Lovejoy Office Building | Portland, OR *Credit: Opsis Architecture*

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Pathways to Zero Carbon Policies

Metropolitan Washington COG March 2021

California Lottery Santa Fe Springs | Santa Fe Springs, CA *Credit: LPAS Architecture + Design*

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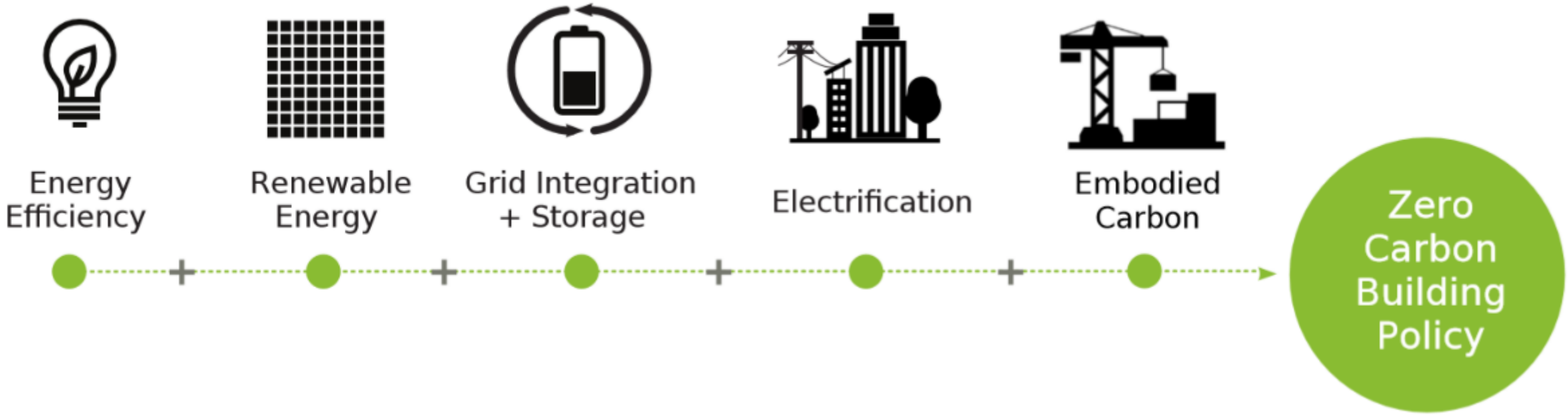
Mission

To achieve better buildings that are zero energy, zero carbon, and beyond – through research, policy, guidance and market transformation – to protect people and the planet.

Five Foundations of Zero Carbon Building Policies



Definitions/Lexicon

Zero Energy

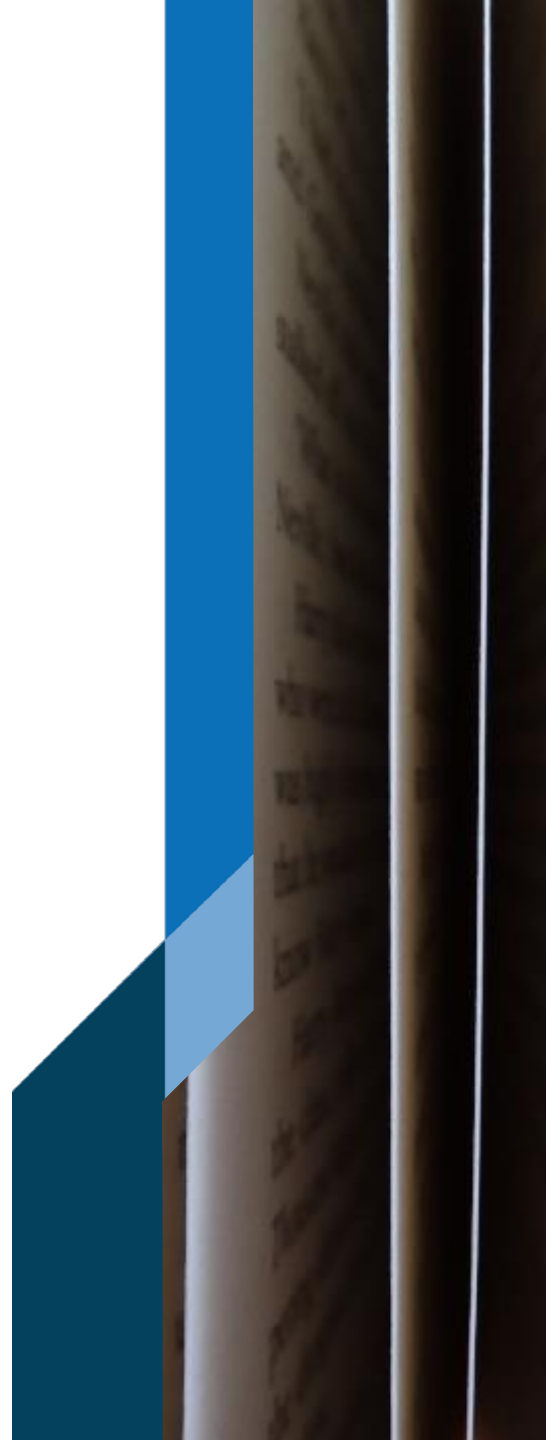
(aka Net Zero Energy, Zero Net Energy)

