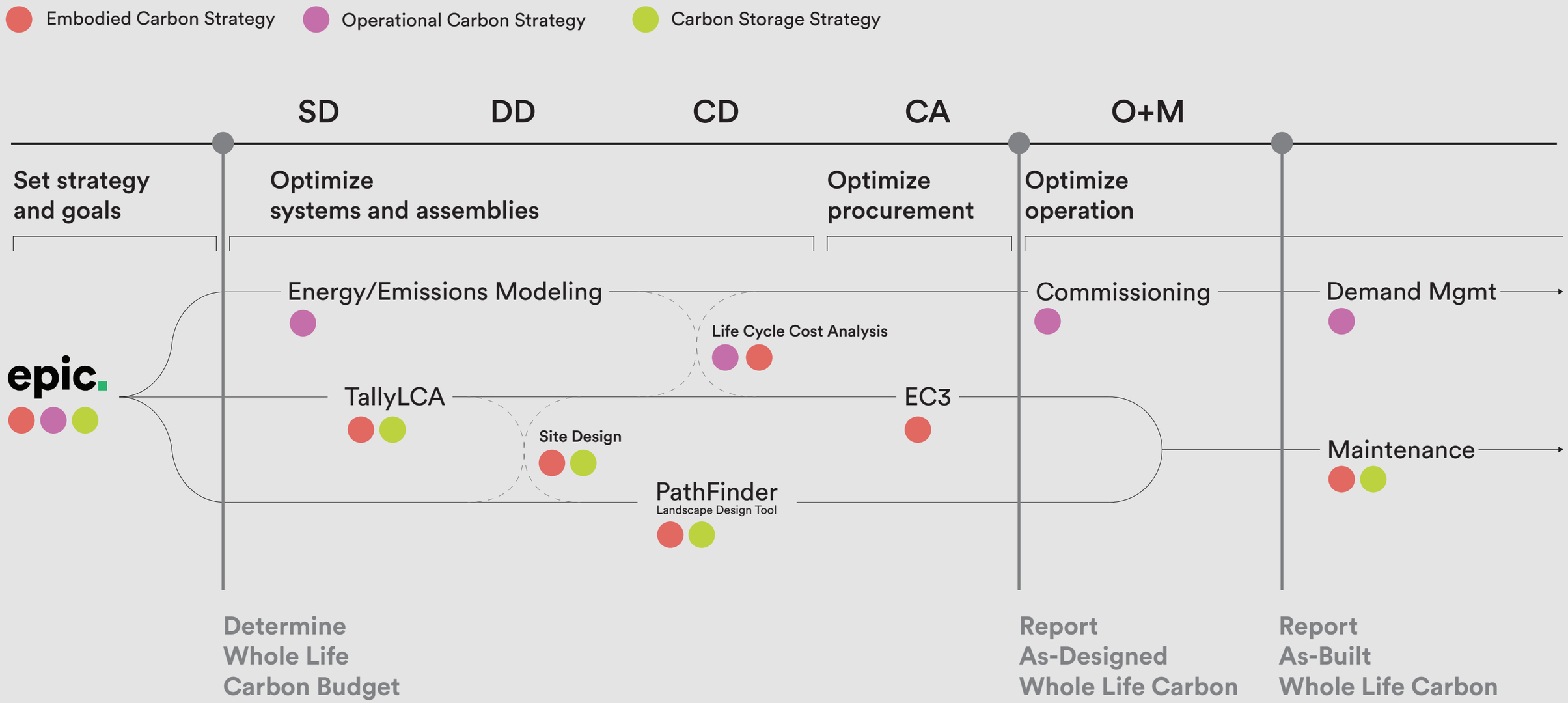
Early Phase Carbon Assessment

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

Lick Wilmerding High School | EHDD

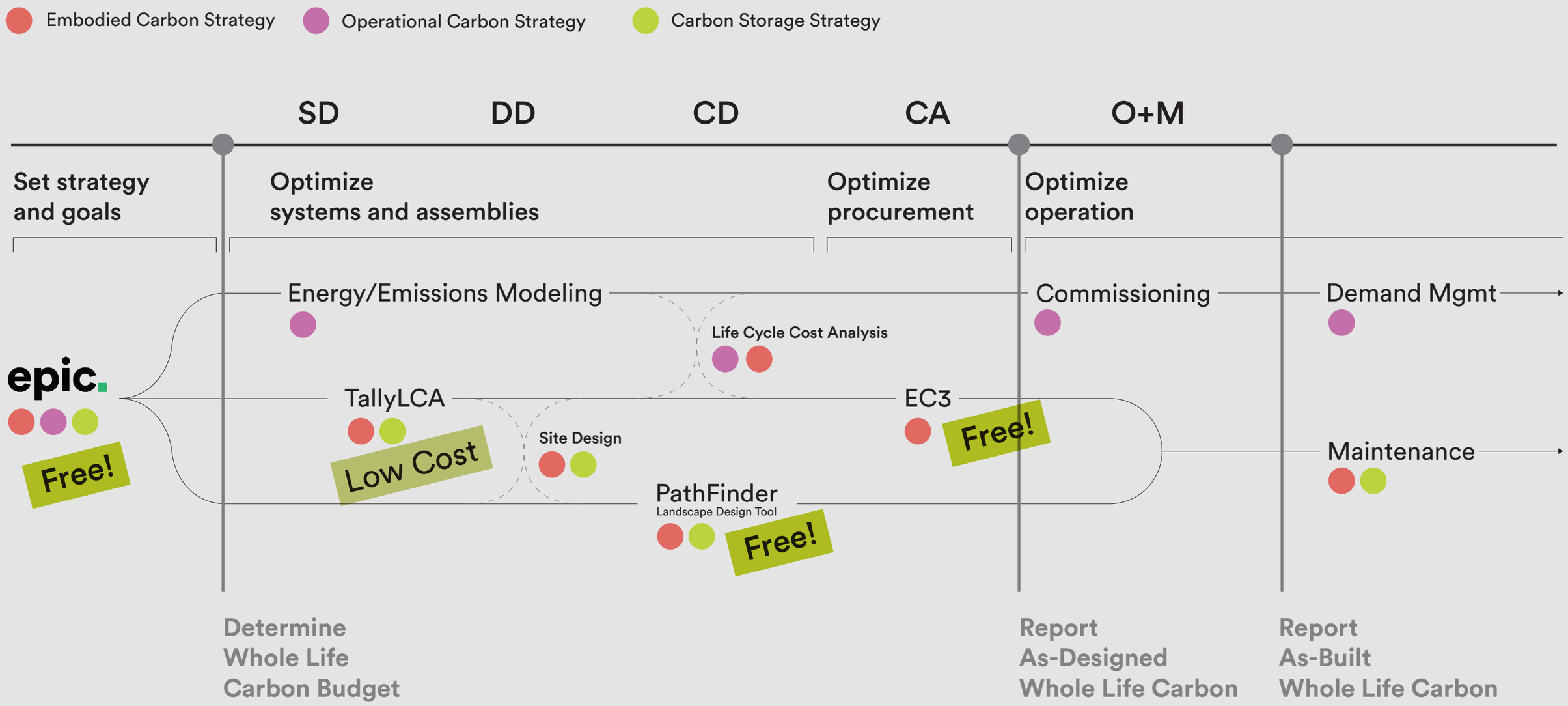
Low-Carbon Design Workflow

An iterative approach to measuring and improving performance



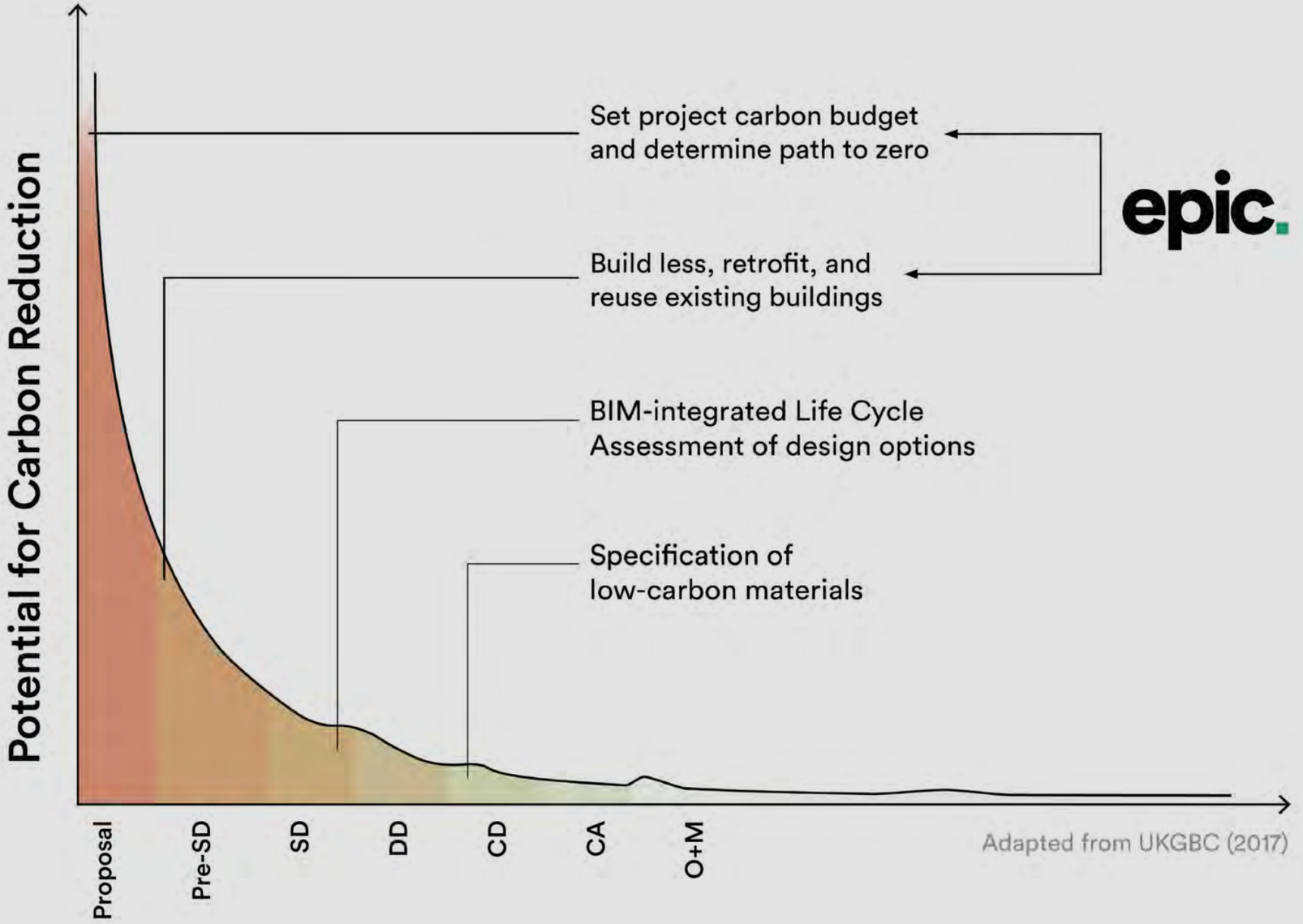
Low-Carbon Design Workflow

An iterative approach to measuring and improving performance



Early phase decisions are the most impactful

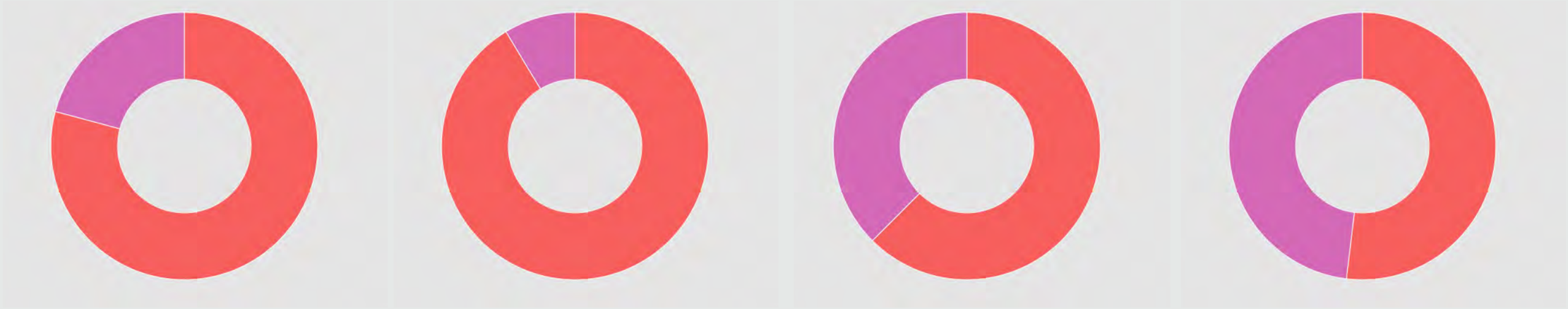
