



# C-PACE Clean Construction Materials Cohort Kickoff | May 28 2025

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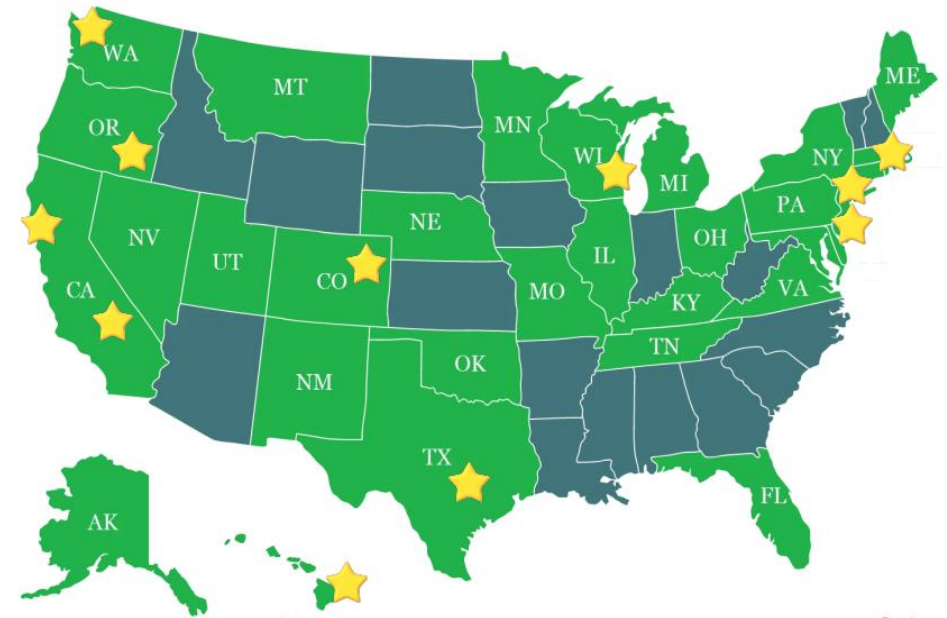
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# Embodied Carbon + C-PACE: Takeaways

1. Embodied carbon is **important and happening now**.
2. Industry and government have laid the foundation (**data, design & manufacturing practices, standards, policy**).
3. Now, **financing is needed** to accelerate embodied carbon reduction **at scale**.
4. **We need your help** (C-PACE community) **to update C-PACE** to include embodied carbon.



# Embodied carbon is the other half of building impact



## **Embodied Carbon**

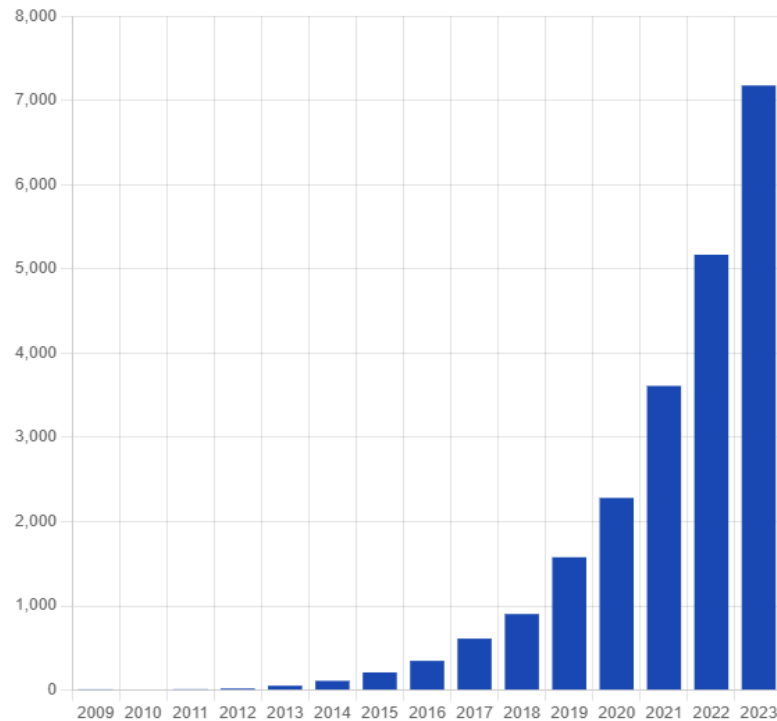
The emissions from manufacturing, transportation, and installation of building materials.

