

A blue-tinted photograph of industrial water treatment equipment, including large pipes and valves, is positioned at the top of the slide.

Pricing Water to Achieve Full Cost Recovery

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Webinar 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

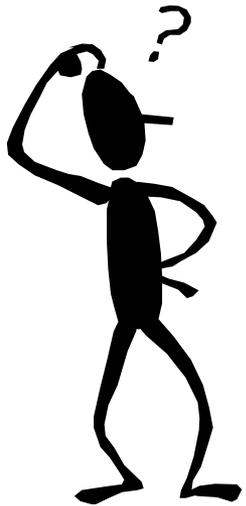


Rate structures are the primary way that we as water systems “communicate” with our customers

Here’s a question we hear often...



Are our
rates right?

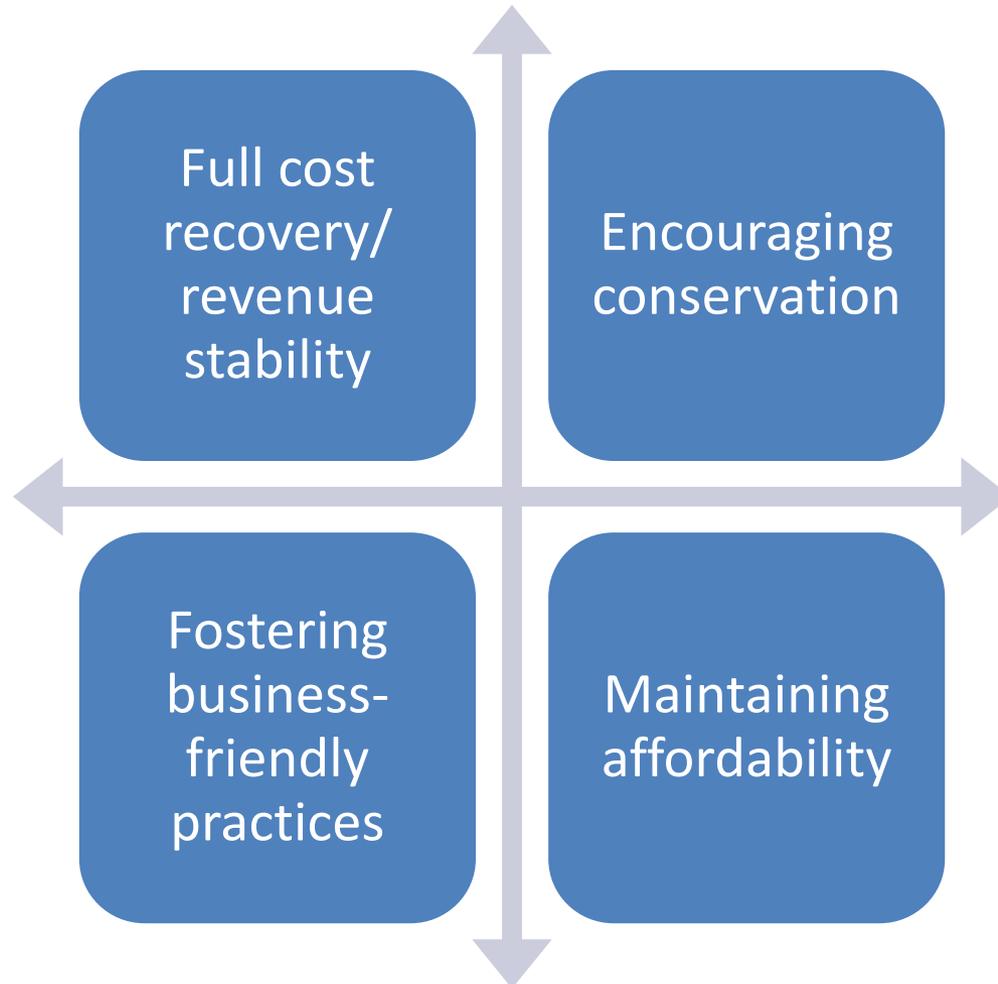


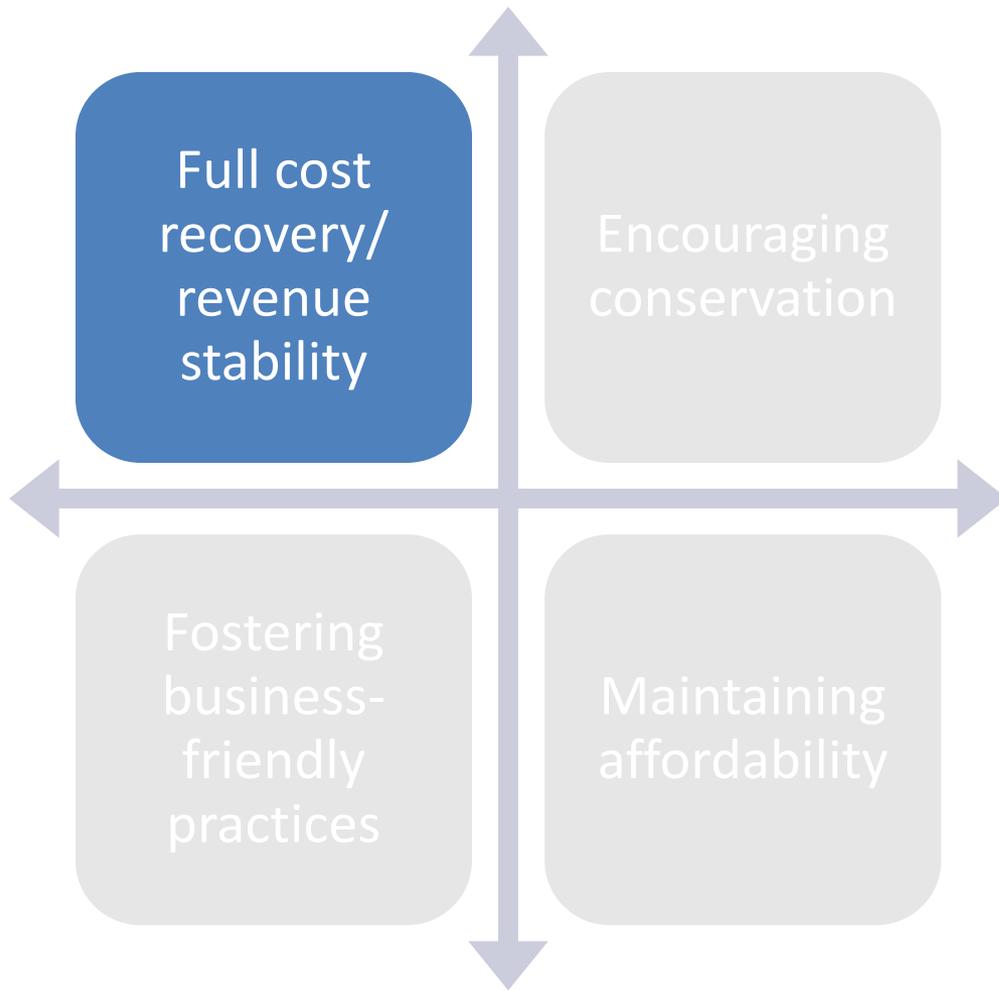
It depends...





Water System Objectives





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

- O&M
- Capital needs
- Debt service

Why do this?



Polling Questions



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 Painful Art 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



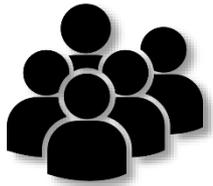
Let's figure out some rates for an example water system that cover the full cost of providing water service



