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February 4, 2014

### MEMORANDUM

**TO: Power Committee**

**FROM: Tom Eckman, Charlie Grist and Massoud Jourabchi**

**SUBJECT: Overview of Federal Appliance Efficiency Standards and Their Impacts**

Congress charged the US Department of Energy with establishing and maintaining a process for regularly updating energy efficiency standards for appliances, heating and cooling equipment, motors and a variety of other energy consuming products. The staff will provide an overview of the history federal standards and their historical impact on the region's load. Twenty three new or revised standards have been adopted since the Sixth Plan. An additional twelve standards are scheduled to be finalized prior to the adoption of the Seventh Plan. Staff will also describe the analysis that is currently underway to determine the impact of these standards on the regions future load growth and estimates of remaining conservation potential.

The Energy Policy and Conservation Act (EPCA) of 1975 established test procedures and conservation targets and labeling for major residential appliances. It also called upon the newly formed Department of Energy (DOE) to set standards for these appliances if the targets were not met. Three years later Congress enacted the National Energy Policy and Conservation Act (NECPA) that amended EPCA require standards. Nearly a decade past before Congress enacted and President Reagan signed into law the National Appliance Energy Conservation Act (NAECA) in 1987, the first national minimum efficiency standards for appliances. NAECA not only establish federal minimum standards for water heaters, clothes washers, refrigerators and other appliances, it set a schedule for the DOE to follow that was designed to ensure that these standards would be updated on a regular basis. NAECA has been amended four

times to include additional products and to require DOE to maintain a more consistent update schedule.

In 2005, the Energy Policy Act (EPA 2005) set new standards for 16 products and directed DOE to set standards via rulemaking for another five. In 2007, Congress passed the Energy Independence and Security Act (EISA 2007), enacting new or updated standards for 13 products. EISA also included a requirement that DOE maintain a schedule to regularly review and update all standards and test procedures, specially that it review each standard for potential revision at least every six years.

In 2013 Congress passed the American Energy Manufacturing and Technical Corrections Act (AMETCA) which amended EPCA to clarify the review requirements for commercial standards first put in place by EISA 2007. In essence, AMETCA requires that DOE review for potential revision any commercial equipment standard on the same six year interval as EISA requires for residential products.

Council staff estimates that through 2012, cumulative savings from federal standards are just under 1,000 average megawatts. They contribute almost twenty percent of the savings achieved in the region since 1978.

Although federal standards have been a significant contributor to both regional and national energy savings, historically the US DOE has failed to meet the update schedule required by Congress. As a result, in July of 2005 fifteen states, including New York and California and three public interest groups sued DOE for failure to comply with congressionally mandated standards update schedules. In December of 2005, DOE signed a consent decree placing it under a court supervised to eliminate its standards backlog within five years. In January 2006, DOE adopted a 5-year plan to address both the backlog and new standards rulemakings required by the Energy Policy Act of 2005 and EISA. DOE now has completed its standard setting rulemakings on all backlog products and completed all but one of the rulemakings prescribed by EISA. This translates into completing rulemakings on 24 products and updating numerous test procedures since 2009.

Because of DOE's commitment to comply with the court supervised schedule, federal standards rulemaking activity is occurring at a pace that is six-fold faster than since NAECA was enacted in 1987. This offered the Council and others an unprecedented opportunity to secure cost-effective efficiency gains through federal standards rather than through utility programs. For example, by the end of 2013 DOE had issued final standards for water heaters, refrigerators, freezers, central air conditioners and heat pumps, clothes washers and room air conditioners, all of which were identified as having significant conservation potential in the Sixth Plan

The Council has actively participated in DOE's rulemaking proceedings since 1987. Staff was appointed by the Secretary of Energy to serve on DOE's Appliance Standards and Rulemaking Advisory Committee (ASRAC). ASRAC was established to further improve the DOE's process of establishing energy efficiency standards for certain appliances and commercial equipment, particularly to facilitate negotiated rulemakings. Staff also participates in technical hearings on proposed standards and provides analysis in support of adopting standards at the levels of efficiency identified as being

