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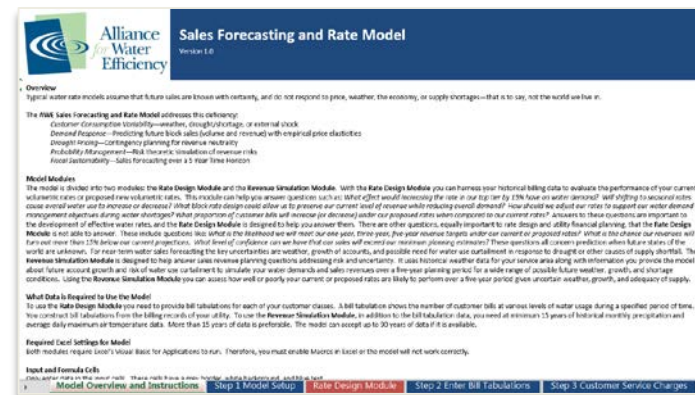
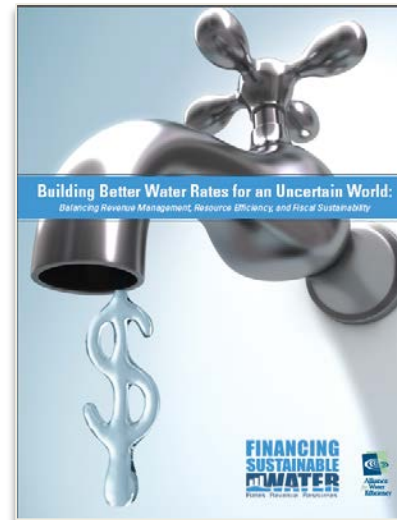
Using the AWE Rate Model to Examine Drought Rates: The Benefit of Analyzing Scenarios

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AWE's Financing Sustainable Water

- **Building Better Rates in an Uncertain World:** A Handbook to explain key concepts, provide case studies and implementation advice
- **AWE Sales Forecasting and Rate Model:** An innovative, user-friendly tool to model scenarios, solve for flaws, and incorporate uncertainty into rate making
- **FinancingSustainableWater.org:** Web-based resources to convene the latest research and information in one location



AWE Sales Forecasting and Rate Model

- Models Water Demand Variability
- Models Water Revenue Variability
- Analyzes Customer Bills
- Assesses Affordability
- Assesses Fiscal Sustainability
- Analyzes Uncertainty
- Allows Scenario Planning

Alliance for Water Efficiency
Sales Forecasting and Rate Model
Version 1.0

Overview
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:

- 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

Model Modules
The model is divided into two modules: the **Rate Design Module** and the **Revenue Simulation Module**. With the **Rate Design Module** you can harness your historical billing data to evaluate the performance of your current volumetric rates or proposed new volumetric rates. This module can help you answer questions such as: *What effect would increasing the rate in our top tier by 15% have on water demand? Will shifting to seasonal rates cause overall water use to increase or decrease? What block rate design could allow us to preserve our current level of revenue while reducing overall demand? How should we adjust our rates to support our water demand management objectives during water shortages? What proportion of customer bills will increase (or decrease) under our proposed rates when compared to our current rates? Answers to these questions are important to the development of effective water rates, and the **Rate Design Module** is designed to help you answer them. There are other questions, equally important to rate design and utility financial planning, that the **Rate Design Module** is not able to answer. These include questions like: *What is the likelihood we will meet our one-year, three-year, five-year revenue targets under our current or proposed rates? What is the chance our revenues will turn out more than 15% below our current projections. What level of confidence can we have that our sales will exceed our minimum planning estimates? These questions all concern prediction when future states of the world are unknown. For near-term water sales forecasting the key uncertainties are weather, growth of accounts, and possible need for water use curtailment in response to drought or other causes of supply shortfall. The **Revenue Simulation Module** is designed to help answer sales revenue planning questions addressing risk and uncertainty. It uses historical weather data for your service area along with information you provide the model about future account growth and risk of water use curtailment to simulate your water demands and sales revenues over a five-year planning period for a wide range of possible future weather, growth, and shortage conditions. Using the **Revenue Simulation Module** you can assess how well or poorly your current or proposed rates are likely to perform over a five-year period given uncertain weather, growth, and adequacy of supply.**

What Data is Required to Use the Model
To use the **Rate Design Module** you need to provide bill tabulations for each of your customer classes. A bill tabulation shows the number of customer bills at various levels of water usage during a specified period of time. You construct bill tabulations from the billing records of your utility. To use the **Revenue Simulation Module**, in addition to the bill tabulation data, you need at minimum 15 years of historical monthly precipitation and average daily maximum air temperature data. More than 15 years of data is preferable. The model can accept up to 90 years of data if it is available.

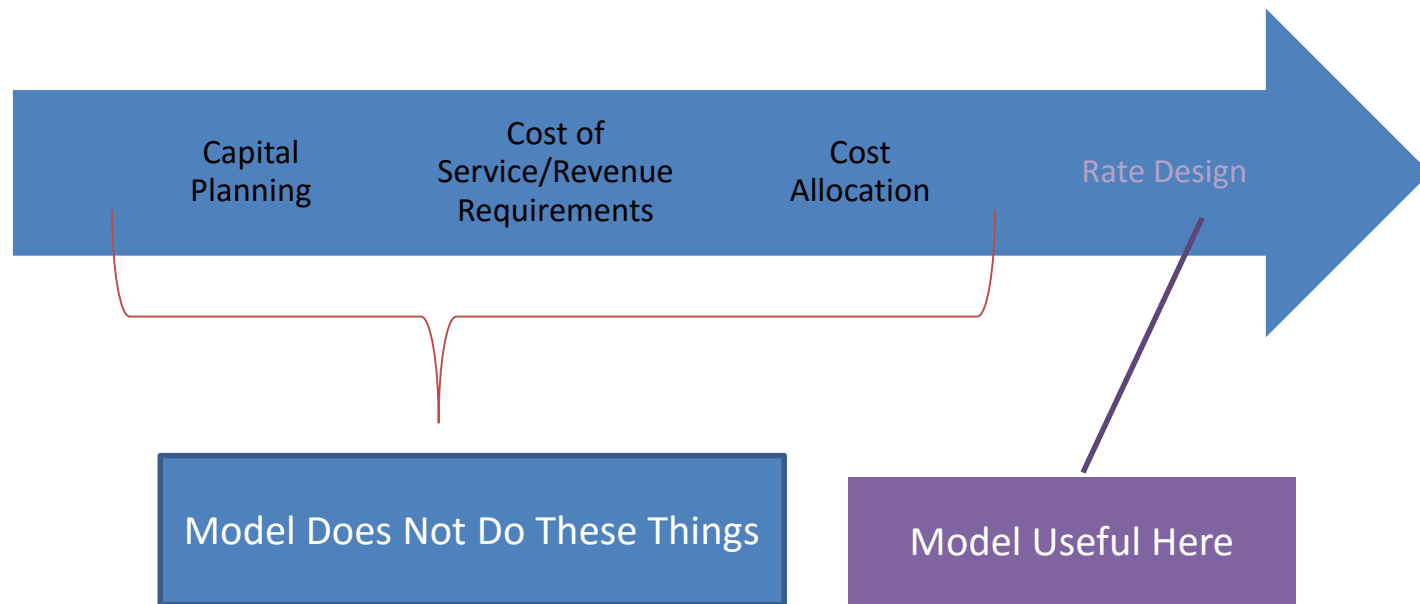
Required Excel Settings for Model
Both modules require Excel's Visual Basic for Applications to run. Therefore, you must enable Macros in Excel or the model will not work correctly.

