

Promoting Supply Reliability through Demand Side Management

Ken Baerenklau

University of California – Riverside
School of Public Policy

Joint work with Professors Kurt Schwabe and Ariel Dinar of UC Riverside

Six P's of demand side management

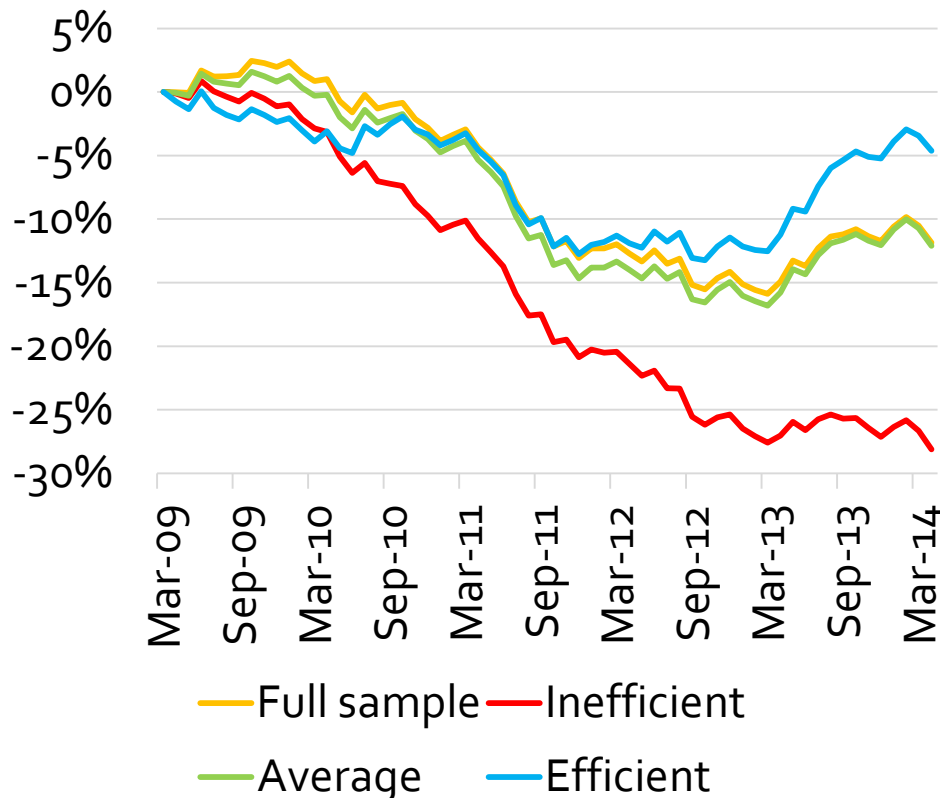
- › **Pricing**: higher price → lower demand
- › **Programming**: encourage use of conservation practices
- › **Pleading**: voluntary requests for conservation
- › **Prohibiting**: mandatory restrictions and other requirements
- › **Pressuring**: social norm messaging and peer influence
- › **Plastering**: education and information campaigns

Pricing: an effective tool

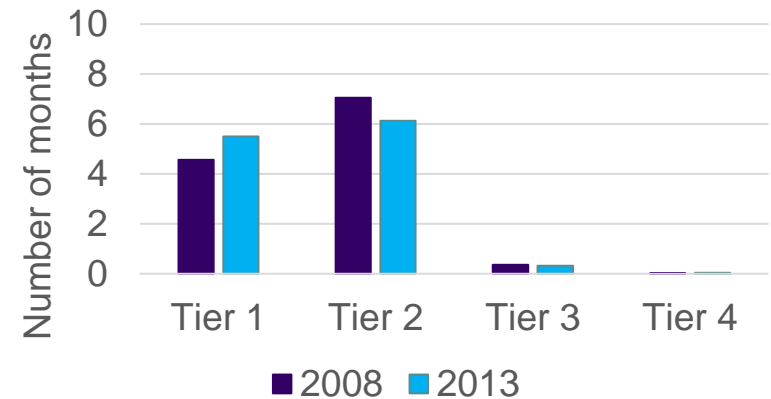
- › There is **ample evidence** that customers respond to price changes and that pricing is a cost-effective means of achieving conservation goals.
- › Price elasticity of water demand (a measure of price responsiveness) in the residential sector tends to be around -0.4 to -0.6 **but it depends on local conditions**
- › If customers are metered then pursuing conservation through pricing does not create any additional **monitoring** challenges.