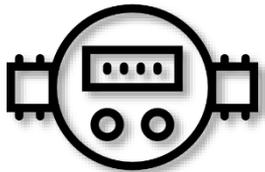


Irwindale, USA Exercise

Small town with a water and wastewater system



Population: 1,100



Service Connections: 450



MHI: \$24,432

Non-Rate Revenues

	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 sewage

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

$$\frac{\$344,445}{450} = \frac{\$765.43}{12} = \$63.79$$

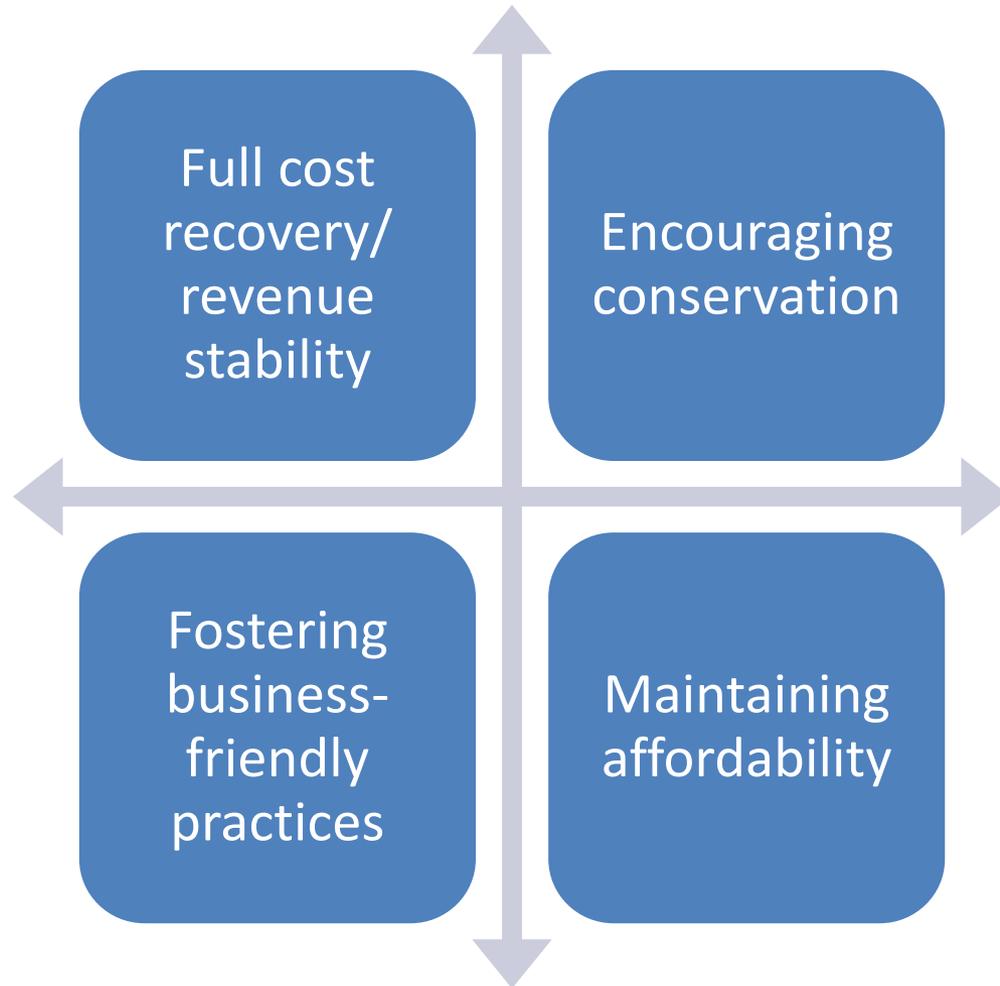
Total Needed Revenue

Total Annual Bill

Total Accounts

Monthly Bill

Which Rate Setting 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 1,000 gallons

