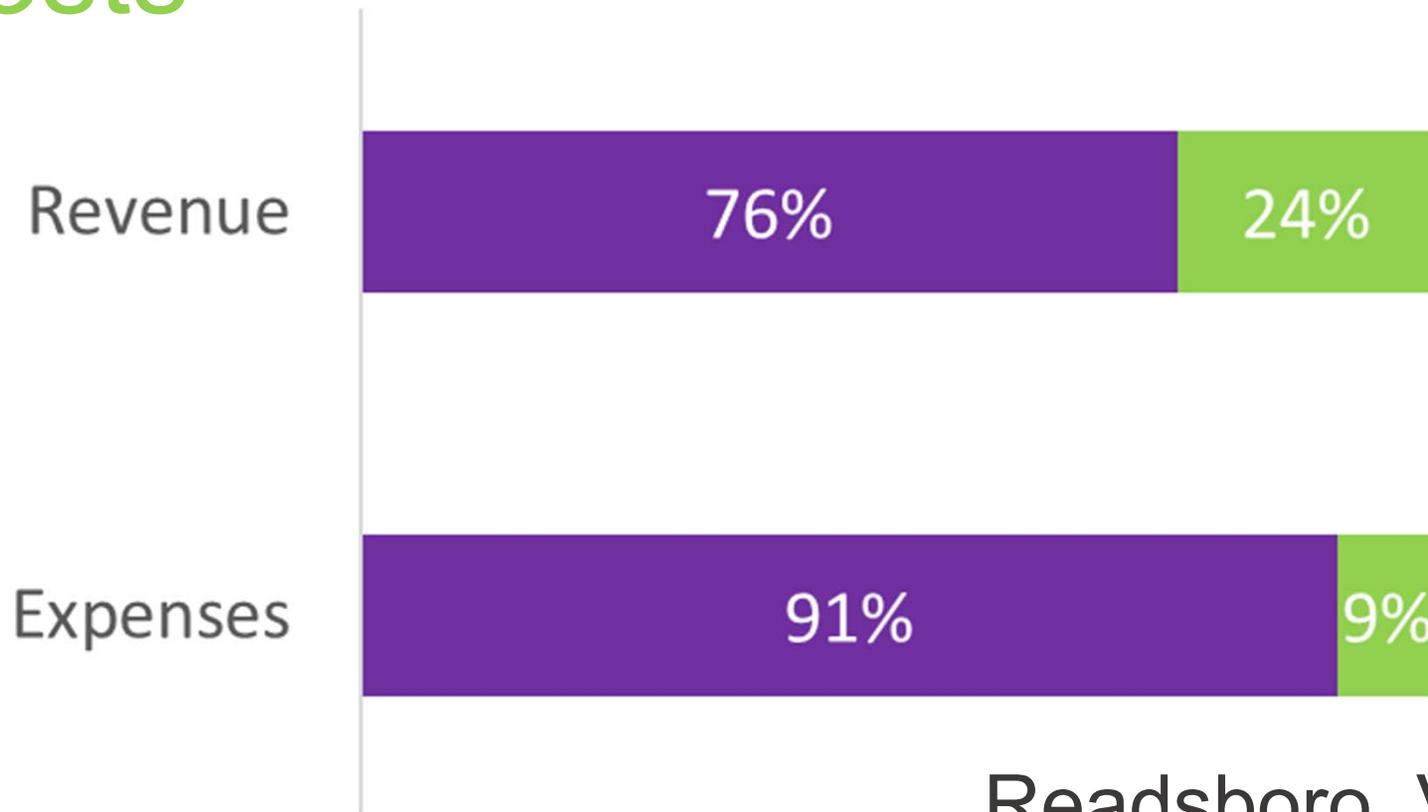
Base Charge for Fixed Costs; Volumetric Charge for Variable Costs

