

# Oregon Department of **ENERGY**

EO 20-04  
Implementation:  
Energy Code  
Stakeholders

Facilitator: Roger Kainu  
July 15, 2020  
1-2:30pm



# Agenda

Topic	Lead	Action	Time
Greeting and roll call	ODOE staff	Welcome and review of attendees	10 min
Recent actions	ODOE staff	Share activities of subgroup, NEEA, BCD and ODOE	5 min
2006 Oregon Residential Code	BCD/ODOE staff	Describe 2006 code - inputs and assumptions	30 min
2030 Target Home	NEEA	NEEA shares suggested inputs to meet 2030 goal	15 min
Q/A	All	Open time for questions and answers	20 min
Wrap-up	ODOE	Determine action items and announce next meeting.	10 min

# Participants

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Avista

Cascade Natural Gas

City of Ashland

City of Beaverton

City of Bend

City of Eugene

City of Hillsboro

City of Hood River

City of Milwaukie

City of Portland

Climate Solutions

Earth Advantage

Energy Trust of Oregon

Home Builder

Jackson County

NEEA

New Buildings Institute

NW Natural

OHBA

ORACCA

Pacific Power

Panasonic

Portland General Electric

TRC

# Recent Activities

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## 2006 Oregon Residential Code Baseline Review

- Team
  - Northwest Energy Efficiency Alliance
  - Oregon's Building Code Division
  - Oregon Department of Energy
- Discussion
  - Modeling inputs and assumptions
  - Methodologies
  - Data Sources

# 2006 Oregon Residential Code Baseline

- Methodology
- References
- What you will see today

# Modeling Inputs and Assumptions

Characteristics	
Home Size	2,376 sq ft
Stories	2
Occupants	(REM/Rate N/A)
Bedrooms	4
Window Area	15% Window to Floor Area Ratio

# Modeling Inputs and Assumptions

Envelope	
Flat Ceiling	R-38
Wood Framed Walls	R-21 Conventional
Windows	U-0.40, SHGC-0.40
Doors	U-0.20
Underfloor	R-25
Slab Edge	R-15 for 2 ft
Air-tightness	8 ACH50

# Modeling Inputs and Assumptions

## Heating and Cooling

Gas Furnace	Heat: 78% AFUE
Gas Furnace + AC (Heat+Cool)	Heat: 78% AFUE Cool: 13 SEER
Central Heat Pump (Heat+Cool)	Heat: 7.7 HSPF Cool: 13 SEER
DHP w/ Elec Zonal (Heat+Cool)	Electric Zonal



# Modeling Inputs and Assumptions

## Heating and Cooling

Ducts	R-8 Outside Envelope 15% Leakage
Mech Ventilation Fan	50 cfm 0.5 CFM/watt Cycle 8 hrs
Thermostat	Manual

# Modeling Inputs and Assumptions

## Water Heating (DHW)

DHWH - Gas	40 Gal 0.57 EF (Gas)
DHWH - Electric	50 Gal 0.90 EF (Elect.)
Hot Water Consumption	(REM/Rate N/A)
Fixtures & Pipe Insulation	No low flow fixtures or pipe insulation

# Modeling Inputs and Assumptions

## Lighting

Lighting

0% CFL

100% Incandescent

(REM/Rate Total Use  
Calculated)

Lighting Hours

# Modeling Inputs and Assumptions

## Unregulated Loads

Appliances, kWh/yr	Federal Minimum 2,549 kWh/yr
Plug Loads, kWh/yr	2,850 kWh/yr.- REM/Rate Total Use Calculation

# Weighting Assumptions

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## Construction Type

Crawl space	73%
Slab	27%

# Weighting Assumptions

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## HVAC

Gas furnace, central AC	53%
Gas furnace, no AC	29%
Central heat pump	12%
Electric zonal heating	6%

# Questions and Answers

- We welcome your feedback and thoughts

# 2030 Target Home

- 60% reduction from 2006 Oregon Residential Code Baseline
- What may that look like?





# NEEA Study of Oregon Residential Code

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Presented to Oregon Energy Codes Stakeholder Panel  
July 15, 2020

Bing Liu, Shilpa Surana (NEEA)  
Mark Frankel, Henry Odum (Ecotope)





## Oregon Executive Order (EO) 17-20

Newly constructed residential buildings to achieve equivalent performance levels with DOE Zero Energy Ready specification by 2023.

### NEEA's Study Goals:

1. Provide a summary snapshot of the annual energy consumption of single-family homes by establishing the 2017 Oregon Residential Specialty Code (ORSC) baseline.
2. Determine the difference in energy consumption between the 2017 ORSC baseline and the ZER specification.
3. Provide several combinations of measures to achieve ZER-equivalent energy savings by 2023.



March 18, 2020

REPORT #E20-399

## Oregon Residential Specialty Code: Energy Efficiency Analysis

Prepared For NEEA:

Shilpa Surana, Engineer  
Christopher Dymond, Product Manager  
Bing Liu, Sr. Manager, Codes,  
Standards & New Construction

Prepared by:

Henry Odum, P.E.  
Paul Kinter, Analyst

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## Key Takeaway:

- Oregon 2023 Code needs to improve 6-14% efficiency to achieve ZER-equivalent energy performance.
- Limited combination of measures were analyzed in the study to demonstrate how to achieve ZER-equivalency.