Sewer \$10.73 per 1,000 gallons

Out of Town

Water \$15.44 per 1,000 gallons

Sewer \$21.46 per 1,000 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

\$344,445

Total Needed Revenue

32,877,590

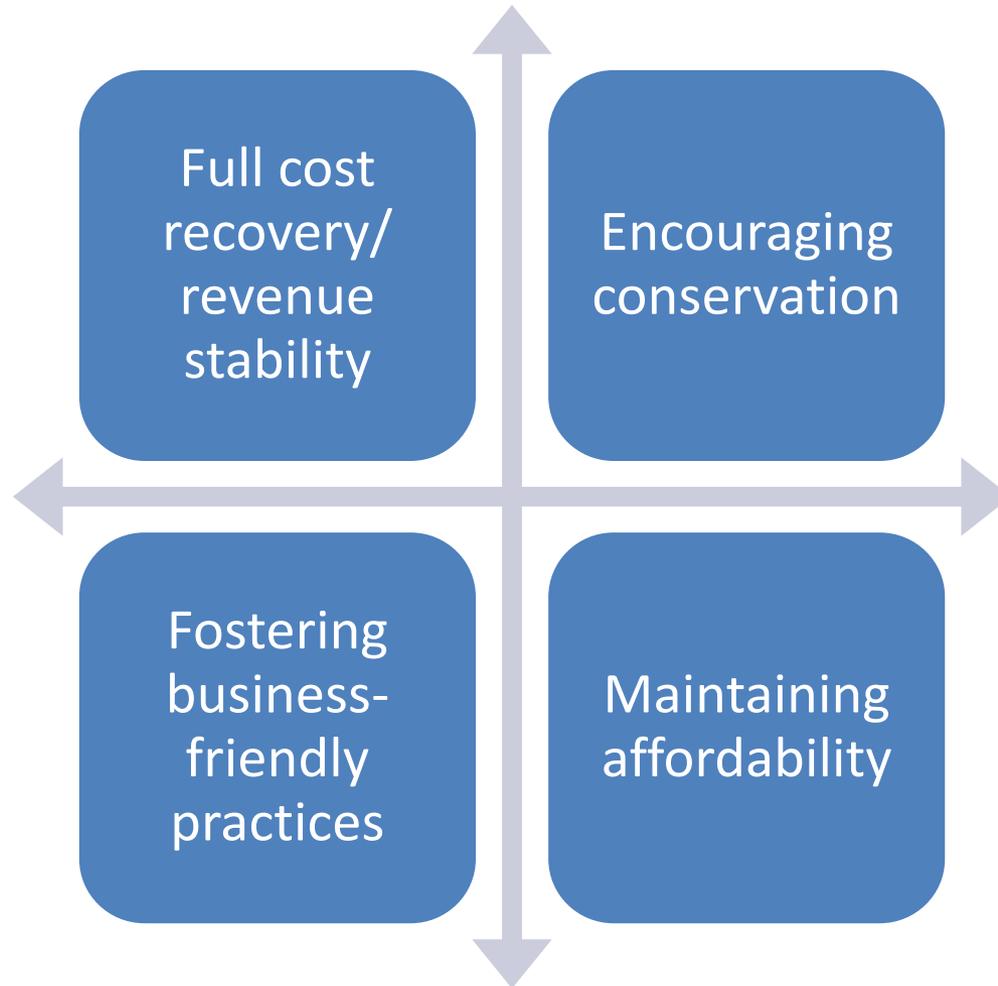
Total Gallons Sold

x 1,000 =

\$10.48

Price per 1,000 Gallons

Which Rate Setting Objectives?



A photograph of industrial water treatment equipment, showing large blue pipes and machinery. The image is partially obscured by the text overlay.