Waiting until BIM data is available is waiting too long



Early phase decisions are complex!

Proportion of embodied and operational emissions vary widely

San Francisco	Seattle	Albuquerque	Salt Lake City
12,000 tons CO_2e	10,400 tons CO_2e	15,200 tons CO_2e	18,200 tons CO_2e
79% Embodied	91% Embodied	62% Embodied	52% Embodied
21% Operational	9% Operational	38% Operational	48% Operational

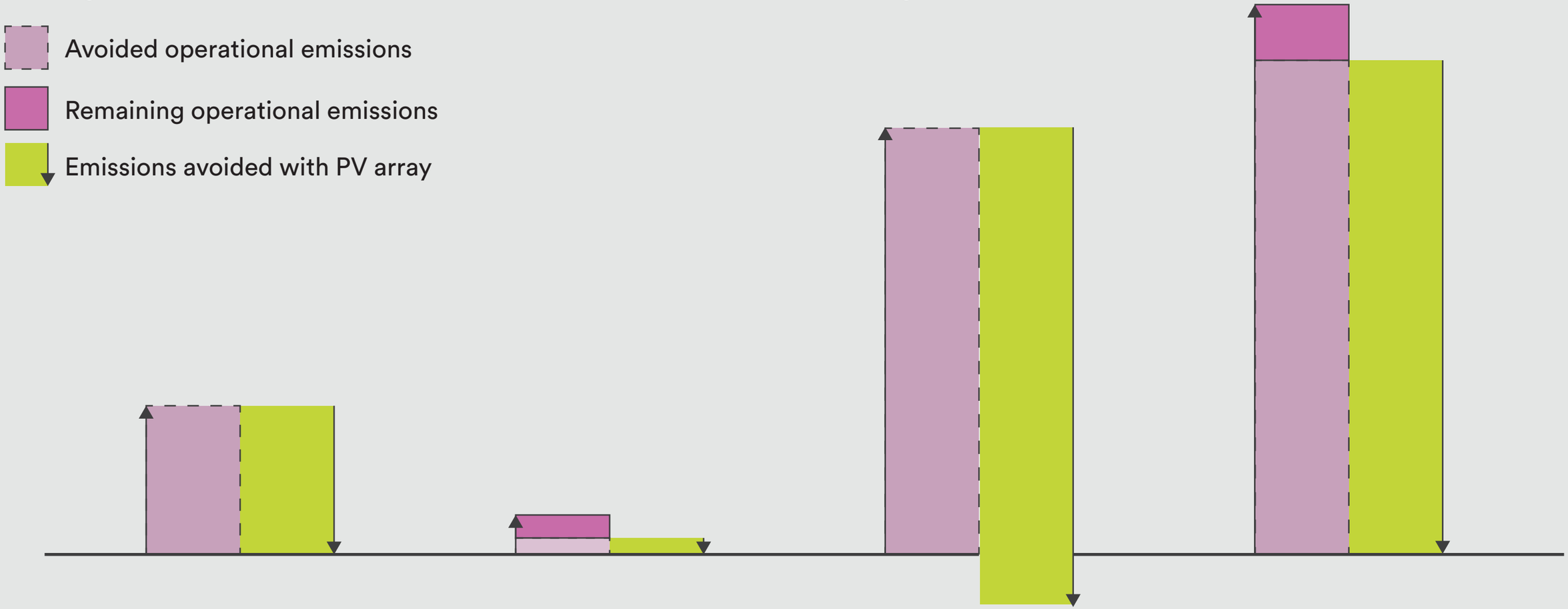


Building Parameters: 30 year period; 100,000 sf K-12 School; EUI of 30 kBtu/sf/yr; all-electric

ehdd.

