

RESIDENTIAL AND AGRICULTURE

Residential Sector

Approach, Methods, & Measures



dreamstime.com

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**

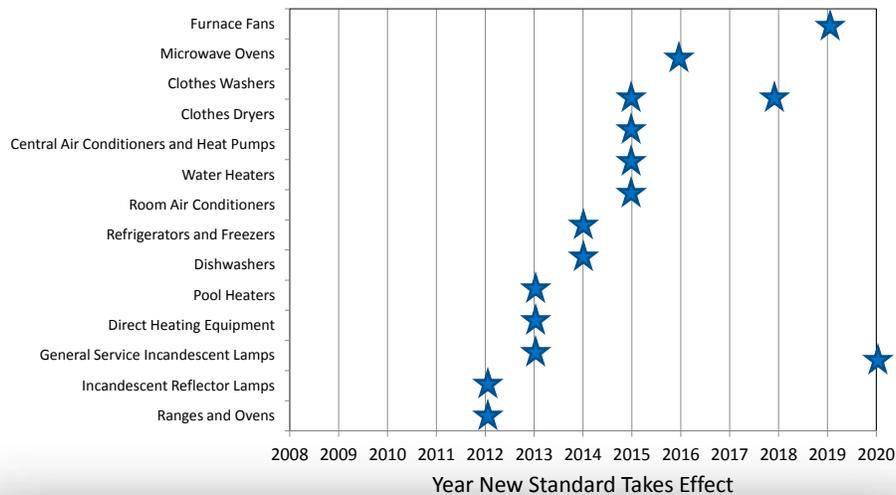
Scope of Residential Analysis

- **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)



Potential New Standards

(Two may provide data for 7P)

Product Covered	Initial Legislation	Updated DOE Standard Expected	Potential Effective Date
Battery Chargers	EPACT 2005	2015	2017
Central Air Conditioners and Heat Pumps	NAECA 1987	2017	2022
Clothes Dryers	NAECA 1987	2017	2020
Clothes Washers	NAECA 1987	2018	2021
Dehumidifiers	EPACT 2005	2016	2019
Direct Heating Equipment	NAECA 1987	2016	2021
Dishwashers	NAECA 1987	2015	2018
External Power Supplies	EPACT 2005	2015	2017
Furnace Fans	EPACT 2005	2020	2025
Microwave Ovens	NAECA 1987	2019	2022
Pool Heaters	NAECA 1987	2016	2021
Ranges and Ovens	NAECA 1987	2015	2018
Refrigerators and Freezers	NAECA 1987	2018	2021
Room Air Conditioners	NAECA 1987	2017	2020
Water Heaters	NAECA 1987	2016	2021
Wine Chillers	NAECA 1987	2016	2019

RBSA + Metering

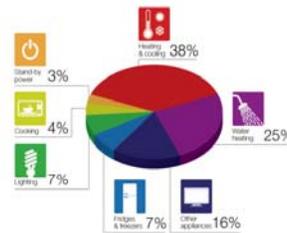
- Baseline saturation data across building types and region (as of 2011)
- Consumption data
- Load shapes (non-weather dependent)
 - DHP load shape from NEEA metering study



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)



Source: sa.gov.au

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

Building Type	
Single Family	} New split for 7P
Low-Rise Multifamily	
High-Rise Multifamily	
Manufactured	

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

28					
29	# HOMES APPLICABLE BY YEAR FOR MEASURE - Showerhead - Retro			EXISTING HOMES	
30	Applicability		UNITS PER HOME	Showerhead - Retro	3
31	52%		1.8	Single Family	1966527
32	58%		1.3	Multifamily - Low Rise	399332
33	58%		1.3	Multifamily - High Rise	90379
34	34%		1.6	Manufactured	136324
~					

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



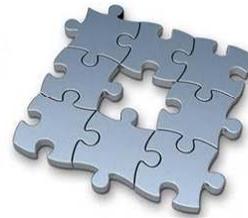
Potential New Measures

- 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**



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?

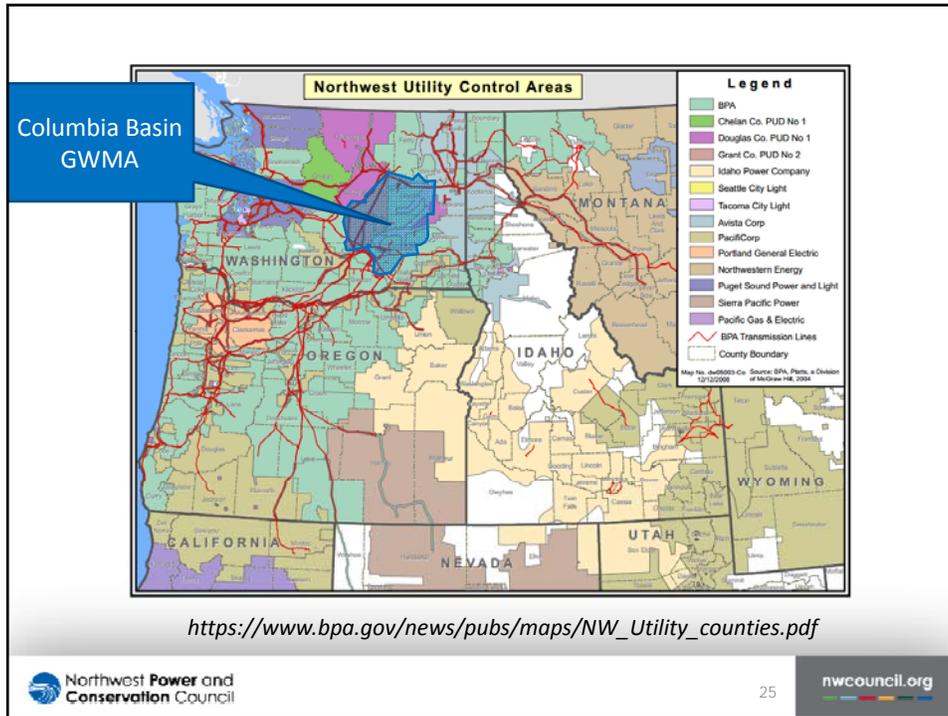
Conservation or Non-Energy Benefit?

- **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)



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)

Northwest Power and Conservation Council | 26 | nwcouncil.org

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

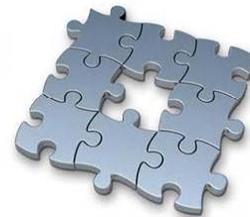
- Stock watering tank*
- Motor rewind*
- Water heaters
- High volume, low speed fans
- Storage shed ventilation fan VFD*
- Compressed air improvements



*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