Confronting the Carbon: Mitigating Embodied Carbon from a Resiliency Perspective

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ETCC ET Summit

Energy Solutions

Celebrating 30 years

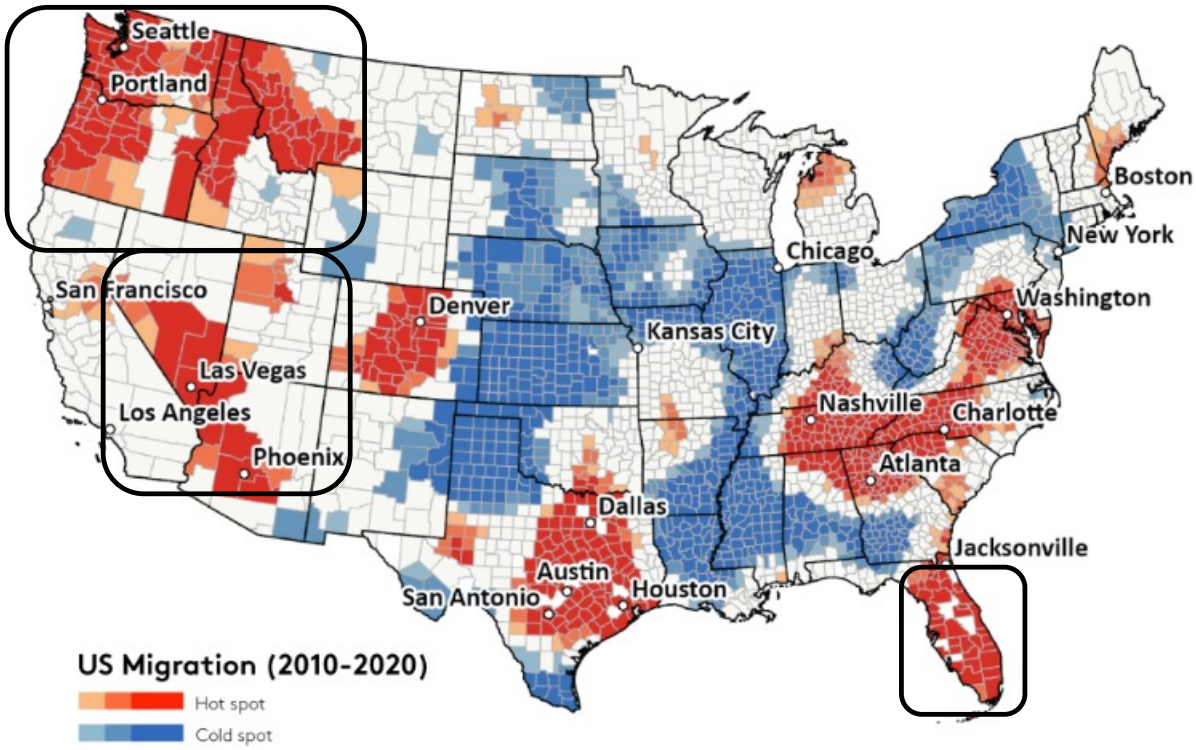
Agenda

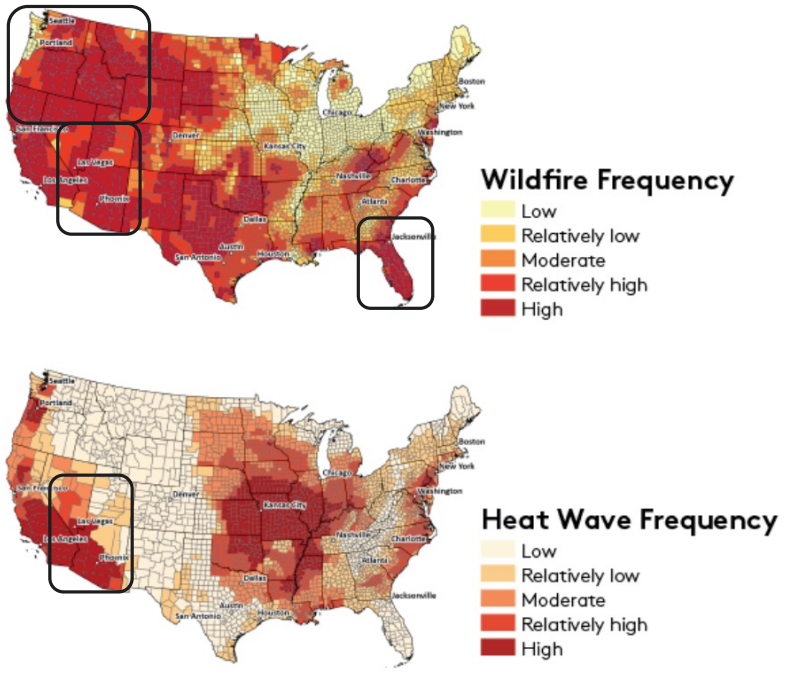
1	About Energy Solutions	*1 min*
2	Why Embodied Carbon?	*2 min*
3	Embodied Carbon as a Resiliency Option	*6 min*
4	Final Thoughts	*1 min*

