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↑ Building Growth

**2060: 2.5 trillion ft²
230 billion m²**

Constructing an entire New York City every month

Information Source: <https://architecture2030.org/new-buildings-operations/>
By 2060, the world is projected to add 230 billion m² (2.5 trillion ft²) of buildings, or an area equal to the entire current global building stock*. This is the equivalent of adding an entire New York City to the planet every 34 days for the next 40 years.
*UN Environment, Global Status Report 2023

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Climate is Rapidly Changing

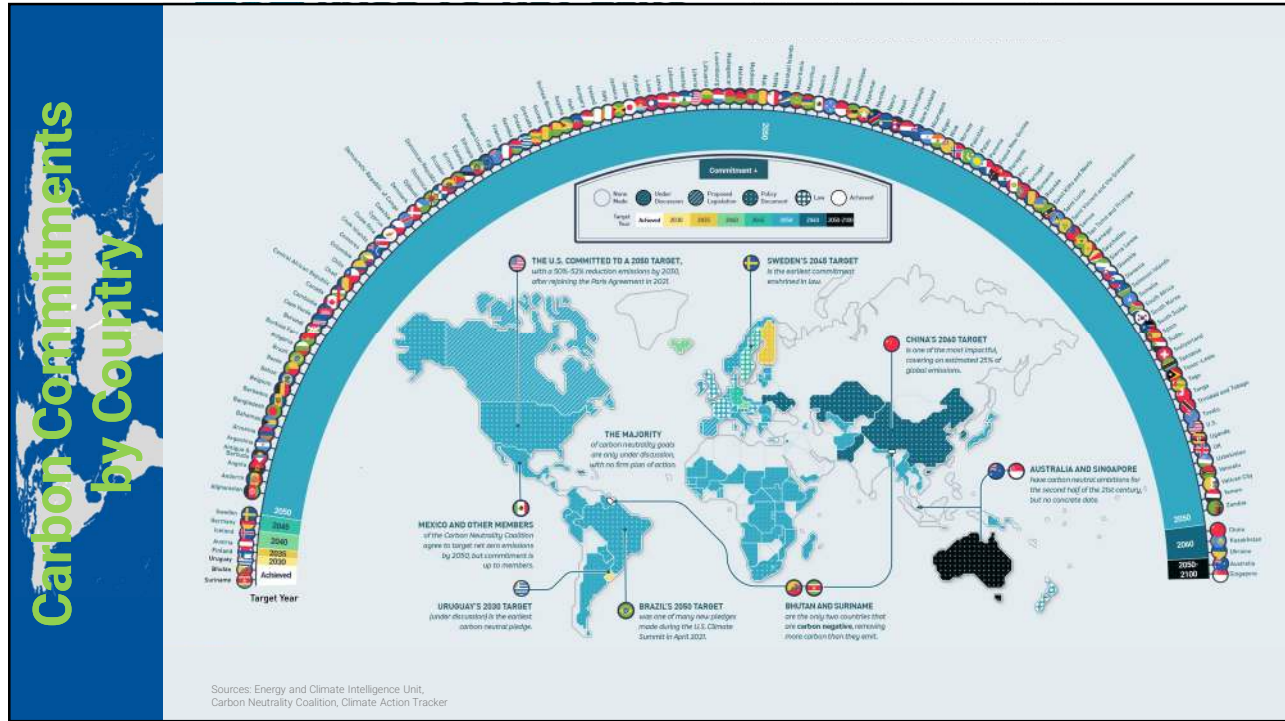
2015 UN Paris Agreement
2°C to 1.5°C

2018 UN IPCC Recommendation
1.5°C

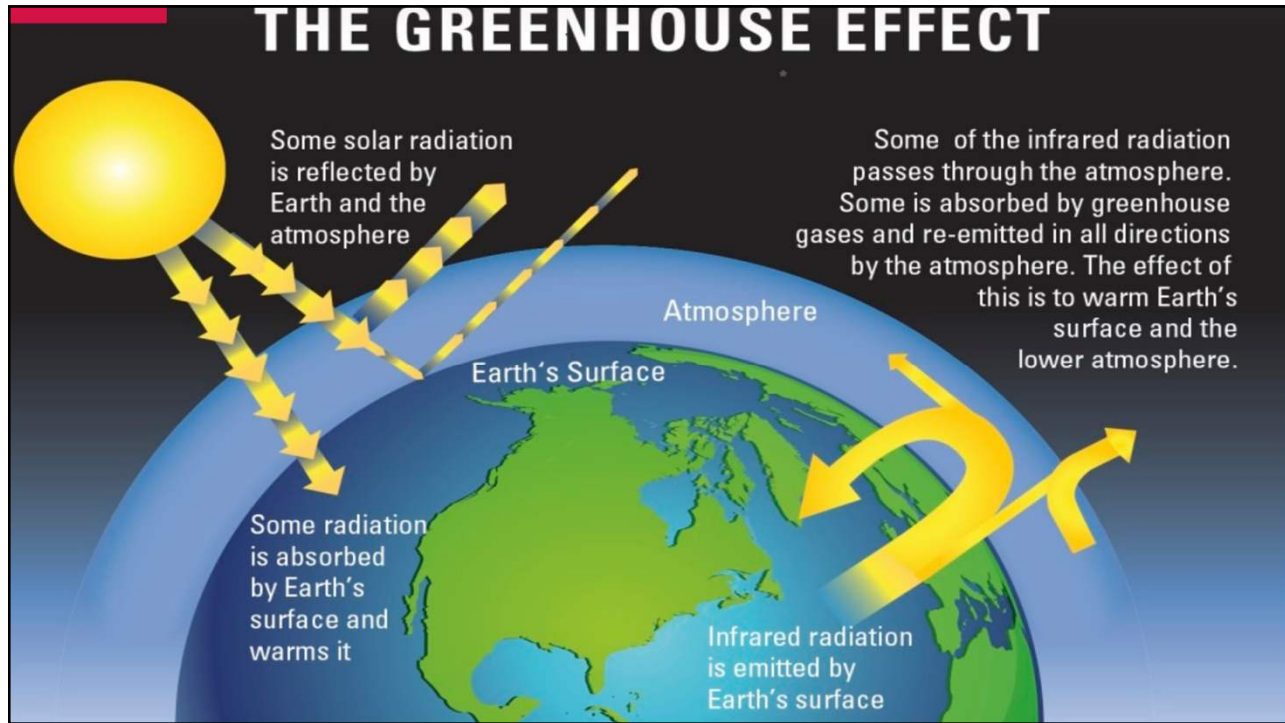
In 2015, the Paris Agreement was adopted to limit the global temperature rise maximum at 2°C with a strong recommendation to retain it at 1.5°C

