Using Whole Life Carbon Tools Early In Design to Achieve Net Zero Carbon Buildings

Three Case Studies Using the
C.Scale's EPIC Tool

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Principal, EHDD
Co-founder, C.Scale

ehdd. | c.scale™

Our Climate Positive Commitment

Electrify Everything

No on-site fossil fuels

Maximize efficiency and PV

Design to use energy when it is clean

Decarbonize Materials

Reduce concrete and steel impacts

Design systems and landscape for carbon sequestration

Seek deep material innovation

Reimagine What Exists

Design transformation for existing buildings

Avoid new embodied emissions

Retrofit for high performance

Resilience For A Change

Recognize risks of a changing climate

Design robust, passive, localized systems

Integrate battery-PV in microgrids

Leadership Through Advocacy

Speed and scale are essential

Support advanced policy through real world perspective

Form partnerships to promote change

C.Scale Take a Whole Carbon View

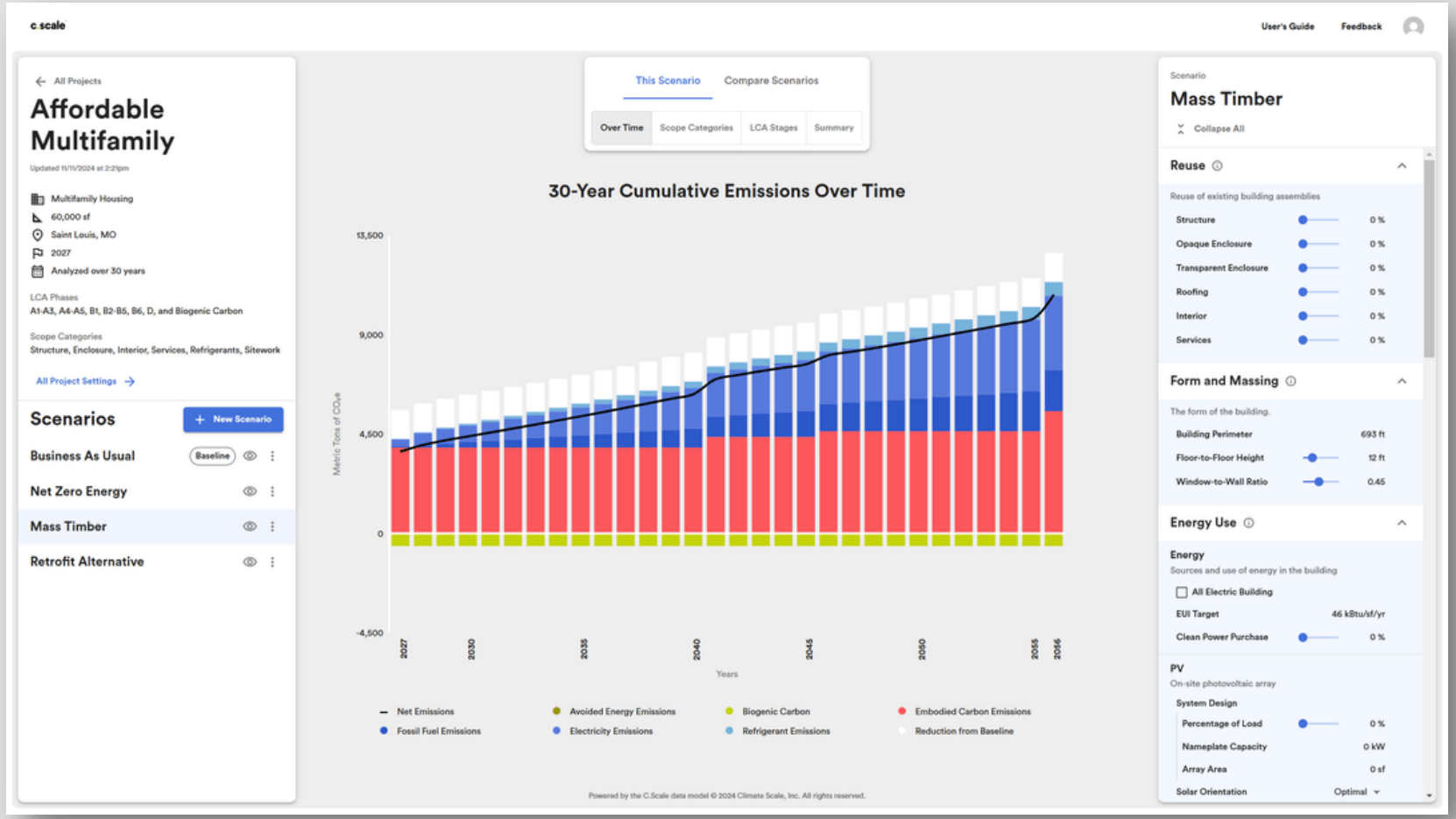
Combining Estimates of Embodied, Operational, and Site Carbon

Go to
https://www.cscale.io/
for open access

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

- Material-related carbon
- Energy-related carbon
- Carbon storage



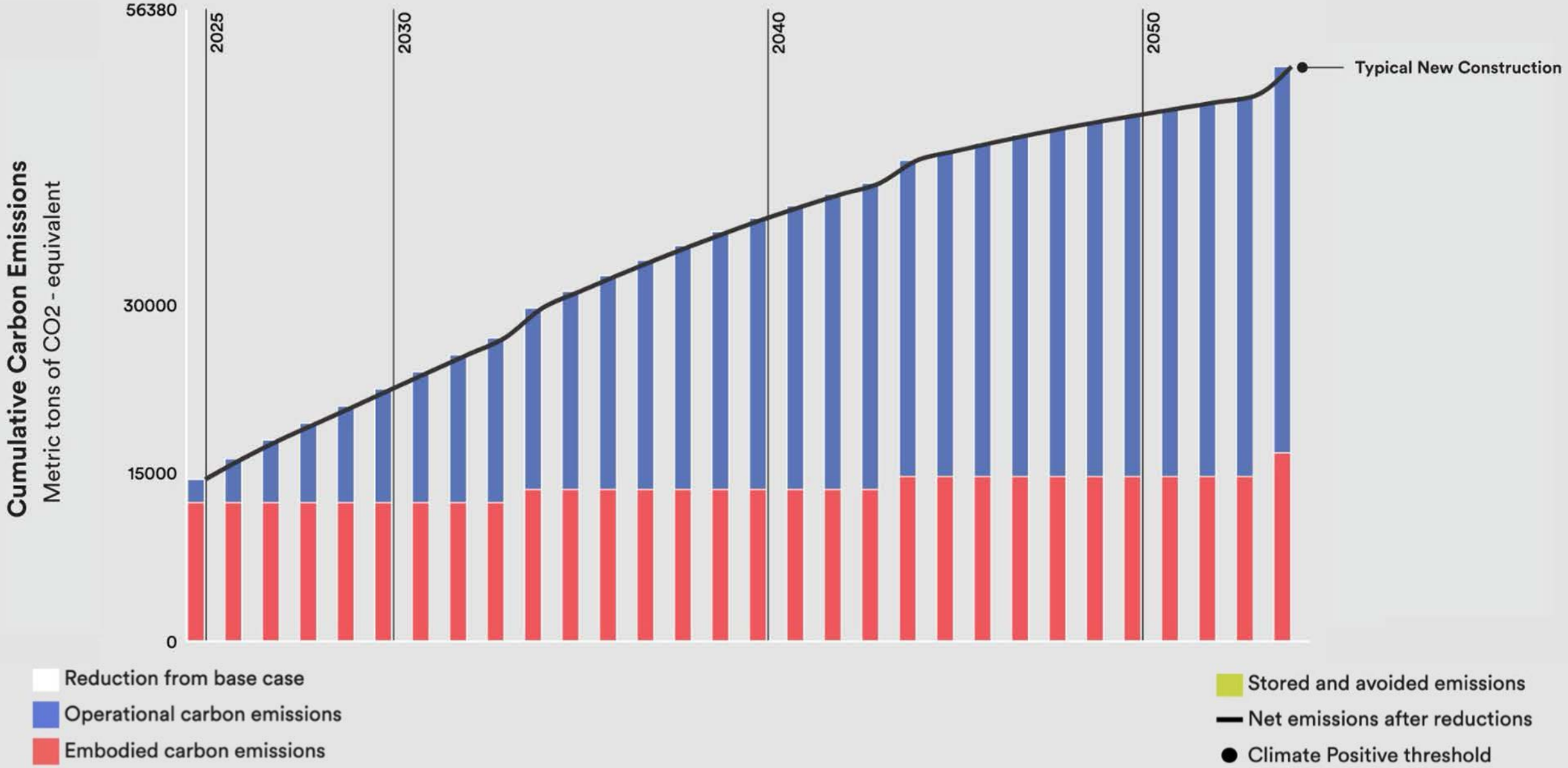
Case Study

AIA National Headquarters:
The first fully decarbonized major renovation in the U.S.


