City of Boulder Energy Codes:
Residential Energy Conservation Code Training

April 2017
OUTLINE

- Background and Context
- General Code Updates (apply to residential and commercial)
- Residential Code Updates
- Implementation Tools and Website
- Questions
BACKGROUND AND CONTEXT
THE IMPORTANCE OF NET ZERO ENERGY CODES

CITY OF BOULDER CLIMATE AND ENERGY GOALS

80X2050
COMMUNITY EMISSIONS REDUCTION

80X2030
CITY ORGANIZATION EMISSIONS REDUCTION

100X2030
PERCENT CLEAN ELECTRICITY

~ 1 million metric tons CO$_2$e
~ 10% savings by 2050
Santa Monica, CA requires net zero for all new homes.
Code is effective: Monday May 8, 2017

- Exception (for Commercial projects only): Any building with site review approval, or that has filed a complete site review application (that is later approved).
OVERARCHING ENERGY CODE CHANGES


CURRENT

Adopt a stand-alone energy code

MAY 8
OVERARCHING ENERGY CODE CHANGES

Residential
- New Construction
  - < 500 SF: Mandatory + Prescriptive
  - ≥ 500 SF: Mandatory + ERI Requirement
- Additions
  - < 1,000 SF: Mandatory + Prescriptive
  - ≥ 1,000 SF: Mandatory + ERI Requirement
- Alteration/Repair
  - < 26% of AV: Mandatory + Energy Advisor
  - 26 – 50% of AV: Mandatory + Energy Assessment
  - > 50% of AV: Triggers New Construction Requirements

Commercial
- New Construction & Additions
  - < $500,000: Mandatory + Prescriptive
  - ≥ $500,000: Mandatory + 30% better than ASHRAE 90.1-2010 baseline
- Alteration/Repair
  - < 26% of AV: Mandatory + Scope must comply with Prescriptive Requirements
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AV = Actual Values as Assessed by Boulder County’s Tax Assessor
# Overarching Energy Code Changes

## Residential

- **New Construction**
  - < 500 SF: Mandatory + Prescriptive
  - ≥ 500 SF: Mandatory + ERI Requirement

- **Additions**
  - < 1,000 SF: Mandatory + Prescriptive
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OVERARCHING ENERGY CODE CHANGES

Regulate multifamily units (MFUs) under the commercial energy code

Residential: detached one- and two-family dwellings and multiple single family dwellings (townhouses and duplexes) with a separate means of egress and their accessory structures, as well as Group R-3 and R-4 buildings three stories or less in height above grade plane.
How is floor area measured?

**DEFINITION**: The total square footage of all levels as measured from the inside finished surface of the walls, but excluding courts, unconditioned garages, and uninhabitable crawl spaces and attics.
Cumulative Permits

Square footage and construction value triggers for additions and alterations are based on all permits filed within 24 months.
(1) Remove Green Points system and streamline non-energy requirements.

(2) Reduce the maximum allowable Energy Rating Index (ERI) for new homes and additions.

(3) Revise the requirements for alterations.

(4) Allow off-site renewable energy.

(5) Electrical Vehicle Charging Outlets are required.