Input and Formula Cells
Only enter data in the input cells. These cells have a gray border, white background, and blue text.

Model Overview and Instructions | Step 1 Model Setup | Rate Design Module | Step 2 Enter Bill Tabulations | Step 3 Customer Service Charges



The Model in the Rate Setting Process



Designing Drought Rates

Rate Design Tables

Rate Performance Indicators

Drought Stage Selector

2. Rate Performance by Drought/Shortage Stage

The tables in this section hold two sets of rates. Your proposed rates are carried over from Step 3. These rates are used on this worksheet. They are used for calculating the revenue impacts of drought stages. The Stage rates are the rates that would apply for a given drought shortage stage. To see how your rates would change for a drought stage, click the Reset Drought Stage Rates to Proposed Rates. This will copy your Proposed rates to the Stage Rates. You can then use the Select Drought Stage drop-down list to cycle through the drought stages and see how your sales revenue would be impacted by each drought stage. The impacts to annual sales volume and revenue for each Customer Class are summarized to the right of the rate tables. You can adjust the Stage Rates to see how your annual sales volume and revenue would respond. You can adjust the size or number of blocks as well as the rates for each block. You can use trial and error to find rates appropriate to each drought/shortage stage, or you can use Excel's goal-seek or solver functionality to do this. Section 3 provides a calculator that can quickly identify rates for a given drought/shortage stage that are revenue neutral.

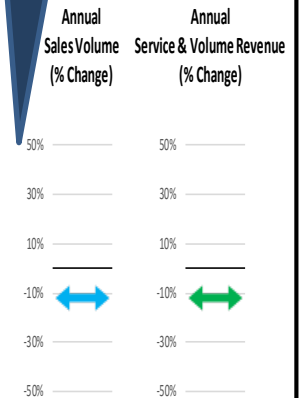
Select Drought Stage

Rate Performance by Customer Class

Customer Class	Annual Sales Volume		
	Proposed	Stage 2	% Change
CCF	8,913,705	7,844,060	-12.0%

Customer Class	Annual Sales Revenue (Thou. \$)		
	Proposed	Stage 2	% Change
Service	\$12,263	\$12,263	0.0%
Volume	\$27,744	\$24,415	-12.0%
Total	\$40,007	\$36,678	-8.3%

Impact of Drought Stage Rates Relative to Proposed Rates



Single Family

	Off Peak Season			
	Proposed Rates		Stage 2 Rates	
	Block (CCF)	Rate (\$/CCF)	Block (CCF)	Rate (\$/CCF)
Block 1	5	\$2.50	5	\$2.50
Block 2	10	\$2.50	10	\$2.50
Block 3	15	\$2.50	15	\$2.50
Block 4	15	\$2.50	15	\$2.50
Block 5	15	\$2.50	15	\$2.50

	Peak Season			
	Proposed Rates		Stage 2 Rates	
	Block (CCF)	Rate (\$/CCF)	Block (CCF)	Rate (\$/CCF)
Block 1	5	\$3.75	5	\$3.75
Block 2	10	\$3.75	10	\$3.75
Block 3	15	\$3.75	15	\$3.75
Block 4	15	\$3.75	15	\$3.75
Block 5	15	\$3.75	15	\$3.75