## **Operational Carbon**

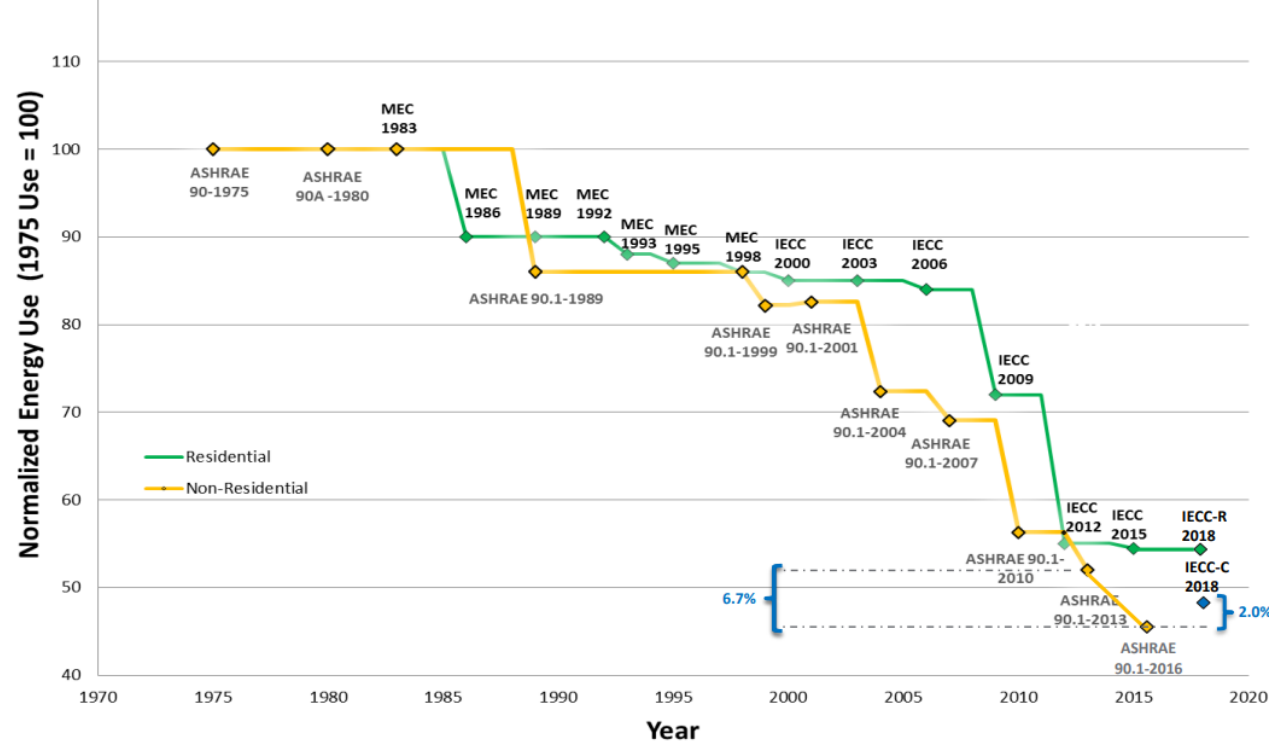
The emissions from a building's energy consumption.

# C-PACE has Expanded Exponentially with New Construction

With diminishing opportunities to increase operational energy efficiency

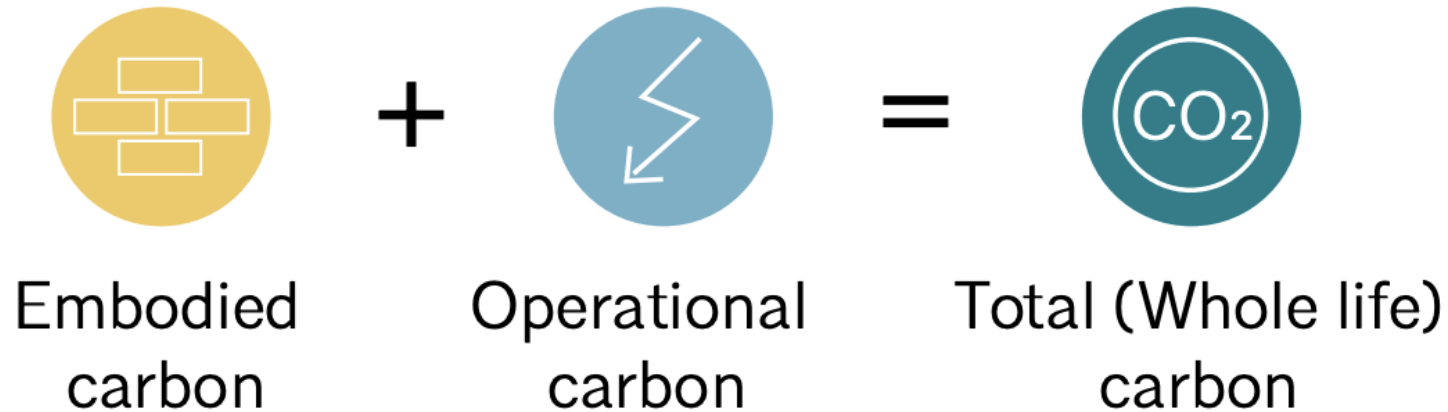


Improvement in Residential and Non-Residential Model Energy Codes (Year 1975-2015)  
Courtesy of Pacific Northwest National Laboratory



