

Early Phase

Carbon Assessment

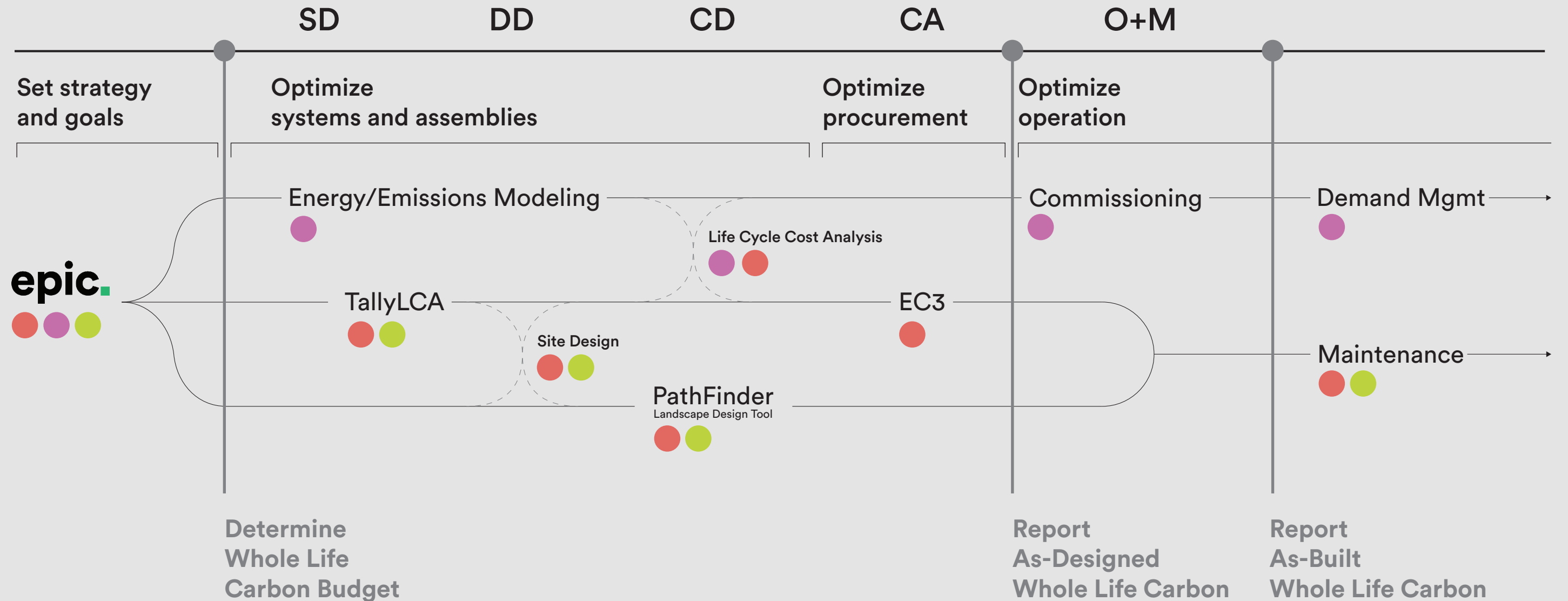
as part of a **Low-Carbon
Design Workflow**



Low-Carbon Design Workflow

An iterative approach to measuring and improving performance

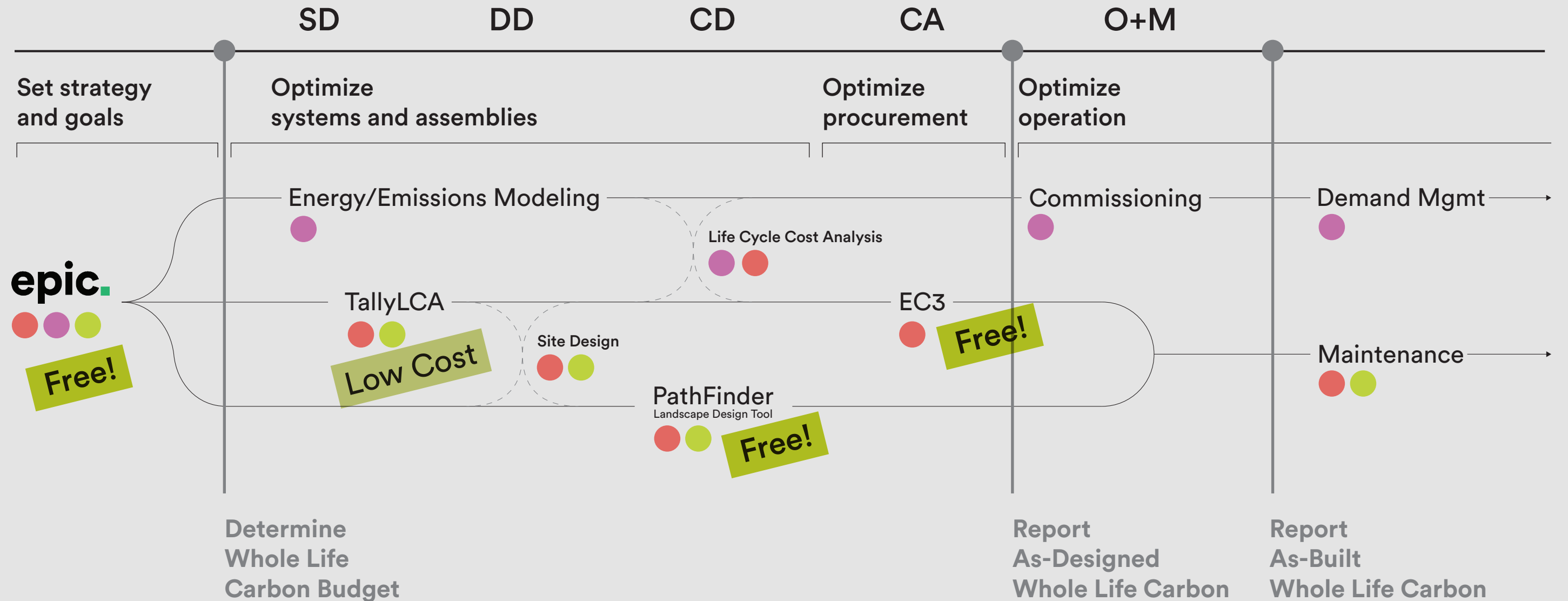
● Embodied Carbon Strategy ● Operational Carbon Strategy ● Carbon Storage Strategy



Low-Carbon Design Workflow

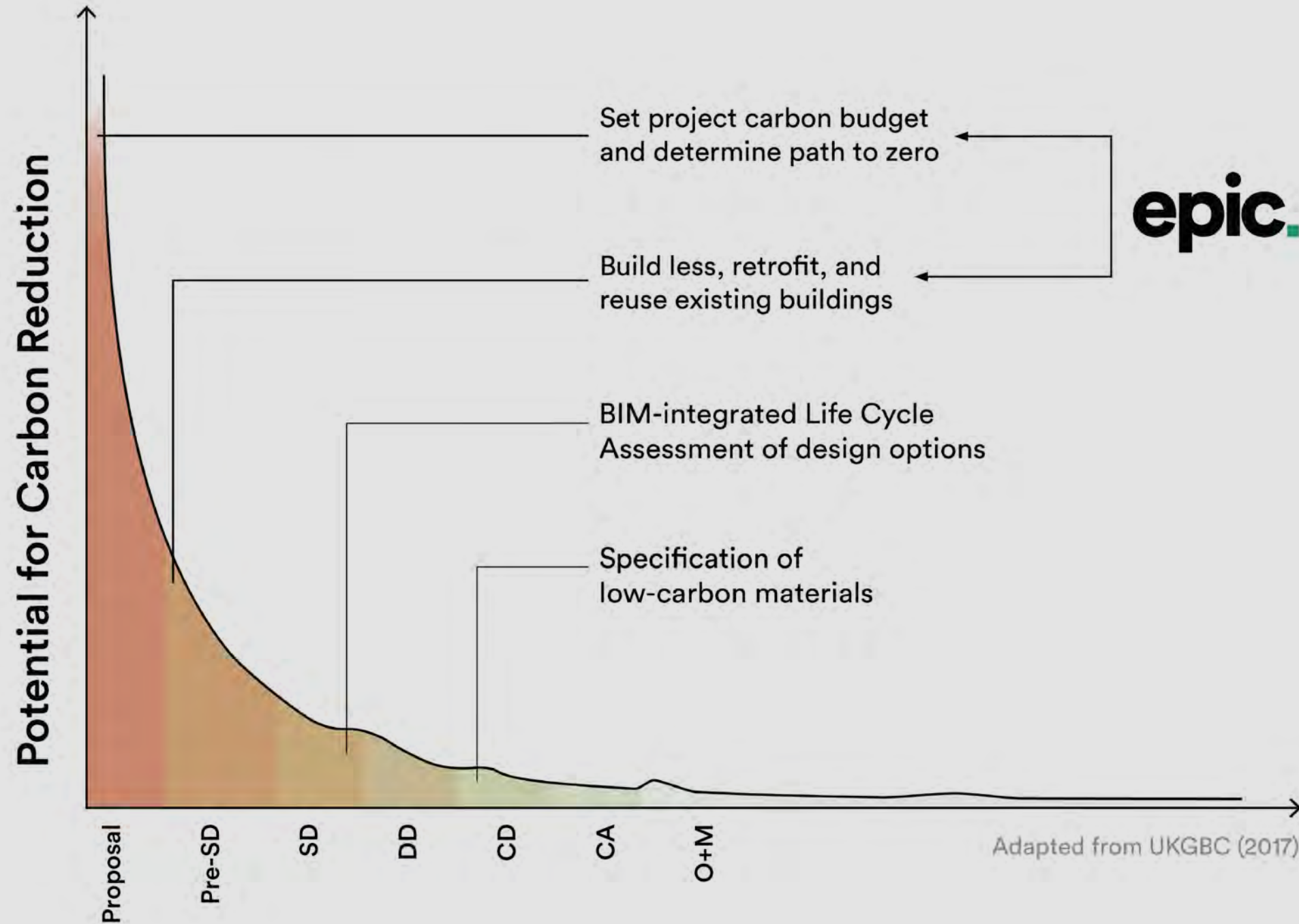
An iterative approach to measuring and improving performance

