



# 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

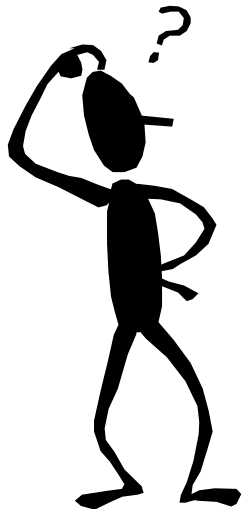


Rate structures are the primary way that we as water systems “communicate” with our customers

Here’s a question we hear often...



Are our  
rates right?

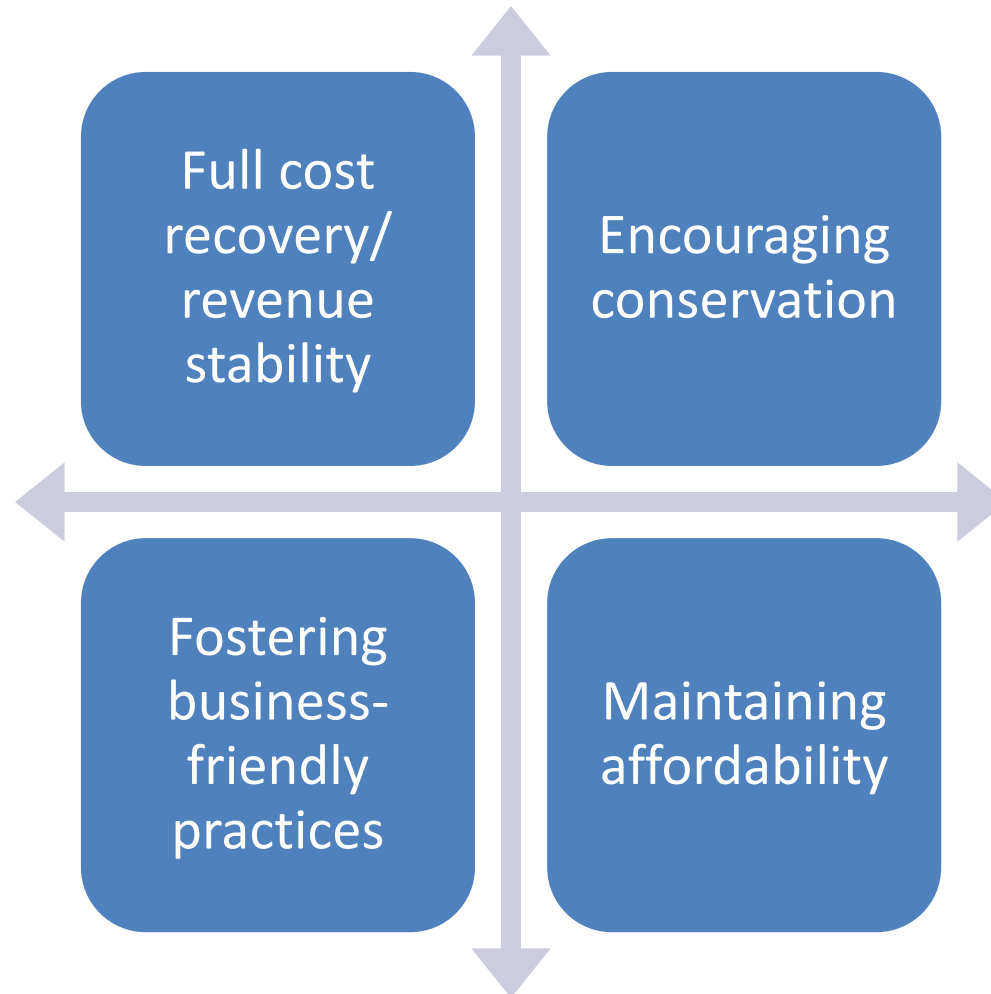


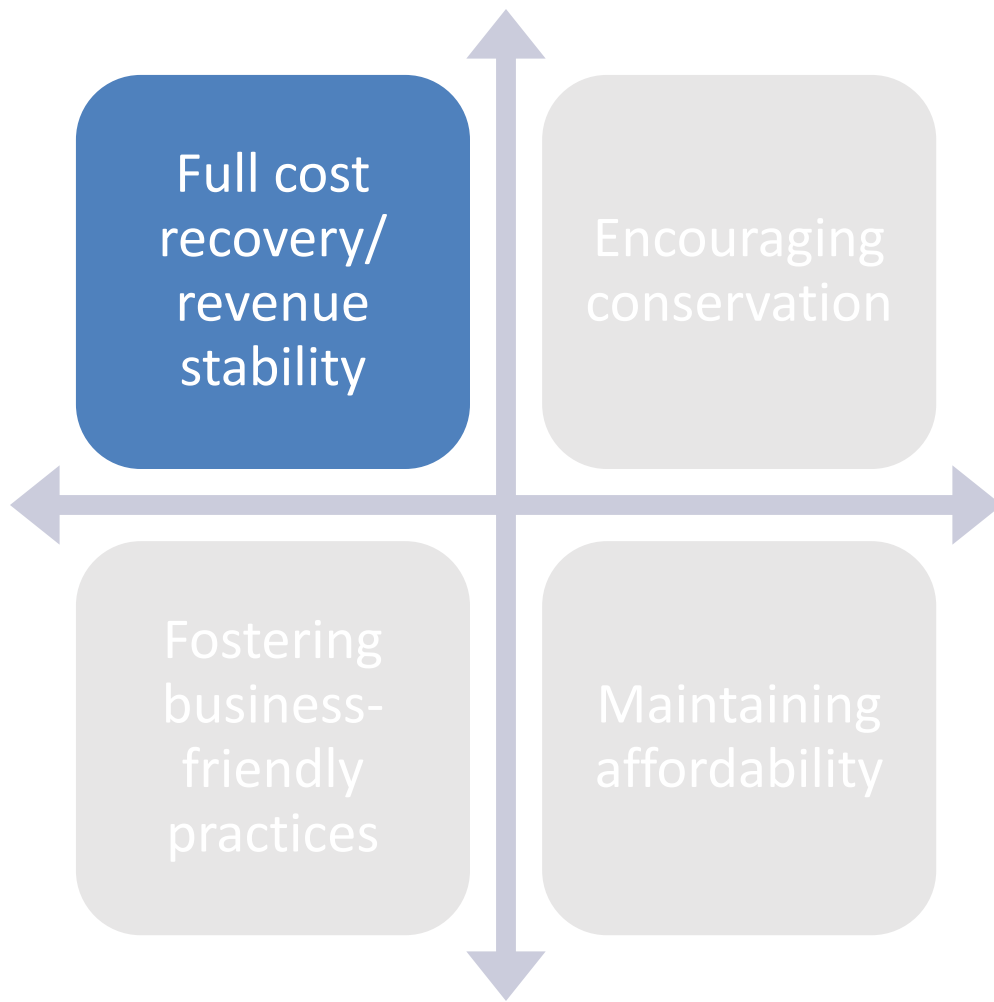
It depends...





# 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 revenues<sup>1</sup>*
- *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.<sup>2</sup>

