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SLIDES: Economic Incentives for Demand Reduction

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Economic Incentives for Demand Reduction

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"*A discussion between two conservationists who are interested in conserving different things often degenerates into polite name calling or worse. Smith will tell Jones that he doesn't know what true conservation is. And Jones will reply acidly that what Smith proposes—far from being conservation—is profligate waste. Finally the discussion ends from boredom or exhaustion, with each conservationist walking away shaking his head and saying to himself that he doesn't see how anyone could hold such inane views.*"

Orris C. Herfindahl, 1961 (Pg. 1)

Overview

- What is Conservation?
- Types of Conservation Programs
  - A conservation “supply curve”
  - The importance of customer types
- Why Would Someone Conserve or not Conserve?
  - An example
  - The role of the utility
- Potential Barriers to Conservation

What is Conservation?

Conservation as defined by the state of Colorado:

"*Water conservation* means water use efficiency, wise water use, water transmission and distribution system efficiency, and supply substitution. The objective of water conservation is a long-term increase in the productive use of water supply in order to satisfy water supply needs without compromising desired water services. (§37-60-126C.R.S.) "

Colorado Water Conservation Board Website

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What is Conservation?

An economists view of conservation:

"*It is preferable, in my opinion, to preserve common usage and to agree that a conservative act is one which saves something for future use instead of present use or which saves something for use instead of nonuse…A proper usage, if the everyday meaning of "conserve" is retained, should not involve the implicit view that conservation is always desirable. Sometimes it is, but sometimes it is not.* ***The question always is whether the gains outweigh the costs****."*

Orris C. Herfindahl, 1961 (Pg. 4)

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An Overview of Demand Management Policies

- Pricing Strategies
  - Price Level
  - Price Structure
- Non-price Strategies
  - *Outreach and Education*
  - *Restrictions*
  - *Technology Rebates*

Excellent Overviews of the Literature on the effectiveness of these programs:

- Barta (2004; Colorado Water Resources Research Institute)
- Klein et al. (2007)

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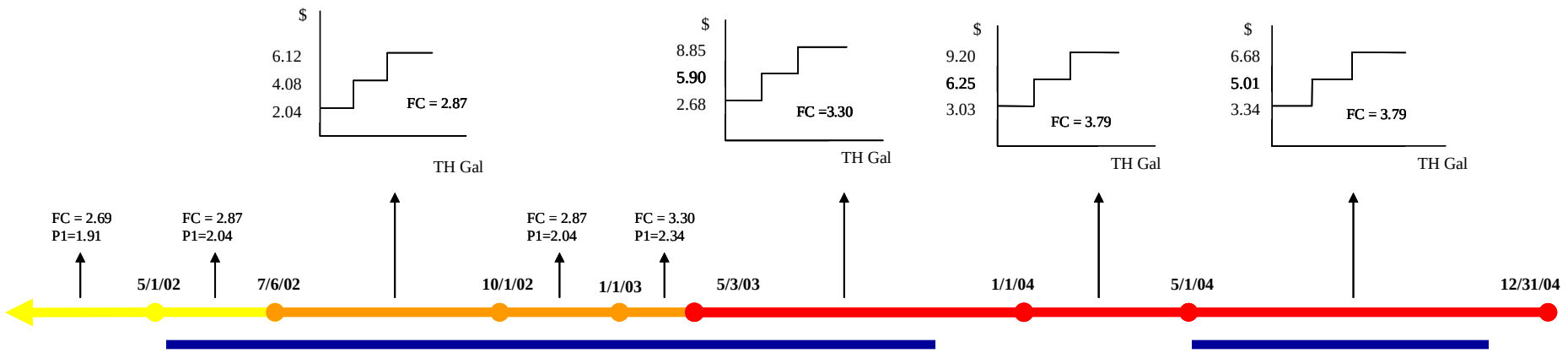
Timeline of Price and Restriction Policies



Single Rate

Households face a fixed service cost (FC) plus a uniform per unit charge (P1); all prices are shown per thousand gallons (TH Gal)

Inc. Block Rate

In addition to FC, households face an increasing block rate structure for all units consumed. Block widths are standardized across all households

Inc. Block Rate based on Water Budgets

In addition to FC, households face an increasing block rate structure for all units consumed. Block widths are **specific** to each household, based on average daily indoor consumption (ADIC) and an irrigation allowance (IA). Households receive a varying percentage of their ADIC and IA in each block depending on drought conditions.