● Embodied Carbon Strategy ● Operational Carbon Strategy ● Carbon Storage Strategy



Early phase decisions are the most impactful

Waiting until BIM data is available is waiting too long

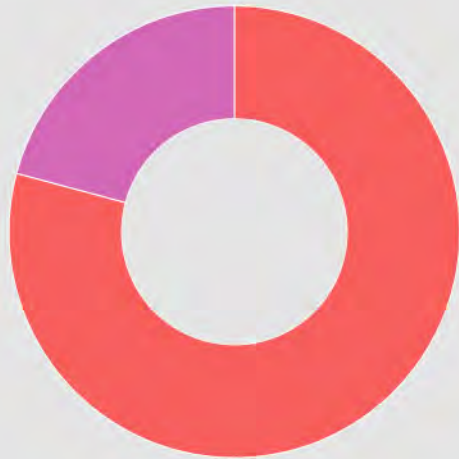


Early phase decisions are complex!

Proportion of embodied and operational emissions vary widely

12,000 tons CO₂e

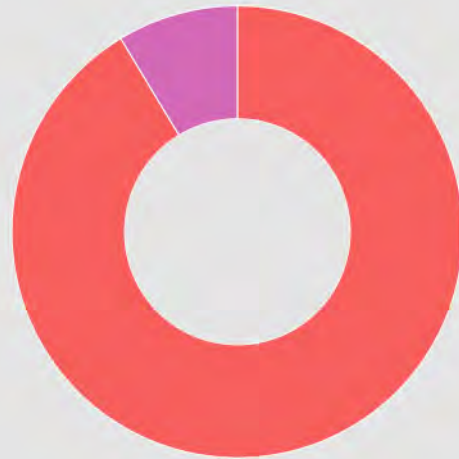
79% Embodied
21% Operational



San Francisco

10,400 tons CO₂e

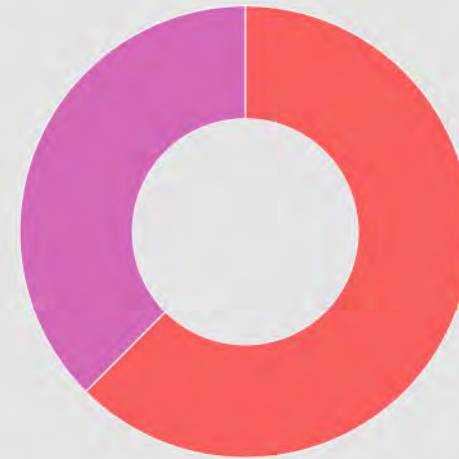
91% Embodied
9% Operational



Seattle

15,200 tons CO₂e

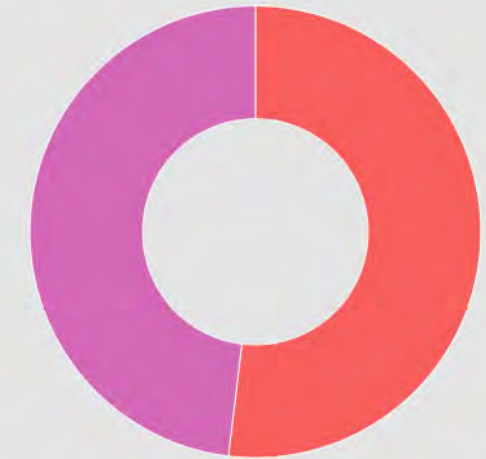
62% Embodied
38% Operational



Albuquerque

18,200 tons CO₂e

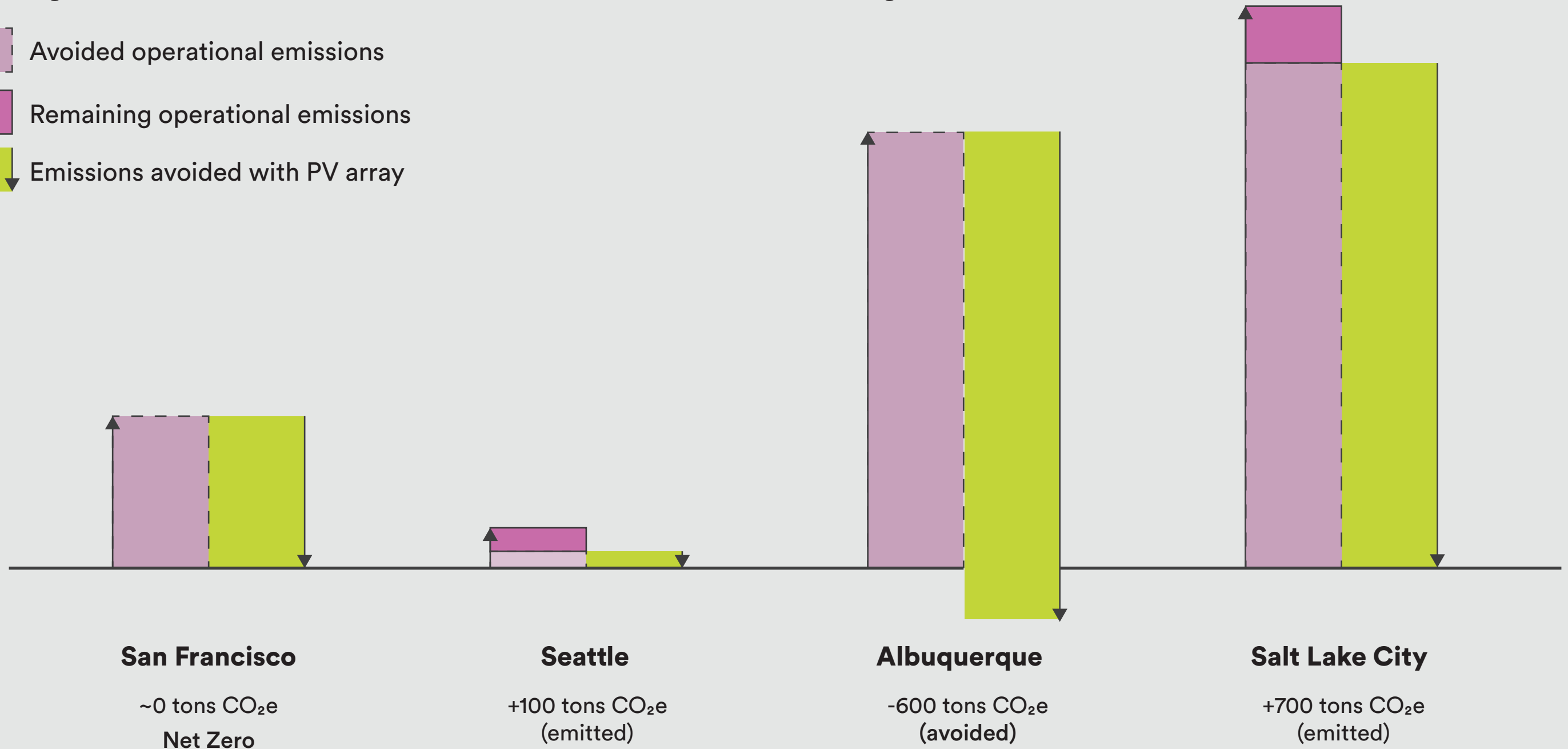
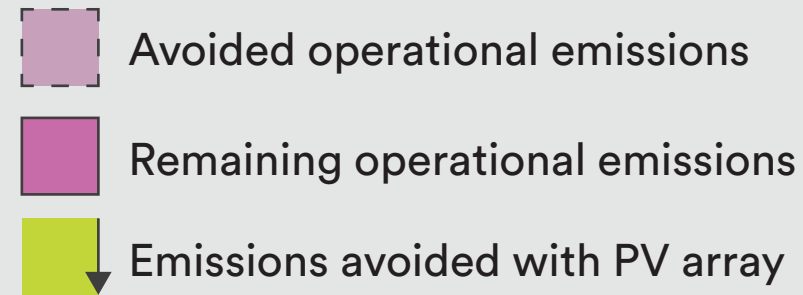
52% Embodied
48% Operational



