# Oregon Department of **ENERGY**

## EO 20-04 Implementation: Energy Code Stakeholders

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

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# 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 |

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# Participants

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

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# Recent Activities

## 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

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# 2006 Oregon Residential Code Baseline

- Methodology
- References
- What you will see today

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# 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 |

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# 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 |

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# Modeling Inputs and Assumptions

| Heating and Cooling | |
|---|---|
| Gas Furnace | Heat: 78% AFUE |
| Gas Furnace + AC (Heat+Cool) | Heat: 78% AFUE<br>Cool: 13 SEER |
| Central Heat Pump (Heat+Cool) | Heat: 7.7 HSPF<br>Cool: 13 SEER |
| DHP w/ Elec Zonal (Heat+Cool) | Electric Zonal |

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# Modeling Inputs and Assumptions

| Heating and Cooling | |
|---|---|
| Ducts | R-8<br>Outside Envelope<br>15% Leakage |
| Mech Ventilation Fan | 50 cfm<br>0.5 CFM/watt<br>Cycle 8 hrs |
| Thermostat | Manual |

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# 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 |

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# Modeling Inputs and Assumptions

| Lighting | |
|---|---|
| Lighting | 0% CFL<br>100% Incandescent |
| Lighting Hours | (REM/Rate Total Use Calculated) |

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# 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 |

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# Weighting Assumptions

| Construction Type | |
|---|---|
| Crawl space | 73% |
| Slab | 27% |

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# Weighting Assumptions

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

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# Questions and Answers

- We welcome your feedback and thoughts

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# 2030 Target Home

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

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# NEEA Study of Oregon Residential Code

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

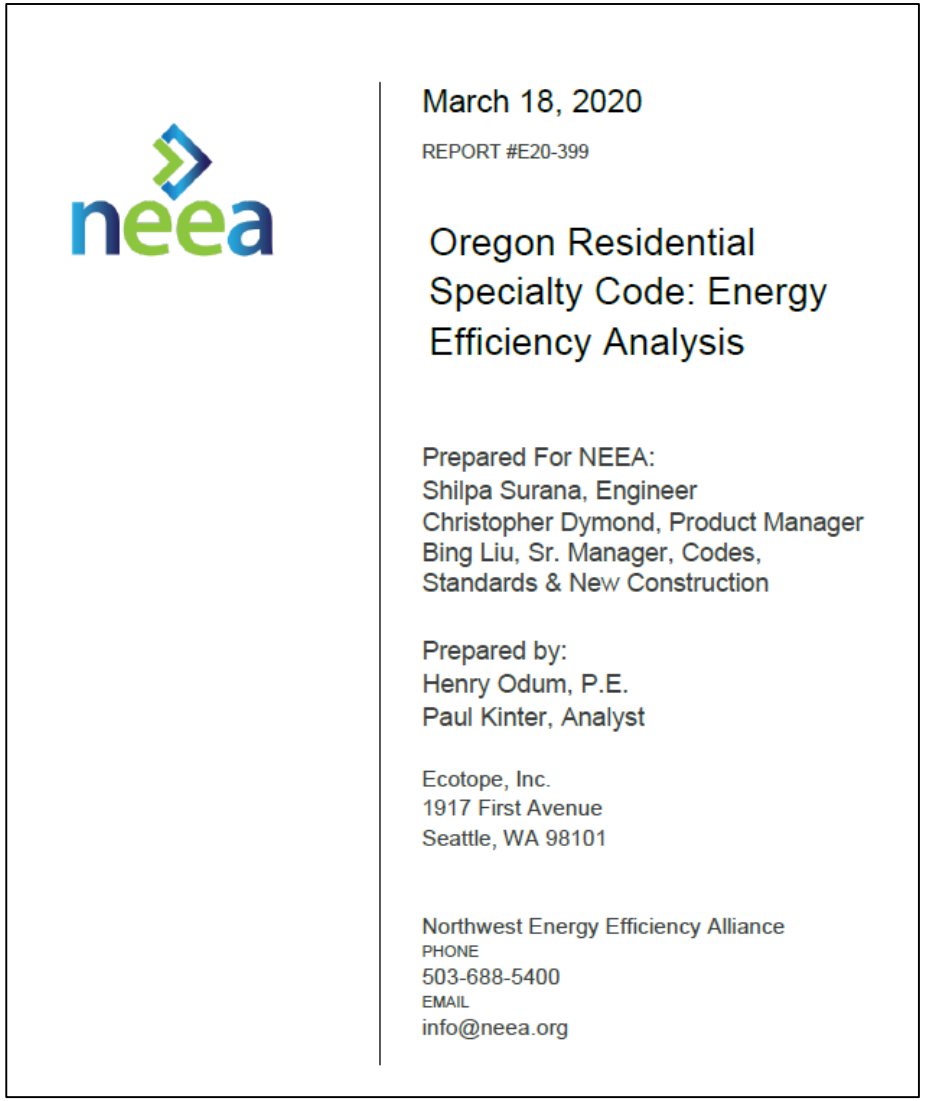
Newly constructed residential buildings to achieve equivalent performance levels with DOE Zero Energy Ready specification by 2023.