There’s no “one size fits all” decarbonization strategy

Strong differences between relative and absolute reductions, regional variation



San Francisco

~0 tons CO_2e

Net Zero

Seattle

+100 tons CO_2e
(emitted)

Albuquerque

-600 tons CO_2e
(avoided)

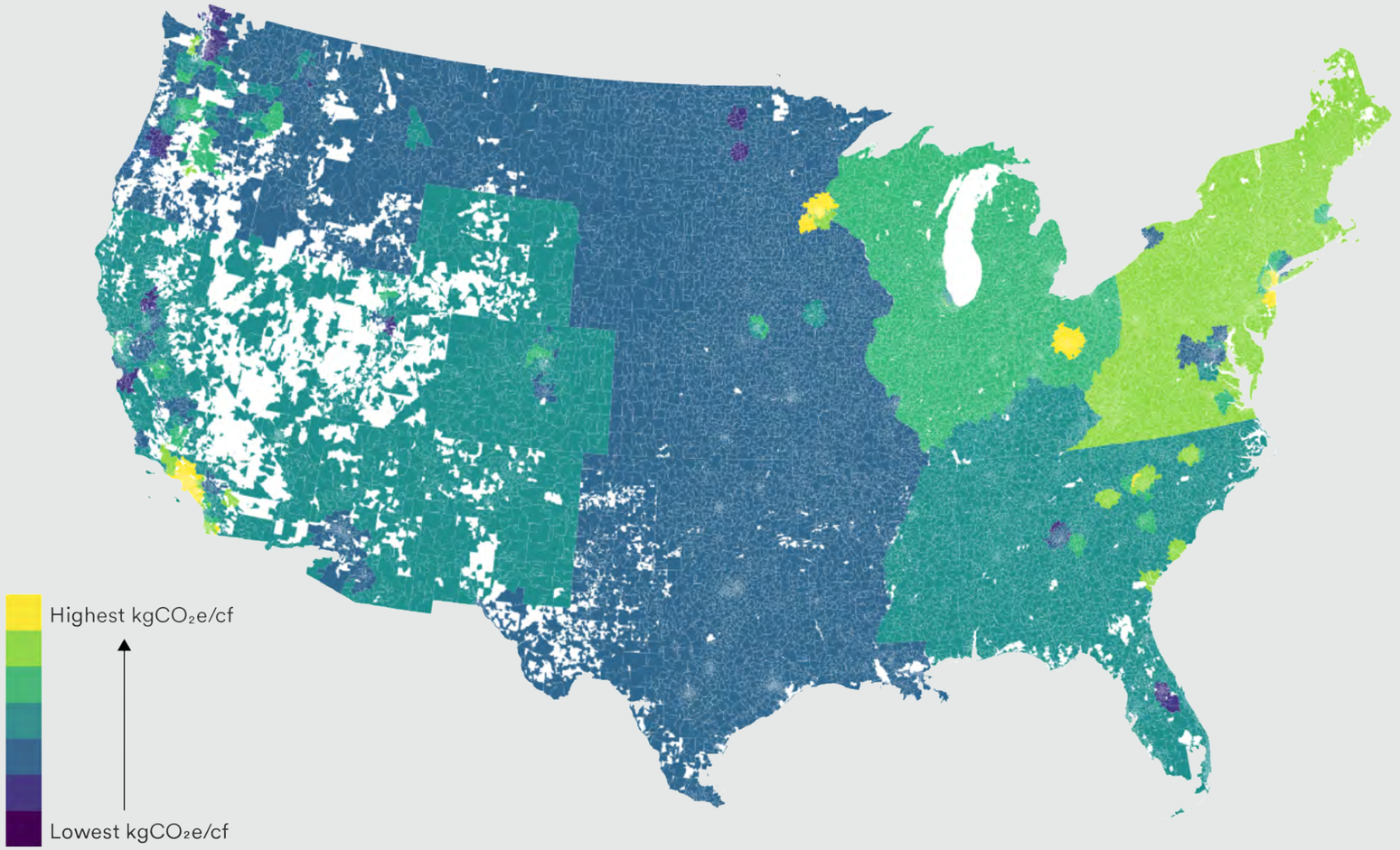
Salt Lake City

+700 tons CO_2e
(emitted)

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**

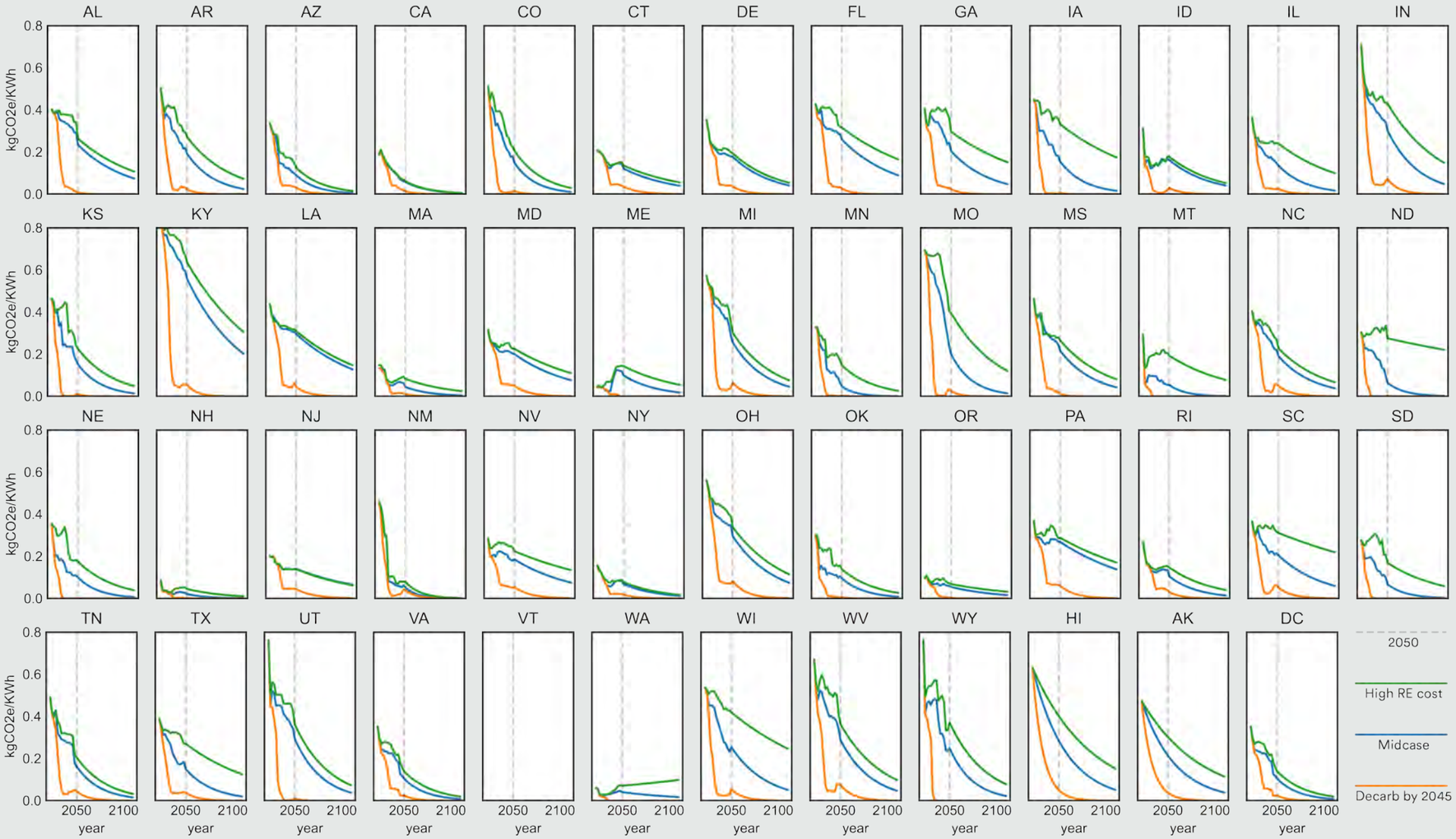
Carbon Intensity of Concrete



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

ehdd.

Energy | **Emissions vary across space and time**



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

ehdd.