A zero energy building combines energy efficiency and renewable energy generation to consume only as much energy as can be produced onsite through renewable resources over a specified time period. (Source: U.S. Department of Energy)

Zero Carbon

(aka Net Zero Carbon, Zero Net Carbon)

A zero carbon building is defined as one that is highly energy-efficient and produces onsite, or procures, carbon-free renewable energy in an amount sufficient to offset the annual carbon emissions associated with operations. (Source: Zero Carbon Building Standard Canada Green Building Council)



Electrification

Electrification refers to replacing direct fossil fuel use (e.g., propane, heating oil, gasoline) with electricity [use] in a way that reduces overall emissions and potentially energy costs while lowering other air pollutants.
(Source: Environmental and Energy Study Institute)

Building-Grid Integration

(aka Grid-Enabled Buildings, Grid Harmonization)

Building-grid integration refers to the integration and optimization of homes and commercial buildings with the nation's energy grid. (Source: Department of Energy)

Policy Landscape

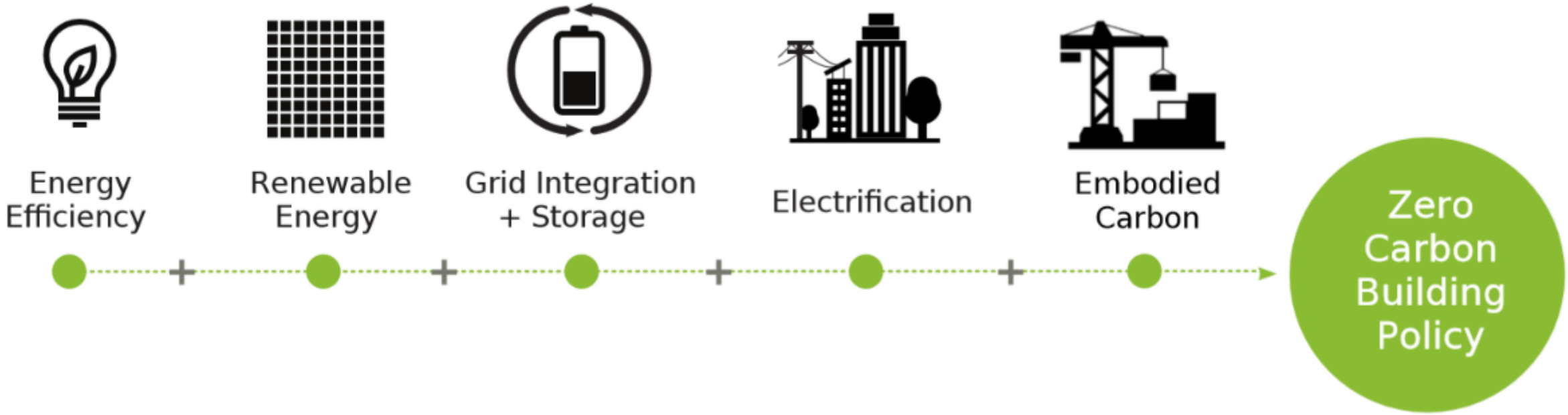
Building Policy Landscape

- New Construction : **CODES,** Zoning
- Existing Buildings : Benchmarking, Retro-commissioning, Building performance standards
- Municipal Policies : Zoning, Incentives, Gas moratoriums, various other sustainability actions (green roofs, stormwater, EE upzoning)
- State Policies : Utility regulation (RPS, fuel switching), **CODES**

Building Policy Landscape Gaps

- Codes impact existing buildings as well – just at a different scale
- Municipal ordinances can be underutilized
- Incentives and pairing with utility programs can help start change and show progress to code updates mandatory for all