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



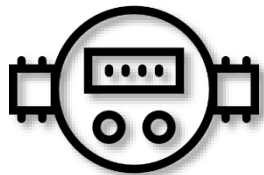


# Irvindale, USA Exercise

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

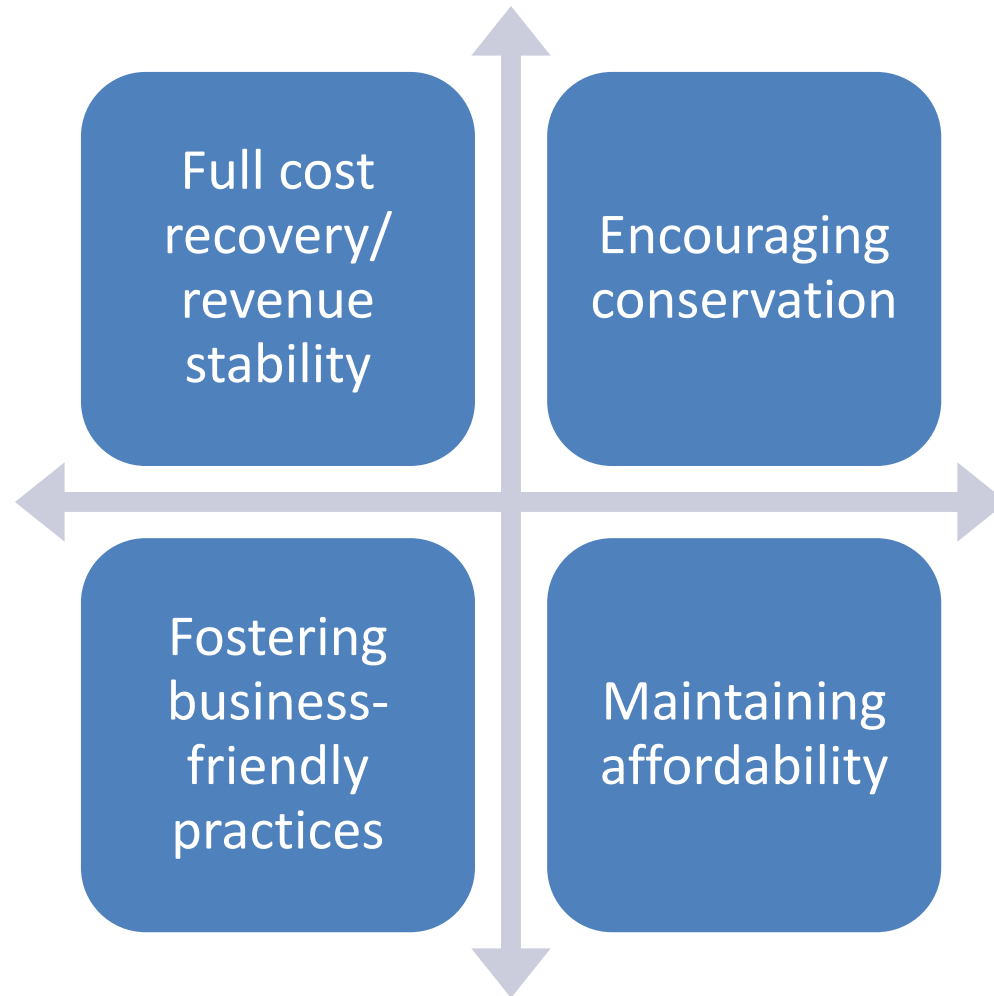


# Payment for Access

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



# 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 =**

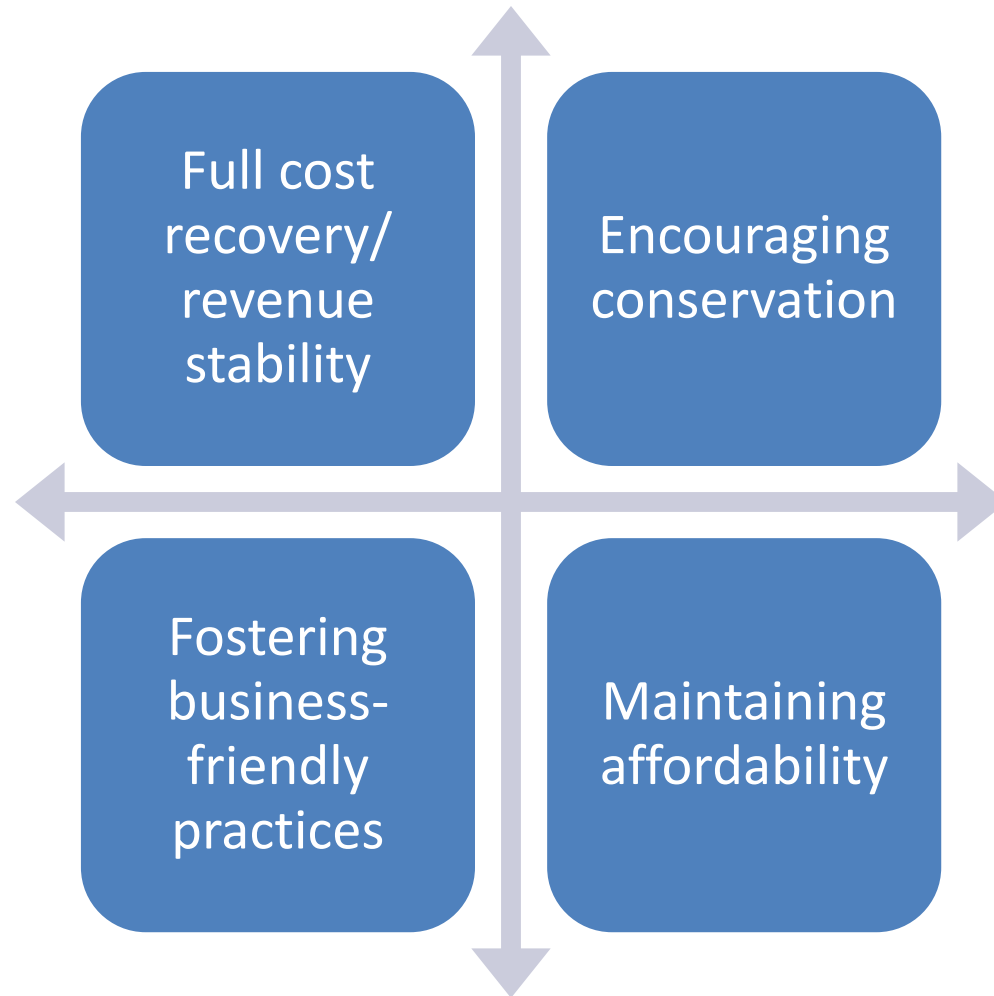
\$10.48

*Price per 1,000 Gallons*





# Which Rate Setting Objectives?





# 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

Revenue

76%

24%

Expenses

91%

9%

Readsboro, VT

A blue-tinted photograph of industrial machinery, specifically large pipes and valves, serving as a background for 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