California Water Service

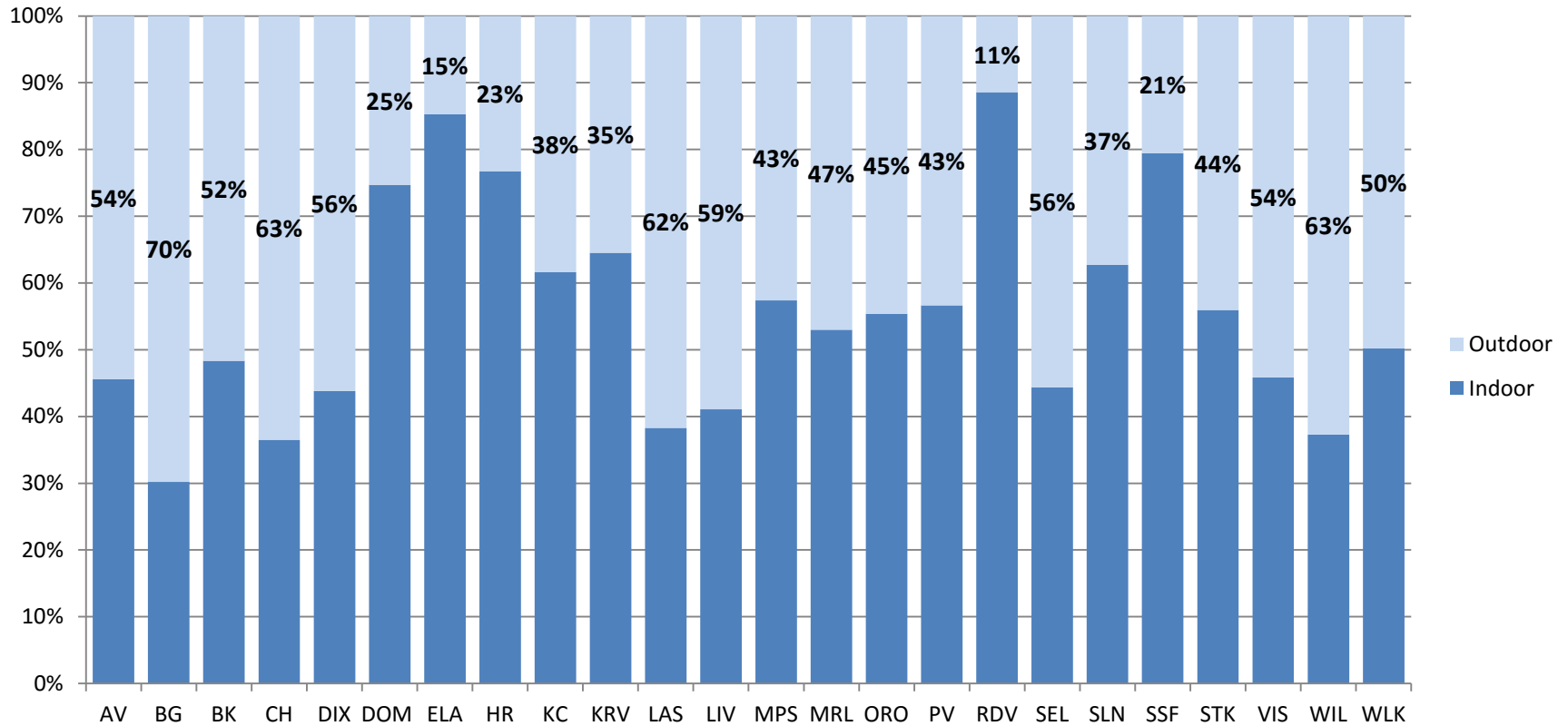


California Water Service

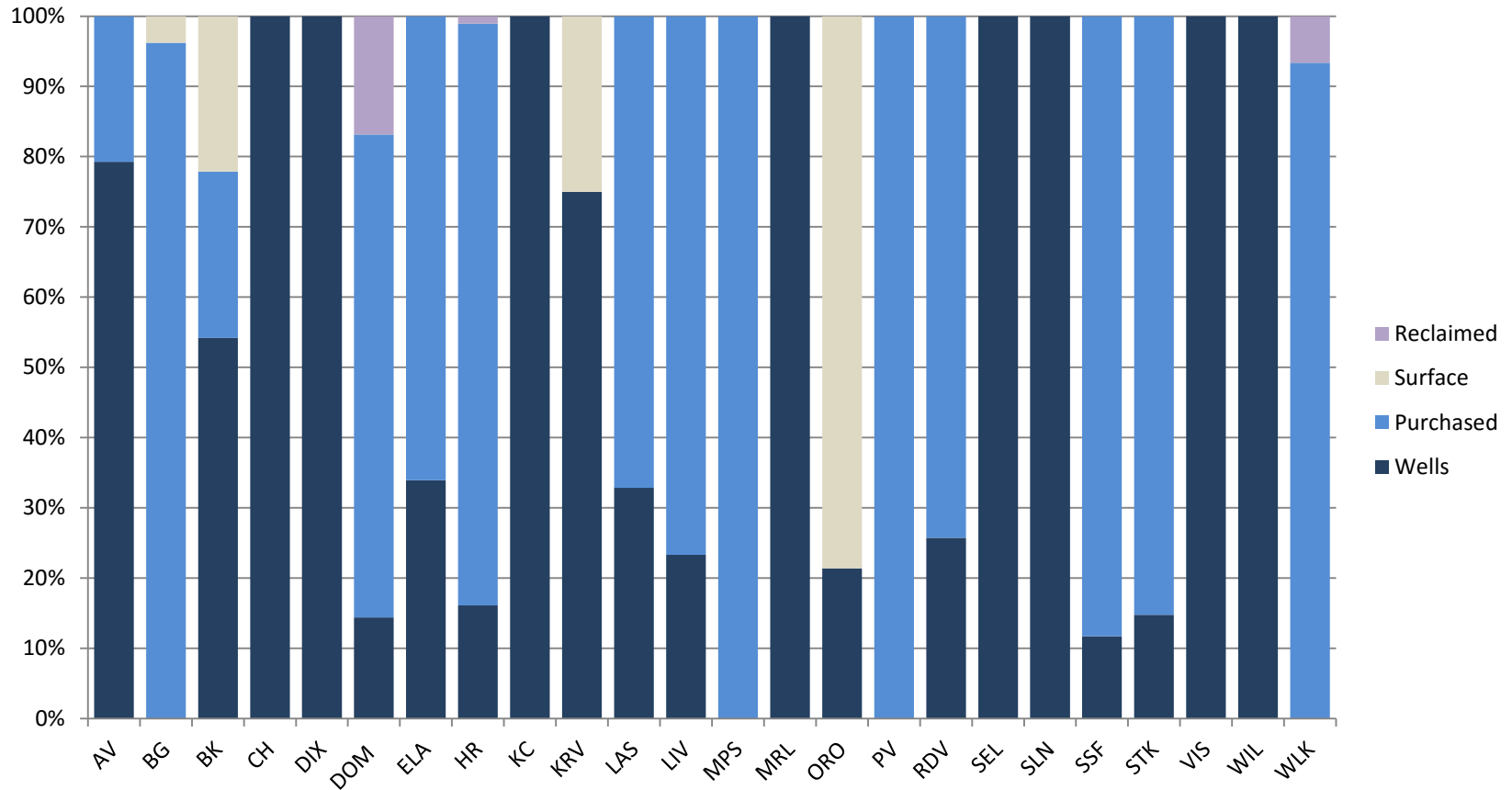
- 24 service areas
- 80 communities
- 500,000 service connections
- 2,000,000 population



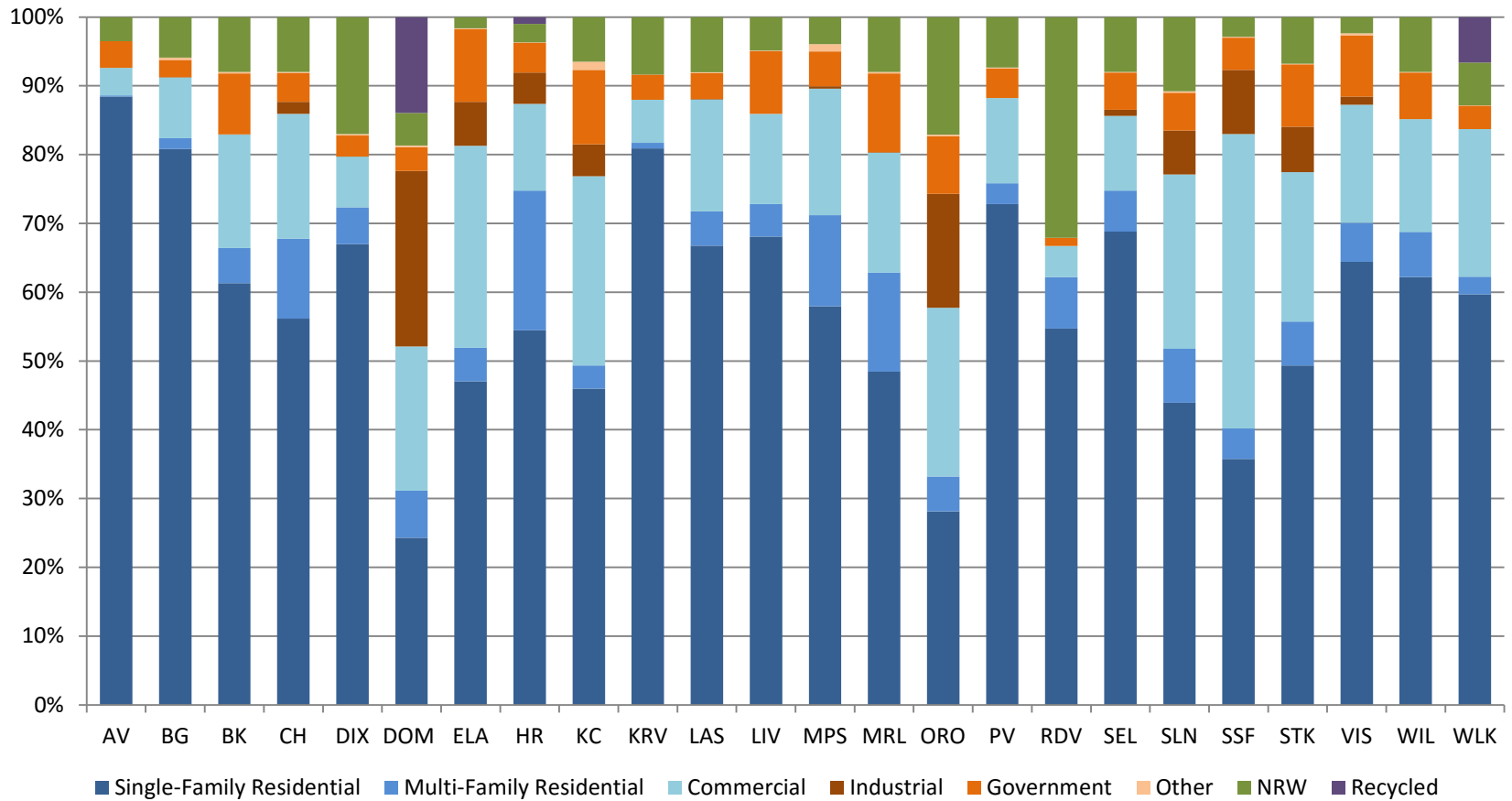
Single-Family Residential Indoor/Outdoor Water Use



