This presentation premiered at WaterSmart Innovations

watersmartinnovations.com
M&V Guidelines, Water Retrofits, & NextGeneration PPPs for Public Sector
WaterSmart Innovations 2017

Jorge Figueroa, Western Resource Advocates
The Big Picture: Framing the Challenge

The Global Risks Landscape 2017

What is the impact and likelihood of global risks?

Risks that can cause significant negative impact to countries and industries (likelihood v. impact)

Source: World Economic Forum, 2017
The Perfect Storm: Water Scarcity and the Great and Growing Cities of the West

Projected Colorado River Supply-Demand Imbalance: greater than 3.2 million acre-feet by 2060
The Perfect Storm: Colorado River Water Supply and Demand Imbalance

<table>
<thead>
<tr>
<th>STATE</th>
<th>POPULATION (JULY 2008)</th>
<th>POPULATION GROWTH (2000-2008)</th>
<th>RANK</th>
<th>PRECIPITATION (INCHES)</th>
<th>RANK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nevada</td>
<td>2,600,167</td>
<td>30%</td>
<td>1</td>
<td>9.5</td>
<td>50</td>
</tr>
<tr>
<td>Arizona</td>
<td>6,500,180</td>
<td>27%</td>
<td>2</td>
<td>13.1</td>
<td>48</td>
</tr>
<tr>
<td>Utah</td>
<td>2,736,424</td>
<td>23%</td>
<td>3</td>
<td>11.9</td>
<td>49</td>
</tr>
<tr>
<td>Colorado</td>
<td>4,939,456</td>
<td>15%</td>
<td>7</td>
<td>15.5</td>
<td>45</td>
</tr>
<tr>
<td>New Mexico</td>
<td>1,984,356</td>
<td>9%</td>
<td>17</td>
<td>13.9</td>
<td>46</td>
</tr>
<tr>
<td>U.S. Average</td>
<td>1,984,356</td>
<td>8%</td>
<td></td>
<td>34.3</td>
<td></td>
</tr>
</tbody>
</table>

Source: Western Resource Advocates, 2009

Water Security
“The availability of an acceptable quantity and quality of water for health, livelihoods, ecosystems and production, coupled with an acceptable level of water-related risks to people, environments and economies.”
Source: Grey and Sadoff, 2007

2050 and beyond

NASA: “Unprecedented Drought Risk in the American Southwest”
Source: Cook et al., 2015
Long-term data reveals:
- Prices for water and sewer maintenance continue to rise at rate much higher than overall rate of inflation (CPI)
- Recent price trends for electricity generally tracking overall rate of inflation
- Recent price trends for natural gas fallen below the overall rate of inflation

Source:
Janice Beecher, Michigan State University, Trends in Consumer Prices (CPI) for Utilities
Recent Trends
Water Research Foundation, 2014

Median increase in nominal monthly bills 2004-2012 was 50%, compared to cumulative increase in CPI of 22% in same period

Next 25 Years
American Water Works Association, 2012

Buried No Longer Report’s Key Findings,
1. Nationally, investment needs for water infrastructure more than $1 trillion over next 25 years.
2. Water bills will go up

**BURIED NO LONGER:**
Confronting America’s Water Infrastructure Challenge
**Water and Energy EPC Market Study Results**

**Potential Savings via Market-Based Solutions in the Colorado River Basin States***

<table>
<thead>
<tr>
<th>Savings Type</th>
<th>Total Savings Potential</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>6,400,000 MWh</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>4,200 MCu. Ft</td>
</tr>
<tr>
<td>Water</td>
<td>104,000 AFY</td>
</tr>
<tr>
<td>$$$</td>
<td>$975,000,000</td>
</tr>
</tbody>
</table>

**Public Facilities**
- Public Water Systems
- Public Wastewater Systems

*Calculations from Western Resource Advocates and McKinstry, Inc. 2015, and subsequent ground-truthing verifying the study’s data and assumptions.*
Justification

Potential savings in public buildings via water efficient retrofits*

<table>
<thead>
<tr>
<th>State</th>
<th>Acre-feet/yr</th>
<th>$/yr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colorado</td>
<td>6,840</td>
<td>$8,400,000</td>
</tr>
<tr>
<td>Nevada</td>
<td>4,680</td>
<td>$7,800,000</td>
</tr>
<tr>
<td>New Mexico</td>
<td>2,280</td>
<td>$2,800,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>13,800</strong></td>
<td><strong>$19,000,000</strong></td>
</tr>
</tbody>
</table>

*Calculations from the *Tapping the Power of the Market* study, and subsequent ground-truthing verifying the study’s data and assumptions.

