Measuring the Revenue Impacts of Drought, and What to Do About It.

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Presentation at CSMFO Conference
Anaheim, CA

Today's Presentation

- Evidence: Economic Impacts of the Drought
- Rates, Use & Revenue
- What's Ahead: Results from *Drought Hangover Research Project*
- Where do we go from here?
- Resources

Droughts exasperate revenue woes

Source: Fayetteville Observer 2/6/04

Economic Impact on Urban Water Agencies (2014)

- Credit rating agencies say “we are concerned with potential credit quality deterioration due to narrower operating margins, leading to reduced debt service coverage ratios and, subsequently, rating agency downgrades.”

Urban Revenue Impacts, cont.

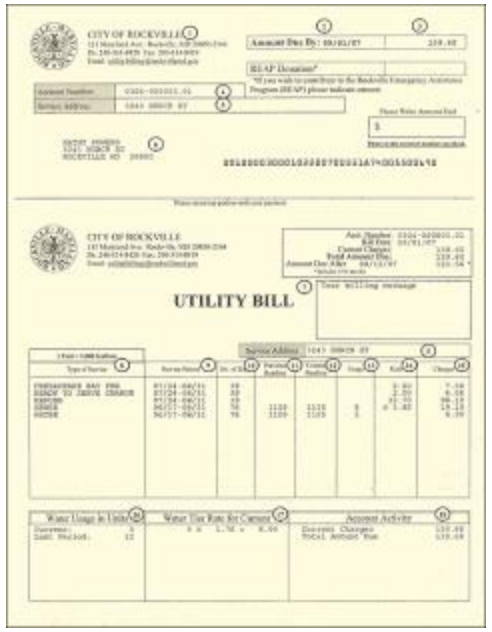
- City of Santa Monica: Immediate 20% reduction in water sales from 2013 levels.
- CPUC regulated water agencies: Annual water and wastewater revenues total $1.4 billion, 20% loss = $280 Million; conservative impact=$140,000,000 loss -- annually.

Is there a relationship between water rates and customer use?

In theory

As rates go up, water use goes down

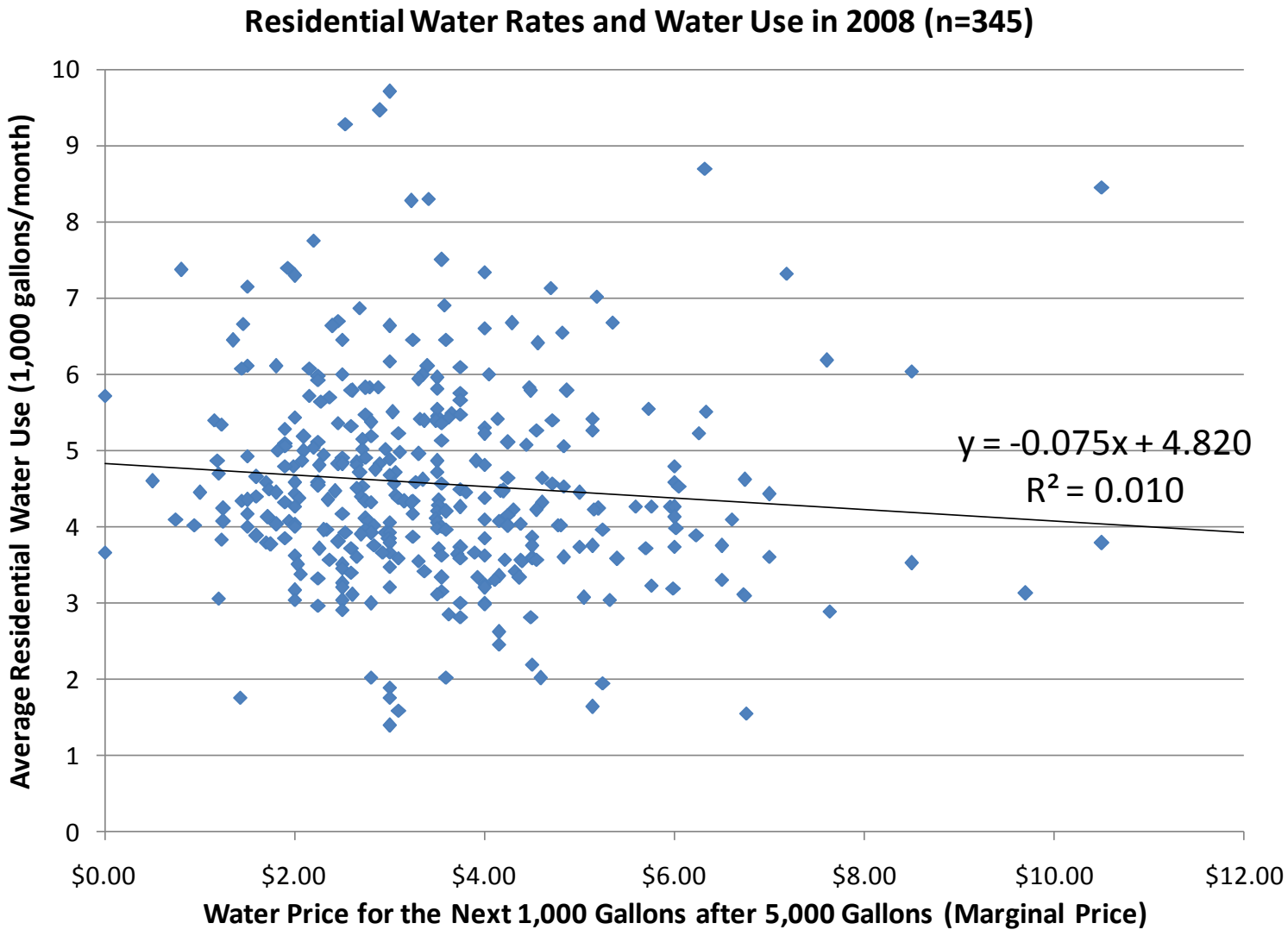
Utilities set rates based on projected use to recover costs