Over \$9Bn has been invested in commercial buildings through C-PACE with **\$3.5Bn in the past 3 years to new construction. Many C-PACE programs are at or exceed IECC 2021.**

# Embodied Carbon Is a Huge Unaddressed Opportunity for C-PACE

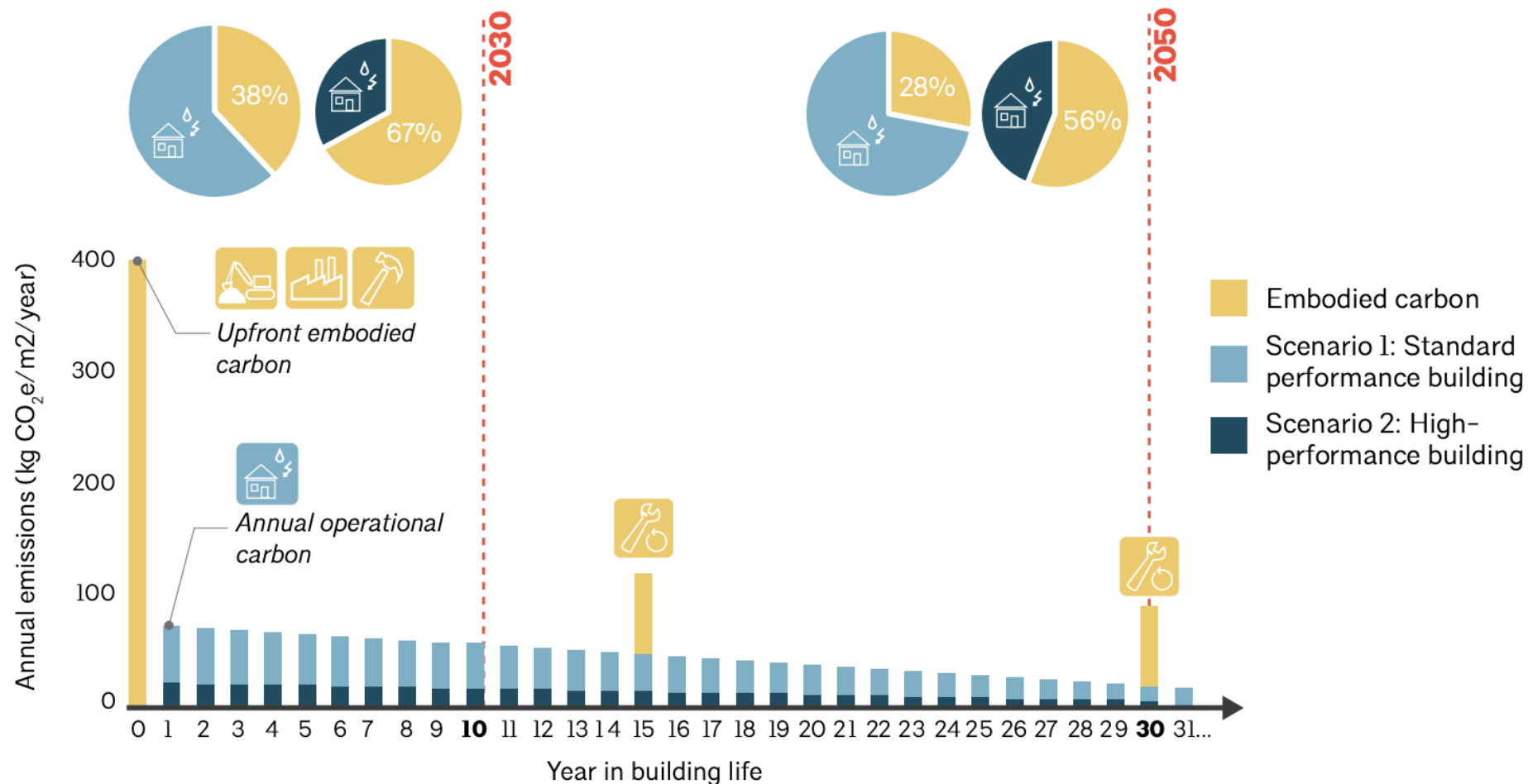


Source: [Architecture 2030](#)

# Embodied Carbon Is a Huge Unaddressed Opportunity for C-PACE

**FIGURE 3:**  
**Embodied carbon**  
**lifetime emissions**

Data Sources: Embodied Carbon Benchmark Study and Commercial Buildings Energy Consumption Survey (CBECS), assuming a medium-sized commercial office building. Assumes gradual grid decarbonization to zero by 2050.