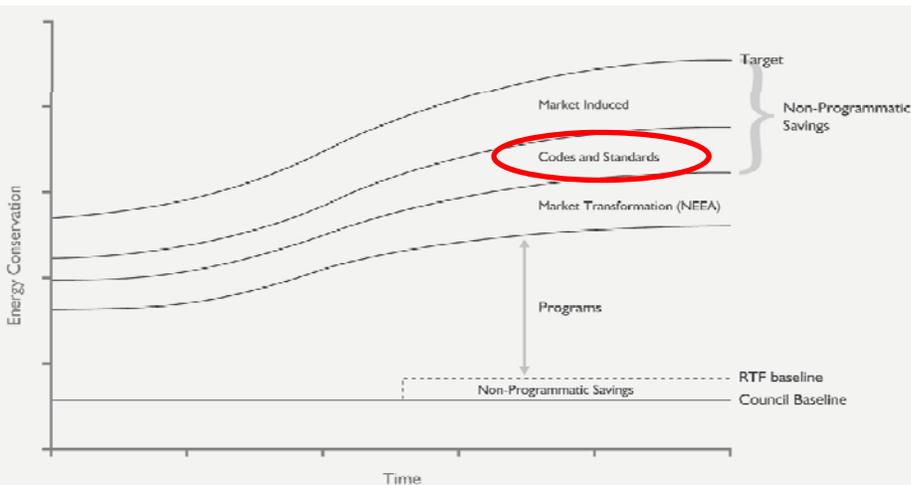
cost-effective in the Council plan. Staff also works with utilities and NEEA to assist in their efforts to support improvements in federal standards at levels consistent with the Plan.

Due to the unprecedented pace of standards adoption since the development of the Sixth Plan, staff has been working with Bonneville and its contractor (Navigant) to estimate the impact of these new standards on regional load growth and future conservation potential. This analysis is not yet complete. In particular, staff intends to present the draft results to the Council's Conservation Resource Advisory Committee (CRAC) for review. Once the CRAC's review is complete staff will present its findings to the Council for consideration and use in the development of the Seventh Plan. In addition, staff intends to make the detail results and models used to develop the estimates of savings and load forecast impacts of these new standards available to others in the region for their use.