Water Supply Source Overview



Water Demand Overview



Process

- Preliminary analysis of 14 scenarios
 - Bakersfield, Livermore, Los Altos, Stockton
- Narrowed to 3 scenarios
- Analysis of 3 scenarios
 - 21 service areas
- Reviewed and refined
- Determined feasibility



Scenario Planning – 14

- No change to Tier 1
- Tier 2 changes (25-50%)
- Tier 3 changes (25-100%)
- New Tier 4 (25-200%)
- New Tier 5 (25%-400%)
- Non-residential (25-50%)



Scenario Planning - 3

Tier	Scenario 1	Scenario 2	Scenario 3
Tier 1	No Change	No Change	No Change
Tier 2	25%	50%	25%
Tier 3	50%	100%	50%
Tier 4*	N/A	N/A	100%
Non-Residential	25%	50%	25%



Price Elasticity

Price Response Scenario	Low		Medium		High	
	Off Peak	Peak	Off Peak	Peak	Off Peak	Peak
Single-Family	-0.050	-0.150	-0.100	-0.300	-0.150	-0.450
Multi-Family	-0.025	-0.075	-0.050	-0.150	-0.075	-0.225
Non-Residential	-0.100	-0.100	-0.200	-0.200	-0.300	-0.300



AWE Model - Inputs

2. Rate Performance by Drought/Shortage Stage

The tables in this section hold two sets of rates. Your proposed rates are carried over from Step 3. These cannot be modified on this worksheet. They provide the point of reference for calculating the revenue impacts of drought stages. The Stage rates are the rates that would apply for a given drought/shortage stage. To see how your Proposed rates would perform in a drought stage, click the Reset Drought Stage Rates to Proposed Rates. This will copy your Proposed rates into the tables for the Stage Rates. You can then use the Select Drought Stage drop-down list to cycle through the drought stages and see how your sales revenue would be impacted by each stage. Impacts to annual sales volume and revenue for each Customer Class are summarized to the right of the rate tables. You can adjust the Stage Rates to see how your annual sales volume and revenue would respond. You can adjust the size or number of blocks as well as the rates for each block. You can use trial and error to find rates appropriate to each drought/shortage stage, or you can use Excel's goal-seek or solver functionality to do this. Section 3 provides a calculator that can quickly identify rates for a given drought/shortage stage that are revenue neutral.

Single Family

	Off Peak Season			
	Proposed Rates		Stage 2 Rates	
	Block (CCF)	Rate (\$/CCF)	Block (CCF)	Rate (\$/CCF)
Block 1	11	\$2.72	11	\$2.72
Block 2	17	\$2.95	17	\$3.69
Block 3	1000000	\$3.43	1000000	\$5.15
Block 4	1000000	\$3.43	1000000	\$5.15
Block 5	1000000	\$3.43	1000000	\$5.15

	Peak Season				
	Proposed Rates		Stage 2 Rates		
	Block (CCF)	Rate (\$/CCF)	Block (CCF)	Rate (\$/CCF)	
	11	\$2.7222	1	11	\$2.72
	17	\$2.9495	1.25	17	\$3.69
	1000000	\$3.4323	1.50	1000000	\$5.15
	1000000	\$3.4323	1.50	1000000	\$5.15
	1000000	\$3.4323	1.50	1000000	\$5.15

Multi Family

	Off Peak Season			
	Proposed Rates		Stage 2 Rates	
	Block (CCF)	Rate (\$/CCF)	Block (CCF)	Rate (\$/CCF)
Block 1	1000000	\$2.97	1000000	\$3.71
Block 2	1000000	\$2.97	1000000	\$3.71
Block 3	1000000	\$2.97	1000000	\$3.71
Block 4	1000000	\$2.97	1000000	\$3.71
Block 5	1000000	\$2.97	1000000	\$3.71

	Peak Season				
	Proposed Rates		Stage 2 Rates		
	Block (CCF)	Rate (\$/CCF)	Block (CCF)	Rate (\$/CCF)	
	1000000	\$2.97	1.25	1000000	\$3.71
	1000000	\$2.97		1000000	\$3.71
	1000000	\$2.97		1000000	\$3.71
	1000000	\$2.97		1000000	\$3.71
	1000000	\$2.97		1000000	\$3.71

Non Residential

	Off Peak Season			
	Proposed Rates		Stage 2 Rates	
	Block (CCF)	Rate (\$/CCF)	Block (CCF)	Rate (\$/CCF)
Block 1	1000000	\$2.97	1000000	\$3.71
Block 2	1000000	\$2.97	1000000	\$3.71
Block 3	1000000	\$2.97	1000000	\$3.71
Block 4	1000000	\$2.97	1000000	\$3.71
Block 5	1000000	\$2.97	1000000	\$3.71

	Peak Season			
	Proposed Rates		Stage 2 Rates	
	Block (CCF)	Rate (\$/CCF)	Block (CCF)	Rate (\$/CCF)
	1000000	\$2.97	1000000	\$3.71
	1000000	\$2.97	1000000	\$3.71
	1000000	\$2.97	1000000	\$3.71
	1000000	\$2.97	1000000	\$3.71
	1000000	\$2.97	1000000	\$3.71

Select Drought Stage Stage 2

Rate Performance by Customer Class

	Annual Sales Volume		
	Proposed	Stage 2	% Change
CCF	4,360,963	3,844,916	-11.8%

	Annual Sales Revenue (Thou. \$)		
	Proposed	Stage 2	% Change
Service	\$0	\$0	#DIV/0!
Volume	\$12,408	\$11,742	-5.4%
Total	\$12,408	\$11,742	-5.4%

	Annual Sales Volume		
	Proposed	Stage 2	% Change
CCF	1,235,734	1,089,054	-11.9%

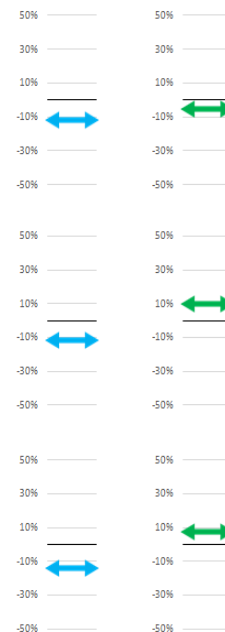
	Annual Sales Revenue (Thou. \$)		
	Proposed	Stage 2	% Change
Service	\$0	\$0	#DIV/0!
Volume	\$3,664	\$4,037	10.2%
Total	\$3,664	\$4,037	10.2%

