



Building Decarbonization in Denver

MEP Alliance | November 16, 2023

Better Buildings, Better Lives

Imagine a Zero-Carbon Future where:

- **Buildings and Homes are healthy**
- **We are all comfortable in extreme temperatures**
- **We can all breathe quality air indoors, even on the smokiest days**

**Better
Buildings,
Better
Lives**

**Buildings and Homes are responsible for
64%
of climate pollution in Denver.**

**Better
Buildings,
Better
Lives**

**BUT Denver's electric grid will be
85% renewable by 2030
AND carbon-free by 2050.**

Better Buildings, Better Lives

Electric heat pumps and efficient buildings are the key to shifting off natural gas and eliminating emissions by 2040 (or sooner where it's easier)

Denver's equitable path to zero-carbon will:

- **Create good local jobs**
- **Make Denver more competitive**
- **Reduce energy burden**
- **Reduce energy bills.**

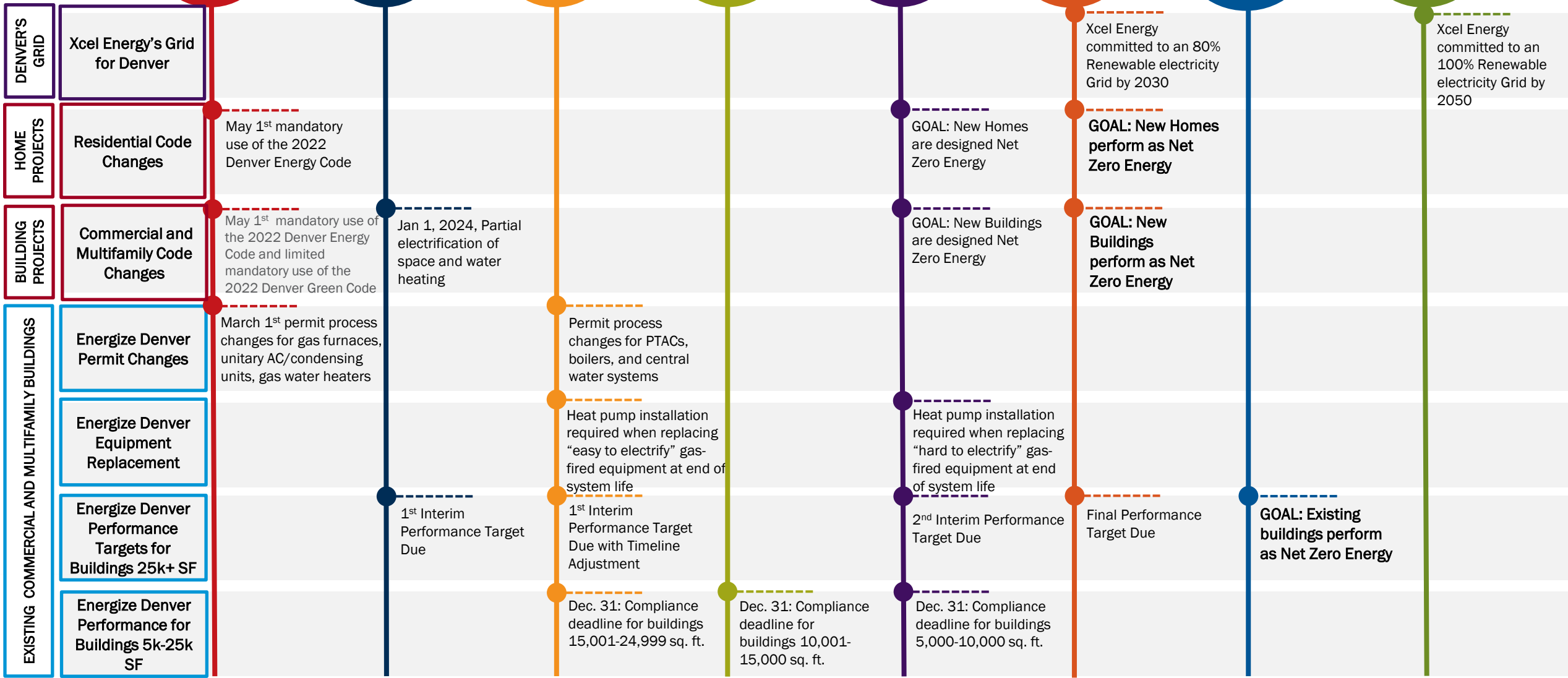
**Better
Buildings,
Better
Lives**

Agenda

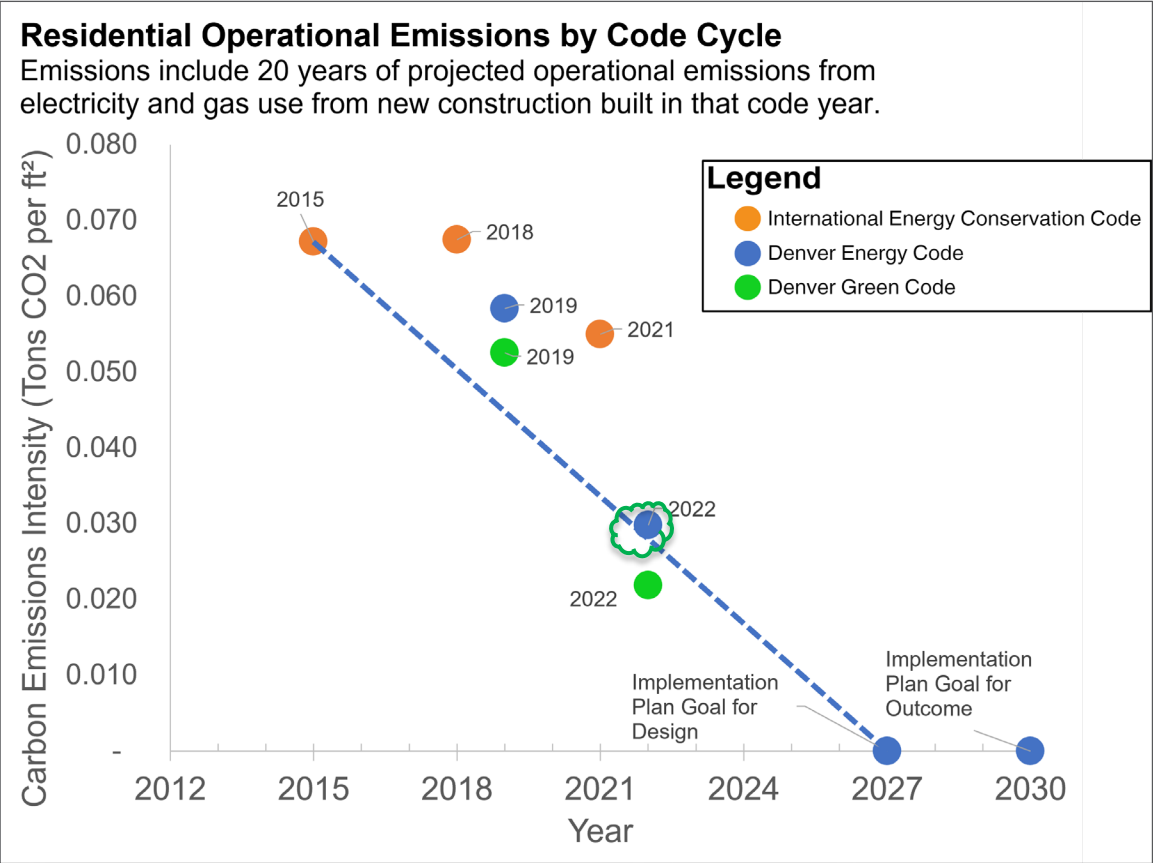
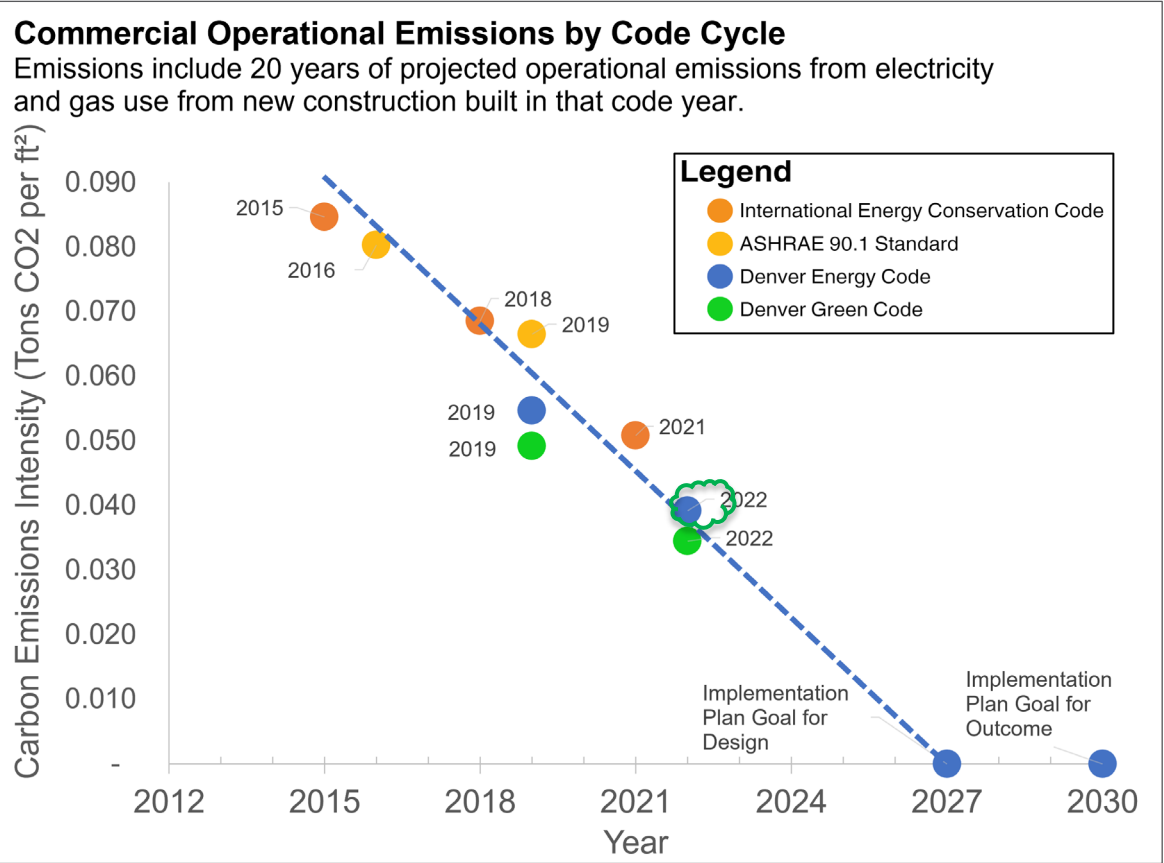
1. Decarbonization in New Construction
2. Building Performance Policy for Existing Commercial Buildings
 - Denver Program
 - Comparison to Colorado State BPS
3. Electrification Requirements and Incentives
 - Commercial and Multifamily
 - Residential
4. Resources & Contact Information



Decarbonization in New Construction



2022 Denver Energy Code – Accomplishments



* These charts show Carbon Emissions progress from the 2022 DEC with the goal that buildings are designed as NZE by 2027 and perform as NZE by 2030. The closer the 2022 Denver Energy Code is to the blue trajectory line, the closer we are to achieving our NZE goals.