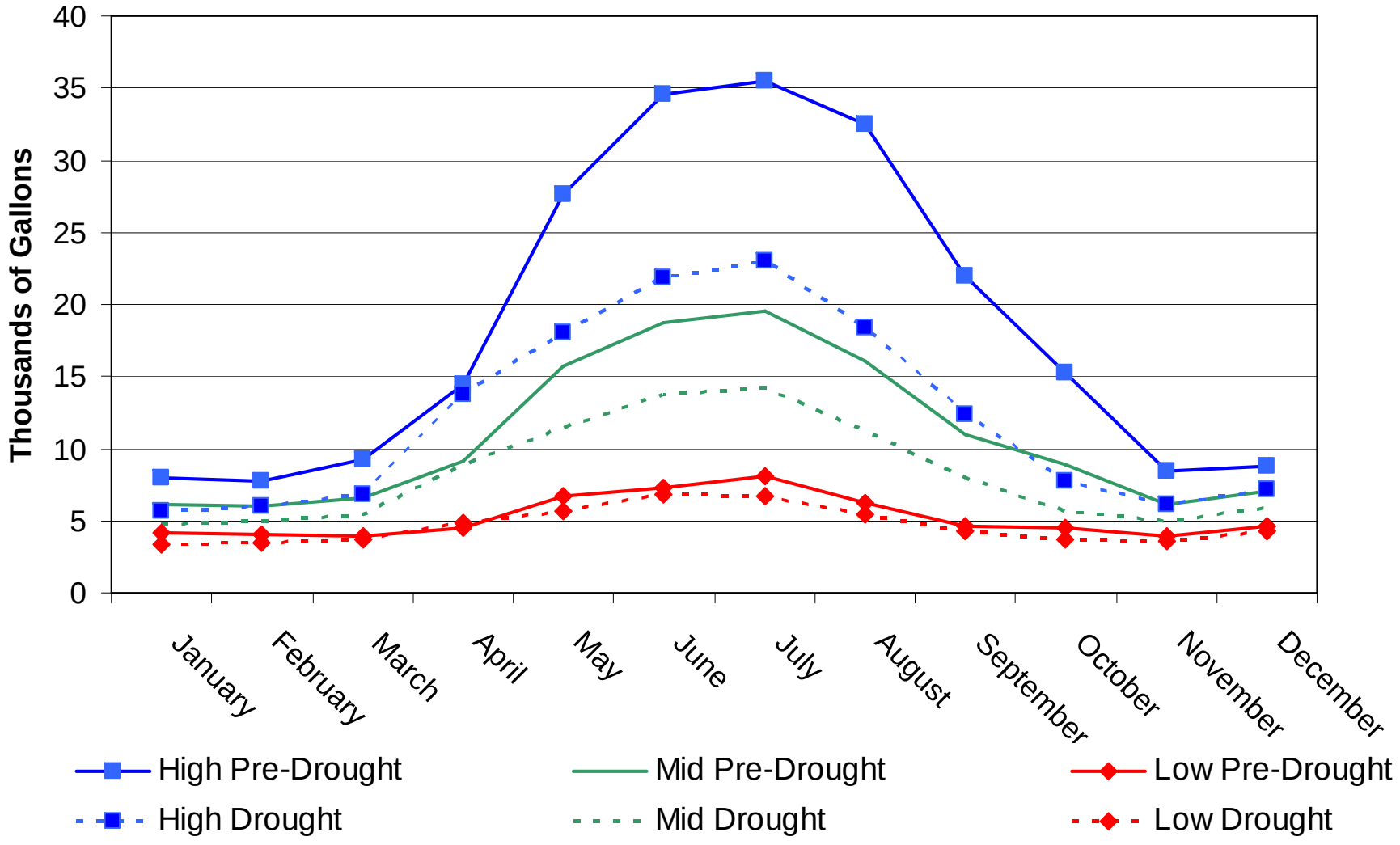
* Block widths in diagrams not to scale

** Rate structure type reflects the rate structure utilized during summer months

Water Restrictions

Source: City of Aurora: Water Management Plan (2002-2004) and ratesall.txt provided by the City of Aurora Utilities Department.

