# This presentation premiered at WaterSmart Innovations

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# Water Conservation Tools

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# Planning Ahead

- Cost Effectiveness Analysis
- Avoided Costs and Environmental Benefits
- Waste Water Avoided Costs
- Water Rate Evaluation and Design Tool
- Cost and Savings Study and Flex Track Menus
- DSS Model
- To be released: New CEA Tool

# Traditional CEA Tools

- CUWCC
  - Coverage Calculator
  - Simple CEA Models for BMPs
  - Direct Utility Avoided Cost Model
  - Environmental Benefits Model

# Things You Need to Know or Estimate to Apply CEA to Water Conservation

1. What does the water conservation measure entail?
2. What will it cost to implement?
3. How much water will it save?
4. What is the value of the saved water?
5. What other benefits or costs should you take into account?

# Value of Saved Water

- Utility/Ratepayer
  a. Avoided O&M (water & wastewater)
  b. Avoided Water Purchases
  c. Deferred/Downsized Capital Projects (water & wastewater)
  d. Revenues from other entities
  e. Avoided Shortages
- Program Participant
  a. Reduced water bill
  b. Reduced energy bill
  c. Other
- Society
  a. All the above, excluding Transfer Payments
  b. Environmental benefits

# Cost and Savings Study

- To supplement CUWCC's existing *CEA Guidelines*
- To identify and summarize the best available information about program costs and water savings;
- To assess the reliability and exportability of information for quantifying and valuing conservation activity and for preparing cost-effectiveness exemption claims; and
- To identify the absence of, and note critical deficiencies in, cost and savings estimates.

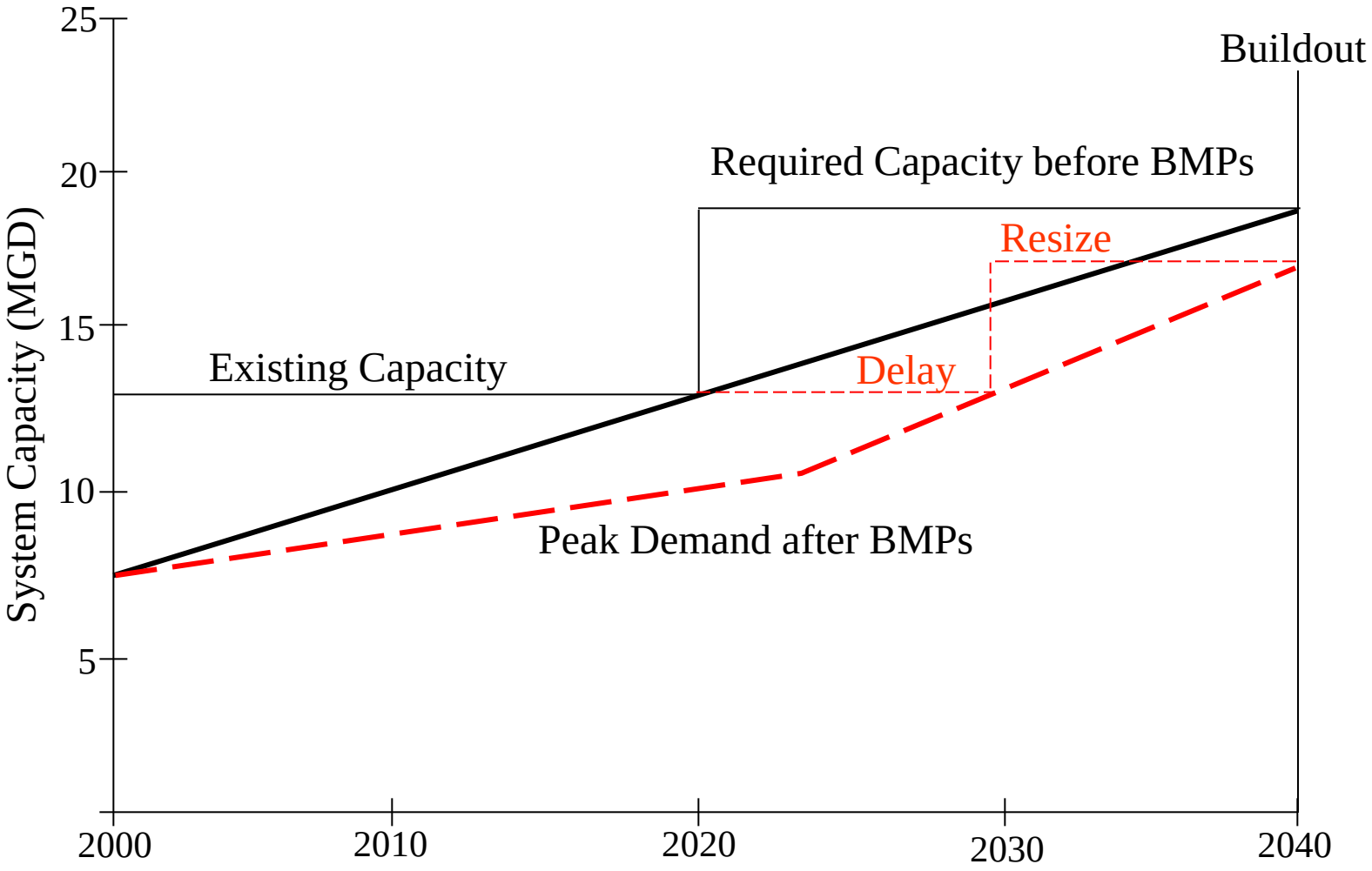
It Does Not:

