Building Codes and Climate Goals

Climate Camp | April 2021
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.
Building Codes 101
What’s a Building Code?

• Laws that regulate how we design and build
• Covers everything from structural design to energy use
• Impact on new construction and existing buildings
Code and Standards Bodies

International Code Council

ASHRAE

NFPA
Code/Standard Development

- Committees are convened
- Proposals are developed, submitted and vetted
- Proposals are sent out for public comment
- Proposals finalized and voted on
- New editions are published (~3 years)
38% US Emissions

75% electricity consumption

50% fossil gas consumption
Office Building Energy Use

Existing Building: 70%
US Codes: 46%
ZNE: 46%

Just 1 ZNE Building will save 169 tons GHG/year
Cut GHG 50% by 2030; Zero by 2050

Re-enter Paris Agreement

Limit global warming to 1.5 degrees Celsius
1.5° Code Framework
Understanding Carbon

Embodied Carbon
Manufacture, transport and installation of construction materials

Operational Carbon
Building energy consumption
The Five Foundations of Zero Carbon Building Policies

- Energy Efficiency
- Renewable Energy
- Grid Integration + Storage
- Building Electrification
- Life-Cycle Impacts

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## Scope and Goal

<table>
<thead>
<tr>
<th>Scope</th>
<th>Goal</th>
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</thead>
<tbody>
<tr>
<td>Efficiency</td>
<td>Highly Efficient / Passive Resilience</td>
</tr>
<tr>
<td></td>
<td>Base Codes / Building Systems</td>
</tr>
<tr>
<td>Electrification</td>
<td>Prohibit all on-site combustion</td>
</tr>
<tr>
<td></td>
<td>Building Systems + Vehicles</td>
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<tr>
<td>Renewables</td>
<td>Onsite resilience, Support RPS and additive procurement</td>
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<tr>
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<td>Onsite, Offsite + Procurement</td>
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<tr>
<td>Grid Integration</td>
<td>TOU Carbon reduction and Grid-sensitive</td>
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<td></td>
<td>Controls, Storage</td>
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<tr>
<td>Lifecycle Impact</td>
<td>Lifecycle GHG reductions</td>
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<tr>
<td></td>
<td>Embodied Carbon, Refrigerants + Deconstruction</td>
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<tr>
<td>Equity</td>
<td>Ensure just transition, Improve health, Workforce Opportunities</td>
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<tr>
<td></td>
<td>[TBD]</td>
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</table>
Energy Efficiency

Impacting base codes and building systems to achieve highly-efficient, passively resilient buildings
ICC Energy Code Status

• 2021 produced:
  • ~10% efficiency gain
  • The most challenges to the code development process
• Change IECC from code to standard
• Removed voting process for governmental members
• Call for development committees closed April 23.
ASHRAE Energy Standard

• 90.1 Determination Released
  • 4.7% site energy
  • 4.3% source energy
  • 4.3% energy cost
  • 4.2% carbon emissions
• Building Decarbonization Task Force
• Standard 228p released for public comment April 2, 2021
• 90.1 and 189.1 technical work supported by National Labs
Codes Developing through 2023
Renewable Energy

Providing onsite, offsite and procurement regulation to achieve resilience, support RPS and additive generation
Renewable Energy in Code

2021 IECC

Zero Energy Appendix for the 2021 IECC

The Zero Energy Appendix is a 2021 addendum for model code use in new residential buildings. The appendix is an option in the 2021 IECC that, if adopted, will result in residential buildings having net zero energy consumption over the course of a year. That is, a house will produce as much energy as it consumes, achieving near-zero energy usage.

Why is this needed?

States and cities across the country are pursuing policies to reduce the energy consumption of buildings. About 70% of cities and counties and 15 states are signatories to the “We Are 100%” commitment supporting climate action to limit the goals of the Paris climate accord, and over 100 cities have committed to using 100% renewable energy rates among all the time. The building energy code is an important policy tool for jurisdictions as they pursue these types of goals.

Many of these energy and climate-related goals have a target year of 2050, so the time is not to provide an option in the model energy code. While jurisdictions already own models, the model code to meet their needs; many do not have the in-house expertise to develop, and sell this type of code language.

Integrating a zero-energy building appendix into the 2021 IECC as a jurisdictional requirement or option will make the model energy code a more flexibly applicable tool.

