MEMORANDUM

TO: Council Members

FROM: Tom Eckman and Charlie Grist

SUBJECT: Estimated Savings from Federal Appliance and Equipment Efficiency Standards

At the February Power Committee meeting staff provided an overview of the federal appliance and equipment efficiency standards program and described the historical impact on regional electricity use of these standards. Staff estimated cumulative regional electricity savings from federal standards since 1987 when they were first enacted through 2012 were nearly 1,000 average megawatts. At the May Power Committee meeting staff will present the results of an analysis of the savings and impact on future regional electricity demand of the standards enacted since the 6th Plan was adopted. Staff worked closely with a Bonneville consultant to review the inputs and assumptions to ensure they were consistent with those used in the 6th Plan. When more recent data was available (e.g., data from the Residential Building Stock Assessment), it was incorporated into the analysis.

Summary of Findings

- Near term (2010-2014) savings from standards are estimated to be just over 100 average megawatts, or about eight percent of the 6th Plan’s 1200 average megawatt five-year conservation goal
- Near term savings are dominated by lighting efficiency improvements.
• Medium term savings (2015-2019) savings from standards are estimated to be approximately 265 average megawatts, or just over thirty percent of the 6th Plan’s goal for lost opportunity conservation resource development during that period.
• Medium term savings come primarily from commercial and industrial equipment and residential water heaters.
• Savings from federal standards adopted since the 6th Plan are estimated to be approximately 780 average megawatts from 2010 through 2029, or about thirteen percent of the Plan’s long-term conservation goal.
• It is anticipated that an additional eight federal standards will be finalized by the end of 2014, further reducing regional load growth and capturing additional conservation potential identified in the 6th Plan.
Impact of Federal Appliance Standards
Regional Loads and Conservation Goals

May 6, 2014
Savings from Many Mechanisms
Today’s Presentation

- Estimated savings from federal efficiency standards during the 6\textsuperscript{th} Plan’s first (2010-2014) and second (2015-2019) five years
  - How much savings will federal standards contribute towards the 6\textsuperscript{th} Plan’s regional conservation goals?
- Estimated impact of federal efficiency standards on 2015 to 2029 load growth
24 New Federal Efficiency Standards Take Effect by 2017
Capturing Some of the 6th Plan’s Efficiency Potential

Ranges and Ovens
Boilers, Commercial
Refrigeration Equipment, Commercial
Vending Machines
General Service Fluorescent Lamps
Incandescent Reflector Lamps
Direct Heating Equipment
Pool Heaters
Clothes Washers, Commercial
Dishwashers
Clothes Dryers
Central Air Conditioners and Heat Pumps
Small Electric Motors
Water Heaters
Fluorescent Lamp Ballasts
Room Air Conditioners
Refrigerators and Freezers
Commercial Central AC and Heat Pumps
Dishwashers
Clothes Washers, Commercial
Pool Heaters
Direct Heating Equipment
Incandescent Reflector Lamps
General Service Fluorescent Lamps
Vending Machines
Refrigeration Equipment, Commercial
Boilers, Commercial
Ranges and Ovens
Year New Standard Takes Effect
And There Are Eight More on the Way in 2014 DOE Rulemaking Schedule

