



Building Performance Improvement Board

1/18/2023

Learn more at <https://www.montgomerycountymd.gov/green/energy/beps.html>

Agenda

- **Administrative items**
- **Recap actions from previous meeting**
- **Site EUI Target setting discussion**
 - **Discussion goals / outcomes (discussion: 10 minutes)**
 - **Revisit EE and EE-ZNC Mid-Point Targets (slides: 15 minutes, discussion: 20 minutes)**
 - **Under-Resourced Buildings (slides: 5 minutes, discussion: 15 minutes)**
 - **Incentives Brainstorm (slides: 5 minutes, discussion: 20 minutes)**



Administrative Items

Actions

- Approve meeting notes



Previous Meeting Recap

ZNC Target Overview

- Reviewed ZNC target option with findings from BEPS Technical Report
- Reviewed currently available local, state, federal, and utility incentive and financing programs.

Action Items

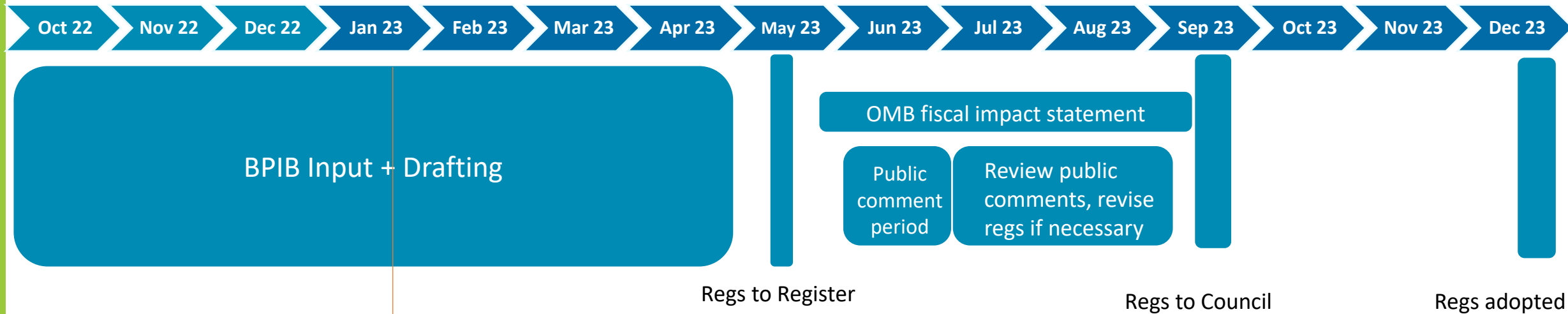
- Members asked about examples of incentive programs in other jurisdictions, particularly those that focus on preserving housing affordability with investments in building efficiency
 - Covered in Incentives section below



Site EUI Standard Setting: Goals for Discussion/Outcomes

Regulation Development

- Board provides recommendations
- DEP drafts regulations in consultation with Office of County Executive
- Public comment period
- County Council deliberation – 60 days, vote up or down, with comments back to CE
- If not adopted, back through public comment period and revote



Technical Guidance Development

Goals for Discussion & Outcomes

Goals:

- Focus on *principles* and *methodology* of standard setting
- Apply uniform standard setting methodology to each building group to arrive at site EUI targets...not debating numbers
- Extensions/adjustments for under-resourced buildings still a topic that needs discussion

Outcomes:

- Establish pros and cons of each proposed standard
- Document items that DEP (and others) should take into advisement about range of EUI targets when drafting/deliberating regs
- Summarize areas of consensus and non-consensus in board report
- Vote on recommended target methodology?
- Continue discussing other areas that need attention – under resourced buildings, BPIPs, renewable energy allowance, etc, with site EUI options in mind

Action Item

In advance of Feb 1 meeting, each member to provide written thoughts on site EUI target options, including a list of pros and cons for each, plus any other considerations they feel should be taken into advisement.

		EE	EE-ZNC Midpoint	ZNC
Technical feasibility	Pros			
	Cons			
Economic feasibility	Pros			
	Cons			
Alignment w state/County goals	Pros			
	Cons			
Comments				



Site EUI Targets: Revisiting Options

Target Method 1: Energy Efficiency (EE) Target

- Achievable through energy efficiency measures for the typical building.
 - Most buildings should be able to achieve these reductions through efficiency and equipment optimization of electric and fossil fuel-based systems.
 - For some buildings, the easiest pathway may be electrifying some systems. Electrification is a very effective site EUI energy efficiency measure.
- Calculated by applying a moderate reduction of energy use to the typical building in each building type:

End Use	Percent reduction from the localized median EUI for EE target
Electricity	15%
Gas Space Heating	20%
Gas Water Heating	10%
Gas Cooking	0%
Gas Laundry/Other	0%

