Proposed Changes to Hot Water and Water Heating Calculations in the 2008 California Building Energy Efficiency Standards

Jim Lutz
Lawrence Berkeley National Laboratory
jdlutz@lbl.gov
Water and Wastewater Tariffs

• change cost and benefit calculation for measures that reduce consumption of hot water
• savings in water and waste water bills to end user
• Recommendation:
  – $2 per HCF (100 cubic feet) savings
Water and Wastewater Tariffs: Methodology

- high growth areas
- number of new single family homes and units of multi-family housing
  - built in 2004
  - Construction Industry Research Board
- websites and telephone calls
- water tariffs for 74 cities or counties
  - (64% of all new housing)
- waste water tariffs for 65 cities or counties
  - (57% of all new housing)
Water Tariffs: Results

Number of Unique Tariffs with a Given Marginal Rate ($/HCF)

- 0 to $0.50
- $0.51 to $1
- $1.01 to $1.50
- $1.51 to $2
- $2.01 to $2.50
- $2.51 to $3
- $3.00 and up

The diagram shows the distribution of water tariffs by marginal rate, with the highest number of tariffs falling within the $0.51 to $1 range.
Tankless Gas Water Heaters

• change EF of tankless gas water heaters
• multiply listed EF by 0.912
Tankless Gas Water Heaters

• Current ACM overvalues performance
  – small hot water draws
  – heat exchanger “cool down”
Tankless Gas Water Heaters
Efficiency by Draw Volume
Distribution System Multipliers

• Changes
  – Parallel pipe
  – demand controlled recirculation
  – pipes buried in soil w & w/o insulation
  – all rounded to the nearest tenth.
## Distribution System Multipliers

<table>
<thead>
<tr>
<th>Measure</th>
<th>DSM Current</th>
<th>DSM Proposed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pipe Insulation [all lines] (PIA)</td>
<td>0.9</td>
<td>0.9</td>
</tr>
<tr>
<td><strong>Piping System Buried in Soil (PS)</strong></td>
<td>-----</td>
<td>3.8</td>
</tr>
<tr>
<td>Piping System Buried in Soil with Insulation (PSI)</td>
<td>-----</td>
<td>1.0</td>
</tr>
<tr>
<td>Point of Use (POU)</td>
<td>0.00</td>
<td>0.0</td>
</tr>
<tr>
<td>Standard Case (STD)</td>
<td>1.00</td>
<td>1.0</td>
</tr>
<tr>
<td>[Pipe Insulation Kitchen Lines = 3/4 inches]</td>
<td>1.00</td>
<td>1.0</td>
</tr>
<tr>
<td>Standard Pipes with no Insulation (SNI)</td>
<td>1.19</td>
<td>1.2</td>
</tr>
<tr>
<td>Parallel Piping (PP)</td>
<td>1.04</td>
<td>1.0</td>
</tr>
<tr>
<td>Recirculation, no control (RNC)</td>
<td>4.52</td>
<td>4.5</td>
</tr>
<tr>
<td>Recirculation + Timer Control (RTm)</td>
<td>3.03</td>
<td>3.0</td>
</tr>
<tr>
<td>Recirculation + Temperature Control (RTmp)</td>
<td>3.73</td>
<td>3.7</td>
</tr>
<tr>
<td>Recirculation + timer/temperature (RTmTmp)</td>
<td>2.49</td>
<td>2.5</td>
</tr>
<tr>
<td>Recirculation + Demand Control (RDmd)</td>
<td>1.31</td>
<td>1.0</td>
</tr>
</tbody>
</table>
Eligibility Requirements

• Insulation
  – recirculating sections
  – all in-soil hot water piping
  – to kitchen sink and dish washer (regardless of pipe size)
  – avoid future shrinkage.
    • compressed along its length
    • sealed from one length to the next
    • elbows shall be insulated, taped, and sealed to adjacent pipe sections.
Eligibility Requirements

• Demand recirculation systems
  – push buttons only
  – not occupancy sensors
  – push buttons must be located in
    • kitchen
    • master bathroom
    • all additional full bathrooms
Parallel Piping Hot Water Distribution Systems

- mandatory changes installation requirements
- water heater to manifold piping
  - distance $\leq$ ten feet
  - minimum R-4 pipe insulation