

# Mining data from billing records

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Billing & Collection Systems

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# What data do you have in your billing records?

## Basic

- Customer number
- Bill date
- Meter reading (volume)
- Charge(s)
- Bill code

*What can you do with just these?*

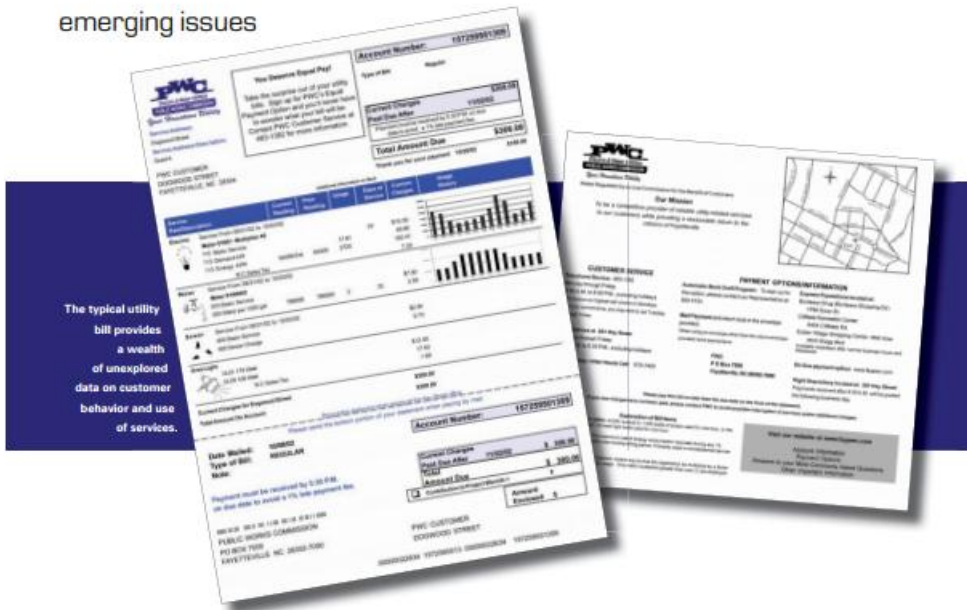
## Additional

- Meter number
- Block
- Customer type
- Last meter read date
- Due date
- Adjustment
- Late
- Disconnect/re-connect
- Address
- Payment method
- etc.

# Example

2	Account	Service	Type	zip	Billing code	ccf	Charge	Meter read date	Days since last reading	Meter size
3	131461	water	volume	28312	300	3	6.87	8/2/2006	32	5/8
4	131461	water	base	28312	300	0	4.08	8/2/2006	32	5/8
5	131461	sewer	volume	28312	400	3	8.43	8/2/2006	32	5/8
6	131461	sewer	base	28312	400	0	5.01	8/2/2006	32	5/8
7	131461	water	volume	28312	300	3	6.87	8/31/2006	29	5/8
8	131461	water	base	28312	300	0	4.08	8/31/2006	29	5/8
9	131461	sewer	volume	28312	400	3	8.43	8/31/2006	29	5/8
10	131461	sewer	base	28312	400	0	5.01	8/31/2006	29	5/8
11	131461	water	volume	28312	300	2	4.58	10/2/2006	32	5/8
12	131461	water	base	28312	300	0	4.08	10/2/2006	32	5/8
13	131461	sewer	volume	28312	400	2	5.62	10/2/2006	33	5/8
14	131461	sewer	base	28312	400	0	5.01	10/2/2006	33	5/8

emerging issues



Boyle, Eskaf, Tiger & Hughes

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CHRISTINE E. BOYLE, SHADI ESKAF, MARY WYATT TIGER, AND JEFFREY A. HUGHES

## Mining water billing data to inform policy and communication strategies

WITH THE DATA MINING METHODOLOGY DESCRIBED HERE, UTILITIES CAN USE DATA THEY ALREADY COLLECT TO TAILOR COMMUNICATIONS WITH CUSTOMERS AND INFORM MANAGEMENT DECISIONS.

**W**ater utilities in the United States struggle over how to set policies, design rate structures, and implement communication procedures that are effective and appropriate to their customer base. Adding to the complexity of these tasks is that water management requires local planning, and cookie-cutter strategies often fail to consider that customer characteristics and water demand vary from one town to the next, even within the same state or geographic region. For example, the same conservation initiative that succeeds at one utility may fail to reach its conservation goals or costs much more at a neighboring utility, solely because customers in the two communities have different water use patterns. Consequently, the revenue effects of the conservation initiative will be vastly different for the two utilities.