Base Chrg Lower Bound	Rate
38.00	0 0.000000
	4 9.500000

Readsboro, VT



Base Charge for Fixed Costs; Volumetric Charge for Variable Costs



Readsboro, VT



Base Charge for **Fixed Costs**; Volumetric Charge for **Variable Costs**

- What information do we need to make this calculation?
- Total revenue needed to cover fixed costs
- Total Accounts
- Total revenue needed to cover variable costs
- Total gallons sold



For the Exercise

Revenues from Rates:

\$344,445

Everything else



\$292,045

Fixed Cost

W/S Utilities
Chemicals & Salt
Purchase Water Bill



\$52,400

Variable
Cost



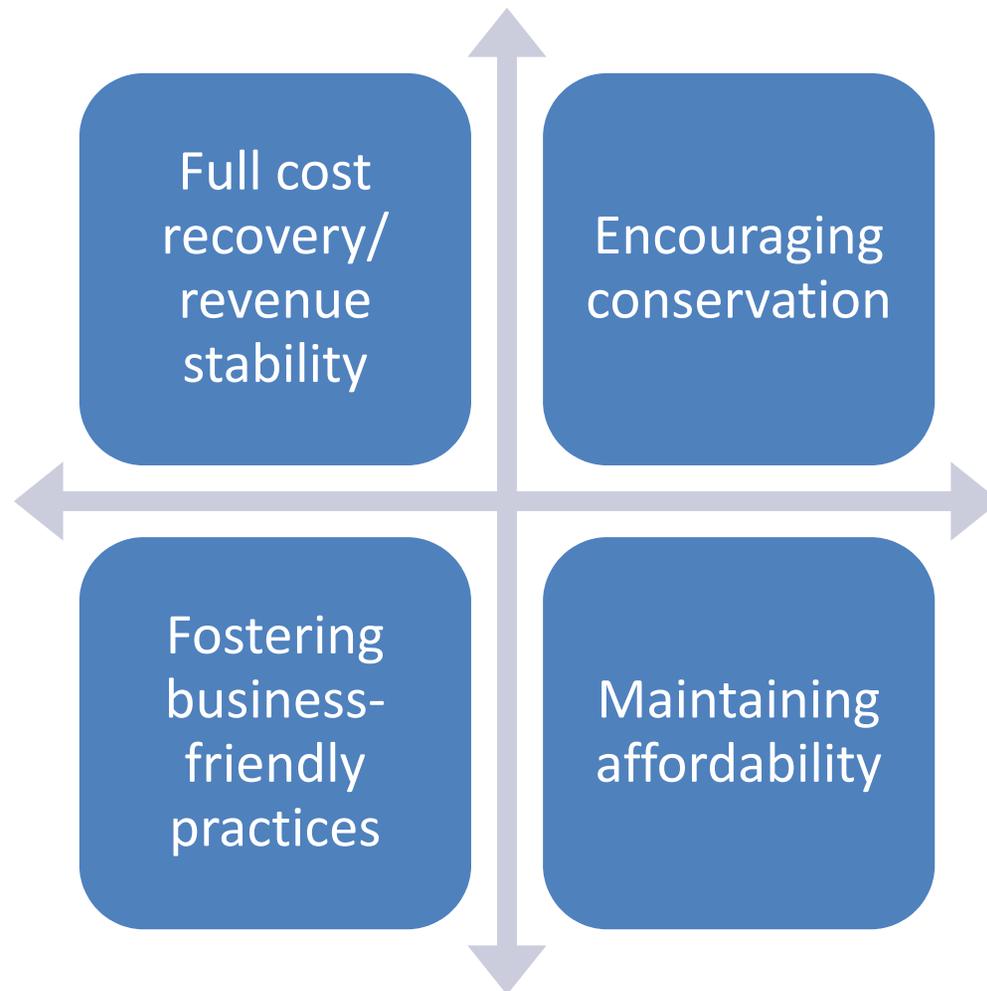
Base Charge for **Fixed Costs**; Volumetric Charge for **Variable Costs**