<table>
<thead>
<tr>
<th>Date</th>
<th>Product</th>
<th>Rulemaking Stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>Battery Chargers and External Power Supplies**</td>
<td>Final rule</td>
</tr>
<tr>
<td>January</td>
<td>Commercial Furnaces**</td>
<td>Proposed rule or neg. determ.</td>
</tr>
<tr>
<td>January</td>
<td>Commercial Packaged A/C and Heat Pumps**</td>
<td>Proposed rule or neg. determ.</td>
</tr>
<tr>
<td>January</td>
<td>Commercial Water Heaters**</td>
<td>Proposed rule or neg. determ.</td>
</tr>
<tr>
<td>January</td>
<td>Furnace Fans**</td>
<td>Final Rule</td>
</tr>
<tr>
<td>January</td>
<td>IRLs (Certain ER, BR, and Small Diameter)**</td>
<td>Proposed rule</td>
</tr>
<tr>
<td>January</td>
<td>Packaged Terminal A/C and Heat Pumps**</td>
<td>Preliminary analysis</td>
</tr>
<tr>
<td>January</td>
<td>Residential Boilers**</td>
<td>Preliminary analysis</td>
</tr>
<tr>
<td>January</td>
<td>Automatic Ice Makers</td>
<td>Proposed rule</td>
</tr>
<tr>
<td>January</td>
<td>Dehumidifiers</td>
<td>Proposed rule</td>
</tr>
<tr>
<td>February</td>
<td>Metal Halide Lamp Fixtures</td>
<td>Final rule</td>
</tr>
<tr>
<td>February</td>
<td>Ceiling Fans and Ceiling Fan Light Kits</td>
<td>Preliminary analysis</td>
</tr>
<tr>
<td>February</td>
<td>Commercial Refrigeration Equipment</td>
<td>Final rule</td>
</tr>
<tr>
<td>March</td>
<td>General Service Fluorescent Lamps and IRLs**</td>
<td>Proposed rule</td>
</tr>
<tr>
<td>March</td>
<td>Commercial Clothes Washers</td>
<td>Proposed rule</td>
</tr>
<tr>
<td>March</td>
<td>Wine Chillers and Misc. Refrigeration Products</td>
<td>Preliminary analysis</td>
</tr>
<tr>
<td>April</td>
<td>Walk-In Coolers and Freezers</td>
<td>Final rule</td>
</tr>
<tr>
<td>May</td>
<td>Automatic Ice Makers</td>
<td>Final rule</td>
</tr>
<tr>
<td>May</td>
<td>Electric Motors</td>
<td>Final rule</td>
</tr>
<tr>
<td>June</td>
<td>Commercial Furnaces*</td>
<td>Final rule</td>
</tr>
<tr>
<td>June</td>
<td>Commercial Packaged A/C and Heat Pumps*</td>
<td>Final rule</td>
</tr>
<tr>
<td>June</td>
<td>Commercial Water Heaters*</td>
<td>Final rule</td>
</tr>
<tr>
<td>June</td>
<td>IRLs (Certain ER, BR, and Small Diameter)*</td>
<td>Final rule</td>
</tr>
<tr>
<td>July</td>
<td>Commercial and Industrial Pumps</td>
<td>Proposed rule</td>
</tr>
<tr>
<td>July</td>
<td>High-Intensity Discharge (HID) Lamps</td>
<td>Proposed rule</td>
</tr>
<tr>
<td>July</td>
<td>Residential Boilers</td>
<td>Proposed rule or neg. determ.</td>
</tr>
<tr>
<td>August</td>
<td>Fans and Blowers</td>
<td>Proposed rule</td>
</tr>
<tr>
<td>August</td>
<td>Single Package Vertical A/C and Heat Pumps*</td>
<td>Proposed rule</td>
</tr>
<tr>
<td>October</td>
<td>Packaged Terminal A/C and Heat Pumps*</td>
<td>Proposed rule</td>
</tr>
<tr>
<td>October</td>
<td>Vending Machines</td>
<td>Preliminary analysis</td>
</tr>
<tr>
<td>November</td>
<td>General Service Fluorescent Lamps and IRLs**</td>
<td>Final rule</td>
</tr>
</tbody>
</table>
Extent of Federal Standards Influence?

Fraction of Electric Use Covered by Federal Standards

- Residential: Covered
- Commercial: Covered
- Industrial: Covered
Impact on Northwest

- Council worked with Bonneville and its consultant to estimate the impact of standards adopted since the Sixth Plan
  - Near term impacts (2010-2014)
  - Long term impacts (2015-2035)
- Objective of analysis
  - Determine contribution of standards savings toward achievement of the Sixth Plan conservation targets for 2010 – 2015
  - Determine implications for the Seventh Plan’s forecast of post-2015 load growth and remaining conservation potential
Why Are Standards Part of Seventh Plan?