Potential savings in Colorado via turf replacement (residential), cooling towers (commercial), and irrigation audits and upgrades (commercial)

<table>
<thead>
<tr>
<th>Measure</th>
<th>Penetration Level</th>
<th>Potential Savings (AFY)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turf Replacement</td>
<td>25% of single family homes, ≤ 60% turf</td>
<td>125,800 to 211,700</td>
</tr>
<tr>
<td>Cooling Towers--increased cycle concentration</td>
<td>50% by 2030</td>
<td>3,100 to 24,500</td>
</tr>
<tr>
<td>Commercial landscape audits w/ irrigation upgrades</td>
<td>25% commercial irrigators</td>
<td>1,500 to 5,800</td>
</tr>
</tbody>
</table>

Source: Colorado SWSI Phase 2 Conservation Matrix
Financing and Paying Performance Contracting Projects

Major Steps
Water Measurement and Verification (M&V) Project

Drivers

- Lack of M&V guidelines for consumptive use reduction measures
- Lack of water efficiency investments through state EPC programs
- Questionable quality of data currently reported on water savings that limits the ability for states to compare savings across projects
Water Measurement and Verification (M&V) Project

Vision
Bring uniformity to the way states, utilities, performance contractors, and water efficiency engineering consultants calculate water savings

Goals
- Provide clear, accessible, step-by-step methods to determine water savings
- Create consistency and enhance transparency in how water savings are calculated that allows for comparison of savings across similar efficiency programs and measures
- Strengthen the credibility of water efficiency savings and reduce M&V costs
- Model and reference for future protocols in analogous water efficiency markets, e.g. Property Assessed Clean Energy Programs (PACE M&V), Water Utility Demand Management Programs (EM&V)
Water Measurement and Verification (M&V) Project

Process

- Engaging performance contracting industry stakeholders and key subject matter experts is essential to the process

- Develop a usable product within less than a year

- Adopted by
  - State EPC programs
  - Steering Committee member organizations
  - Technical Advisory Groups (TAGs) participants
State Officials

- Harold Trujillo, New Mexico Energy Technology and Engineering Bureau Chief, New Mexico EPC Program
- Kelly Thomas, Energy Program Manager, Nevada Governor’s Office of Energy, Nevada EPC Program
- Taylor Lewis, Program Engineer, Colorado Energy Office Colorado EPC Program

Utilities

- Patrick Watson, Conservation Services Administrator, Southern Nevada Water Authority (SNWA)
- Carlos Bustos, Water Conservation Program Manager, Albuquerque Bernalillo County Water Utility Authority
- Frank Kinder, Senior Conservation Specialist, Colorado Springs Utilities

Stakeholder-Based Organizations

- Donald Gilligan, President, NAESCO
- Mary Ann Dickinson, President and CEO, Alliance for Water Efficiency
- William D. Taylor, Private Sector Co-Chair, ESC Nevada Chapter
- Oscar Rangel, Private Sector Co-Chair, ESC Nevada Chapter
- Scott Griffith, Private Sector Co-Chair, ESC Mexico Chapter

Federal Officials

- Paul Matuska, Water Accounting and Verification Group Manager, US Bureau of Reclamation

Performance Contracting Consultants

- John Canfield, President, Trident Energy Services
- Chris Halpin, President, Celtic Energy
Project Organization

Purpose and Objective
Transparency, feedback on draft protocols, buy-in
Feedback on process and work plan; high-level review; education and buy-in
Protocol Development

Stakeholder Review Process
(Energy Service Coalition)

Steering Committee

Measure Protocols

Usability

Usability, validity, consensus

TAG 1: Outdoor
TAG 2: Turf Conversion
TAG 3: Cooling Towers
Technical Advisory Groups

Co-Leads and Facilitators
WRA
Colorado EPC Program

Technical Lead
PNNL

TAG Facilitator
WRA

Senior Advisors of Project
NREL
9Kft Strategies in Energy
M&V Protocols:
(1) Outdoor Irrigation
(2) Turf Conversion
(3) Cooling Tower (Evaporative Cooling System) Retrofits

Objective

Designate a performance-based protocol that specifies direct measurement of water use
Structure of M&V Protocols

- M&V Plan Elements
- Baseline and Post Installation
  Water Use Determination
- Data (Weather) Normalization
- Commissioning Protocol
M&V Process

Determine measurement boundary

Document baseline condition

Define study and measurement periods

Measure baseline

Normalize water use

Measure post-installation water use

Collect water use data via a meter

Implement water conservation measure
Water Use Estimate and Normalization

**Water Use Determination**
- Preferred method: Continuous measurement with dedicated meter
- Acceptable method: Short term measurement with temporary meter

**Normalization**
- Develop a ratio of historic weather conditions to current conditions
  - E.g., Historic Net ET/Current Net ET
- Adjust water use by multiplying by this ratio
M&V Protocols

RESULTS

- Create consistency and enhance transparency in how water savings are calculated

- Increase confidence in water efficiency investments for public sector clients, lenders, performance contractors, state EPC programs, and water utilities
Thank You!

For questions and/or copies of protocols:

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