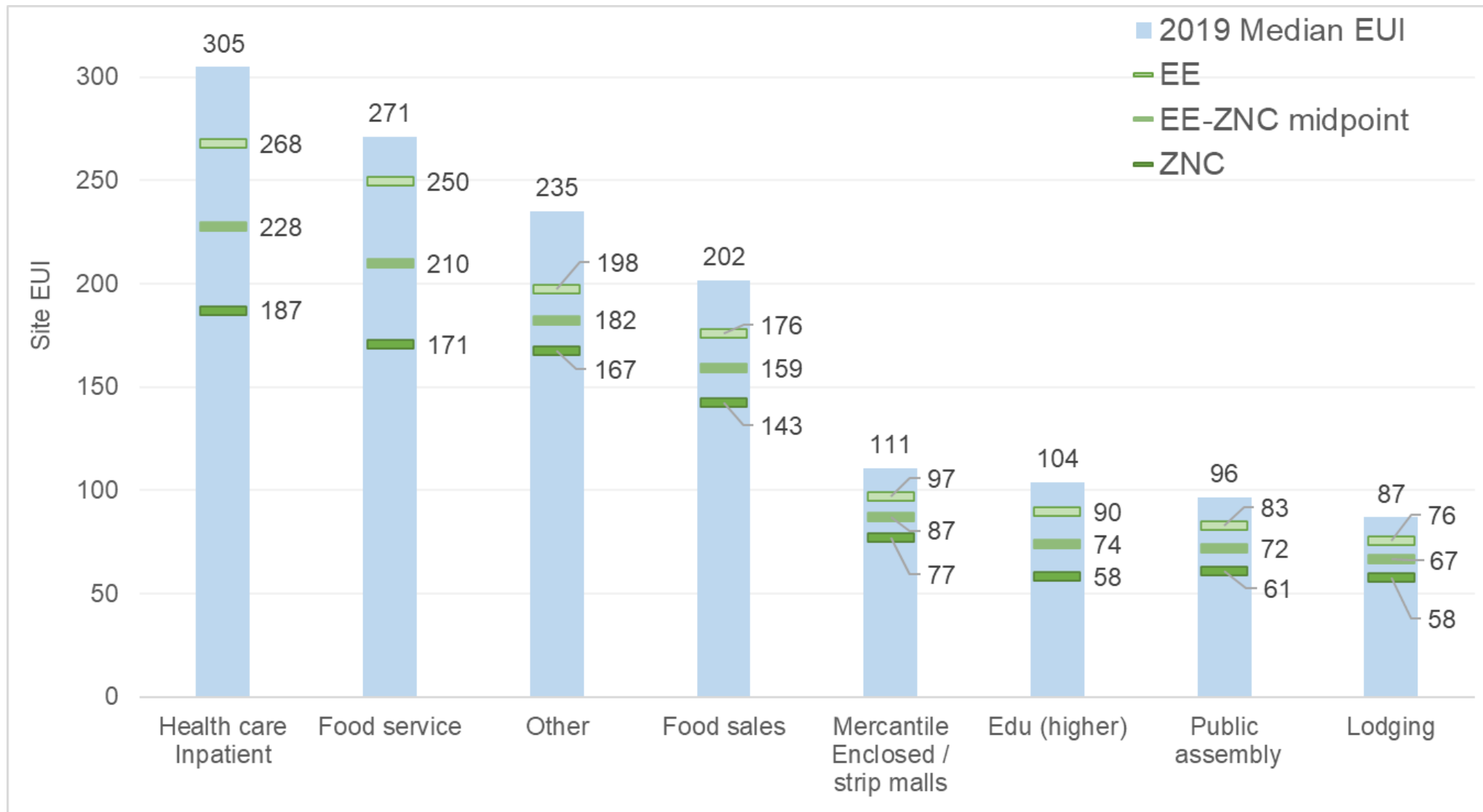
Target Method 2: Zero-Net Carbon Compatible (ZNC) Target

- An EUI level simulating the electrification of all fossil fuel end uses using market-ready technology in an energy efficient building.
- The ZNC targets are a technically feasible limit on building energy performance for each group

