RESIDENTIAL AND AGRICULTURE

Residential Sector
Approach, Methods, & Measures
Overview Residential

- Scope
- Impact of federal standards
- Availability of new data
- Methodology approach and updates
  - Impacts to key measures from Sixth Power Plan
- Changes to measure list
  - Deletions & additions
  - Data gaps

Scope of Residential Analysis

- About 17 measure bundles, e.g.
  - Lighting
  - Appliances
  - Water heating
  - Weatherization
  - HVAC system upgrades
  - Consumer electronics

- Many measure permutations ~ 638
  - By building type, climate zone, vintage, heating system
  - By decision event (New, Retrofit, Natural Replacement)
  - Multiple efficiency tiers
Source of Data

- Equipment regulated by federal standards
  - Federal rulemakings, sales data
- Building-configuration dependent
  - New RBSA for characteristics & saturations
  - Sales data & market trend analysis
- Other measures
  - Regional Technical Forum
  - Program tracking data
  - Evaluation reports

New Federal Efficiency Standards (Residential only)

- Furnace Fans
- Microwave Ovens
- Clothes Washers
- Clothes Dryers
- Central Air Conditioners and Heat Pumps
- Water Heaters
- Room Air Conditioners
- Refrigerators and Freezers
- Dishwashers
- Pool Heaters
- Direct Heating Equipment
- General Service Incandescent Lamps
- Incandescent Reflector Lamps
- Ranges and Ovens

Year New Standard Takes Effect

Potential New Standards
(Two may provide data for 7P)

<table>
<thead>
<tr>
<th>Product Covered</th>
<th>Initial Legislation</th>
<th>Updated DOE Standard</th>
<th>Potential Effective Date</th>
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<tr>
<td>Battery Chargers</td>
<td>EPACT 2005</td>
<td>2015</td>
<td>2017</td>
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<tr>
<td>Central Air Conditioners and Heat Pumps</td>
<td>NAECA 1987</td>
<td>2017</td>
<td>2022</td>
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<td>Clothes Dryers</td>
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<td>Dehumidifiers</td>
<td>EPACT 2005</td>
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<td>2020</td>
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<td>Water Heaters</td>
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<td>2016</td>
<td>2021</td>
</tr>
<tr>
<td>Wine Chillers</td>
<td>NAECA 1987</td>
<td>2016</td>
<td>2019</td>
</tr>
</tbody>
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RBSA + Metering

- Baseline saturation data across building types and region (as of 2011)
- Consumption data
- Load shapes (non-weather dependent)
  - DHP load shape from NEEA metering study

Source: ENERGY STAR
RTF work

- Many of the 6P measures have been reviewed by RTF
  - Seventh Plan will rely on this work
- SEEM updated to SEEM96
- SEEM has been calibrated to heating loads
  - Measures are in process of being updated (SF Wx adopted)

Methodology (Units)

- Units driven by number of homes
  - Load forecast model provides number of new and existing homes by year by segment
  - Also, square feet per home for weatherization
- Units estimates tied to load forecast
Methodology (Costs & Savings)

- **Bottom-Up Approach**
  - Establish baseline (kWh/unit)
  - Incremental costs & savings over baseline
  - Typically not top-down percent reduction

**Achievable Savings Potential =**
Number Units * kWh savings per Unit * Achievable Penetration

Change in Methodology

- Residential supply curve workbooks now “look” more like the Sixth Power Plan commercial workbooks
  - Annual stock turnover
  - Equivalent nomenclature for ramp rates
  - Better source for baseline data
Key Measures from Sixth Plan

- Residential lighting
  - RBSA on saturation
  - EISA standards
  - Availability of SSL
- Showerheads
  - RBSA on saturation of low-flow units
  - RBSA on electric water heating saturation
  - RTF update on savings