	Annual Sales Volume		
	Proposed	Stage 2	% Change
CCF	11,394,247	9,807,198	-13.9%

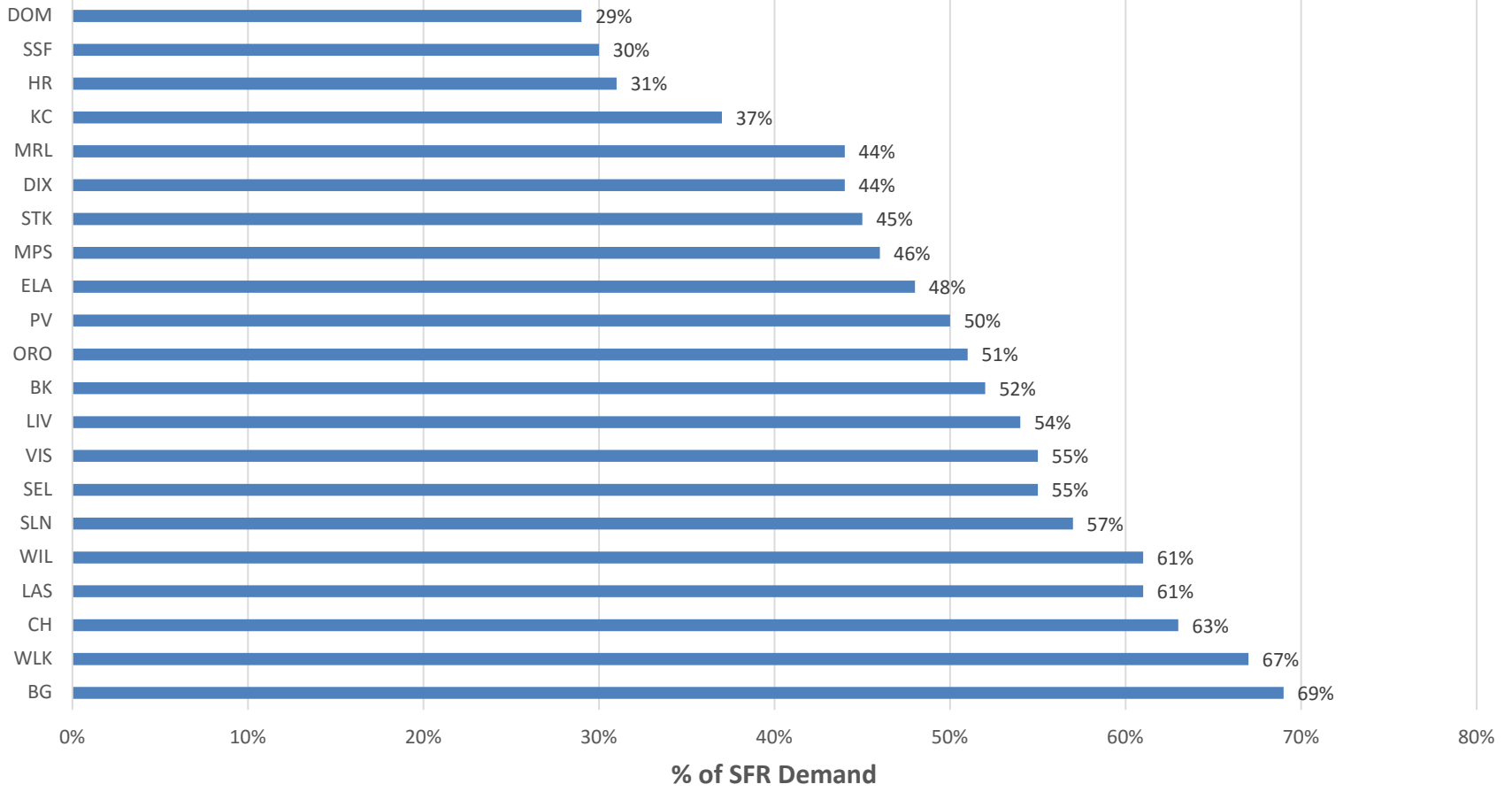
	Annual Sales Revenue (Thou. \$)		
	Proposed	Stage 2	% Change
Service	\$0	\$0	#DIV/0!
Volume	\$33,789	\$36,353	7.6%
Total	\$33,789	\$36,353	7.6%

Impact of Drought Stage Rates Relative to Proposed Rates

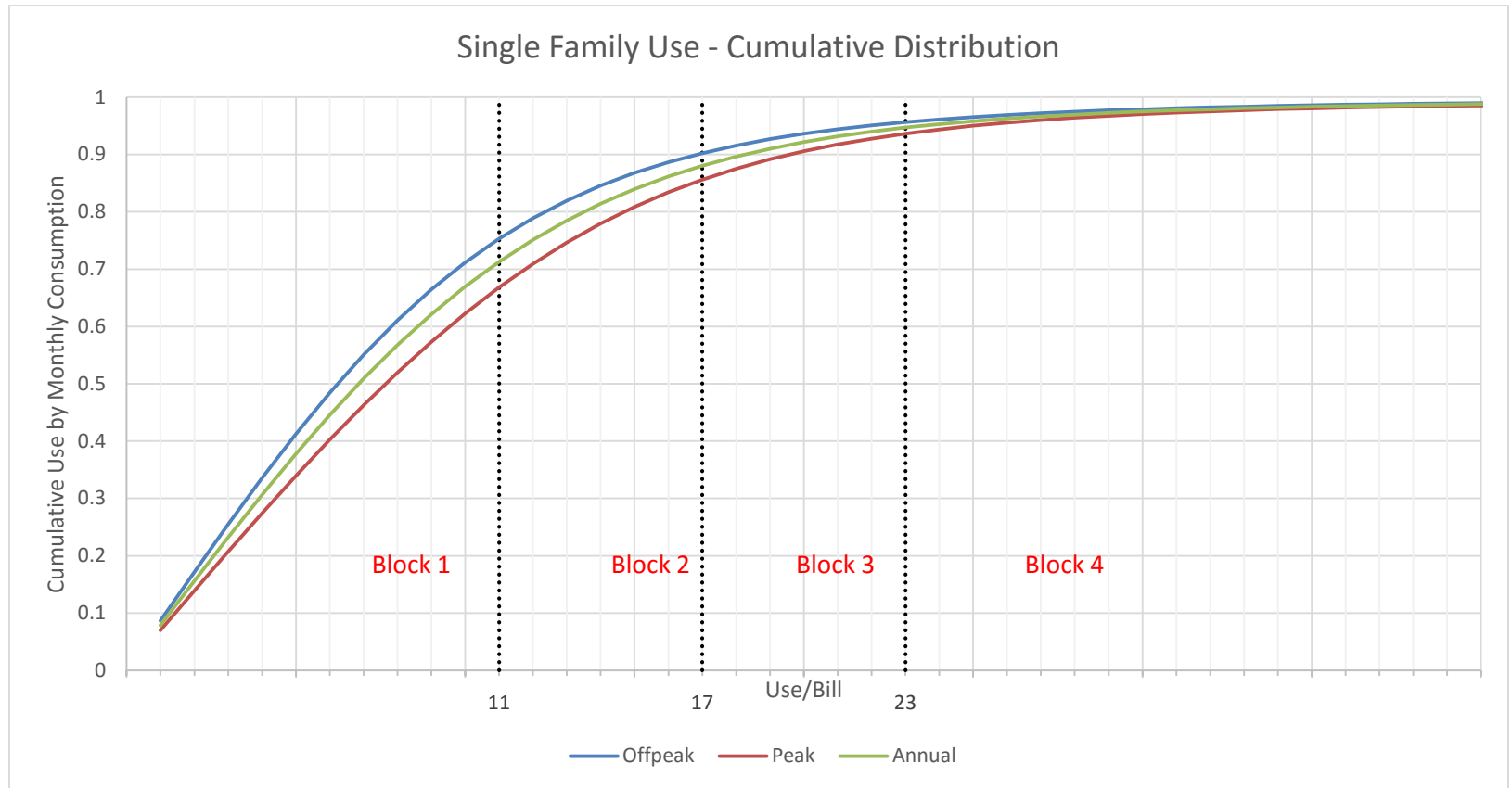
Annual Sales Volume (% Change) Annual Service & Volume Revenue (% Change)