Five Foundations of Zero Carbon Building Policies



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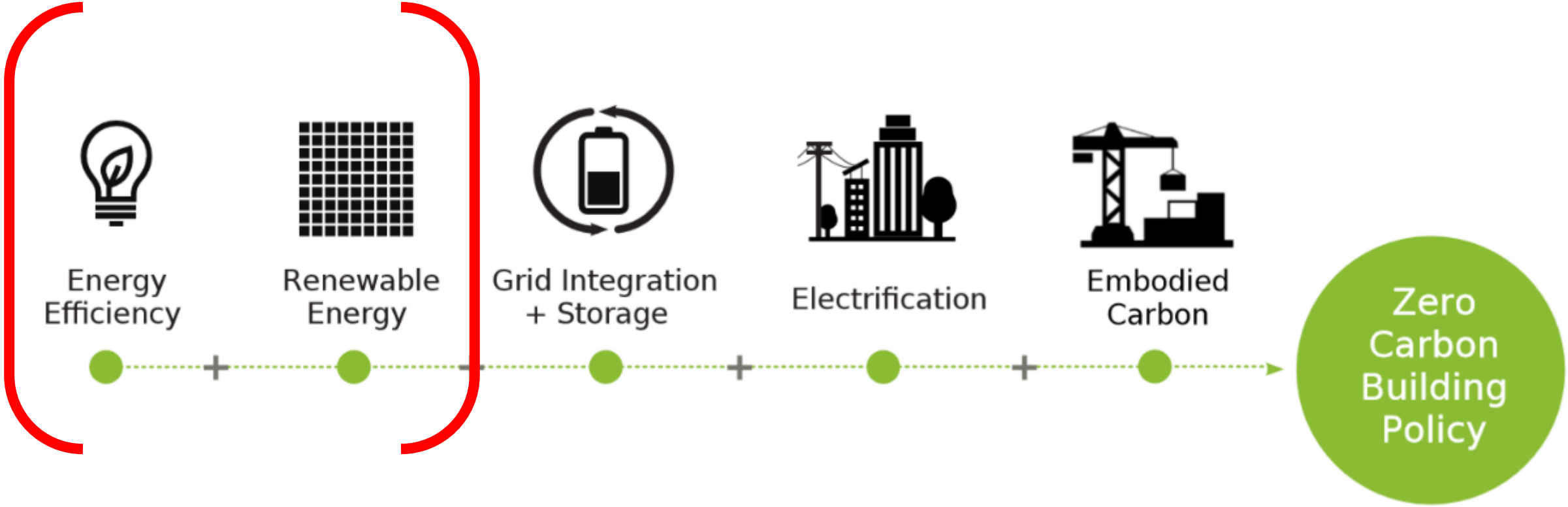


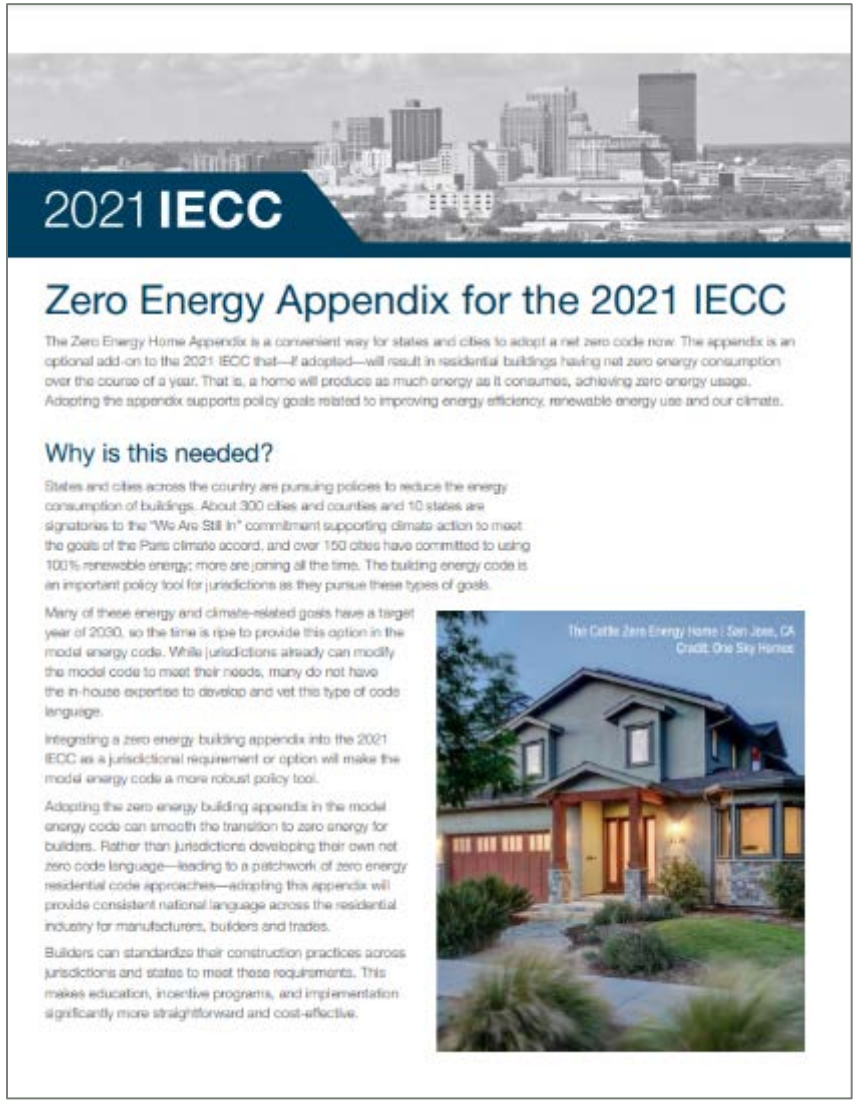
The basis of ZNE

ZNE Policy Landscape

- Codes primary vehicle for EE
- Building Performance Standards
- FAR/Zoning incentives
- Utility incentives
- RECs
- Solar incentives/market
- Benchmarking and Retro-commissioning (limited)