Information Source: United Nations IPCC SR-15

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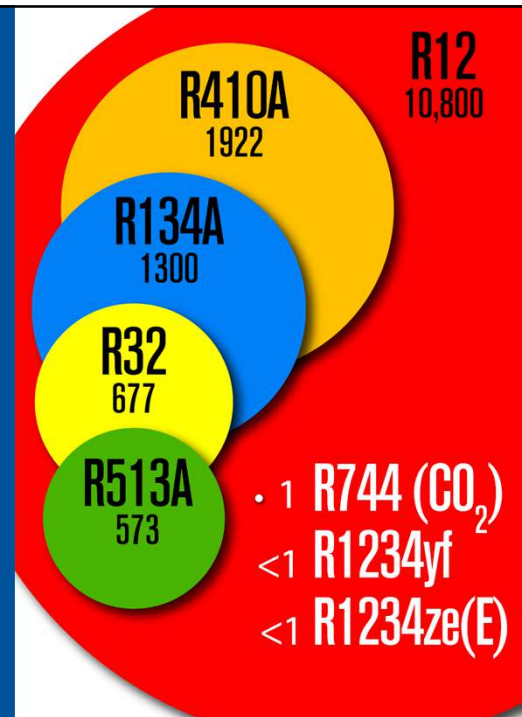
building decarbonization...

whole life = operational
+ embodied

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Carbon dioxide equivalent (CO₂e): a measure used to compare the impact of various greenhouse gases based on their 100-year time horizon global warming potential (GWP). CO₂e approximates the time-integrated warming effect of a unit mass of a given greenhouse gas relative to that of carbon dioxide (CO₂).

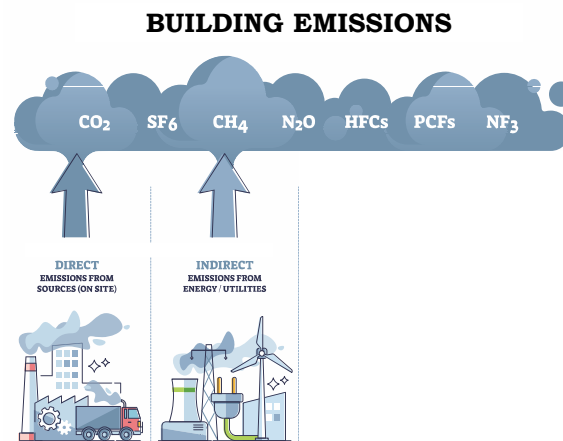
Global warming potential (GWP): an index for estimating the relative global warming contribution of atmospheric emissions of a particular greenhouse gas compared to emissions of an equal mass of carbon dioxide (CO₂)



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Direct emissions: GHG emissions from sources owned or controlled by the reporting entity (primarily from on-site combustion of fossil fuels).

Indirect emissions: GHG emissions due to activities of the reporting entity but occur at sources owned or controlled by other entity (primarily from electricity generated off-site to power buildings).



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Whole building life cycle assessment (WBLCA): a methodology for assessing environmental impacts associated with all the stages of the life cycle of a building.

Environmental product declaration (EPD): an independently verified and registered document that communicates transparent and comparable information about the life-cycle environmental impact of products to enable comparisons between products fulfilling the same function.



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Building Performance Standards (BPS): a policy that requires building owners to meet performance targets by actively improving their buildings over time. These can include energy or emissions targets that buildings must meet to reduce energy and climate impacts.