Does it happen in practice?

Yes!

Utilities with higher rates generally have lower residential use



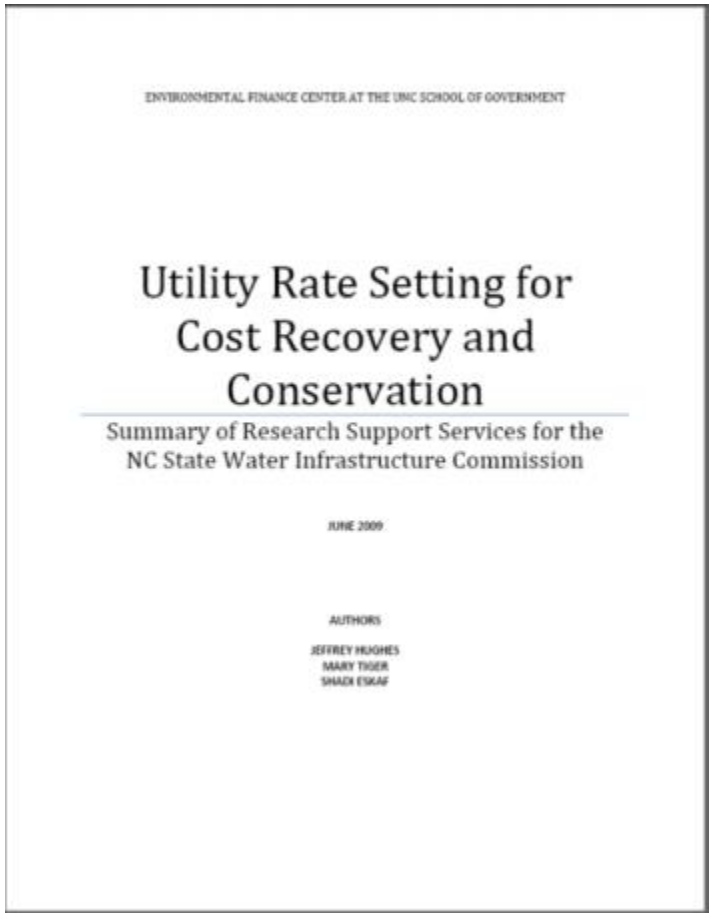
Source: EFC (2009) *Utility Rate Setting for Cost Recovery and Conservation*

What about one utility that raises its rates from one year to the next?

Study of >250 NC utilities, tracking their rates and usage over two years.

Utilities that raised their rates saw a decline in their average residential water use.

http://efc.unc.edu/projects/NC_ratesetting.htm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Utility Rate Setting for Cost Recovery and Conservation

Summary of Research Support Services for the NC State Water Infrastructure Commission

JUNE 2009

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Is this unique to the sampled utilities?

Studies and studies and studies showing the same result all over the country

Studies *of the studies*

“Price Elasticity of Demand”