# Overview of Federal Appliance Standards and Their Impact on Regional Loads

February, 2014

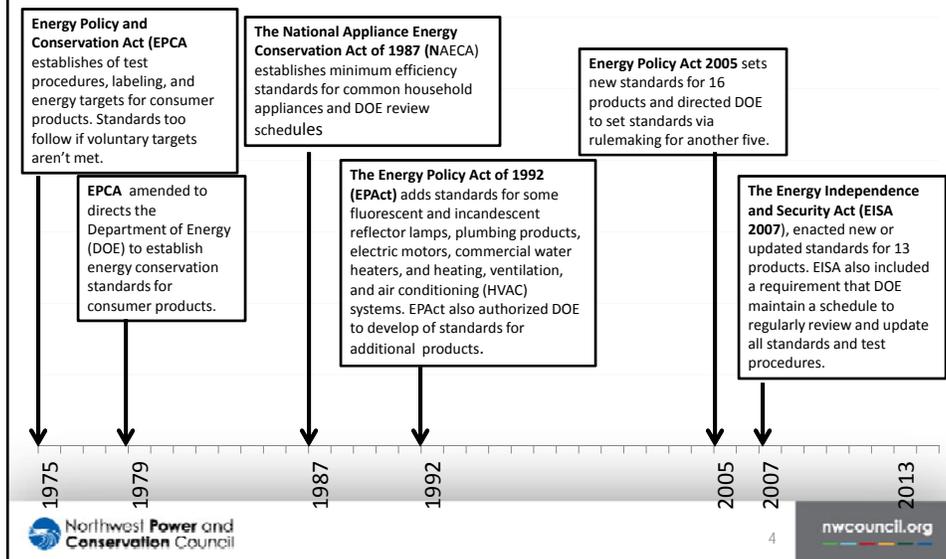
## Savings from Many Mechanisms

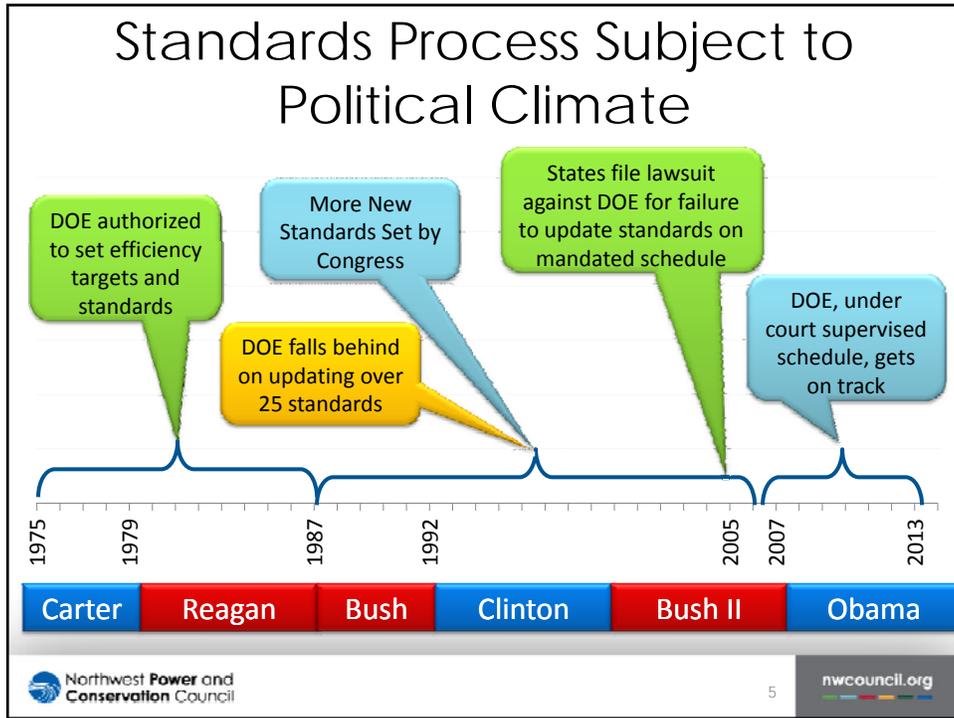


## Today's Presentation

- Short history and “primer”
- Council involvement in standard setting process
- Why standards are important mechanism for capturing savings
- Historical impact of federal efficiency standards

## Legislative History of Federal Appliance Standards





## Current Status

- Currently there are minimum energy efficiency standards for more than 50 categories of appliances and equipment.
- Products covered by standards represent about 90% of home energy use, 60% of commercial building use, and 29% of industrial energy use.
- DOE must now review each product standard every six years to determine whether it should be revised

## Major Product Categories Covered by Federal Efficiency Standards

- Battery Chargers and External Power Supplies
- Ceiling Fan Light Kits
- Residential & Commercial Clothes Washers
- Commercial Ice Makers
- Commercial Packaged Air Conditioners and Heat Pumps
- Commercial Packaged Heating and Cooling Equipment
- Residential & Commercial Refrigerators & Freezers
- Commercial Warm Air Furnaces
- Residential & Commercial Water Heaters and Unfired Water Heater Tanks
- Compact Fluorescent Lamps
- Dehumidifiers
- Direct heating equipment
- Electric Motors
- Exit Signs
- General Service Fluorescent Lamps and Ballasts
- General Service Incandescent Lamps
- Incandescent Reflector Lamps
- Low & Medium Voltage Transformers
- Metal Halide Lamps Fixtures
- Pool heaters
- Refrigerated Beverage Vending Machines
- Residential Central Air Conditioners and Heat Pumps
- Residential Clothes Dryers
- Residential Dishwashers
- Residential Furnaces & Boilers
- Residential Ranges and Ovens
- Room Air Conditioners
- Single Packaged Vertical Air Conditioners and Heat Pumps
- Torchiers
- Traffic and Pedestrian Signal
- Walk-in Coolers and Walk-In Freezers