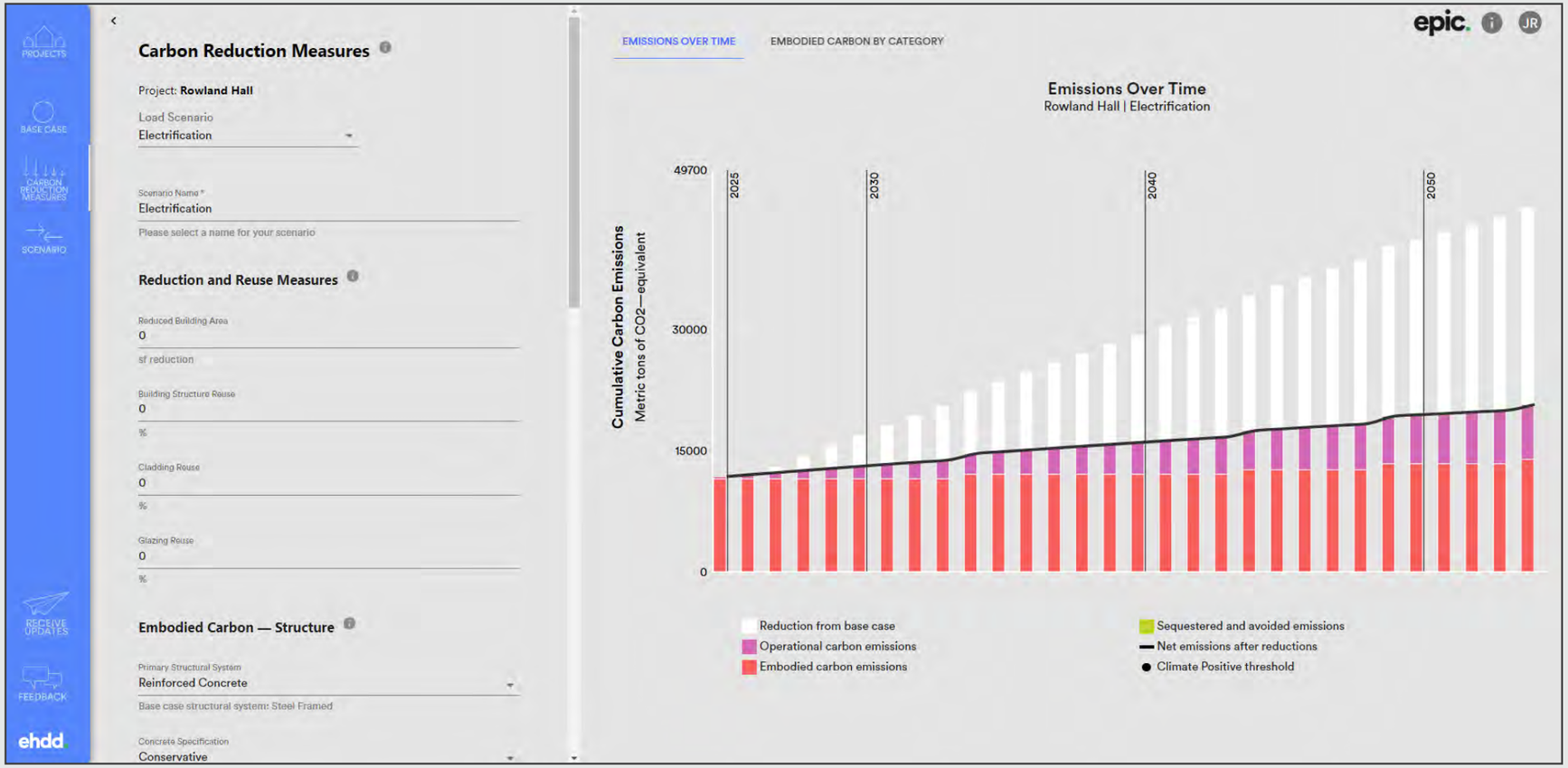
EPIC takes a “whole life carbon” view

Integrated models of embodied, operational, and landscape carbon

Carbon reduction strategies

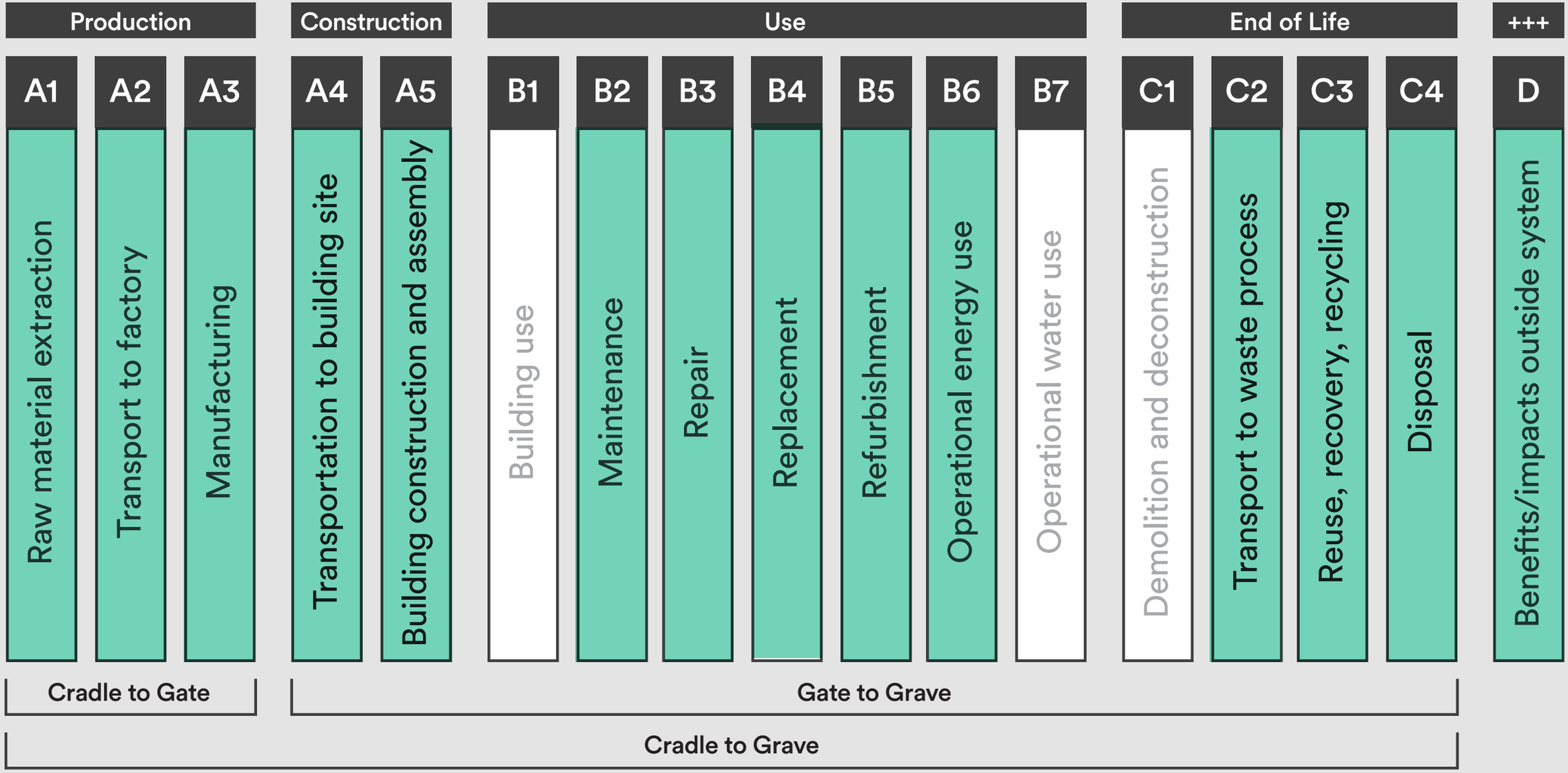
- Build less
- Reuse existing structure
- Switch structural system
- Low-carbon materials
- Longer lived interiors
- Low-carbon envelope
- Store carbon in materials
- All-electric building
- Increase energy efficiency
- Add onsite renewables
- Carbon-storing landscape

- Embodied carbon emissions
- Operational carbon emissions
- Carbon storage, avoided carbon



ehdd.