Residential ZE Appendix to the 2021 IECC

- Collaboration between NBI and NRDC
- **Goal:** Codify a pathway to achieve residential NZE construction
- **Objectives:**
  - Show jurisdictions that NZE is within reach
  - Increase efficiency over base IECC
  - Establish a recognizable structure to move the code and the appendix forward in future cycles



Building Performance Standards

Washington DC

Size: 50,000 sqft

Measuring: Energy

Metric: ENERGY STAR

Standard is recalculated each compliance cycle

Washington State

Size: 50,000 sqft

Measuring: Energy

Metric: EUI

Targets under development

New York City

Size: 25,000 sqft

Measuring: Carbon

Metric: kgCO2e/sf

Standard is fixed through 2034

St Louis, MO

Size: 50,000 sqft

Measuring: Energy

Metric: Site EUI

Standard is recalculated each compliance cycle

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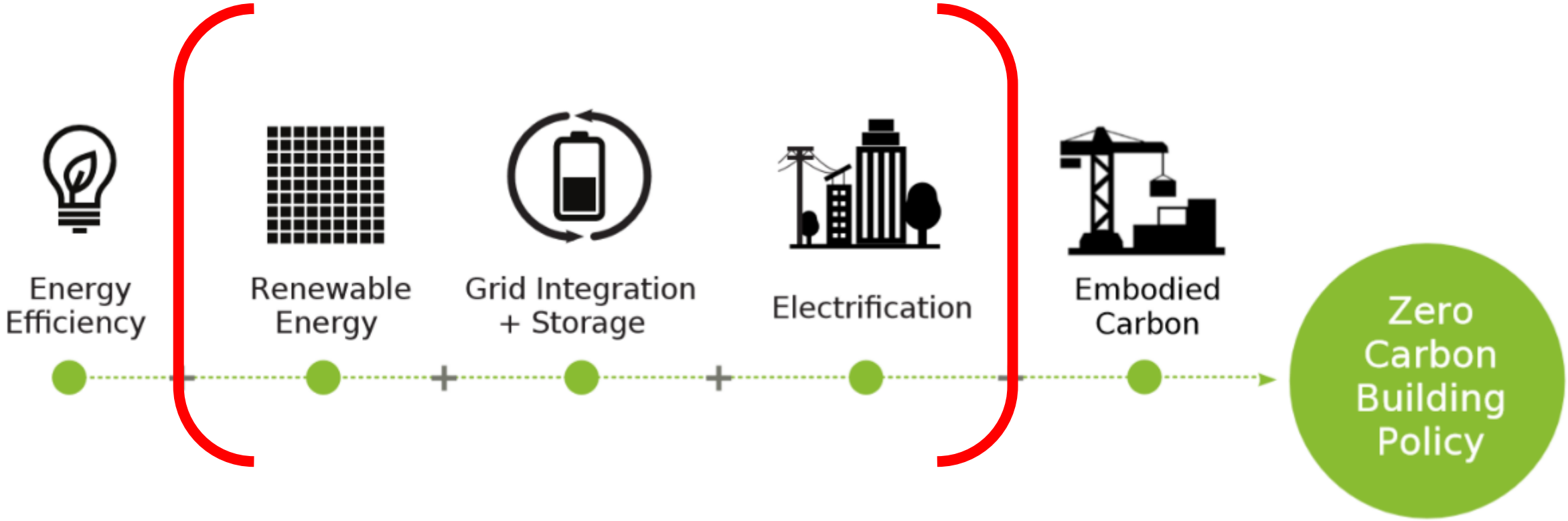
Equity Implications for NZE

- Balancing increased first cost with operational savings
- Considering impact of renovations and the split incentive
- Solar projects with individual electric metering
- Solar projects where RECs are sold
- Resiliency and survivability increases

