CalNEXT Embodied Carbon Market Characterization

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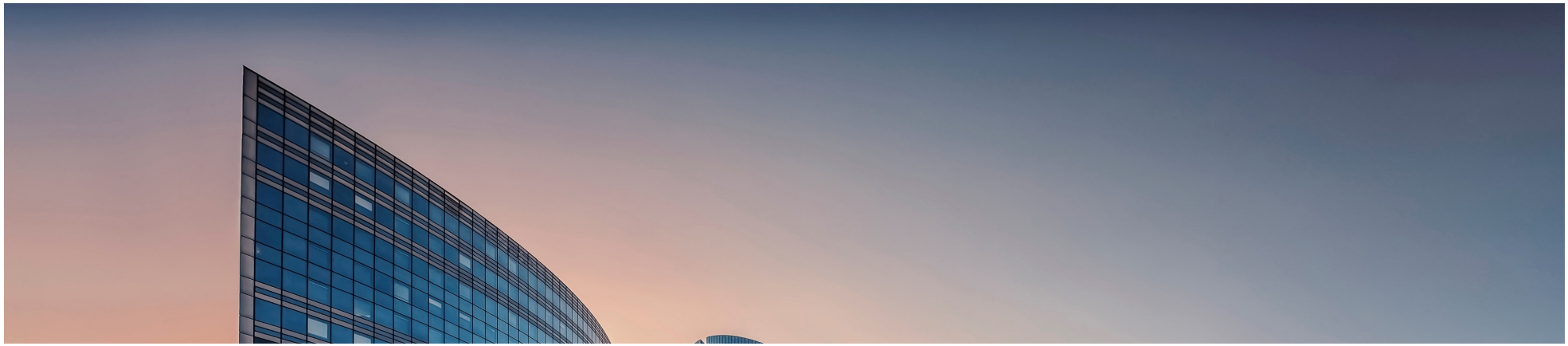
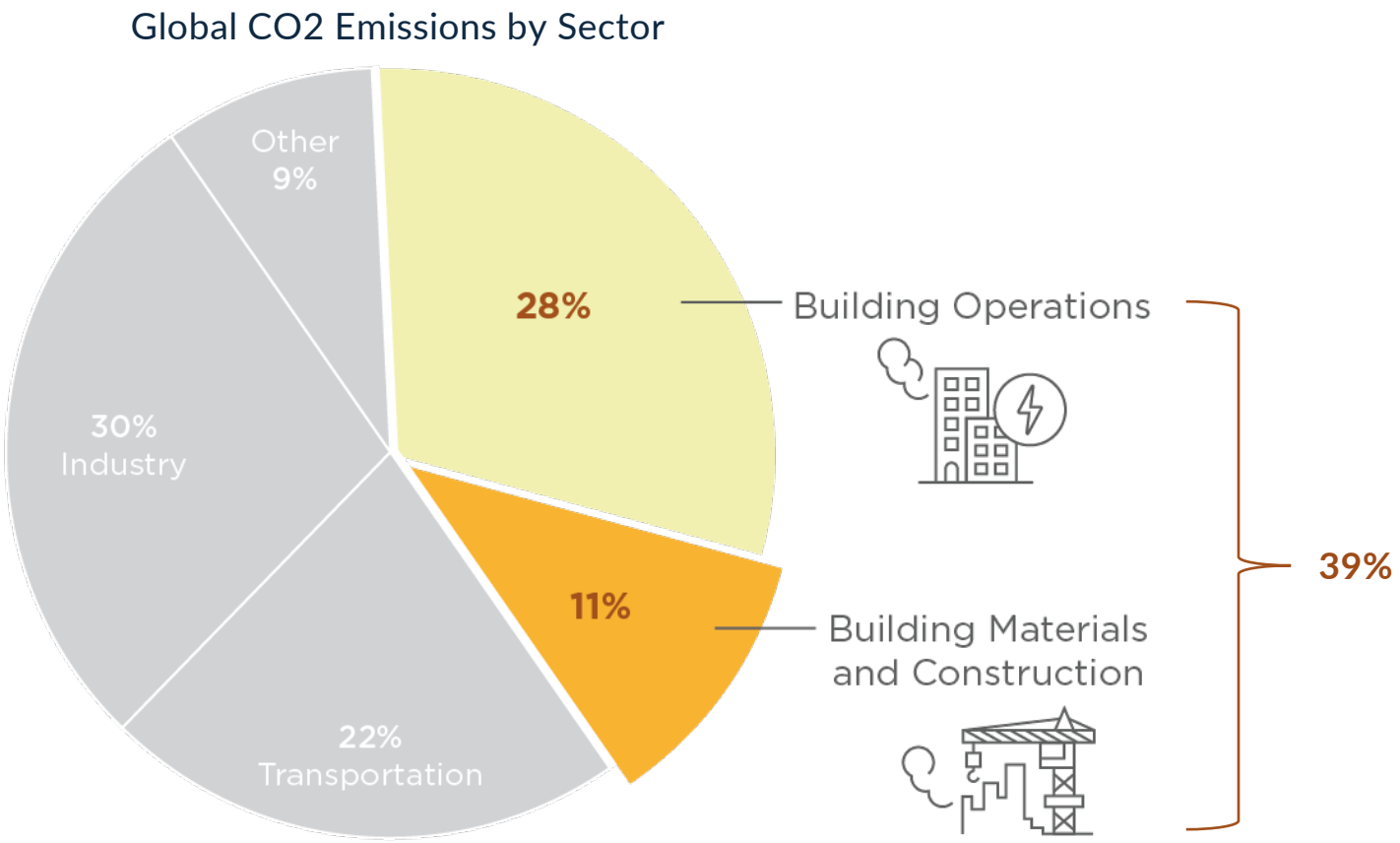
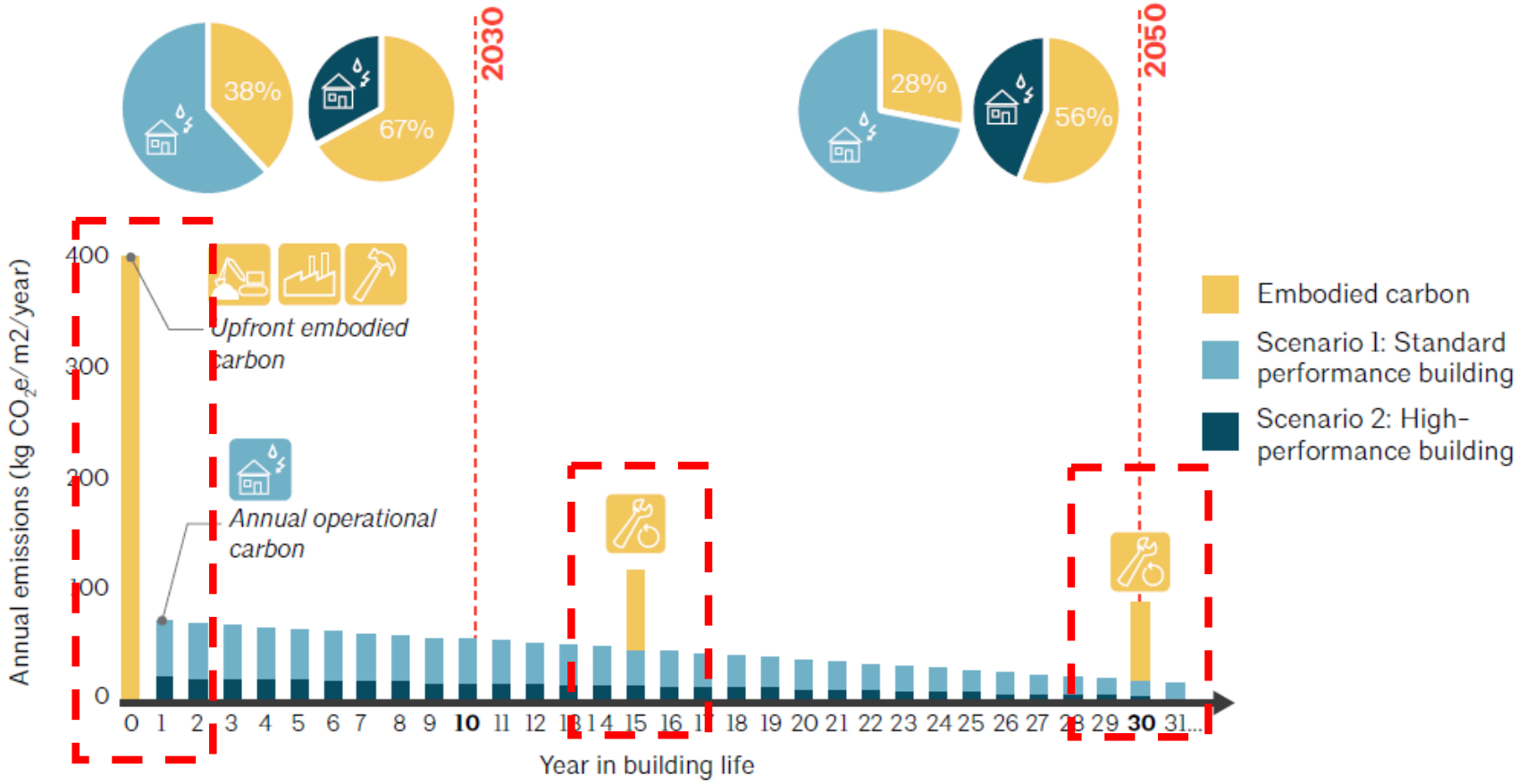