1735
THE AMERICAN INSTITUTE OF ARCHITECTS

Base Case | Typical New Construction

The AIA National Headquarters Renovation



Equitable & Scalable

STEPS TO DECARBONIZATION

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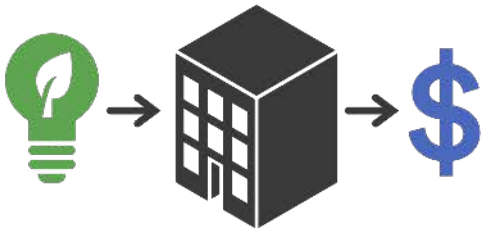

Push energy efficiency to cost effective limit

Equitable & Scalable

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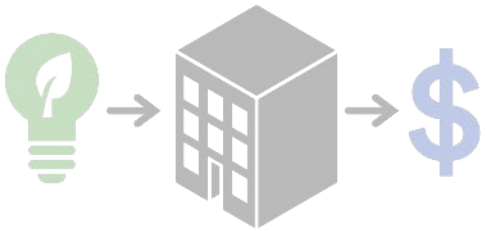

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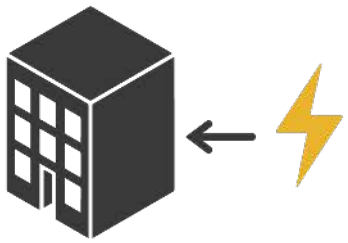
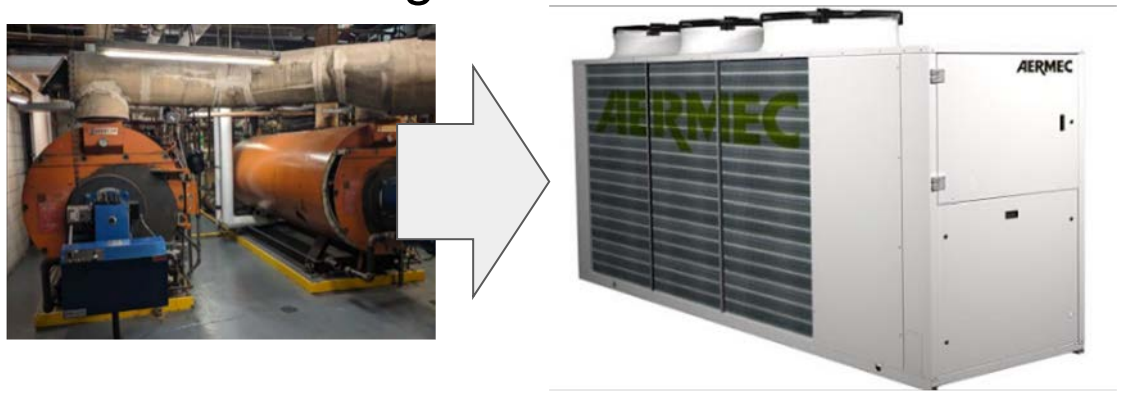


Electrify all building systems

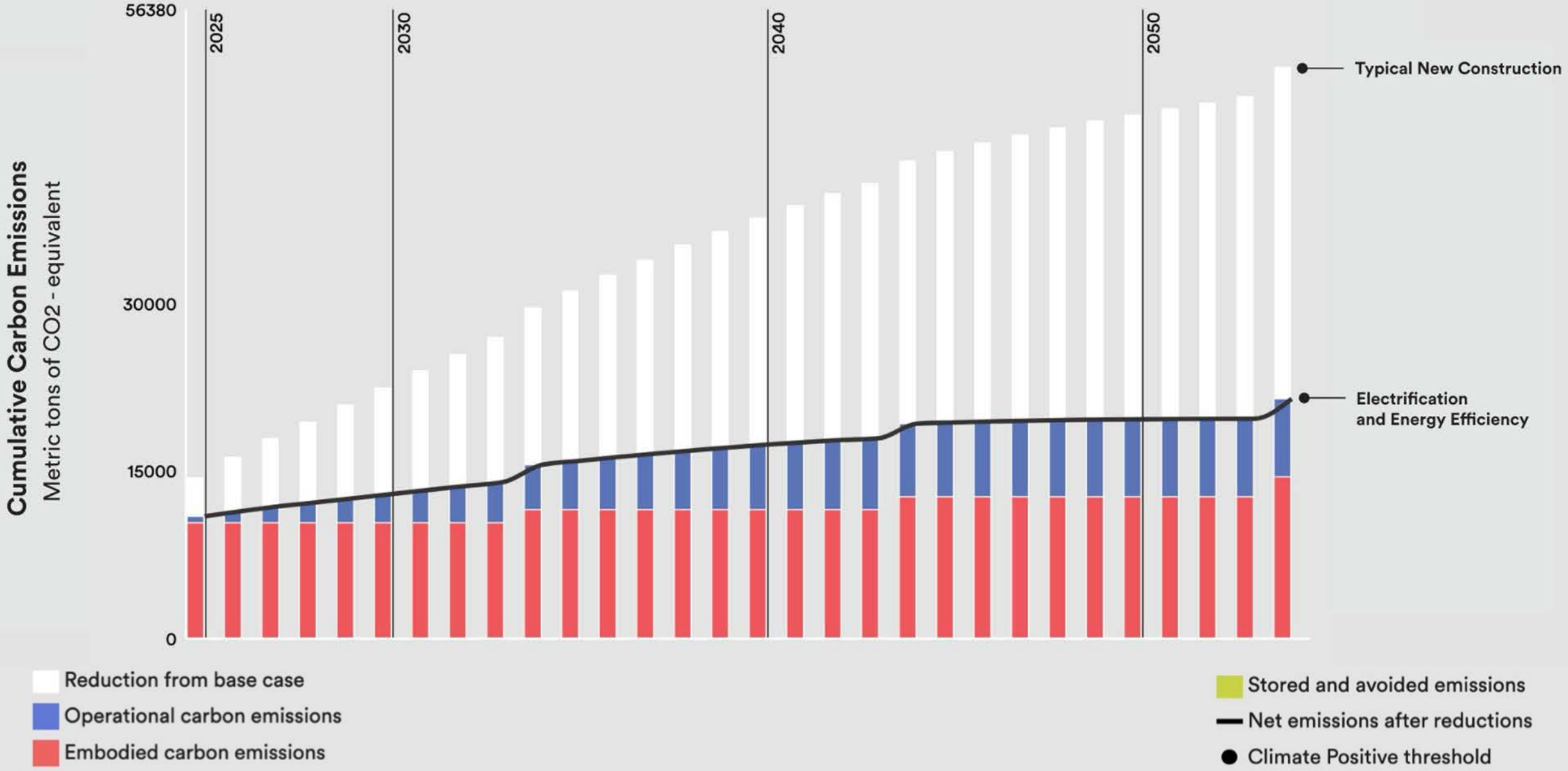
Heat Pump Domestic Water Heating

Heat Pump Heating Hot Water



Energy Efficiency & Electrification

The AIA National Headquarters Renovation



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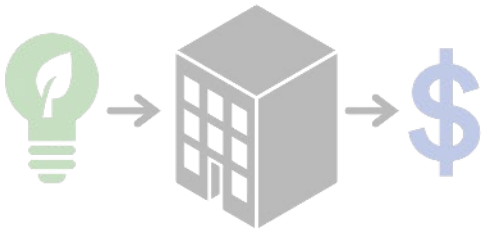

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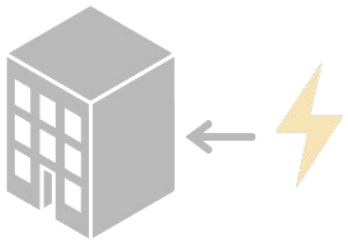

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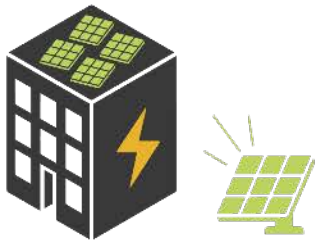


Serve building with 100% renewable energy (mix of onsite and offsite)