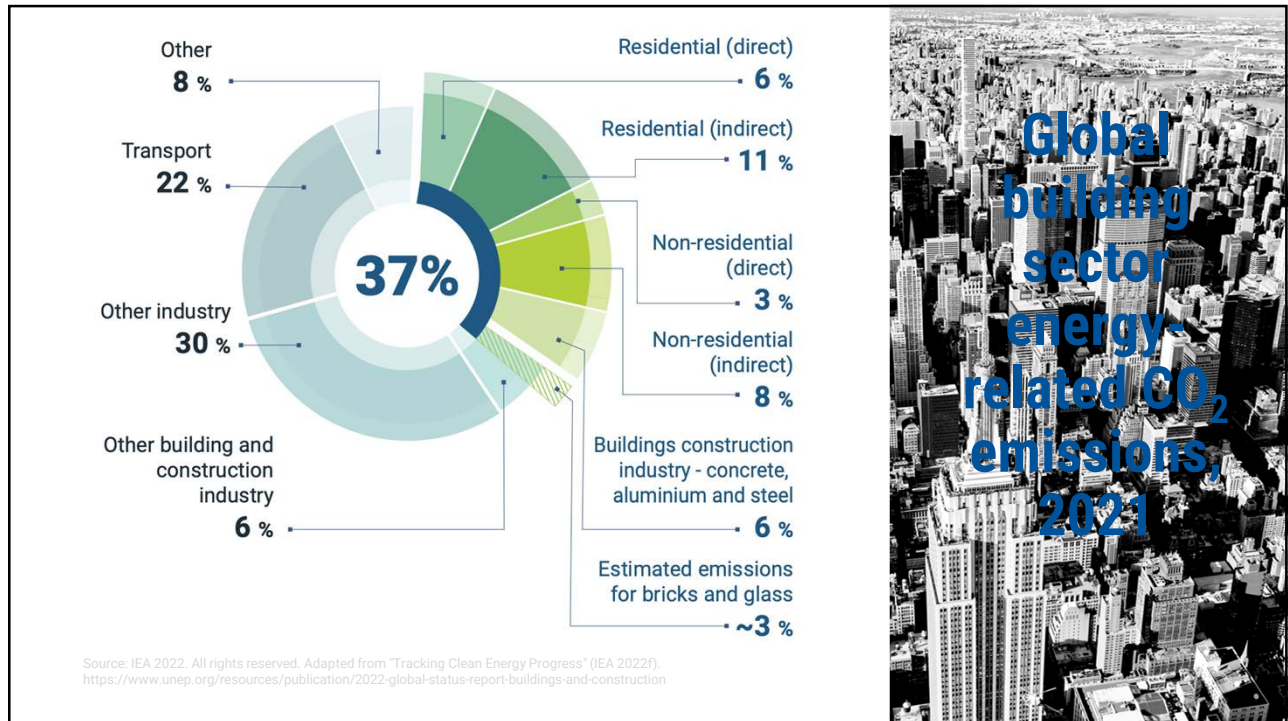


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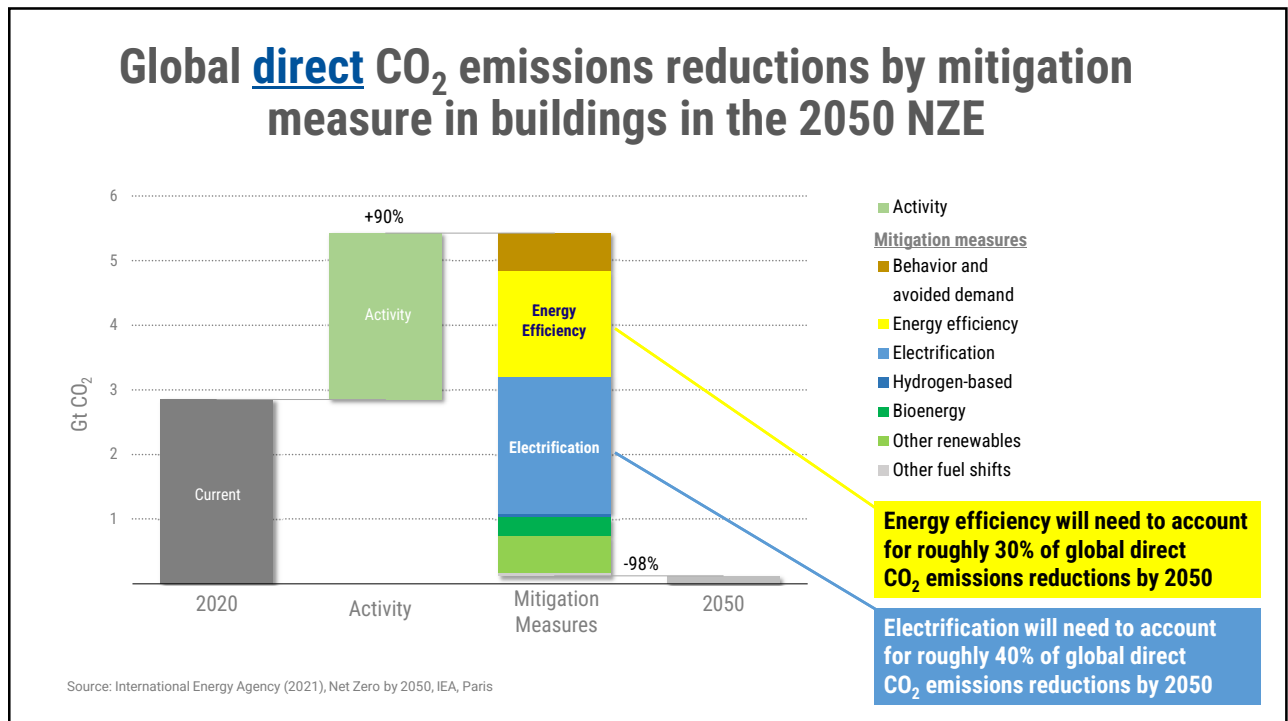
Building Decarbonization