Without reliable data, it is difficult for water providers to customize their demand management and communication strategies to their customer base. However, the reality is that utilities already collect much of the information they need to inform such decisions, but most, if not all, utilities do not use this valuable data set to its fullest potential. This article proposes that customer billing data offer a valuable tool—one that is readily available to water utilities—that can facilitate a new understanding of customer water use, inform

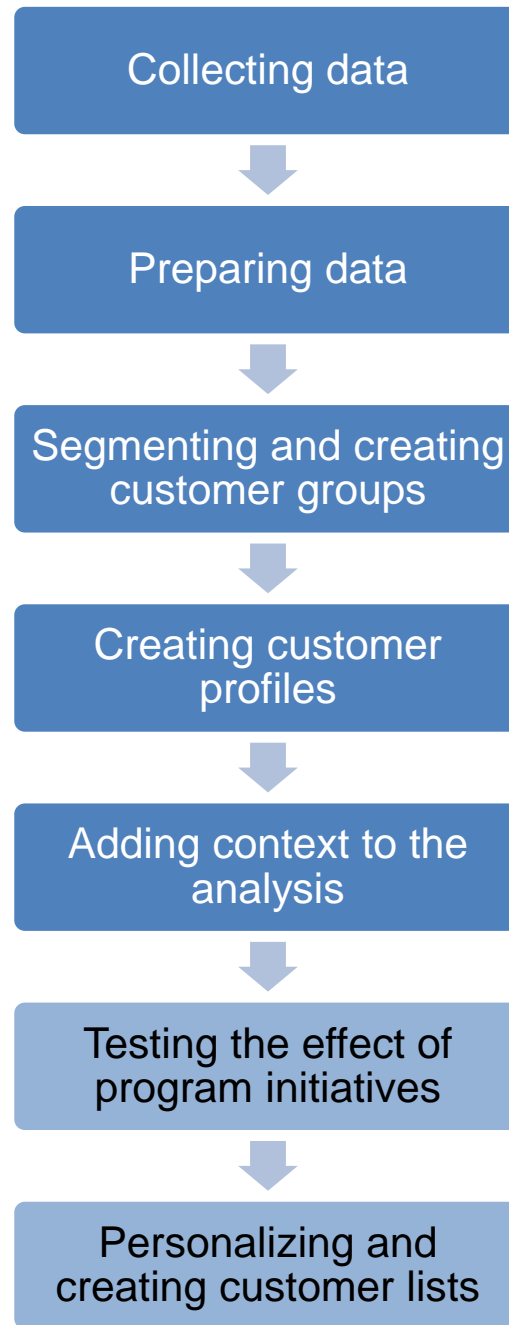
Or use the EFC website:

<http://efc.unc.edu/projects/ResidentialWaterConsumptionBehavior.htm>

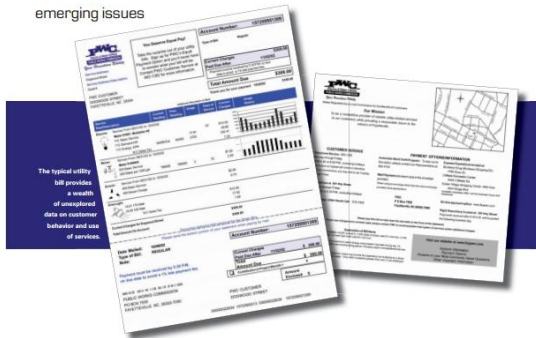
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# Steps



emerging issues



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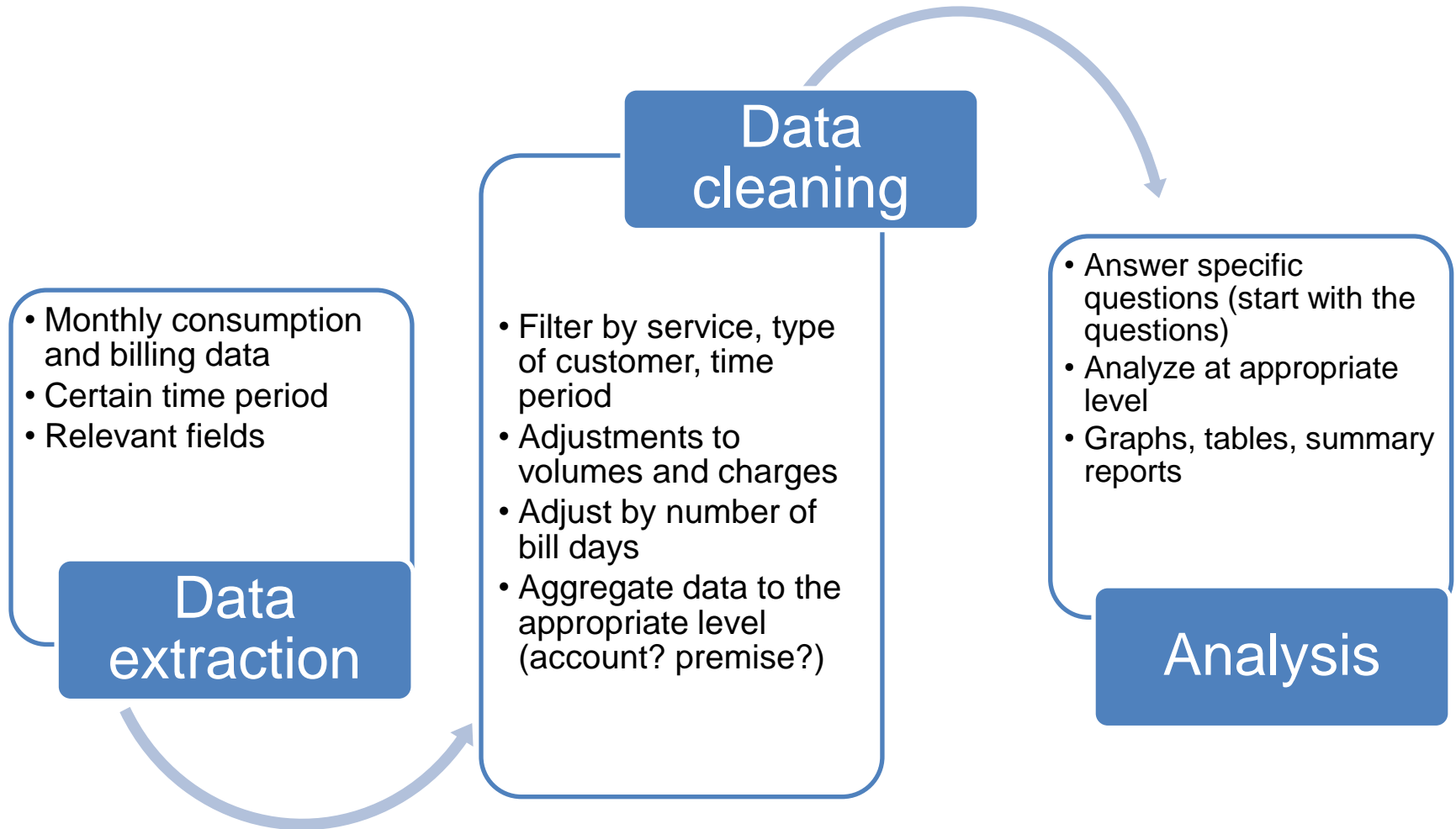
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# Method