% of SFR Demand Facing Higher Drought Rate

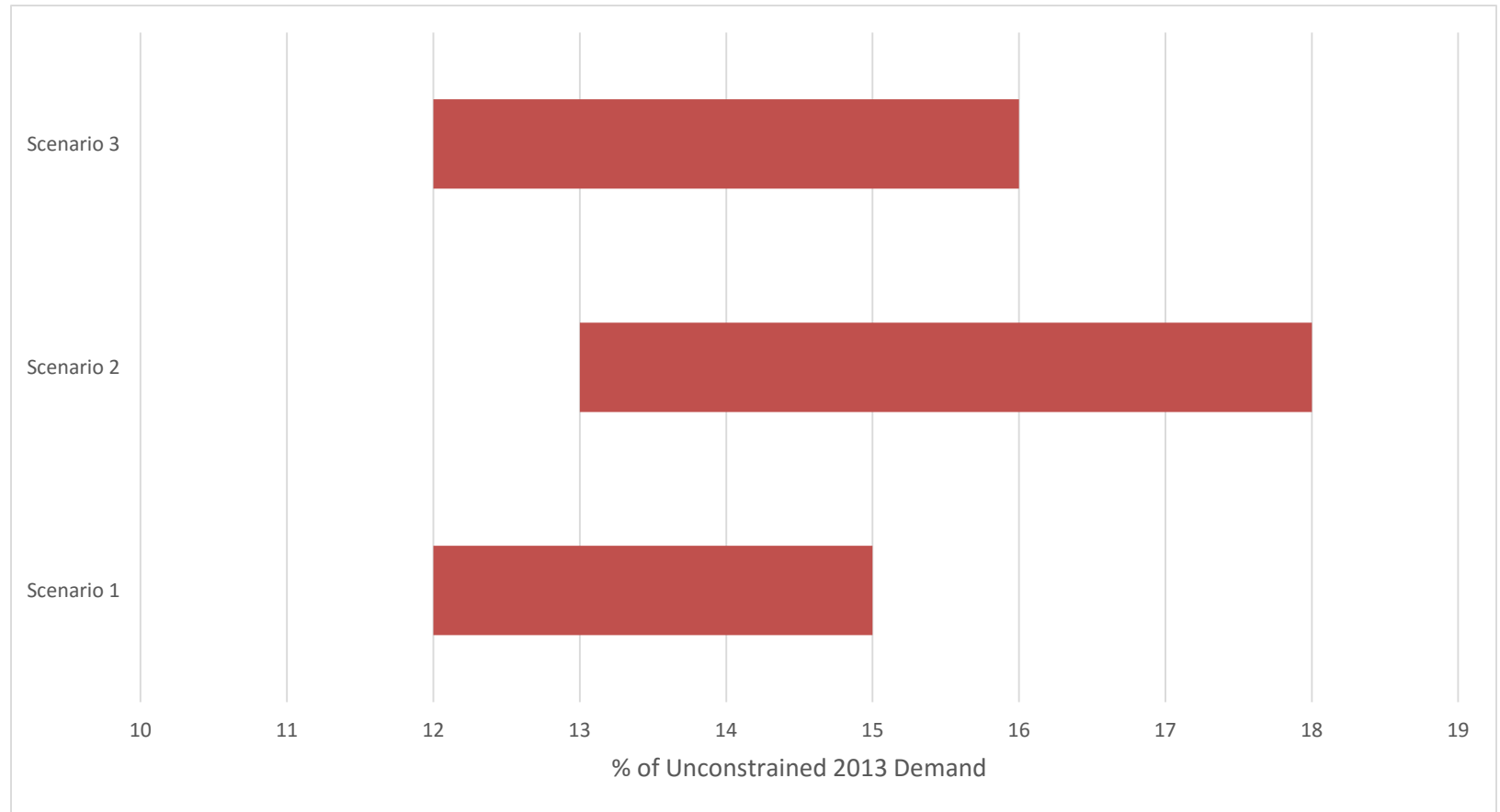


Dominguez



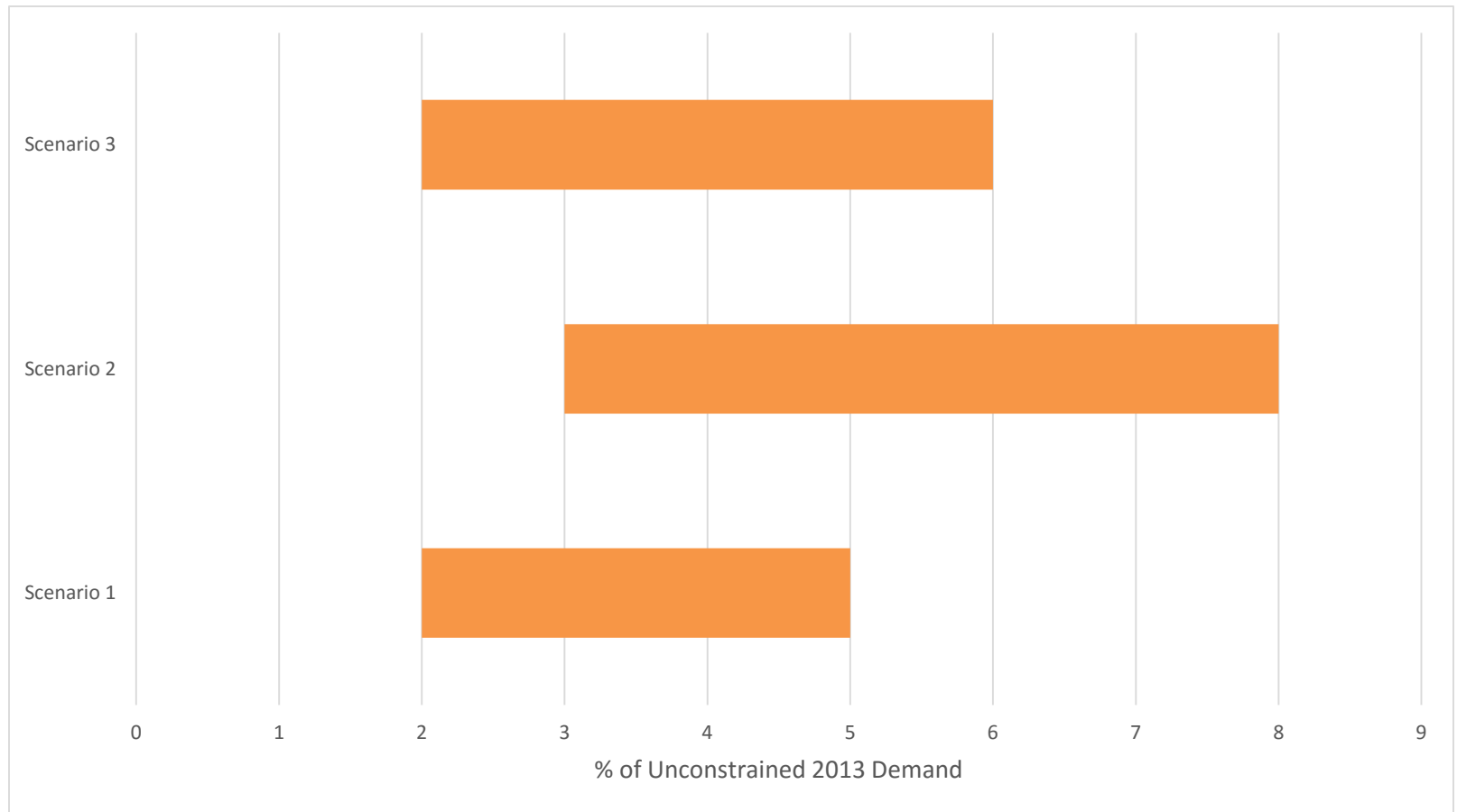
Average Reduction in SFR Demand

Price + Non-Price Conservation