**Understanding
the Global Issue**

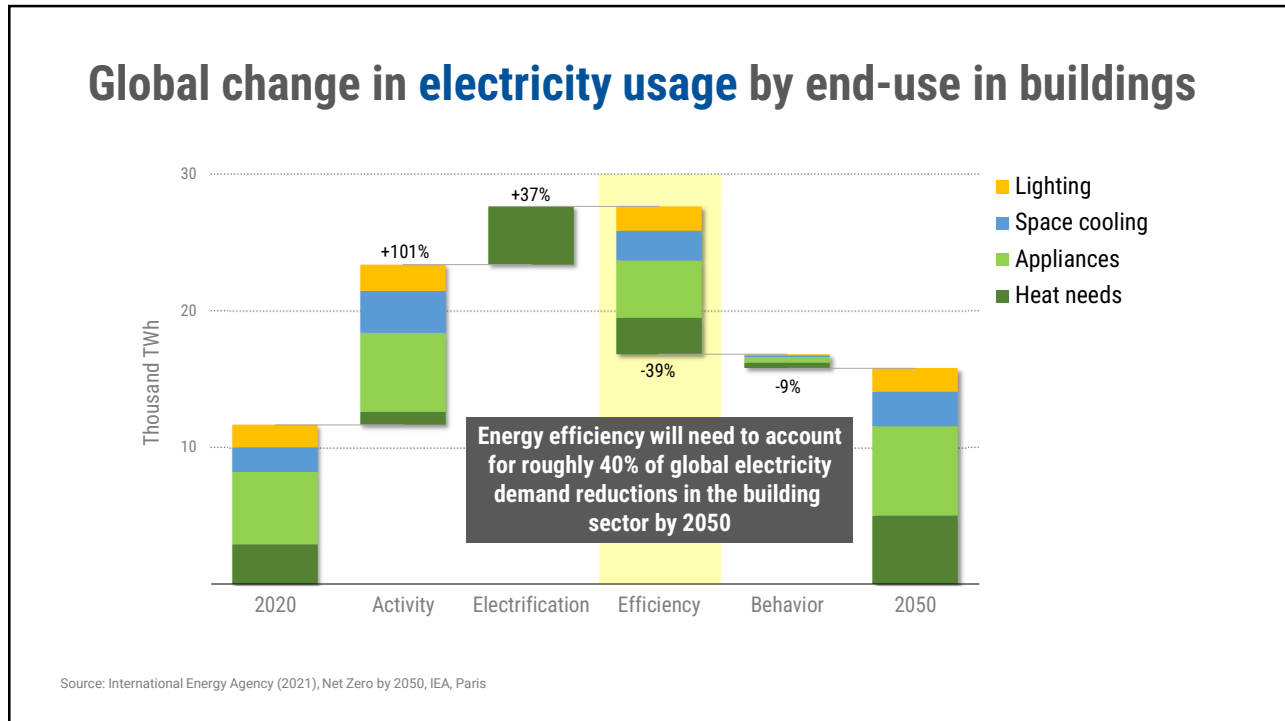
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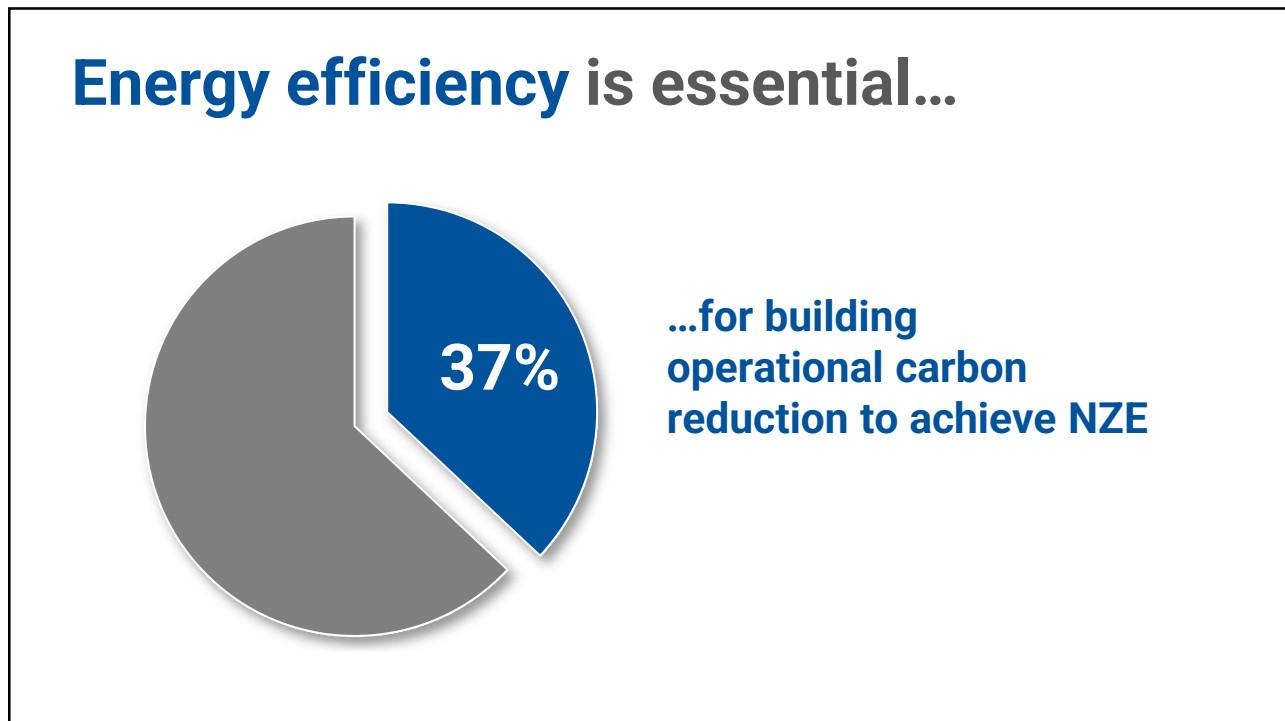
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