$$\frac{\boxed{\$292,045}}{\text{Fixed Annual Costs}} \div \frac{\boxed{\$648.99}}{\text{Total Annual Bill}} = \frac{\boxed{\$54.08}}{\text{Monthly Base Bill}}$$
$$\frac{\boxed{450}}{\text{Total Accounts}} = \mathbf{12}$$

$$\frac{\boxed{\$52,400}}{\text{Variable Annual Costs}} \times \mathbf{1,000} = \frac{\boxed{\$1.59}}{\text{Price per 1,000 Gallons}}$$
$$\frac{\boxed{32,877,590}}{\text{Total Gallons Sold}}$$



Which Water System Objectives?





\$25 Base Charge; Rest from Volumetric Rates

- Pick a base charge and see what the volumetric charge would need to be



\$25 Base Charge; Rest from Volumetric Rates

WATER & SEWER RATES AND FEE SCHEDULE EFFECTIVE

IN TOWN

WATER MINIMUM (1000 GALLONS)	\$25.00
SEWER MINIMUM (1000 GALLONS)	\$25.00
DISPOSAL FEE	\$ 5.00
ADDITIONAL WATER PER 1000 GALLONS	\$ 6.15

Denton, NC



\$25 Base Charge; Rest from Volumetric Rates

- What information do we need to make this calculation?
- Total Accounts
- Total Revenue Needed
- Total Gallons



\$25 Base Charge; Rest from Volumetric Rates

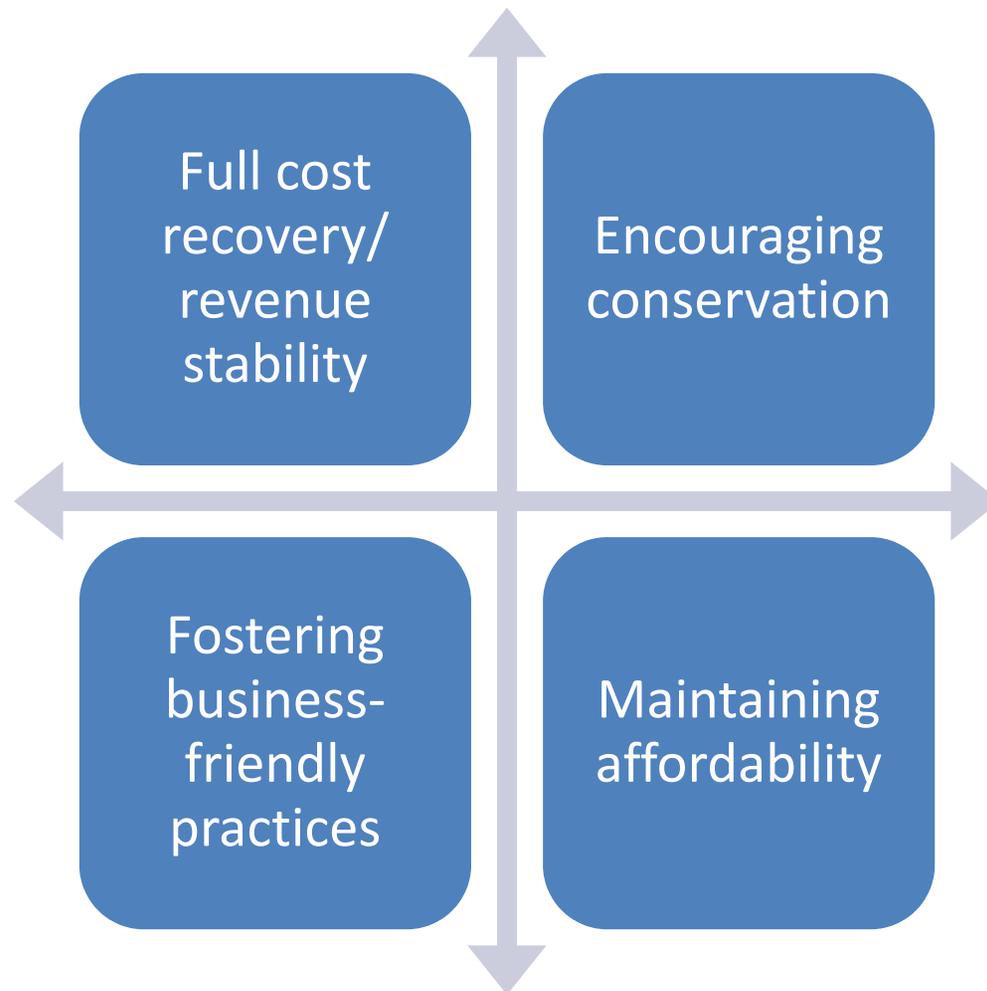
$$\begin{array}{r} \boxed{12} \\ \text{Months} \end{array} \times \begin{array}{r} \boxed{\$25} \\ \text{Monthly Base} \\ \text{Bill} \end{array} \times \begin{array}{r} \boxed{450} \\ \text{Total Accounts} \end{array} = \begin{array}{r} \boxed{\$135,000} \\ \text{Total from Base Bill} \end{array}$$

