Seattle Public Utilities
Long-Term Water Demand Forecast

Operating Board
October 6, 2011

Bruce Flory, SPU Principal Economist
Why Do We Need a Demand Forecast?

– **2013 Water System Plan**
  - Supply Planning
  - Conservation Planning
  - Transmission and Distribution System Planning

– **Financial Planning:**
  - Long term
  - Short Term (Rate Design)
Model Overview

Forecast Methods

Cost & Complexity

Low

Trend Extrapolation
Per Capita
Fixed Flow Factor
Variable Flow Factor
End Use Econometric

High

Low & Complexity
– Base Year Flow Factors by Sector and for Seattle and Wholesale Customers:
  ✓ Current weather-adjusted consumption
  ✓ Current households and employment
Future Flow Factors are affected by:

- Changes in average household size
- Future income growth
- Future growth in water/sewer rates
- Future conservation program savings
- Passive savings
Model Overview (cont.)

– Forecasts of households and employment
  ✓ Source: PSRC
  ✓ Forecasts extrapolated beyond 2040

– Other Adjustments to Forecast:
  ✓ Forecast of non-revenue water
  ✓ Forecast of other sources of supply
  ✓ Potential new wholesale customers
  ✓ Block contracts
The gray area represents the added uncertainty involved in extrapolating beyond 2040.
SPU Forecast with Constant and Variable Flow Factors

- Current Firm Yield
- Actual
- Variable Flow Factors (2011 Draft Forecast)
- Constant Flow Factors
What’s Changed?

1. Calibrated to 2010
2. Cascade Water Alliance Block
3. PSRC Demographic Forecast
4. Impact of Declining Household size
5. Code Savings -> Passive Savings
6. Median Rather Than Average Income
7. Price & Conservation Assumptions
8. Projected Non-Revenue Water
9. Specific Wholesale Customers
2. Cascade Block

Supplemental Block from 2008 Contract

- 2007 WSP Forecast
- 2011 Draft Forecast
- Actual

Annual MGD

2005 2010 2015 2020 2025 2030 2035
4. Adjust for Declining Household Size

- Calculate projected annual household size
- Reduce per household flow factors (by % change in household size times size elasticity)
- Elasticity of demand with respect to household size = 0.38
- Source: End-Use study conducted by SWD in mid-1990s.
- 10% decline in hhld size by 2060
- Reduces forecast by 7 mgd (5%)
5. Code Savings -> Passive Savings

Passive Savings consists of:

- **Code savings**
  - ✓ 1992 code for showerheads, toilets and aerators
  - ✓ 2001 code for clothes washers
  - ✓ 2002 code for aerators
  - ✓ Anticipated 2011 (effective 2015)

- **Beyond Code – Market Transformation**
  - ✓ Energy Star/CEE standards for washing machines
  - ✓ Replacements
  - ✓ New construction
  - ✓ PSE
5. Code Savings -> Passive Savings

### Passive Savings in MGD

<table>
<thead>
<tr>
<th>Year</th>
<th>Single Family</th>
<th>Multi-family</th>
<th>Non-Residential</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2020</td>
<td>2.5</td>
<td>1.7</td>
<td>0.6</td>
<td>4.9</td>
</tr>
<tr>
<td>2030</td>
<td>5.6</td>
<td>4.0</td>
<td>1.2</td>
<td>10.8</td>
</tr>
<tr>
<td>2040</td>
<td>7.5</td>
<td>5.8</td>
<td>1.7</td>
<td>15.0</td>
</tr>
<tr>
<td>2050</td>
<td>8.5</td>
<td>7.0</td>
<td>2.1</td>
<td>17.7</td>
</tr>
<tr>
<td>2060</td>
<td>9.0</td>
<td>7.8</td>
<td>2.4</td>
<td>19.2</td>
</tr>
</tbody>
</table>

- Passive Savings reduces 2060 forecast by **19 mgd** and exceeds earlier estimate of code savings by **7 mgd**.
6. Income Growth – Median vs Average

Index of U.S. Per Capita and Bottom 90% Income: 1920=1

Average Annual Rate of Growth: 2%
6. Income Growth – Median vs Average

- Median Income
  - Assume average annual growth 0.9%
- Reduces forecast of 2060 demand by 12 mgd (8%)
7. Water & Sewer Rates

– Water and sewer rates have increased by more than 2% annually, inflation-adjusted.

– Rate models project almost flat real rates after several years of large increases.

### Annual Growth Rates

<table>
<thead>
<tr>
<th>Period</th>
<th>Retail</th>
<th>Wholesale</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010-2015</td>
<td>5.1%</td>
<td>2.0%</td>
</tr>
<tr>
<td>2016-2060</td>
<td>0.4%</td>
<td>0.4%</td>
</tr>
</tbody>
</table>
7. Rates & Programmatic Conservation

- 15 mgd of combined rate-induced & programmatic conservation by 2030
  ✓ Rate-induced savings by 2030: 7 mgd
  ✓ Implies 8 mgd of programmatic conservation

- Model predicts 5 mgd of additional rate-induced savings from 2030-2060
  ✓ No additional programmatic savings

- Increases forecast of 2060 demand by 3 mgd
8 & 9. Other Stuff

- Non-Revenue Water
- Renton
- Other New Wholesale Customers
Actual & Forecast Total & Billed Water Consumption Per Capita:
Saving Water Partnership Customers

Gallons Per Day per Person

Actual GPD per Person
Forecast GPD per Person

Total
Billed
The gray area represents the added uncertainty involved in extrapolating beyond 2040.