- Provide or endorse the use of single, uniform estimates
- Pretend to provide definitive or complete estimates. Highlights the limitations of currently available estimates

# Avoided Costs and Environmental Benefits

- Total Savings
  - Need to estimate total savings for entire conservation program, not just individual measures.
- Marginal Supply Source
  - Which supply source will savings displace?
  - Which costs truly avoidable?
- Magnitude and Timing of Savings
  - Are savings sufficiently large to defer/ resize expansion?
  - How are savings split between peak/offpeak
- Other System Impacts
  - Are wastewater operating costs avoided?
  - Are savings sufficiently large to defer/ resize expansion?

# Deferral/Downsize Decision



# Direct Utility Avoided Cost Model

- Developed for CUWCC/AWWARF
- Model Calculates
  - Short-run operating costs
  - Long-run avoided system expansion costs
  - Total Avoided Cost (SR + LR)
  - Peak and Off-Peak
- Available on CUWCC Website

# Direct Utility Avoided Cost Model

A spreadsheet planning tool

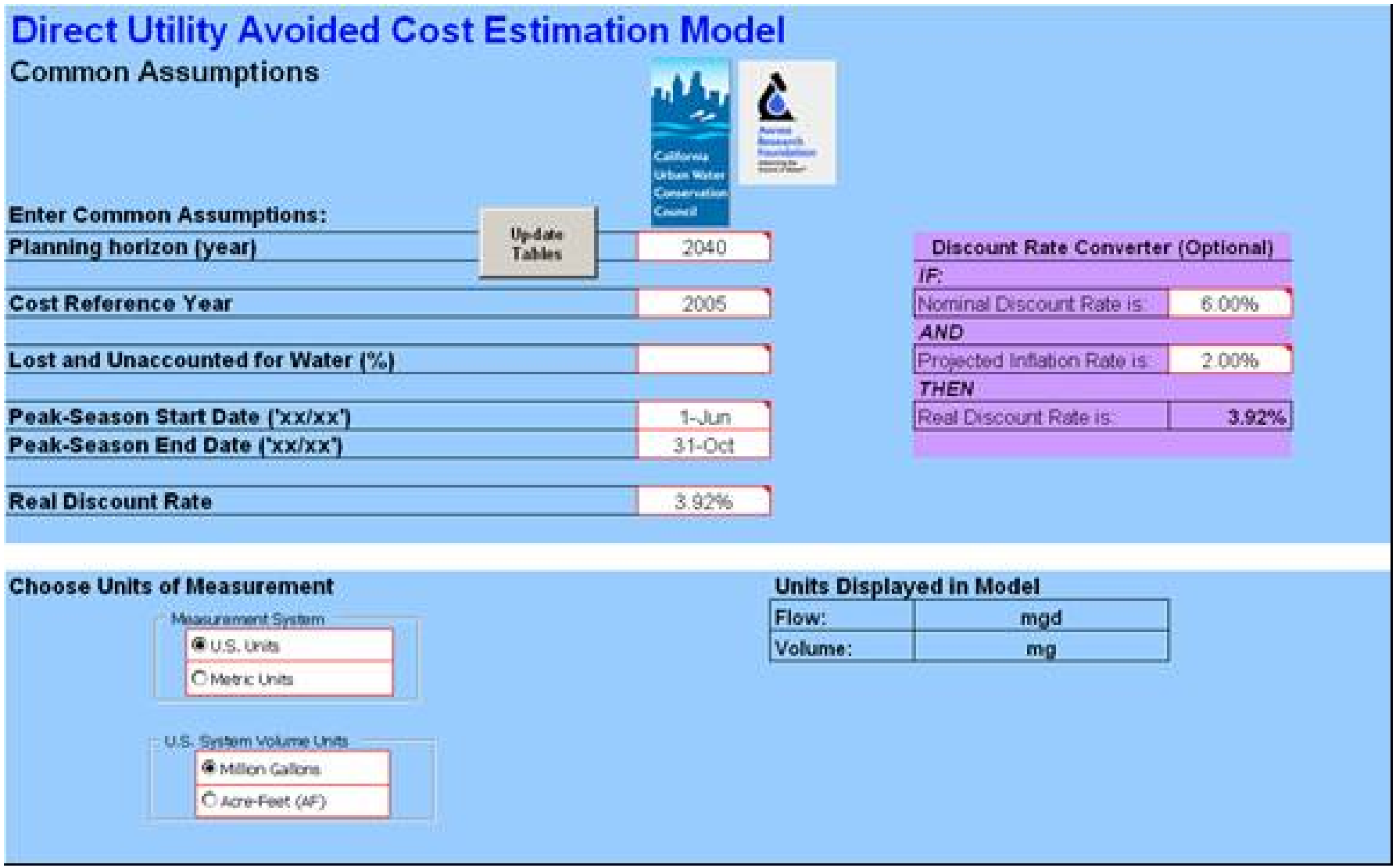
- The model is designed to be robust and defensible
- Model can handle many complexities

….estimates two avoided cost components, for each year and for peak/nonpeak periods:

- **Short-run Avoided Costs**. These are the costs that are immediately avoided due to the reduced water production that results from the conservation-induced demand reductions.

- **Long-run Avoided Costs**. Conservation-caused demand reductions also may allow the deferral and/or downsizing of planned supply or facility additions and expansions.