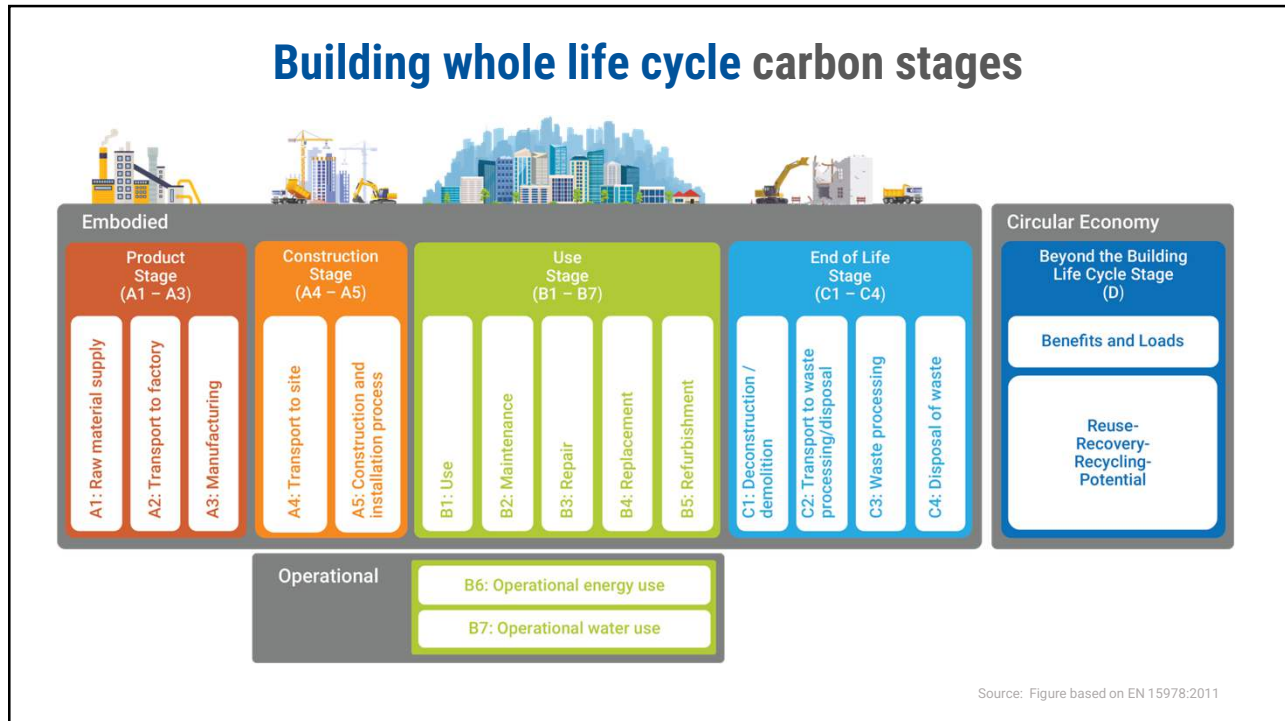
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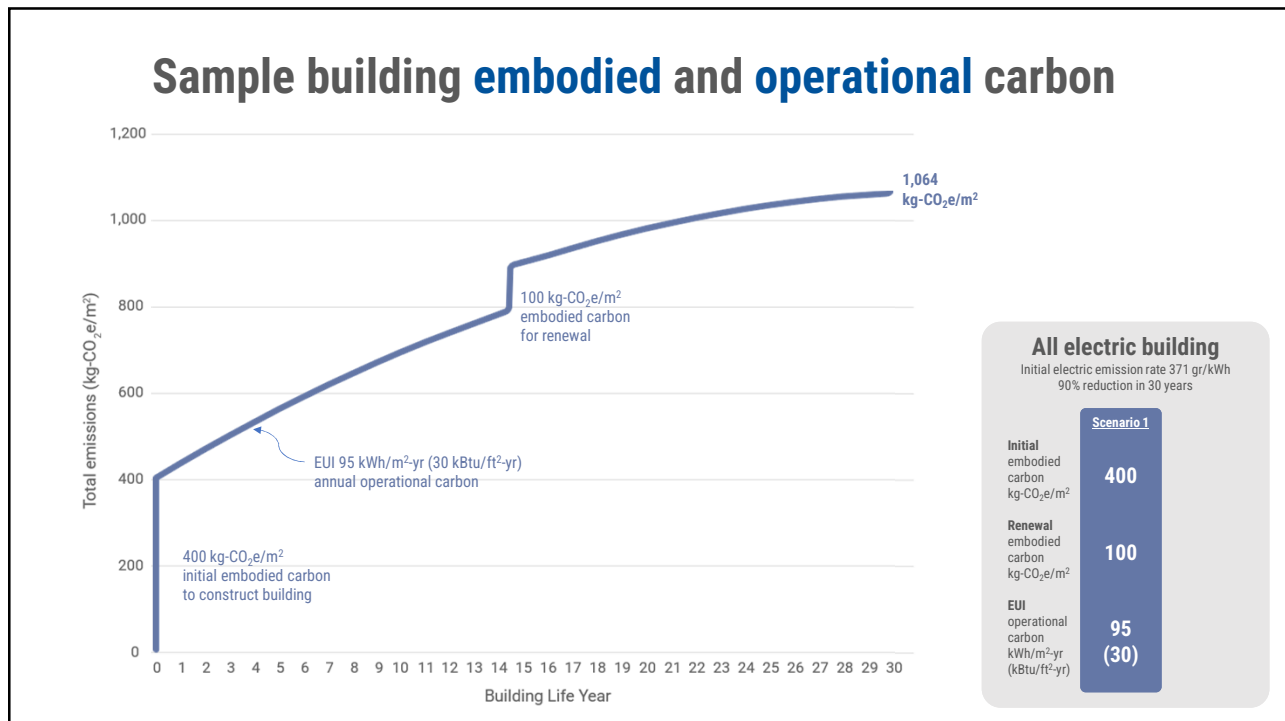
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