# Different subsets of data yield different information

## Billing records for this month, individual customer

- Transactions
- Late / cut-off

## Billing records for this month, all customers

- Percent and list of active/inactive customers
- Total water volume sold (and non-revenue water for this month)
- Total charges, by customer type and by service



# Different subsets of data yield different information

## Billing records for several months (1 year+), all customers

- Total and trends of water volume sold by month
- Breakdown volume sales by meter size, block/use amount, type
- Total and trends of charges, by customer type and service
- Utility-wide projections of the future (volume sales, revenues)
- Examine impact of weather, policies, rate increases, economy,...

*“Bill-level”*

## Billing records for several months (1 year+), individual customer

- Track how customers are changing consumption patterns
- Identify customers based on water-use behavior and payment habits (hone policies, rate structure designs, and target communications)
- Advanced analysis: panel data regressions to show effects of rate increases, policies, weather, on customers

*“Customer-level”*

# Examples of questions you can answer

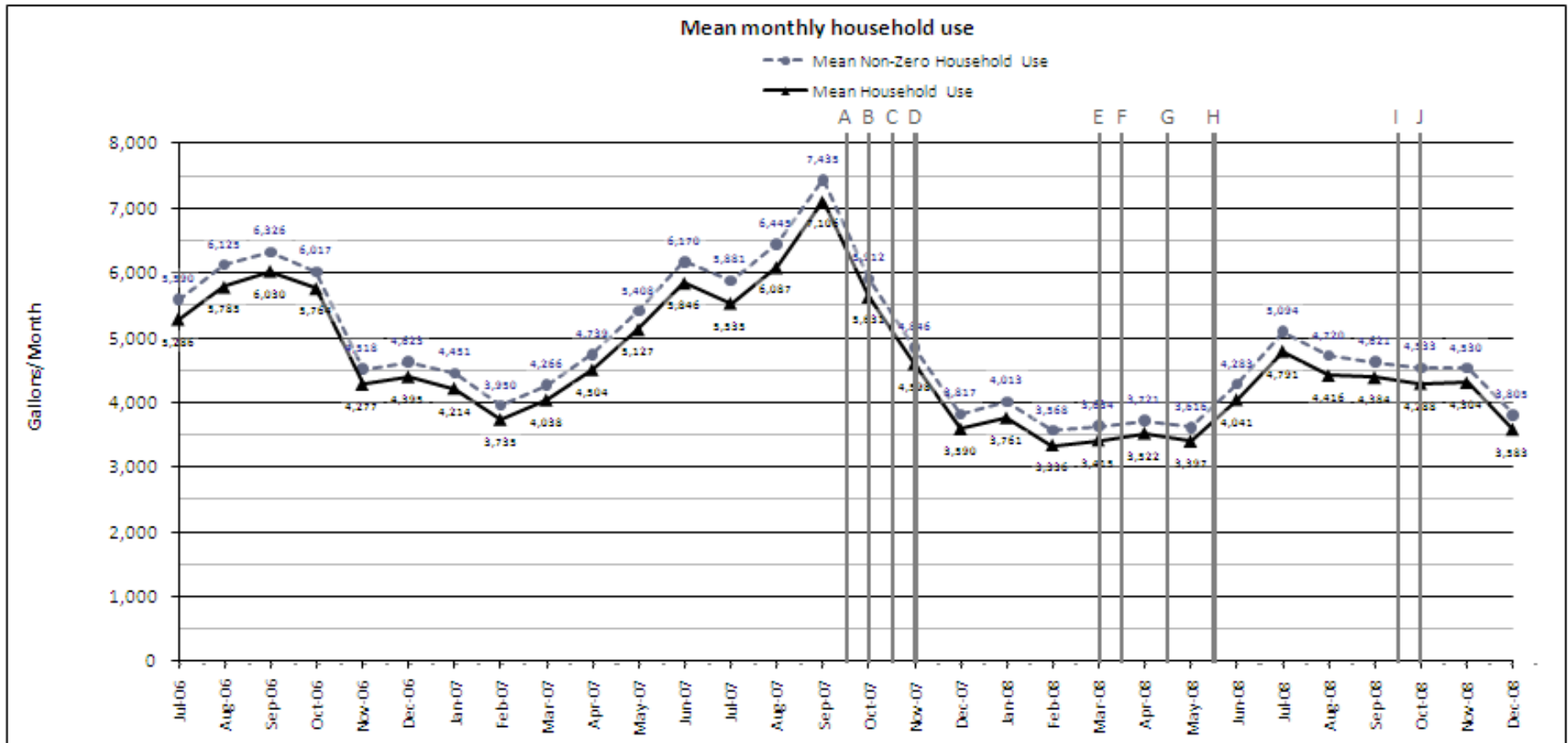
- What is the total amount charged in the past fiscal year for residential/commercial/industrial customers? “Bill-level”
- What was the maximum volume of water sold in any month in the past year? “Bill-level”
- What is the average household water use? “Bill-level”
- What was the percentage of bills that were for 3,000 – 5,000 gallons/month? “Bill-level”