# Common Assumptions Sheet



# Forecasted Demands Sheet

**Forecasted Demands**

| Demand Data Entry Units: | Flow | | | |
|---|---|---|---|---|
| | Seasonal Demand | | Annual Demand Growth | | Peak Season |
| | Peak | Off-Peak | Peak-Season | Off-Peak Season | 1 mgd Deferral Periods |
| Year | (mgd) | (mgd) | (mgd) | (mgd) | (years) |
| 2005 | 200.0 | 100.0 | 4.0 | 2.0 | 0.250 |
| 2006 | 204.0 | 102.0 | 4.1 | 2.0 | 0.245 |
| 2007 | 208.1 | 104.0 | 4.2 | 2.1 | 0.240 |
| 2008 | 212.2 | 106.1 | 4.2 | 2.1 | 0.236 |
| 2009 | 216.5 | 108.2 | 4.3 | 2.2 | 0.231 |
| 2010 | 220.8 | 110.4 | 4.4 | 2.2 | 0.226 |
| 2011 | 225.2 | 112.6 | 2.3 | 1.1 | 0.444 |
| 2012 | 227.5 | 113.7 | 2.3 | 1.1 | 0.440 |
| 2013 | 229.8 | 114.9 | 2.3 | 1.1 | 0.435 |
| 2014 | 232.1 | 116.0 | 2.3 | 1.2 | 0.431 |
| 2015 | 234.4 | 117.2 | 2.3 | 1.2 | 0.427 |
| 2016 | 236.7 | 118.4 | 2.4 | 1.2 | 0.422 |
| 2017 | 239.1 | 119.5 | 2.4 | 1.2 | 0.418 |
| 2018 | 241.5 | 120.7 | 2.4 | 1.2 | 0.414 |
| 2019 | 243.9 | 121.9 | 2.4 | 1.2 | 0.410 |
| 2020 | 246.3 | 123.2 | 2.5 | 1.2 | 0.406 |
| 2021 | 248.8 | 124.4 | 1.2 | 0.6 | 0.804 |
| 2022 | 250.0 | 125.0 | 1.3 | 0.6 | 0.800 |
| 2023 | 251.3 | 125.6 | 1.3 | 0.6 | 0.796 |
| 2024 | 252.5 | 126.3 | 1.3 | 0.6 | 0.792 |
| 2025 | 253.8 | 126.9 | 1.3 | 0.6 | 0.788 |
| 2026 | 255.1 | 127.5 | 1.3 | 0.6 | 0.784 |
| 2027 | 256.4 | 128.2 | 1.3 | 0.6 | 0.780 |
| 2028 | 257.6 | 128.8 | 1.3 | 0.6 | 0.776 |
| 2029 | 258.9 | 129.5 | 1.3 | 0.6 | 0.772 |
| 2030 | 260.2 | 130.1 | 1.3 | 0.7 | 0.769 |
| 2031 | 261.5 | 130.8 | 1.3 | 0.7 | 0.765 |
| 2032 | 262.8 | 131.4 | 1.3 | 0.7 | 0.761 |
| 2033 | 264.1 | 132.1 | 1.3 | 0.7 | 0.757 |
| 2034 | 265.5 | 132.7 | 1.3 | 0.7 | 0.753 |
| 2035 | 266.8 | 133.4 | 1.3 | 0.7 | 0.750 |
| 2036 | 268.1 | 134.1 | 1.3 | 0.7 | 0.746 |
| 2037 | 269.5 | 134.7 | 1.3 | 0.7 | 0.742 |
| 2038 | 270.8 | 135.4 | 1.4 | 0.7 | 0.739 |
| 2039 | 272.2 | 136.1 | 1.4 | 0.7 | 0.735 |
| 2040 | 273.5 | 136.8 | 1.4 | 0.7 | 0.731 |

# Variable Operating Costs

**Variable Operating Costs**

**Number of Components?**

| Component Type | Component Name | Existing or Planned? | On-Line Year (for Planned) | Loss Rate | Ref. Year Power Costs ($/mg) | Ref. Year Chemical Costs ($/mg) | Ref. Year Purchase Costs ($/mg) | Ref. Year Other Costs ($/mg) | Ref. Year Revenues ($/mg) |
|---|---|---|---|---|---|---|---|---|---|
| Su | Diversion A | e | | 5% | $20 | | | | $10 |
| T | WTP A | e | | | $150 | $75 | | | |
| Su | GW #1 | p | 2015 | 20% | $100 | | | | |
| CP | Path Group 25 | e | | | $25 | | | | |
| CP | Path Group 50 | p | 2010 | | $50 | | | | |
| | | | Annual Real Escalation Rates: | | 1.00% | 0.00% | 2.00% | 0.00% | 0.00% |

# On Margin Probabilities

**A system component is said to be 'on the margin' if its operations would be cut back in response to conservation-induced demand reductions.**