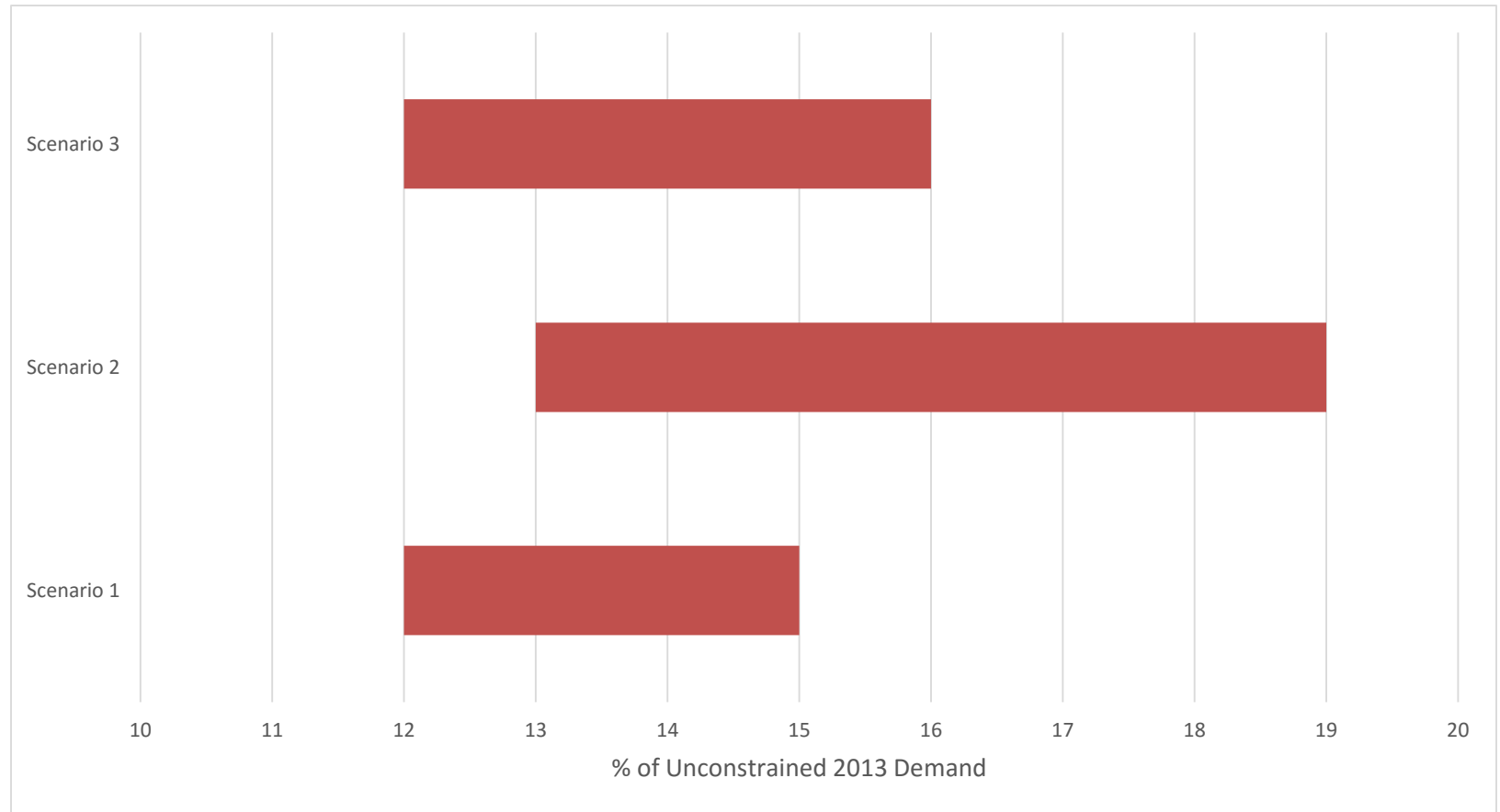
Average Reduction in SFR Demand

Price Only



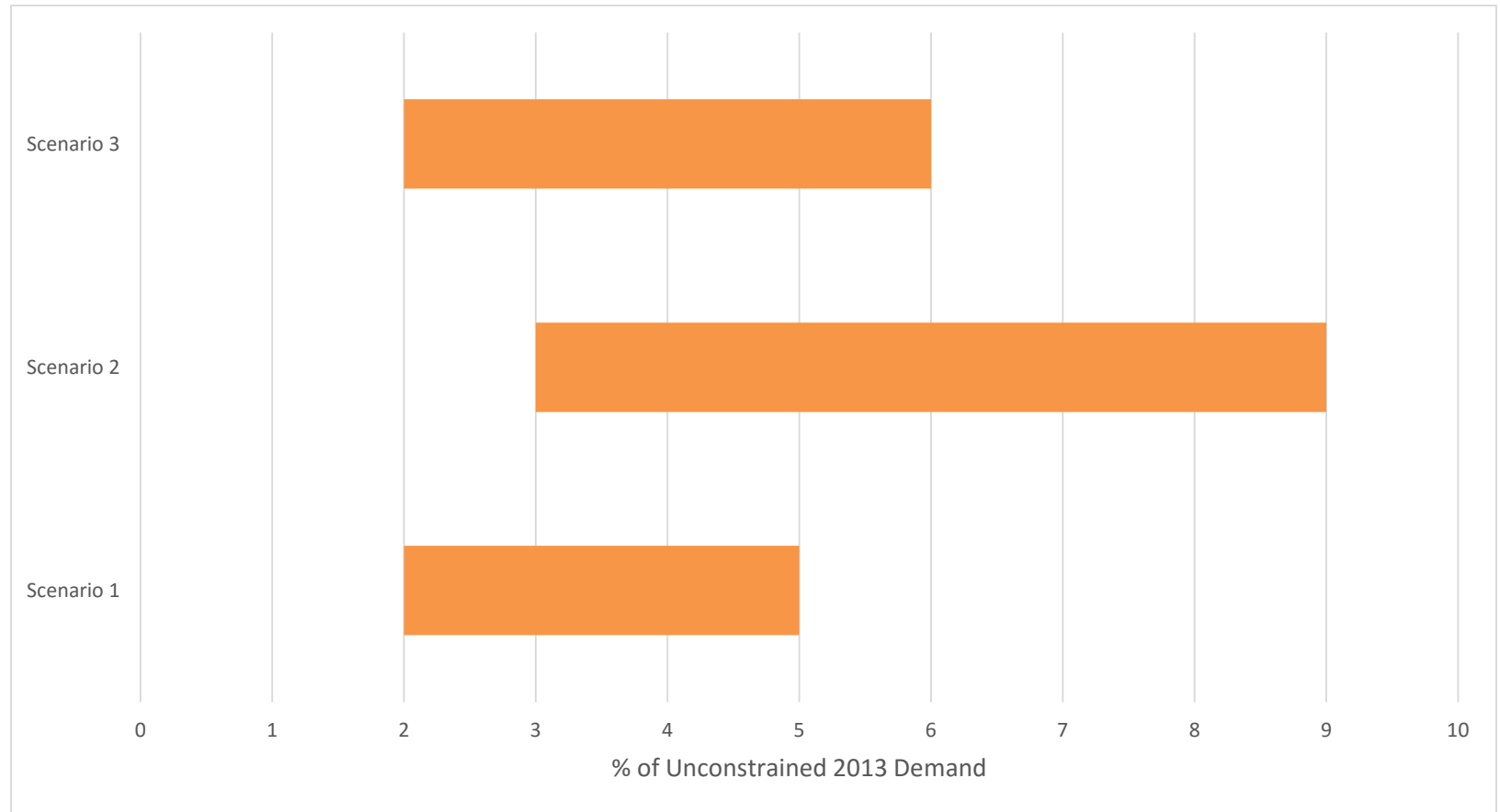
Average Reduction in Total Demand

Price + Non-Price Conservation