# Examples of questions you can answer

- Which residential customers irrigate during the summer? “Customer-level”
- If we set the first block size to end at 5,000 gallons/month, how many customers would end up paying the second block rate? All the time? “Customer-level”
- Did our ban on outdoor watering reduce consumption? “Bill-level”  
“Customer-level” if assessing effect on specific customers

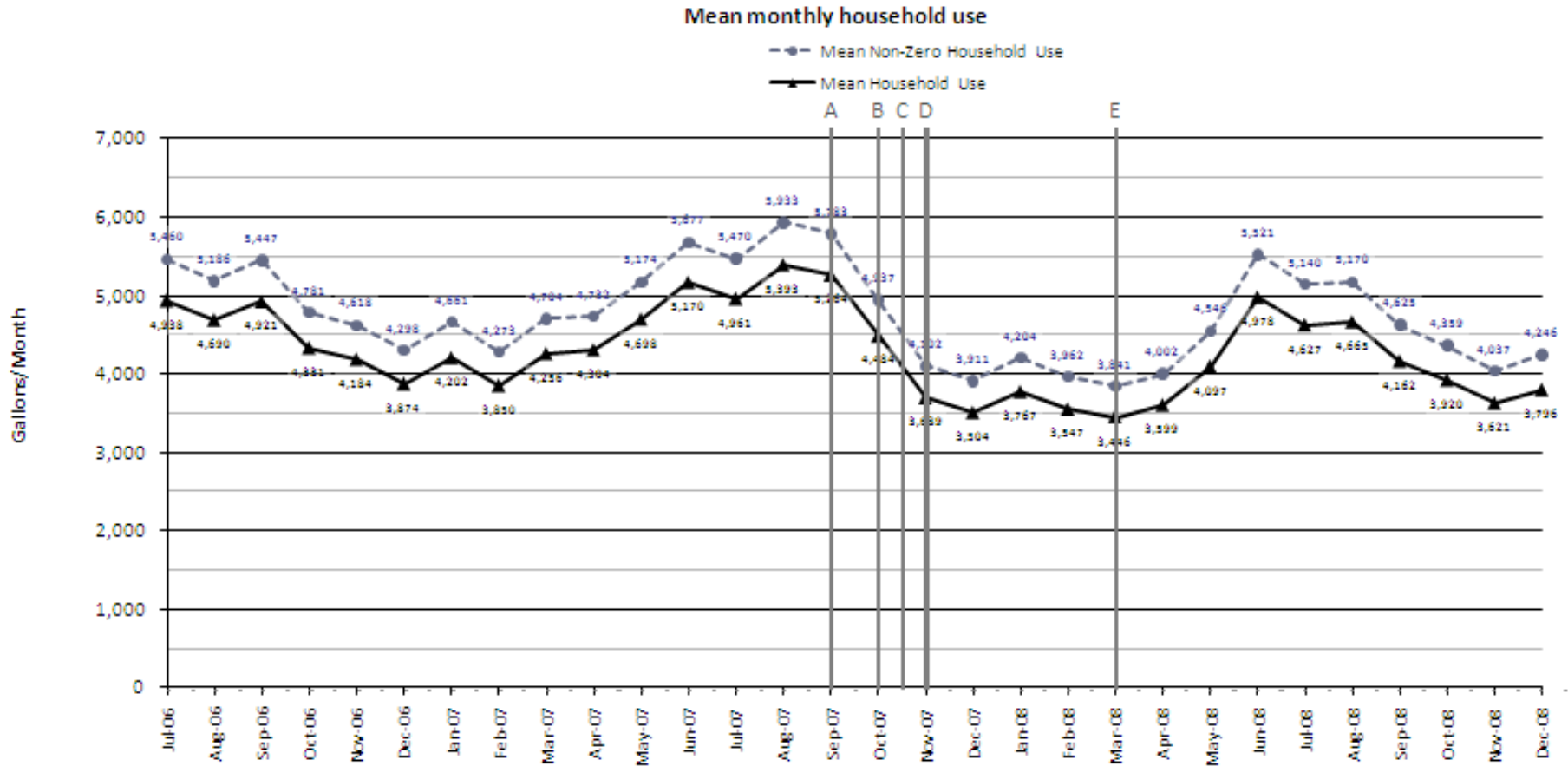


# 1) Observe trends and variations



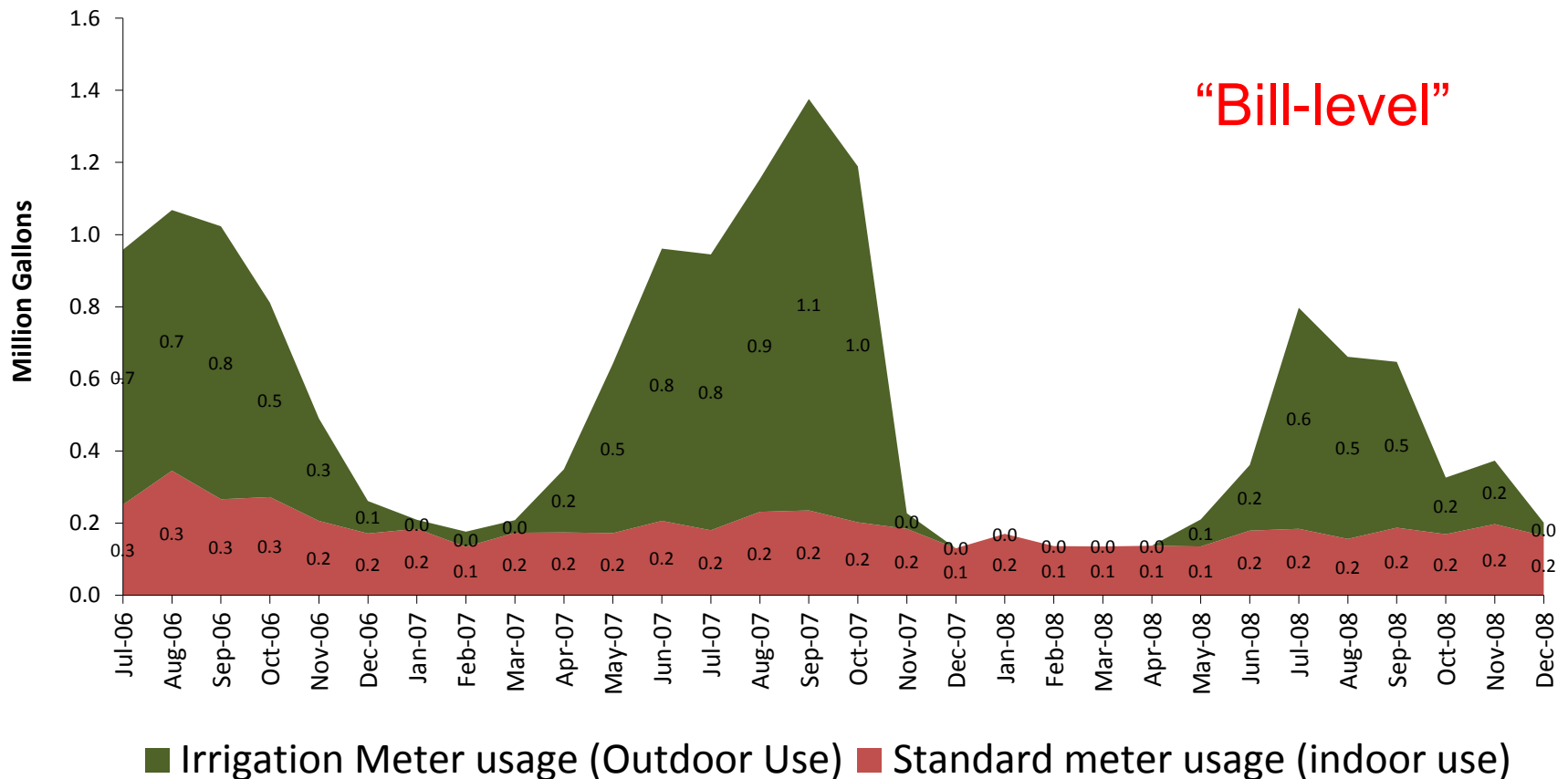
“Bill-level”