**System Components:**
**On-Margin Probabilities**

| | | | Diversion A | WTP A | GW #1 | Path Group 25 | Path Group 50 |
|---|---|---|---|---|---|---|---|
| | | *On-line dates:* | | | *2015* | | *2010* |
| **Year** | **Season** | ***Type:*** | *Su* | *T* | *Su* | *CP* | *CP* |
| 2005 | Peak | | 100% | 100% | 0% | 20% | 0% |
| | Off-Peak | | 100% | 100% | 0% | 10% | 0% |
| 2010 | Peak | | 70% | 100% | 0% | 20% | 30% |
| | Off-Peak | | 80% | 100% | 0% | 10% | 20% |
| 2015 | Peak | | 50% | 100% | 30% | 30% | 30% |
| | Off-Peak | | 80% | 100% | 10% | 10% | 20% |
| 2020 | Peak | | 40% | 100% | 30% | 30% | 25% |
| | Off-Peak | | 80% | 100% | 10% | 10% | 20% |
| 2025 | Peak | | 45% | 100% | 40% | 40% | 25% |
| | Off-Peak | | 85% | 100% | 10% | 10% | 15% |
| 2030 | Peak | | 55% | 100% | 40% | 50% | 20% |
| | Off-Peak | | 90% | 100% | 10% | 10% | 10% |
| 2035 | Peak | | 55% | 100% | 40% | 50% | 20% |
| | Off-Peak | | 90% | 100% | 10% | 10% | 10% |
| 2040 | Peak | | 55% | 100% | 40% | 50% | 20% |
| | Off-Peak | | 90% | 100% | 10% | 10% | 10% |

# Short-Run Avoided Costs

**Short-Run Avoided Costs**
**($/mg)**

**Seasonal by Component, at 5-Year Intervals, Loss-Adjusted to Meter and Escalated**

| Year | Season | Power | Chemicals | Purchases | Other | Rev Unesc | Revenue | Total |
|---|---|---|---|---|---|---|---|---|
| 2005 | Peak | $176.05 | $75.00 | $0.00 | $0.00 | $10.53 | ($10.53) | $240.53 |
| 2005 | Off-Peak | $173.55 | $75.00 | $0.00 | $0.00 | $10.53 | ($10.53) | $238.03 |
| 2010 | Peak | $194.16 | $75.00 | $0.00 | $0.00 | $7.37 | ($7.37) | $261.79 |
| 2010 | Off-Peak | $188.49 | $75.00 | $0.00 | $0.00 | $8.42 | ($8.42) | $255.07 |
| 2015 | Peak | $243.60 | $75.00 | $0.00 | $0.00 | $5.26 | ($5.26) | $313.34 |
| 2015 | Off-Peak | $211.91 | $75.00 | $0.00 | $0.00 | $8.42 | ($8.42) | $278.49 |
| 2020 | Peak | $250.68 | $75.00 | $0.00 | $0.00 | $4.21 | ($4.21) | $321.47 |
| 2020 | Off-Peak | $222.72 | $75.00 | $0.00 | $0.00 | $8.42 | ($8.42) | $289.30 |
| 2025 | Peak | $283.05 | $75.00 | $0.00 | $0.00 | $4.74 | ($4.74) | $353.32 |
| 2025 | Off-Peak | $232.32 | $75.00 | $0.00 | $0.00 | $8.95 | ($8.95) | $298.37 |
| 2030 | Peak | $300.19 | $75.00 | $0.00 | $0.00 | $5.79 | ($5.79) | $369.40 |
| 2030 | Off-Peak | $242.31 | $75.00 | $0.00 | $0.00 | $9.47 | ($9.47) | $307.84 |
| 2035 | Peak | $315.50 | $75.00 | $0.00 | $0.00 | $5.79 | ($5.79) | $384.71 |
| 2035 | Off-Peak | $254.67 | $75.00 | $0.00 | $0.00 | $9.47 | ($9.47) | $320.20 |
| 2040 | Peak | $331.60 | $75.00 | $0.00 | $0.00 | $5.79 | ($5.79) | $400.81 |
| 2040 | Off-Peak | $267.66 | $75.00 | $0.00 | $0.00 | $9.47 | ($9.47) | $333.19 |
| 2045 | Peak | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 |
| 2045 | Off-Peak | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 |
| 2050 | Peak | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 |
| 2050 | Off-Peak | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 |