<https://neea.org/resources/oregon-residential-specialty-code-energy-efficiency-analysis>



## Oregon Executive Order (EO) 20-24

Adopt a building energy efficiency goal for 2030 that represents a 60% reduction in building site energy consumption from the residential and commercial energy codes that were in effect in 2006.

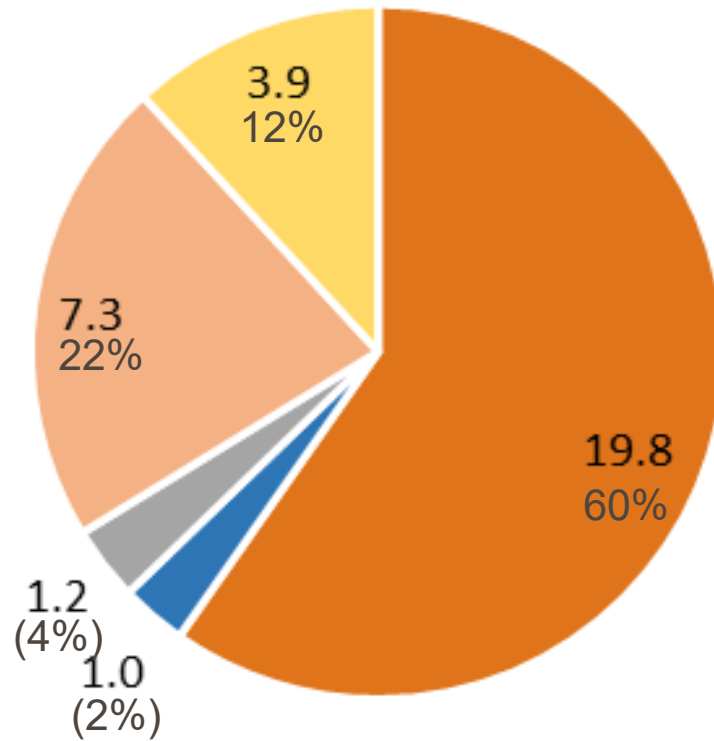
### NEEA's 2030 Code Study:

1. Establish the 2006 code baseline.
2. Determine the energy consumption among the 2006 baseline, 2017 Oregon code, BCD's proposed Reach Code, ZER specs and the 60% reduction in the 2030 energy efficiency goals.
3. Provide several combinations of measures to achieve the 2030 energy efficiency goal.



# 2006 Baseline Energy End Use (State-wide Weighed Average)

Regulated EUI - 33 kBtu/sf/yr (weighted)



■ Heating ■ Cooling ■ Fan ■ Water Heating ■ Lighting



# 2030 Oregon Residential Code Measures to Consider

## Data Sources:

1. Regional building stock assessment and metering data
  - RTF, RBSA, SFNC Characteristics and Practice Study (RLW Analytics, 2007), HPWH Validation Study etc.
2. Best practices of super-efficient homes in the region and nation wide
3. EPS New Construction homes and other above-code programs in Oregon
4. California's Net Zero Code, Incentives and other stretch codes
5. Field study of new homes in Oregon (2019-2020)
6. NEEA's pilot projects and studies
  - Market ready high performance walls: [phase 1 report](#); [phase 2 report](#)
  - NEEA's Advanced Water Heater [Specs](#)
  - NEEA's Thin Triple Pane Window [Study](#)
7. Passive House Program (PHIUS)