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

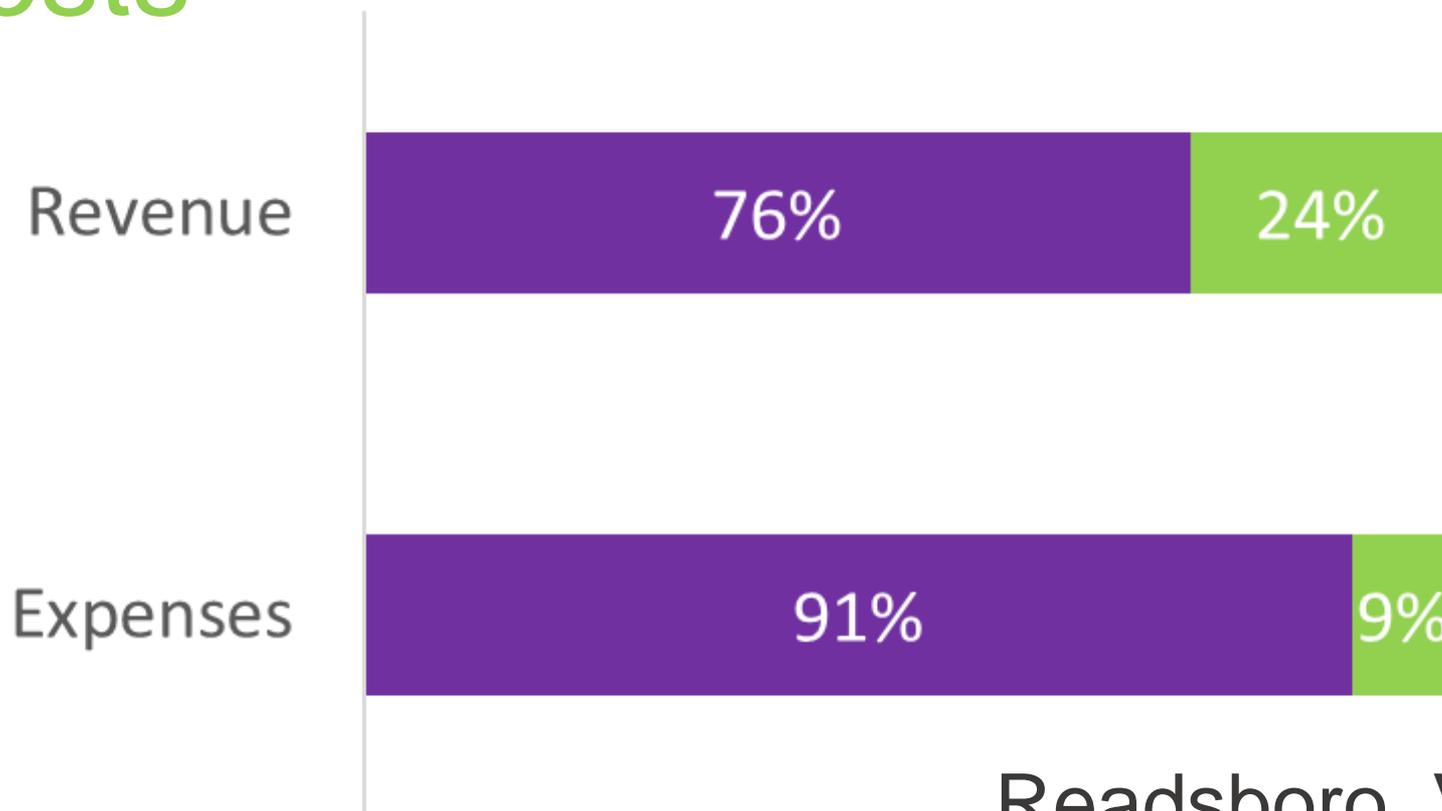
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4

9.500000

Readsboro, VT

Base Charge for Fixed Costs; Volumetric Charge for Variable Costs



Readsboro, VT

A blue-tinted photograph of industrial machinery, including large pipes and valves, is positioned at the top of the slide.

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 number of accounts
- Total revenue needed to cover variable costs
- Total gallons sold