Commercial Amendments

1. Commercial Partial Electrification for Space Heating
2. Commercial Partial Electrification for Water Heating
3. Commercial Prescriptive Path
4. Commercial Appendix G Energy Cost Modeling Metric
5. Commercial Appendix G Site Energy Use Modeling Metric
6. Commercial Performance Target Energy Modeling Metric
7. Commercial Electric Vehicles Update
8. Demand Load Management for Water Heaters
9. Additional energy code amendments that advance the goals of Comprehensive Plan 2040 along with updates to coordinate with Energize Denver requirements



1-2: Aligned with Energize Denver



3-6: To aid electrification, ease of use, and align with the city's Comprehensive Plan 2040

[Link to Commercial Resources](#)

Electrification for Space Heating

C403.2.4 – Space heating equipment

- Effective date of **January 1st, 2024**
 - **Fossil-fuel warm air furnaces and electric resistance space heating equipment are not to be permitted for space heating**
 - Focus on systems with design, technology, and equipment that is currently available
 - Aligns with Energize Denver requirements
- **Exceptions:**
 - Emergency power or standby power, as approved by building official
 - Makeup air systems where ERV is prohibited by Denver Mechanical Code
 - Electric resistance used for heat pump supplementary heat
 - Electric resistance up to 5 W/sf
 - Gas furnaces or electric resistance in heated plenums or freeze protection
 - Electric resistance in buildings that use a performance path for compliance
 - Replacement furnaces that comply with Alterations C503.3.3

Electrification for Water Heating

C404.10 Water heaters.

- Effective date of January 1st, 2024
- Fossil fuel and electric resistance instantaneous and storage water heaters are not to be permitted to provide potable hot water
- Focus on systems with design, technology, and equipment that is currently available
- Aligns with Energize Denver requirements

• Exceptions:

- Electric resistance elements in heat pumps
- Electric resistance elements for recirculation loop temperature maintenance
- Electric storage water heaters with a volume ≤ 20 gallons
- Instantaneous electric water heaters within 10 feet of point of use
- Hot water storage tanks without electric resistance or fossil-fuel heating elements
- Water heating systems that require water temperature $\geq 141^\circ\text{F}$
- Electric resistance equipment where on-site renewables serves 100% the annual service water heating requirement
- Electric resistance storage water heating equipment where solar thermal serves 75% of the annual service water heating requirement
- Electric resistance in buildings that use a performance path for compliance
- Replacements of gas-fired storage water heaters or instantaneous water heaters that comply with Alterations C503.4.1

2022 Denver Green Code: **Applicability**

1. **Limited Mandatory Use**

All new **commercial** projects + major renovations*
Choose provisions
Gain familiarity

Read + Familiarize
Choose **12/7*** of **116** provisions

2. **Voluntary Enhanced Use**

Four options:

1. As-Written
2. LEED Platinum
3. Zero Net Energy, All Electric
4. Passive House + Non-Energy As-Written



Commercial - Denver Green Code (DGC)

Limited mandatory use for new and major renovation commercial projects

[Denvergov.org/GreenCode](https://denvergov.org/GreenCode)

Table 101.4.1 Limited Mandatory Use: Quantity of Provisions Required		New Construction	Major Renovation
Chapter 1	Scope and Administration: Ecological Impact Statement (EIS)*	0	0
Chapter 4	Residential Energy [RE]	0	0
Chapter 5	Site Sustainability	4	2
Chapter 6	Water Use Efficiency [WE]	1	0
Chapter 7	Commercial Energy	1	1
Chapter 8	Indoor Environmental Quality [EQ]	1	1
Chapter 9	Materials and Resources [MR]	3	1
Chapter 10	Construction and Plans for Operation [CX]	2	2

**The EIS can be used as a substitute for any one required provision*

Net Zero Energy Hub – Codes and Resources

www.denvergov.org/EnergyCode

Resources for:

- New provisions in the 2022 Denver Energy Code
- The Denver Energy Code compliance pathways
- Specifics to each phase of a new building project, from design and construction to alterations and additions
- Training videos to walk you through specific provisions that have been updated since the 2019 Denver Building Code

Net Zero Energy Hub - Codes and Resources

This resource hub pulls together information from Denver and pairs it with resources from across the country to help building owners, professionals, and residents:

- Learn about changes in the 2022 Denver Building and Fire Code and the 2022 Denver Green Code
- Understand the importance of building electrification and energy efficiency
- See examples of successful Net Zero Energy building projects in a variety of building types and uses
- Navigate new regulations and requirements with confidence!



Resources for New Commercial and Multifamily Buildings

Buildings that are regulated by the Denver Commercial Building Code, which include commercial buildings and multi-unit residential buildings that are not regulated by the Denver Residential Code.



Resources for New Single Family, Duplex, and Townhomes

Any detached one- or two-family dwelling unit and townhomes three stories or less are regulated by the Denver Residential Code.



Electrification Pilot Funding for New Construction

Denver is offering incentives for new buildings built with all-electric equipment. Learn about our Design Incentives and All-Electric Pilot programs, and find out if your project qualifies.

Net Zero Energy Hub – Codes and Resources



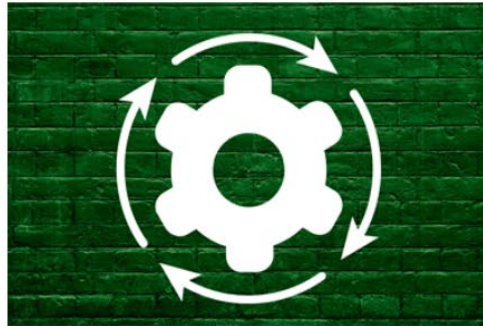
Overview



Design Phase



Construction Phase



Operations &
Maintenance



Alterations &
Additions



New Building
Electrification Rebates

Net Zero Energy Hub – Codes and Resources



Design Phase

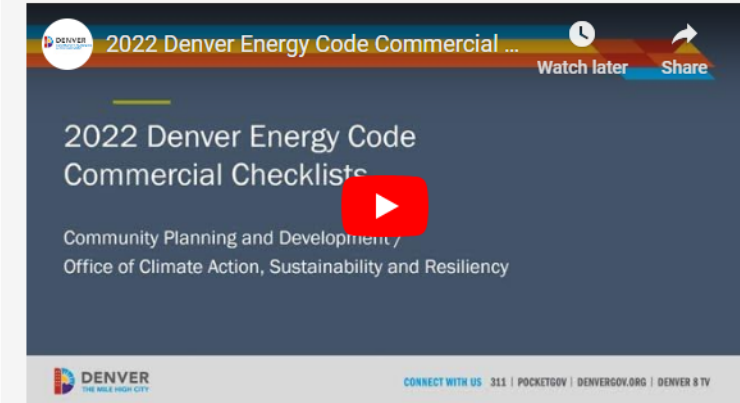
Resources for the 2022 Denver Energy Code

The Denver Energy Code is a section of the Denver Commercial Building Code. It lays out requirements for buildings to comply with for Denver to meet or exceed its climate action goals. There are several compliance pathways for the Denver Energy Code. These resources will help you understand what you are required to do. The Denver Energy Code will be updated during every code cycle to maintain the path Denver needs to meet the goal of all new buildings and homes achieving Net Zero Energy by 2030.