$$\begin{array}{r} \boxed{\$344,445} \\ \text{Total Revenue Needed} \\ - \boxed{\$135,000} \\ \text{Total from Base Bill} \\ \hline \boxed{\$209,445} \\ \text{Total Needed from Volumetric} \end{array}$$

$$\begin{array}{r} \boxed{\$209,445} \\ \text{Total Needed from Volumetric} \\ \hline \boxed{32,877,590} \\ \text{Total Gallons Sold} \end{array} \times 1,000 = \begin{array}{r} \boxed{\$6.37} \\ \text{Price per 1,000 Gallons} \end{array}$$



Which Water System Objectives?





Which looks most right to you?

- A. \$63.79 base
- B. \$10.49 per 1,000 gallons
- C. \$54.08 base
\$1.59 per 1,000 gallons
- D. \$25.00 base
\$6.37 per 1,000 gallons



So where do you think the \$25 per month base charge came from?



How This Impacts Customers

- All four rate structures get us to the same total revenue
- But how does each approach impact different types of customers?



How This Impacts Customers



1,000 gallons/month



4,000 gallons/month



12,000 gallons/month



34,000 gallons/month



Exercise

How much will water service cost per month for different customers under each rate structure?



The Rates

- \$63.79 base
- \$10.49 per 1,000 gallons
- \$54.08 base
\$1.59 per 1,000 gallons
- \$25.00 base
\$6.37 per 1,000 gallons



Payment for Access



\$63.79

\$63.79

\$63.79

\$63.79



Payment for Volume of Product Received



\$10.48

\$41.92

\$125.76

\$356.32



Base Charge for Fixed Costs; Volumetric Charge for Variable Costs



\$55.67

\$60.44

\$73.16

\$108.14



\$25 Base Charge; Volumetric Charge for Rest



\$31.37

\$50.48

\$101.44

\$241.58



	 1,000 gallons/month	 4,000 gallons/month	 12,000 gallons/month	 34,000 gallons/month
Payment for Access (Fixed Monthly Bill)	\$63.79	\$63.79	\$63.79	\$63.79
Payment for Volume of Product Received	\$10.48	\$41.92	\$125.76	\$356.32
Base Charge for Fixed Costs; Volumetric Charge for Variable Costs	\$55.67	\$60.44	\$73.16	\$108.14
\$25 Base Charge; Volumetric Charge for Rest	\$31.37	\$50.48	\$101.44	\$241.58



These numbers are based on
Irvindale's budget

Does **Maybe, but
probably
not**



Your revenues last year were...

- A. Significantly higher than expected
- B. Slightly higher than expected
- C. Close to as planned
- D. Slightly lower than planned
- E. Significantly lower than planned



What causes variation?