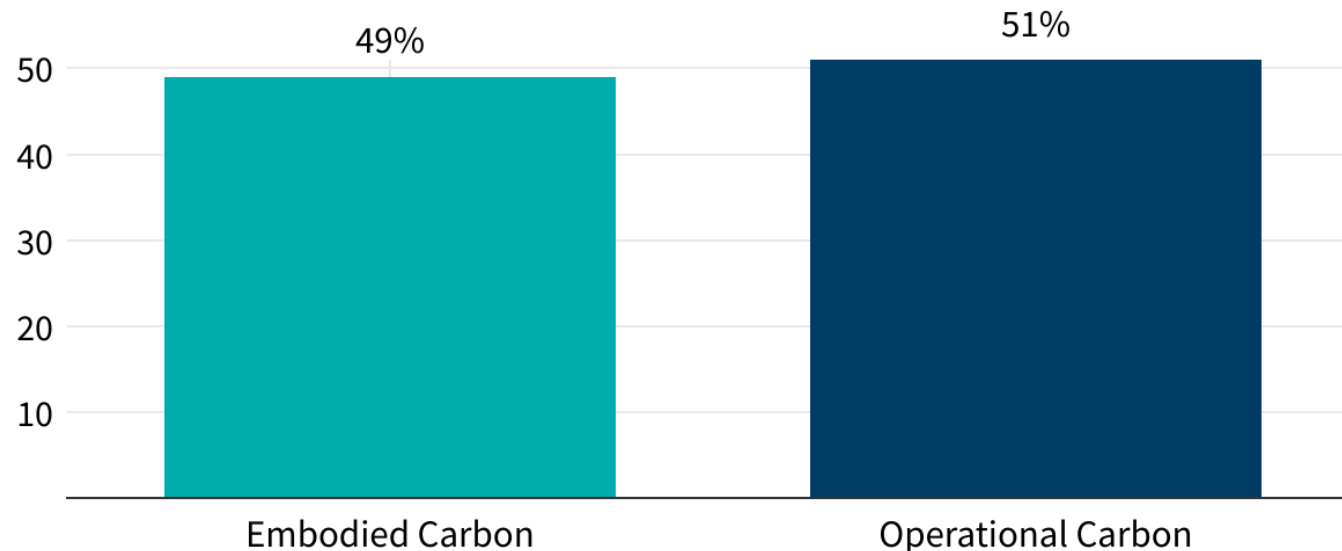


Source: [Architecture 2030](#)