[See the Denver Energy Code Resources](#)

Denver Energy Code Commercial Resources

Denver Energy Code Checklists



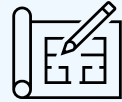
[Community Planning and Development's](#) energy code checklists are designed to support project teams in navigating complexities of the energy code, and succeeding in delivering projects that support our community's expressed priorities.

A commercial checklist is required for all commercial and multi-family residential construction projects. Projects using the Performance Path are required to use the two files for the energy modeling report.

[Learn more and see the checklists](#)

New Building Electrification Incentive Program

A) Design Support



partial funding for drawing sets and as-built drawings that can be reviewed by Denver builders to help inform how electrification can work for their projects

B) Pilot Projects



partial funding for builders or property owners interested in leveraging city funds to help a new building project be built all-electric

Equity and Local Focus: 50% of the pilot project funds will be prioritized for affordable housing or otherwise serve or benefit under-resourced communities in Denver. Denver-based and/or MWBE firms and organizations are especially encouraged to apply for incentives.

[Apply Today!](#)

www.denvergov.org/NetZero



Building Performance Policy

Decarbonization in Existing Commercial Buildings

Energize Denver Ordinance for commercial buildings

Reduces emissions from buildings 80% by 2040

Applies to all commercial, multifamily, institutional, municipal, manufacturing, agricultural, and industrial buildings

Benchmarking

- Buildings 25,000 sq. ft. and larger
- Submit energy data annually
- All data publicly available at www.energizedenver.org

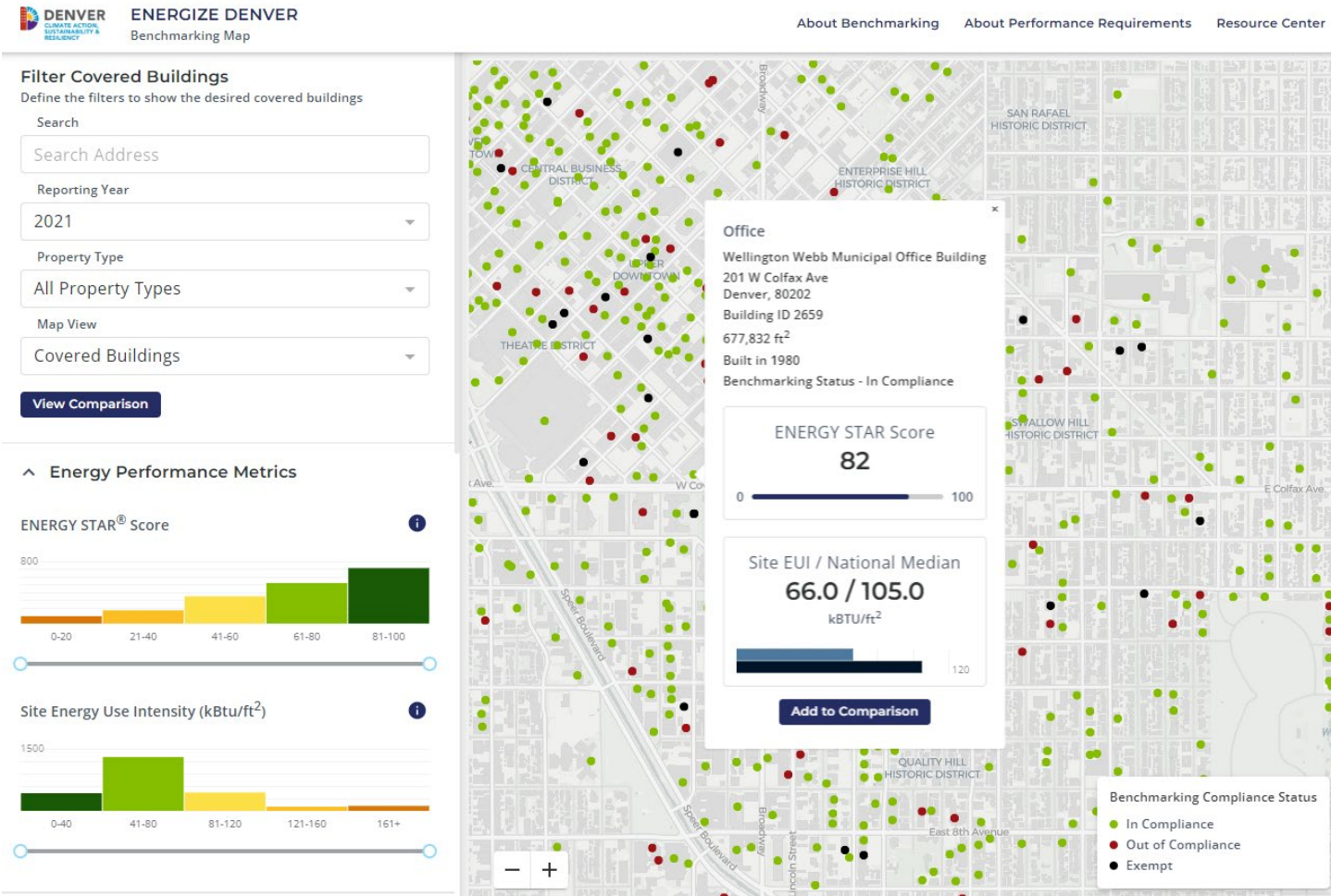
Performance

- Minimum energy efficiency requirements for buildings 25,000 sq. ft. and larger
- LED or Renewable requirements for buildings 5,000 -24,999 sq. ft.
- Focused on improvements to energy efficiency and increasing renewables

Electrification

- Applicable to all commercial buildings, no matter the size
- Partial electrification of space and water heat and cooling equipment upon system replacement, when cost effective

Benchmarking since 2016



- Buildings 25,000 square feet and larger
- Reports submitted through Energy Star Portfolio Manager (ESPM)
- Due June 1 each year
- New 3rd Party Data Verification Requirements coming in the years where performance is evaluated
- <https://energizeddenver.org/>

Setting 2030 Targets

Applicable to almost 3,000 buildings in Denver!