Water Use by Type of User, Before and During Drought



Effectiveness of Price and Restrictions: Evidence from Aurora, Co

	Price Elasticity
All	-0.60
Low Users	-0.34
Middle Users	-0.57
High Users	-0.75

Price Elasticity $= \dfrac{\%\, change\ in\ quantity\ demand}{\%\, change\ in\ price}$

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Why Would Someone Conserve? Example: Low-Flow Sink

Base Case: Sink
Alternative: Low-Flow Sink

	Base Case	Alternative	Savings from Alternative
Initial Investment Costs:			
Capital Requirements as of Base Date			
Future Costs:			
Energy Consumption Costs			
Energy Demand Charges			
Energy Utility Rebates			
Water Costs			
Recurring and Non-Recurring OM&R Costs			
Capital Replacements			
Residual Value at End of Study Period			
	----------	----------	----------
Subtotal (for Future Cost Items)			
	----------	----------	
Total PV Life-Cycle Cost			

Payback Period
Estimated Years to Payback (from beginning of Service Period)
Simple Payback occurs in year
Discounted Payback occurs in year

Adapted from Page 33 of DOE 2002

A Conservation "Supply Curve"

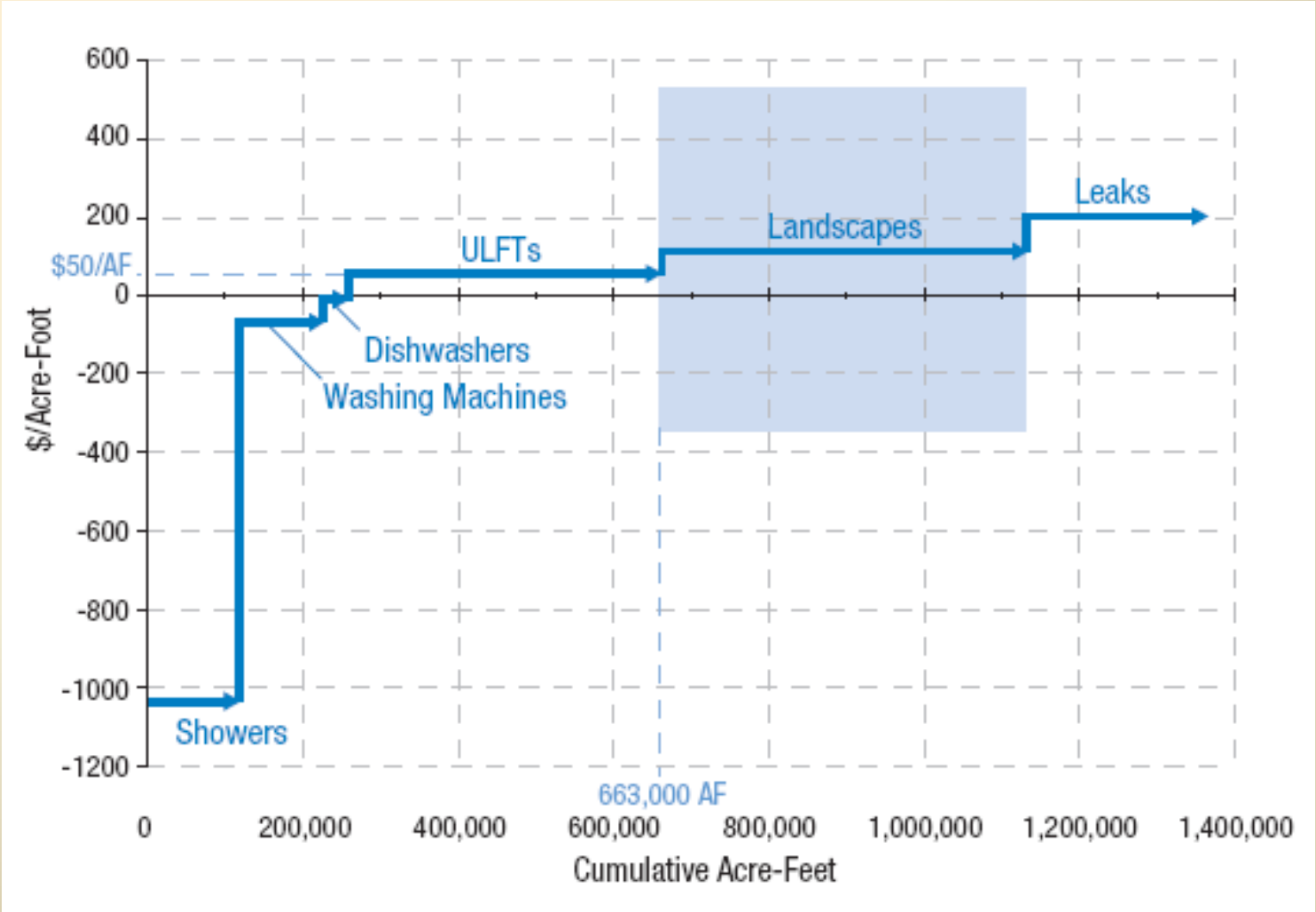

Figure 5-1, Pg. 116, Gleick, Peter H, et al. 2003

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Why Would Someone NOT Conserve? Example: Low-Flow Sink

Base Case: Sink
Alternative: Low-Flow Sink

	Base Case	Alternative	Savings from Alternative
Initial Investment Costs:			
Capital Requirements as of Base Date			
Future Costs:			
Energy Consumption Costs			
Energy Demand Charges			
Energy Utility Rebates			
Water Costs			
Recurring and Non-Recurring OM&R Costs			
Capital Replacements			
Residual Value at End of Study Period			
Subtotal (for Future Cost Items)	----------	----------	----------
Total PV Life-Cycle Cost	----------	----------	

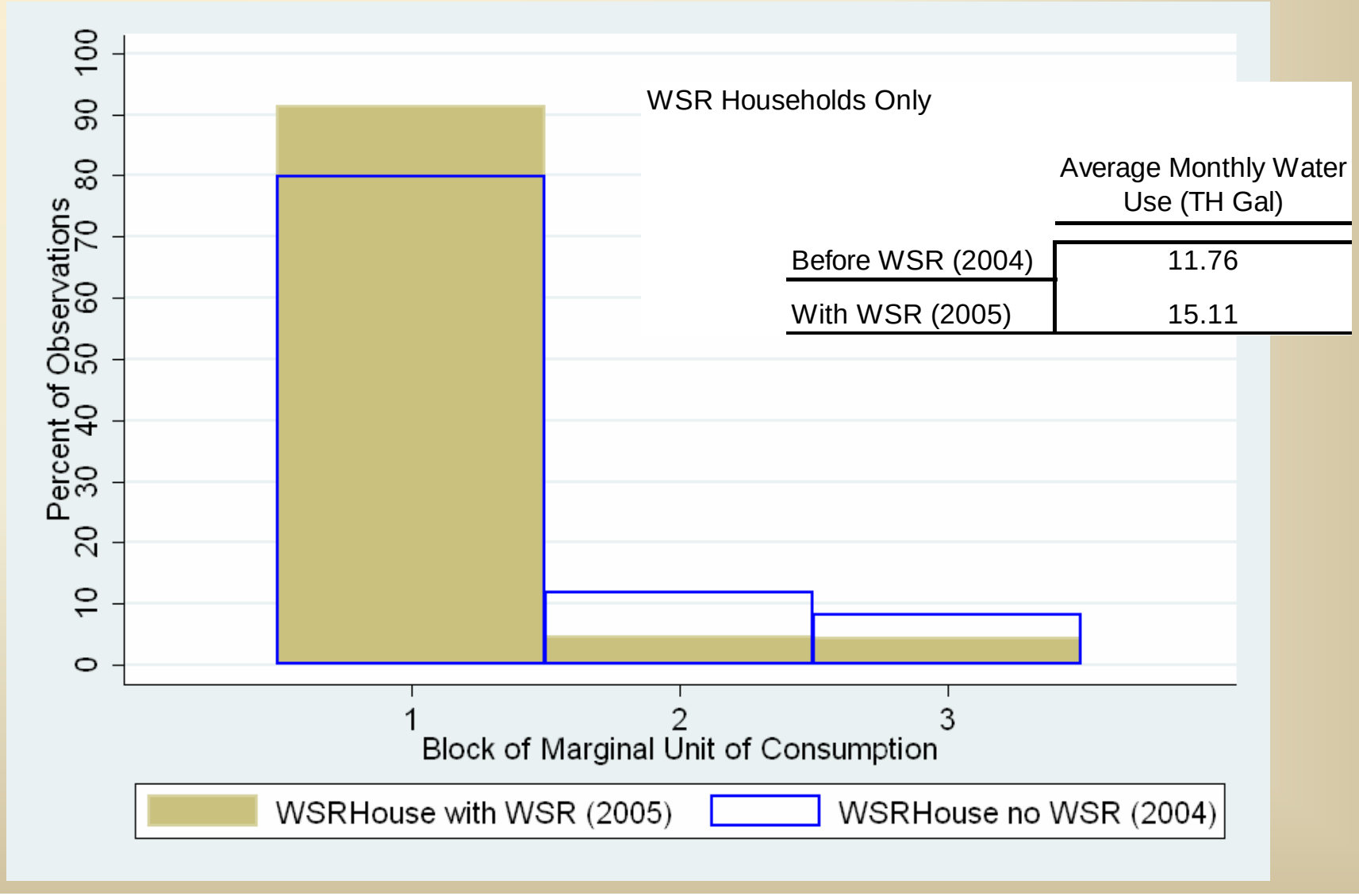
How can the utility impact the customers' decision?

