It all adds up to Zero

• Incentive design drives building load reduction
• Strategic alignment to Architecture 2030
• Project milestones, from customer kick-off to occupancy
• EUI used as a target-setting metric
Path to Net Zero is a roadmap to zero energy

A New Buildings outreach manager will meet with the project team to establish an initial Energy Use Intensity, EUI, target and energy-efficient design strategies.

**Market research & trends**

Research finding
Net zero buildings are possible with technologies available today – *Energy Trust’s market research, 2009*

Trends
- Energy targets adopted as design goals
- Passive design strategies increased
- User-focused integrated design process
- Developing market of AEC professionals
- Different approaches to costing

Photo: Multnomah Rural Fire Protection District Fire Station 76, Gresham
2019 Net Zero Fellowships

- Up to $50,000 to support commercial building net-zero energy research over 12 to 18 months
- Funding for new research to advance design best practices, technologies and considerations, and grow net-zero expertise in Oregon
- Learn more at energytrust.org/zero-grants

Energy Trust’s market transformation approach

- Support continued market development of high-performance and net-zero design
- Address market barriers through research grants
  - Design and Engineering barriers are advancing quickly.
  - Address the barrier strategically, rather than individual projects
  - Many barriers to designing and building better buildings
- Diffusion of information from within the community
  - Bridged the gap in technical and economic considerations from a developer’s perspective
  - Considers climate resilience and building performance under today’s changing climate and future climate conditions in two cities.
Myth or Trend?

- Gap between the predicted and measured performance.

Midrise Multifamily

Low-to-Midrise Office
Myth or Trend?

Case Study 1: Meier and Frank (Vestas) Building:

• 170,679 square feet
• 5 floors
• Commercial office tenants: GE, Vestas, Urban Shift
• Certified LEED Platinum in 2012
• Historic renovation operational since 2013

Energy Benchmarking – EUI 36.58 kbtu/sf

• Verified through utility bills
• Gap between predicted and measured energy performance is 21.2%
• Onsite PV generation offsets 6-9% of building electricity usage
**Myth or Trend?**

Case Study 2: Beech Street Apartments

- 36,742 square feet (Building only managed by home forward)
- 4 floors
- 48 units of affordable housing for women and children
- New Construction (2014)
- LEED for Homes Platinum certified

---

**Beech Street Apartments Sustainability Features**

Awning Window Ventilation Challenges
**Myth or Trend?**

**Case Study 2: Beech Street Apartments**

EUI 42.62 kbtu/sf

- Verified through utility bills
- Gap between predicted and measured energy performance is 22%

---

**Is Cost a barrier?**

- Pricing is the direct cost of construction materials and labor, including standard markups.
- Work is priced in 2018 dollars in the City of Portland
- Pricing assumes a competitive bid process with at least 3 bidders and no preference for union or non-union labor.
Is Cost a barrier?

Market Context – Construction Costs are HIGH

Is Cost a barrier?
Is Cost a barrier?

Financial Analysis - Basics

- Key variables for a project to move forward or “pencil”:
  - Cost to build ($$$ paid by owner)
  - Income/Rents ($$$ to owner)
- Project must provide enough economic return to attract investors
- \[ \text{Return} = \frac{\text{Net Income (Rents)}}{\text{Net Cost}} \]
- Rents must be high enough and cost must be low enough to generate return
- Net Cost is cost less subsidies, grants, tax credit equity, etc.
Is Cost a barrier?

Financial Assumptions

• Timing: the projects are in today’s construction costs with today’s rents
• Location: building location stays the same
• No additional rent premium for Path to NZ building versus Baseline LEED Platinum buildings
• However, we DO assume utility savings benefits proforma

<table>
<thead>
<tr>
<th>Bundled Strategies</th>
<th>EUI (kbtu/sf)</th>
<th>Annual Energy Savings</th>
<th>Annual Cost Savings</th>
<th>First Cost</th>
<th>Cost/sf</th>
<th>Cost/EUI/ sf</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building As Is</td>
<td>36.12</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1: Envelope Upgrade</td>
<td>34.97</td>
<td>3.19%</td>
<td>$13,432</td>
<td>$1,034,718</td>
<td>$6.06</td>
<td>$5.28</td>
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<tr>
<td>2: Shading</td>
<td>35.38</td>
<td>2.05%</td>
<td>$8,182</td>
<td>$259,038</td>
<td>$1.52</td>
<td>$2.06</td>
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<tr>
<td>3. Lighting/Plug Load Reductions</td>
<td>33.90</td>
<td>6.14%</td>
<td>$7,261</td>
<td>$270,124</td>
<td>$1.85</td>
<td>$0.84</td>
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<tr>
<td>4. Heat Pump Water Heater</td>
<td>35.97</td>
<td>0.41%</td>
<td>-$4,057</td>
<td>$11,466</td>
<td>$.07</td>
<td>$0.46</td>
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<tr>
<td>5. Ground Source Heat Pump</td>
<td>22.67</td>
<td>37.23%</td>
<td>$44,395</td>
<td>$1,526,850</td>
<td>$8.95</td>
<td>$0.67</td>
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<tr>
<td>All Strategies, Bundled</td>
<td>20.50</td>
<td>43.25%</td>
<td>$54,062</td>
<td>$3,148,117</td>
<td>$18.44</td>
<td>$1.18</td>
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</table>
Is Cost a barrier? Resulting Economics – Vestas Office