$$Elasticity = \frac{\%\ Change\ in\ Demand}{\%\ Change\ in\ Price}$$

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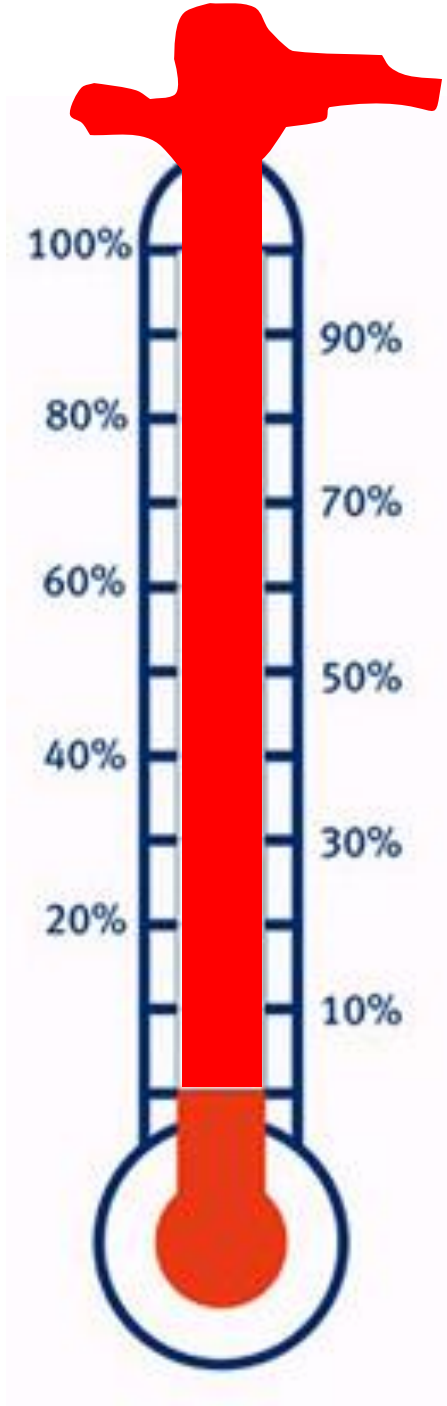
Before we continue – why should you care?

If you ignore it, danger of overestimating potential revenues when you propose to raise rates

Driving efficiency through price (long term)



What do you think?

$$Elasticity = \frac{\%\ Change\ in\ Demand}{\%\ Change\ in\ Price}$$

If a utility raises price (rates) by 100%, how much will average demand (water use) decline?

Example

$$Elasticity = \frac{\%\ Change\ in\ Demand}{\%\ Change\ in\ Price}$$

Utility A:

- Combined W & WW price increases 10%
- Demand decreases 2%

What is the elasticity?

Elasticity = -2% / 10% = -0.2

So raising rates will lower water use. Are we in danger of *lowering* total revenues by raising rates?

No!

The decrease in water use is
smaller than the increase in rates.

So revenues will still increase over the previous year, but just not as much as you may have thought (unless you accounted for elasticity)

What elasticity number should you use?

Price specification	Study	Price elasticity
Nordin specification (marginal price and difference)	Agthe and Billings (1980)	−0.179 to −0.705
	Billings and Agthe (1980)	−0.267 to −0.49
	Billings (1982)	−0.56 to −0.66
	Howe (1982)	−0.06 to −0.57
	Agthe et al. (1986)	−0.26 to −0.62
	Deller et al. (1986)	−0.36 to −1.12
	Billings (1987)	−0.06 to −0.5
	Billings and Day (1989)	−0.52
	Nieswiadomy and Molina (1989)	−0.09 to −0.86
	Hewitt and Hanemann (1995)	−1.57 to −1.63
	Barkatullah (1996)	−0.23 to −0.28
	Agthe and Billings (1997)	−0.39 to −0.57
	Dandy et al. (1997)	−0.12 to −0.86
	Corral et al. (1998)	−0.11 to −0.17
	Renwick and Archibald (1998)	−0.33 to −0.53
	Renwick and Green (2000)	−0.16
	Martinez-Espiñeira (2002b)	−0.12 to −0.28
Marginal price	Howe and Linaweaver (1967)	−0.21 to −1.57
	Gibbs (1978)	−0.51
	Carver and Boland (1980)	−0.02 to −0.70
	Jones and Morris (1984)	−0.07 to −0.21
	Martin et al. (1984)	−0.256
	Williams (1985)	−0.263 to −0.539
	Martin and Thomas (1986)	−0.50
	Williams and Suh (1986)	−0.25
	Moncur (1987)	−0.03 to −0.68
	Schneider and Whitlatch (1991)	−0.11 to −0.262
	Lyman (1992)	−0.39 to −3.33
	Martin and Wilder (1992)	−0.32 to −0.60
	Nieswiadomy (1992)	−0.02 to −0.17
	Nieswiadomy and Cobb (1993)	−0.17 to −0.29
	Hansen (1996)	−0.003 to −0.1
	Kulshreshtha (1996)	−0.23 to −0.78
	Höglund (1999)	−0.10
	Pint (1999)	−0.04 to −1.24
Average price	Sewell and Roueche (1974)	−0.067 to −0.568
	Gibbs (1978)	−0.62
	Foster and Beattie (1979)	−0.27 to −0.76
	Hanke and de Mare (1982)	−0.15
	Jones and Morris (1984)	−0.18 to −0.34
	Williams (1985)	−0.619 to +0.332
	Williams and Suh (1986)	−0.184