# Tackling embodied carbon is critical to getting ahead of future emissions

## Total Global Emissions of Global New Construction from 2020-2050

Business as Usual Projection



Data from IEA, originally drawn by Architecture 2030

Source: IEA, 2019



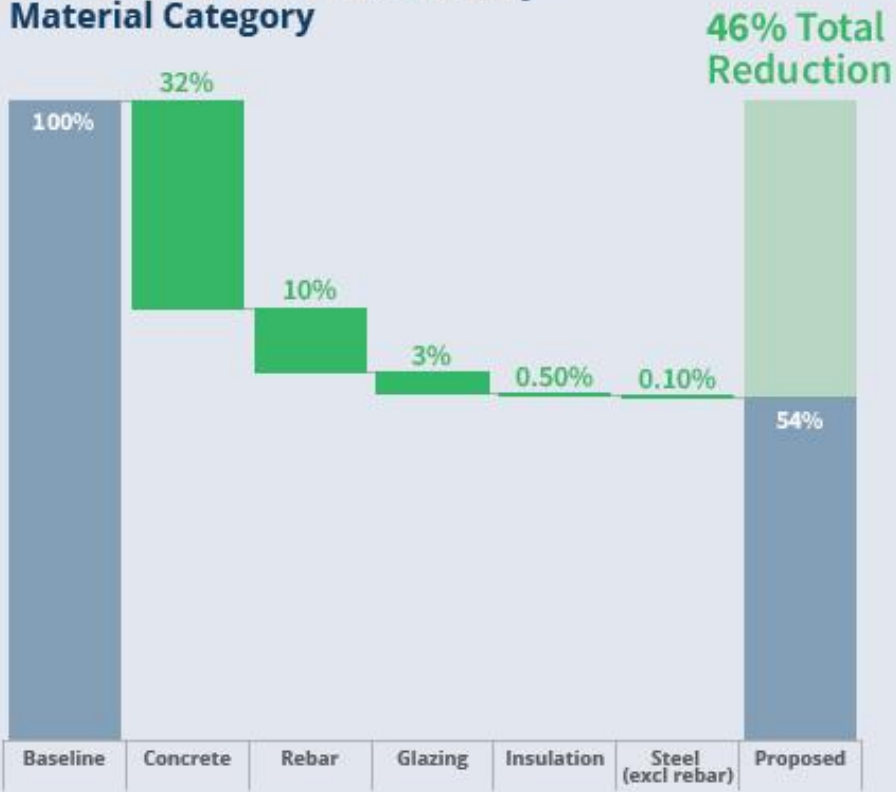
**By 2050:**  
**Embodied carbon** will account for almost **half the total carbon emissions** from global new construction



# Case Study 1: Mid-Rise Concrete and Steel Construction

In a five-story, 200,000 ft<sup>2</sup>, mixed-use office building with a **steel-reinforced concrete slab and steel and concrete above-grade** construction, we identified a potential **46% reduction** in up-front embodied carbon by focusing on a wide array of building components. The cost premium for this reduction in embodied carbon is **less than 0.5%** of the overall project cost.

Embodied Carbon Reduction by Material Category



Up-front embodied carbon reduction from baseline	Cost premium of low-embodied-carbon measures
46%	< 0.5% Of Total Budget
CO <sub>2</sub> e reduced (metric tons)	Building components in scope
2,228	Structural systems Glazing Roofing Interior wall materials (unfinished) Insulation

No-Cost Measures:

- Ready-Mix Concrete
- Metal Decking
- Roofing

One-for-one Substitutions:

- Gypsum Sheathing
- Insulation

Low-Cost Measures:

- Glazing
- Structural steel + rebar

# C-PACE Clean Construction Materials Cohort Goals



1. **Develop and disseminate best practices** for integrating embodied carbon into C-PACE programs nationwide.



2. **Foster a learning community** that shares insights from C-PACE embodied carbon policy and implementation efforts.

# 2025 Objectives



1. Convene **3 strategic discussions** (Summer, Fall, Winter 2025) to co-develop best-practice guidance for program guideline and statute updates.



2. Publish ***Embodied Carbon in C-PACE Policy Primer*** in Q1 2026:
  - **3-5 page policy guidance document** aimed at Program Administrators and State Legislators identifying best-practices for including Embodied Carbon into C-PACE.

# Cohort Timeline

## Kickoff (May 2025)

- Goal-setting & landscape
- Learnings from CO, NY, DC

## Meeting 2 (October 2025)

- Solution refinement

## Publish Primer (February 2026)

## Meeting 1 (July 2025)

- Solution development

## Meeting 3 (December 2025)

- Primer review



# Cohort Participation Overview

**RMI:** Facilitation, lead authorship of Policy Primer.

## **Attendees:**

- *No formal commitment required. Any level of engagement welcome!*
- **Live:** Attend three **1-hour virtual workshops** in 2025.
- **Offline:**
  - Complete Embodied Carbon in C-PACE **Survey** (10 mins)
  - Provide **comments, feedback on Primer** over email and/or in 1:1 meetings.

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# Incorporating Embodied Carbon into C-PACE

1. Incorporating embodied carbon into C-PACE can be **relatively straightforward**.
2. As with operational energy, we can **build on existing standards and policies**.
3. The C-PACE community will need to **work together** to design **future-proofed, right-sized, streamlined statutes and guidelines**.

Reducing **embodied energy** is **equivalent** to improving "**energy efficiency**" when taking a **whole-life** view of energy consumption.