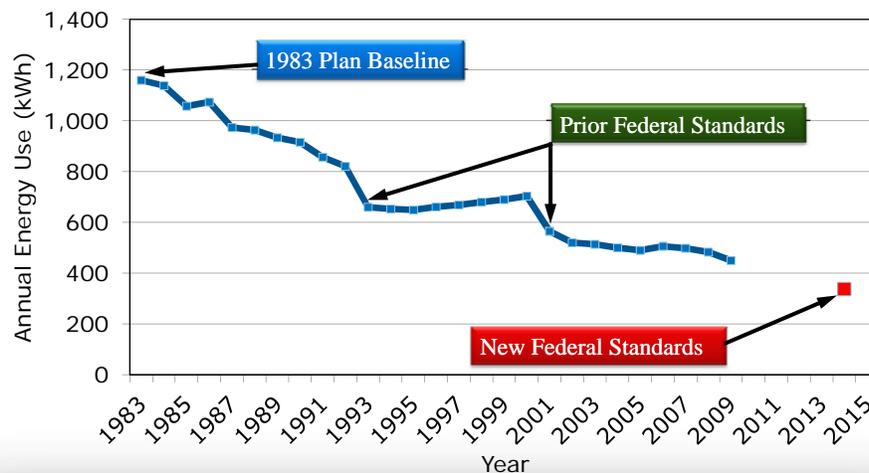
## Council Involvement

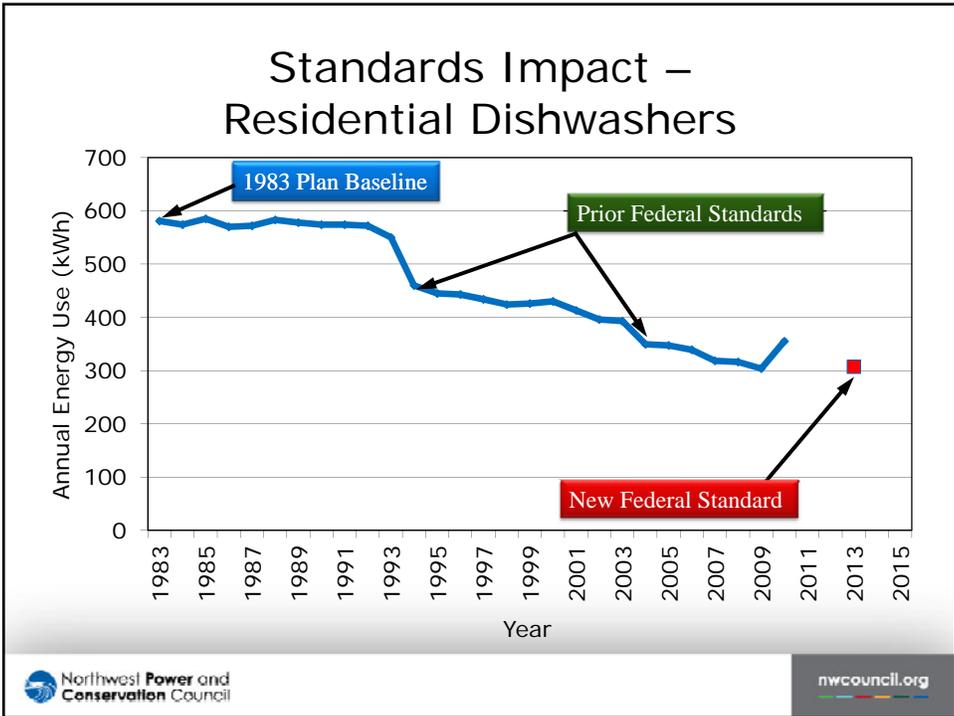
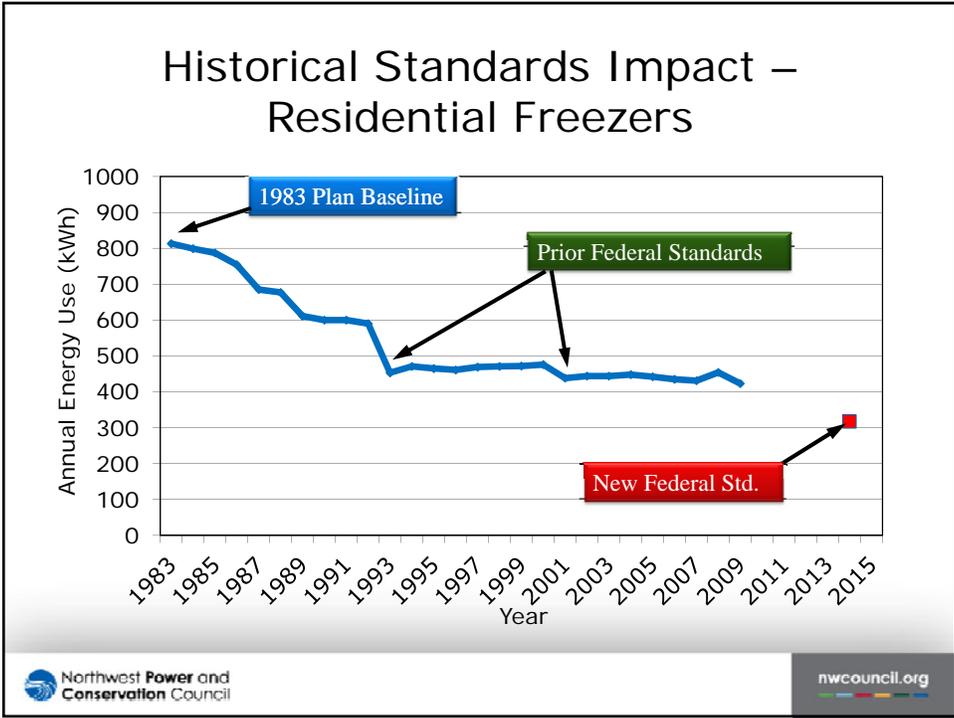
- Council testified before Congress in support of National Appliance Energy Conservation Act (NAECA) which established federal standards
- Council has actively participated in standards setting process since passage of NAECA in 1987 by supporting standards at efficiency levels consistent with those found to be cost-effective in its Plans
  - Staff serves on US DOE's Appliance Standards and Rulemaking Advisory Committee (ASRAC)
  - Staff participates in technical rulemaking hearings and submits technical comments
  - Staff works with regional utilities and NEEA to inform and encourage their participation in standards rulemaking processes (e.g., solicited letters of support from utilities for distribution transformer efficiency standards)
  - Executive Director "signs-off" on Council comments on proposed final rules and letters of support for levels of efficiency consistent with Council Plan