Why Embodied Carbon?

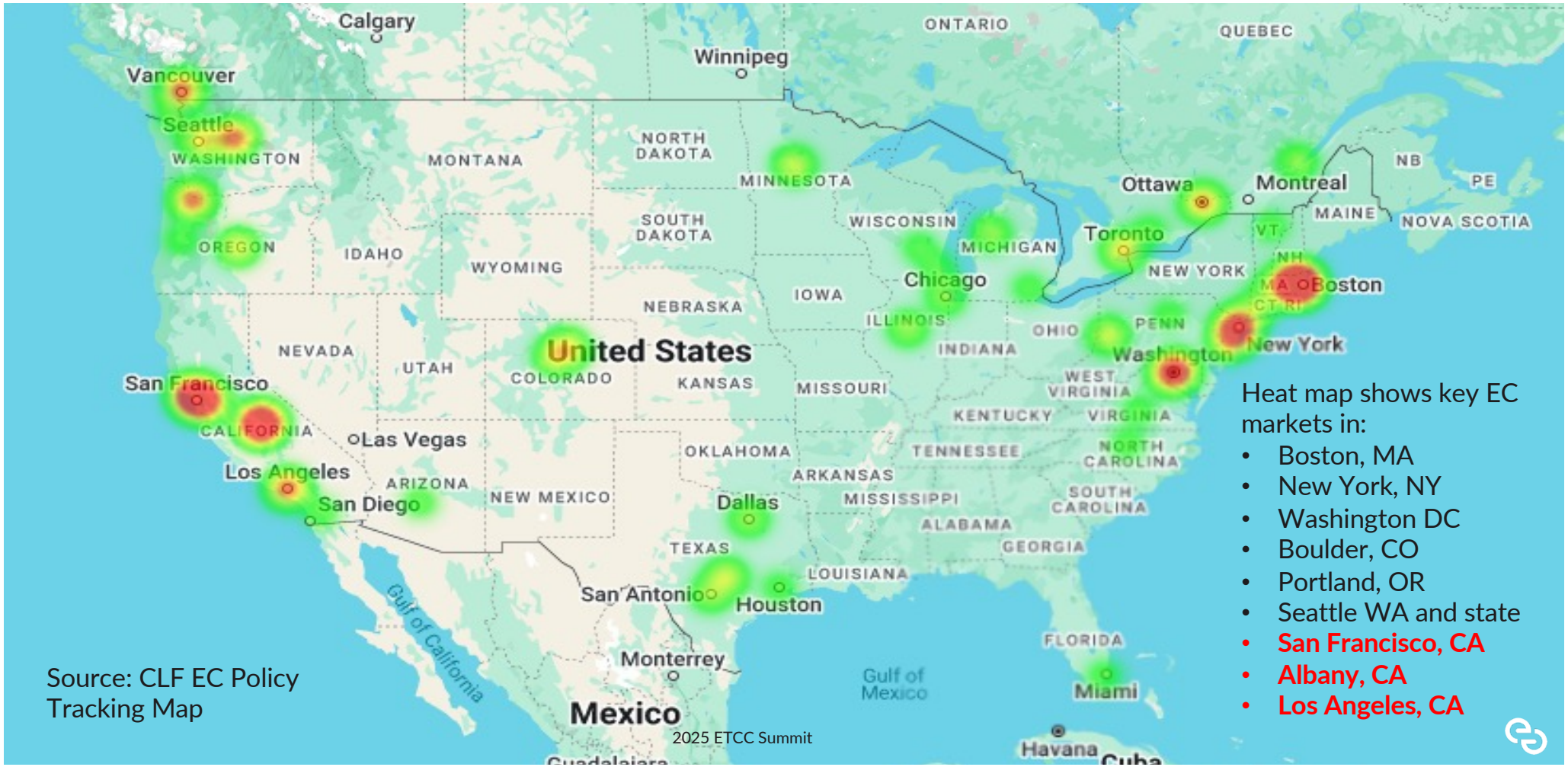
Why Embodied Carbon is Important



Why Embodied Carbon Needs to be Addressed Now