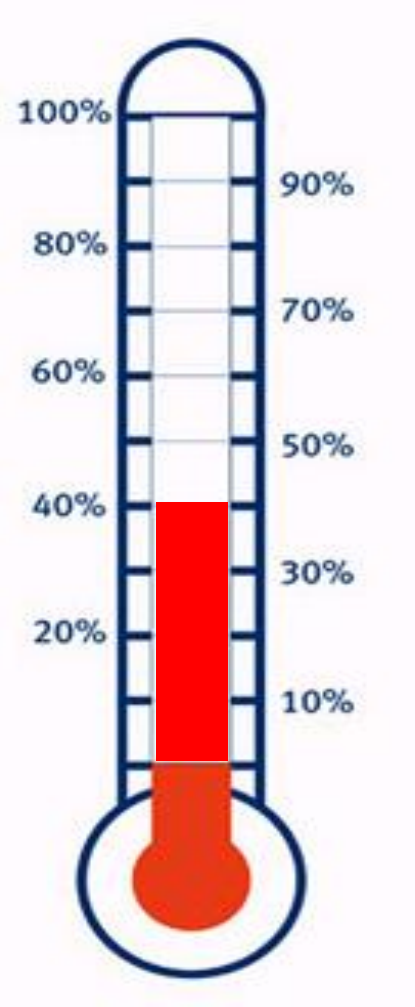
From Arbues, Garcia-Valinas & Martinez Espiniera, 2003

Residential customers:

In the neighborhood of

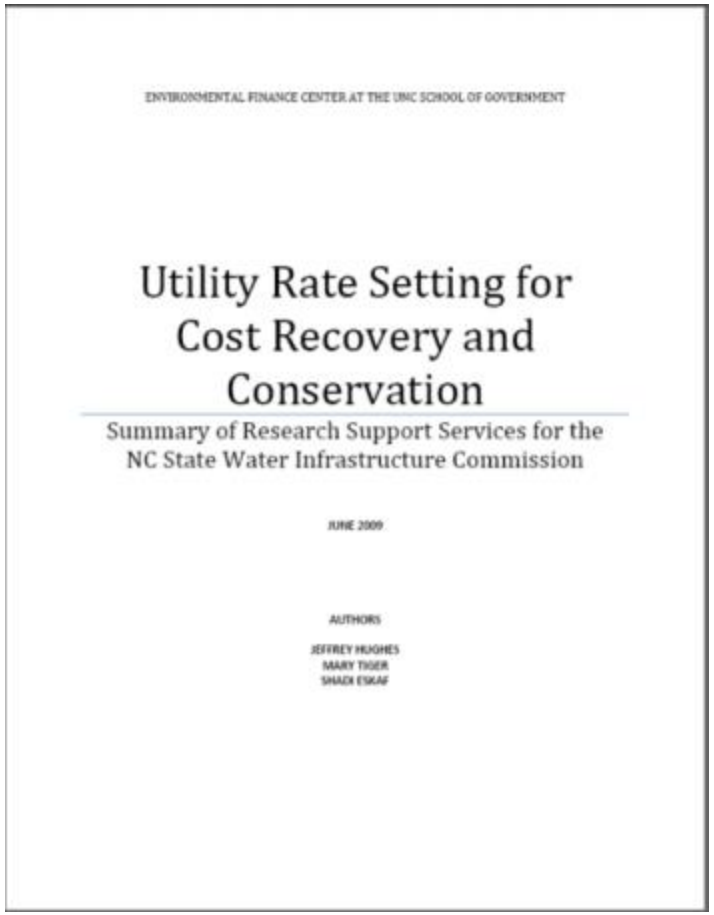
-0.2 to -0.8

What elasticity number should you use?



Average residential elasticity is between -0.3 and -0.4

30 - 40%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Case Study: Medium Sized Water Agency in Northern Ca.

Agency wants to track percent change in monthly water use, and the revenue impacts throughout the drought.

Purposes:

- ✓ Target conservation interventions with precision;
- ✓ Measure effectiveness of conservation interventions;
- ✓ Estimate revenue impacts associated with conservation to assess revenue risk and **potential rate structure changes**

Actionable Insight

- ✓35.2% of this utility's customers reduced use by over 40%, relative to baseline year;
- ✓This drought –related conservation resulted in $1.2 million revenue loss for the utility (~25% in 2014);
- ✓Analysis informed size & triggers of the utility's drought reserve fund;
- ✓Led to transition to more revenue stable rate structures (higher fixed portion of bill)

Credit Rating Agency's are Watching closely

“California Water Restrictions May Sink Utility Revenue”

“Some utilities have structural rate design features that smooth revenue declines when water sales drop.”

Examples include: “City of Santa Cruz and Eastern Municipal Water District”

Drought Hangover: Post Drought Conservation in NC

Research Questions: Measuring the Drought Hangover

- **Duration:** Following the end of the drought, how long did it take for residential customers to "bounce back" to stable monthly use-levels (new baseline use)?

- **Water-use change:** By how much did baseline-residential water use change following the 2007 drought?

Length of Drought Hangover: Results

Durham

- 11 months between end of drought and establishment of new baseline
- New baseline is lower than the drought-behavior period. Drought marked a transition to a permanent decline in use.
- Permanent Behavioral and structural water use changes.

Raleigh & Winston Salem

- Raleigh : 20 months between end of drought and establishment of new baseline
- Winston Salem - 16 months between end of drought and establishment of new baseline
- The new baseline is lower than pre--drought; but higher than the drought-behavior period use.
- Customer water use “BOUNCED BACK” during drought hangover period…

Study led by Shadi Eskaf & EFC

Measuring Post –drought Change in Use

Average residential customer use declined by:

Durham: 26.3%

Raleigh: 16.8%

Winston Salem: 43.3%

How does Drought Hangover affect utilities?