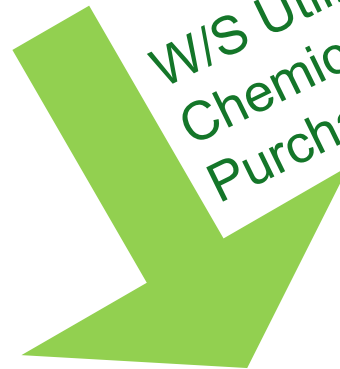
Everything else



\$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

*Monthly Base Bill*

450

*Total Accounts*

12

\$52,400

*Variable Annual Costs*

**x 1,000 =**

\$1.59

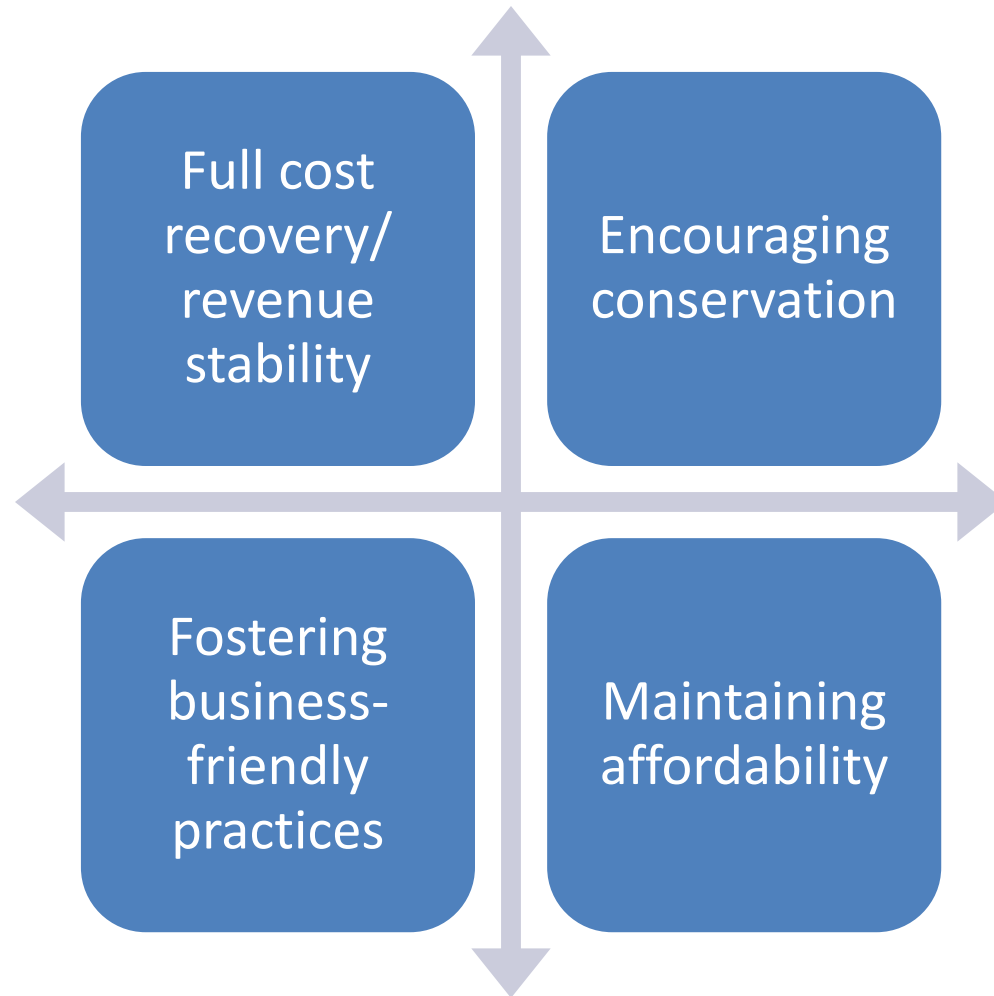
*Price per 1,000 Gallons*

32,877,590

*Total Gallons Sold*



# 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

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

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

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

A blue-tinted photograph of industrial machinery, possibly a water treatment plant, featuring large pipes and mechanical components.

# 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

A blue-tinted photograph of industrial machinery, possibly a pump or engine, with various pipes and mechanical components visible.

# 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)



UNC  
ENVIRONMENTAL FINANCE CENTER



Division of  
WATER  
RESOURCES  
Public Water  
Supply Section

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
Debt Service	\$11.50	\$13.00	\$14.00	\$17.00	\$20.00	\$21.00
Other Expenses	2,000	2,000	2,000	2,000	2,000	2,000

Category	2015
Administrative	\$190,000
Comp. Interest	\$200,000
Contracted services	\$181,250
Regional Sewer Authority operations & maintenance	\$100,750
Internal services	\$75,000
Chemical services	\$60,000
Repairs and maintenance	\$45,000
Other charges	\$400,750

Year:	2015	2016	2017	2018	2019	2020
Existing	\$11.50	\$13.00	\$14.00	\$17.00	\$20.00	\$21.00
New						
Block End:						
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	\$6.00	\$6.50
10,000 gal/mo	\$5.00	\$5.50	\$6.00	\$6.50	\$7.00	\$7.50