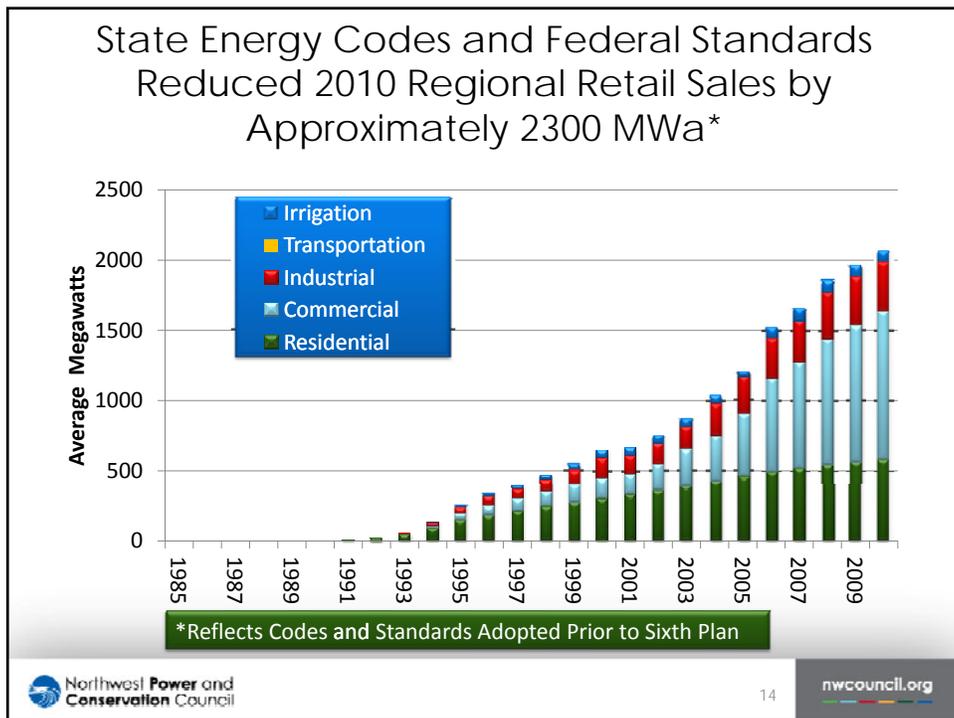
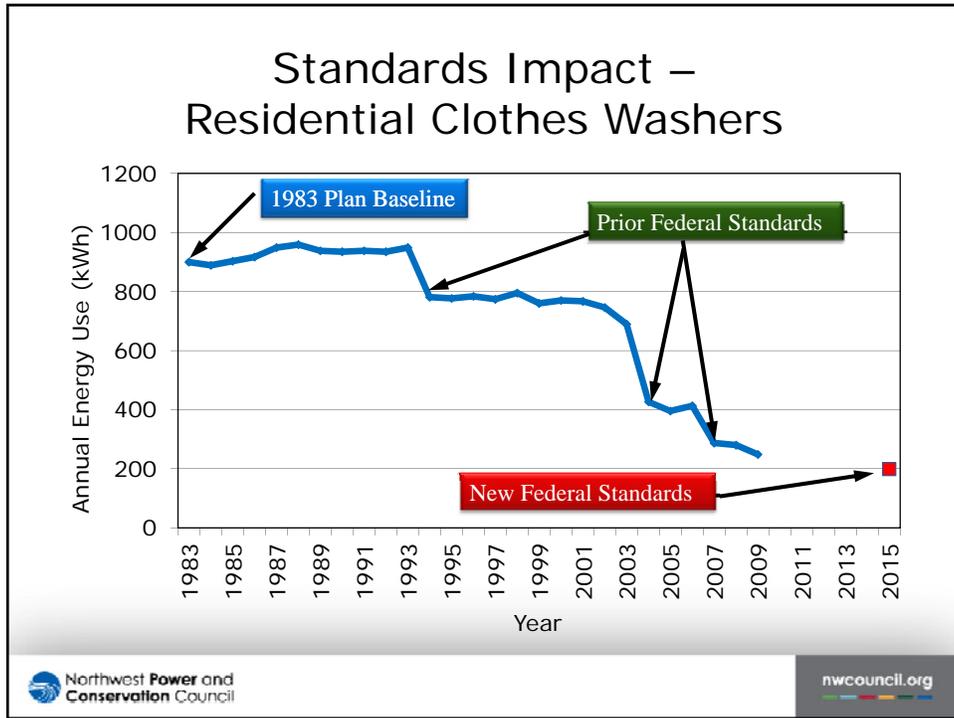
## Why Federal Efficiency Standards Are Valuable