- ❑ Potential to overestimate water use in subsequent years
- ❑ Set rates too low
- ❑ Revenue shortfall

Only way out of it is to raise rates significantly?

There has to be a better way!

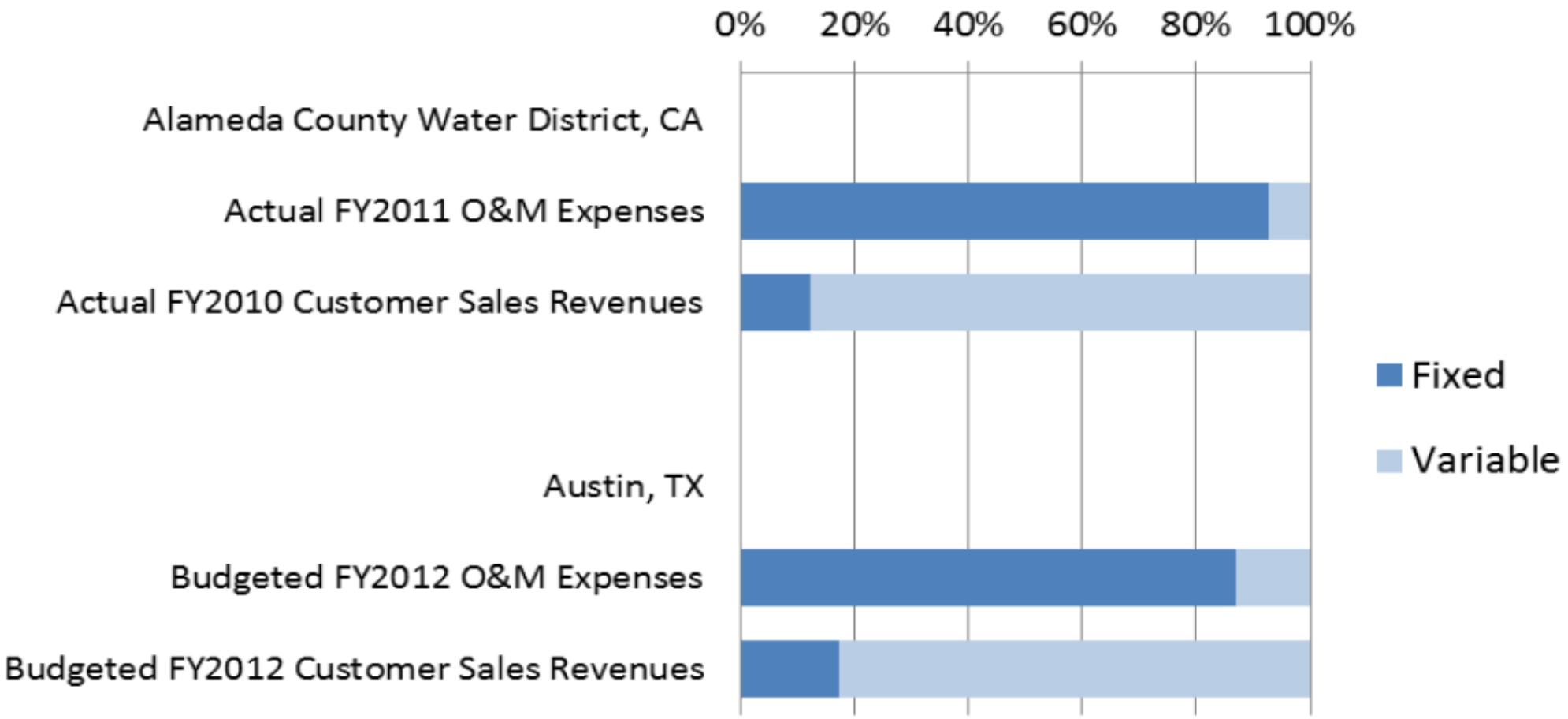
For most utilities the reality of reduced water demand presents a significant financial challenge: rising infrastructure costs must be recovered from a sinking sales base. Simply raising rates will not necessarily solve the problem.

Solutions: Water Utility 2.0?

Change What you Sell

- Capacity, Readiness to Serve
- Pricing and other revenue streams

Fixed Versus Variable O&M Expenses and Customer Sales Revenue



Source: EFC

Alternative Revenue

- Fireline protection
- Line Insurance
- Pre Paid Water Service
- Others….

Change How You Sell it

Alternative Business Models – Its Time.