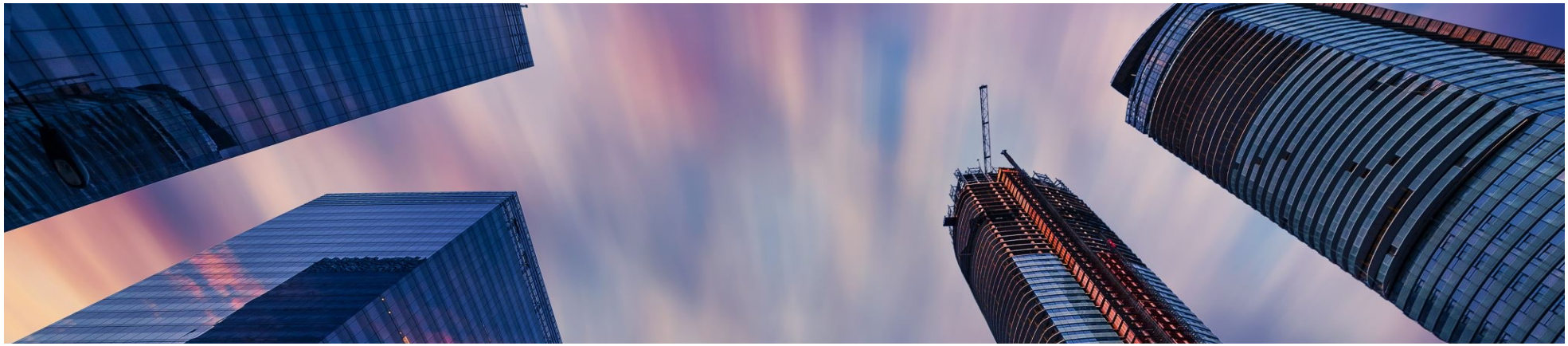
Where is the Embodied Carbon Policy Activity



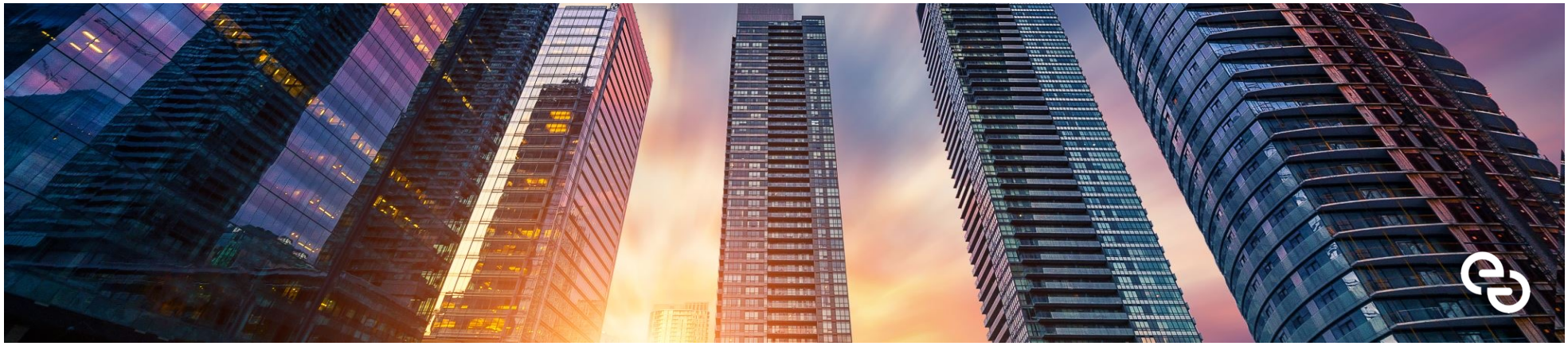
Heat map shows key EC markets in:

- Boston, MA
- New York, NY
- Washington DC
- Boulder, CO
- Portland, OR
- Seattle WA and state
- **San Francisco, CA**
- **Albany, CA**
- **Los Angeles, CA**

Source: CLF EC Policy Tracking Map



CalNEXT Market Characterization Study



CalNEXT Market Characterization Study

Our Mission Statement

As California successfully reduces carbon from operational emissions through increased renewable energy, energy efficiency, and electrification… **Embodied Carbon** will become an increasing share of the **remaining carbon emissions in buildings.**

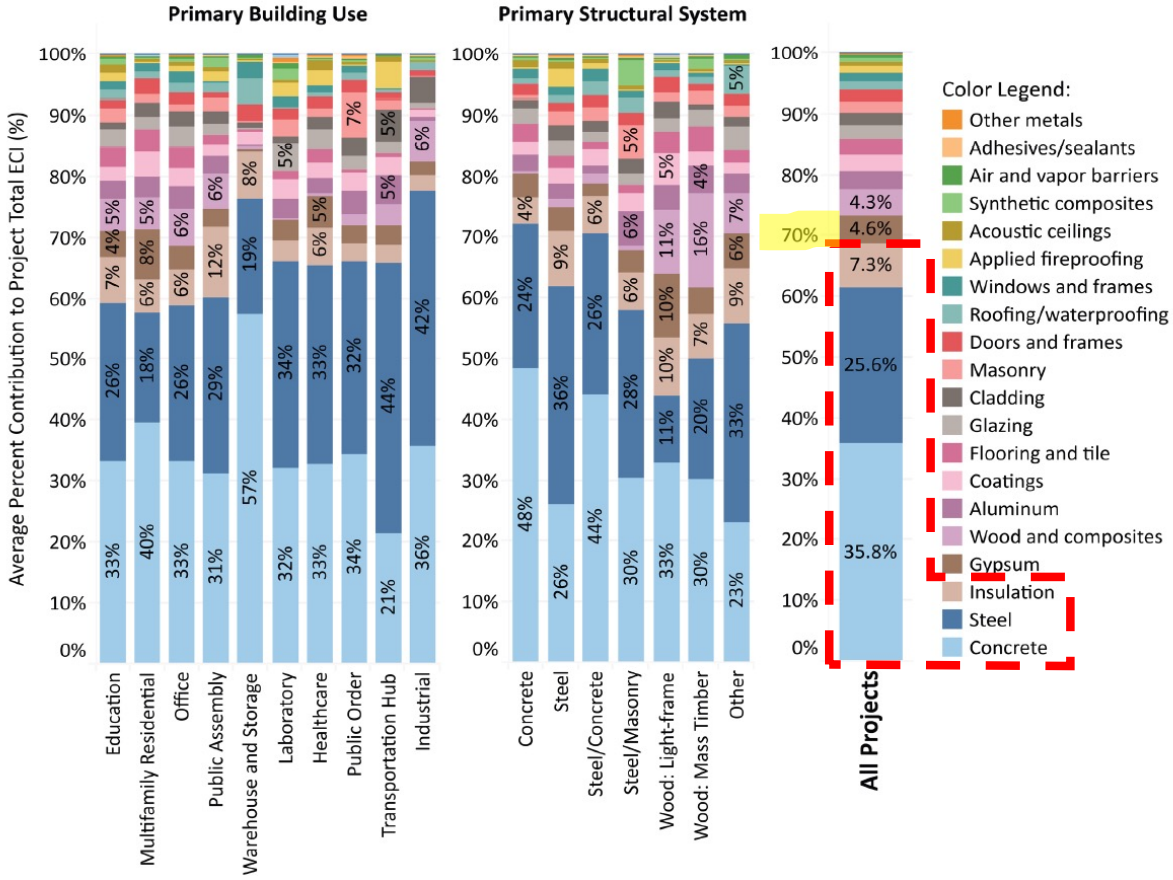
CalNEXT Market Characterization Study

Project Objectives

1. Study Embodied Carbon in the California market
2. Compare the various Embodied Carbon baseline options
3. Estimate the potential GHG savings associated with Embodied Carbon
4. Develop potential program pathways for Embodied Carbon

Source: https://carbonleadershipforum.org/the-embodied-carbon-benchmark-report/

Why We Focused on Concrete, Steel, and Insulation



Source: https://carbonleadershipforum.org/the-embodied-carbon-benchmark-report/

Comparing the various EC Baseline Options

- 6 different baseline options in California
- Varying levels of performance across options
- Requires deciphering and a decision

Material Type	Declared Unit	BCCA (01/2025)	CALGreen (2022)	CALGreen (2025 Proposed)	CLF (2025)	EC3 Baseline (USA)	EC3 Baseline (CA)
Ready Mix Concrete							
3,000 psi	m3	N/A	489.00	349.00	279.00	322.00	315.00
4,000 psi	m3	N/A	566.00	404.00	323.00	354.00	348.00
5,000 psi	m3	N/A	661.00	472.00	378.00	385.00	367.00
6,000 psi	m3	N/A	701.00	501.00	401.00	402.00	387.00