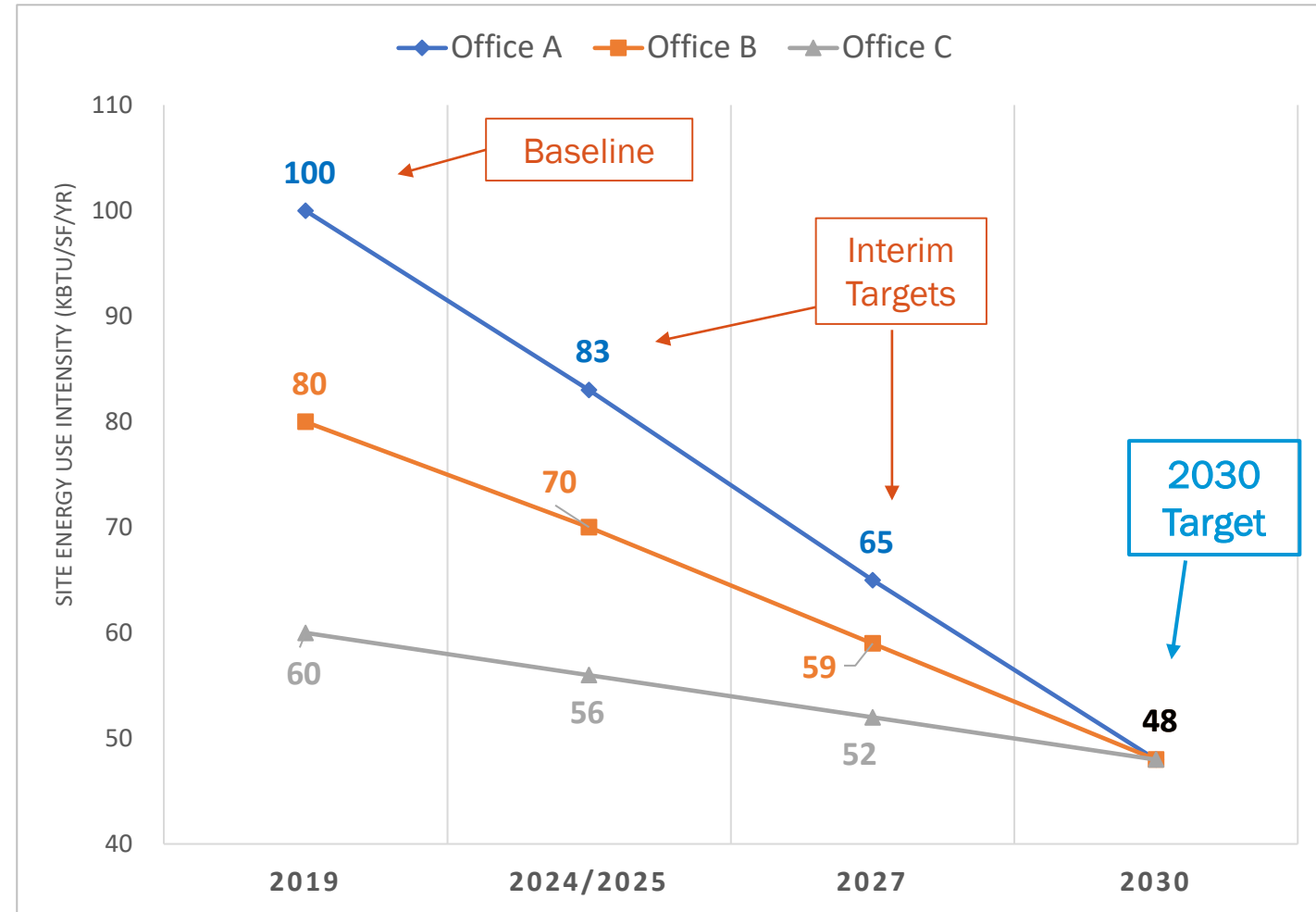
- Applies to all buildings 25,000 sq. ft. and larger
- Targets set at the 15th percent for all covered buildings in Denver using 2019 baseline (i.e. 85% of covered buildings will have to take action)
- Mixed-use buildings will have a blended target based on weighted % of 3 largest building types

ESPM Building Type	Target EUI
Office	48.3
Hotel	61.1
Multifamily Housing	44.2
Performing Arts Center	53.2
Distribution Center	25.4
Restaurant	194.1
Medical Office	69.0

**Targets set for 70+ different property types*

Performance Targets and Maintenance

- Target Setting:
 - Baseline = 2019
 - Interim targets for 2024/2025 and 2027
 - Final 2030 target
- Maintenance: all covered buildings must maintain 2030 target indefinitely
- The targets are the minimums that CASR regulates during performance evaluation. Building owners can move faster if they choose.



Benchmarking for Normalized Performance Targets

Important for benchmarking to reflect certain items in detail for normalized performance targets and target adjustments:

- Swimming pools
- Data Centers
- Parking
- Electric vehicle charging stations
- Third-party loads to exclude (must be sub-metered)
- **High-intensity building types should be broken out with correct square footage**



Submitting a Target Adjustment

Any target adjustment a building is looking to have must be done through the City's online submission form.