- Rebates
- Price
- Information

Payback Period
Estimated Years to Payback (from beginning of Service Period)
Simple Payback occurs in year
Discounted Payback occurs in year

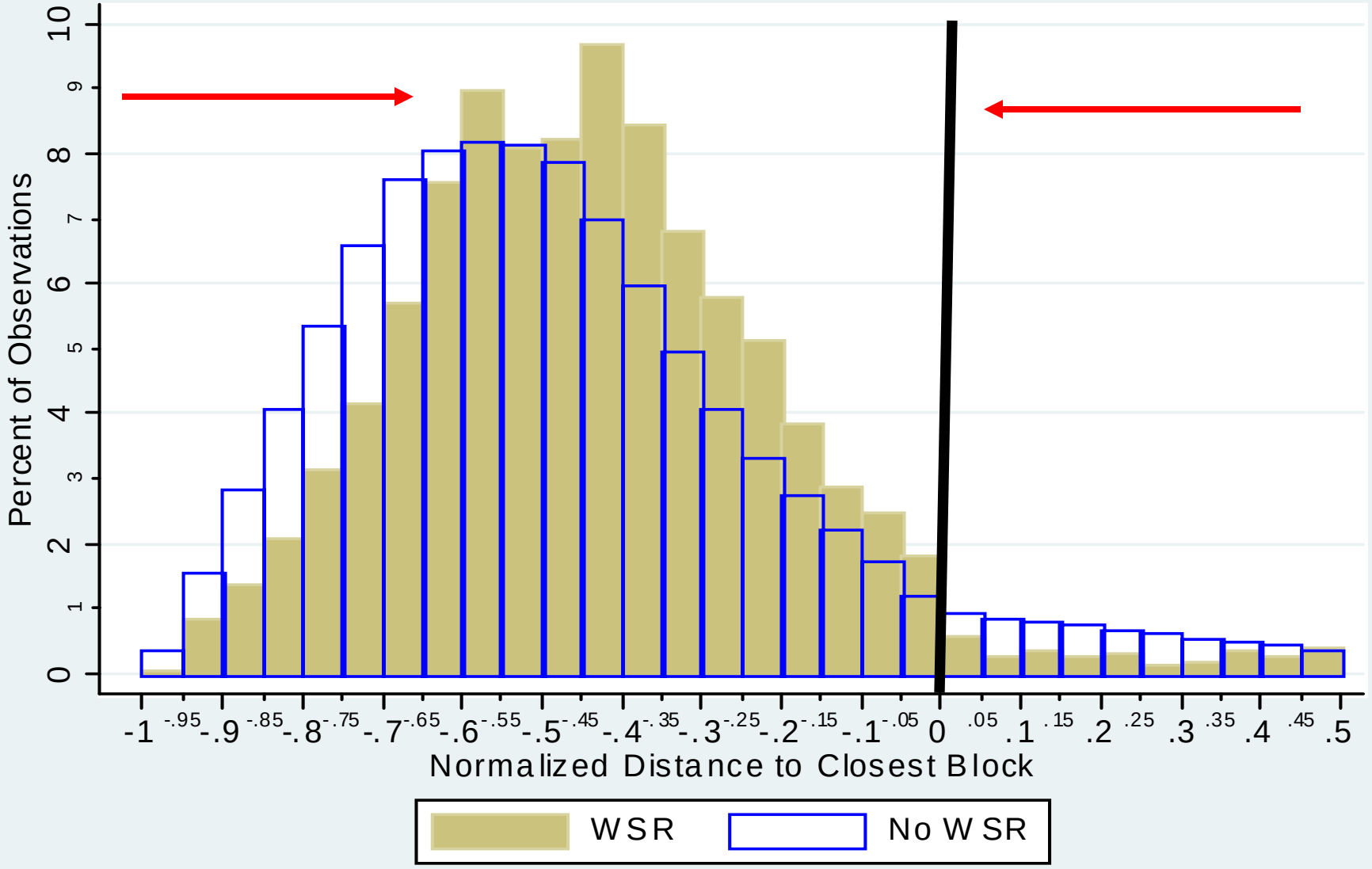
Adapted from Page 33 of DOE 2002

Does Information Matter?



	Average Monthly Water Use (TH Gal)
Before WSR (2004)	11.76
With WSR (2005)	15.11

Are “Smarter” Customers more Responsive Customers?



Questions? Coments?

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References

- Herfindahl, O.C., 1961, *What is Conservation?,* Reprint No. 30, Resources for the Future, Washington, D.C.
- Barta, Rachel, *Stretching Urban Water Supplies in Colorado: Strategies for Landscape Water Conservation*, Special Report 13, 2004, Colorado Water Resources Research Institute
- U.D. Department of Energy: Office of Energy Efficiency and Renewable Energy, *Domestic Water Conservation Technologies: Using less water and energy is an investment in a sustainable future*, Report Num. DOE/EE-0264, Washington, DC, 2002
- Gleick, Peter H, et al., *Waste Not, Want Not: The potential for urban water conservation in California,* Oakland, California, Pacific Institute for Studies in Development, Environment, and Security, 2003