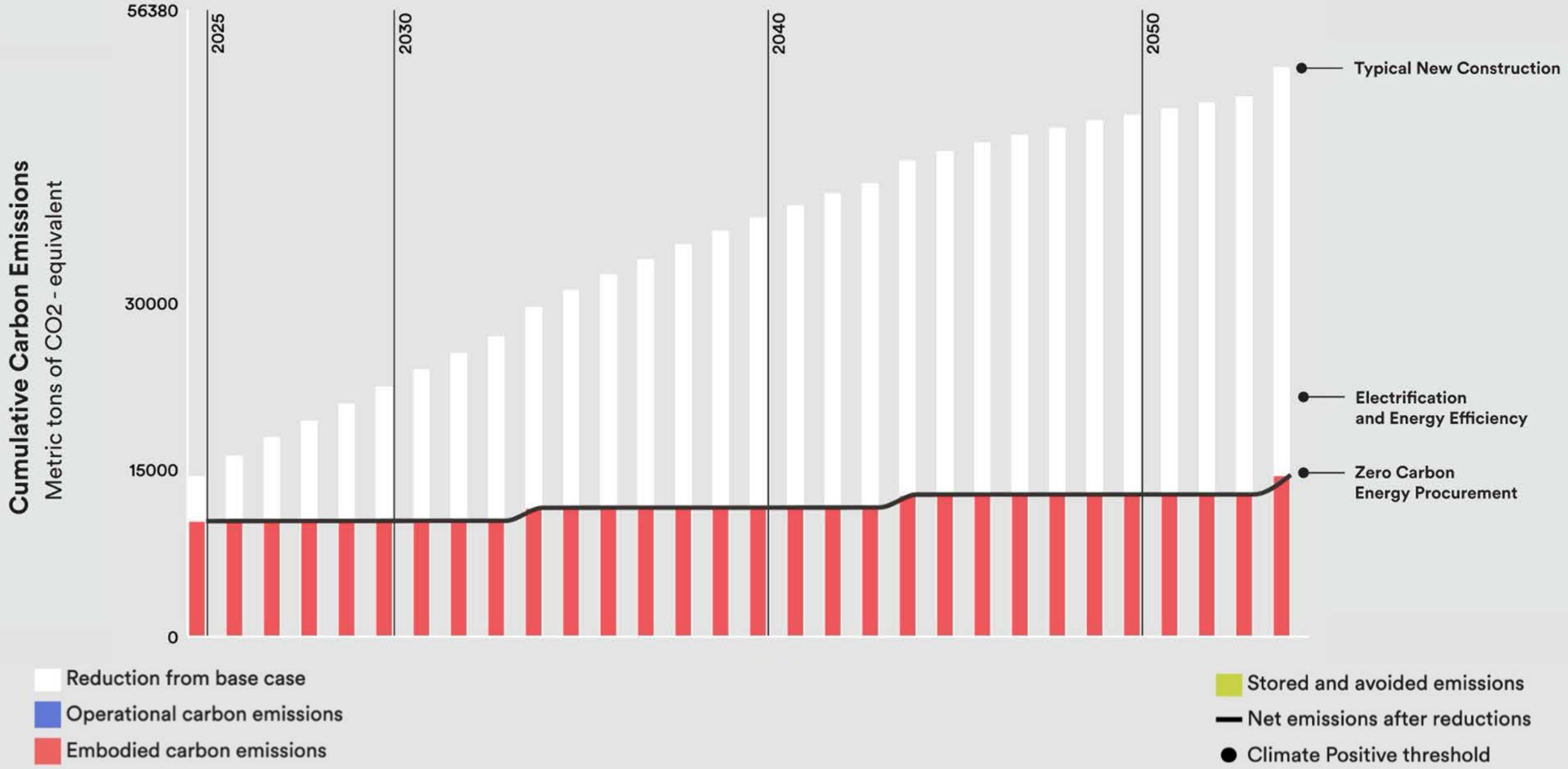
90% Off-site Renewables

CleanChoice ENERGY®

DC POWER CONNECT

Zero Carbon Energy Procurement

The AIA National Headquarters Renovation



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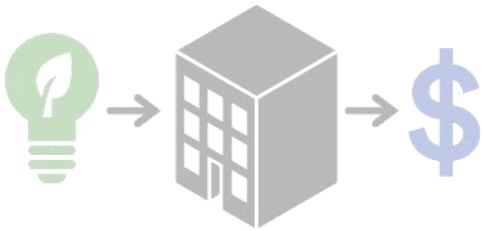

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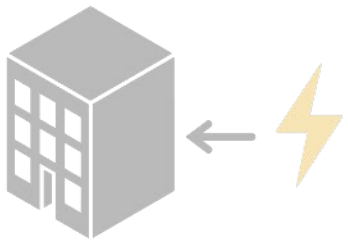

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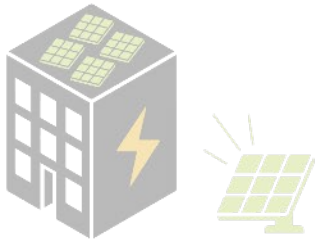

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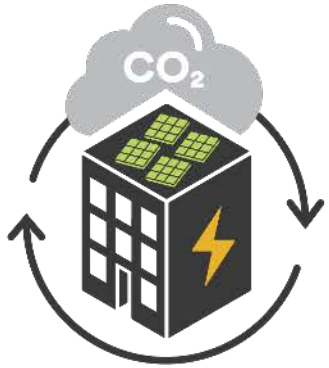
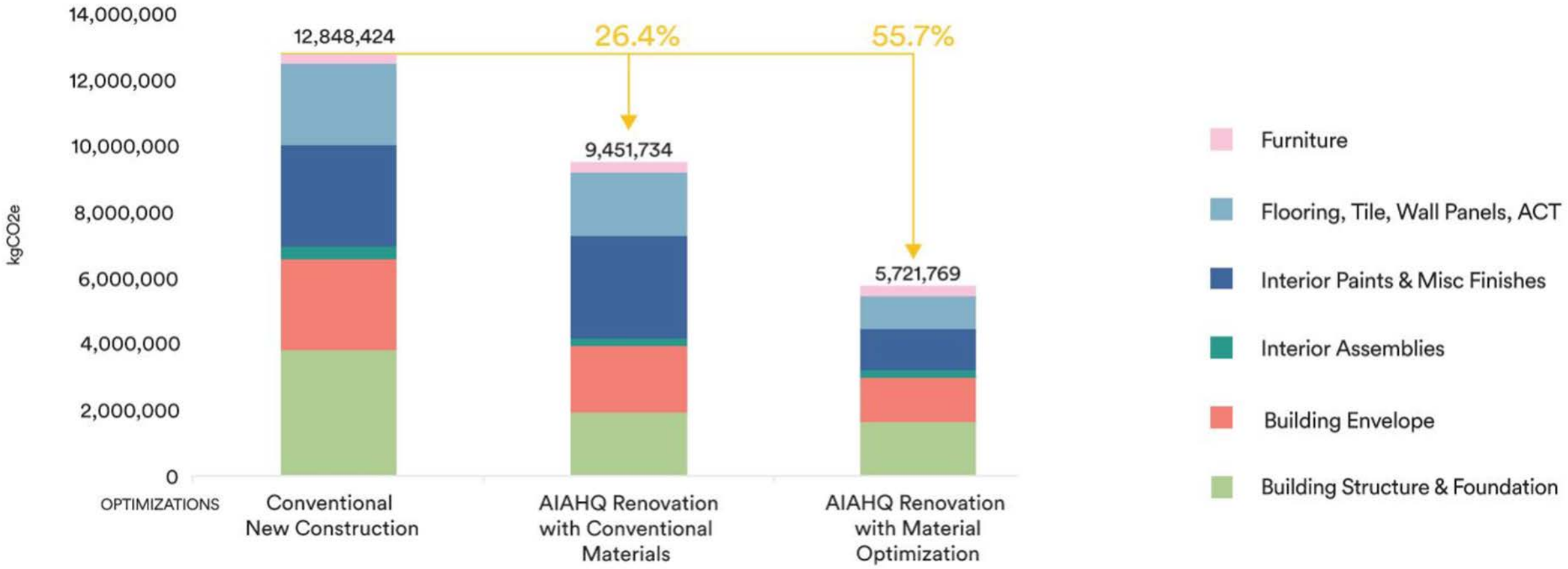