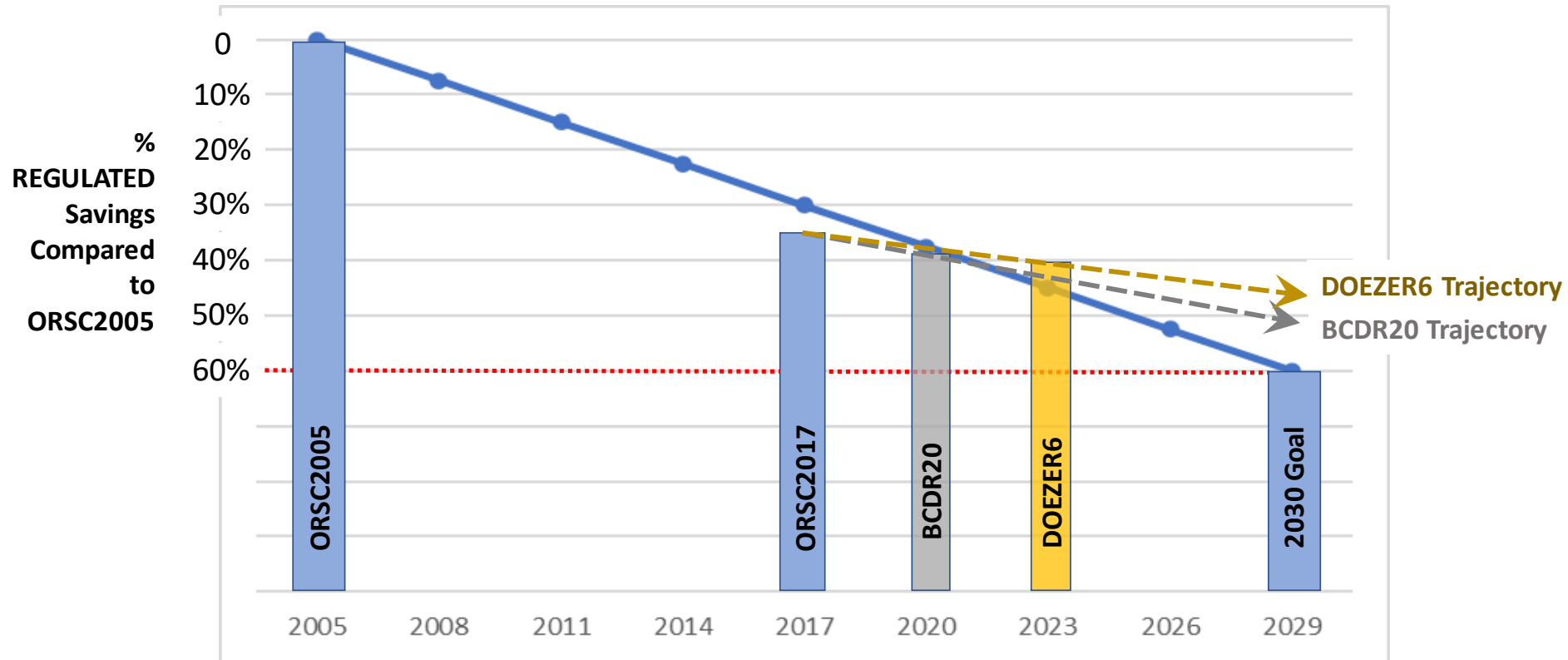
# 2030 Measures to Consider – Preliminary List

Envelope	Performance Target
<b>Super-Efficient Walls</b>	$U \leq 0.045$ for above-grade walls (nominal R21 + R4.5 ci) $U \leq 0.040$ for below-grade walls (R21 2 ft + BG)
<b>Super Windows</b>	Window $U \leq 0.20$ (thin triple pane)
<b>Air Tightness</b>	$ACH50 \leq 2.0$ Must pair with balanced mechanical ventilation with HRV
HVAC	Performance Target
<b>Balanced Ventilation w/HRV</b>	Balanced mechanical ventilation that meets ASHRAE 62.2 fresh air minimums with high-efficient HRV (sensible recovery efficiency 80%, fan power $\leq 1.2$ cfm/W)
<b>Efficient Ducts</b>	Pressure drop of ducted system is less than 0.75 in WG At least 95% of ducts are located inside conditioned space Duct leakage to exterior meets ANSI standard 310 Grade 1 requirements
<b>HVAC System Design</b>	Zone based sizing, with equipment capacity not greater than 125% of design load as calculated by ACCA manual J
<b>HVAC Equipment Efficiency</b>	a. Gas-fired furnace or boiler AFUE 95%, or b. Air source heat pump HSPF $\geq 12.0$ , EER $\geq 11.0$ , or d. Ductless heat pump HSPF $\geq 12.5$ , EER $\geq 12.0$ .
Water	Performance Target
<b>Electric HPWH</b>	Meets Tier 4 of the Advanced Water Heater Specification (COP $\geq 4.0$ , limited backup element, CTA 2045 grid communication function)
<b>Gas HPWH</b>	Meets Tier 3 of the Advanced Water Heater Specification for Gas-Fueled Residential Storage Water Heaters (COP $\geq 1.2$ )
<b>Gas Tankless Water Heater</b>	Not allowed as base path Builders could use tankless condensing gas water heater as trade off



# Preliminary Analysis\*

## Code Version Comparison



\*Analysis was conducted in May 2020, prior to the Oregon stakeholder panel meetings. NEEA is updating the 2006 code baseline based on the coordination reviews with BCD and ODOE. The final analysis will be published this summer. 24





## Next Steps

- Update the 2006 baseline
- Continue to develop the 2030 code measures
- Conduct analysis on energy saving potentials from the combinations of measures
- Publish NEEA's report

# » Discussions

Bing Liu, P.E., Fellow ASHRAE

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# Questions and Answers

- We welcome your feedback and thoughts

Meeting  
#2  
Wrap-up



- Recording will be available
- Action items identified and distributed
- Next meeting date 8/12
- Any questions, please send to:  
[Roger.Kainu@Oregon.Gov](mailto:Roger.Kainu@Oregon.Gov)

- Meeting materials:  
<https://www.oregon.gov/energy/Get-Involved/Pages/Energy-Code-Stakeholder-Panel.aspx>

- BCD:  
<https://www.oregon.gov/bcd/Pages/energy-eo.aspx>