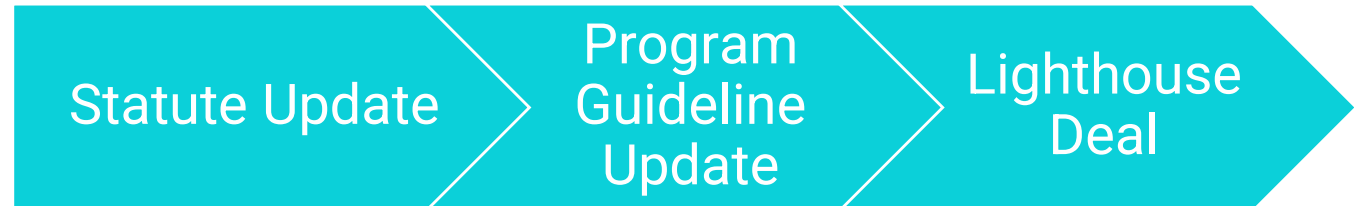


# Integration Pathways

***Existing Statutes  
Allow Embodied  
Energy Improvements***

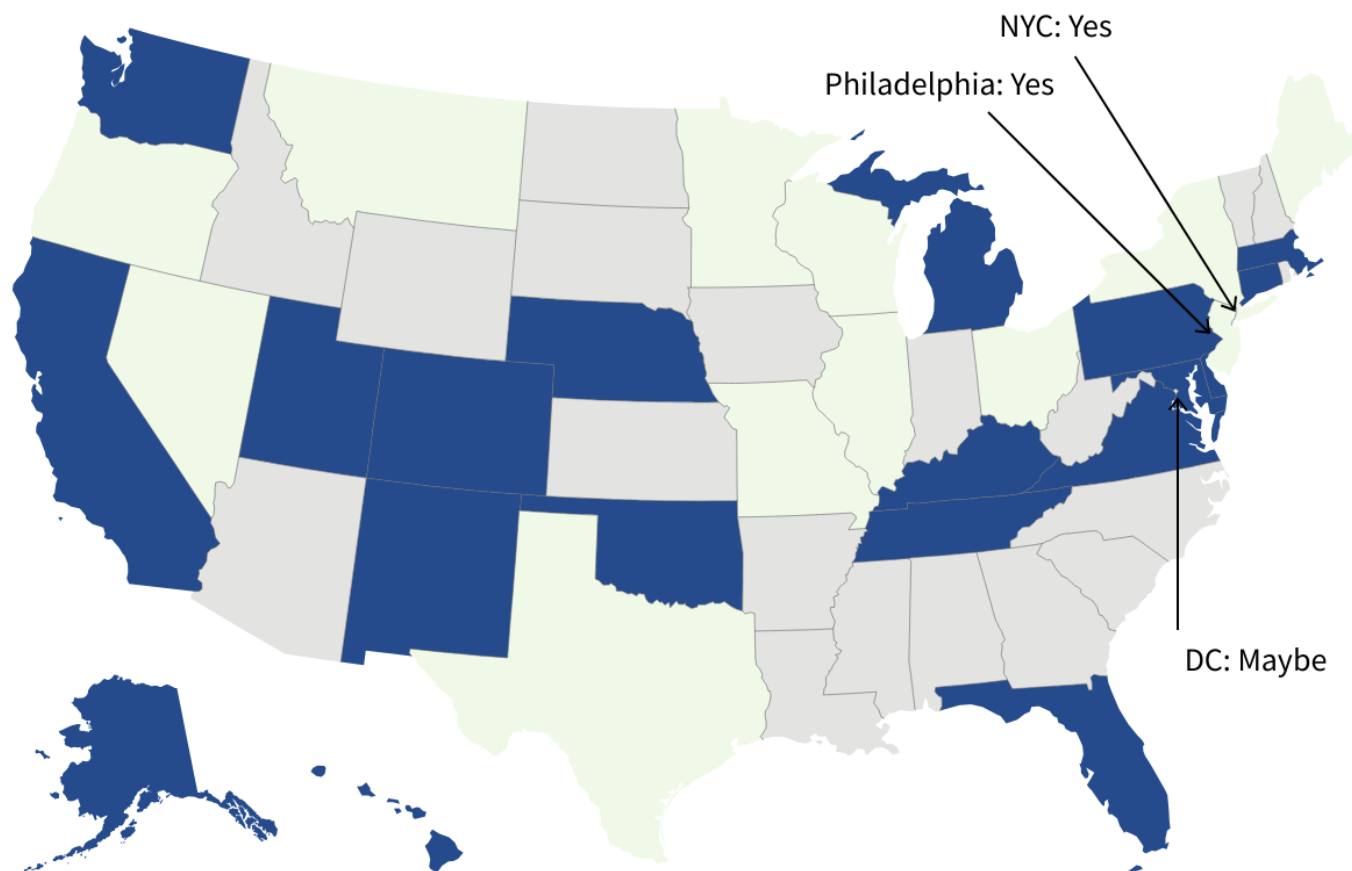


***Existing Statutes Don't  
Allow Embodied  
Energy Improvements***



## Do my C-PACE program's enabling statutes allow embodied carbon?

Maybe Yes



Based on review of C-PACE enabling statutes by Nuveen Green Capital.