# 2) Don't forget about context



# 3) Residential irrigation can be substantial

Monthly usage by households with irrigation meters

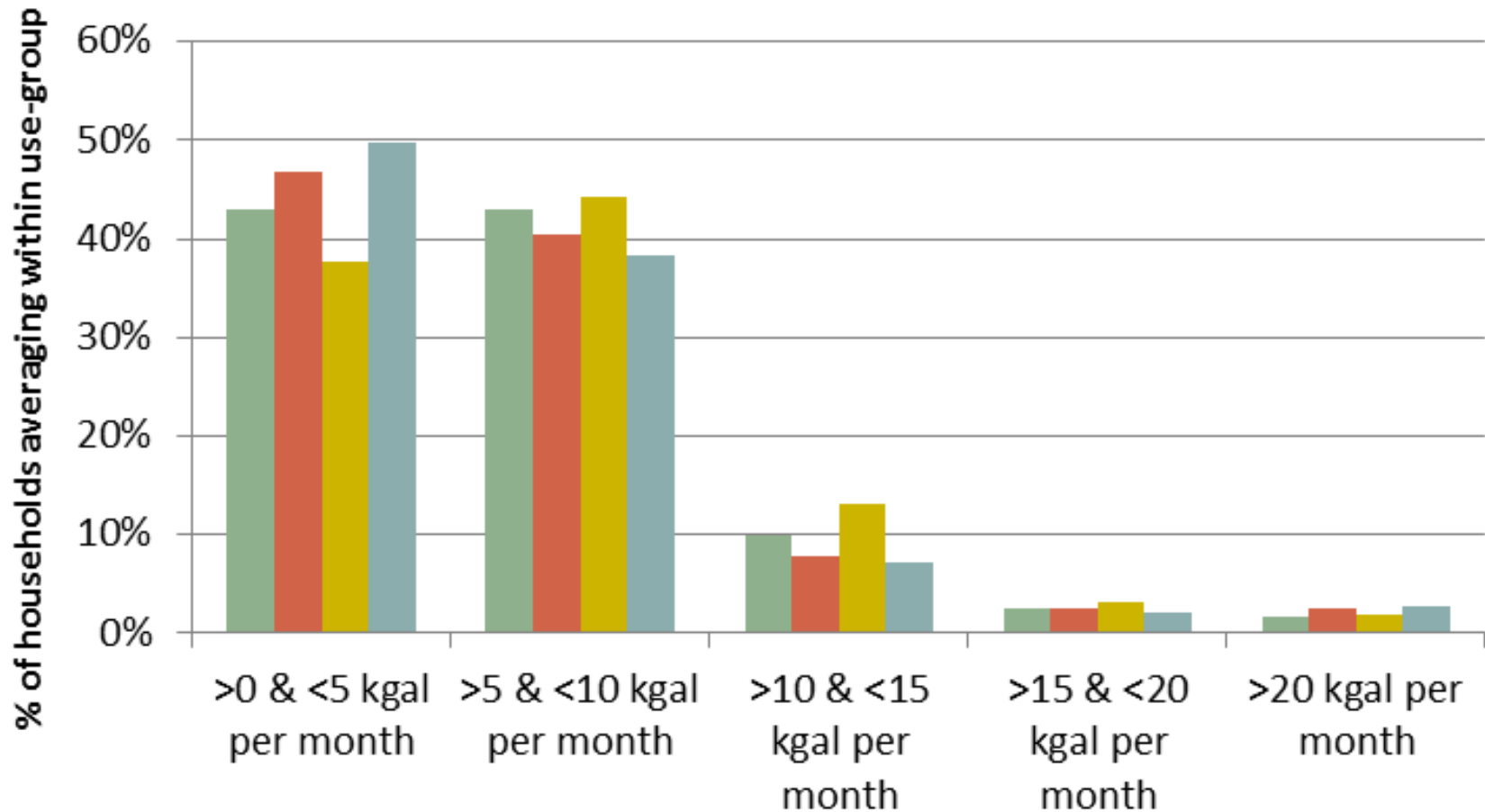


## 4) “Residential customers” are *not* homogenous within the utility

- Irrigators?
- Peakers?
- Significant contributors to the bottom line?
- Responsive to drought restrictions and conditions?