- Impact on load forecasts
- Establish base for conservation potential
Standards Impact Lost-Opportunity Savings Goals

5-Year Acquisitions (MWa)

- Discretionary
- Lost-Opportunity

2010-2014
- 800 Lost-Opportunity
- 400 Discretionary

2015-2019
- 800 Lost-Opportunity
- 860 Discretionary

Standards Primarily Capture Lost-Opportunity Resource Savings
Analytical Approach

- Focus on federal standards not included in Sixth Plan baseline
- Target analysis on standards with largest impact
- Collect data on actual units shipped and their efficiency
- Account for interactions between standards, state energy codes and utility programs to avoid “double counting” of savings
- Determine “net impact” of standards
Assessment Method

Was Standard Assumed in 6th Plan?
- Yes
- No

No Savings - Impact Included in Load Forecast

Does New Federal Standard Require Savings Above 6th Plan Baseline?
- No
- Yes

Do 6th Forecasts of Units Effected by Standard Match Estimated Actual Sales?
- No
- Yes

Compute "one time" contribution/adjustment to 6th Plan conservation goal

Compute Annual and Cumulative Savings from Federal Standard
Impact Analysis Focuses Analysis on 26 Standards

<table>
<thead>
<tr>
<th>Residential</th>
<th>Commercial/Industrial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential Dishwashers</td>
<td>Walk-in Coolers and Freezers</td>
</tr>
<tr>
<td>Residential Clothes Washers</td>
<td>Commercial Refrigeration Products</td>
</tr>
<tr>
<td>External Power Supply</td>
<td>Commercial Clothes Washers</td>
</tr>
<tr>
<td>Residential Refrigerators and Freezers</td>
<td>Pre-rinse Spray Valve</td>
</tr>
<tr>
<td>Residential Water Heater</td>
<td>Commercial CAC and Heat Pumps</td>
</tr>
<tr>
<td>Residential Heat Pumps</td>
<td>Packaged Terminal AC and HP</td>
</tr>
<tr>
<td>Torchieres</td>
<td>Illuminated Exit Signs</td>
</tr>
<tr>
<td>Ceiling Fan Lighting Kits</td>
<td>Electric Motors</td>
</tr>
<tr>
<td></td>
<td>Distribution Transformers</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Lighting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metal Halide Lamp Fixtures</td>
</tr>
<tr>
<td>Mercury Vapor Lamp Ballasts</td>
</tr>
<tr>
<td>Fluorescent Lamp Ballasts</td>
</tr>
<tr>
<td>General Service Fluorescent Lamps</td>
</tr>
<tr>
<td>Incandescent Reflector Lamps</td>
</tr>
<tr>
<td>Candelabra &amp; Intermediate Base</td>
</tr>
<tr>
<td>Incandescent Lamps</td>
</tr>
<tr>
<td>Medium Base Compact Fluorescent Lamps</td>
</tr>
<tr>
<td>High Intensity Discharge Lamps</td>
</tr>
</tbody>
</table>
Not All 26 Standards Produced Savings Over the 6th Plan Baseline

- Standards Reflected in Sixth Plan Load Forecast
  - Mercury vapor lamps ballast
  - External power supplies
  - Residential clothes washers
  - General service incandescent lamps

- Standards that do not directly impact electricity consumption
  - Commercial oil and gas boilers
Three Bundles of Savings

- Residential Appliances & Equipment
- Commercial & Industrial Equipment
- Lighting
Residential Appliance and Equipment Savings From Seven Federal Standards That Take Effect by 2015 Are Just Under \textbf{350} Average Megawatts by 2029