- Able to apply for multiple adjustments at 1 time
- Required Items
 - Online Application
 - Verified 2019 Benchmarking
 - Data Verification Checklist from Portfolio Manager
 - Supporting Documentation (ex. Drawings for a Sq. Ft. Adjustment)

[Targets - City and County of Denver \(denvergov.org\)](https://denvergov.org)

Example Target Adjustment

Indoor Swimming Pool

Calculation:

- Step 1: (2030 EUI Target x Gross Sq. Ft.) + (Pool kBtu) = Adjusted Target kBtu
- Step 2: Adjusted Target kBtu/Gross Sq. Ft. = Adjusted 2030 Target EUI

TABLE 20: INDOOR SWIMMING POOL ADJUSTMENTS

Property Type	Recreational (20 yds x 15 yds)	Short Course (25 yds x 20 yds)	Olympic (50 m x 25 m)
School	786,742 kBtu/yr	1,311,236 kBtu/yr	3,920,889 kBtu/yr
Hotel	537,075 kBtu/yr	895,125 kBtu/yr	2,676,625 kBtu/yr
Other	487,127 kBtu/yr	811,878 kBtu/yr	2,427,696 kBtu/yr

Parking

TABLE 22: PARKING ADJUSTMENTS

Parking Type	End Use	Parking Area Site Energy
Open Parking	Lighting	2.989 kBtu/ft ² /yr
Partially Enclosed (No Walls)	Lighting	8.967 kBtu/ft ² /yr
Completely Enclosed Parking (Walls)	Lighting	8.967 kBtu/ft ² /yr
	Ventilation	2.39 kBtu/ft ² /yr
	Heating (if present)	0.009354 kBtu/ft ² /yr

[Technical Guidance for Target Adjustments \(denvergov.org\)](https://denvergov.org)

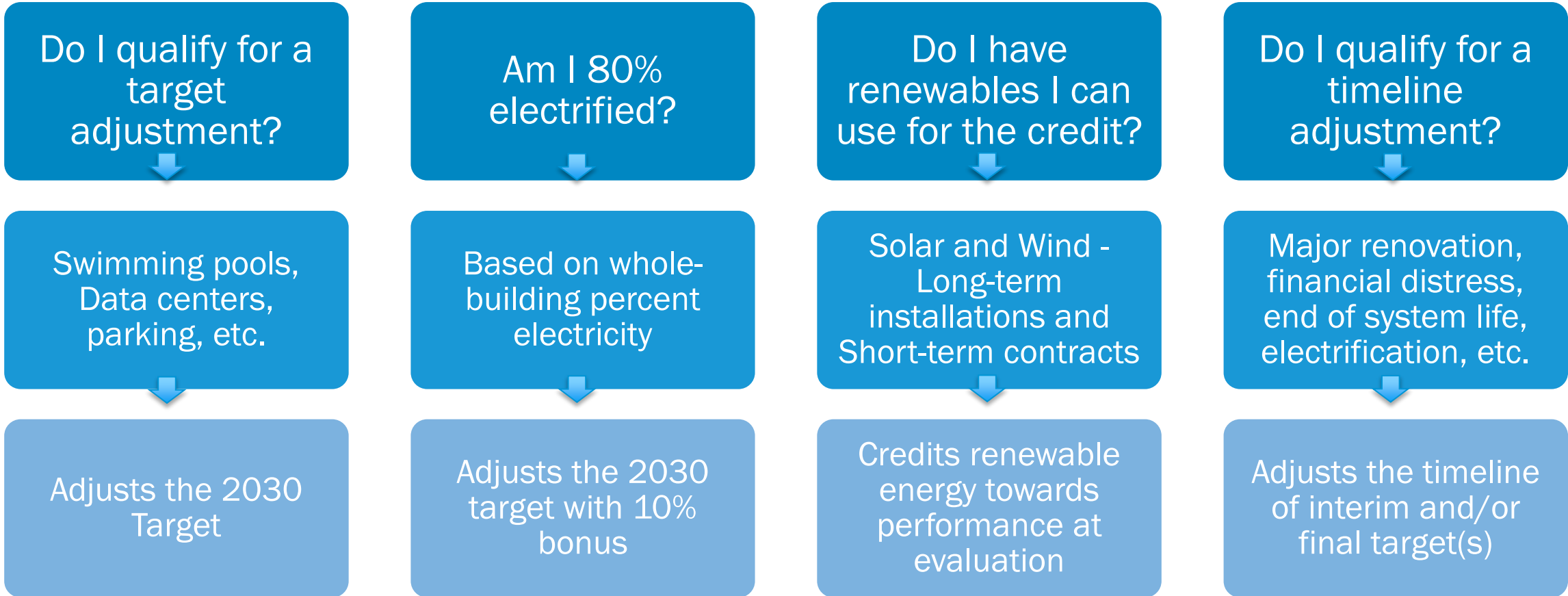
Benchmarking for Proper Mixed-Use Targets

Strip Mall Example

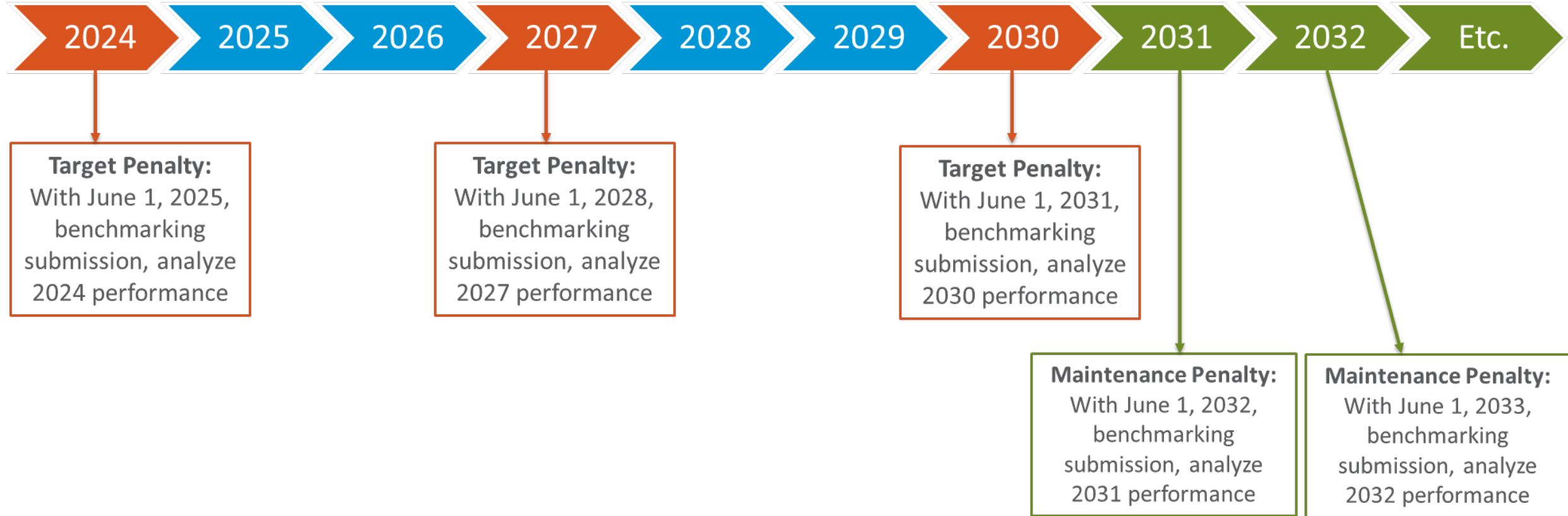
<ul style="list-style-type: none">• 10 units• benchmarked as 100% “strip mall” property type• 2030 target = 66.6	<ul style="list-style-type: none">• 10 units• 20% restaurants• 60% grocery store• 20% retail store• 2030 target = 146.2	<ul style="list-style-type: none">• 10 units• 50% restaurants• 10% bar/nightclub• 10% fast food• 30% retail store• 2030 target = 149.9
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Flexibility in Compliance