Single Family Home	Attached Home Condo	Apartments
		
		
1300 Square Feet Landscape Area	435 Square Feet Landscape Area	No Landscape

Allocation based rates @ IRWD

Water Budget & Bill Estimator

1. Select a Month:

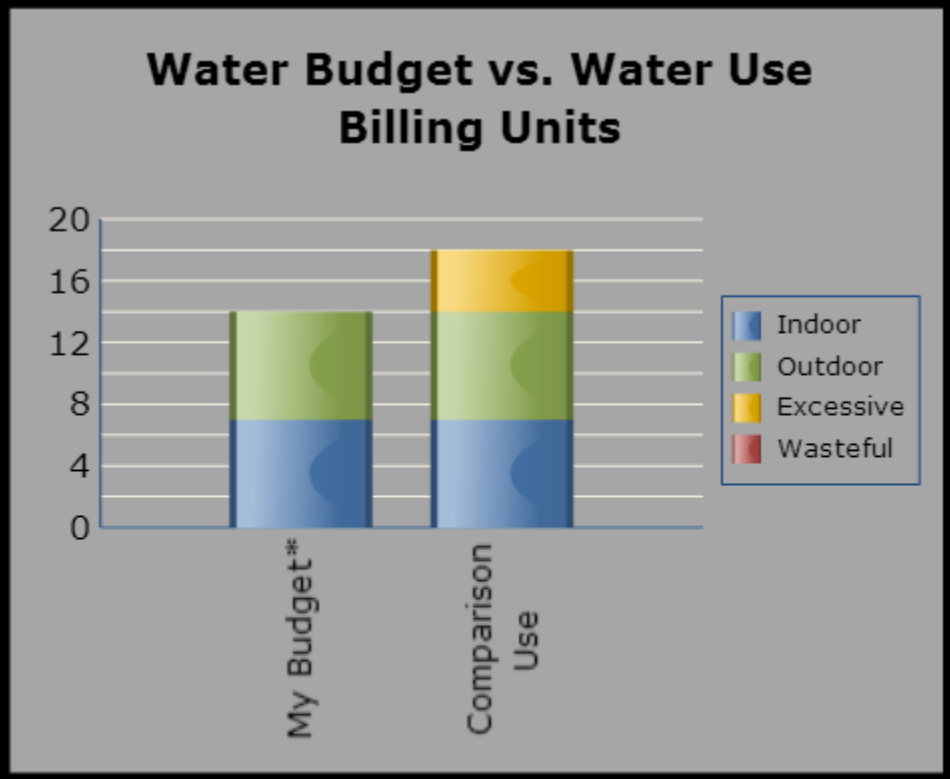
January
February
March
April
May

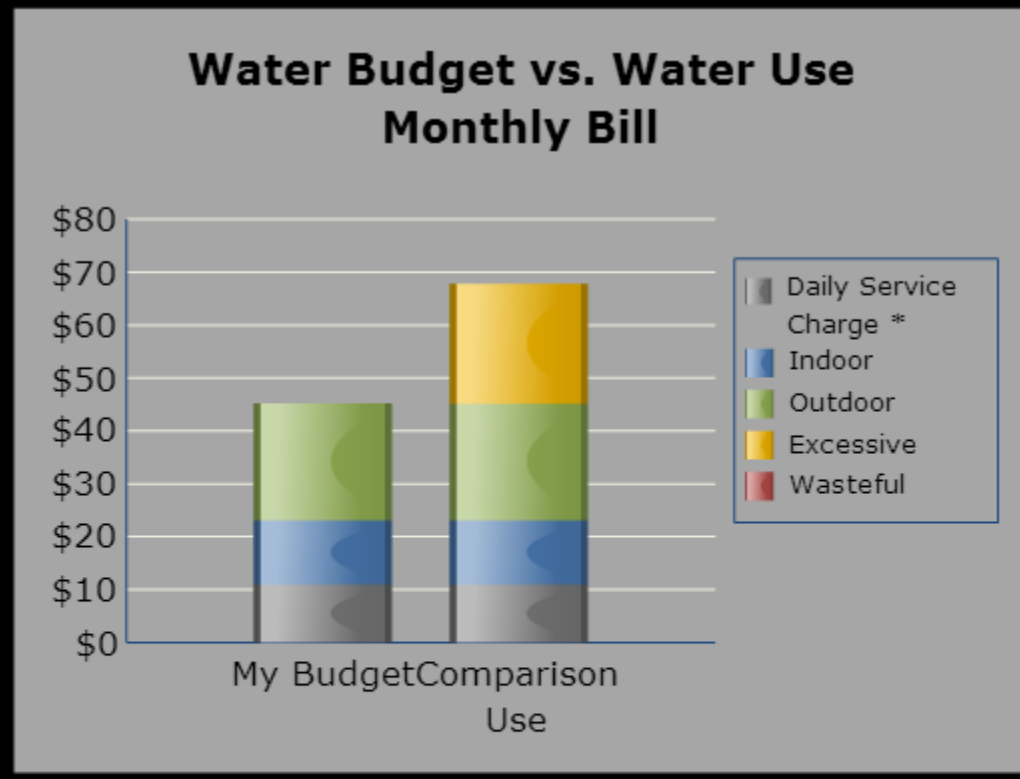
2. Double-click each item to enter

Household size: 3

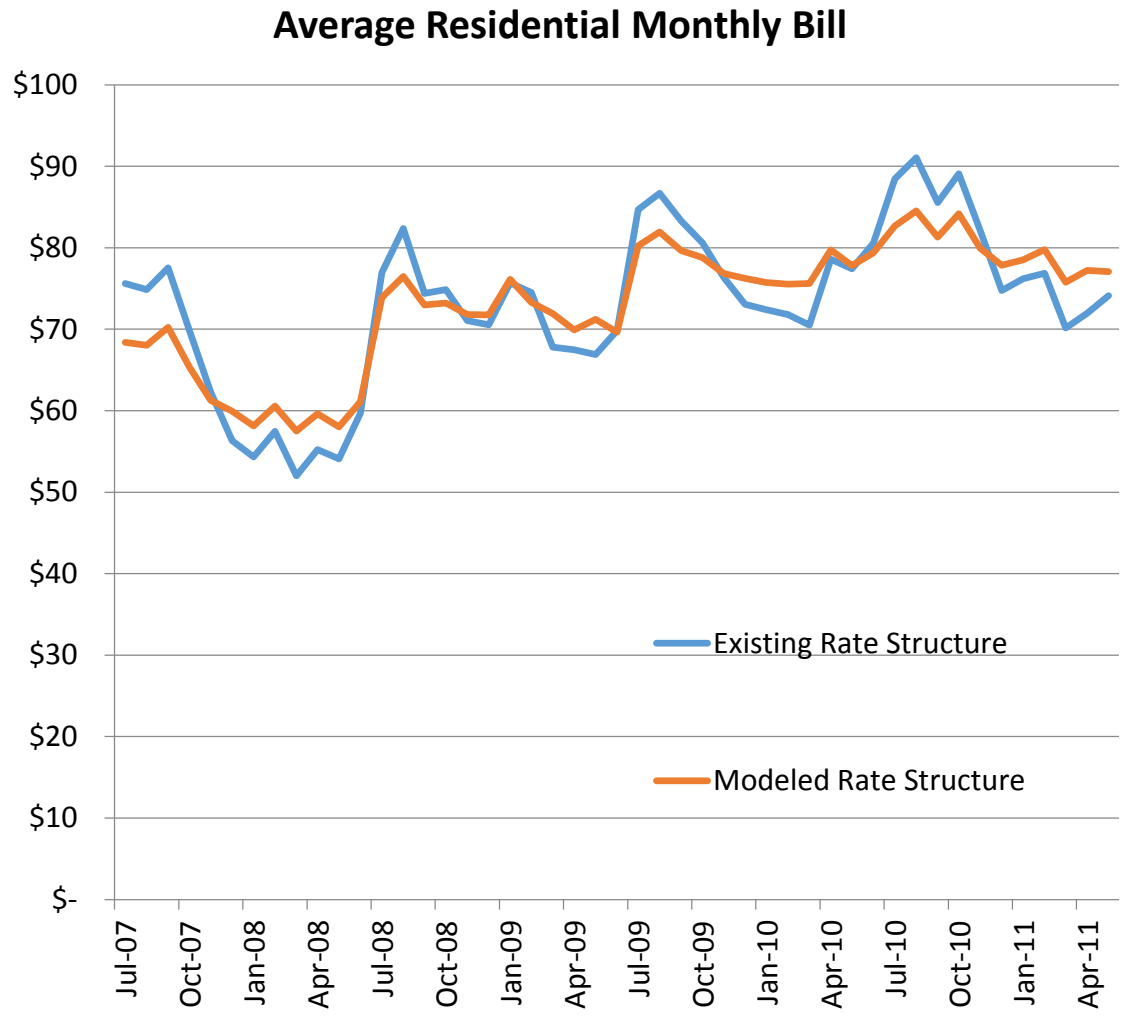
Irrigated area: 3,000
Your lot size minus non-irrigated area
(house footprint, garage, driveway, patios, etc.)

Compare water (billing units): 18
Enter the number of billing units you'd like to compare to the amount budgeted for your household and property.





Simulated charges for Budget Based Rates using City of Durham's actual residential water use (n = 1.6 million bills in 4 years)



Allocation-based Rates

- Revenue-neutral each FY
- Revenue depends less on water use
- More stable revenue flow, resembles cost structure

PeakSet Base: A Pricing Model for Utility Revenue Stability and Customer Conservation

- Inspiration: Electricity Peak Charge Model
- A customer's base charge for the fiscal year set based on the 3-year rolling average peak use

	Current BJWSA residential rate structure	PeakSet base residential rate structure
% fixed annual revenue	18%	57%
Base rate	$6.00/meter – water + $6.00/meter - irrigation	$1.85/kgal applied to 3-year rolling average of peak month of demand
Variable rate	$3.46/kgal of previous month's use	$0.52/kgal of previous month's use

THE DAVIS enterprise

Wednesday, May 6, 2015 YOLO COUNTY NEWS

How the city arrived at the proposed rates

By Tom Sakash

From page A1 | February 01, 2013 |

* **Editor's note**: This is the last in a series of stories examining the proposed Woodland-Davis joint surface water project, including project specifics, the city of Davis' water utility in general and arguments for and against Measure I in the March 5 mail-only election.