For Irvindale

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

\$292,045

Fixed Annual Costs

\$648.99

Total Annual Bill

\$54.08

450

Total Accounts

12

Monthly Base Bill

\$52,400

Variable Annual Costs

x 1,000 =

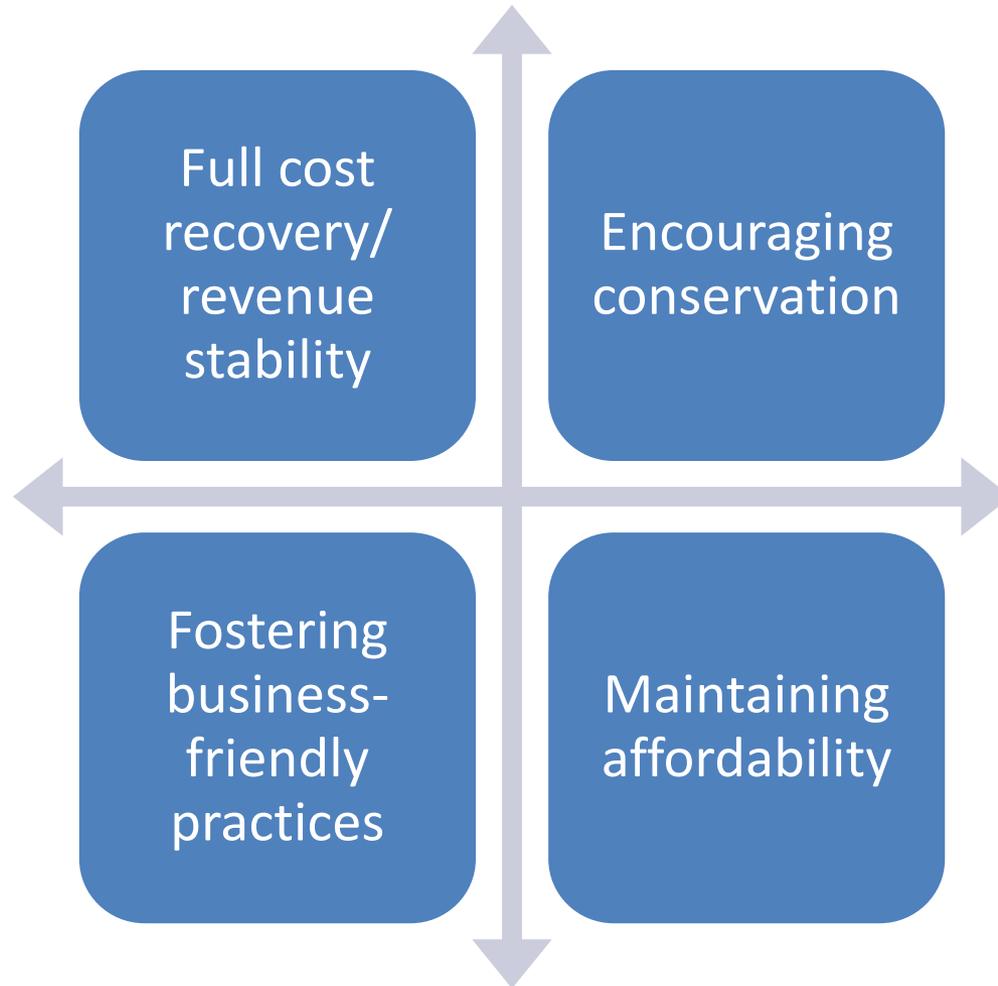
\$1.59

32,877,590

Total Gallons Sold

Price per 1,000 Gallons

Which Rate Setting 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

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

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

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



The Monthly Rate Structures

1. Base charge of \$63.79
2. Volumetric charge of \$10.48 /1,000 gal
3. Base charge of \$54.08
Volumetric charge of \$1.59 /1,000 gal
4. Base charge of \$25
Volumetric charge of \$6.37 /1,000 gal



Poll Question



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

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



What causes variation?

- Rate changes
- Population change
- Loss or gain of a big customer
- Economic conditions
- Change in collection rates
- Weather
- Usage restrictions
- Technology



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

- 1) Navigate using worksheet tabs at bottom of screen or following arrows and clicking on buttons
- 2) 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	\$11.50	\$13.00	\$14.40	\$17.00	\$20.00	\$21.00
New	2,000	2,000	2,000	2,000	2,000	2,000

Block End	4,000 gal/mo	7,000 gal/mo	10,000 gal/mo	13,000 gal/mo	16,000 gal/mo	19,000 gal/mo
Existing	\$2.78	\$2.78	\$2.78	\$3.00	\$3.50	\$4.00
New	\$5.00	\$5.00	\$7.00	\$5.00	\$5.00	\$9.00