Rate Changes



As rates go up, usage goes down

As a rule of thumb, typically usage goes down 3-4% for every 10% increase in rates



Population Change



Customers could be coming into your system or leaving your system



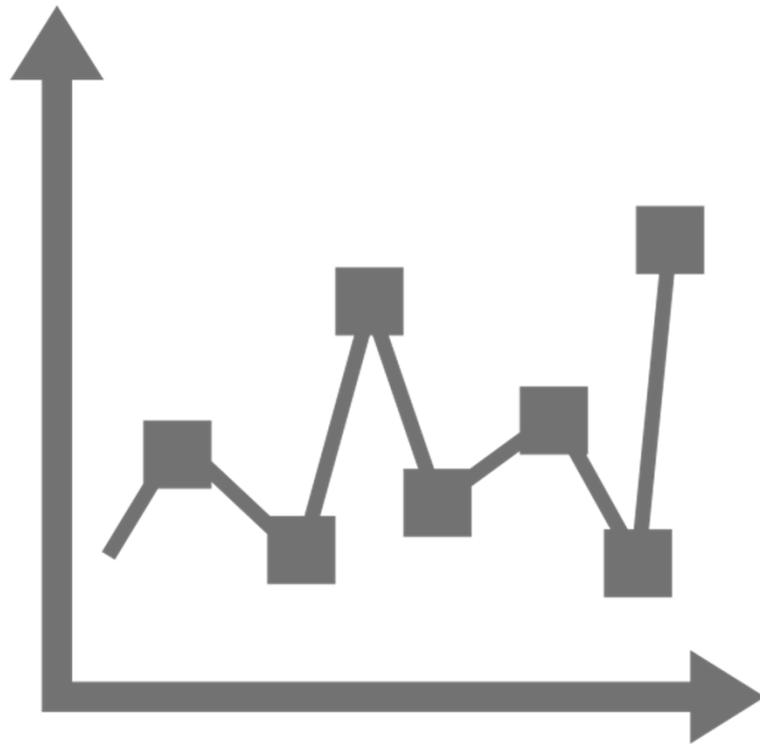
Loss of a Big Customer



Some customers use significantly more water than others. Losing a single big user can have a disproportionate impact on revenues



Economic Conditions



Economic downturns can cause customers to cut back on water use. Conversely, periods of economic growth can lead to higher water consumption



Changes in Collection Rates



Even if the number of customers doesn't change, how often they are paying you may be changing



Weather



Rainy conditions or dry/drought conditions can impact how much water customers use for outside irrigation



Water Use Restrictions



Whether due to water supply shortages or drought conditions, restricting water use will obviously impact revenues