Adopting the zero-energy building appendix in the model energy code can smooth the transition to zero-energy buildings. Rather than jurisdictions developing their own zero code language—leading to a patchwork of zero energy residential code approaches—adopting this appendix will enable a national solution to align the American residential industry for manufacturers, builders, and trades.

Building standards for construction properties across jurisdictions and states to meet these requirements. This makes education, incentive programs, and implementation significantly more straightforward and cost-effective.
Electrification

All building systems and vehicles powered by clean electricity.
Gas v. Electric Commercial Bldgs (Site BTUs)

Breakdown of Electricity vs. Gas Consumption by City
Based on CBECS 2012 Data by Census Division

<table>
<thead>
<tr>
<th>City</th>
<th>Electricity</th>
<th>Gas</th>
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<tr>
<td>Aspen</td>
<td>42%</td>
<td>58%</td>
</tr>
<tr>
<td>Berkeley</td>
<td>35%</td>
<td>65%</td>
</tr>
<tr>
<td>Boston</td>
<td>39%</td>
<td>61%</td>
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<tr>
<td>Boulder</td>
<td>42%</td>
<td>58%</td>
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<tr>
<td>Cambridge</td>
<td>39%</td>
<td>61%</td>
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<tr>
<td>Denver</td>
<td>42%</td>
<td>58%</td>
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<td>Grand Rapids</td>
<td>45%</td>
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<tr>
<td>Los Angeles</td>
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<tr>
<td>Minneapolis</td>
<td>37%</td>
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<tr>
<td>Montgomery County</td>
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<td>Philadelphia</td>
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<tr>
<td>St. Louis</td>
<td>37%</td>
<td>63%</td>
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<tr>
<td>Washington</td>
<td>24%</td>
<td>76%</td>
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Emissions intensity of electricity generation by city
Data from retail 2016 and Portfolio Manager

<table>
<thead>
<tr>
<th>City</th>
<th>Electricity Grid Emissions Intensity (lb CO2e/MWh)</th>
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</thead>
<tbody>
<tr>
<td>Aspen</td>
<td>1300</td>
</tr>
<tr>
<td>Berkeley</td>
<td>1200</td>
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<tr>
<td>Boston</td>
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<td>St. Louis</td>
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<tr>
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Energy Transitions

Gas ban backlash spreads across the U.S.

Jeffrey Tomich, E&E News reporter • Published: Tuesday, February 2, 2021

Tennessee, Oklahoma, Arizona and Louisiana enacted laws last year prohibiting bans on new gas hookups. Bills have been filed this year in a half-dozen others, Indiana and Kansas, where lawmakers have been moving on the issue.

Berkley, Calif., City Council adopted a ban on natural gas hookups the summer of 2019.

A year and a half later, the decision has generated backlash, with opponents saying the city's actions are motivated by politics, not climate change.
Grid Integration

Buildings include controls and storage to respond to time-of-use carbon and resilience signals.
One-Way Grid
The proliferation of distributed generation creates a need for more active grid management.

GridOptimal Technologies and Strategies:
- Renewable energy
Storage and smart devices can help support clean grid operations.

GridOptimal Technologies and Strategies:
- renewable energy
- energy efficiency
- electric vehicle
- energy storage
- smart connected controls
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 vehicles
- Energy storage
- Smart connected controls
Impact of Grid-Integrated Buildings
Lifecycle Impact

Design for embodied carbon, refrigerants, and deconstruction to reduce the lifecycle GHG impact of buildings
Global CO$_2$ Emissions

Source: Global Alliance for Buildings and Construction 2018 Global Status Report
Policy Solutions
HERE'S WHAT THAT WOULD MEAN PER YEAR BY 2050:

- **Electricity Savings**: 335 billion kilowatt hours (kWh)
- **Lower Utility Bills**: $65 billion
- **Water Saved**: 850 billion gallons
- **Climate Emission Cuts**: 200 million metric tons of carbon dioxide

**Equal to what**
- **Electricity produced in a year by 60,000 new wind turbines**
- **What Texans save on lotteries every year**
- **Annual pollution from 60 coal-fired power plants**

**Learn more at appliance-standards.org**
“Beyond” Code
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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NYSERDA
Questions?

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