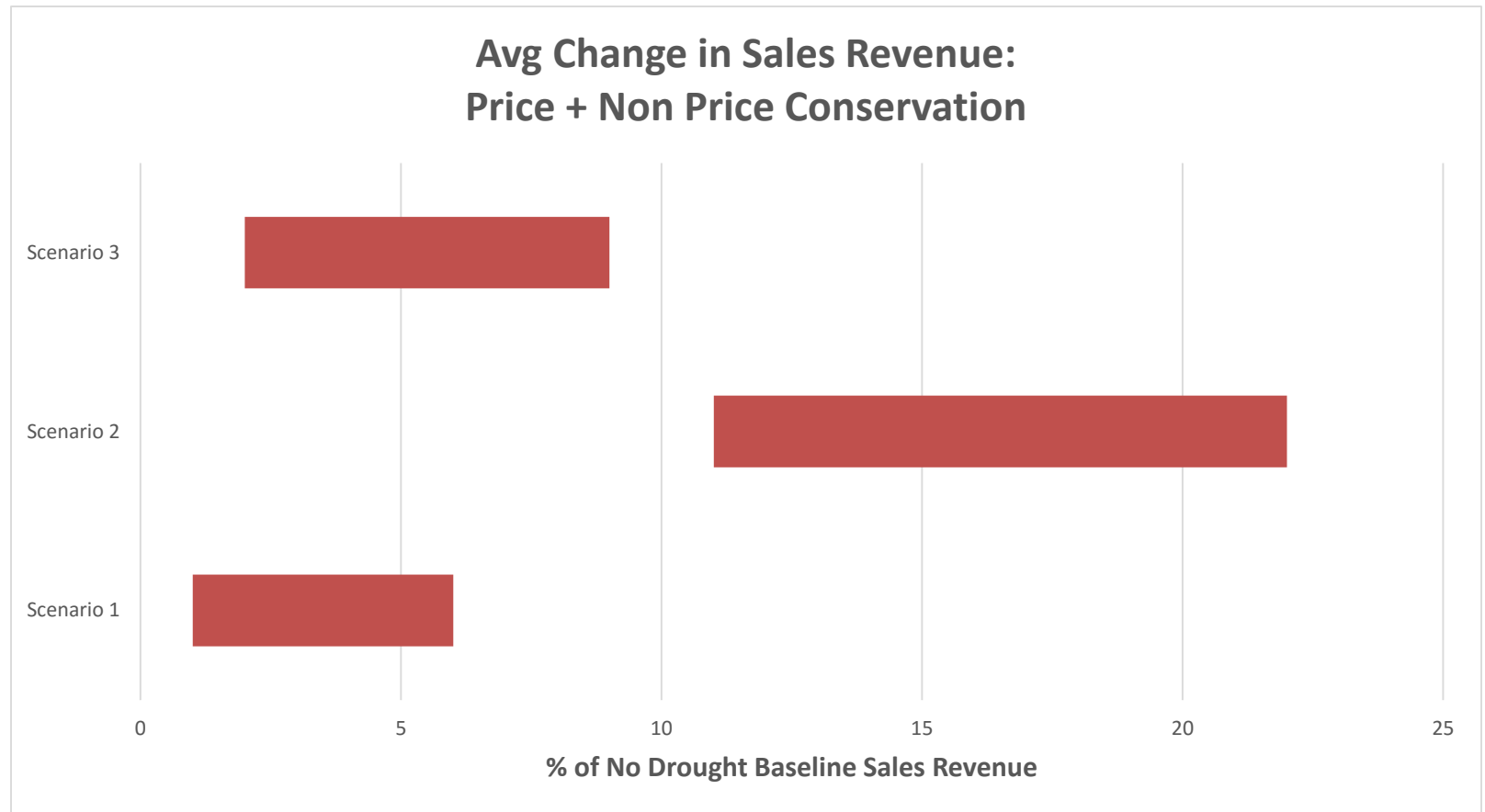
Average Reduction in Total Demand

Price Only



Average Change in Sales Revenue

Price + Non-Price Conservation



Contact Information

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