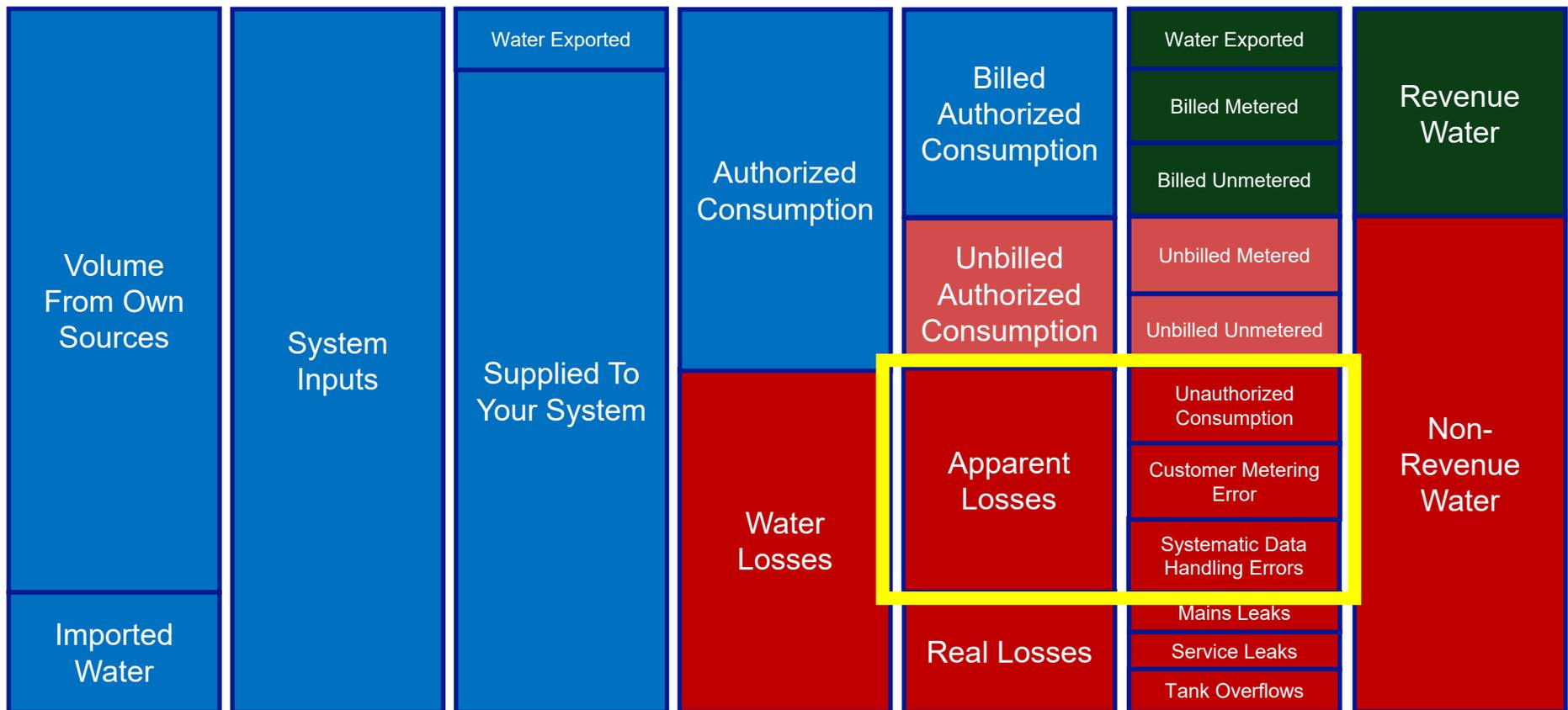
Technology



Fixtures use less water today than in the past, and overall per capita water demand is decreasing across the country



Bill Correctly





What to do?

- Multiple forecasts based on different assumptions
- Ideally, be conservative
- Don't forget price elasticity
- Use tools to stress test projections
- Give board options



Water and Wastewater Rates Analysis Model

<http://efc.sog.unc.edu> or <http://efcnetwork.org>

Find the most up-to-date version in Resources / Tools

Water & Wastewater Rates Analysis Model

Version 2.8.2 (last updated August 4, 2015)



Developed by the Environmental Finance Center at the University of North Carolina, Chapel Hill
<http://efc.sog.unc.edu>



Funded by the U.S. Environmental Protection Agency and the Public Water Supply Section of the North Carolina Department of Environment and Natural Resources

[Get Started](#)

[Download a copy of the model populated with data from an example utility](#)

DESCRIPTION

A do-it-yourself, simplified financial model to assist utility managers and private system owners in setting water and wastewater rates.