## 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.
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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:**

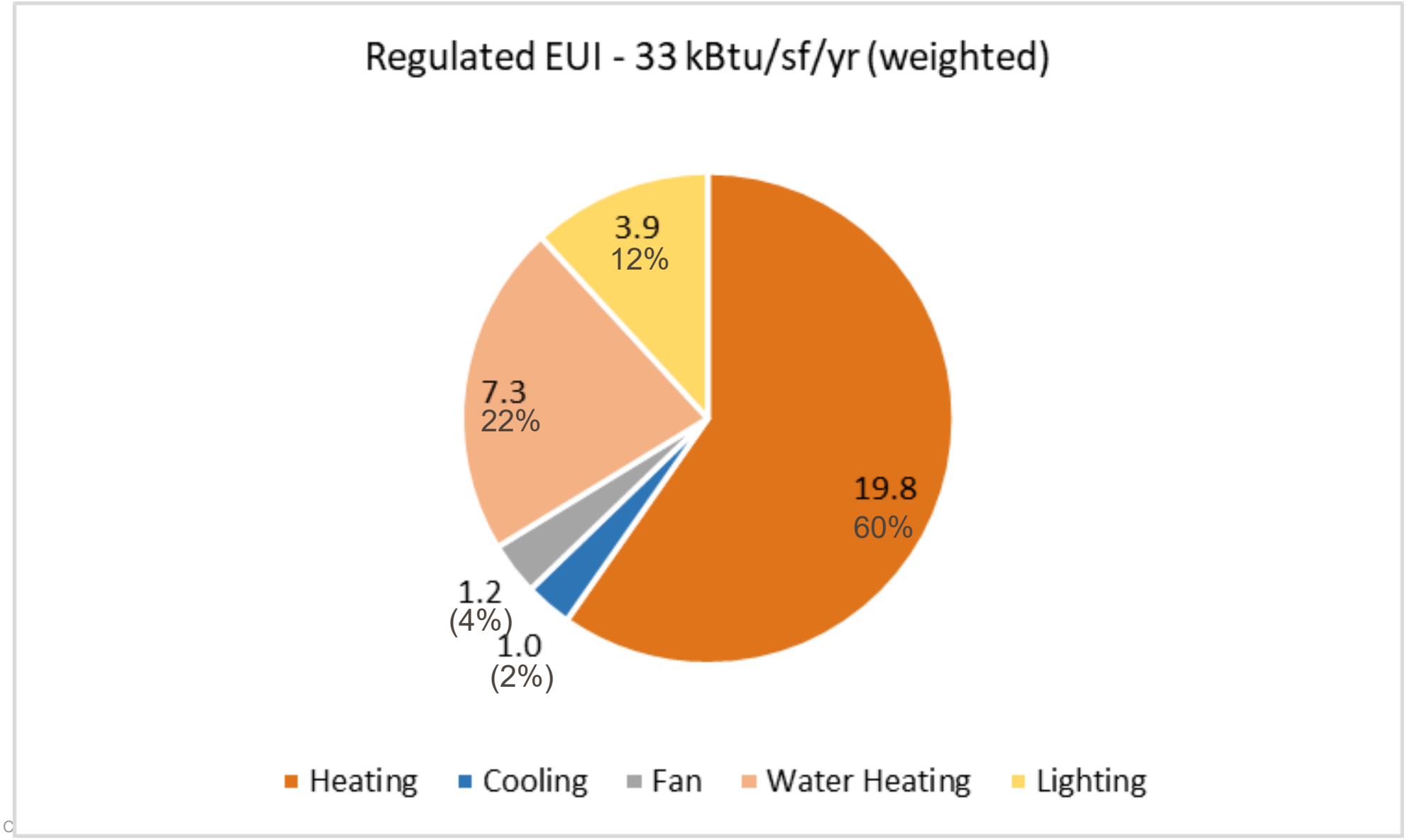
1. Establish the 2006 code baseline.