**Map:** RMI • **Source:** RMI, NGC • Created with Datawrapper

## Conclusions:

- Many C-PACE programs' enabling statutes may already allow embodied carbon.
- 2025 Update: CO25 SB182 explicitly allows financing of low embodied carbon materials.

*RMI nationwide policy analysis forthcoming.*

# Early Policy Learnings

- **Colorado SB 25 182**
- **New York SB C-PACE Statute Update**
- **Savings Investment Ratio (SIR) Methodology Development**
- **Bonus Technology Approach**

# Colorado SB 182

*(4.5) "EMBODIED CARBON IMPROVEMENT" MEANS ONE OR MORE INSTALLATIONS OR MODIFICATIONS TO REAL PROPERTY USING **ELIGIBLE MATERIALS**, AS DEFINED IN SECTION 24-92-118 (2)(b), THAT RESULT IN THE **REDUCTION OF THE INSTALLATION'S OR MODIFICATION'S EMBODIED EMISSIONS** AS ESTABLISHED IN POLICIES CREATED BY THE COLORADO ENERGY OFFICE, CREATED IN SECTION 24-38.5-101, AND IN CONSULTATION WITH THE OFFICE OF THE STATE ARCHITECT.*



# Title 24. Government State § 24-92-118

*(b) “Eligible material” means materials used in the construction of a public project, including, but not limited to:*