- **Lower Cost** – Standards produce savings at lower “total cost” because they avoid program administrative costs.
- **Larger Savings** -- Standards effect the entire market while programs effect only a portion of the market resulting in greater total savings for comparable improvements in efficiency
- **Greater Equity** -- The “compliance cost” of meeting a standard is borne by the consumers who benefit from the increased efficiency.

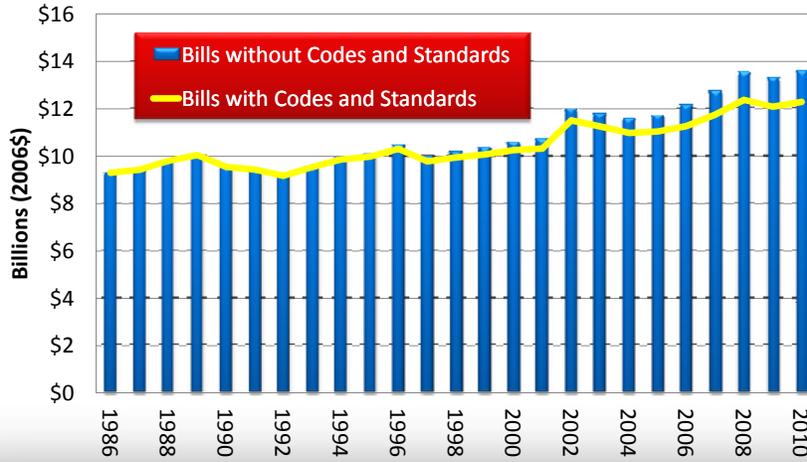
## Historical Standards Impacts – Residential Refrigerators