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)



# 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)

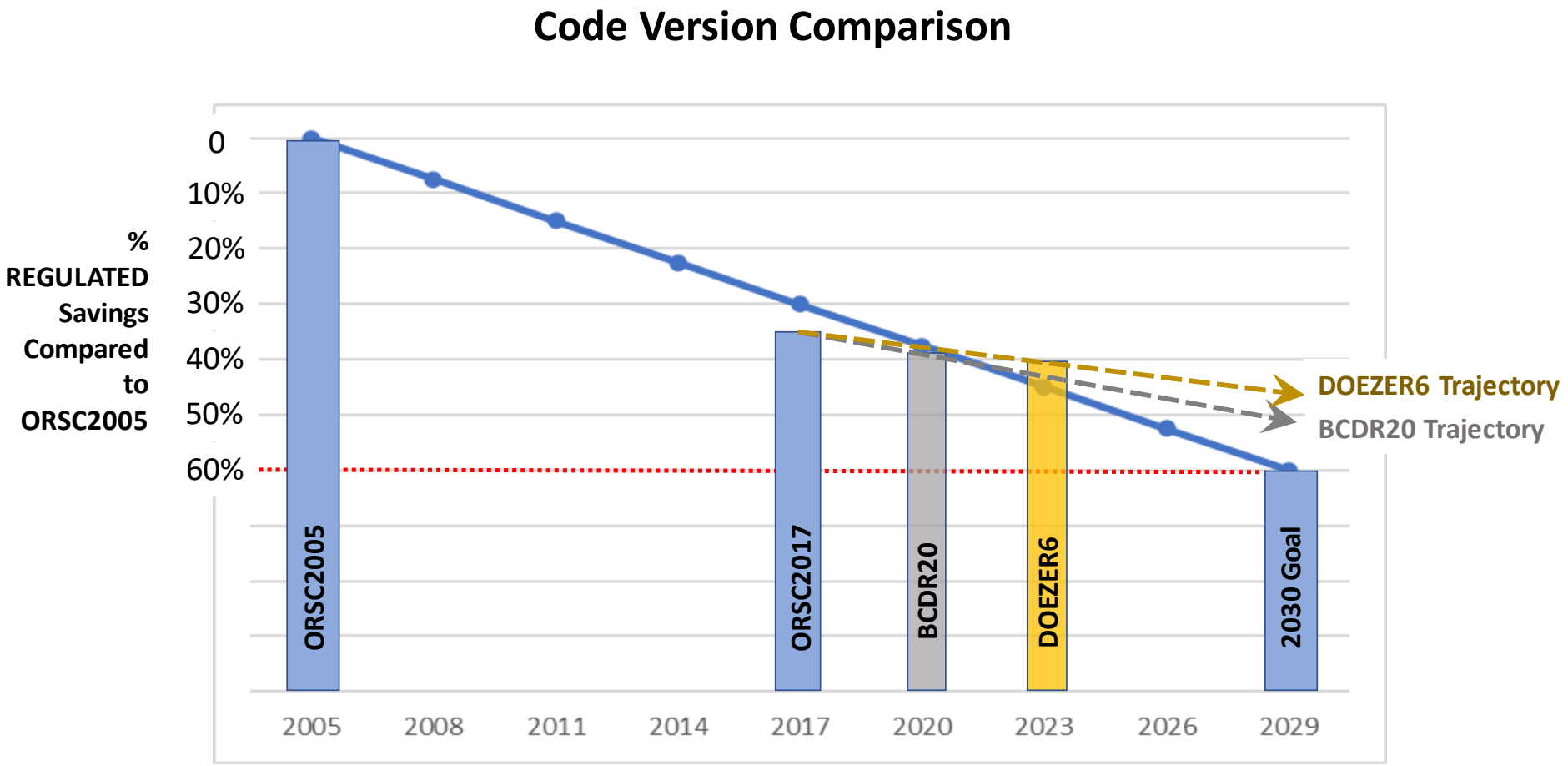
 

# 2030 Measures to Consider – Preliminary List

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

# Preliminary Analysis*




*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.

# 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

503-688-5437; bliu@neea.org

# Questions and Answers

- We welcome your feedback and thoughts

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# 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

- 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

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