- Maddaus, William O., *Realizing the Benefits From Water Conservation*, Water Resources Update 114 (1999): 10
- Colorado Water Conservation Board Website (CWCB), *Water Conservation*, Accessed:05/01/2009, <http://cwcb.state.co.us/Conservation/Conservation/>.

References

- Kenney, Doug et al., *Residential Water Demand Management: Lessons from Aurora, Colorado*. Journal of the American Water Resources Association, 2008
- Metcalf, Gilbert and Kevin A. Hassett, *Measuring the Energy Savings from Home Improvement Investments: Evidence from monthly billing data.*, The Review of Economics and Statistics, Vol. 81, No. 3. (Aug., 1999), pp. 516-528
- Waldman, Donald M., and Michael T. Ozog, *Natural and Incentive Induced Conservation in Voluntary Energy Management Programs*, Southern Economic Journal, Vol. 62, 1996
- Klein, Bobbie, Doug Kenney, Jessica Lowrey, and, Chris Goemans, 2007, Factors Influencing Residential Water Demand: A Review of the Literature, Available online at: http://wwa.colorado.edu/resources/water_demand_and_conservation/literature_review_version_1_12_07.pdf
- Gaudin, S., Effect of Price Information on Residential Water Demand, Applied Economics, Vol. 38, 2006.