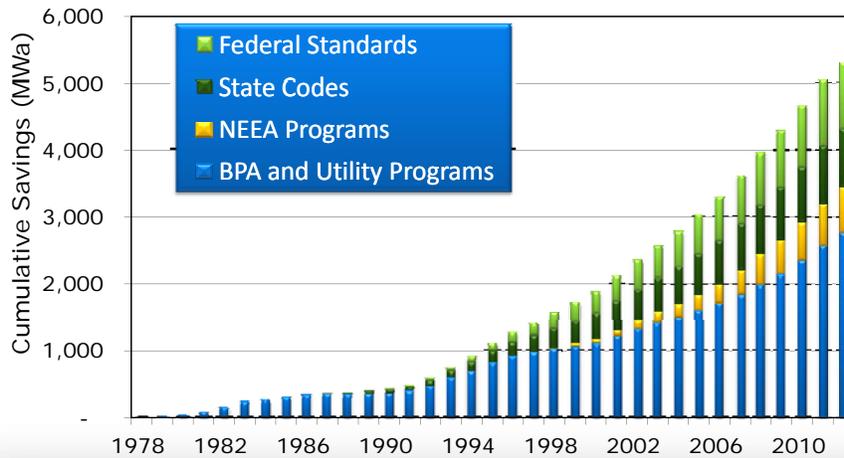




### Regional Consumers Paid \$10 Billion Dollars Less In Their Electric Bills From 1986-2010 Due to State Codes and Standards



### Federal Standards Contribute About 20% of Cumulative Regional Conservation Savings



## Twenty Four New or Revised Standards Have Been Adopted Since Sixth Plan

Sector	Product Covered	Initial Legislation	Last Standard Issued	Effective Date
Commercial/Industrial	Boilers, Commercial	EPACT 1992	2009	2012
Commercial/Industrial	Commercial Refrigeration Equipment	EPACT 2005	2009	2012
Lighting	General Service Fluorescent Lamps	EPACT 1992	2009	2012
Lighting	Incandescent Reflector Lamps	EPACT 1992	2009	2012
Residential	Ranges and Ovens	NAECA 1987	2009	2012
Commercial/Industrial	Vending Machines	EPACT 2005	2009	2012
Commercial/Industrial	Clothes Washers	EPACT 2005	2010	2013
Residential	Direct Heating Equipment	NAECA 1987	2010	2013
Residential	Pool Heaters	NAECA 1987	2010	2013
Commercial/Industrial	Small Electric Motors	EPACT 1992	2010	2015
Residential	Water Heaters	NAECA 1987	2010	2015
Residential	Central Air Conditioners and Heat Pumps	NAECA 1987	2011	2015
Residential	Clothes Dryers	NAECA 1987	2011	2015
Lighting	Fluorescent Lamp Ballasts	NAECA 1988	2011	2014
Residential	Furnaces	NAECA 1987	2011	2013
Residential	Refrigerators and Freezers	NAECA 1987	2011	2014
Residential	Room Air Conditioners	NAECA 1987	2011	2014
Residential	Clothes Washers	NAECA 1987	2012	2015
Commercial/Industrial	Commercial CAC and HPs (Water- and Evaporatively-Cooled)	EPACT 1992	2012	2013
Residential	Dishwashers	NAECA 1987	2012	2013
Commercial/Industrial	Distribution Transformers: Liquid-Immersed	EPACT 1992	2013	2016
Commercial/Industrial	Distribution Transformers: Low-Voltage Dry-Type	EPACT 2005	2013	2016
Commercial/Industrial	Distribution Transformers: Medium-Voltage Dry-Type	EPACT 1992	2013	2016
Residential	Microwave Ovens	NAECA 1987	2013	2016
Residential	External Power Supplies	EISA 2007	2014	2016
Lighting	Metal Halide Lamp Fixtures	EISA 2007	2014	2016