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

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

Structure

Envelope

MEP

Solar PV

Hardscape

Interior Fitouts

Landscape Maintenance

Land Use Change

Landscape

Electricity Use

Onsite Combustion

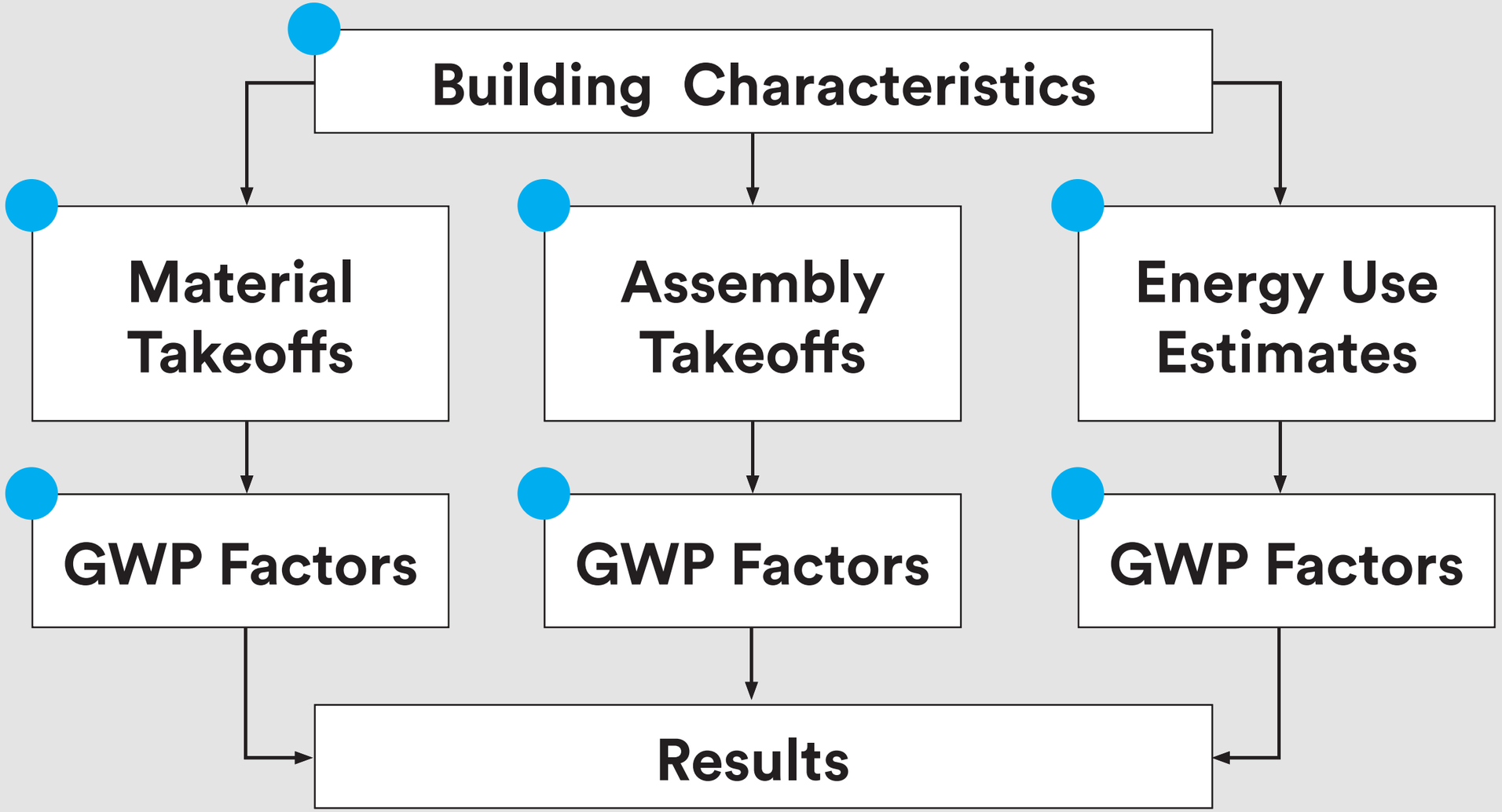
Methane Leakage

Solar PV

Refrigerant Leakage

Anatomy of EPIC

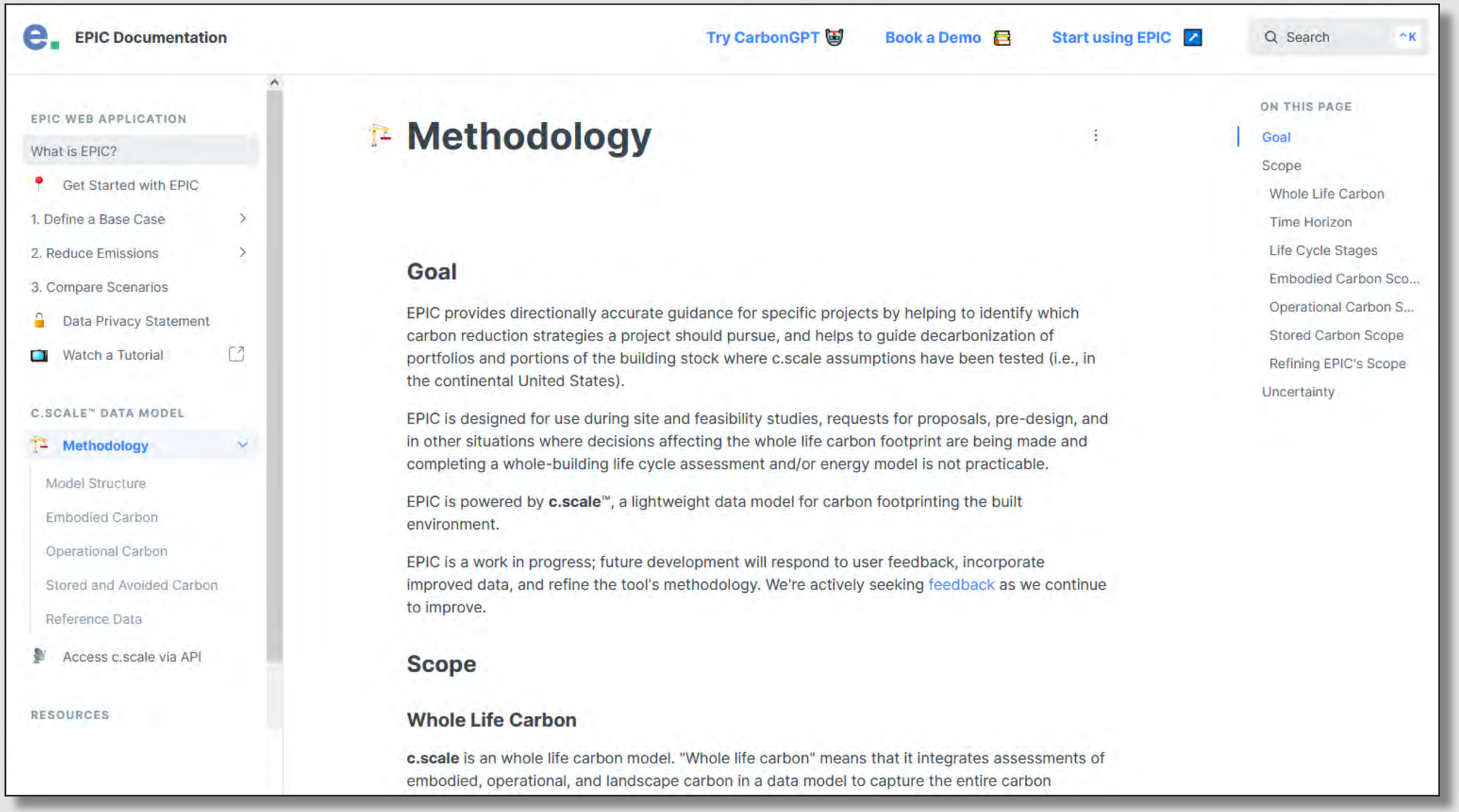
Whole carbon modeling approach



Adjust with Carbon Reduction Measures

Transparent Methodology

www.epic-docs.dev



epic.