At a basic level, for compliance, all you have to do is meet the EUI target by its due date and turn in benchmarking to prove it!



Building Performance Assessment Timeline



Buildings 5,000-24,999 sq. ft.: Lighting or Renewable Requirements

Applicable to more than
6,000 buildings in
Denver!

- Perform 1 of these options by the deadline:
 - Certify that a minimum of 90% of the building's total lighting load is provided by LED lights, **OR**
 - Utilize on- or off-site renewable power generation to meet a minimum of 20% of the building's annual site energy usage
- Step-by-step Compliance Guide available online
- Building owners should claim their building as the first step in compliance: bit.ly/claimmybuilding

Building Size (sq. ft.)	Compliance Deadline
15,001 - 24,999	December 31, 2025
10,001 - 15,000	December 31, 2026
5,000 - 10,000	December 31, 2027

Comparison of Denver & State Programs

- The State of Colorado adopted [rules](#) in August 2023 for the State's BPS requirements for buildings 50,000 sq. ft. and larger. However, this new program does not supersede or replace the Energize Denver [Building Performance Policy](#). While both the State of Colorado and the City and County of Denver will be working together to align our programs as best we can, building owners will need to comply with both BPS programs.
- The State's BPS rules went into effect October 2023, and the Colorado Energy Office (CEO) will be releasing technical guidance to all building owners in November 2023, which they will be accepting public comments on. CEO will also be hosting webinars and open office hours between December 2023 – February 2024 to hear feedback from building owners on what resources would be the most helpful when complying with the State's requirements.
- For more information on the State's BPS requirements, please go to the [State's website](#) or the [Building Performance Colorado program website](#).

Denver BPS



Colorado BPS



	Denver BPS	Colorado BPS
Applicability	<ul style="list-style-type: none">25,000 sq. ft. and largerManufacturing, Agricultural, and Industrial (MAI) buildings included	<ul style="list-style-type: none">50,000 sq. ft. and largerMAI building exclusion at 50% process sq. ft.
Model	Site EUI Targets with trajectory – 2030 EUI Targets by building type with interim targets based on building’s 2019 baseline	<ul style="list-style-type: none">Energy Efficiency Pathway - Site EUI Target by building typeGHG Reduction Pathway - GHGI Target by building typeStandard percent reduction (13 by 2026/29% by 2030 in either metric)
Target dates	<ul style="list-style-type: none">‘24/’25 interim, 2027 interim, 2030 finalMAI: 2026 interim, 2030	<ul style="list-style-type: none">2026 and 2030 targets
Renewables	Renewables can contribute with or without RECS	Renewables must retain RECs; must use after exhausting energy efficiency and electrification measures; If using renewables, must use GHGI target
Adjustment Options	Target Adjustment (standard options), Timeline Adjustment; Electrification credit; 30% reduction property type option	Target Adjustment (more flexible for Under Resourced Buildings, standard options for others); Timeline Adjustment



Electrification Requirements and Incentives

Existing Commercial / Multifamily & Residential Properties

Energize Denver Electrification Requirements

Partial electrification of space and water heating and cooling equipment upon system replacement in all **existing commercial and multifamily buildings** *when cost-effective*

Amending Denver Building and Fire Code	2023	2025	2027
Permit process: Requires plan review for unitary AC/condensing units serving a heated space, gas furnaces, gas hot water heaters – including an Electrification Feasibility Report (EFR)	X		
Equipment replacement: Heat pumps required upon replacement of unitary AC/condensing units serving a heated space, gas furnaces, gas hot water heaters <i>when cost-effective</i>		X	
Permit process: Requires plan review for PTACs, VTACs, boilers, and central hot water systems – including an Electrification Feasibility Report (EFR)		X	
Equipment replacement: Heat pumps required upon replacement of PTACs, VTACs, boilers, and central hot water systems <i>when cost-effective</i>			X

Permitting to install Heat Pumps

Permit process required to install heat pumps replacing covered equipment

When a gas-fired furnace, water heater or unitary air conditioner is replaced with a heat pumps or partial heat pump furnace, then it cannot be permitted as a Quick Permit:

Applicant must apply for Building Log through Denver's E-permits website

- Provide mechanical and electrical drawings prepared by a professional engineer
- Apply for a Zoning Permit for new exterior equipment
- Wastewater review will be required for new ground mounted equipment
- Landmark review may be required for new exterior equipment
- Structural review may be required for new roof mounted equipment

E-permits:

www.denvergov.org/epermits

How to apply for a permit using e-permits:

<https://youtu.be/NWtzaAPjID4>

Existing Building Electrification Program Commercial and Multifamily Incentives

Pilot Program

- Available now
- Covers 100% of the cost of the Electrification Feasibility Report (EFR)
- Covers up to 100% of the cost of heat pump equipment, \$75,000 cap

Electrification Feasibility Report (EFR)