FEATURES

- Comparisons of annual fund balance projections (for up to 20 years) under proposed new rates vs. staying with existing rates
- Adjust rates for the next 1-5 years
- Up to 12 rate structures
- Uniform or block rates (up to 10 blocks)
- Model changes to accounts and water use
- Customizable list of operating and capital expenses
- Building up reserves through rates
- Compare monthly bills under new rates vs. existing rates
- Assess revenue sufficiency and fund balance
- Error notifications

INSTRUCTIONS

- Navigate using worksheet tabs at bottom of screen or following arrows and clicking on buttons
- In the green "Data Input" worksheets, input data in the dark green cells

View Results

Financial forecast of the next few years under "Existing" rates versus "New" rates (graphs of cost recovery and end-of-year fund balance)

How new rates compare to existing rates (graphs of monthly bills)

Year:	2015		2016	2017	2018	2019	2020
	Existing	New					
Revenue	\$11.50	\$13.00	\$14.00	\$17.00	\$20.00	\$21.00	
Change (gallons/month)	2,000	2,000	2,000	2,000	2,000	2,000	

Block End	Year					
	2015	2016	2017	2018	2019	2020
4,000 gal/mo	\$2.78	\$2.78	\$2.78	\$3.00	\$3.50	\$4.00
7,000 gal/mo	\$4.00	\$4.50	\$5.00	\$5.50		
10,000 gal/mo	\$6.00	\$6.50	\$7.00	\$8.00	\$9.00	\$9.00

Watch out for red "Error" messages describing where data entry errors

Created by the Environmental Finance Center at the University of North Carolina, Chapel Hill
Funded by the U.S. E.P.A. and the N.C. Department of Environment and Natural Resources



Water Utility Revenue Risk Assessment Tool

Water Utility Revenue Risk Assessment Tool
How Much Revenue Might Be Lost When Residential Customers Reduce Consumption?

Water Research Foundation | UNC ENVIRONMENTAL FINANCE CENTER

Version 1.0
Version date: November 15, 2013

Developed by: The Environmental Finance Center at the University of North Carolina, Chapel Hill
Developed for: Water Research Foundation

[Click here to access a video tutorial on using the tool.](#)

This tool allows utilities and technical assistance providers to quickly determine the proportion of residential revenues from water sales that may be at risk of loss when residential customers change demand patterns. When residential customers reduce demand, whether due to price elasticity effects, or normal weather fluctuations that affect their water demands, or in reaction to shocks (such as new water conservation programs, water shortage periods, change in economic conditions, etc.), utilities collect less revenue from customer sales than anticipated. Utilities often ask how much of their revenues are really and realistically at risk of loss if their customers lower their consumption. This tool allows utilities and their technical assistance providers to quickly determine these estimates based on the utility's own rate structure, customer demand profile and weather conditions.

The tool requires only minimal data input and uses simplifying assumptions as well as detailed models developed after analyzing hundreds of thousands of real customer water records to understand how water customers change demand patterns.

This simplified tool is focused solely on revenue projections and assessment. Costs and revenue requirements based on customer classifications are not incorporated into this model. The tool allows the user to compare two different residential rate structures and determine which rate structure offers greater revenue resiliency.

Home | Instructions and Data Needs | Input REFERENCE Rates | Input COMPARATIVE Rates | Revenues from REFERENCE Rates | Revenues |

- Excel tool (simplified)
- Focus on residential revenues
- Utility inputs own:
 - Rate structure details
 - Residential customer water use profile
 - Weather patterns
 - Assumptions on price elasticity
- Tool estimates the proportion of revenues that may be lost due to changes in water use patterns due to:
 - Rate increase, alone or plus:
 - Normal weather pattern changes, or
 - One-time, significant and sudden conservation effort