AIA HQ Case Study

AIA National Headquarters Renovation | EHDD

The AIA National Headquarters

Project Description

196,000 sf renovation of 1970s brutalist building

EHDD's Climate Goal

Net Zero Whole Life Carbon

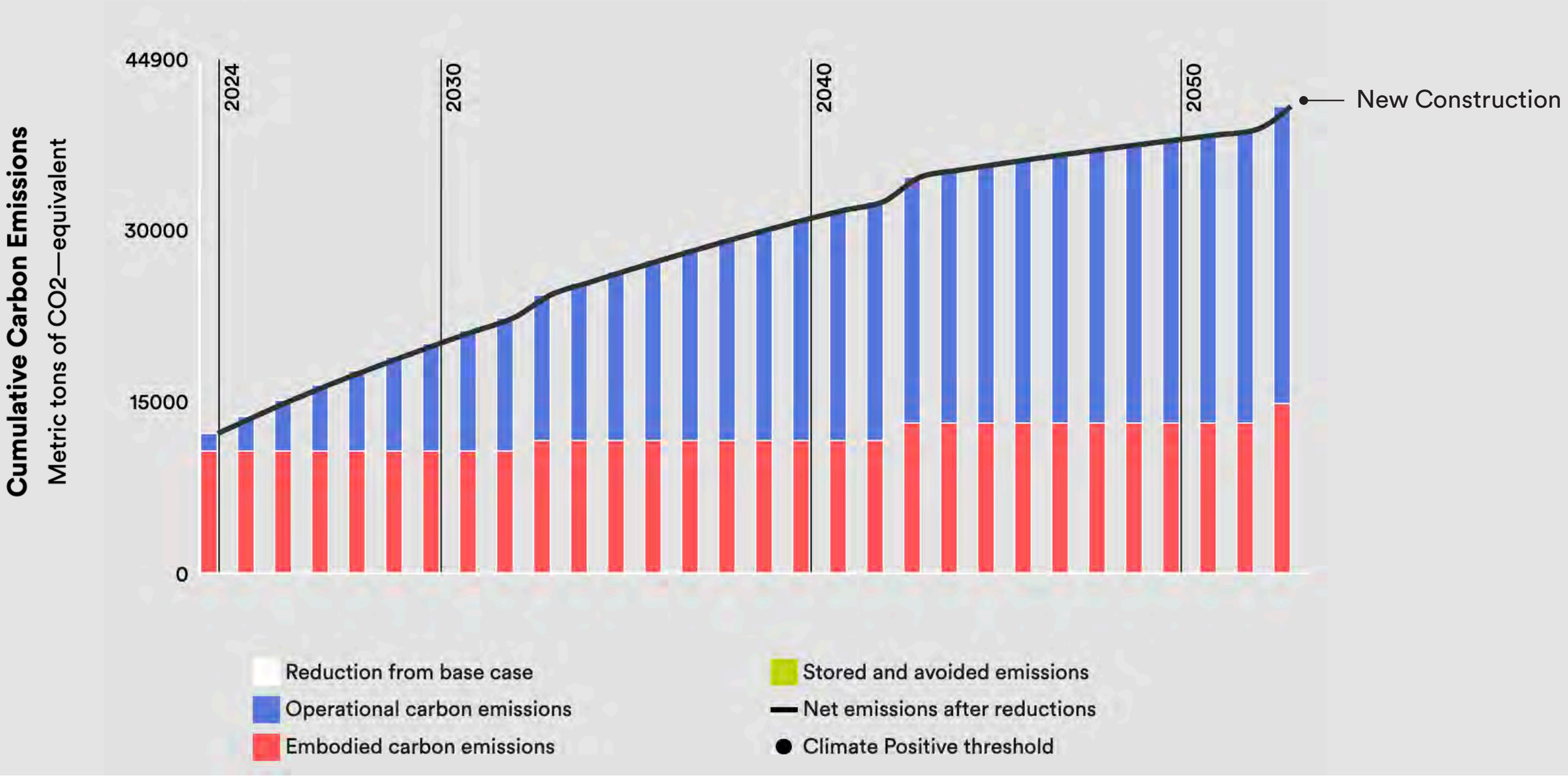
The AIA National Headquarters

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

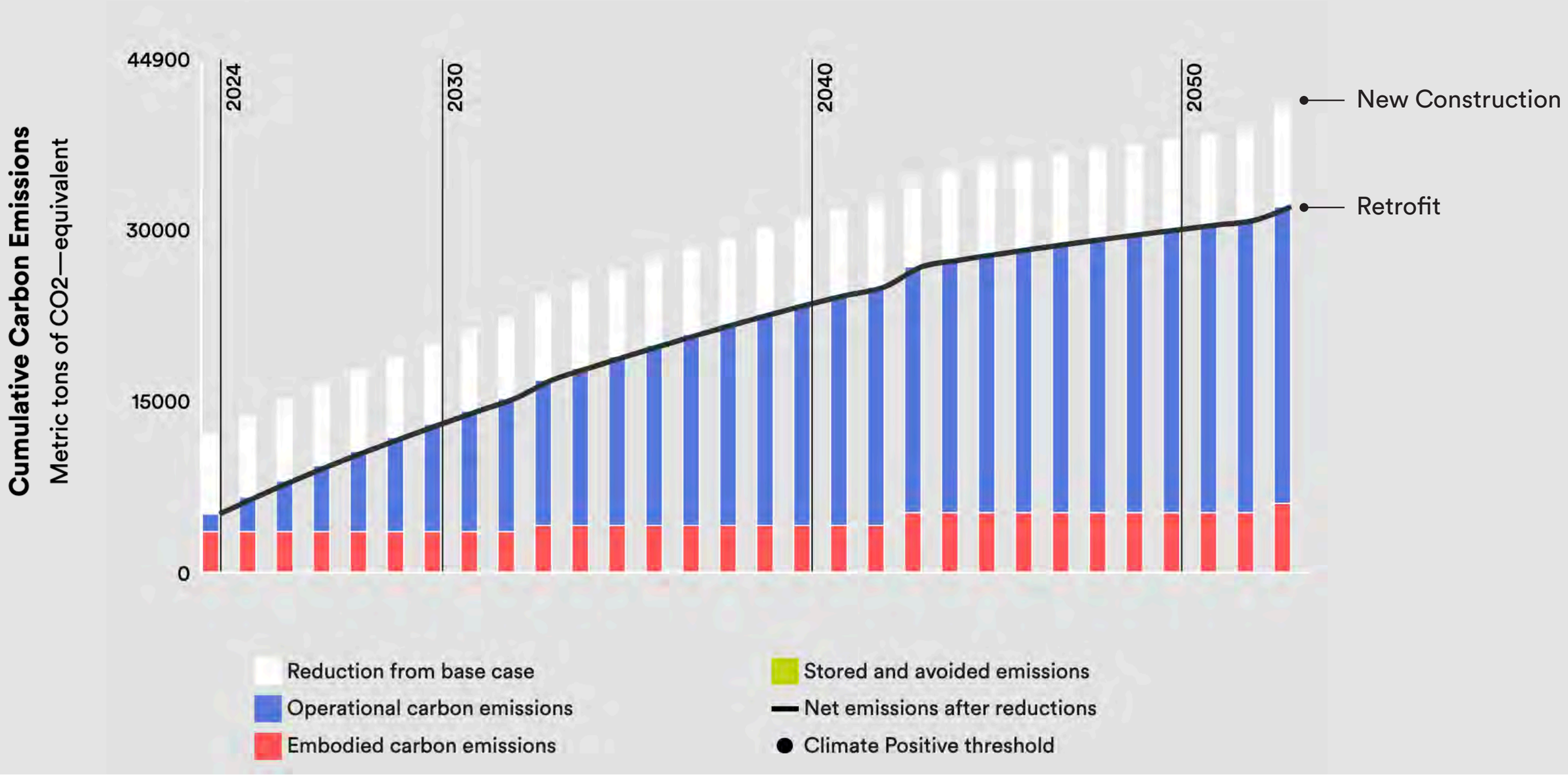
Base Case | New Construction

The AIA National Headquarters Renovation



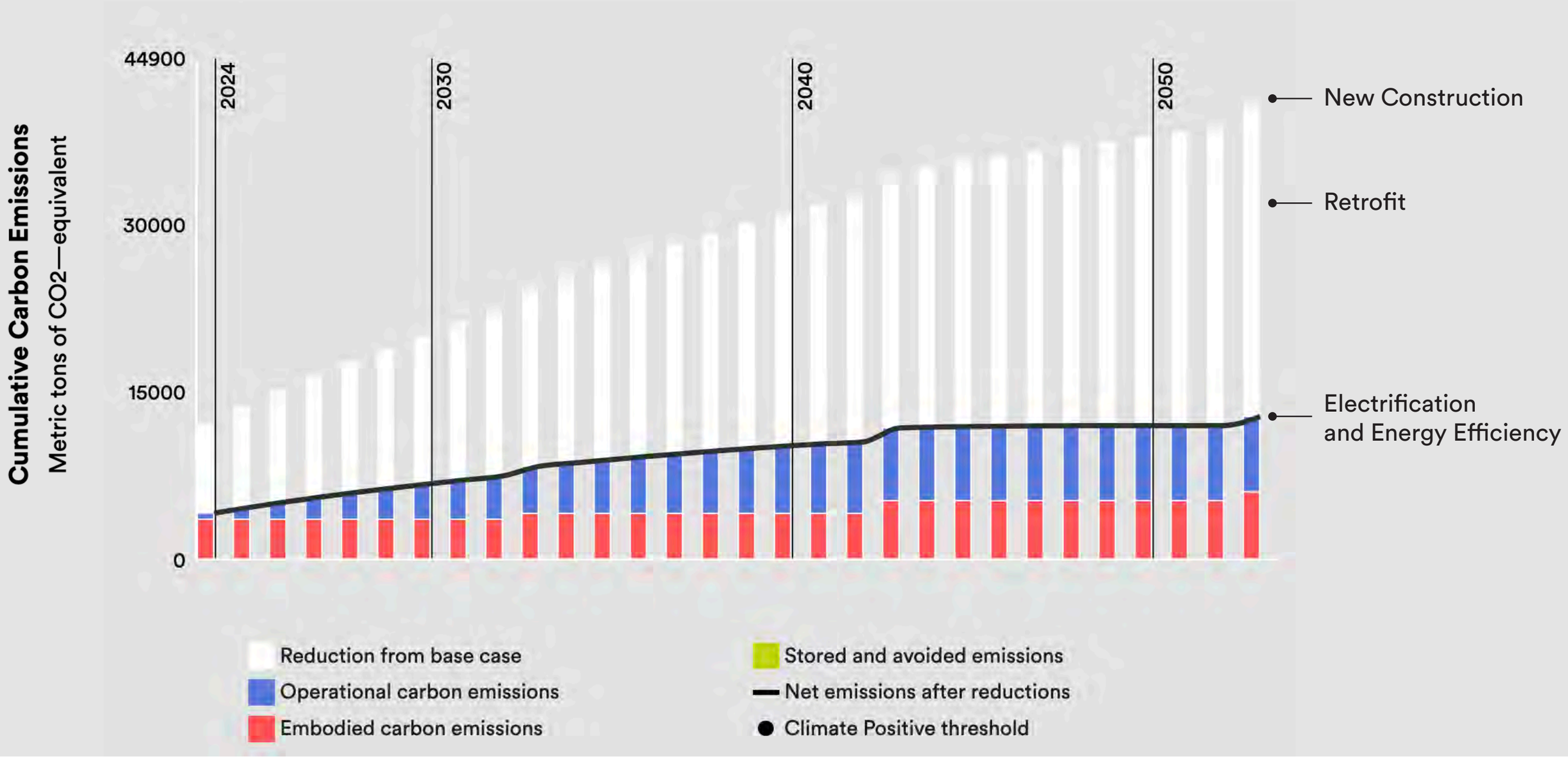
Retrofit, design, and specification of low-carbon materials