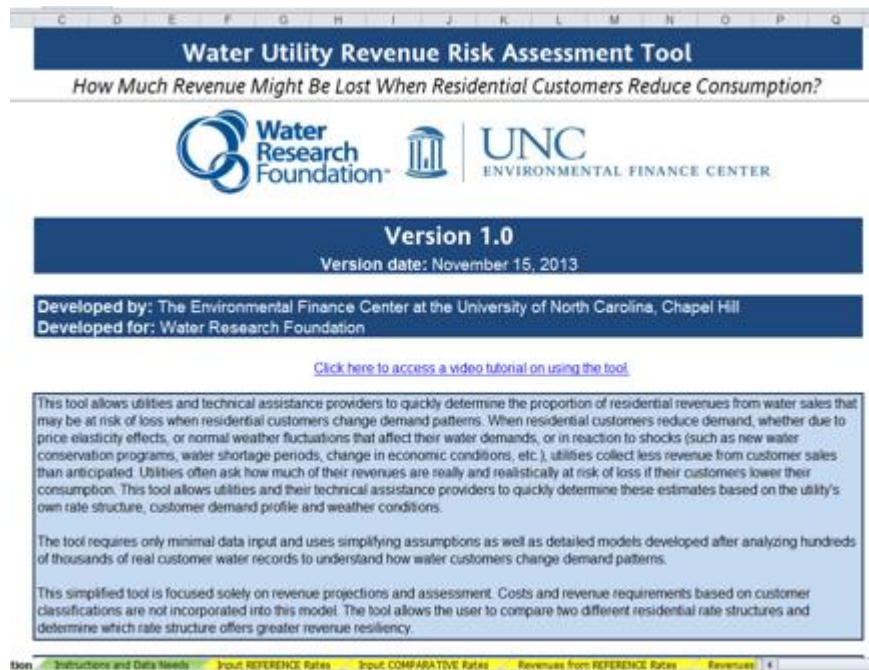
Back to top

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



- 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

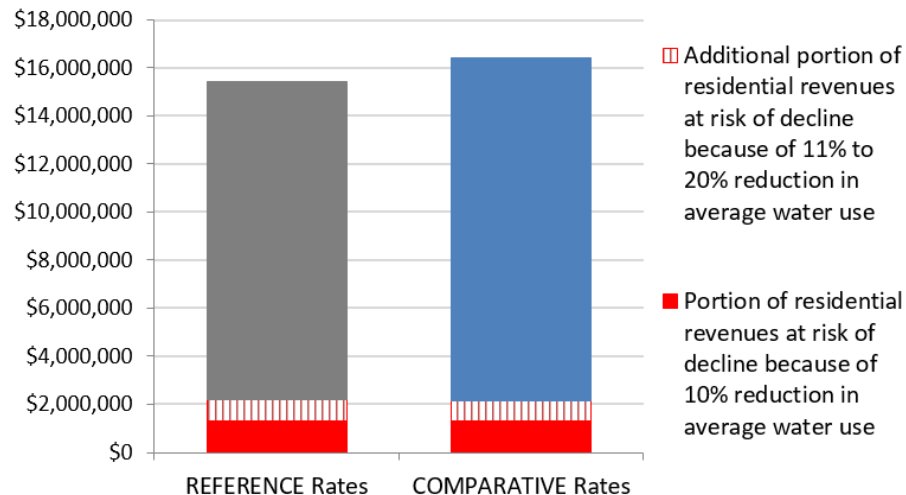
Free to download and use at  
[www.waterrf.org](http://www.waterrf.org)  
[www.efc.sog.unc.edu](http://www.efc.sog.unc.edu)

# 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/>



A project of the  
 Alliance for Water Efficiency

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**Building Better Water Rates for an Uncertain World**

**AWE Sales Forecasting and Rate Model**


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Request Tools

**Rate Model User Guide**

**Appendices: Costing Methods, Demand Forecasting and Revenue Modeling**

**Communications Tools**

 **RATES HANDBOOK**  
Building Better

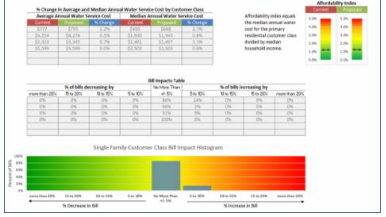
## AWE Sales Forecasting and Rate Model

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







# Pricing Water to Achieve Full Cost Recovery

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