Question the predictable stand for innovation change the landscape

Scott R Armstrong, Senior Façade Specialist, Building Sciences
A Vision for Low Embodied Carbon Buildings
Up-Front Emissions Matter
Time-Based Emissions

IPCC AR5 Greenhouse Gas Concentration Pathways

Representative Concentration Pathways (RCPs) from the fifth Assessment Report by the International Panel on Climate Change

CO₂-equivalent (ppm)

- RCP 8.5
- RCP 6.0
- RCP 4.5
- RCP 2.6
Time-Based Emissions

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Importance of Embodied Carbon

- CODE
- HIGH PERFORMANCE
- NET ZERO

Embodied Carbon: EMBODIED CARBON

Operational Carbon: OPERATIONAL CARBON
Existing Strategies & Frameworks
Existing Strategies & Frameworks

• New Development Focus
• Zero Carbon Balance
• TEUI / TEDI / GHGI / Peak Demand
• Embodied Carbon
Exemplar Design Concepts
EXEMPLAR DESIGNS

Embodied + Operational Carbon Payback Summary

Carbon Emissions (tCO2e)

Tier 1 Reference
Baseline Design
Improved Design +PVs

Years

Baseline Design
Improved Design
Tier 1 Reference
EXEMPLAR DESIGNS

Embodied Carbon Emissions (kgCO₂e) - Baseline Design

- Floors
- Walls
- Foundation
- Columns & Beams
- Roofs
- Total
EXEMPLAR DESIGNS

— Wood Fibre Batt Insulation

— Wood Fiber board insulation
EXEMPLAR DESIGNS

Total Carbon Emissions by System (kgCO₂e)

- Mass Timber Baseline

Columns and Beams | Floors | Foundations | Roofs | Walls
EXEMPLARY DESIGNS

Total Embodied Carbon Emissions (kgCO₂e)

- Baseline: 285 kgCO₂e/m²
- Base+Sequester: 185 kgCO₂e/m²
- Enhanced: 43 kgCO₂e/m²

Source: Carbon Leadership Forum
Existing Buildings
Today’s Built Environment

50% of today’s existing building stock will still be in use in 2050
Today’s Built Environment & Energy Use

50% of today’s existing building stock will still be in use in 2050.

Available energy savings within this building stock are estimated at 20-40%.
Retrofit Scenarios

<table>
<thead>
<tr>
<th>Item</th>
<th>Ex.</th>
<th>New</th>
<th>Impr.</th>
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<tbody>
<tr>
<td>Vision U (W/m² K)</td>
<td>3.7</td>
<td>1.9</td>
<td>49%</td>
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<td>Spandrel U (W/m² K)</td>
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<tr>
<td>SHGC</td>
<td>0.38</td>
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<tr>
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<td>Spandrel U (W/m² K)</td>
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<tr>
<td>SHGC</td>
<td>0.35</td>
<td>0.29</td>
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## Retrofit Scenarios

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<tr>
<td>Vision U (W/m² K)</td>
<td>6.5</td>
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<td>Spandrel U (W/m² K)</td>
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<tr>
<td>Est. Energy Savings</td>
<td>$750,000/yr</td>
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Retrofit Scenarios

FEATURES

- Dynamic solar - responsive glazing (glare control and energy savings)
- Enhanced exterior enclosure
- Upgraded soffit thermal insulation
- Modernized HVAC
- Roof-mounted solar

CARBON NEUTRAL TARGET
EXEMPLAR DESIGNS

Embodied + Operational Carbon Retrofit Scenarios

Carbon Emissions (tCO2e)

Years

Reference
EXEMPLAR DESIGNS

Embodied + Operational Carbon Retrofit Scenarios

Carbon Emissions (tCO2e)

Years

Reference

Retrofit
EXEMPLAR DESIGNS

Embodied + Operational Carbon Retrofit Scenarios

Carbon Emissions (tCO2e)

Years

Reference
Retrofit
Eff. Retrofit
EXEMPLAR DESIGNS

Embodyed + Operational Carbon Retrofit Scenarios

Carbon Emissions (tCO2e)

Years

Reference
Retrofit
Eff. Retrofit
Eff. Retrofit + PV + Low EC
Thank you!