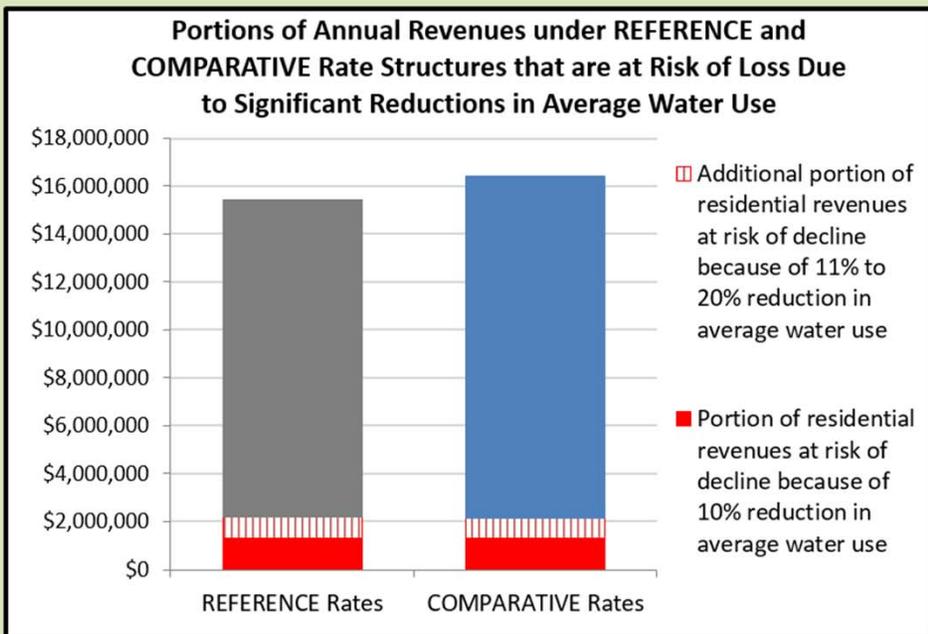
Free to download and use at
www.waterrf.org
www.efc.sog.unc.edu



Water Utility Revenue Risk Assessment Tool

Comparing Revenues After a Significant Decline in Water Use

How do the total revenues compare under both rate structures if there is a reduction of 10% - 20% in average water use and subsequent demand distribution shifts?



Decline in Total Annual Revenues for a:	REFERENCE Rates	COMPARATIVE Rates
10% reduction in avg use	\$1,311,000	\$1,319,000
20% reduction in avg use	\$2,181,000	\$2,167,000
10% reduction in avg use	8.5%	8.0%
20% reduction in avg use	14.2%	13.2%

The comparative rate structure generates revenues that are MORE resilient to sudden and significant declines in residential water use than the revenues generated by the reference rate structure. Revenues under the comparative rate structure are projected to drop 8% - 13.2% for a 10% - 20% reduction in average water use, and their related shifts in demand distribution. These declines occur after including the effect of price elasticity when adjusting rates from the reference rate structure to the comparative rate structure. By comparison, revenues under the reference rate structure are projected to drop 8.5% - 14.2% for the same declines in residential water use.



AWE Sales Forecasting and Rate Model

FINANCING SUSTAINABLE WATER
Rates. Revenue. Resources.

A project of the Alliance for Water Efficiency

HOME WATER EFFICIENCY BUILDING RATES IMPLEMENTATION FISCAL SUSTAINABILITY **TOOLS** RESOURCE SEARCH

Home · Tools · AWE Sales Forecasting and Rate Model

AWE Sales Forecasting and Rate Model

The AWE Sales Forecasting and Rate Model is a new analytical tool that can explicitly model the effects of rate structures. Typical water rate models assume that future sales are known with certainty, and do not respond to price, weather, the economy, or supply shortages — that is to say, not the world we live in. The AWE Sales Forecasting and Rate Model addresses this deficiency and enables analysis of the following:

- Customer Consumption Variability – weather, drought/shortage, or external shock
- Demand Response – Predicting future block sales (volume and revenue) with empirical price elasticities
- Drought Pricing – Contingency planning for revenue neutrality
- Probability Management – Risk theoretic simulation of revenue risks
- Fiscal Sustainability – Sales forecasting over a 5 Year Time Horizon

The Rate Design Module can answer these questions:

- What effect would increasing the top tier rate by 15% have on water demand?
- Will shifting to seasonal rates cause water use to increase or decrease?
- What block rate design could allow us to preserve our current level of revenue while reducing demand?
- How should we adjust rates to support our water demand management objectives during water shortages?
- What proportion of customer bills will

Available for Alliance for Water Efficiency members:

<http://www.financingsustainablewater.org/>