(6) Passive Radon Mitigation system is required.
<table>
<thead>
<tr>
<th>Green Building Green Points</th>
<th>Current</th>
<th>May 8 – COBECC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Efficiency</td>
<td>Mandatory HERS</td>
<td>Mandatory ERI COBECC</td>
</tr>
<tr>
<td>Construction Waste &amp; Demo Management</td>
<td>Mandatory</td>
<td>Mandatory w/increased stringency (IRC 324)</td>
</tr>
<tr>
<td>1 Landscaping</td>
<td>Optional points</td>
<td></td>
</tr>
<tr>
<td>2 Shading of Hardscapes</td>
<td>Optional points</td>
<td>Landscaping points not required, however a Landscape plan must be submitted for all Residential Projects per <strong>Title 9-9-12</strong>.</td>
</tr>
<tr>
<td>3 Surface Water Management</td>
<td>Optional point</td>
<td></td>
</tr>
<tr>
<td>4 High-Efficiency Automatic Irrigation</td>
<td>Optional point</td>
<td></td>
</tr>
<tr>
<td>5 Building Rehabilitation</td>
<td>Optional point</td>
<td>Not required</td>
</tr>
<tr>
<td>6 Energy Performance</td>
<td>Optional points</td>
<td></td>
</tr>
<tr>
<td>7 HVAC Systems</td>
<td>Optional point</td>
<td></td>
</tr>
<tr>
<td>8 Water Heating</td>
<td>Optional point</td>
<td></td>
</tr>
<tr>
<td>9 Lighting and appliances</td>
<td>Optional points</td>
<td></td>
</tr>
<tr>
<td>10 Solar</td>
<td>Optional points</td>
<td>“Solar Ready” requirements (IRC M23)</td>
</tr>
<tr>
<td>11 Water Efficiency high efficiency fixtures</td>
<td>Optional point</td>
<td>Water fixture efficiencies (IRC P29)</td>
</tr>
<tr>
<td>12 Material efficient framing/ structure</td>
<td>Optional points</td>
<td>Not required</td>
</tr>
<tr>
<td>13 Sustainable Products</td>
<td>Optional points</td>
<td>Not required</td>
</tr>
<tr>
<td>14 Indoor Air Quality</td>
<td>Optional points</td>
<td>Not required</td>
</tr>
<tr>
<td>Measure</td>
<td>CURRENT</td>
<td>MAY 8 – COBECC</td>
</tr>
<tr>
<td>------------------------------</td>
<td>----------------------------------------------</td>
<td>--------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Waste Management</td>
<td><strong>Construction Waste Recycling</strong> – must recycle a minimum of 50% new construction waste (wood, metal &amp; cardboard)</td>
<td>Must demonstrate that all recyclable wood, metal, and cardboard materials will be donated, reused, or recycled.</td>
</tr>
<tr>
<td></td>
<td><strong>Demolition Management</strong> projects demolishing more than 50% of the exterior walls must deconstruct at least 65% of materials by weight and divert them from landfill (including concrete and asphalt)</td>
<td>Projects shall demonstrate through a deconstruction plan that 100% of concrete and asphalt and at least 65% of all other materials (excluding concrete and asphalt) will be diverted from landfill for reuse &amp; recycling.</td>
</tr>
</tbody>
</table>
## (1) ELIMINATE GREEN BUILDING GREEN POINTS

<table>
<thead>
<tr>
<th>Measure</th>
<th>OLD REQUIREMENTS</th>
<th>NEW REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landscaping</td>
<td>Optional Green Points</td>
<td>All residential new construction permits must comply with B.R.C. Section 9-9-12 (submit Landscape Plan with application)</td>
</tr>
<tr>
<td></td>
<td>• Shading hardscapes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Surface water management</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• High efficiency irrigation</td>
<td></td>
</tr>
</tbody>
</table>

Landscape plan shall be complete per Title 9 requirements, and include irrigation and solar zones identified for installed or future solar installations per the energy code.
(1) ELIMINATE GREEN BUILDING GREEN POINTS

<table>
<thead>
<tr>
<th>Plumbing Fixture</th>
<th>Maximum Flowrate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lavatory Faucet</td>
<td>1.5 gpm at 60 psi</td>
</tr>
<tr>
<td>Shower Head</td>
<td>2.0 gpm at 60 psi</td>
</tr>
<tr>
<td>Sink Faucet</td>
<td>1.5 gpm at 60 psi</td>
</tr>
<tr>
<td>Water Closet</td>
<td>1.28 gallons per flushing cycle</td>
</tr>
</tbody>
</table>
Solar PV Ready (new buildings only)

1) 40% of roof area designated for PV (no obstructions or shading)
2) Locate and provide space for future required electrical equipment (inverter and meter)
3) Install conduit from roof to future electrical equipment location.
4) Main electrical panel shall have space for future solar.
5) Structural roof load included.
ERI required if floor area ≥ 500 sf
**ERI REQUIREMENTS / NEW CONSTRUCTION**

<table>
<thead>
<tr>
<th>STEP/CALCULATION</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1. Input Proposed Home Size *</td>
<td>0</td>
</tr>
<tr>
<td>Step 2: Record your ERI</td>
<td>0</td>
</tr>
</tbody>
</table>

- [Table R401.2.1](#) establishes ERI requirements for new construction.

**ERI required if floor area $\geq 500$ sf**
(2) ERI REQUIREMENTS/ ADDITIONS

- **Residential**
  - **New Construction**
    - < 500 SF: Mandatory + Prescriptive
    - ≥500 SF: Mandatory + ERI Requirement
  - **Additions**
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    - < 26% of AV: Mandatory + Energy Advisor
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- **Commercial & Additions**
  - **New Construction**
    - < $500,000: Mandatory + Prescriptive
    - ≥ $500,000: Mandatory + 30% better than ASHRAE 90.1-2010 baseline
  - **Alteration/Repair**
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AV = Actual Values as Assessed by Boulder County’s Tax Assessor
CURRENT CODE

- Multiple look up tables based on size of addition and finished house
- Separate new construction requirement “triggers”
- Below those triggers, smaller additions are unfairly penalized

MAY 8 - COBECC

- Additions < 1,000 sf shall meet mandatory and prescriptive requirements of IECC 2012
- Larger additions will use a single lookup table/or the online ERI calculator.
- Requirements more stringent for larger homes, and for adding a large addition as a high % of existing sf
(2) ERI REQUIREMENTS/ ADDITIONS

INSTRUCTIONS: Follow the 3 steps below to calculate the ERI requirement for your project. The calculator estimates your ERI requirement based on an estimated total conditioned space and the percent the addition will increase your current square footage. (i.e. addition sqft/proposed total sqft).