**Annual Escalated Short-Run Avoided Costs by Season**

| Year | Peak-Season | Off-Peak Season |
|---|---|---|
| 2005 | $240.53 | $238.03 |
| 2006 | $244.78 | $241.43 |
| 2007 | $249.03 | $244.84 |
| 2008 | $253.29 | $248.25 |
| 2009 | $257.54 | $251.66 |
| 2010 | $261.79 | $255.07 |
| 2011 | $272.10 | $259.75 |
| 2012 | $282.41 | $264.44 |
| 2013 | $292.72 | $269.12 |
| 2014 | $303.03 | $273.81 |
| 2015 | $313.34 | $278.49 |
| 2016 | $314.96 | $280.65 |
| 2017 | $316.59 | $282.82 |
| 2018 | $318.21 | $284.98 |
| 2019 | $319.84 | $287.14 |
| 2020 | $321.47 | $289.30 |
| 2021 | $327.84 | $291.12 |

# Long-run avoided costs

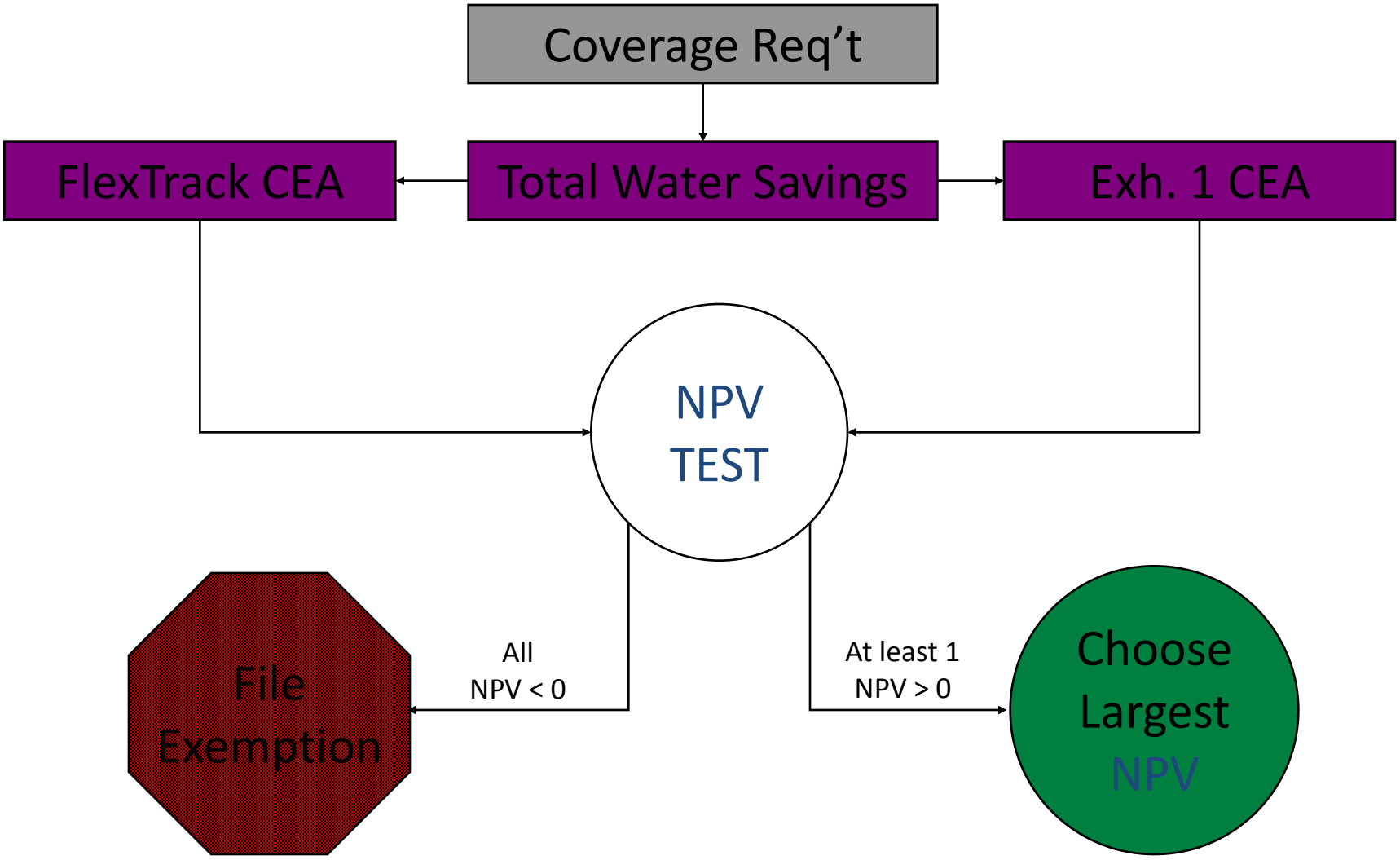
- Based on the degree to which each planned addition would be either *deferred* or *downsized* as a result of conservation-induced demand reductions.
- For each planned system addition, the user must indicate whether it would be deferred or downsized.