UCR study of Eastern's allocation-based rates

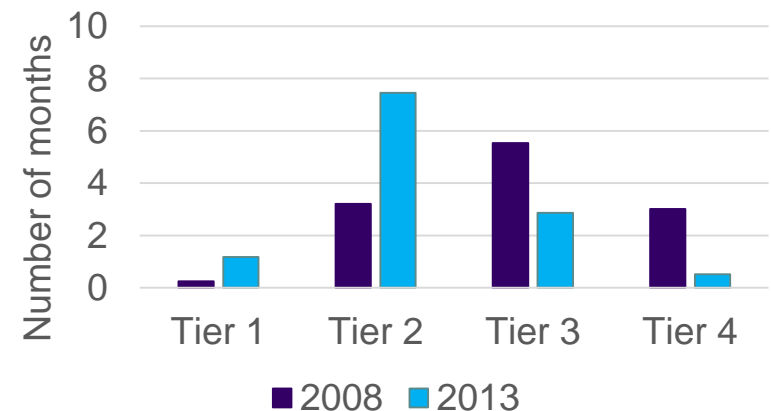
Demand reduction attributable to EMWD's allocation-based rates (Baerenklau, Schwabe & Dinar 2014)



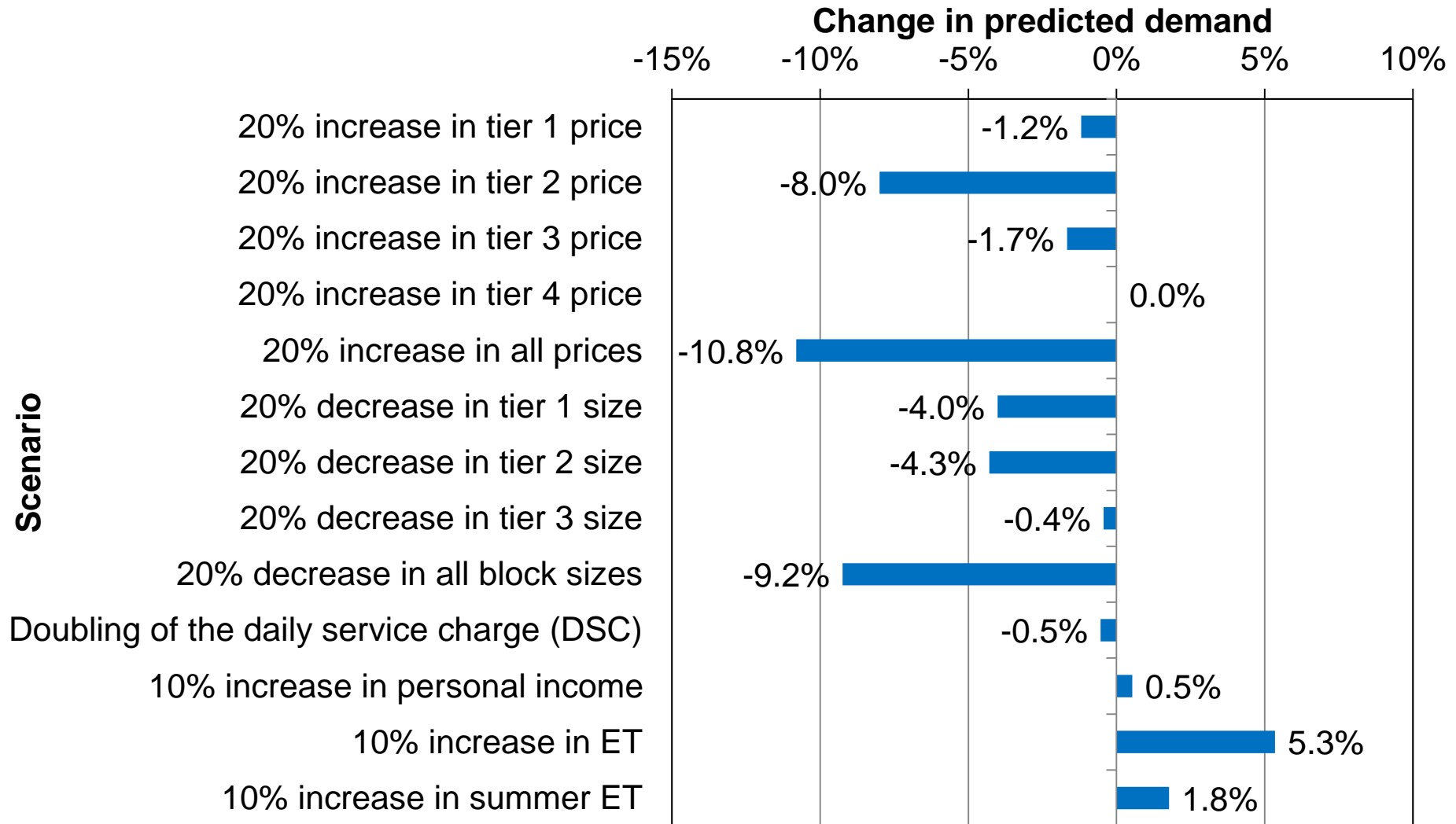
Efficient Households: 11.6 → 11.6



Inefficient Households: 3.4 → 8.6



UCR study of Eastern's allocation-based rates



Pricing is not without inherent drawbacks

- Increased costs are particularly challenging for disadvantaged households and local businesses
- Higher prices hurt customer perceptions and strain customer relationships

Solution: Couple pricing with conservation rebate programs

- Rebate programs make it easier for customers to reduce water use and exposure to high water bills
- Conservation programs are an important complement to pricing

Conservation programs have unpredictable results

Observation: Savings are highly variable and usually less than expected

Examples: Low flow showerheads, low-flush toilets, front load washers,...
(Mayer et al. 1998; Olmstead & Stavins 2007; Schwabe et al. 2014)