Required fields *

<table>
<thead>
<tr>
<th>STEP/CALCULATION</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1. Input Existing Home Size *</td>
<td>0</td>
</tr>
<tr>
<td>Step 2. Input Size of Addition *</td>
<td>0</td>
</tr>
<tr>
<td>Calculated: Total Proposed Conditioned Floor Area</td>
<td>0</td>
</tr>
<tr>
<td>Calculated: Addition is % of total square feet</td>
<td>0</td>
</tr>
<tr>
<td>Step 3: Record your ERI</td>
<td>0</td>
</tr>
</tbody>
</table>

- **Table R401.2.2.2(3)** [link] summarizes the ERI requirements for additions, but is illustrative only as it does not show the applicable ERI for all possible scenarios.
(3) REQUIREMENTS FOR ALTERATIONS

Residential
- New Construction
  - < 500 SF: Mandatory + Prescriptive
  - ≥ 500 SF: Mandatory + ERI Requirement
- Additions
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AV = Actual Values as Assessed by Boulder County’s Tax Assessor
## (3) REQUIREMENTS FOR ALTERATIONS

| **Assessed Value** | Actual value according to Boulder County tax assessor’s database (reappraisal possible) [http://maps.boco.solutions/propertysearch/](http://maps.boco.solutions/propertysearch/)  
| **Construction Valuation** | Total value of work covered by permits in the past 24 months (B.R.C. 4-20-4(d)) |
| **Energy Advising** | Homeowner must contact a 3rd party energy professional to discuss project to learn how efficiency opportunities can be maximized (free thru [EnergySmart](http://www.energysmart.org)). |
| **Energy Assessment** | Homeowner must obtain an energy assessment from a qualified energy assessor (BPI or RESNET Accredited professional). Subsidized thru [EnergySmart](http://www.energysmart.org). |
### (3) REQUIREMENTS FOR ALTERATIONS

<table>
<thead>
<tr>
<th>Thresholds for requirements</th>
<th>Construction valuation is &lt;26% of assessed value of existing building</th>
<th>Construction valuation is 26-50% of assessed value of existing building</th>
<th>Construction valuation is &gt;50% of assessed value of existing building</th>
</tr>
</thead>
<tbody>
<tr>
<td>Requirements</td>
<td>All mandatory and prescriptive energy and building code requirements (for the scope of the alteration)</td>
<td>Energy assessment and advising</td>
<td>Triggers new construction requirements</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Air sealing and insulation in ceiling and walls <em>(R402.4)</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Crawl space insulation, vapor barrier, and ventilation <em>(R402.2.10)</em></td>
<td></td>
</tr>
</tbody>
</table>
(4) ALLOW OFF-SITE RENEWABLES

- Allow community solar garden subscriptions once on-site options are exhausted (new homes only)

- Requirements for subscription:
  - Contract must be at least 20 years
  - Submittal must include a report and analysis by a registered design professional demonstrating the capacity (size) of the subscription required to meet the ERI

- Exceptions may be needed if programs are oversubscribed

Should only be needed for homes > 4,000 sf with shaded roofs
Dwellings with dedicated off-street parking (IRC Chapter 39)

- Applies to New Construction
- Require at least one dedicated 120 V and 240 V outlet for each new dwelling unit.
(6) RADON MITIGATION (NEW CONSTRUCTION)


- Construction techniques are intended to resist radon entry and prepare the building for future post-construction mitigation
  - Subslab depressurization system
  - vented through sump
  - using drain title loop
  - Submembrane depressurization system
Residential Amendment Summary

In 2017, the City of Boulder introduced an updated version of its adopted energy code. This code, known as the 2017 City of Boulder Energy Conservation Code (COBECC), has simplified the compliance approaches and access to information. This resource provides a high level overview of what areas of the 2012 IECC have been significantly amended to create the 2017 City of Boulder Energy Conservation Code. This resource is not a substitute for the code language itself.

**Green Building Green Points Program**
The Green Building Green Points Program has been retired and is no longer required. Key sustainability measures such as landscaping, electrical vehicle charging, and solar ready standards have been incorporated into the 2017 COBECC and the Boulder Revised Code.