# Flex Track Table

## Estimated Water Savings - GPD

| | | GPD | SF Pres. HET | SF Dual HET | MF Pres. HET |
|---|---|---|---|---|---|
| **GPD** | | | 27.2 | 25.7 | 47.2 |
| **SF Pres. HET** | (1) | 27.2 | 1.00 | 1.06 | 0.58 |
| **SF Dual HET** | (1) | 25.7 | 0.94 | 1.00 | 0.54 |
| **MF Pres. HET** | (1) | 47.2 | 1.74 | 1.84 | 1.00 |
| **MF Dual HET** | (1) | 44.9 | 1.65 | 1.75 | 0.95 |
| **CII HET** | (5) | 25.9 | 0.95 | 1.01 | 0.55 |
| **SF Low Flow Showerhead** | (2) | 5.5 | 0.20 | 0.21 | 0.12 |
| **MF Low Flow Showerhead** | (2) | 5.2 | 0.19 | 0.20 | 0.11 |
| **SF HEW** | (3) | 21.5 | 0.79 | 0.84 | 0.46 |
| **MF HEW** | (3) | 80.7 | 2.97 | 3.14 | 1.71 |
| **Low Flow Urinals .5 GPF** | (4) | 13.4 | 0.49 | 0.52 | 0.28 |
| **Low Flow Urinals .26 GPF** | (4) | 15.3 | 0.56 | 0.60 | 0.32 |
| **Waterless Urinals** | (4) | 17.9 | 0.66 | 0.69 | 0.38 |
| **Pre-Rinse Spray Valves - Large Food Service** | (6) | 500.0 | 18.38 | 19.46 | 10.59 |
| **Pre-Rinse Spray Valves - Small Food Service** | (6) | 200.0 | 7.35 | 7.78 | 4.24 |
| **Cooling Towers - Centrifugal, Helirotor** | (7) | 272.7 | 10.02 | 10.61 | 5.78 |
| **Cooling Towers - Absorption** | (7) | 273.1 | 10.04 | 10.62 | 5.79 |
| **Cooling Towers - WSHP** | (7) | 201.6 | 7.41 | 7.84 | 4.27 |
| **Cooling Towers - SCVAV** | (7) | 194.1 | 7.14 | 7.55 | 4.11 |
| **Steam Sterilizer - Jacket & Chamber Condensate** | (8) | 1248.1 | 45.88 | 48.56 | 26.44 |
| **Steam Sterilizer - Ejector Water** | (8) | 1498.0 | 55.07 | 58.29 | 31.74 |