Five Foundations of Zero Carbon Building Policies

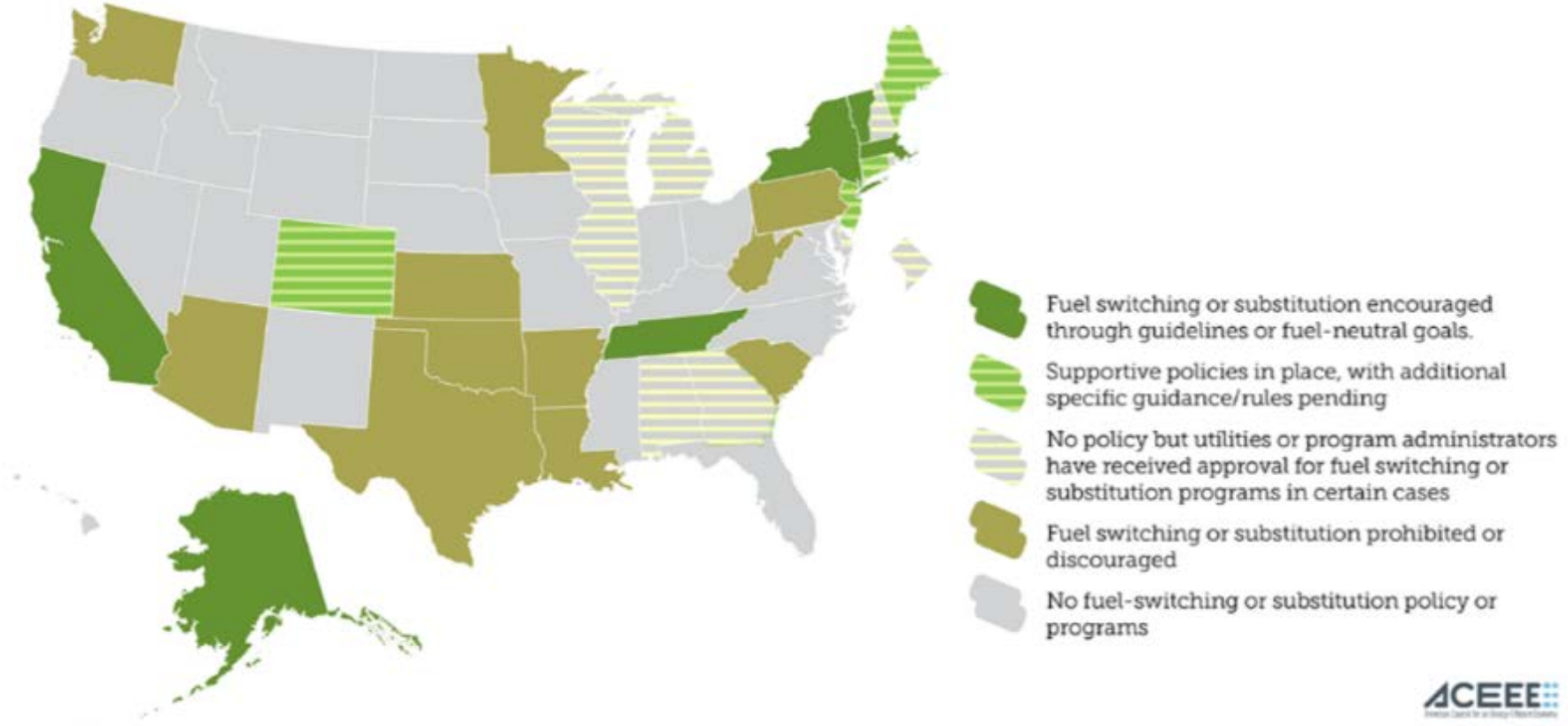


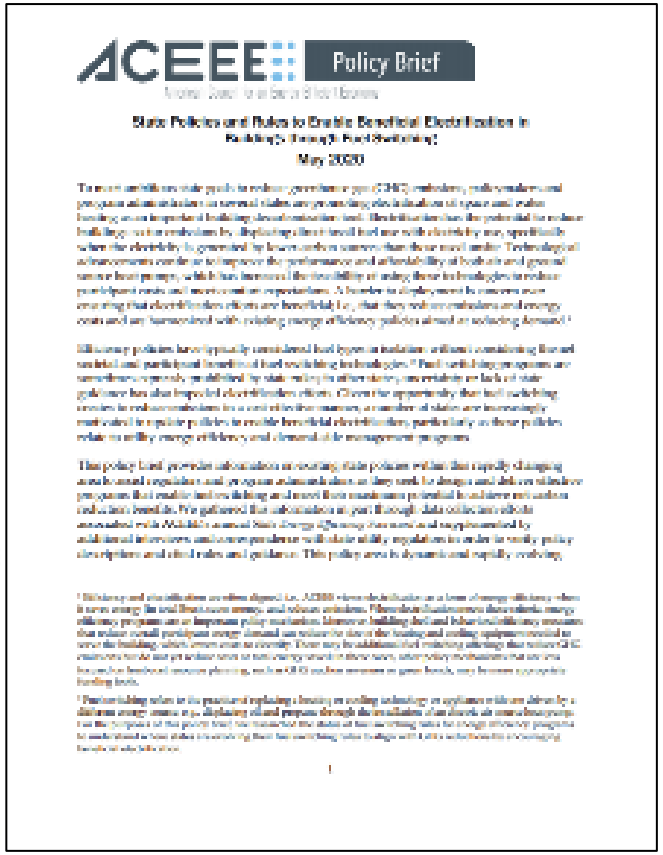
Operational Carbon Policy Landscape

- Municipal “lead by example” ZC policy
- Gas moratoriums
- State preemption and fuel-switching policies
- Codes can be used to play a role
- BPS focused on carbon
- RECs/Solar market
- Utility ADR programs