Salt Lake City

There's no "one size fits all" decarbonization strategy

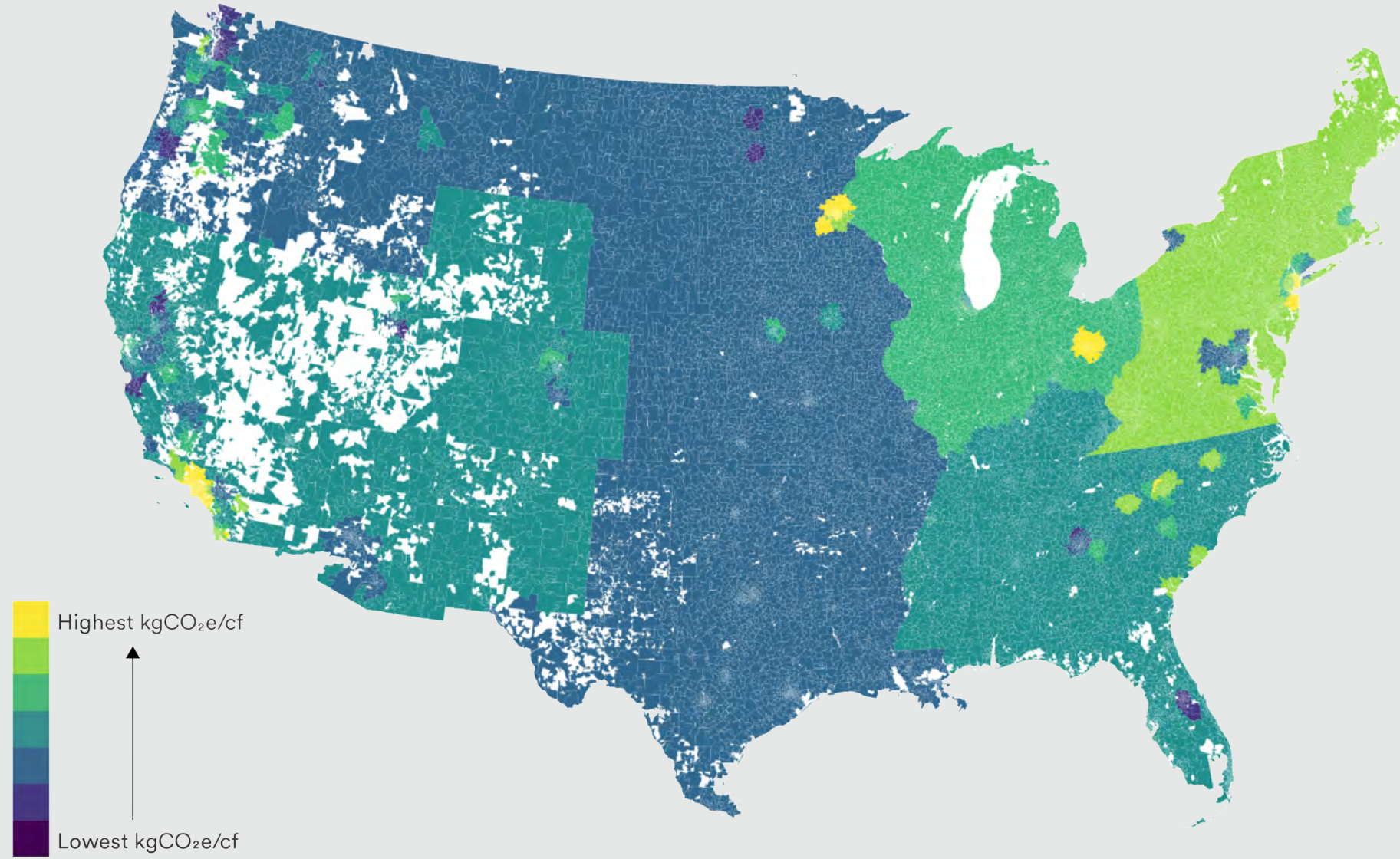
Strong differences between relative and absolute reductions, regional variation



Building Parameters: 30 year period; 100,000 sf K-12 School; EUI of 30 kBtu/sf/yr; all-electric; 470 KW PV Array

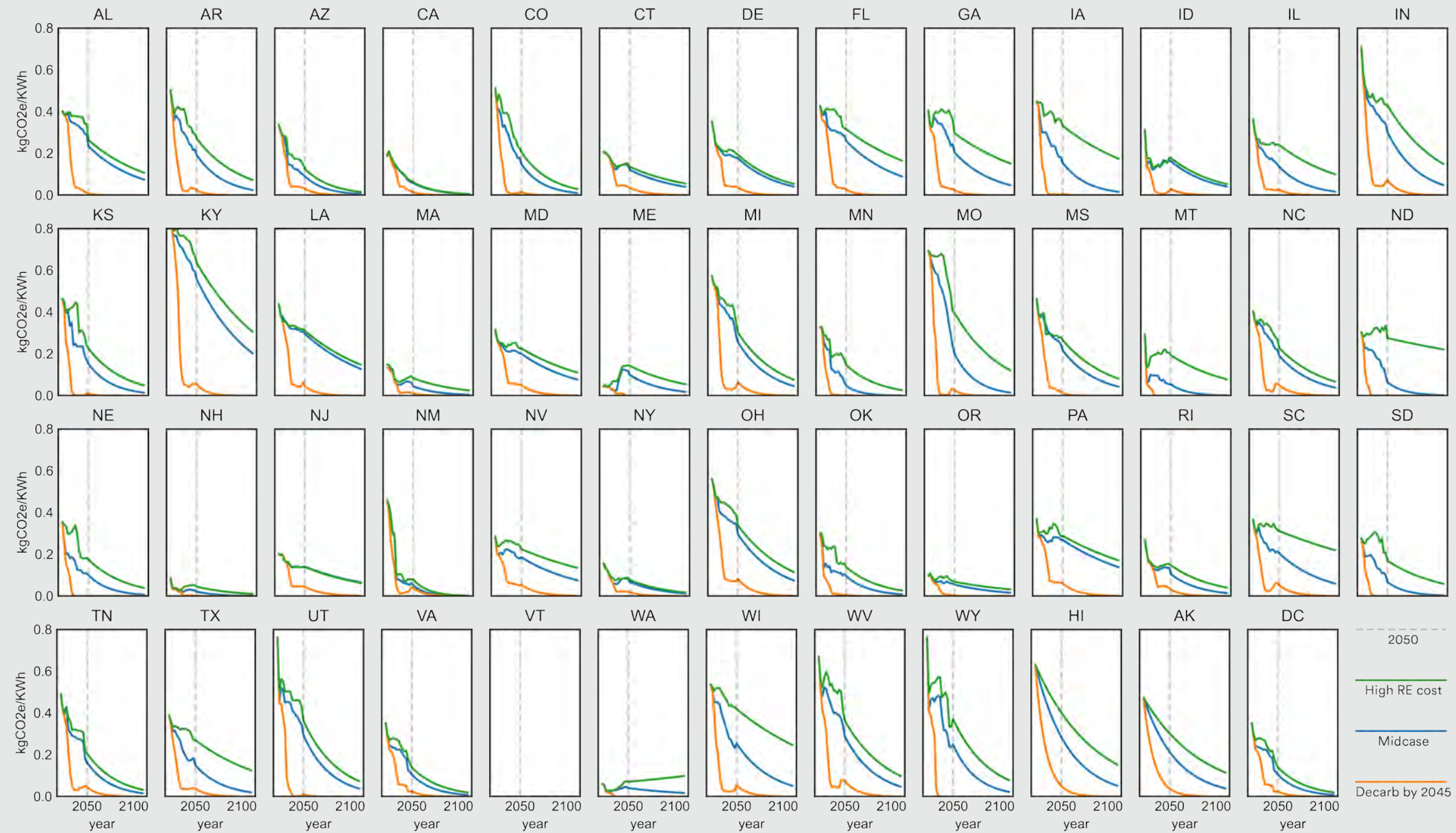
Materials | Emissions vary across space

Carbon Intensity of Concrete



Data from OpenEPD and NRMCA, spatialized by EHDD. Gaps represent areas not covered by US zip code system.