Reasons:

- Behavioral response to incentives is hard to predict
- Engineering calculations typically do not consider behavior

Consequences:

- Rebates often fail to produce high participation rates
- Customers do not use technologies as anticipated
- Cost per unit of water saved is higher than expected

UCR study of high-efficiency sprinkler nozzle program (study funded by Metropolitan)

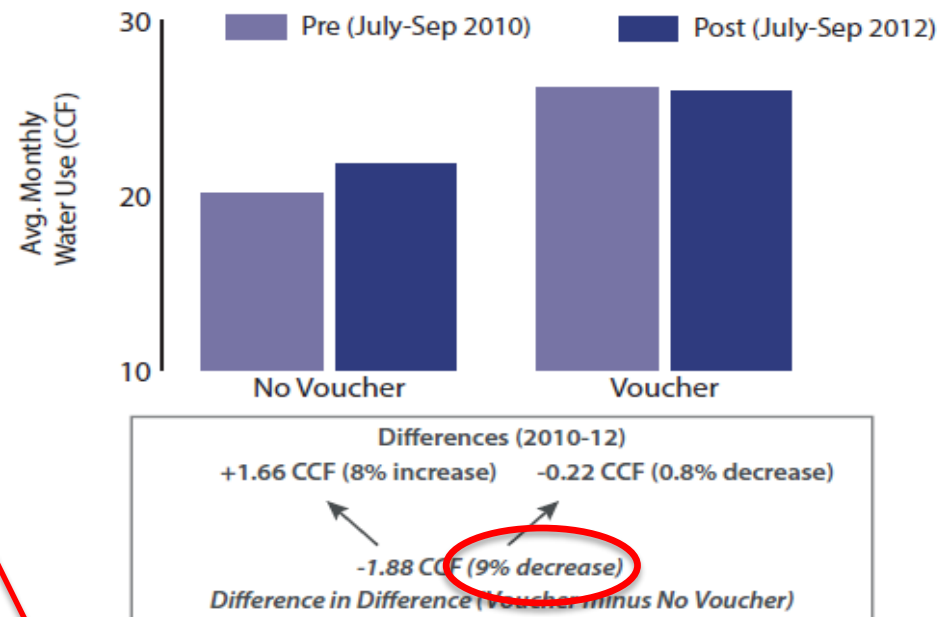


When Should You Select the Pressure-Compensating Model?

Both standard Toro® Precision™ Series spray nozzles as well as Pressure-Compensating models are available to all qualified participants in the FreeSprinklerNozzles.com Program. As a general guideline, residential customers should use the Pressure-Compensating nozzles. For commercial sites, standard Toro® Precision™ Series spray nozzles should be used if pressure regulators are present either on the spray heads or zone valves. Standard Precision™ Series spray nozzles should always be utilized in low-pressure situations.