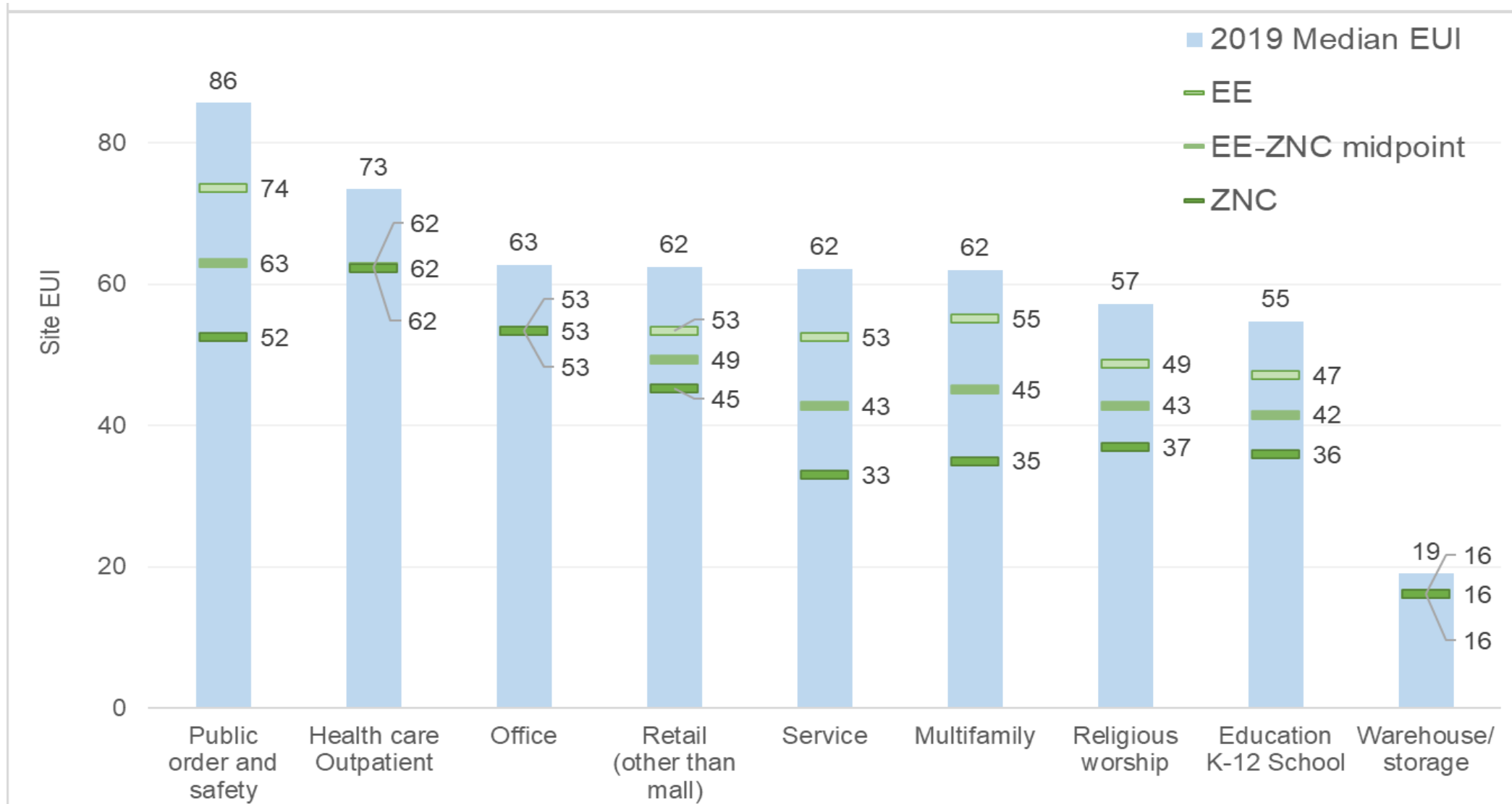
End Use	Percent reduction from the localized median EUI for EE target	Additional percent reduction starting from the EE target for ZNC target
Electricity	15%	0% (no further change)
Gas Space Heating	20%	68%, all electric (COP* 0.80 → 2.50)
Gas Water Heating	10%	59%, all electric (COP 0.90 → 2.20)
Gas Cooking	0%	39%, all electric (COP 0.45 → 0.74)
Gas Laundry/Other	0%	11%, all electric (COP 0.90 → 1.00)

**COP is the Coefficient of Performance of the equipment, defined as energy output (heat) divided by purchased energy input (gas or electricity). A COP of 0.8 is an annual efficiency of 80%. A heat pump can operate at average efficiencies of 250% (COP of 2.50) by extracting heat from the outside air.*

Site EUI Options from BEPS Technical Report (1 of 2)