Energy | Emissions vary across space and time



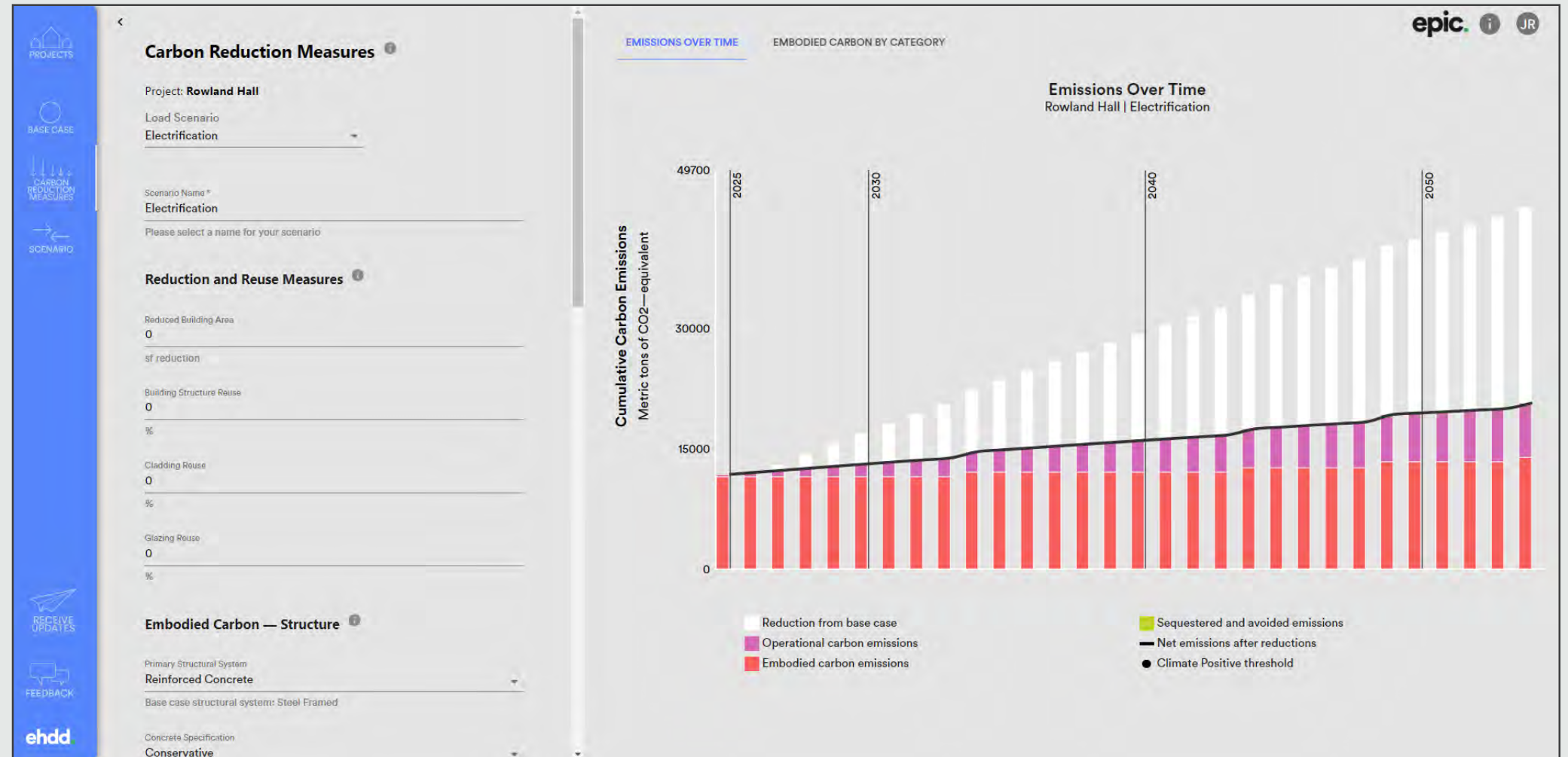
2022-2050 data from NREL Cambium. 2051-2110 extrapolation by EHDD.

EPIC takes a “whole life carbon” view

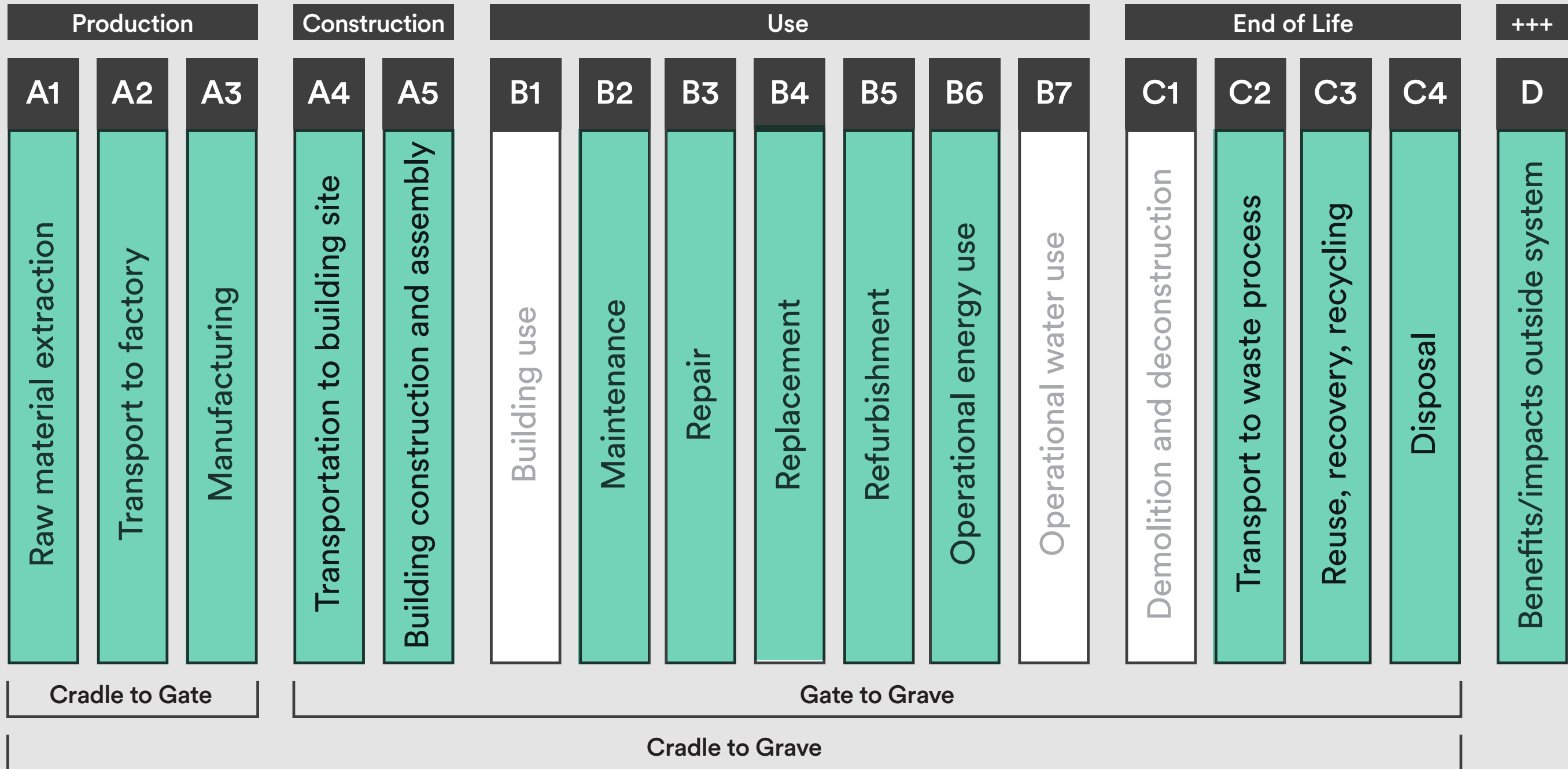
Integrated models of embodied, operational, and landscape carbon

Carbon reduction strategies

- ● Build less
 - Reuse existing structure
 - Switch structural system
 - Low-carbon materials
 - Longer lived interiors
 - Low-carbon envelope
 - Store carbon in materials
 - All-electric building
 - Increase energy efficiency
 - Add onsite renewables
 - Carbon-storing landscape
-
- Embodied carbon emissions
 - Operational carbon emissions
 - Carbon storage, avoided carbon