### Compliance Path Requirements

<table>
<thead>
<tr>
<th>Code Application</th>
<th>COBECC Section</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amended Definitions Section</td>
<td>R202</td>
<td>Definitions section has been amended to include:</td>
</tr>
</tbody>
</table>
|                                  |                | Construction Valuation: The total value of work covered by the permit, to be determined consistent with the standards of Subsection 4-29-4(d), B.R.C. 1981. The higher of the two valuations considered under Subsection 4-29-4(d), B.R.C. 1981, shall be the total value of work.
|                                  |                | Floor Area: The total square footage of all levels as measured from the inside finished surface of the walls, excluding courts, unconditioned garages, and uninhabitable crawl spaces and attics.
|                                  |                | Residential Building: For this code, includes detached one- and two-family dwellings and multiple singlefamily dwellings (townhouses and duplexes) with a separate means of egress and their accessory structures, as well as Group R-3 and R-4 buildings three stories or less in height above grade plane. |
|                                  |                | Energy Assessment and Advising: A number of new definitions were added related to this topic. |
| Assessed Value of Existing Building | R401.2.3       | Actual value as assessed by Boulder County’s Tax Assessor. |
| Compliance for Mixed Occupancy Buildings | R101.4.6 | Where a building includes both residential and commercial occupancies, the building shall meet the requirements of this code for commercial buildings. |
| Community Solar                  | R401.2.1       | Where meeting the required Energy Rating Index (ERI) on the property is practically infeasible, the code official has authority to approve purchase of a solar garden subscription to achieve the required ERI. |

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1 In addition to what is listed in this document, all code requirements from 2012 IECC related to other climate zones were removed.
Residential Mandatory Checklist

- Checklist shall be completed and included on an "Energy Conservation Code" sheet within the plans being submitted for permit application.

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IMPLEMENTATION TOOLS

» ERI Compliance Reports
NEW DOCUMENTATION REQUIREMENTS

1) Permit Application (not new, but permits have been revised)
2) Mandatory and/or Prescriptive Checklist (pasted into plans)
3) Landscape Plan (submit with permit)
4) Solar Ready Requirements (indicate on plans)
5) Electric Vehicle Requirements (indicate on plans)
6) Radon System (indicate on plans)
7) Waste Management Applications
8) ERI reports (where required)
9) Documentation from Energy Adviser (Alterations <26% of AV)
10) Copy of Energy Assessment (Alterations 25-50% of AV)
IMPLEMENTATION TOOLS

FAQs

Energy Code FAQs

NOTE: This document is updated often, please check back regularly to ensure you are referencing the most recent version. Check the date in the footer below.

Questions for Residential AND Commercial Projects

1. Q: Has the city adopted a new energy code?
   A: On March 7, 2017 the City of Boulder adopted the 2017 City of Boulder Energy Conservation Code (COBECC) which prescribes minimum energy efficiency and conservation standards for new buildings and for additions and alterations to existing buildings. Code requirements are effective 60 days after council adoption, the effective date is May 8, 2017. Projects submitting building permit applications on or after May 8, 2017 are subject to the 2017 COBECC.

2. Q: Which projects are “grandfathered” under the codes prior to this recent 2017 update?
   A: Any project which has filed a complete site review application (which is later approved) at the time of the code adoption, will be subject to the codes that were in place at the time the application was filed. If the site review application is denied and a new submittal is required, that project will be subject to the codes in place at the time the new application is filed.

3. Q: Will accessory structures (i.e. offices in a detached garage) be subject to the commercial or the residential energy code requirements?
   A: As part of the recent updates, staff amended the definition for a Residential Building to include accessory structures. With this proposed change, all accessory structures/unitis would be under the residential energy and building codes. In the proposed energy code, Residential Building is defined as: “For this code, includes detached one- and two-family dwellings and multiple single-family dwellings (townhouses and duplexes) with a separate means of egress and their accessory structures, as well as Group R-3 and R-4 buildings three stories or less in height above grade plane.”

4. Q: Do mixed use buildings now fall under the commercial code and are ERI’s no longer required for individual units if my project is a building of all condo units with a garage underneath for example is that a commercial building?
   A: All mixed-use projects will now be required to follow the commercial requirements within the 2017 City of Boulder Energy Conservation Code (COBECC). Refer to the question above for the definition of a Residential Building. The condo unit you describe would not be considered a residential building per this definition, and would therefore need to comply with the commercial provisions of the COBECC.

5. Q: Do the “Solar Ready” requirements apply only to new buildings? Do they apply to additions? Remodels?
   A: The new “Solar Ready” requirements only apply to new buildings and additions and alterations that trigger New Construction requirements.

6. Q: For projects with multiple buildings that are of various uses, will different codes be required for each building?
   A: For multi-building projects with both commercial and residential buildings, so long as buildings are permitted separately, the residential building(s), assuming they comply with the

Updated: March 15, 2017