![Graph showing cumulative savings of various appliances from 2010 to 2028. The graph illustrates the cumulative savings in Megawatts (MWa) for different appliances over time, with a peak of just under 350 MWa by 2029. The appliances include Heat Pumps, Water Heaters, Freezers, Refrigerators, and Dishwashers.](nwpcouncil.org)
However, the estimated contribution of residential appliance and equipment standards savings to Sixth Plan conservation goals is small over the near term.
Commercial & Industrial Equipment Savings From Eight Federal Standards That Take Effect by 2015 Are Nearly 280 Average Megawatts by 2029

Cumulative Savings (MWe)

- PTAC/HP
- CAC Water Evap Cooled
- CAC Air-Cooled
- Distribution Transformers
- Electric Motors
- Walk-in Cooler and Freezers
- Commercial Washer (Laundromat)
- Commercial Washer (MF Common Area)
Commercial and Industrial Equipment Standards Savings Are More Significant Than Residential Over The Near Term

- **Lost-Opportunity Savings Goal**
- **Savings from Commercial & Industrial Standards**

- 38 aMW (2010-2014)
- 74 aMW (2015-2019)

Annual Acquisitions (aMW)

- 0
- 50
- 100
- 150
- 200
- 250

Year:
- 2010
- 2015
- 2020
- 2025
Lighting Standards

- Lighting standards in Sixth Plan forecast
  - General Service Incandescent (2012)
  - Mercury Vapor (2008)
- Seven standards since Sixth Plan (Effective Dates)
  - General Service Fluorescent Lamps (2012)(2014)
  - Fluorescent Ballasts (2015)
  - Metal Halide Fixtures (2012)
  - Halogen Reflector Lamps (2012)
  - Candelabra Lamps (2012)
  - Ceiling Fan Light Kits (2010)
  - Torchieres (2010)
Lighting Savings From Seven Federal Standards That Take Effect by 2015 Are Over \textbf{155} Average Megawatts by 2029

![Bar chart showing cumulative savings from 2010 to 2028 for different standards.](nwncouncil.org)
Federal Lighting Standards Have the Greatest Near-Term Impact

Annual Acquisitions (aMW)

Lost-Opportunity Savings Goal
Savings from Federal Lighting Standards

62 aMW 2010-2014
65 aMW 2010-2014
Federal Standards Are Estimated to Save Just Over 100 aMW by 2014 and 265 aMW between 2015-2019, with Lighting Standards Providing the Largest Near-Term Savings.
How Much Will New Federal Contribute Meeting 6th Plan Goals?

<table>
<thead>
<tr>
<th>5-Year Acquisitions (MWa)</th>
<th>2010-2014</th>
<th>2015-2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lost-Opportunity</td>
<td>100</td>
<td>265</td>
</tr>
<tr>
<td>Savings From Standards</td>
<td>300</td>
<td>595</td>
</tr>
<tr>
<td>Remaining Lost-Opportunity</td>
<td>800</td>
<td>800</td>
</tr>
<tr>
<td>Opportunity Savings Goal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discretionary</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Sources: Northwest Power and Conservation Council

nw council.org
Total Savings Forecast from Federal Standards Add Up to 780 Average Megawatts by 2029
Federal Standards Adopted The Since Sixth Plan
Capture One Quarter of The Twenty-Year Lost-
Opportunity Potential

Cumulative Savings (MWh)

Lost-Opportunity Savings Goal
Residential Appliances & Equipment
Commercial & Industrial Equipment
Lighting Equipment

Northwest Power and Conservation Council
nwccouncil.org
Implication for the Seventh Plan

- Compared to the Sixth Plan:
  - Load forecast will be lower, particularly over the long term
  - Remaining conservation potential will be lower
    - But not as much lower as the load forecast, since standard impact all units, but conservation assessment assumes less than 100% program success
  - Conservation programs will need adjust their focus to measures less impacted by federal standards
Next steps

- Seek peer review through CRAC and RTF
- Incorporate the results into the Seventh Plan’s load forecast and conservation potential assessment
- Provide results to others in the region for incorporation in their load forecast and conservation potential assessments