EPIC includes data from across the building life cycle



EPIC includes data from a wide range of building systems

Typical LCA includes a very narrow scope of analysis

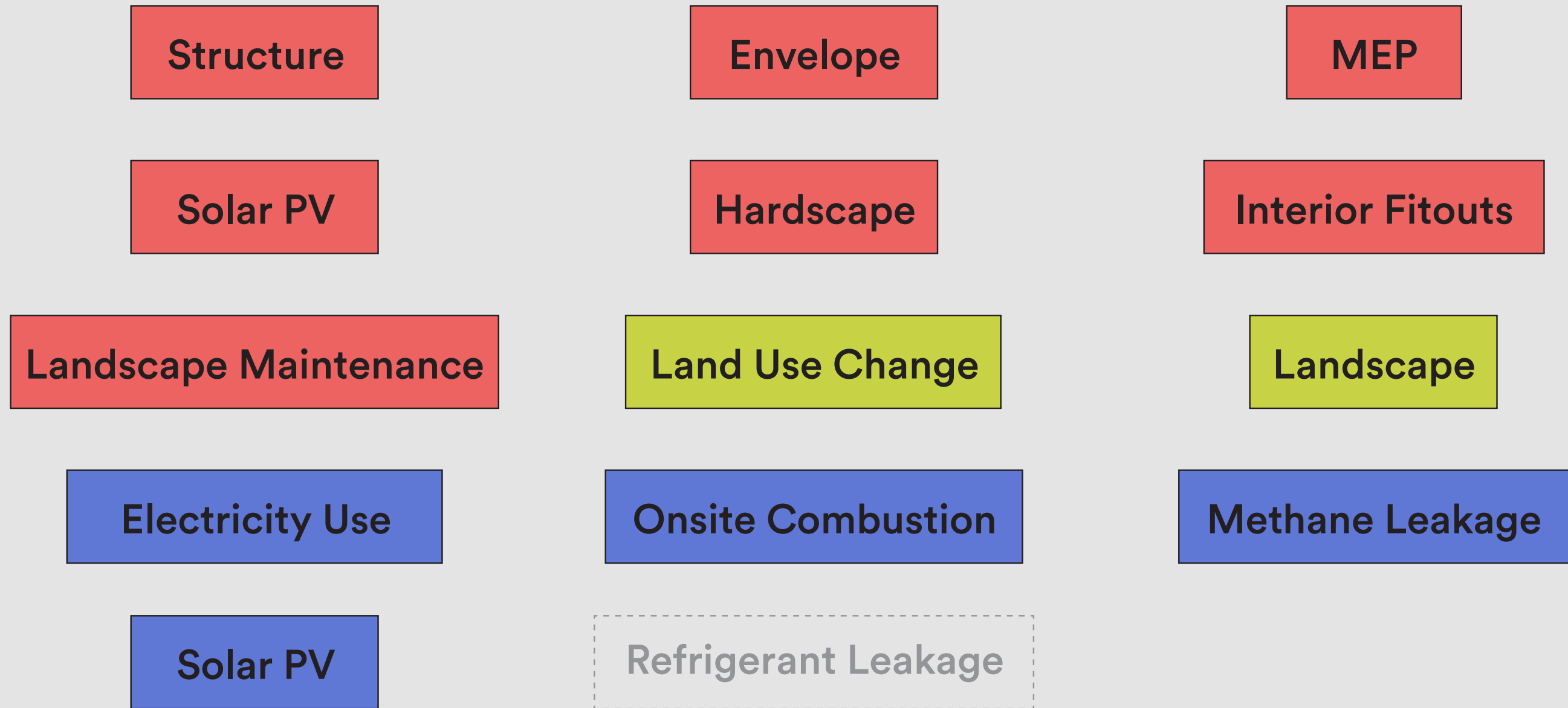


Typical Scope of Carbon Analysis

EPIC includes data from a wide range of building systems

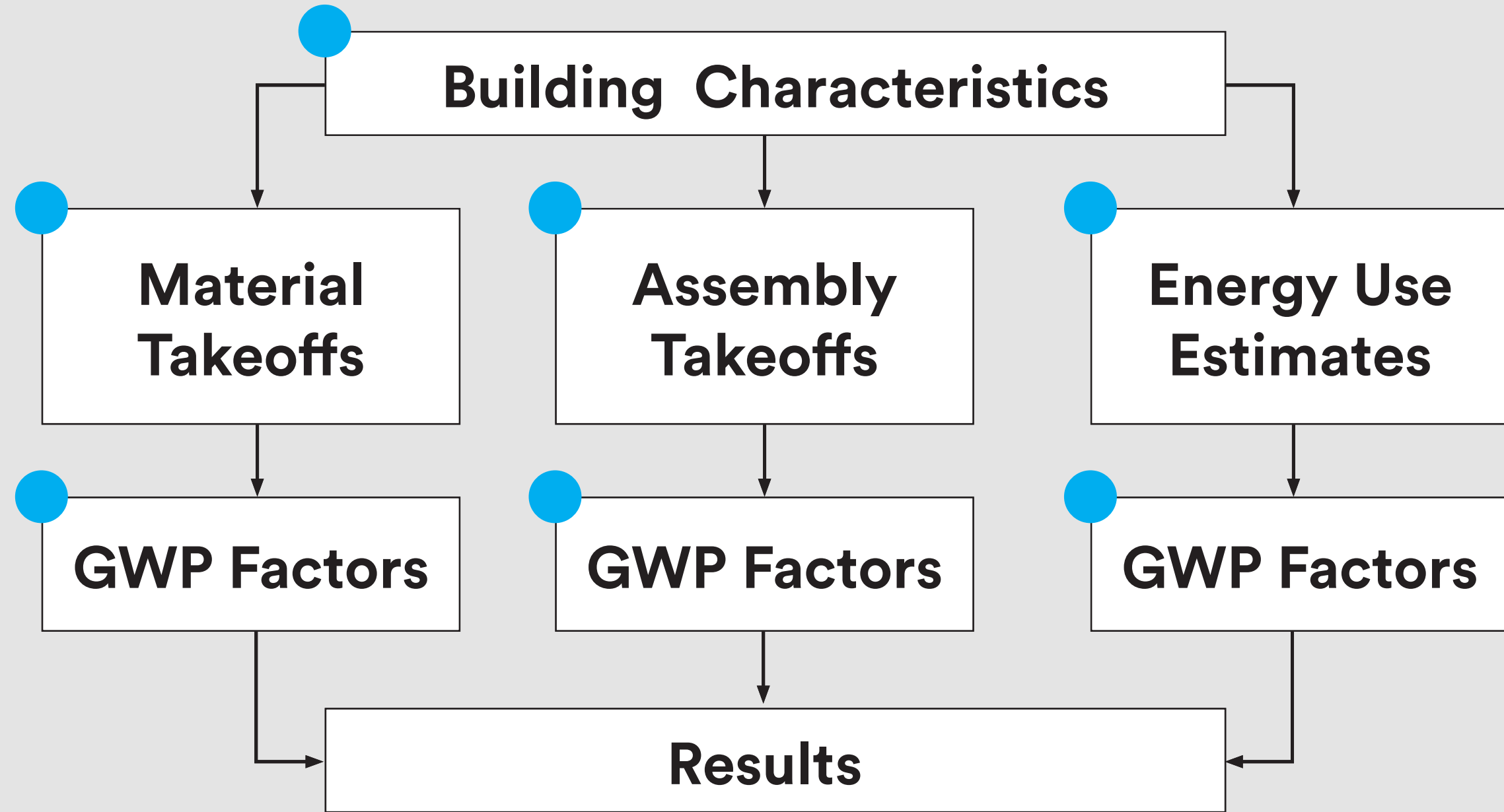
A holistic look at building emissions avoids burden-shifting and widens the decision space

● Embodied Carbon ● Operational Carbon ● Carbon Storage



Anatomy of EPIC

Whole carbon modeling approach



● Adjust with Carbon Reduction Measures

Transparent Methodology

www.epic-docs.dev

The screenshot displays the EPIC Documentation website. The top navigation bar includes the EPIC logo, the text "EPIC Documentation", and three buttons: "Try CarbonGPT", "Book a Demo", and "Start using EPIC". A search bar is located on the right side of the navigation bar. The left sidebar contains a navigation menu with sections: "EPIC WEB APPLICATION" (including "What is EPIC?", "Get Started with EPIC", "1. Define a Base Case", "2. Reduce Emissions", "3. Compare Scenarios", "Data Privacy Statement", and "Watch a Tutorial"), "C.SCALE™ DATA MODEL" (including "Methodology", "Model Structure", "Embodied Carbon", "Operational Carbon", "Stored and Avoided Carbon", and "Reference Data"), and "RESOURCES" (including "Access c.scale via API"). The main content area features a large heading "Methodology" with a small icon to its left. Below this heading, the "Goal" section is highlighted. The "Goal" section text reads: "EPIC provides directionally accurate guidance for specific projects by helping to identify which carbon reduction strategies a project should pursue, and helps to guide decarbonization of portfolios and portions of the building stock where c.scale assumptions have been tested (i.e., in the continental United States). EPIC is designed for use during site and feasibility studies, requests for proposals, pre-design, and in other situations where decisions affecting the whole life carbon footprint are being made and completing a whole-building life cycle assessment and/or energy model is not practicable. EPIC is powered by c.scale™, a lightweight data model for carbon footprinting the built environment. EPIC is a work in progress; future development will respond to user feedback, incorporate improved data, and refine the tool's methodology. We're actively seeking feedback as we continue to improve." Below the "Goal" section, the "Scope" section is visible, followed by the "Whole Life Carbon" section, which begins with the text: "c.scale is an whole life carbon model. 'Whole life carbon' means that it integrates assessments of embodied, operational, and landscape carbon in a data model to capture the entire carbon". The right sidebar contains a section titled "ON THIS PAGE" with a list of links: "Goal", "Scope", "Whole Life Carbon", "Time Horizon", "Life Cycle Stages", "Embodied Carbon Sco...", "Operational Carbon S...", "Stored Carbon Scope", "Refining EPIC's Scope", and "Uncertainty".