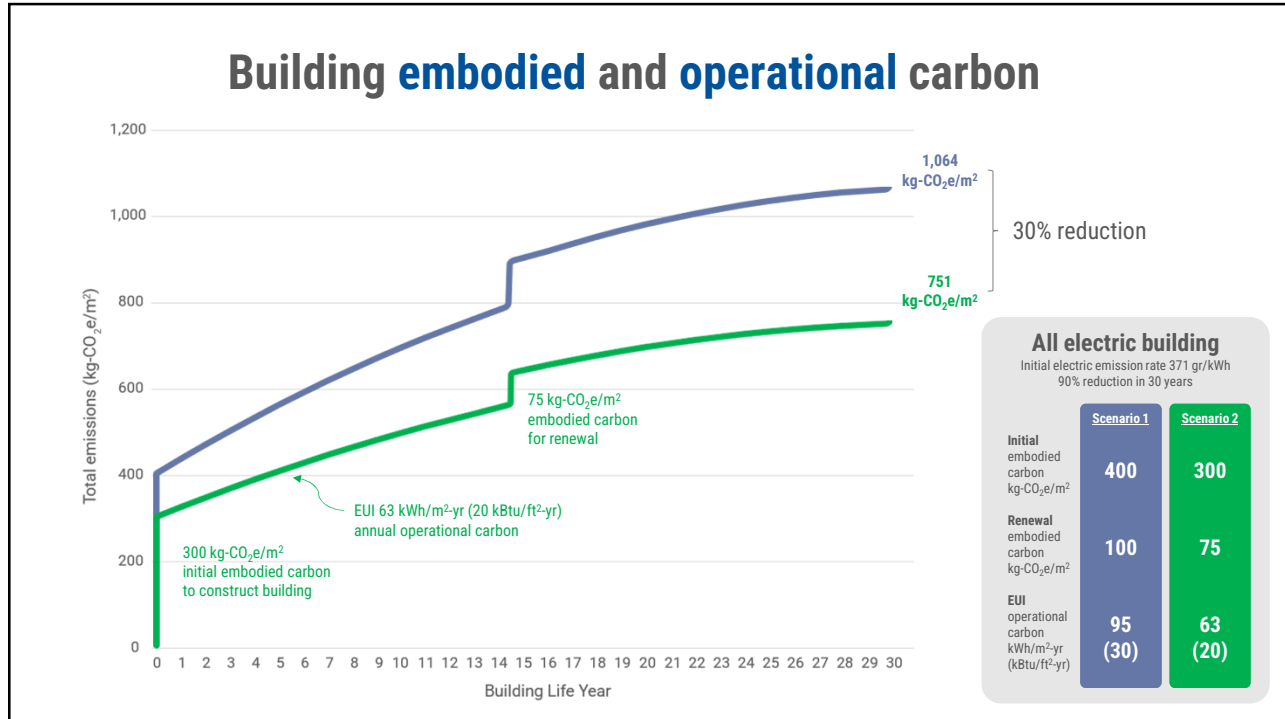
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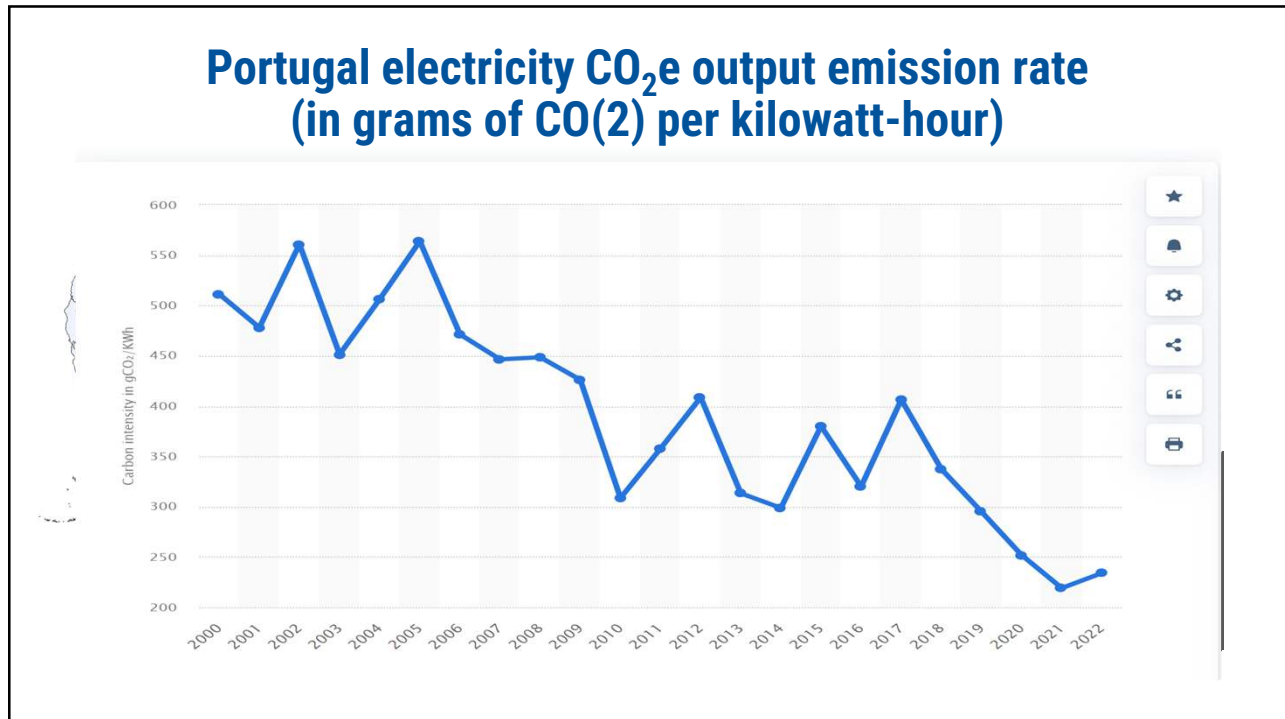
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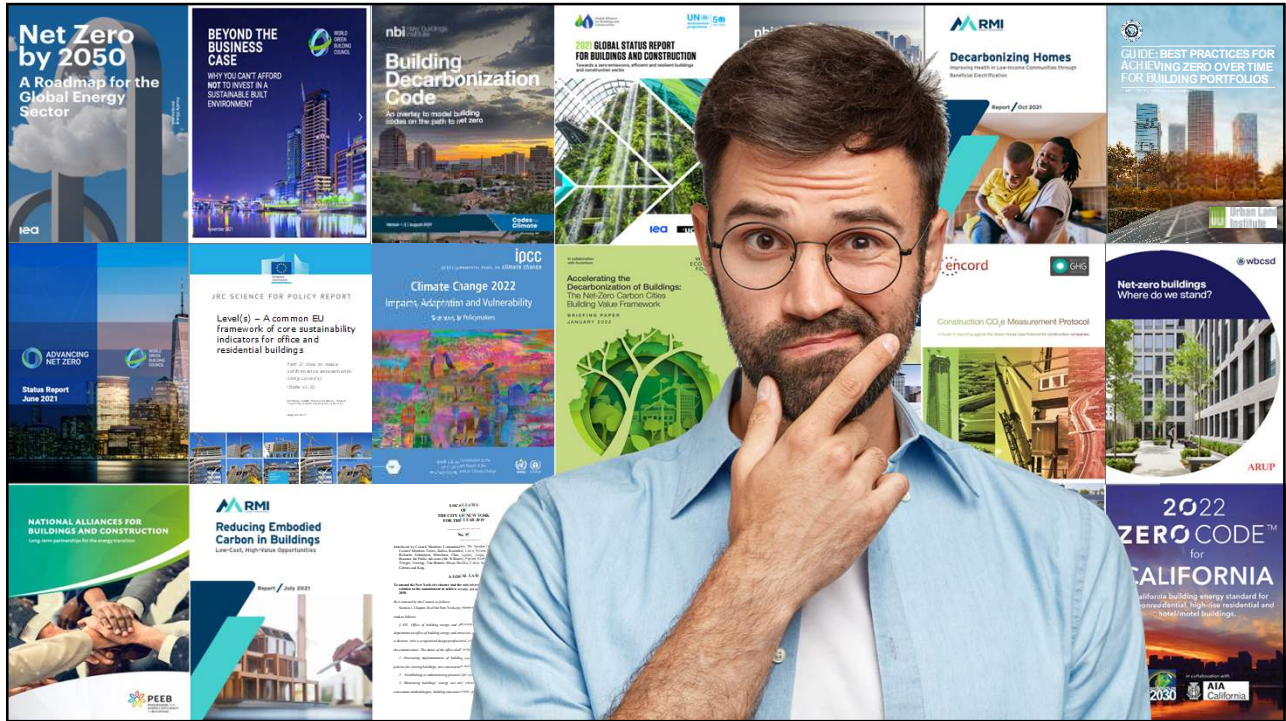