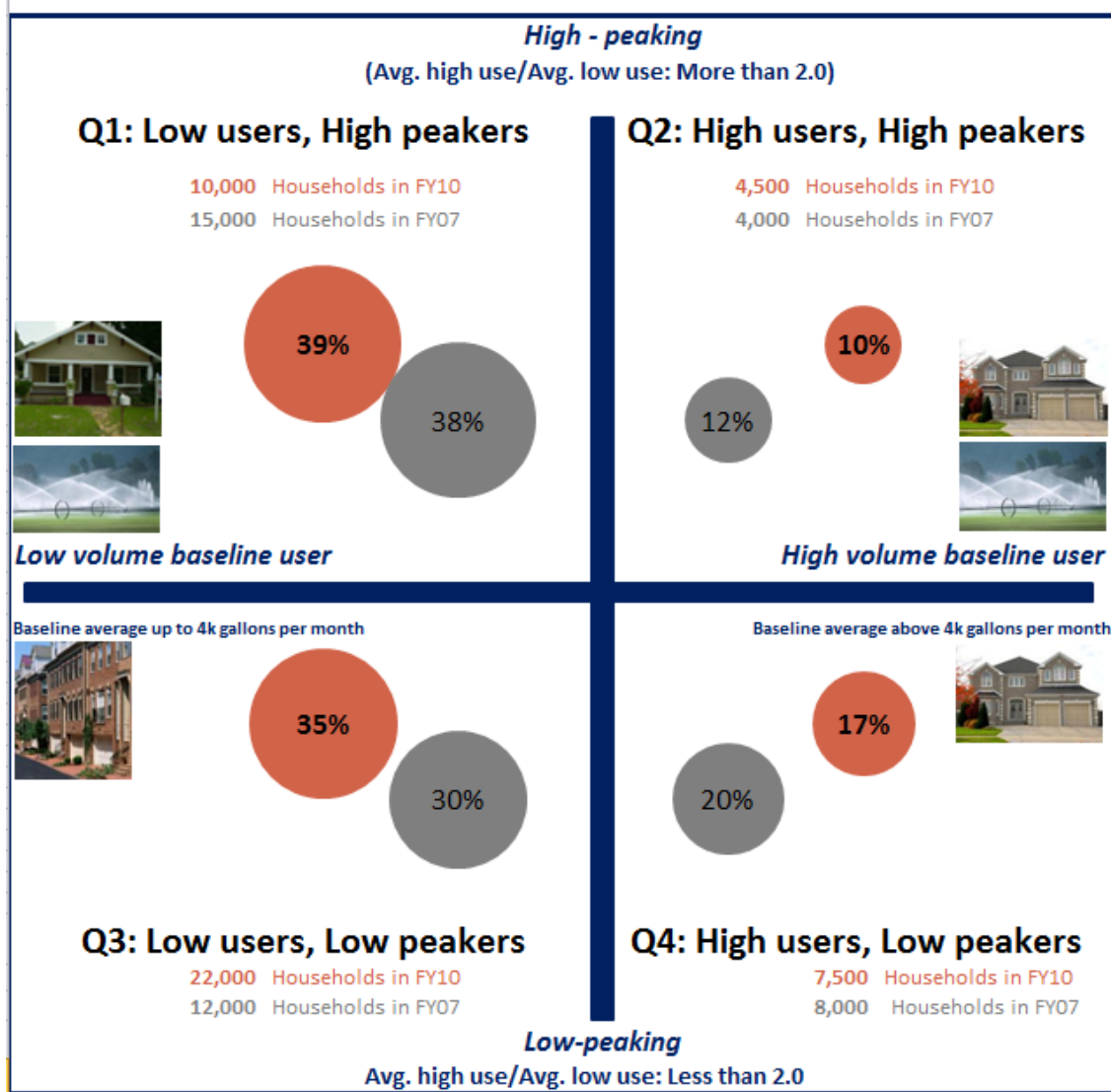


# Average Household Water Use - FY10



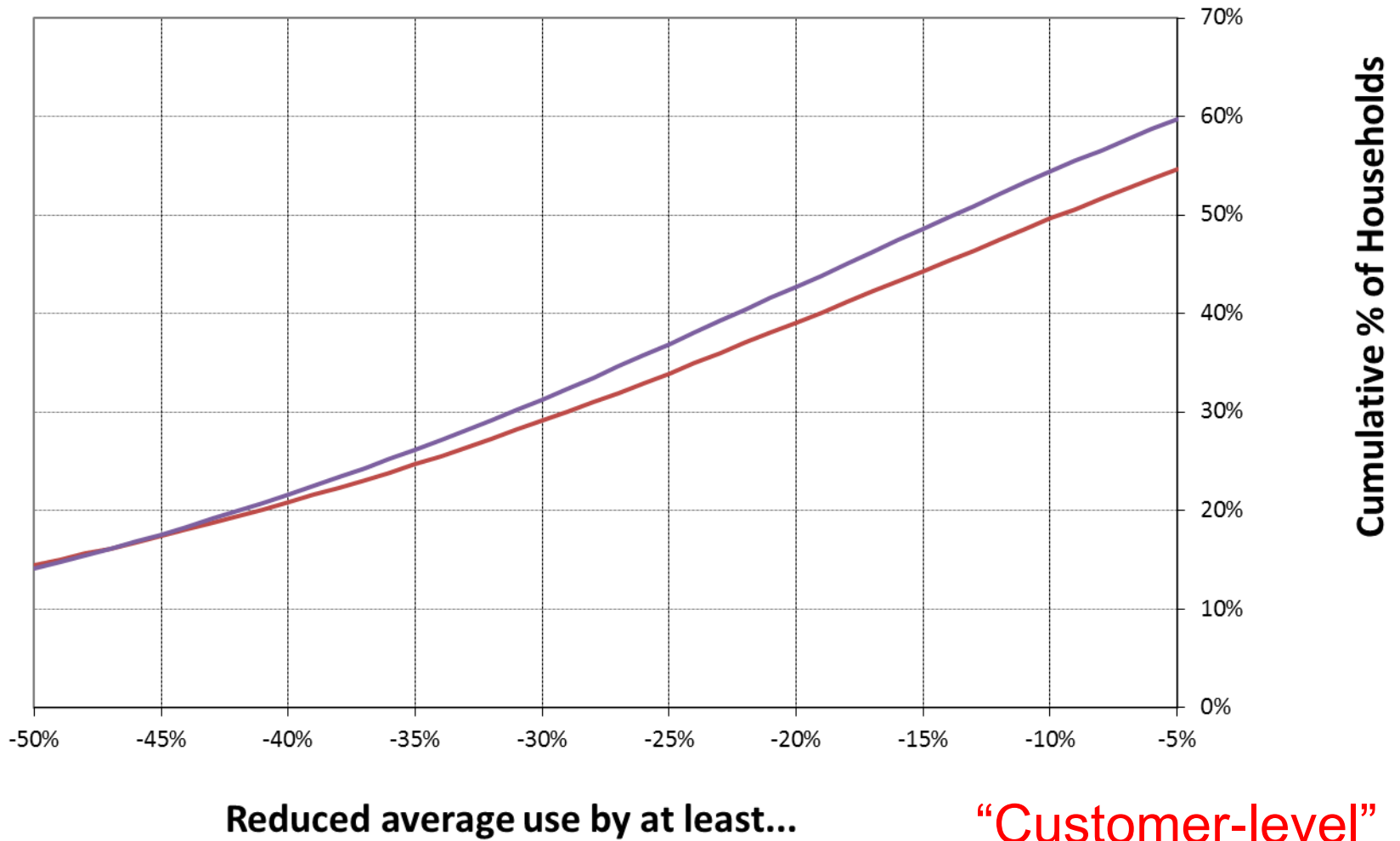
“Customer-level”

# Residential customers based on water-use patterns



“Customer-level”

## Households that REDUCED their average use in FY10 from FY07



Reduced average use by at least...