epic. ■

AIA HQ Case Study



The AIA National Headquarters

Project Description

196,000 sf renovation of 1970s brutalist building

EHDD's Climate Goal

Net Zero **Whole Life Carbon**

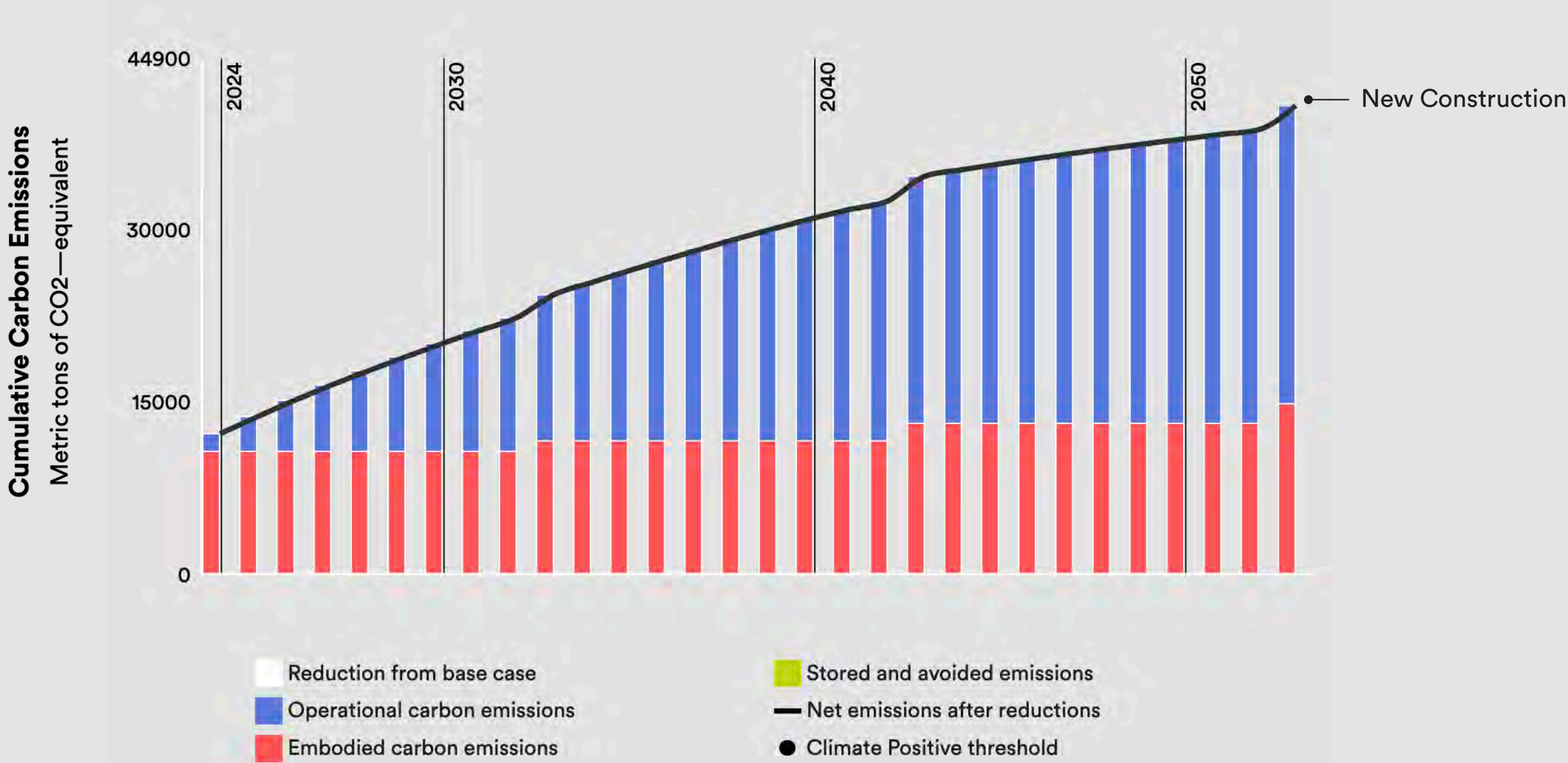
The AIA National Headquarters

Project was not subject to CalGreen Requirements, but could fulfill either the **Building Reuse** or **wbLCA** requirements

	Existing Voluntary	Mandatory 50,000 sf (project aggregate)	Tier 1 50,000 sf (project aggregate)	Tier 2 50,000 sf (project aggregate)
Building Reuse	75% of the structure and enclosure to be reused.	45% of structure and enclosure to be reused.	75% of the structure and enclosure to be reused.	75% of the structure and enclosure to be reused, AND 30% of interior non-structural elements to be reused.
WB LCA	10% reduction from baseline	10% reduction from baseline	15% reduction from baseline	20% from baseline
Prescriptive Approach	--	175% of IW-EPD GWP limits; concrete 130% of ready-mixed GWP values	150% of IW-EPD GWP limits; concrete 130% of ready-mixed GWP values	IW-EPD GWP limits; concrete 130% of ready-mixed GWP values

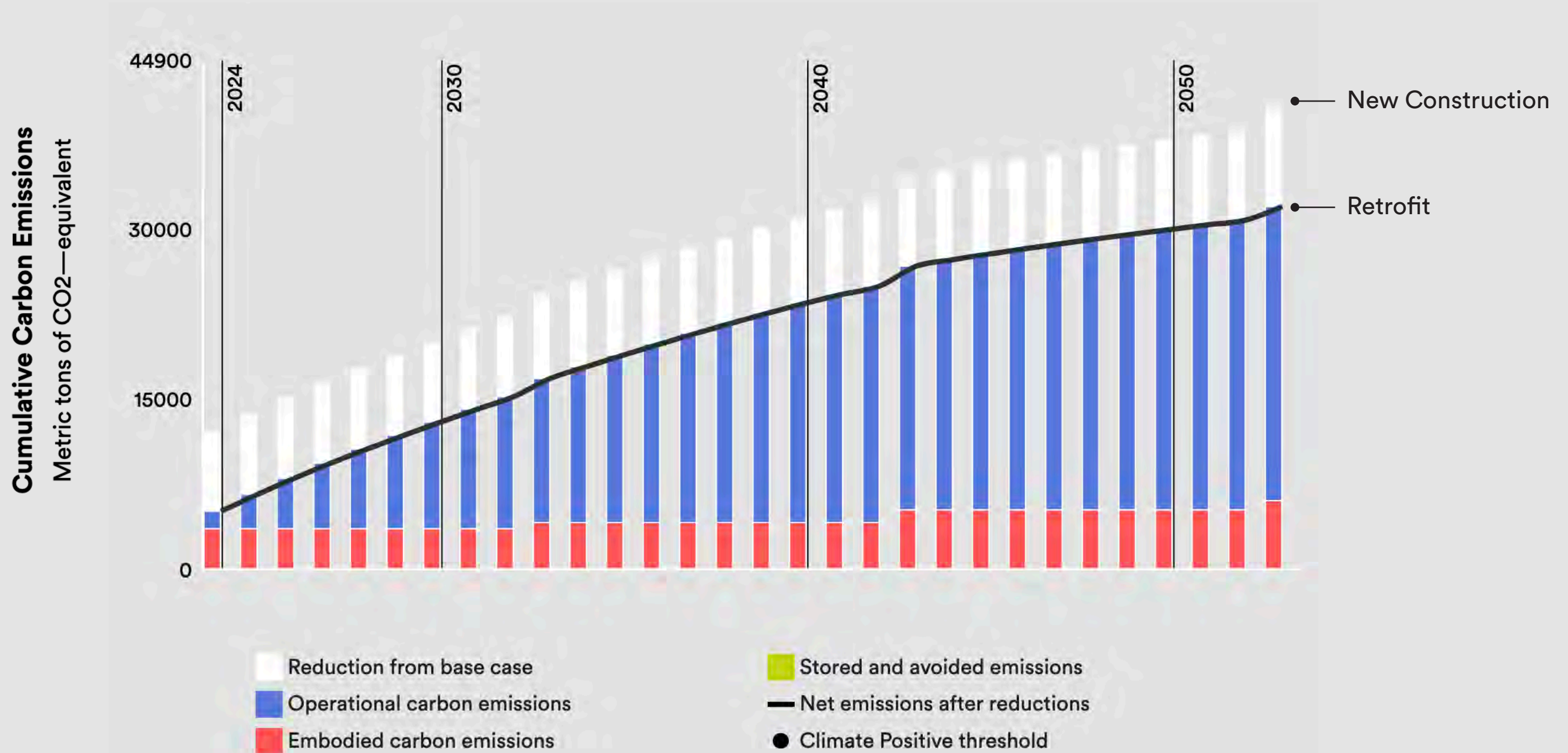
Base Case | New Construction

The AIA National Headquarters Renovation



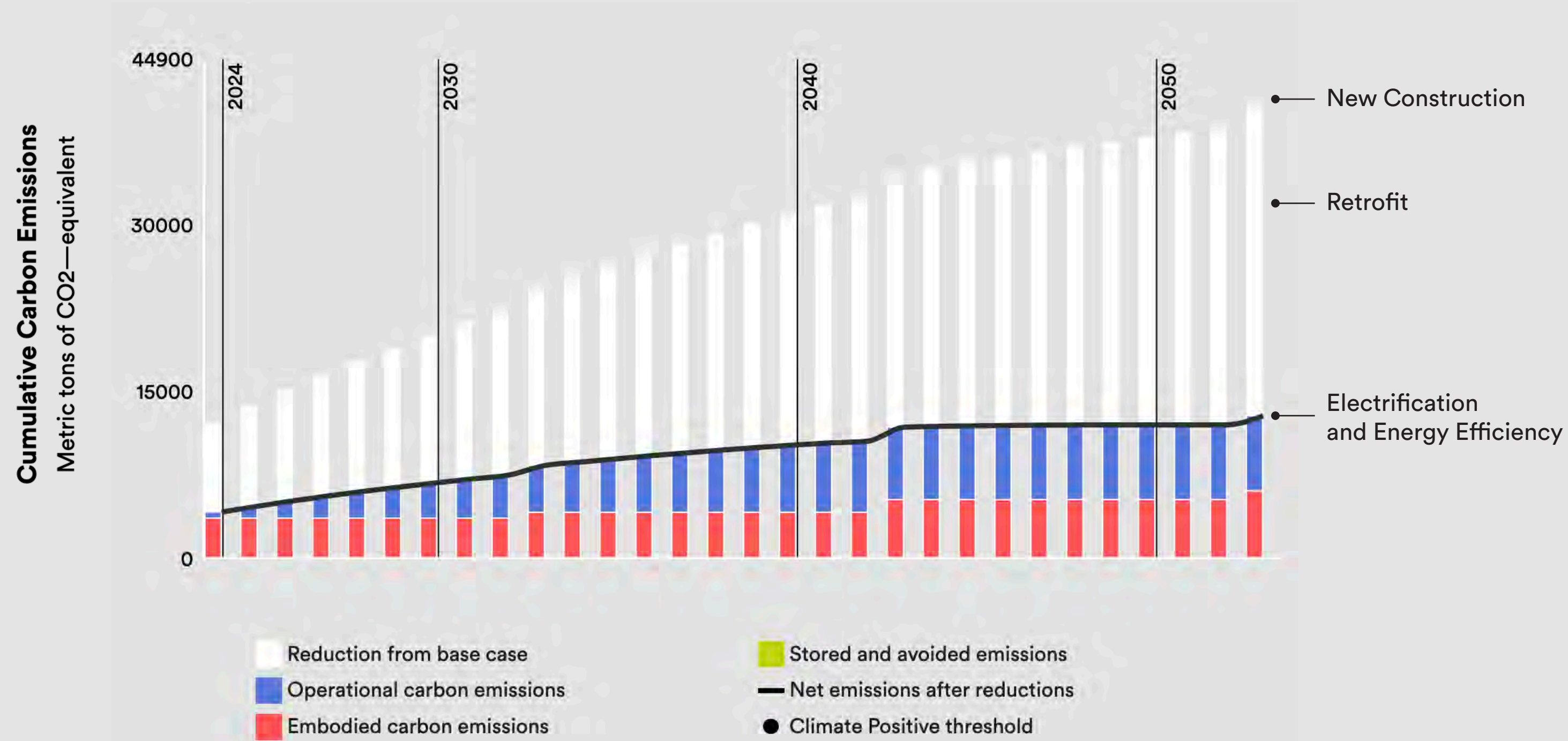
Retrofit, design, and specification of low-carbon materials