*(I) Asphalt and asphalt mixtures;*

*(II) Cement and concrete mixtures; and*

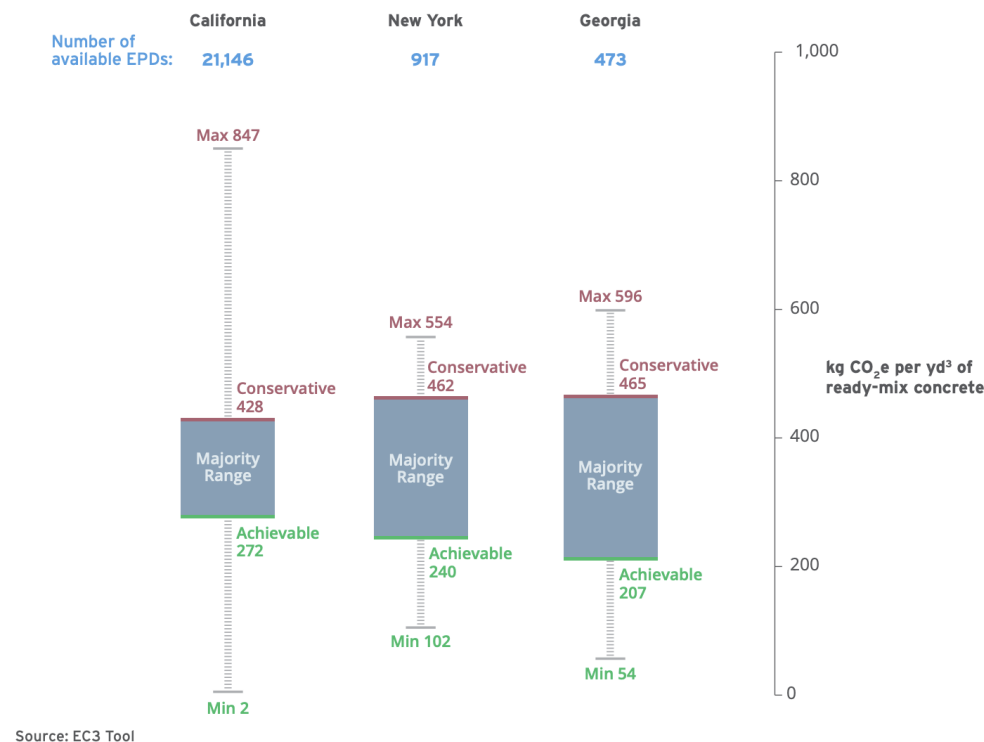
*(III) Steel.*

# New York State Bill A05404B

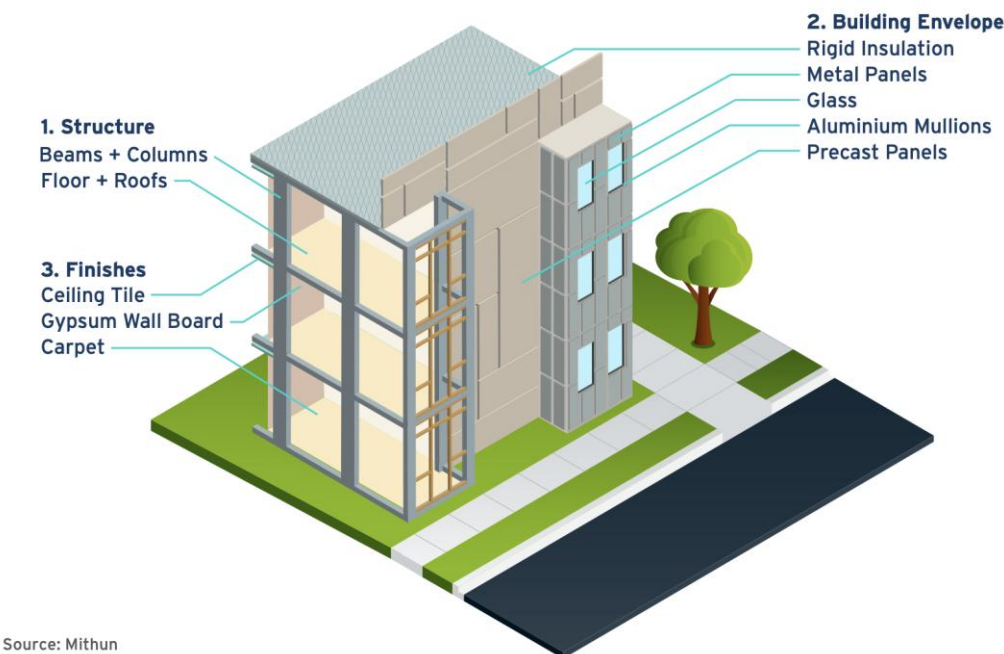
- 6. "Low carbon intensity building component improvement" means any permanently affixed improvement to real property, whether as a component of the new construction of a building or as the renovation or retrofitting of an existing building, to reduce the carbon or other greenhouse gas emissions of those components or the improved property.

# Embodied Carbon Incentives

## 1. Material-Specific



## 2. Whole-Building



# Savings Investment Ratio (SIR) Methodology Development

Where SIR must be demonstrated, calculation methodologies can incorporate positive and negative impacts to:

1. **Upfront costs** (design fees, material costs) and
2. **Operating cash flows** (tenant demand, insurance premiums, compliance costs etc.).



# Embodied Carbon in Pro Forma Modeling

## Capital Costs

Case Inputs
Description
Estimated Embodied Carbon Per Square Foot
Gross Internal Floor Area (sf)
Primary Structural Material
Development Costs (per sf)
Land cost
Administrative costs (Permitting, Overhead, Misc. fees)
Architectural (Design) Fees
Contractor Fees (General Conditions, Overhead, Profit)
Construction cost
Total development cost
Total soft cost
Total hard cost

## Operating Economics

Income (per sf)
Rental rate
Occupancy Rate
Total annual income
Expenses
Operating expenses
Total annual expenses
Financing / Capital Stack
Loan interest rate
Loan period (years)
Loan amortization (years)
Loan to Value Ratio   Loan Value
Annual Debt service
Summary
Initial Net Operating Income
Market Value (Replacement Cost)
Capitalization Rate (NOI / Replacement Cost)
Debt Service Coverage Ratio

## Modeled Scenarios

Embodied Carbon Reduction Measures				
BAU	Material Reduction (Concrete Structure)	Material Reduction + Switching (Low Carbon Concrete)	Material Reduction (Steel Structure)	Mass Timber

*Reach out to us if you have a project you would like to model!*

# Bonus Technology Approach

In instances where:

- Embodied carbon is not yet eligible in statute AND
- Statute updates are unlikely in the near term

Embodied carbon investments could be incentivized via a "Bonus Technology" approach:

- Investments in embodied carbon (e.g. EPD reporting, use of low EC materials, or reduction of whole-life EC) **increase Total Eligible Construction Cost financing limits**. This **unlocks more C-PACE capital** for further C-PACE-eligible improvements.

# Next Steps

1. Fill in **Survey (10 mins)** on Embodied Carbon in C-PACE
2. Join us for our **next meeting** in **July 16 2025**
3. Additional Resources:
  - Paying for Clean Construction Materials with C-PACE – RMI Blog Article
  - Picking up the PACE – Nuveen Green Capital White Paper



# Workshop – Policy Drafting: Embodied Carbon in C-PACE

📅 Wed, July 16

🕒 2:00-3:00 p.m. ET

💻 Virtual

REGISTER



# Q&A





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