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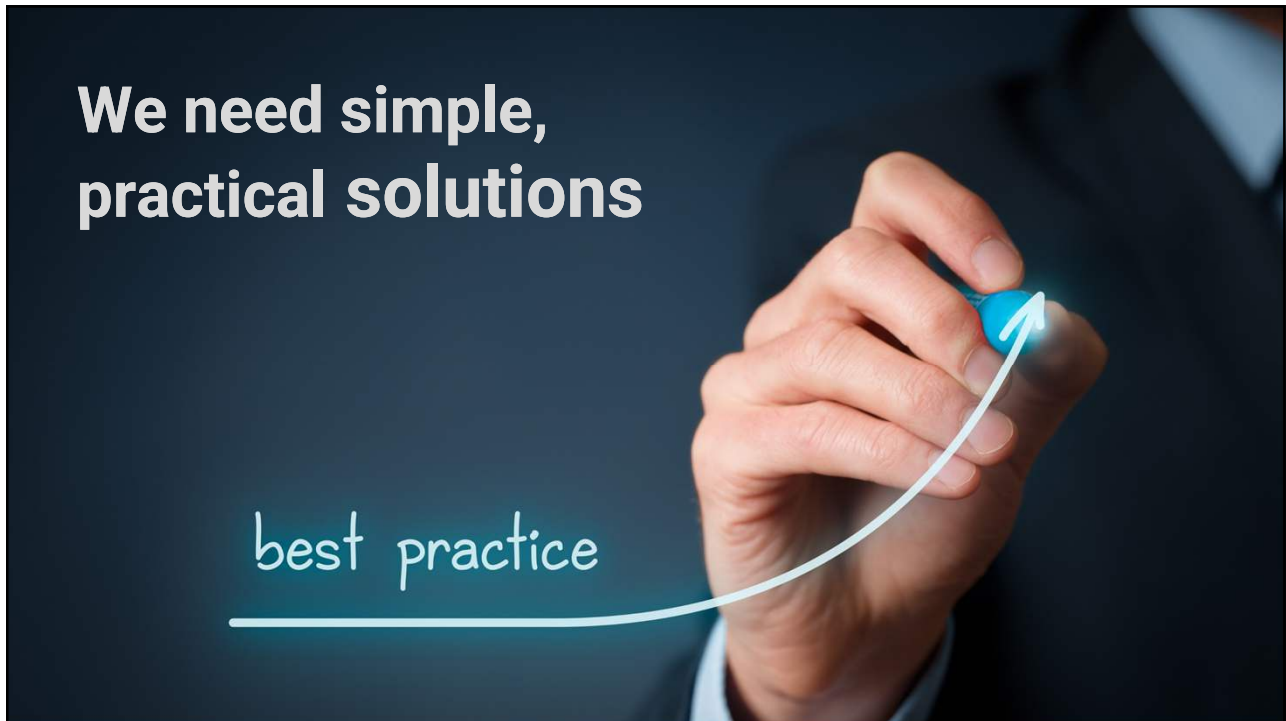
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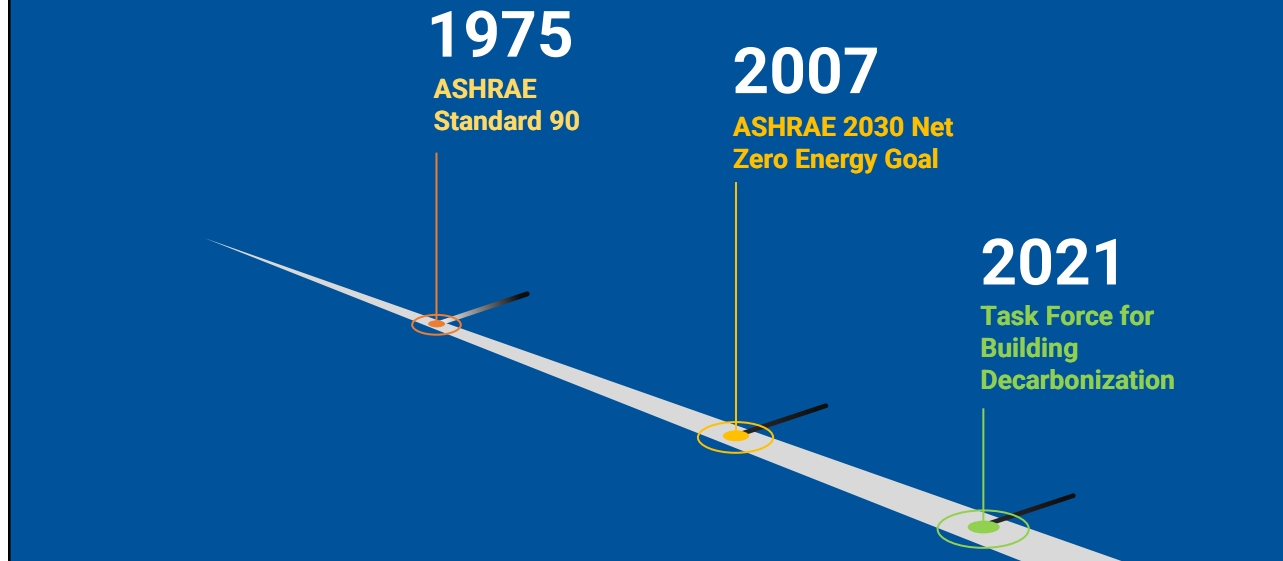