The AIA National Headquarters Renovation



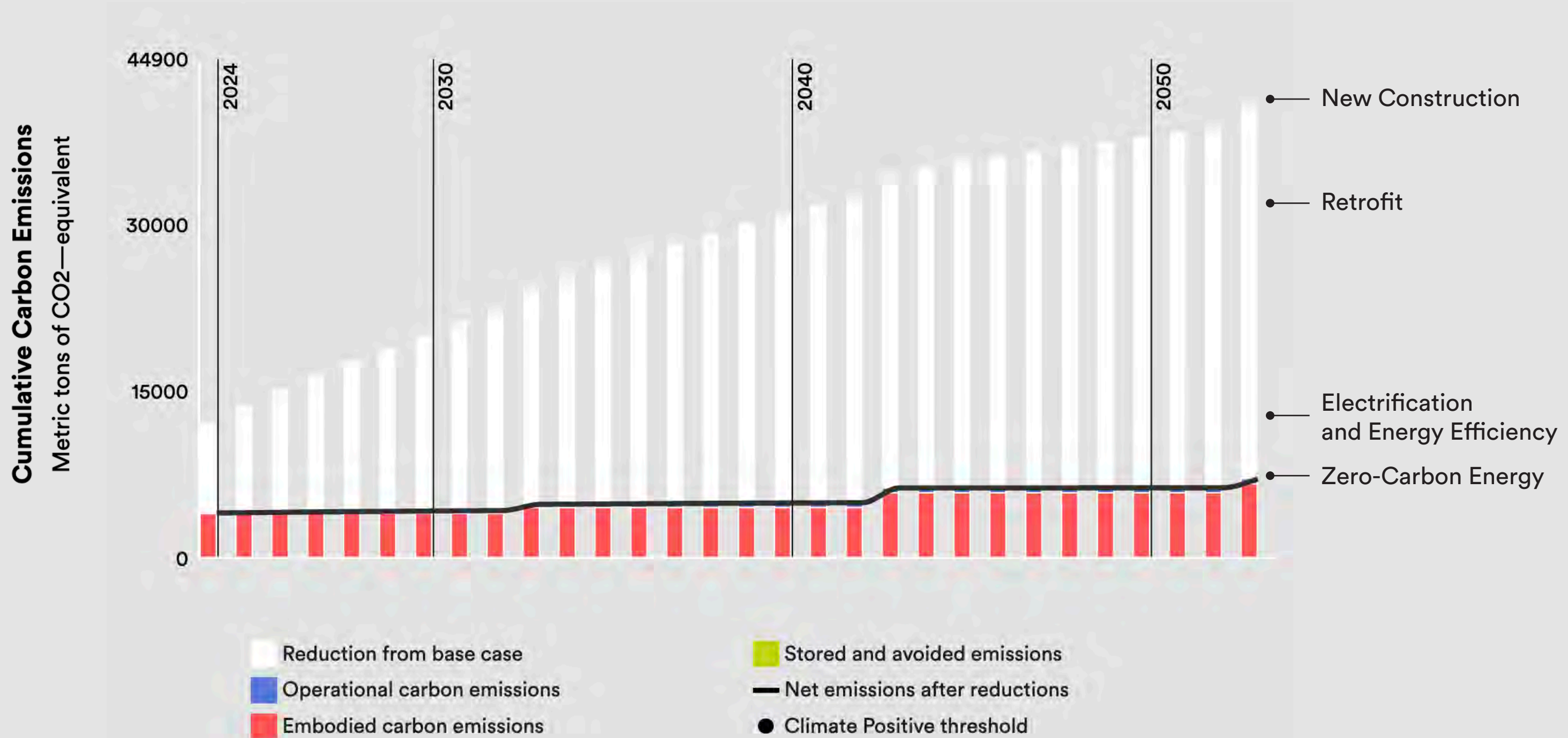
Electrification and energy efficiency

The AIA National Headquarters Renovation



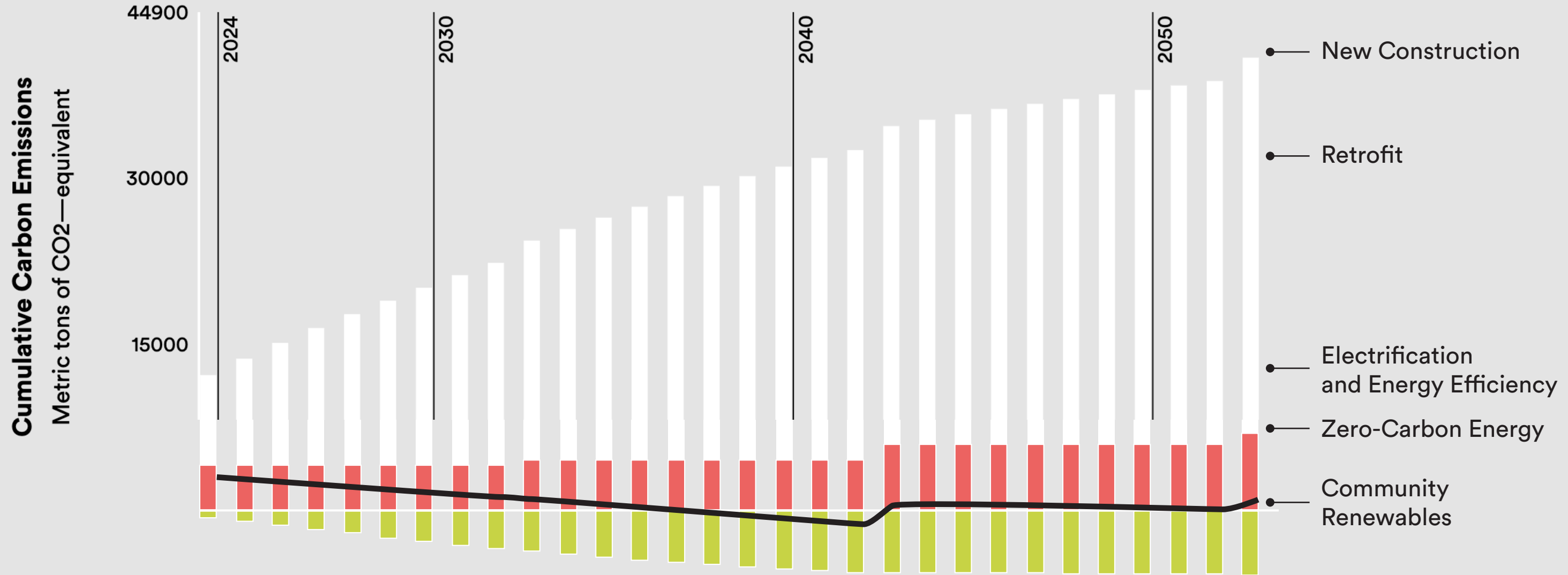
Onsite renewables and clean power purchase

The AIA National Headquarters Renovation



Dedicated community renewables

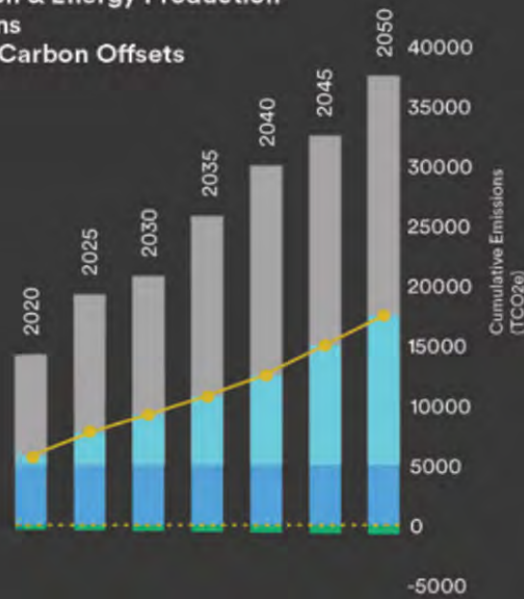
The AIA National Headquarters Renovation



Setting ambitious targets in our proposal ...