The AIA National Headquarters Renovation



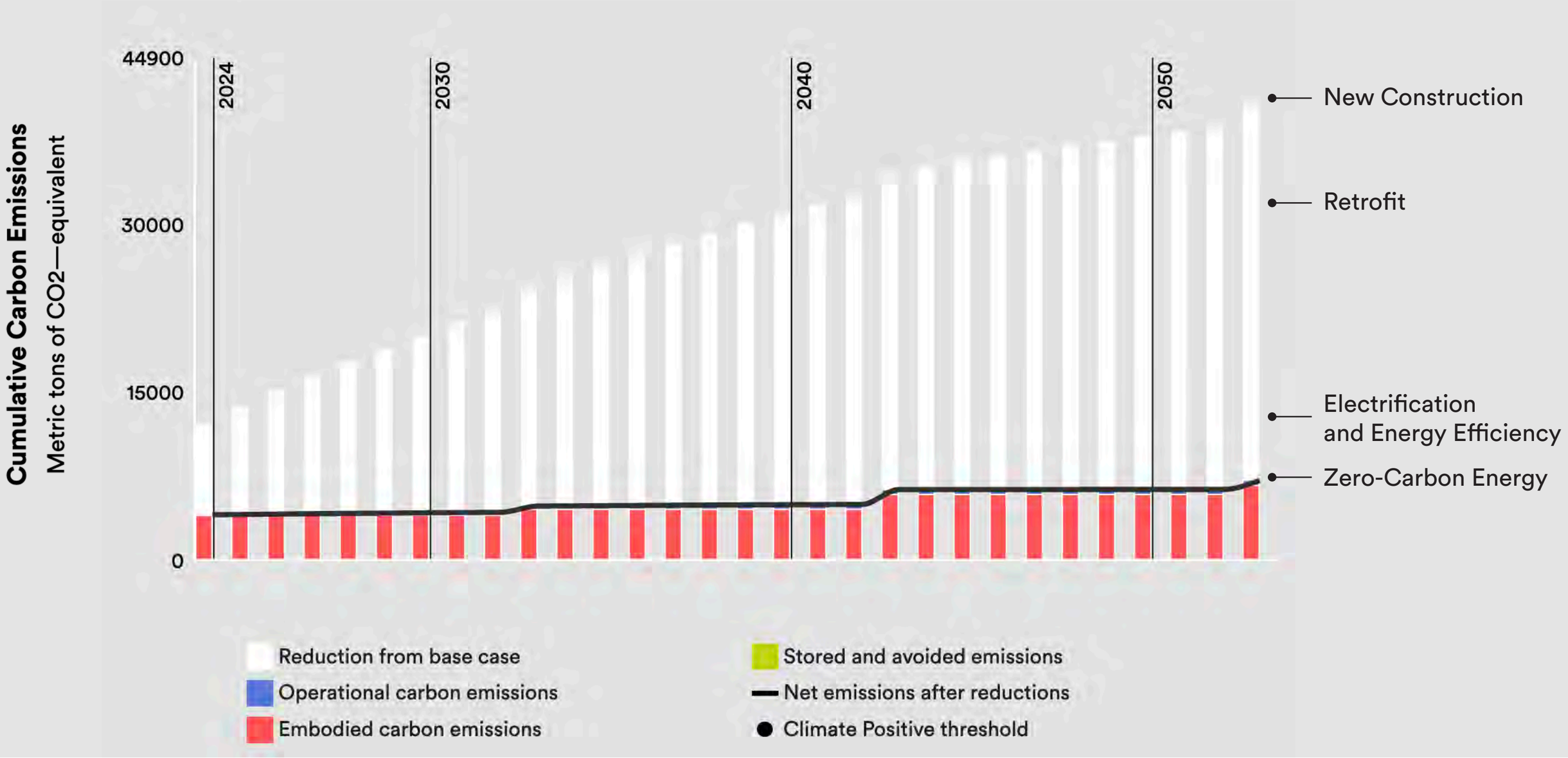
Electrification and energy efficiency

The AIA National Headquarters Renovation



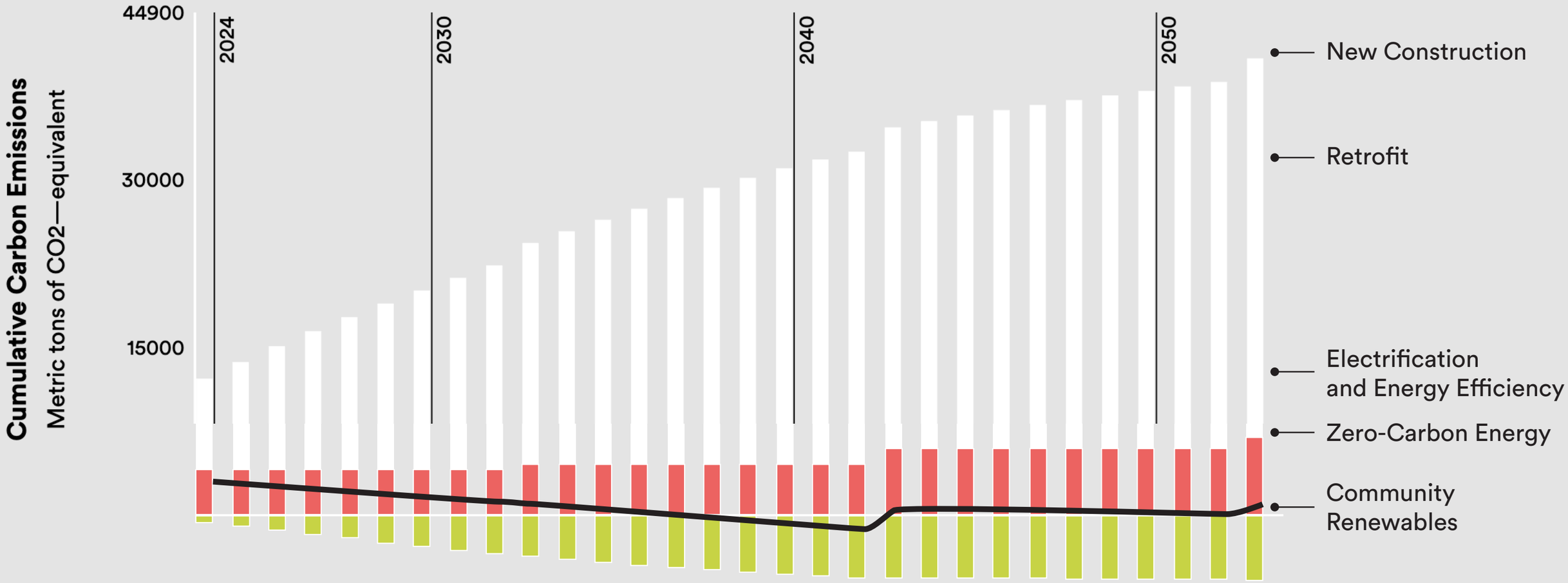
Onsite renewables and clean power purchase

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

Energy Efficiency Only

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

Clean Electrification