- Target Return on Cost for Portland Office: 7.00%

### Vestas Office Building

<table>
<thead>
<tr>
<th>Feasibility</th>
<th>No Historic Tax Credits</th>
<th>Path to Net Zero</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline</td>
<td>Path to Net Zero</td>
</tr>
<tr>
<td>Total Costs in 2018 dollars</td>
<td><strong>$82,080,000</strong>&lt;br&gt;$454/GSF</td>
<td><strong>$85,490,000</strong>&lt;br&gt;$473/GSF</td>
</tr>
<tr>
<td>Additional Capital Incentives /GSF</td>
<td><strong>$52.43</strong></td>
<td><strong>$66.51</strong></td>
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</tbody>
</table>

### Vestas Office Building

<table>
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<td><strong>$85,800,000</strong>&lt;br&gt;$475/GSF</td>
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<tr>
<td>Additional Capital Incentives /GSF</td>
<td><strong>$15.54</strong></td>
<td><strong>$28.02</strong></td>
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Is Cost a barrier?  

<table>
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<tr>
<th>Bundled Strategies</th>
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<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1: Envelope Upgrade</td>
<td>35</td>
<td>3.55%</td>
<td>$1,162</td>
<td>$425,621</td>
<td>$11.58</td>
<td>$9.78</td>
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<tr>
<td>2: 20% Lighting Reduction</td>
<td>35</td>
<td>3.29%</td>
<td>$1,153</td>
<td>$40,301</td>
<td>$1.10</td>
<td>$0.93</td>
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<tr>
<td>3: Nighttime Plug Load Reduction</td>
<td>35</td>
<td>2.36%</td>
<td>$828</td>
<td>$119,480</td>
<td>$3.25</td>
<td>$3.83</td>
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<tr>
<td>4: Heat Pump Water Heater and Hot Water Reduction</td>
<td>27</td>
<td>23.83%</td>
<td>-$1,539</td>
<td>$23,318</td>
<td>$0.63</td>
<td>$0.07</td>
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<tr>
<td>5: Add DOAS w/ HRU/VRF in Units</td>
<td>35</td>
<td>2.18%</td>
<td>$765</td>
<td>$342,576</td>
<td>$9.32</td>
<td>$11.91</td>
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<tr>
<td>All Strategies, Bundled</td>
<td>24</td>
<td>33.02%</td>
<td>$1,361</td>
<td>$951,297</td>
<td>$25.89</td>
<td>$2.24</td>
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</tbody>
</table>
Is Cost a barrier? Resulting Economics – Beech Street

• Target Return on Cost for Portland Multifamily: 5.75%

<table>
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<tr>
<th>Beech Street Apartments</th>
<th>Market Rate</th>
<th>Path to Net Zero</th>
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<tr>
<td>Feasibility</td>
<td>Baseline</td>
<td>Path to Net Zero</td>
</tr>
<tr>
<td>Total Costs in 2018 Dollars</td>
<td>$13,000,000</td>
<td>$14,020,000</td>
</tr>
<tr>
<td>Additional Capital Incentives/GSF</td>
<td>$104.76</td>
<td>$132.24</td>
</tr>
</tbody>
</table>

Is Cost a barrier?

• Commercially available technology today is readily available to build net zero buildings. The market conditions are not quite there yet.
  - Increased demand on labor and materials, combined with not enough supply, has skyrocketed construction costs.

• Increasing baseline standards for code or comfort will make the relative premium costs smaller.

• The current construction market pricing makes net zero buildings challenging. New financing options can make a difference.
  - Financial subsidies and technical resources can help, but there is still a gap.
Thank You

Jessika Iplikci, Senior Program Manager, Energy Trust of Oregon
Shilpa Surana, Codes and Standards Engineer, Northwest Energy Efficiency Alliance