Transform existing building through low carbon renovation

LCA Analysis

Scenarios



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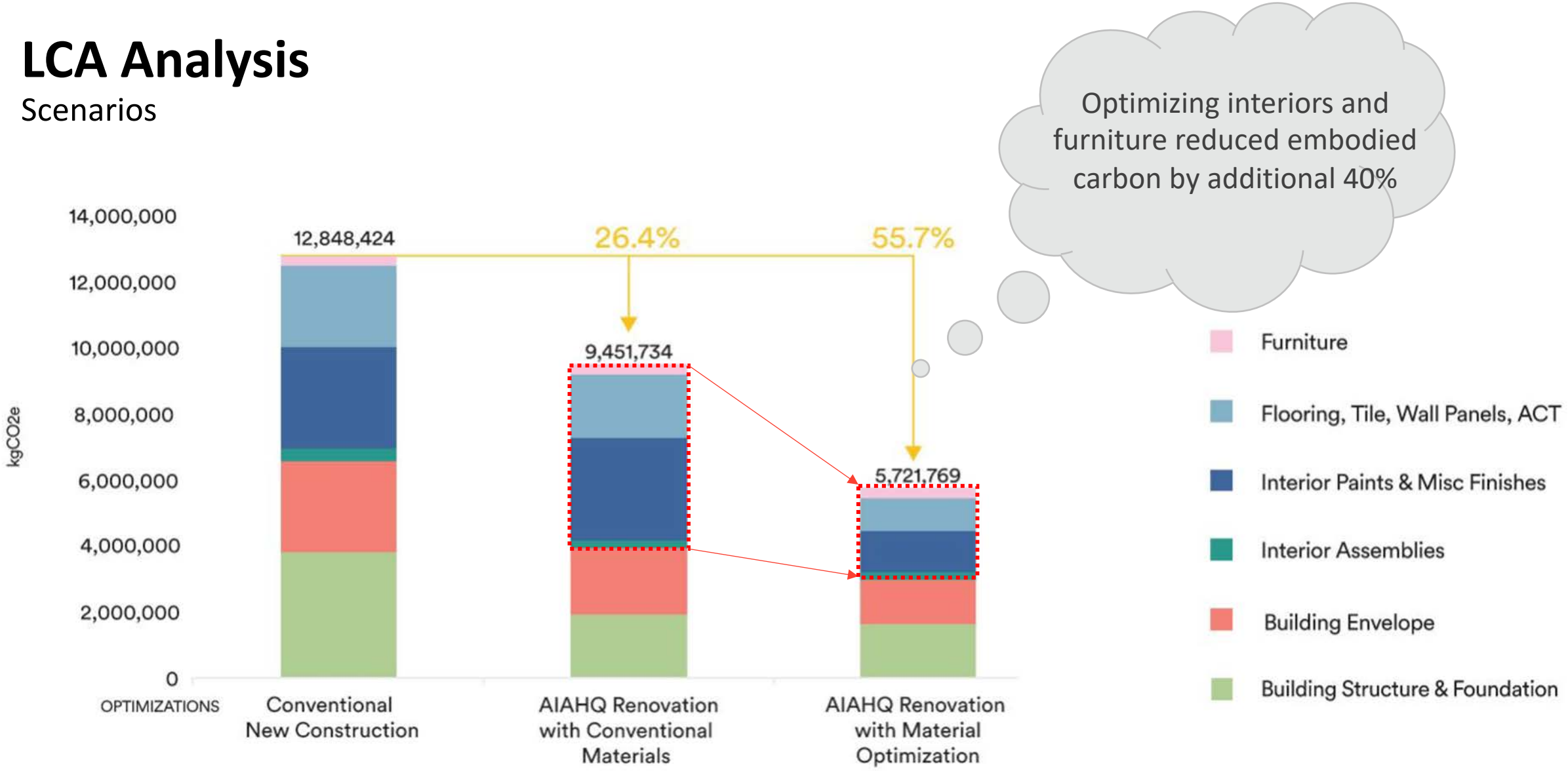
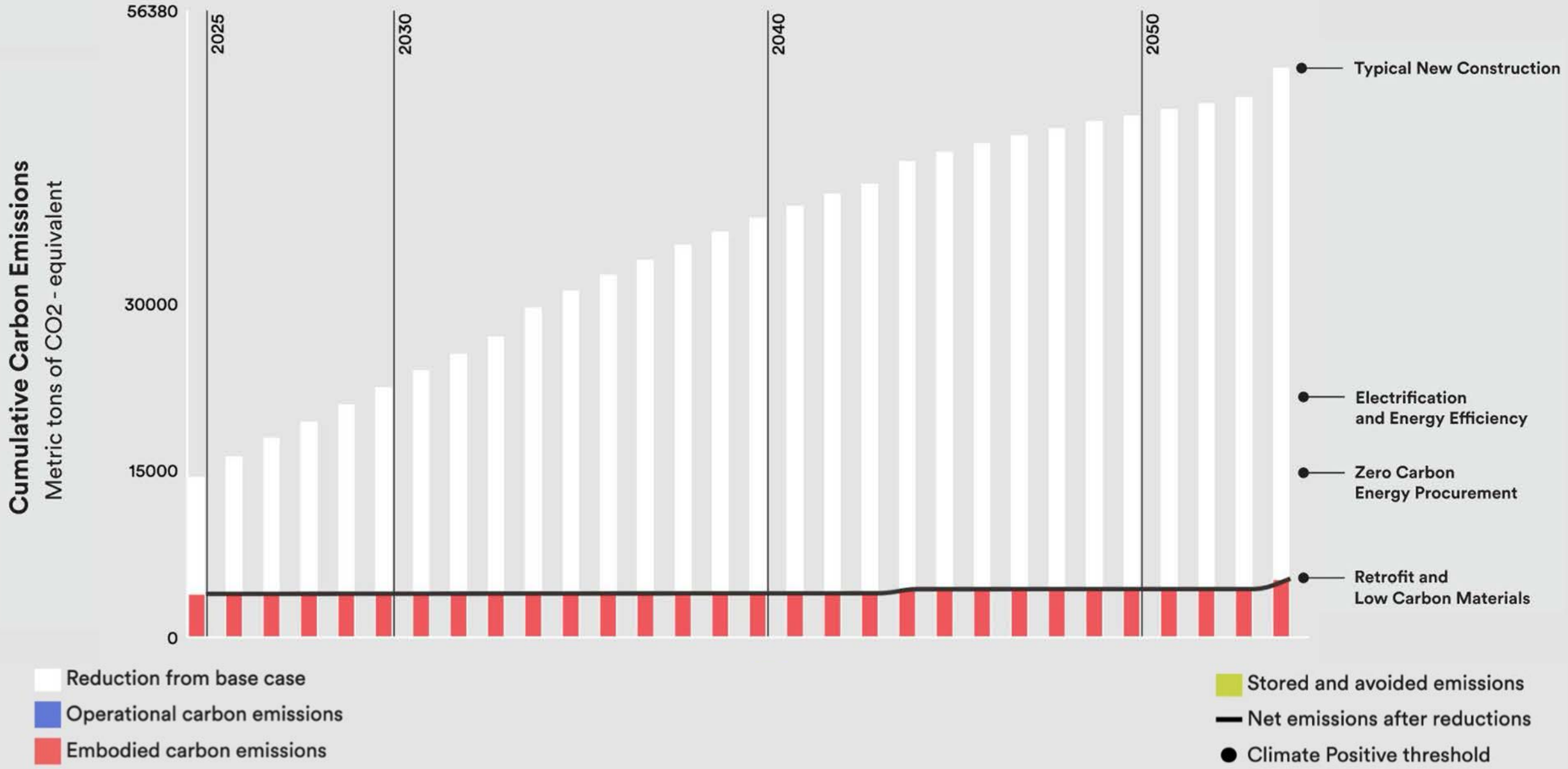


Building Retrofit | Low Carbon Materials

The AIA National Headquarters Renovation



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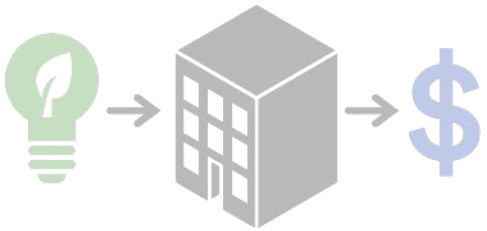

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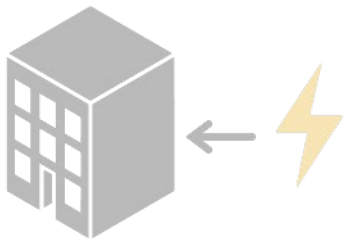

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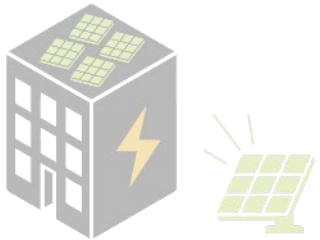

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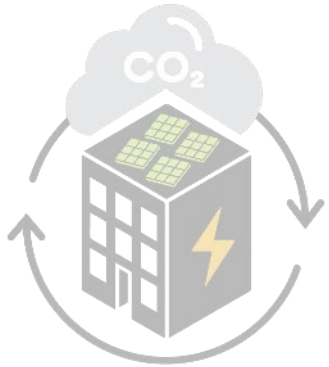