Leveraging Construction Cost Data

- Utilized RSMeans for applicable product categories
- Cost data for dynamic low-EC products is hard to come by
- More pricing transparency is needed

Material Type	Cost per 1 SQFT	Total RValue per 1 SQFT	Cost per 1 SQFT @ R5.678	kgCO2e per 1 M2 @ R5.678	kgCO2e per 1 SQFT @ R5.678	$$ per kgCO2e
Insulation						
Light Density Mineral Wool 3.5"	$ 1.74	15	$ 0.66	3.33	0.309	$ 2.13
Heavy Density Mineral Wool at 1"	$ 1.83	4.2	$ 2.47	8.35	0.776	$ 3.19
Expanded Polystyrene (EPS) at 1"	$ 1.20	3.85	$ 1.77	2.67	0.248	$ 7.13
Polyisocyanurate at 1"	$ 1.78	6.5	$ 1.55	4.19	0.389	$ 3.99
Extruded Polystyrene (XPS) at 1"	$ 1.80	5	$ 2.04	41.00	3.809	$ 0.54
Fiberglass Batt, Unfaced, 3.5" at 16oc	$ 1.08	13	$ 0.47	0.10	[illegible]	$ 50.77
Closed-cell Spray Foam, 3.5"	$ 4.44	24.15	$ 1.04	15.50	1.440	$ 0.72
Blown Cellulose at 3.5"	$ 0.67	13.65	$ 0.28	0.49	0.045	$ 6.16

California Building Specific EC Data

	1	2	3	4	5	6	7	8		% Change
Ready Mix Concrete										
3,000 psi										-26%
4,000 psi										-8%
5,000 psi										-23%
6,000 psi										-27%
LW 3,000 psi										+10%
LW 4,000 psi										-18%
Steel										
Concrete Reinforcing Bar										-16%
Hot-rolled Structural Steel Sections										+23%
Hollow Structural Sections										-3%
Glass										
Flat Glass										0%
Insulation										
Light Density Mineral Wool										-44%
Heavy Density Mineral Wool										-62%
Polyisocyanurate										+107%
Interior Finishes										
Gypsum 5/8"										-6%
Resilient Flooring										+32%

Key:
- GWP lower than baseline
- GWP equal to baseline
- GWP higher than baseline