# BMP Implementation with FlexTrack



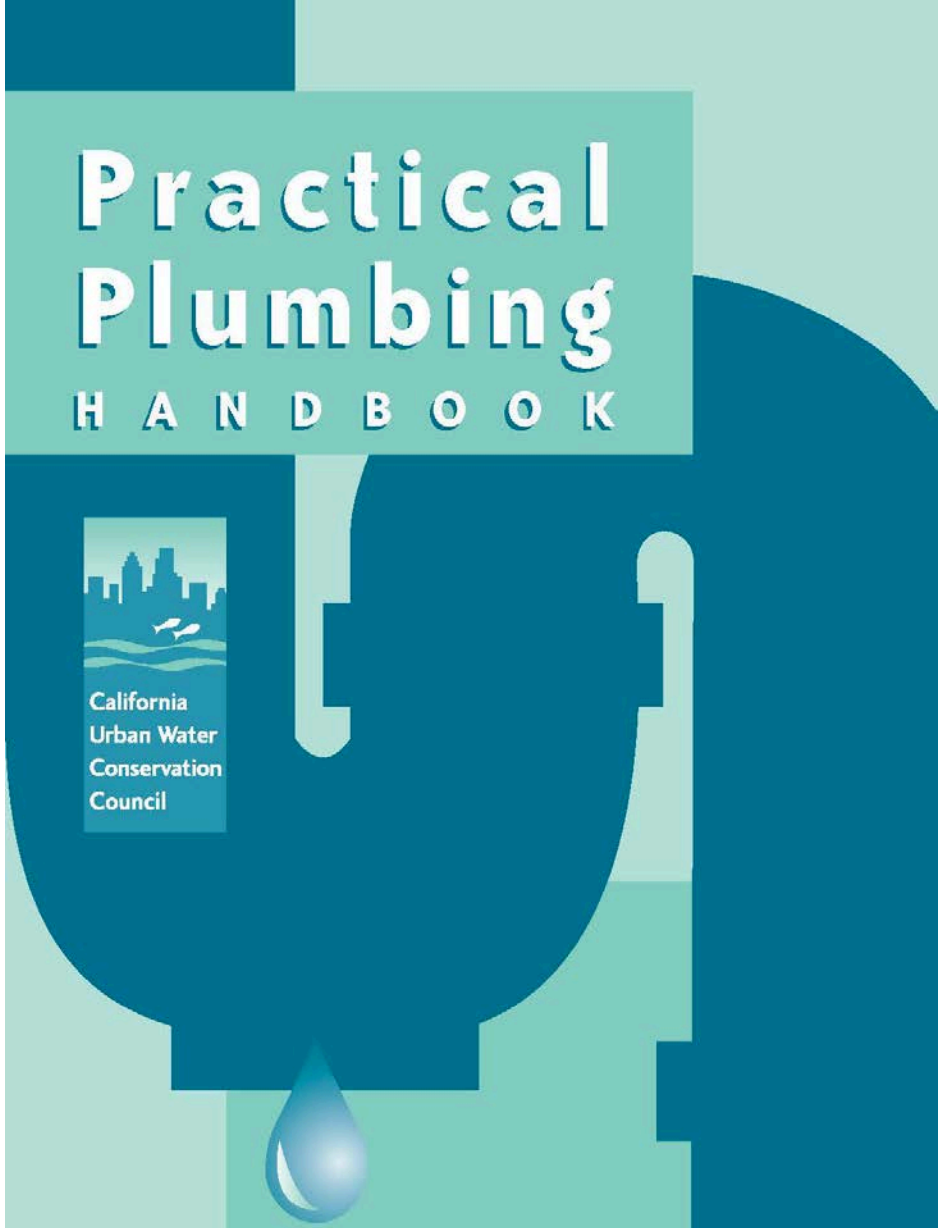
# New CEA Tool

- Appropriate for target planning with added benefit of support for basic conservation program budget planning
- Performs a basic benefit cost analysis MS Excel spreadsheet tool to estimate a “return on investment”
- Tool has the ability to seek the lowest cost measures to implement for the most water savings.
- Includes the capability to input environmental benefits
- Summarizes results across multiple measures

# DSS Model

- Planning approach where there are water scarcity issues and/or medium to large conservation program budget planning needs (e.g., annual budgets of >$500k)
- More sophisticated modeling system in MS Excel with more refined water savings estimates
- Ability to do historical water use analysis, demand forecasting and conservation measure/program evaluation
- All conservation measures designed from a template worksheet that is completely customizable
- Includes scenario planning where multiple “packages” of conservation measures can be compared holistically

# Practical Plumbing HANDBOOK



California Urban Water Conservation Council

*Includes important water-saving tips*

*Revised 2010*