Fuel-switching Policies

Figure 1. Fuel-switching policy status by state





https://www.aceee.org/sites/default/files/pdfs/fuel_switch_revised_5-14-20.pdf

US Electrification Policies

- **31 Total Local Policies:**
  - 30 Cities and 1 County in CA
  - MA and Utah
- **Policy types:**
  - Gas Moratoriums
  - All- Electric - required Reach Codes
  - Electric-preferred – additional requir
  - Building Performance Standards

Building Electrification Technology Roadmap (BETR)

- Collaboration between NBI, BDC and EPRI
- **Goal:** Accelerate the development and adoption of advanced electric technologies
- **Objectives:**
  - Characterize the industry status of technology readiness for electrification including product optimization and site barriers to adoption.
  - Provide guidance that supports building electrification (BE), carbon reduction, energy efficiency and research programs over the next 10 years.

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Concept Paper: Building Electrification Technology Roadmap (BETR)

A Roadmap for accelerating the development and adoption of advanced electric technologies that lead to decarbonization in residential and commercial buildings

Background and Context

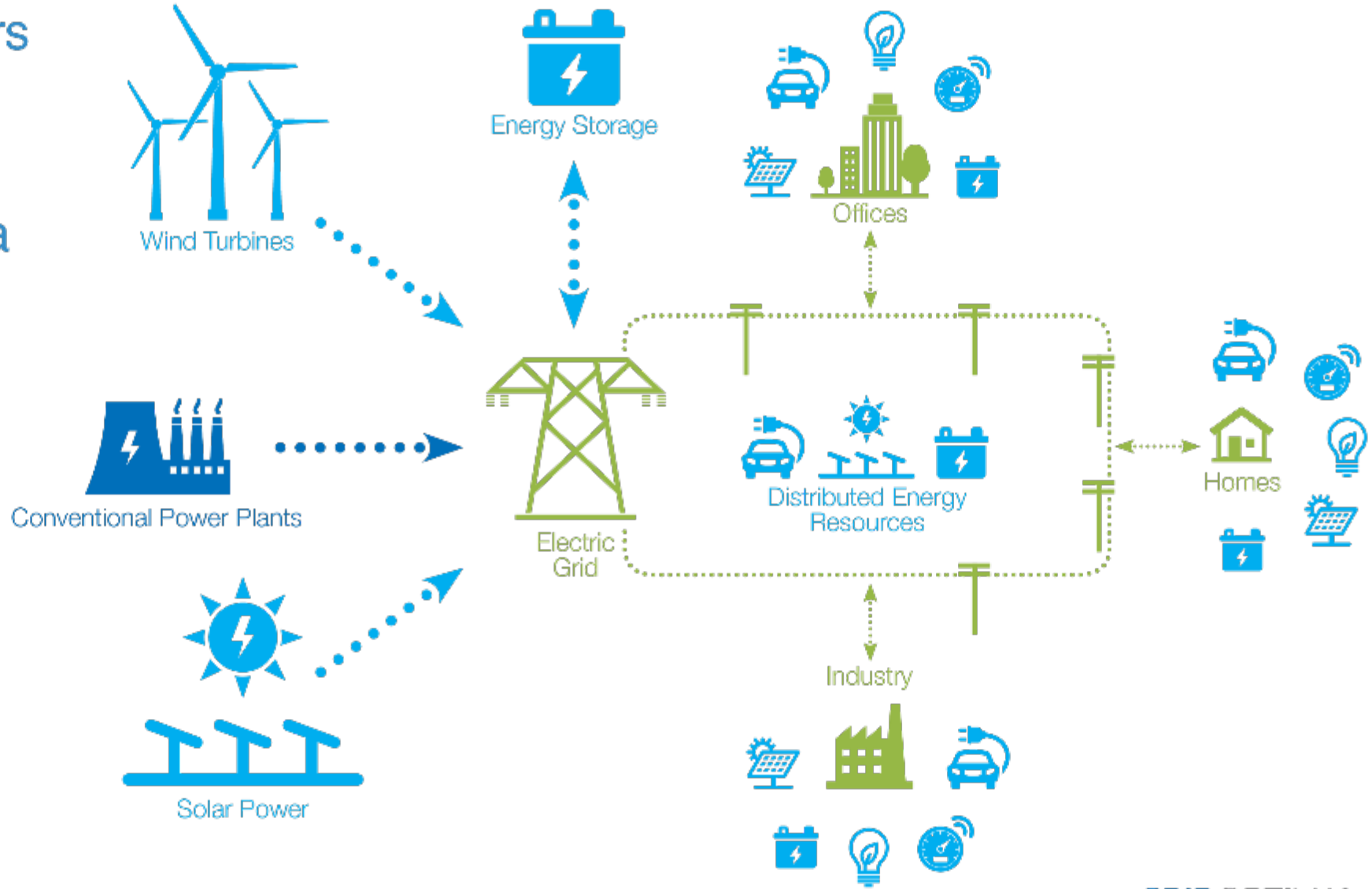
Since the early 1980s, there have been significant and impactful efforts to improve the energy efficiency of buildings through codes, policies and programs. In today's context, the spotlight is focused on carbon emission reductions rather than solely saving kWhs or therms to support climate action plans and policies for greenhouse gas (GHG) reductions. This shift has put momentum behind renewable energy production, both distributed and at utility scale, to decarbonize the grid. While generation-side efforts are critical, the role of buildings' energy use remains an important intervention area for efficiency programs and jurisdictional activities. Building electrification - reducing or eliminating direct use of fossil fuels at the building through advanced electric technologies -- is gaining interest as a key strategy to employ along with grid decarbonization.