Early takeaways

1. *There is a potential of up to **20% embodied carbon reduction** at **no-to-low-cost premium** in the California market (focused on Concrete & Steel)*

2. *After the initial no-to-low-cost 20% reduction, **cost is likely to scale significantly** when trying to achieve additional savings*

3. ***Perception is a huge barrier**, resulting in embodied carbon measures not being brought to the table*

4. ***More study and exploration** of EE harmonization using an ECACC*

Source: https://carbonleadershipforum.org/the-embodied-carbon-benchmark-report/

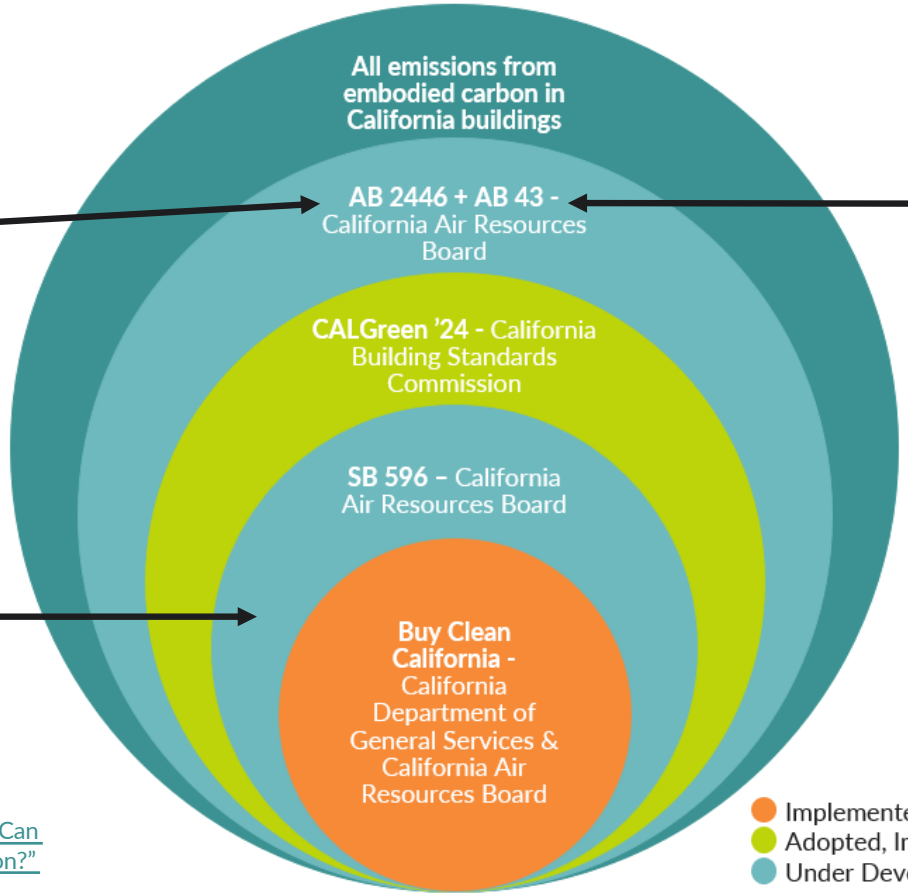
Questions?

Policy Drivers in California

AB 2446: Technical Feasibility, Cost-effectiveness, and Policy Strategies for Reducing Embodied Carbon in Building Materials

SB 596: Net-Zero Emissions Strategy for the Cement Sector

AB 43: Carbon Trading Mechanism similar Low Carbon Fuel Standard



Source: Energy Solutions
ACEEE White Paper, "Coining the Carbon: Can California Commercialize (Embodied) Carbon?"

Call to Action: Timeline to achieve net neutrality in California

- Building codes led by CALGreen are critical for spurring the market onto market change but cannot alone meet the market transformation needs required to meet 2045 Net Neutrality goals.
- Procurement standards such as Buy Clean CA help to create initial demand for low-carbon products but do not address the need to spur market demand for private sector buildings.
- Without holistic approaches to spur adoption of low-carbon products, 2045 net neutrality (and net negativity goals thereafter) appear to be infeasible.