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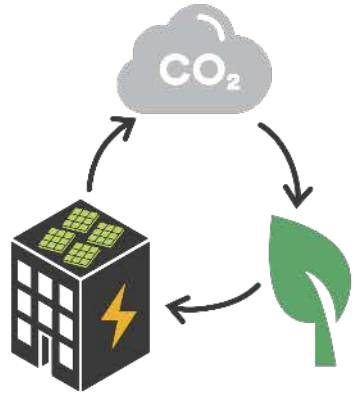
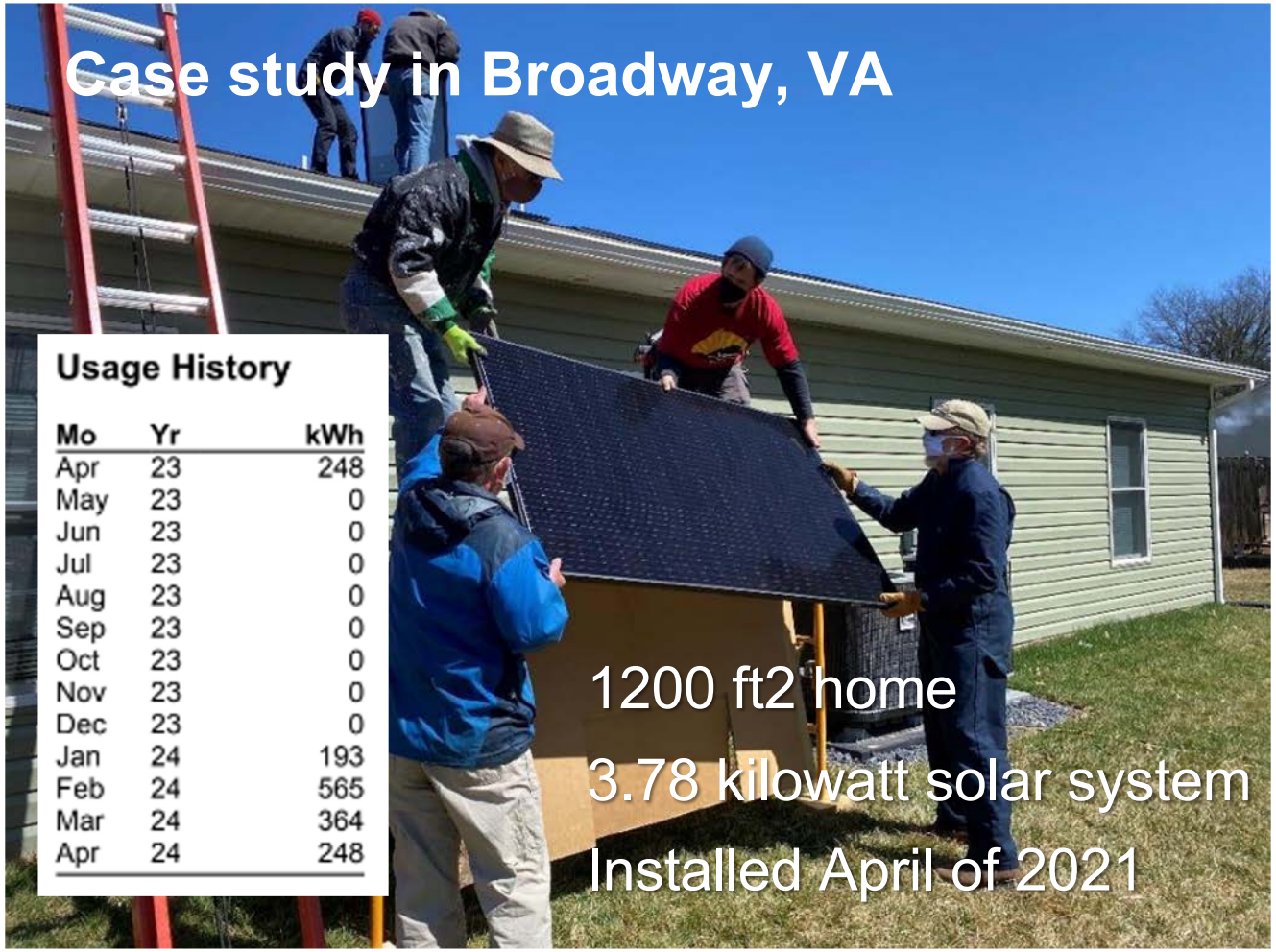


Offset remaining embodied carbon through a socially engaged community offset project

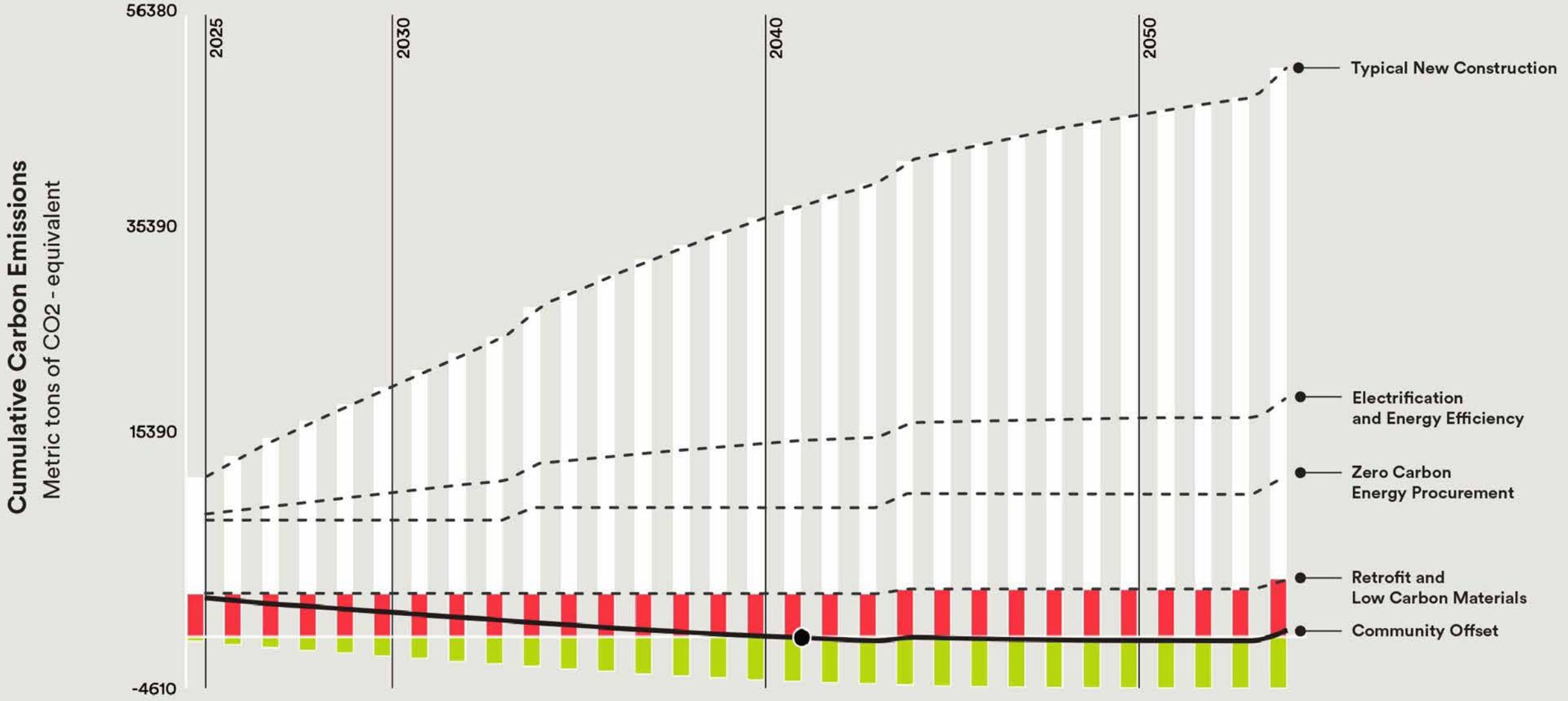
Embodied Carbon Offset with Habitat for Humanity

1. EPIC calcs determined total embodied carbon of 3,057 tCO_2e
2. 360 kW array used over 15 years avoids grid emissions equal to embodied carbon
3. About 900 panels, or 72 homes with 5 kW arrays
4. AIA donated $500k (Cost = $1.25/W) in equipment & management of solar installations on Habitat for Humanity homes
5. Benefits to Homeowner:
   - Annual savings ~ $925
   - Resilience and Energy Cost Stability



Community Offset

The AIA National Headquarters Renovation



Case Study #2

Land Based Sequestration
Connecting Person
to Land and to Climate

Towards Net Zero Whole Life Carbon

Sustainability Vision

Regenerative Agriculture

Which practices make sense for the Ranch?