Published  
02/03/14

Not Yet Released

Published  
01/28/14

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

And There Are More on the Way – DOE 2014 Rulemaking Schedule

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## Impact on Northwest

- Council staff is working Bonneville and its consultant to estimate the impact of standards adopted since the Sixth Plan
- 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

## 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

## Impact Analysis Focuses Analysis on These Standards

### Residential

- Residential Dishwashers
- Residential Clothes Washers
- External Power Supply
- Residential Refrigerators and Freezers
- Residential Water Heater
- Residential Heat Pumps
- Torchieres
- Ceiling Fan Lighting Kits

### Commercial/Industrial

- Walk-in Coolers and Freezers
- Commercial Refrigeration Products
- Commercial Clothes Washers
- Pre-rinse Spray Valve
- Commercial CAC and Heat Pumps
- Packaged Terminal AC and HP
- Illuminated Exit Signs
- Electric Motors
- Distribution Transformers

### Lighting

- Metal Halide Lamp Fixtures
- Mercury Vapor Lamp Ballasts
- Fluorescent Lamp Ballasts
- General Service Fluorescent Lamps
- General Service Incandescent Lamps
- Incandescent Reflector Lamps
- Candelabra & Intermediate Base Incandescent Lamps
- Medium Base Compact Fluorescent Lamps
- High Intensity Discharge Lamps

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## Preliminary Estimates of Residential Savings of Electricity, Natural Gas and Water at Consumers' Meters

	Impacts 2010 - 2014	Impacts 2015 - 2030
Electricity (MWa/year)	7	478
Natural gas (1000 therms/year)	221	18,675
Water (Million gallons/year)	66	25,292

### By 2030

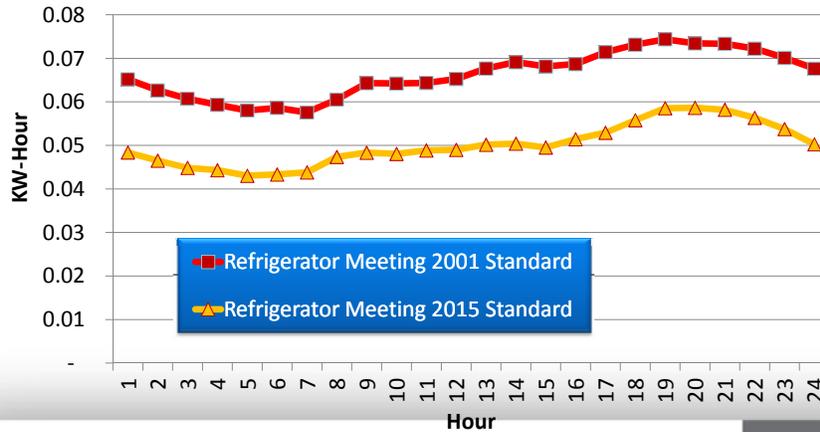
- Water savings from Clothes- and Dishwashers is enough to meet needs demand from Portland Water Bureau's residential customers for over 3 years.
- Natural Gas savings are equal to 5% of NW Natural's 2012 Residential account sales.

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## Standards Also Produce Capacity Impacts

Residential Refrigerator Annual Hourly Demand



## Residential Standards save Energy and Capacity\*

	Impact 2010-2014	Impact 2015-2030
PNW Electricity Savings/year (end use, MWa)	7	478
PNW Electricity Savings/year (system load, MWa)	8	521
Peak-Load Reduction (January, MW)	7	926
Peak-Load Reduction (July, MW)	24	2001

\*Preliminary estimates energy and capacity impacts

## Implication for the Sixth Plan\*

- **Sixth Plan Conservation Target for 2015 is 290 MWA**
  - Approximately 7 MWa of that can be met by these standards.
- **By 2030 , over 500 MWA of the Sixth Plan's residential sector's efficiency target might be met by standards adopted between 2009 and 2013**

**\*Preliminary Estimate**

## 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 assesment assumes less than 100% program success
  - Conservation programs will need adjust their focus to measures less impacted by federal standards

## Next steps

- **Complete impact analysis and seek peer review through CRAC**
- **Present final results to Council**
- **Incorporate the results into the Seventh Plan's load forecast and conservation potential assessment**
- **Provide results to others in the region for incorporation in load forecast and conservation potential assessments**