“Customer-level”

# There may be “hidden” irrigators among your customers

Utility	Number of residential accounts (FY08)	Percentage with irrigation meters	Percent that irrigate with in-ground systems (estimated)
1	75,062	8%	13%
2	36,864	2%	4%
3	225,247	2%	9%
4	18,018	0.2%	4%

“Customer-level”

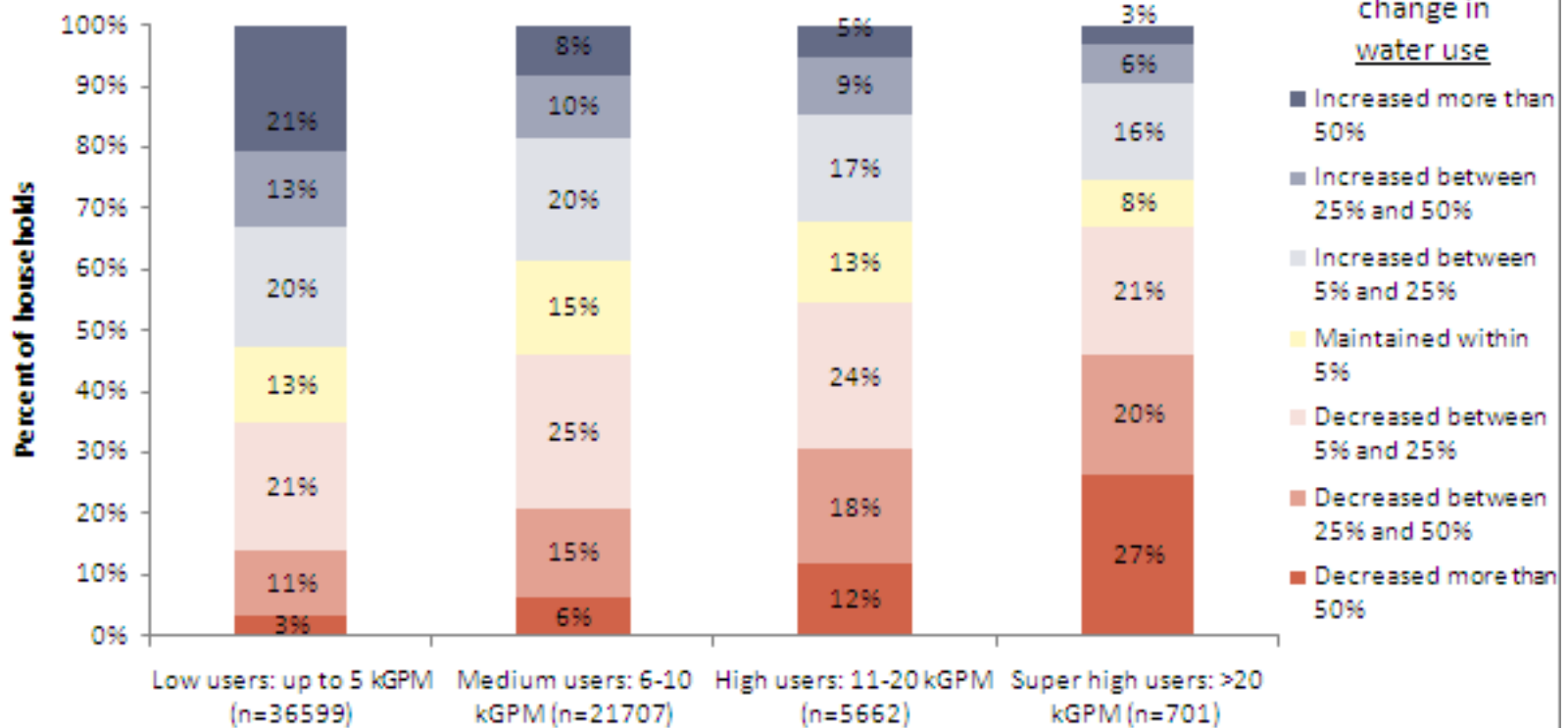
# Changing household water use: at the utility level (“bill-level”)

Utility	Average household water use		Percent change
	FY07	FY08	
Fayetteville PWC	4,980	5,410	+9%

“Bill-level”

# Households change consumption differently

Changes in water use by households with varying levels of usage in FY07



Household types based on their average water use in FY07

“Customer-level”

# Block (Tier) 1

Utility	% of households that never exceeded Tier 1 (FY10)	% of households whose average water use falls in Tier 1 (FY10)	% of households whose 3 lowest non-zero months' average falls in Tier 1 (FY10)
1	58%	69%	92%
2	40%	54%	91%
3	13%	10%	43%
4	14%	11%	
5	9%	22%	72%
6	4%	10%	34%

“Customer-level”

# Capabilities and Opportunities of customer-level analysis

- Customer level communication
  - e.g. Only send watering schedules to known and assumed irrigators
- Customer level impact analysis
  - e.g. Just what percentage of households ever reach your highest tier? And how many households are “punished” by the highest tiers?
- Customer-specific rates (*not just budget-based rates*)



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