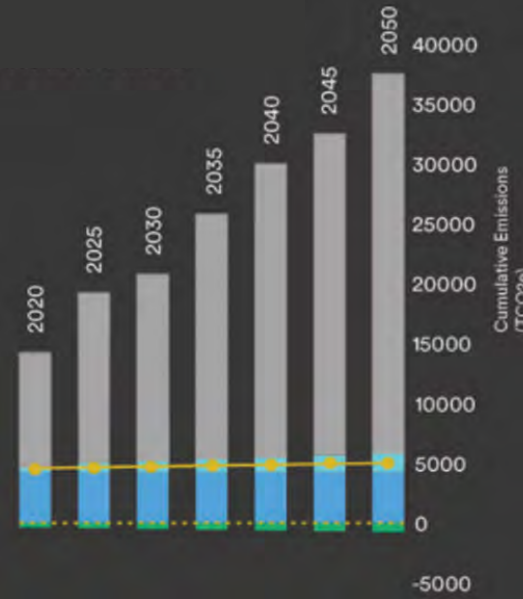
Zero-carbon project proposed to AIA at the beginning of the process

- Reduction from Baseline
- Operational Emissions
- Embodied Emissions
- Sequestration & Energy Production
- Net Emissions
- Cumulative Carbon Offsets



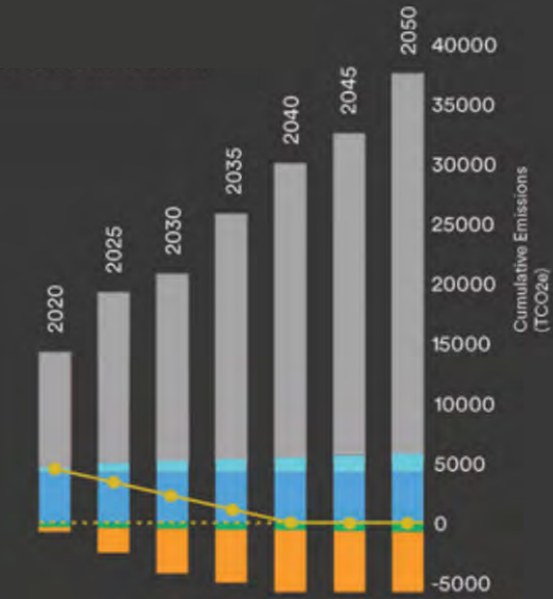
Energy Efficiency Only

- Mixed Fuel: Gas and Electric
- EUI: 44 kBtu/sf/yr
- No PV
- No purchased Green Power



Clean Electrification

- All Electric
- EUI: 40 kBtu/sf/yr
- Embodied carbon reduction measures
- 170 kW PV array on roof
- Purchase 100% Green Power

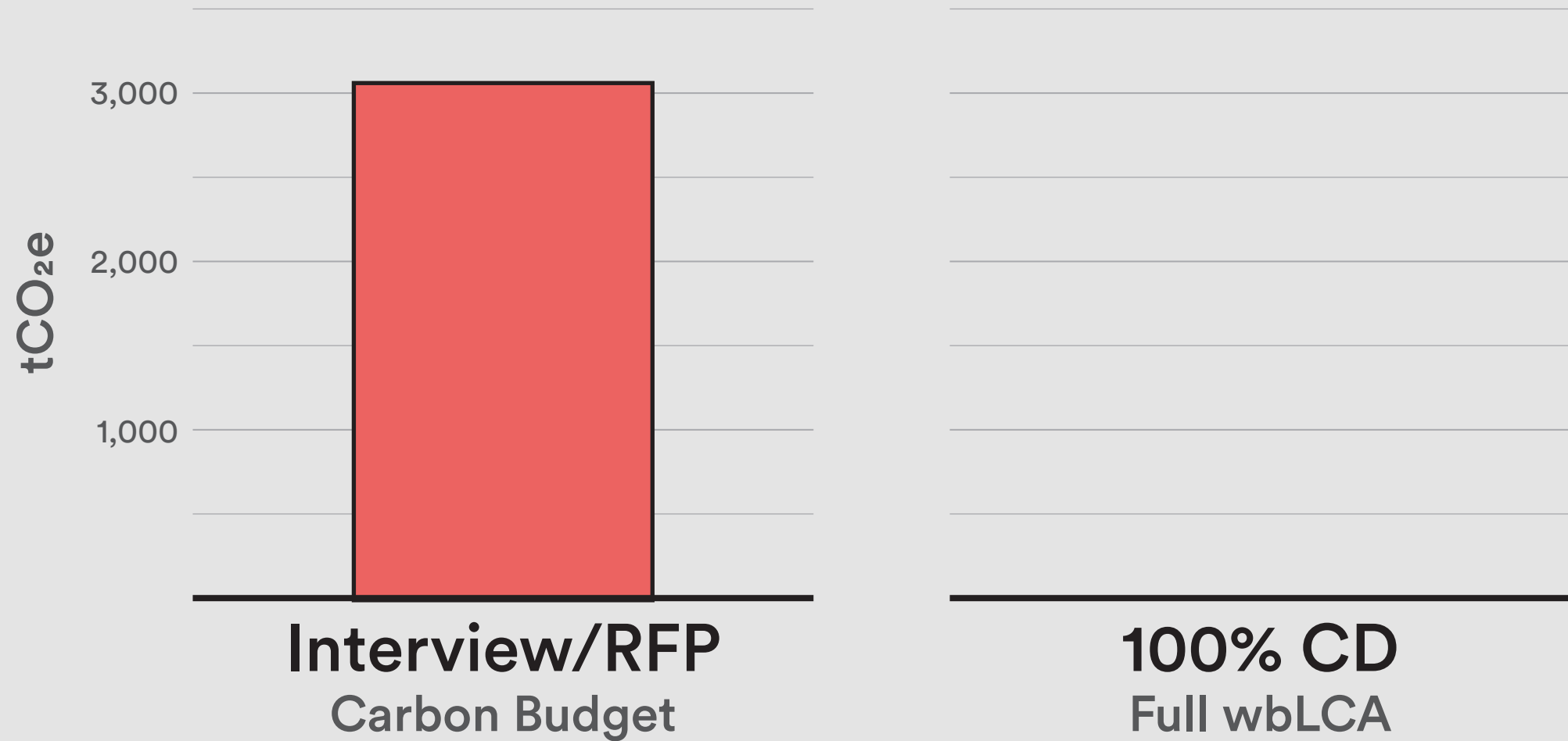


Clean Electrification w/ Local Carbon Offset

- Same as Clean Electrification measures
- Offset all remaining emissions with local off-site decarbonizing/energy efficiency project

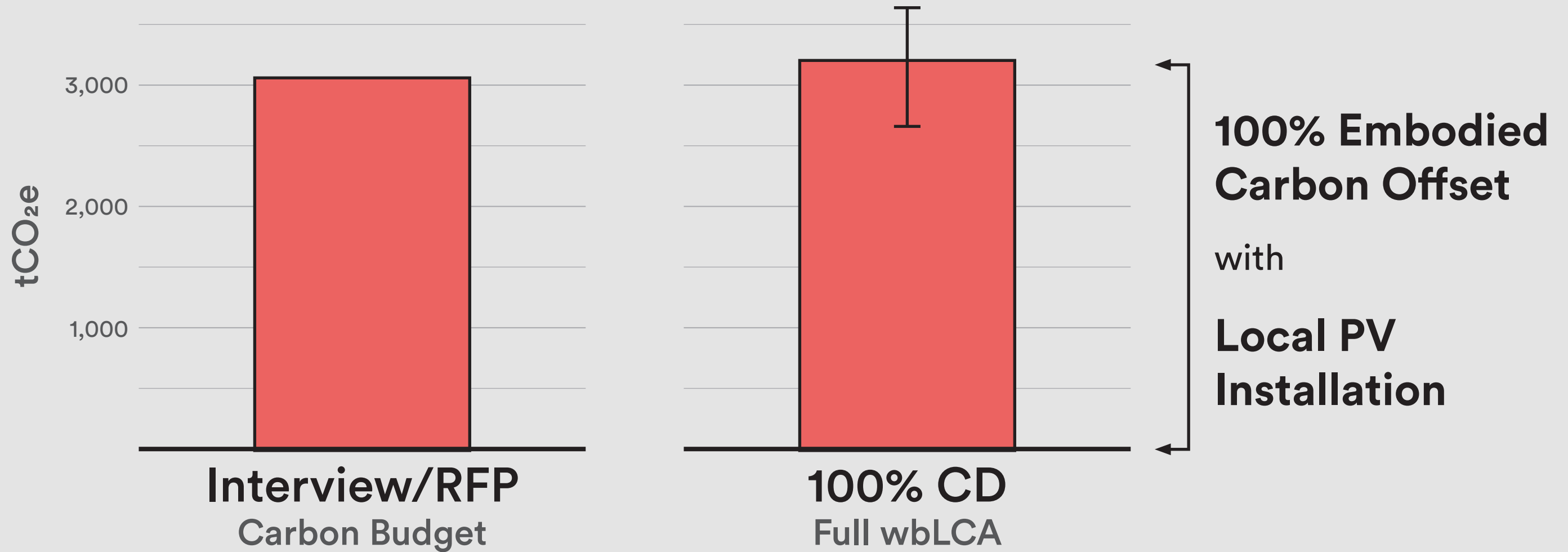
... allowed us to deliver a zero-carbon project

Zero-carbon project proposed to AIA at the beginning of the process



... allowed us to deliver a zero-carbon project

Zero-carbon design delivered to AIA at the end of CD phase



Thank you!

Questions/comments:

j.rusk@ehdd.com

Try EPIC:

epic.ehdd.com