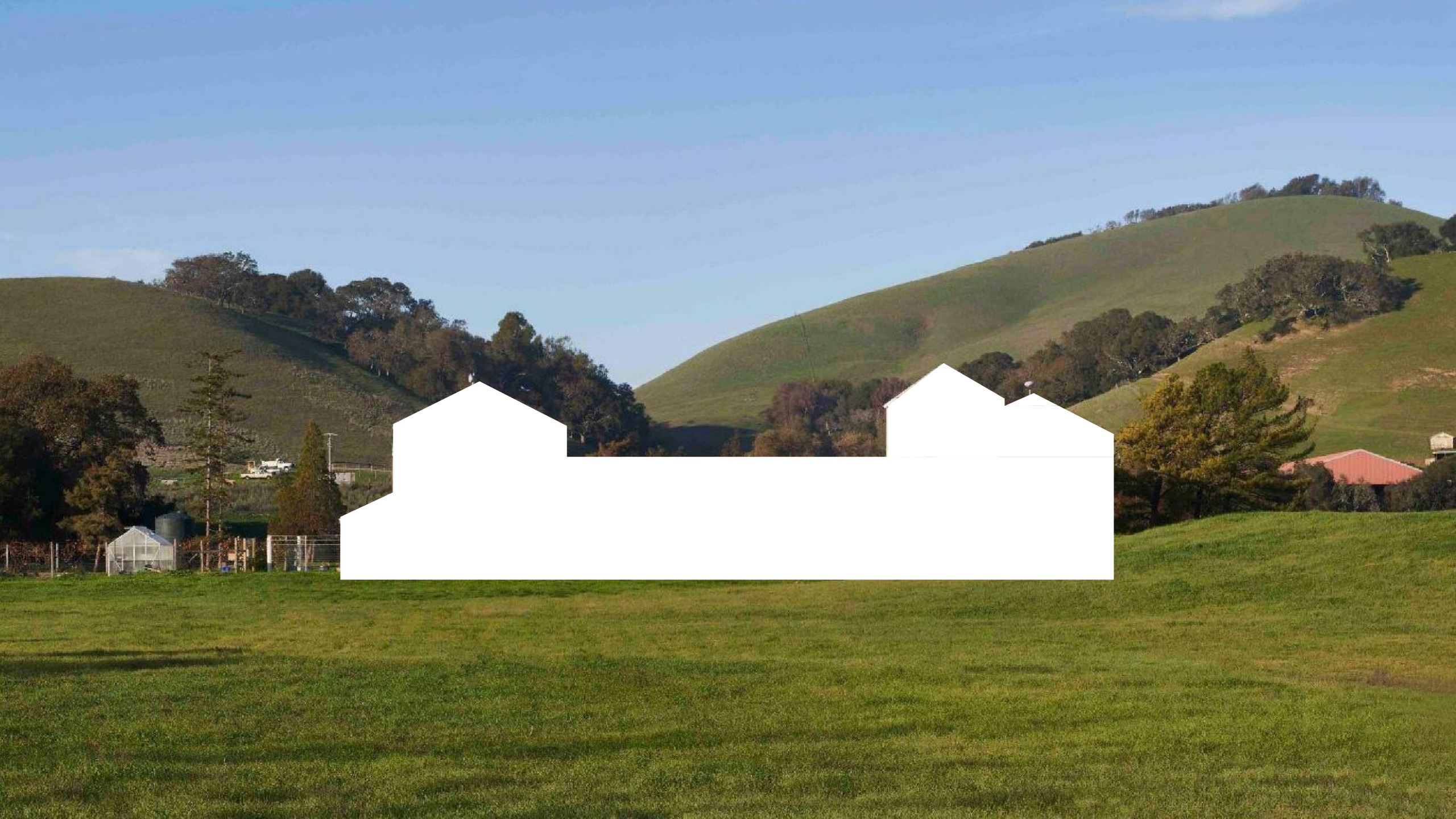
- Compost inoculants
- Mulch/manure addition

} Already tested this! We'd like to do more

- Reduced tillage — A lot of work needs to be done in this area -- great opportunity to support research efforts
- Riparian restoration — Working w/ WRA on grant funding
- Livestock/crop integration
- Alley cropping
- Hedgerows
- Silvopasture — This is planned for the future
- Multispecies grazing — Future chicken integration likely
- Adaptive grazing — vs. rotational? Already in place
- Use no synthetic pesticides or fertilizers — Already in place
- Rangeland seeding — Have done some of this; a longer-term effort
- Biochar — Very curious about this!
- Crop rotation — Interested in doing this in the future
- Cover crops — Already in practice

A system of crop/livestock production that recognizes that natural ecosystems are complex networks that support farms and societies in multiple ways.

- Acknowledges the complexity and interconnectedness of ecosystems
- Context-dependent: Recognizes the unique natural resource characteristics of each farm
- Works to improve/restore natural ecosystems' ability to provide vital services
- Integrates human beings: social outcomes such as farmer wellbeing, farmer innovation, and social connections