More About Energy Solutions

- Our Mission: Create large-scale energy and environmental impacts by leveraging market-based solutions.
- Since 1995, our pioneering, market-driven solutions have delivered reliable, large-scale, and cost-effective savings to our utility, government, and private sector clients across North America.
- We are a mission-led, employee-owned clean energy implementation firm whose team of smart, passionate people are committed to excellence and to building long-lasting, trusted relationships with our clients.

Wildland-Urban Interface (WUI) is a Growing Concern in the U.S.

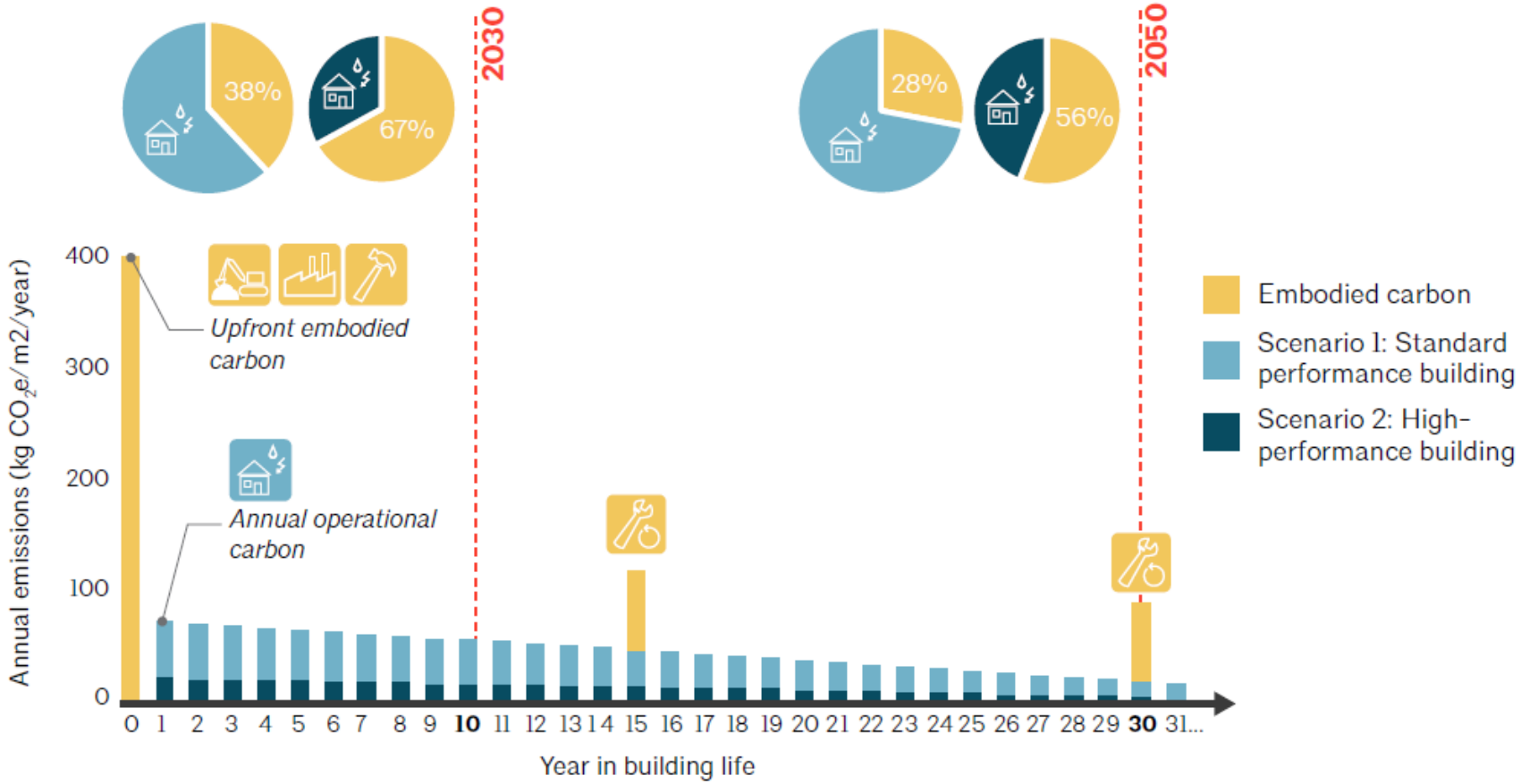




Americans are moving towards areas that are more prone to natural hazards, such as wildfires and heat.