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ASHRAE has a long history...



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**ASHRAE
TASK FORCE**
for
**BUILDING
DECARBONIZATION**

- two subcommittees and eight working groups
- over 150 volunteers from around the world
- have the technical expertise to address this issue

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ASHRAE goals...

2030
the global built environment must halve its 2015 GHG emissions

- All new buildings must be NZE
- Widespread EE retrofits of existing assets
- New construction embodied carbon must be reduced by at least 40%

2050
all new and existing assets must be net zero GHG emissions across the whole life cycle

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Four Key Focus Areas

STANDARDS

EDUCATION

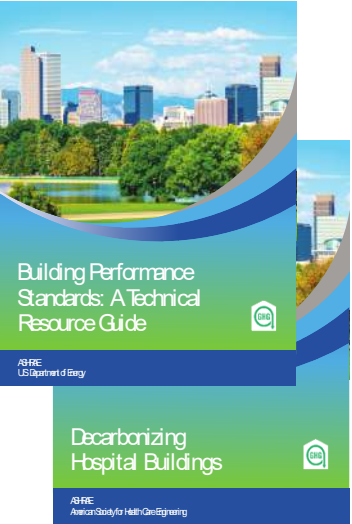
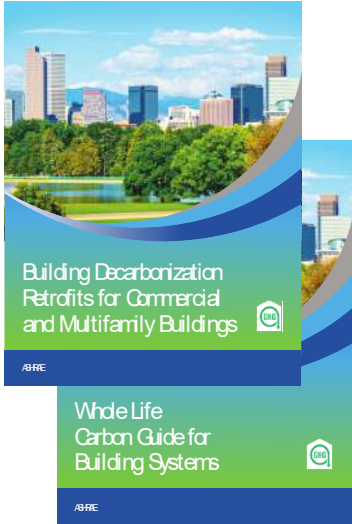
TECHNICAL TOOLS

KNOWLEDGE RESOURCE HUB

POSITION DOCUMENT

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ASHRAE resources in development...



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A **pathway** to building decarbonization...

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Optimize Building Envelope

Building envelope

optimize building orientation and geometry to reduce energy use and maximize solar potential




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Optimize Building Envelope

Energy Efficiency

Energy efficiency

will continue to remain #1 in the loading order of measures



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Optimize Building Envelope

Energy Efficiency

Waste Energy

Utilize waste energy

optimize waste energy streams to reduce energy and water use

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Optimize Building Envelope

Energy Efficiency

Waste Energy

Embodied Carbon

Embodied carbon

review options to reduce embodied carbon with entire life cycle carbon in mind

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Optimize Building Envelope

Energy Efficiency

Waste Energy

Embodied Carbon

Electrify Loads

Electrify loads

this step is to use low carbon energy for heating, service water heating, and cooking

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Optimize Building Envelope

Energy Efficiency

Waste Energy

Embodied Carbon

Electrify Loads

Low GWP Refrigerants

Low GWP refrigerants

lower GWP, reduce fugitive emissions, and maintain efficiency

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Optimize Building Envelope

Energy Efficiency

Waste Energy

Embodied Carbon

Electrify Loads

Low GWP Refrigerants

Demand Management

Demand management

software systems integrated into buildings can help coordinate energy supply, reduce energy demand, and shift energy use

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Optimize Building Envelope

Energy Efficiency

Waste Energy

Embodied Carbon

Electrify Loads

Low GWP Refrigerants

Demand Management

Carbon Free Energy

Carbon free energy

Utilize on- or off-site carbon free energy

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Emerging issues

- scalability of solutions
- electric grid infrastructure
- cold climates
- existing buildings
- economics – money matters!

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Opportunities

- equipment & system innovation
- advanced controls
- integrated solutions
- energy storage
- available incentives

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How to contribute

- educate yourself
- educate colleagues
- educate clients
- educate partners
- educate policymakers
- educate the next generation of leaders

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