Sustainability Vision

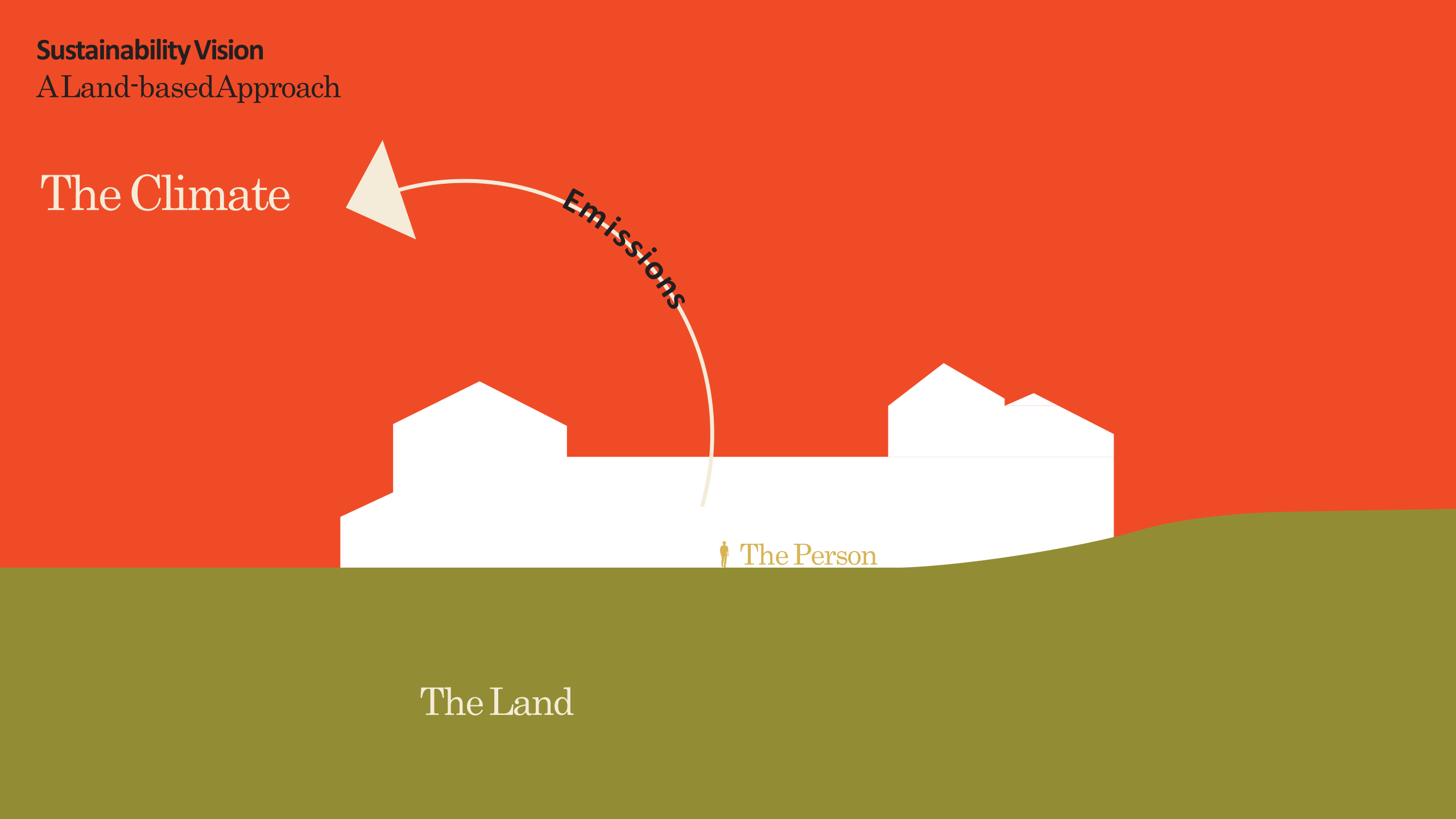
A Land-based Approach

The Climate

The Land

Sustainability Vision

A Land-based Approach



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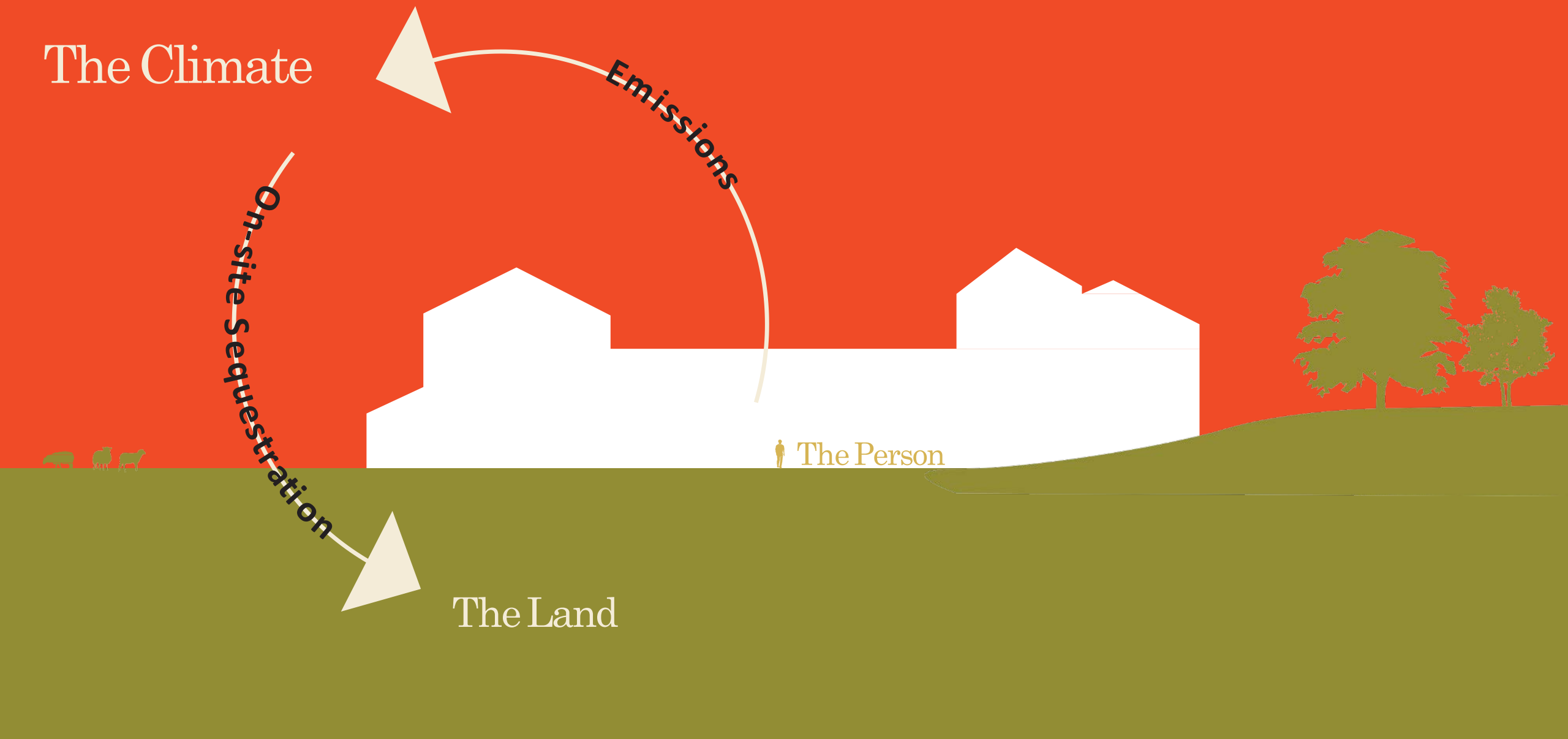
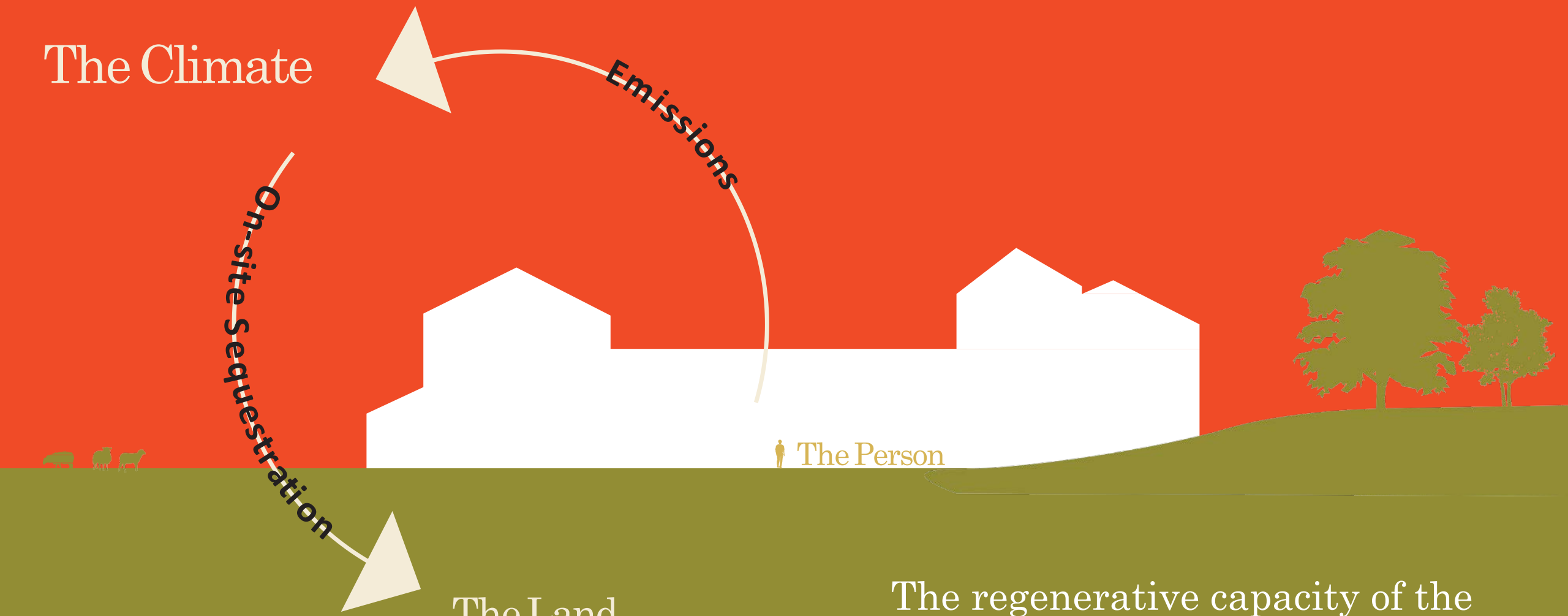
A Land-based Approach