The Need for this Project. Nationally, natural gas accounts for an average of 44% of a home's total energy use varying regionally from 26-60%. For commercial buildings, the range varies more widely by sector from 20-60% of energy use as shown in the figure below[1]. Direct site natural gas use, combined with leakage in delivery, can be responsible for as much as 60% of the CO_2 emissions of a mixed-fuel home with electricity that produced by natural gas fired generation while the same all-electric home has 45% lower carbon emissions[2].

To significantly reduce building site carbon emissions requires broad adoption of efficient electric technologies that are available today but not yet widely adopted, as well as adoption of newer products that can provide the same or improved level of service as incumbent technologies. In response to this need, New Buildings Institute (NBI), the Building Decarbonization Coalition (BDC) and the Electric Power Research Institute (EPRI) identified a set of research tasks to provide information, data and direction on electric technologies that will support efficiency programs and policy makers. Most importantly, the proposed research recognizes, leverages and builds on existing studies and efforts underway on assessing and advancing electric technologies that improve both energy and emissions performance in buildings. The Building Electrification Technology Roadmap (BETR)[3] will put this good work together, fill gaps, and translate it into meaningful results and technical pathways[4] that support decarbonizing the built environment.

[1] EIA Residential Data and CBECs Commercial data. Statistic on homes with natural gas (~50% of U.S. homes) from the American Gas Association Commercial Sector Summary is slightly higher.
[2] E3 2019 Study on Residential Building Electrification in California

GridOptimal empowers players on both sides of the meter to actively support the transition to a carbon free grid



GridOptimal Technologies and Strategies:

- renewable energy
- energy efficiency
- electric vehicle
- energy storage
- smart connected controls

GRIDOPTIMAL™ BUILDINGS INITIATIVE

Equity Implications for Op. Carbon

- Cost of electric heating without weatherization or proper EE upgrades (existing buildings)
- Cost of stranded assets and infrastructure
- Societal costs and health impacts of combustion appliances
- Increased need to pair incentives with targeted use in affordable housing and community businesses to avoid free-ridership