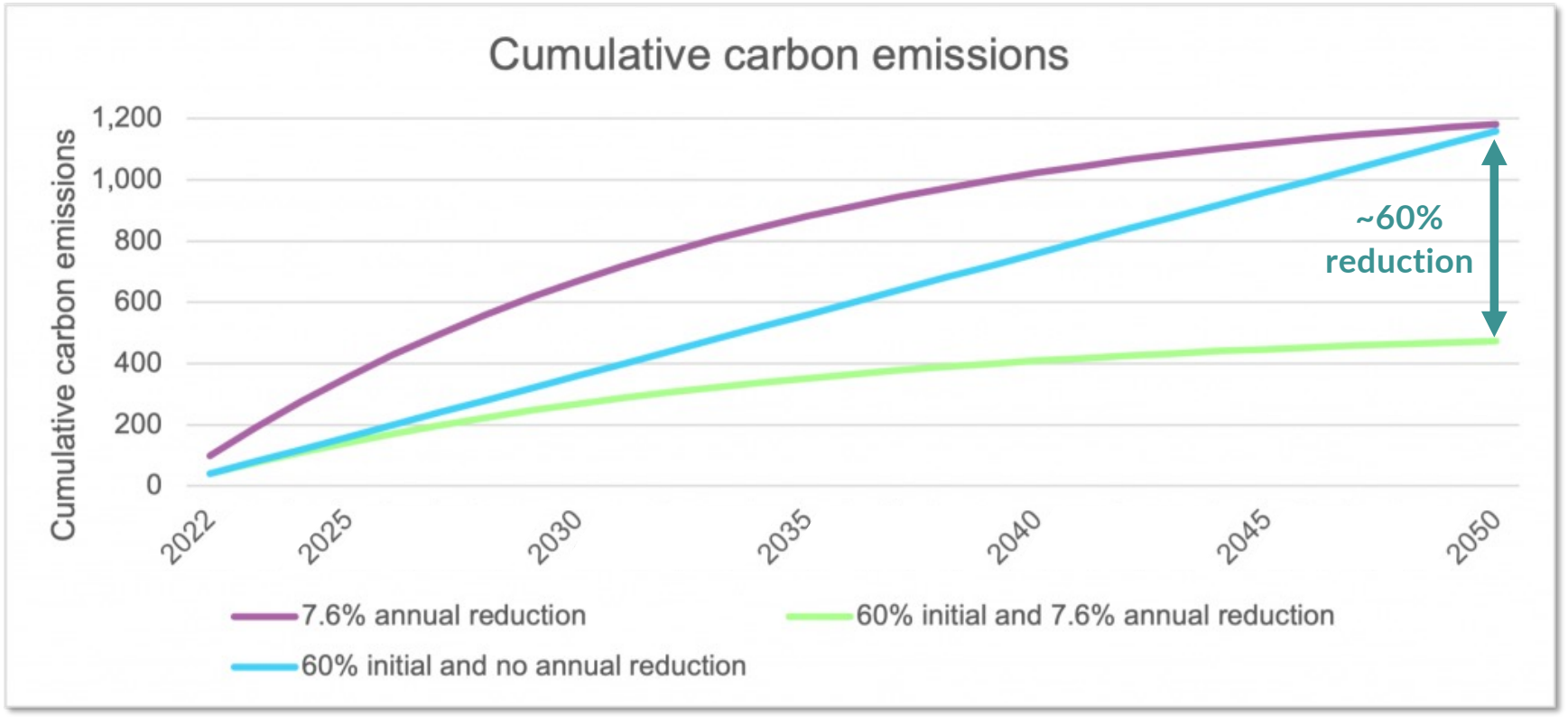
Source: University of Vermont: Americans Are Flocking to Wildfire: U.S. Migration Study, December 8, 2022