Once the Water Advisory Committee had picked the Woodland-Davis surface water project in October as the preferred option to deliver surface water to Davis, the group then took aim at the water rate structure that the city would need to pay for it.

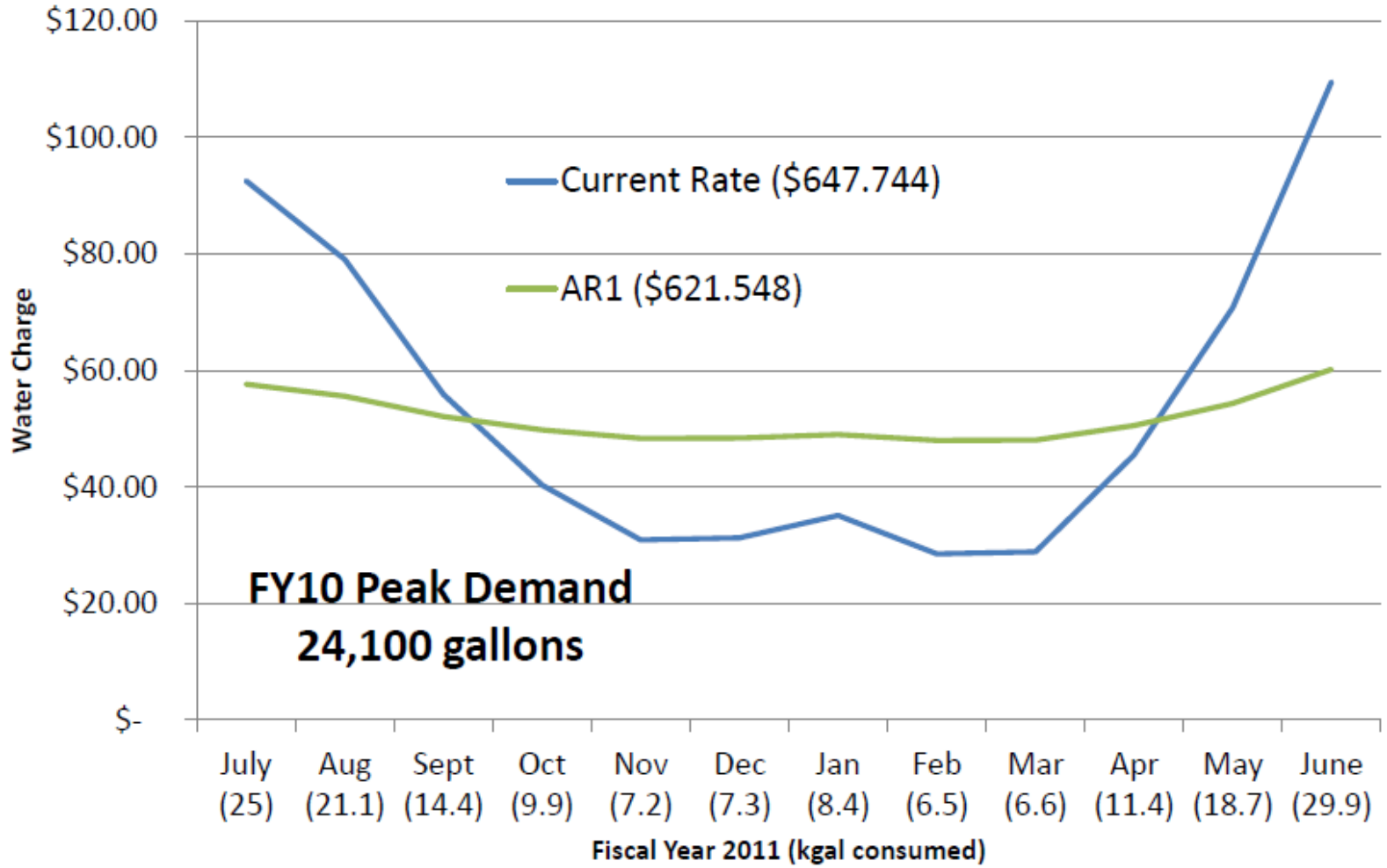
City staff and the city's hired rate consultant, Bartle Wells Associates, presented to the WAC several industry-standard rate models to pick from.

Each closely resembled the way the city currently bills its residents for water: with a fixed rate based on meter size and a variable rate based on consumption. These types of rate models were, in their opinion, industry-standard and compliant with Proposition 218. That voter-approved measure sets the state law for how a public agency can extend, impose or increase utility fees, including for water.

One rate model that Bartle Wells suggested was a three-tiered inclining

Peak-set Base: Example of Customer Impact (Beaufort Jasper Water and Sewer Authority Simulation)

Comparison of monthly charges for water under current rate and a Peak-set Base model



- Questions ?
- Comments?

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