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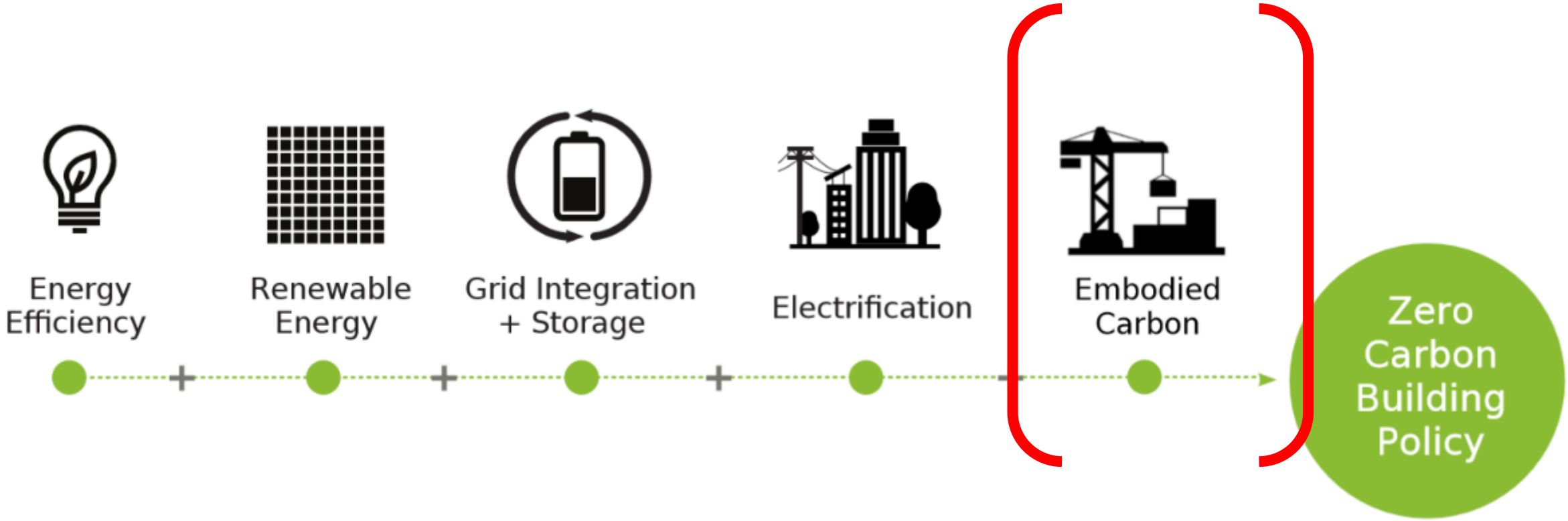
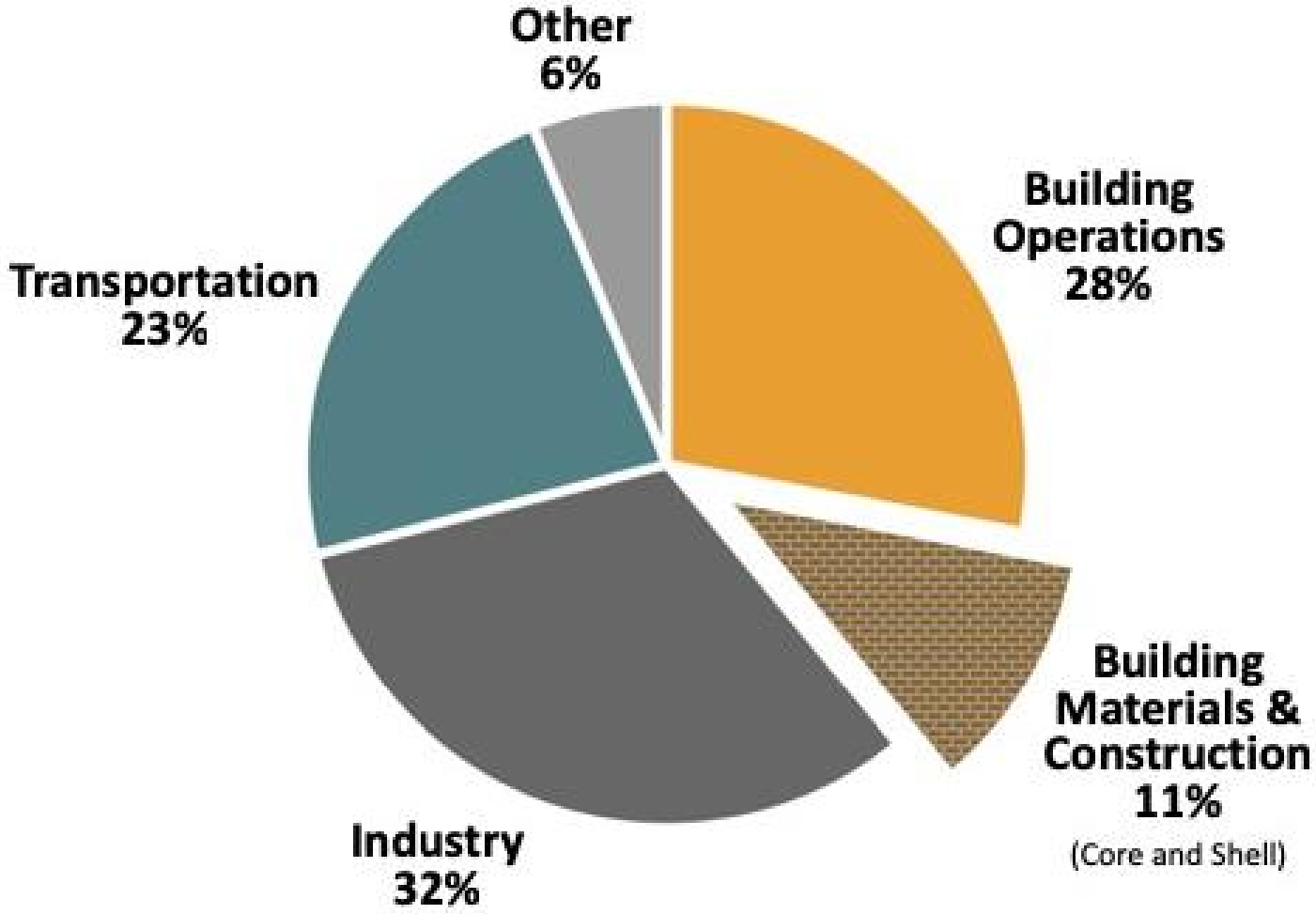


Global CO_2 Emissions



Source: Global Alliance for Buildings and Construction 2018 Global Status Report

Embodied Carbon Policy Landscape

- Buy-Clean
- Materials based codes
- EC disclosure
- Incentives
- Recycling/Reuse municipal policy

Equity Implications for Embodied Carbon

- Balance impacts of reuse with cost and considerations for long term energy and operational carbon savings
- High potential for greenwashing attention

Save the Date!

GETTING TO **zero** FORUM 2021

October 27-29, 2021

New York City

Join building and energy industry leaders at the premier global event dedicated to defining a low-energy, low-carbon future for the built environment.

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Questions?

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