Sustainability Vision

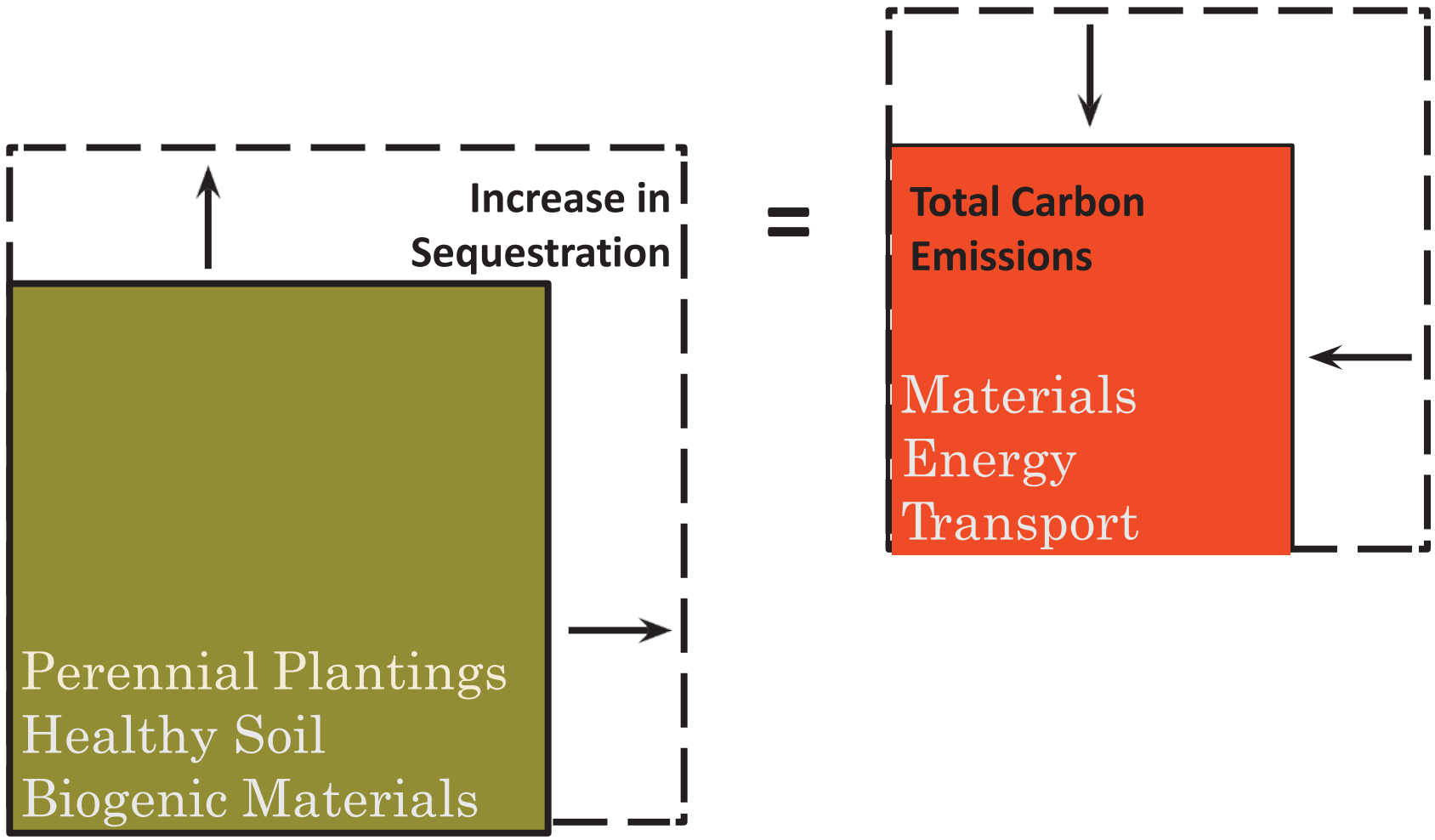
A Land-based Approach



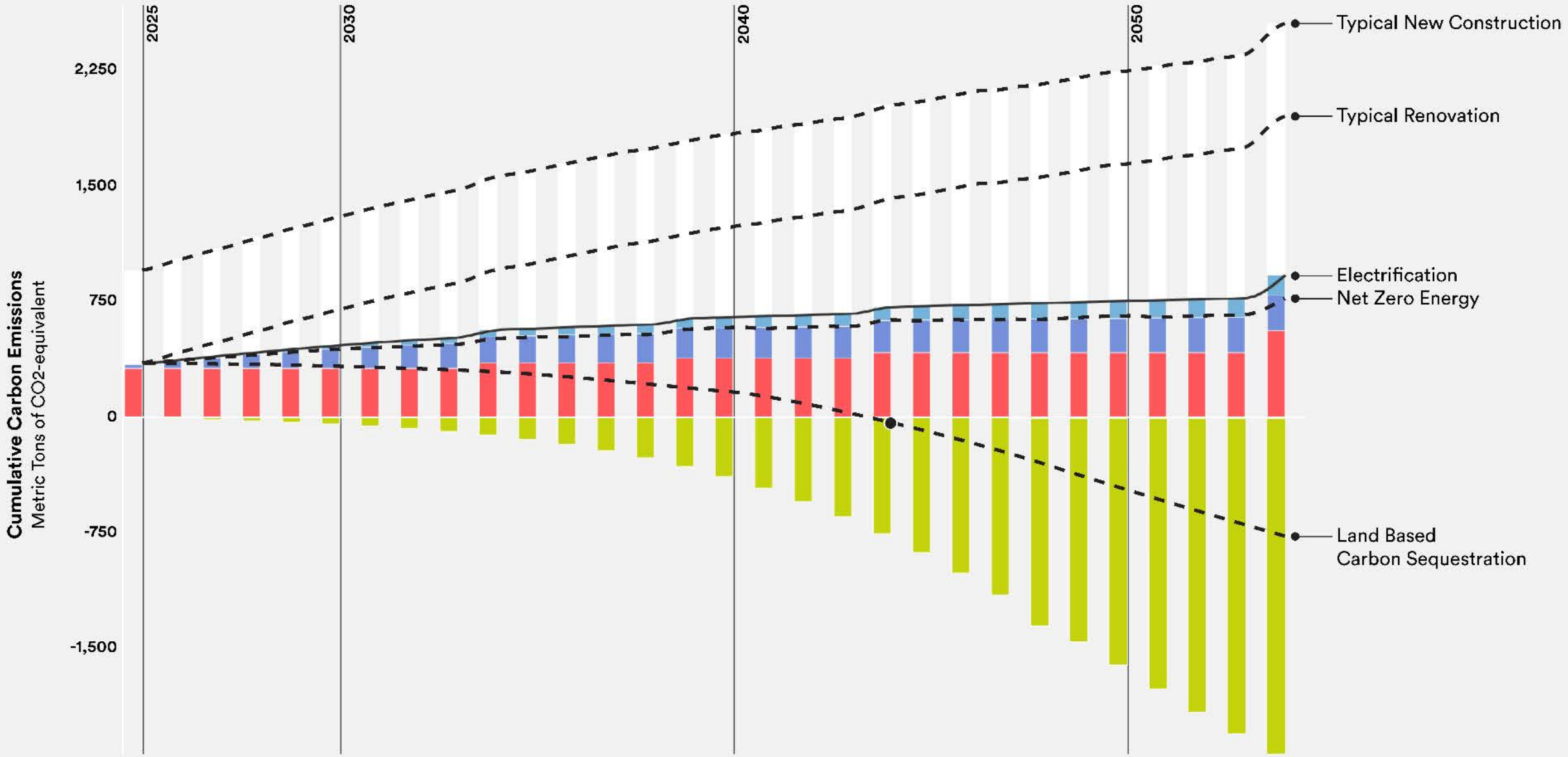
The regenerative capacity of the ranch will balance new emissions.

Sustainability Vision

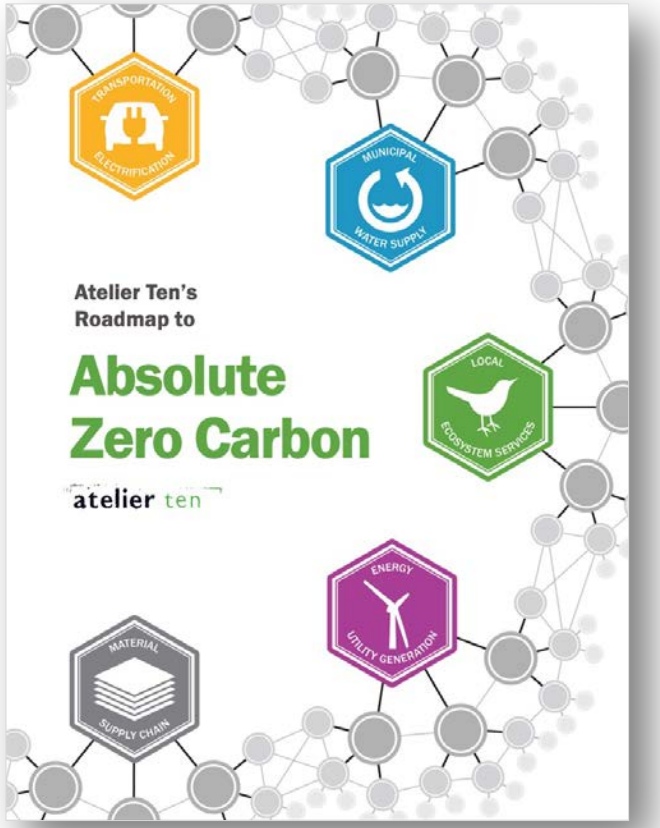
Finding the Balance



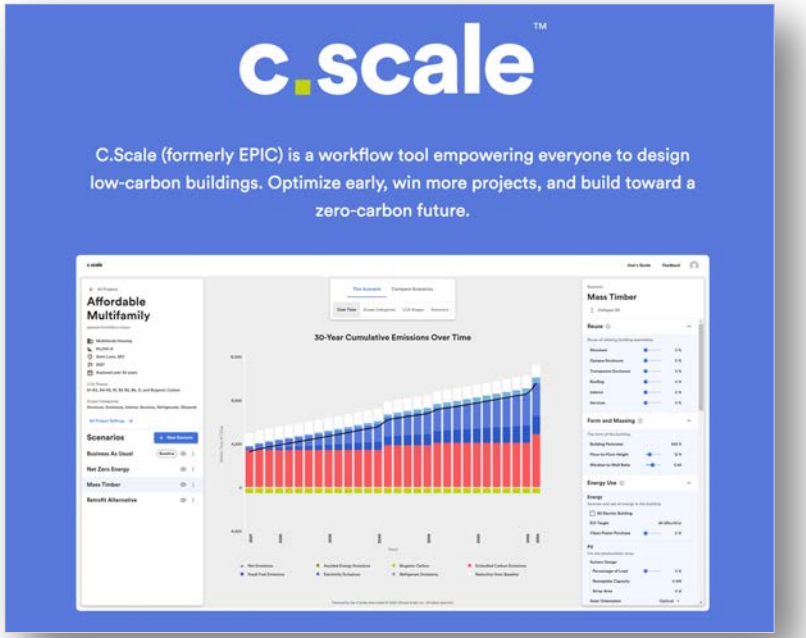
30-year Net Positive Whole Life Carbon



Q&A and Resources



Atelier Ten's Roadmap to Absolute Zero Carbon



C.Scale (formerly EPIC)
https://www.cscale.io/