Why Embodied Carbon Matters



Source: Carbon Leadership Forum

The Time Value of Carbon



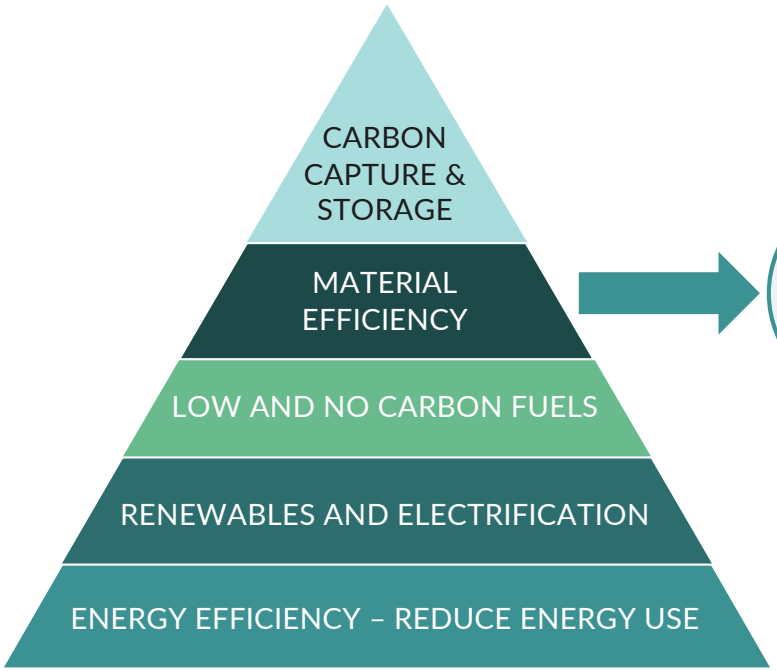
Source: https://www.osmosisim.com/rw/2022/03/15/the-time-value-of-carbon/

Embodied Carbon is Developing in Parallel of EE and BD Policies

		Target	Agency	Measurement
Third Building Block	Embodied Carbon Programs	Addresses remaining "stranded" carbon in buildings not removed by operational efficiency programs. Becomes the largest unaddressed greenhouse gas (GHG) category after operational efficiency savings.	TBD	CO2 emissions equivalent reduction
Second Building Block	Decarbonization Programs	Addresses operational efficiency savings but does not address embodied carbon. Program examples include codes and standards, new construction, and fuel substitution, electric vehicle programs.	CPUC and CEC CARB	Total system benefit (TSB) and CO2 emissions reduction
First Building Block	Energy Efficiency Programs		CPUC	Total system benefit (TSB)

Source: Energy Solutions https://energy-solution.com/wp-content/uploads/2024/09/Uraine_ACEEE-Summer-Study-v240829.pdf

Embodied Carbon's Value as a Net Zero Policy



Energy efficiency is the foundation for other decarbonization strategies

Source: Energy Star

Operational vs. Embodied Carbon Considerations

Operational Carbon

Embodied Carbon

Low Embodied Carbon Building Materials as Wildfire Mitigation Measures

Category	Building Materials	Benefits	Strategies
Siding/foundation	Concrete	1. Reduced carbon footprint 2. Enhanced fire safety	1. Select low-carbon materials 2. Select fire-resistant products 3. Consider natural and regenerative materials
	Fiber cement		
	Brick and stone		
Structural	Recycled steel (with fireproofing)		
	Aluminum (w/ fireproofing)		
Mass timber	Cross-laminated timber (CLT) with fireproofing		
Insulation	Insulated concrete forms		
	Cellulose insulation		
	Corn cob, light straw-clay, hemp line, mineral wool		
Roofing	Metal, clay and tile roofing, concrete		
Plasterboard	Gypsum plasterboard		

Source: Staples Construction: Top Sustainable Fire-Resistant Building Materials (March 2, 2025) and additional sources

Comparing Materials for Embodied Carbon and Wildfire Mitigation

Asphalt Shingle
6.5 kgCO2e
(per 1 m2)

Clay Tile
9.3 kgCO2e
(per 1 m2)

Standing Seam Metal Roof
27.4 kgCO2e
(per 1 m2)

Final Thoughts

Conclusions	Implications
1. WUI will be an ongoing risk and driver for wildfire mitigation	• Wildfire risks are becoming a national if not a bi-national threat
2. Embodied carbon building materials can have wildfire mitigation benefits	• Some potential benefits, however, actual costs are non-transparent
3. Embodied carbon can offer complimentary benefits to EE and BD programs	• Embodied carbon offers incremental GHG savings, represents a “no-regrets” strategy and can reflect additional cost-effectiveness benefits if allowed and counted as a non-energy benefit • The CalNEXT team has identified a potential 20% in GHG savings at low-to-no-cost

4. Climate resiliency is about making long-term impacts as well as short-term investments	• The time to act is not today, but rather yesterday
	  • Embodied carbon = upfront carbon impacts
	  • Seeds need to be planted today in order to harvest for tomorrow
	  • Zero carbon reduction can’t be done on a piecemeal basis

Thank you

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Questions?