Error: missing block rates
Error: missing block size

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

The screenshot shows the title page of an Excel spreadsheet. At the top, the title "Water Utility Revenue Risk Assessment Tool" is displayed in a dark blue box, with the subtitle "How Much Revenue Might Be Lost When Residential Customers Reduce Consumption?" below it. Logos for the Water Research Foundation and the UNC Environmental Finance Center are visible. A blue box indicates "Version 1.0" with a version date of "November 15, 2013". Below this, it states "Developed by: The Environmental Finance Center at the University of North Carolina, Chapel Hill" and "Developed for: Water Research Foundation". A link "Click here to access a video tutorial on using the tool" is provided. A text box contains a detailed description of the tool's purpose and assumptions. At the bottom, a navigation bar shows tabs for "Instructions and Data Needs", "Input REFERENCE Rates", "Input COMPARATIVE Rates", "Revenues from REFERENCE Rates", and "Revenues".

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

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

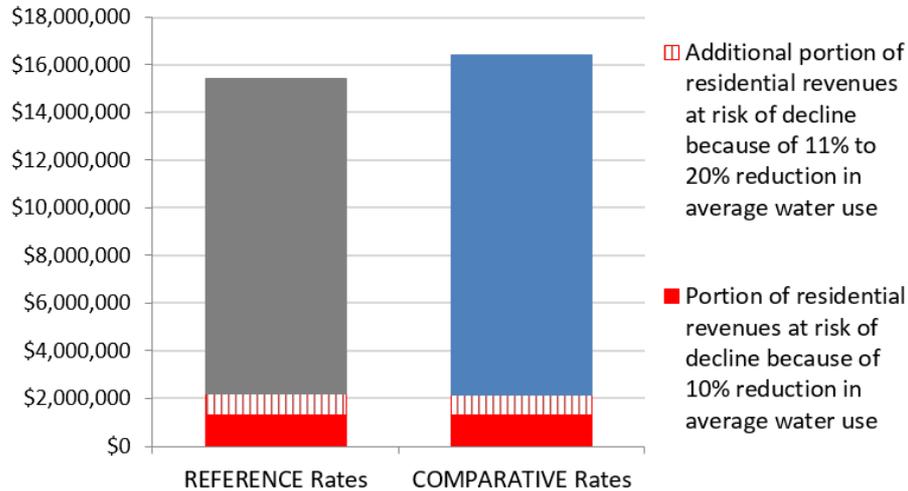
Free to download and use at
www.waterrf.org
www.efc.sog.unc.edu

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?

Portions of Annual Revenues under REFERENCE and COMPARATIVE Rate Structures that are at Risk of Loss Due to Significant Reductions in Average Water Use



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

Available for
Alliance for Water Efficiency members
<http://www.financingsustainablewater.org/>

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

Building Better Water Rates for an Uncertain World

AWE Sales Forecasting and Rate Model

Rate Model Video Tutorials

Request Tools

Rate Model User Guide

Appendices: Costing Methods, Demand Forecasting and Revenue Modeling

Communications Tools

RATES HANDBOOK
Building Better

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

Table: % Change in Average and Median Annual Water Demand for Customer Class

Customer Class	Base Rate		15% Increase		Seasonal Rates	
	Avg	Med	Avg	Med	Avg	Med
Single-Family Residential	100%	100%	95%	90%	105%	100%
Multi-Family Residential	100%	100%	98%	95%	102%	100%
Commercial	100%	100%	99%	98%	101%	100%
Industrial	100%	100%	99%	98%	101%	100%

Table: % of Bills Increasing by

Customer Class	Base Rate		15% Increase		Seasonal Rates	
	Avg	Med	Avg	Med	Avg	Med
Single-Family Residential	10%	5%	15%	10%	5%	10%
Multi-Family Residential	8%	4%	12%	8%	4%	8%
Commercial	5%	3%	7%	5%	3%	5%
Industrial	3%	2%	4%	3%	2%	3%

Figure: Single-Family Customer Class Bill Impact Histogram

A blue-tinted photograph of industrial water treatment equipment, including large pipes and valves, is positioned at the top of the slide.

Pricing Water to Achieve Full Cost Recovery

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