- Available now
- Covers up to \$2,500 of the cost of the Electrification Feasibility Report (EFR)
- 3 EFRs per year
- Preapproval required
- www.NewDayNewCode.com

Heat Pump Equipment

- Available now
- Covers part of the cost of heat pump equipment
- Preapproval required
- www.DenverGov.org/BuildingElectrificationRebates

Commercial & Multifamily Rebates fall 2023

www.denvergov.org/HeatPumpRebates
electrification@denvergov.org








Eligible Equipment	Denver Rebate Value
 <p>Heat pump rooftop units</p>	<p>Small dual fuel or all electric (<11.25ton / <135k BTU/h) = \$5,000 Large dual fuel or all electric (≥11.25 ton / 135k BTU/h) = \$8,000</p> <p><i>Energy Star adder = \$3,000</i> <i>All-Electric Heat Pump RTU adder = \$5,000</i></p>
 <p>Split air-source heat pumps</p>	<p>High efficiency = \$3,000 Cold climate = \$5,500</p>
 <p>Mini-split heat pump</p>	<p>High efficiency = \$3,000 Cold climate = \$5,500</p>
 <p>Heat pump water heater</p>	<p>Light commercial (≥2.8 - <3.5 UEF) = \$2,500 Light commercial (≥3.5 UEF) = \$3,500</p> <p><i>Smart HPWH adder = \$200</i></p>

Rebates for Equity Priority Buildings, such as affordable housing and nonprofits, are doubled, not to exceed total project cost.

Existing commercial buildings, multifamily apartment buildings, and multifamily condominium buildings are eligible. New construction is not eligible.

Denver Residential Rebates fall 2023

www.denvergov.org/HeatPumpRebates
climateactionrebates@denvergov.org

Eligible Equipment	Denver Rebate Value	Contractor Eligibility Requirements
 Air source heat pump	\$1,500 (high efficiency) \$3,500 (cold climate)	Eligible contractors must be an Xcel Registered Trade Partner.
 Ground source heat pump	\$3,500	
 Mini-split heat pump	\$1,500 (high efficiency) \$3,500 (cold climate)	
 Heat pump water heater	\$1,000 (high efficiency) \$1,750 (smart water heaters)	
 Solar	\$4,000 if you already have a heat pump or vehicle-to-home EV charger	Eligible contractors must be a licensed electrician.
 Battery storage	\$500 available to all residents \$2,750 if the house has a heat pump	
 EV charging home wiring	\$1,000	

Residential Programs

Healthy Homes Pilot Program

- 200 pilots for air-quality-improving and building electrification upgrades with free air quality testing. For Income Qualified homeowners, condo-owners and renters living with chronic respiratory issues in City and County of Denver.
- Homeowners, condo-owners and renters contact Energy Outreach Colorado at 303-226-5065 or healthyhomes@energyoutreach.org. (hablamos español)
- Multifamily building owners and managers in the City and County of Denver can learn more by answering a few questions at bloccpower.io/electrify-denver. Or Contact russ@bloccpower.io. (hablamos español)

CASR Staff Contact: mac.prather@denvergov.org

Electrification Program Resources

- Information on heat pumps
- Program and rebate measure details and requirements, including program eligibility (residential + commercial/multifamily)
- Rebates for Electrification Feasibility Reports (commercial)
- Contractor trainings and information on permitting heat pumps
- Instructions for installers applying for residential rebates
- How to use the installer portal (residential)

www.denvergov.org/CAREContractorResources

www.denvergov.org/HeatPumpRebates

Heat Pump Rebates

Save money when you install a heat pump! Efficient electric heat pumps cool your building in the summer and heat your building in the winter. We now have rebates for all building types to help you install a heat pump and enjoy better indoor air quality and a more comfortable building. Get yours today!



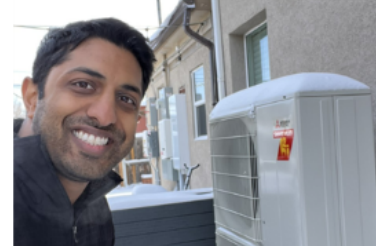
Rebates for Homeowners

Denver's Home Energy Rebates are for single-family homes and multifamily buildings with four or fewer units. Work with a contractor to save thousands of dollars when you install a heat pump or other qualifying home energy upgrades.



Rebates for Commercial and Multifamily Buildings

Denver's Building Electrification Rebates help the owners of commercial buildings, multifamily buildings with five or more units, or individual condo owners when they install a heat pump. Save thousands of dollars when you electrify your building!



Heat Pumps 101

Not sure what a heat pump is? That's okay! It's an old technology that is making a major comeback right now. That's because they could be the key to electrifying our homes and decreasing carbon emissions from heating and cooling our spaces.

Equity- Related Programming & Impact



Equity Related Activity	Details	Audience
Electrification for Existing Buildings	<ul style="list-style-type: none"> • 50% incentives to Equity Priority Buildings • 100% funding from Climate Protection Fund (CPF) 	<ul style="list-style-type: none"> • Affordable housing • Human service providers • BIPOC tenants and owners
Healthy Homes	<ul style="list-style-type: none"> • 100% funding from CPF 	<ul style="list-style-type: none"> • Low Air Quality areas • Low-income and energy-burdened households • Community members with respiratory conditions
Building Performance Compliance Assistance	<ul style="list-style-type: none"> • Long-term technical assistance in meeting energy requirements • Build a case to support building 5k-24,999k ft² 	<ul style="list-style-type: none"> • Property owners • Property managers (Affordable + Naturally Occurring Affordable Housing) • Nonprofits • Commercial
New Construction	<ul style="list-style-type: none"> • 50% funding allocated for equity priority buildings 	<ul style="list-style-type: none"> • Affordable housing • Nonprofits • Cultural centers

For more information on the new construction program, go to www.denvergov.org/EnergyCode

For more information on the building performance requirements, go to www.denvergov.org/EnergizeDenver

For more information on the electrification rebate programs, go to www.denvergov.org/HeatPumpRebates

Be in touch!

For questions about our new construction program: tom.gleason@denvergov.org

For questions regarding benchmarking and building performance:
energizedenver@denvergov.org

For questions about electrification programs or requirements:
electrification@denvergov.org