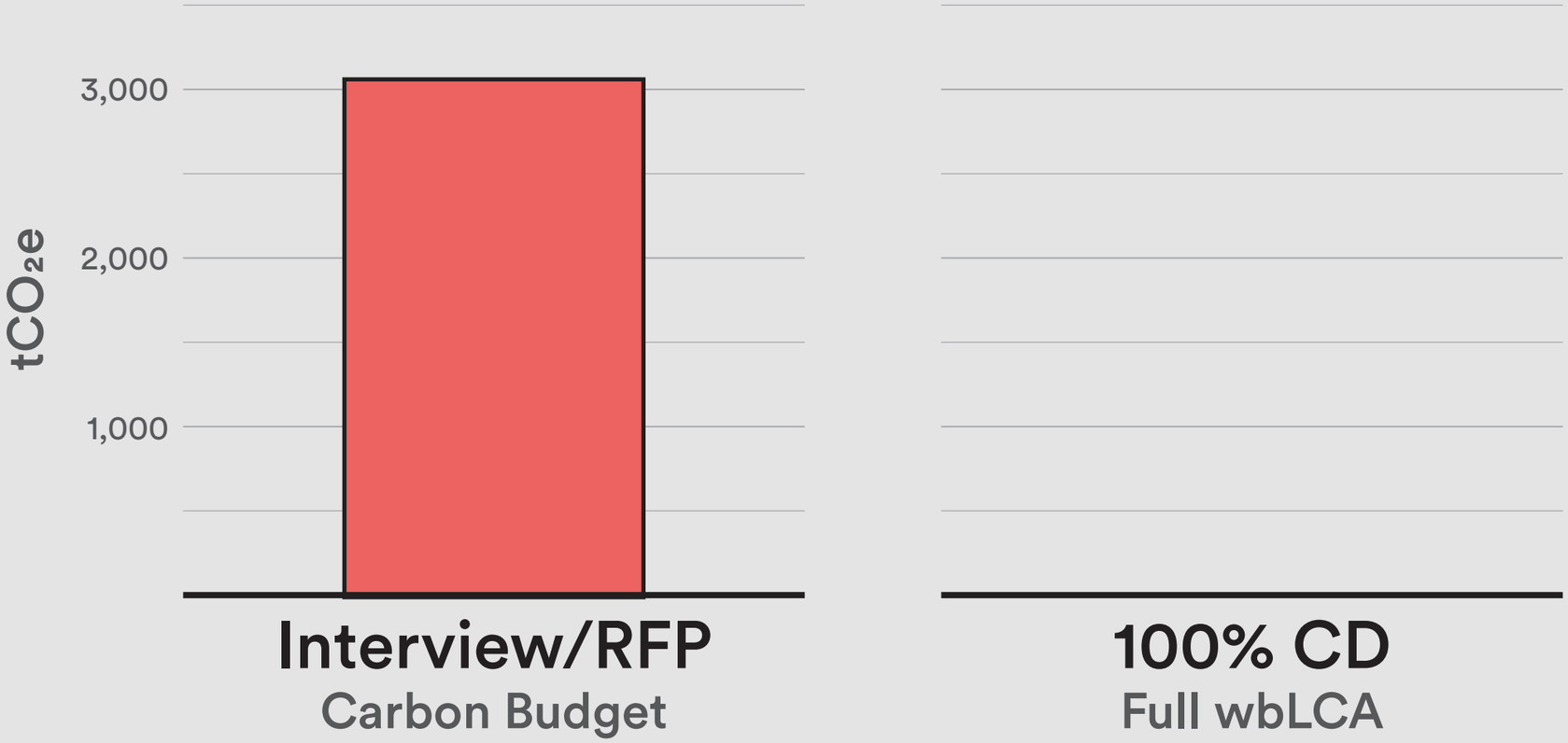
- All Electric
- EUI: 40 kBtu/sf/yr
- Embodied carbon reduction measures
- 170 kW PV array on roof
- Purchase 100% Green Power

Clean Electrification w/ Local Carbon Offset

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

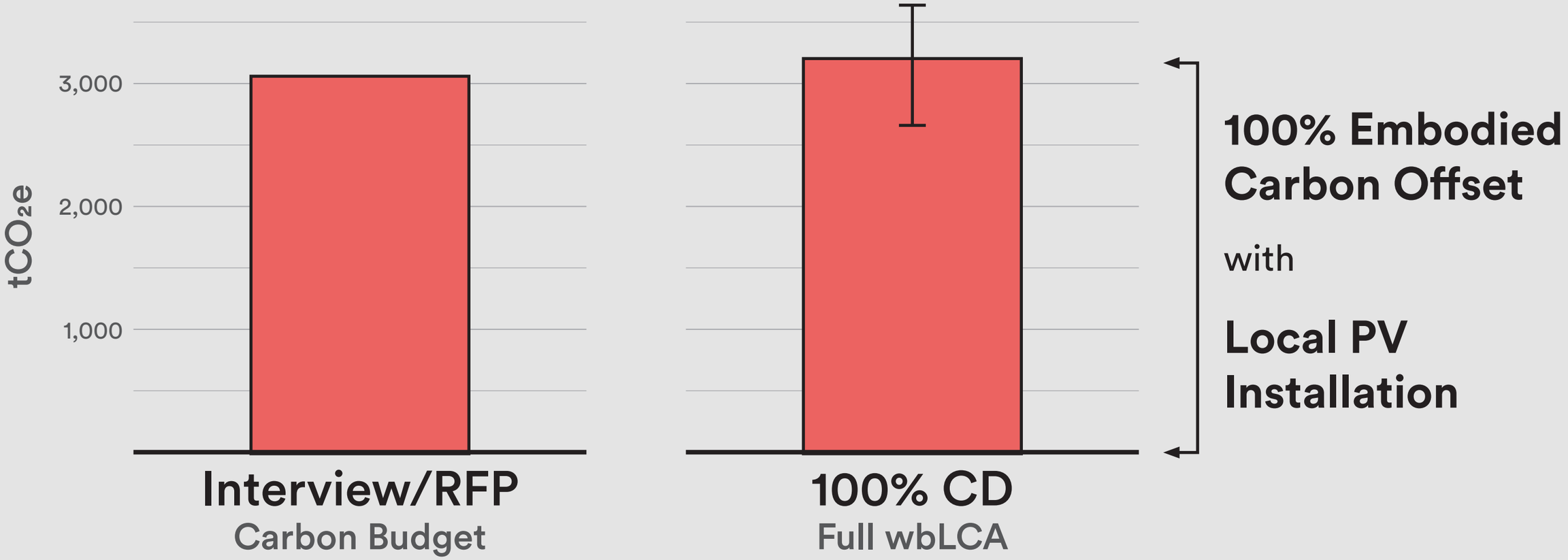
… allowed us to deliver a zero-carbon project

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