Key Measures, Cont

- Weatherization
  - Updated saturations from RBSA
  - Updated costs primarily from Energy Trust data
  - Updated savings through SEEM
- Ductless heat pump
  - Updated saturations from RBSA
  - Updated costs primarily from NEEA data
  - Updated savings through SEEM
Measures to Drop

- Efficient electric water heater tank
- TVs, though market changes rapidly, so watch for UHDs
- Set-top boxes

Potential New Measures

- Variable-capacity heat pumps
- Heat pump dryers
- Faucet aerators
- Advanced power strips
- DHP with ducted baseline
- Water heater pipe insulation
- Combo DHP/HPWH
- WiFi thermostats
- Behavioral
- Lighting controls
- Home automation
- VSDs for well pumps
Measure Data Gaps

- VSDs for well pumps
  - How many wells are out there?
  - How much does a VSD save?
- Lighting controls
  - What are the savings?
- Home automation
  - What are the savings?
  - What is the cost?

Summary of Issues and Data Needs: Residential

- Savings, stock, and methodology all updated from Sixth Plan
- Any additional measures to include/drop?
- Do you have any data to help fill gaps?
  - Esp for well pumps, lighting controls, home automation
- Other questions or comments?
Agricultural Sector

Key Measures from Sixth Plan

- Pump, Nozzle, Gasket Replacement
  - Program accomplishments
  - RTF updates
- Scientific Irrigation Scheduling
The Water-Spreading Issue

- Agricultural irrigation requires electricity to pump water
- In many regions of the Northwest, agricultural irrigation water savings on one field are not expected to result in net regional water savings
  - “Use it or lose it” water rights
  - Grower may “spread” water to additional acreage on farm
  - Growers with Junior Rights can use saved water not used on farm
- Water spreading increases the total agricultural yield of the region, but does not decrease the regional electricity consumption

Should irrigation measures that result in water spreading – rather than a net reduction in electricity consumption – be considered conservation?
Conservation or Non-Energy Benefit?

- **Water Spreading as Conservation**
  - Industrial measures are often normalized to kWh per unit of product
  - Improving the kWh/unit product is considered conservation IF we don’t expect total production volume is correlated with efficiency
  - But, irrigation production volume is correlated with efficiency when saved irrigation water is spread
  - Productivity improved, but need for generation stays same

- **Water Spreading as a Non-Energy Benefit (NEB)**
  - Comparable to “take-back” effects for other measures
  - A user gets more utility out of device or service after it is more efficient
  - NEB appropriate methodology when we do expect a correlation between energy consumption and output (or utility)

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Sixth Plan

- Only considers irrigated acreage in the Columbia Basin Ground Water Management Area (GWMA)
  - WA counties of Adams, Franklin, Grant, and Lincoln
- Rationale: Water saved in other regions of the Northwest would be spread (i.e., used elsewhere).
Current Program Implementation

- Irrigation programs are operating in areas outside of Columbia Basin GWMA
  - (Columbia Basin GWMA plus XXX counties)
Should Supply Curves Include Irrigation Savings for Areas Where Water Spreading Likely?

- If yes
  - Consider conservation potential from all irrigated acreage in NW (~7,000,000 acres)?

- If no
  - Consider Columbia Basin GWMA only?
  - Consider other regions of the Northwest?
  - Make clear that potential and savings estimates are only for the GWMA (and other specific regions)?
  - If considering regions where some spreading is expected, how should this be valued as a non-energy benefit?

OTHER AGRICULTURAL MEASURES
Potential New Measures

- Stock watering tank*
- Motor rewind*
- Water heaters
- High volume, low speed fans
- Storage shed ventilation fan VFD*
- Compressed air improvements

*RTF UES measures

Data Gaps

- Number of units based on national data rather than regional
- No recent stock assessment to gauge baseline saturation
Summary of Issues and Data Needs: Agriculture

- Should SIS be considered outside Columbia Basin GWMA?
- Should water spreading be considered conservation or NEB?
- Any available data on agriculture stock?
- Other measures to include?

End
Residential & Agriculture