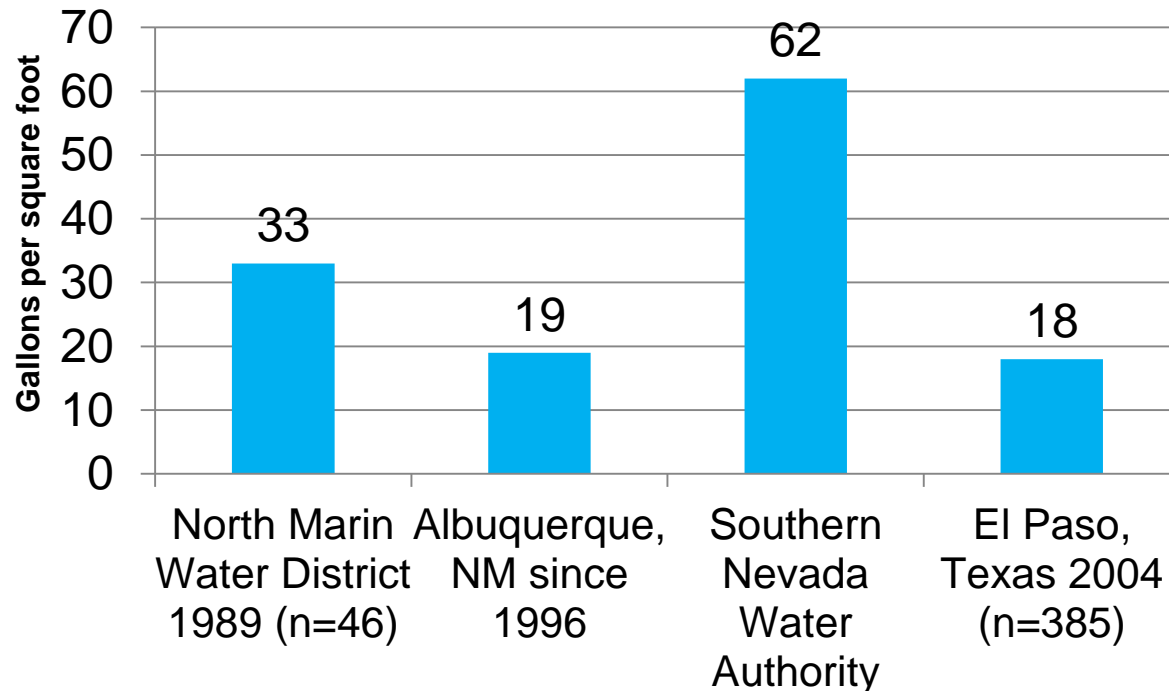
Figure 2. Water Use Pre- and Post-Phase II Program Period*



1/3 of potential efficiency when installed

Recent study of turf removal programs

Estimated Water Savings and Costs
(Addink 2014)



Cost/AF:	\$512	\$718	\$532	\$1834
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Did not require irrigation improvements

Pleading and Prohibiting

- **Voluntary requests** have relatively small effects

 - Atlanta case study (Ferraro et al. 2011; Bernedo et al. 2014)

 - Technical advice suggesting ways to reduce water use: **no reduction**
 - Technical advice with a request signed by the GM: **2.7% reduction**
 - EMWD study: uniform rates

 - Requests for short-term voluntary conservation have a **5% effect** in the month issued
- **Mandatory restrictions** can be very effective *if enforced!*

 - Enforcement is costly
 - Behavior is slippery
 - Restrictions are inefficient and thus costly to households

 - Estimated cost of restrictions relative to a price-based approach: 25% to 50% of a household's average water bill (Mansur and Olmstead 2007; Grafton and Ward 2008).

Pressuring and Plastering

- **Pressuring** (i.e. social norm messaging) is relatively new
 - Atlanta case study (Ferraro et al. 2011; Bernedo et al. 2014)
 - Technical advice, GM letter, social norm comparison: **4.8% reduction**
 - EBMUD case study (Mitchell and Chestnutt 2013)
 - WaterSmart Home Water Reports: **5.6% reduction**
- **Plastering** (i.e. information and education)
 - Billing frequency: no detectable effect (Olmstead and Stavins 2007)
 - Conservation messaging (Janmaat 2012, *working paper*)
 - **Message source variety** increases conservation effort
 - Knowledge of water issues *does not!*

Main messages

- › A demand-side management strategy should be built around a **robust rate structure**
- › Conservation programs work well as **complements** to a rate structure
- › Try to **avoid mandatory restrictions**
- › **Messaging** may function more like advertising than education; and peer pressure appears to be cheap but effective
- › **Understanding** your customers, **targeting** your policies, and continually **evaluating** your strategies will improve effectiveness.

Thank you!