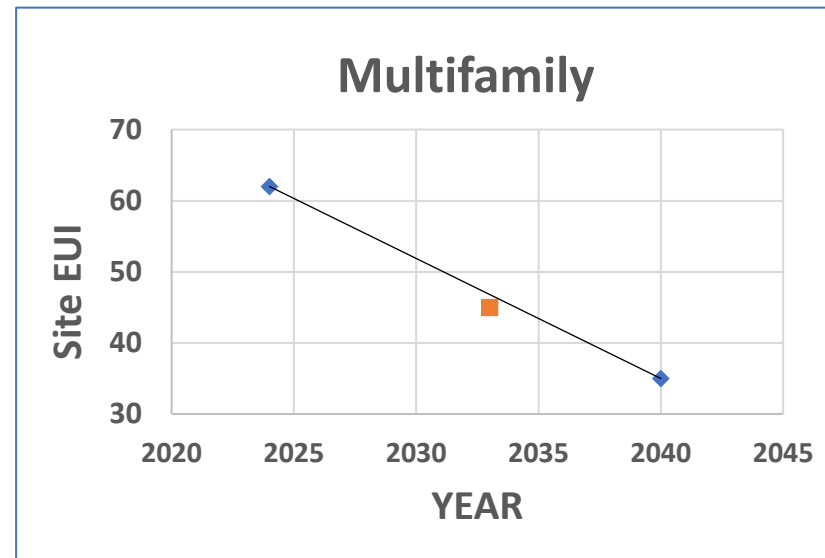


Site EUI Options from BEPS Technical Report (2 of 2)



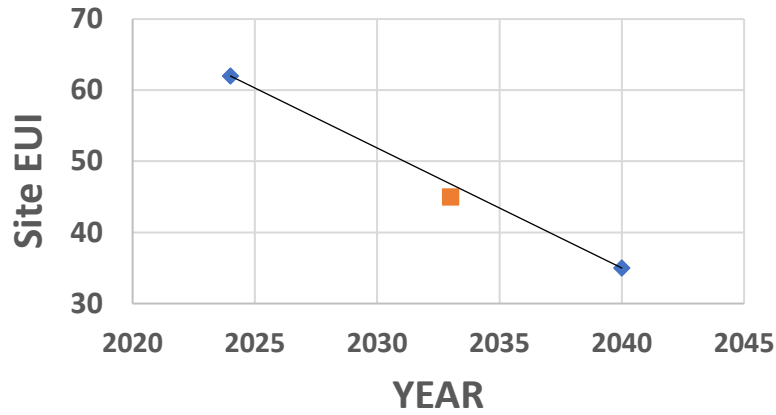
EE/ZNC Consideration: On the Road to 2040

- We agreed the EUI targets should at least be somewhat aligned with the 2040 State goal of zero net direct GHG emissions
- ZNC is defined as the EUI that would eliminate most combustible fuels
- If we equate ZNC to the state's 2040 goal, how does that relate to the EE/ZNC target?
- The blue line is a constant decrease in EUI from the building group median baseline in 2024 to the ZNC in 2040
- The orange point is the EE/ZNC EUI target in 2033, when building groups 1 and 2 are to be completed

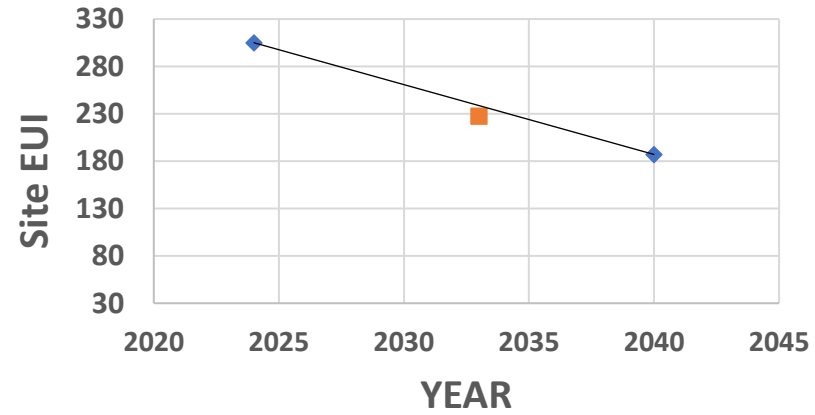


EE/ZNC Consideration: On the Road to 2040

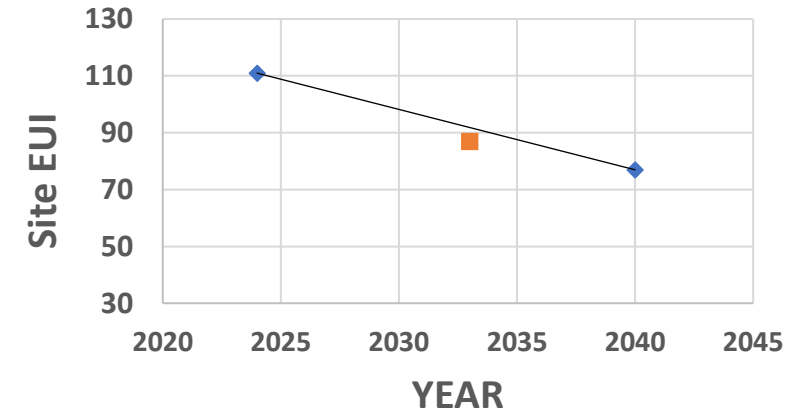
Multifamily



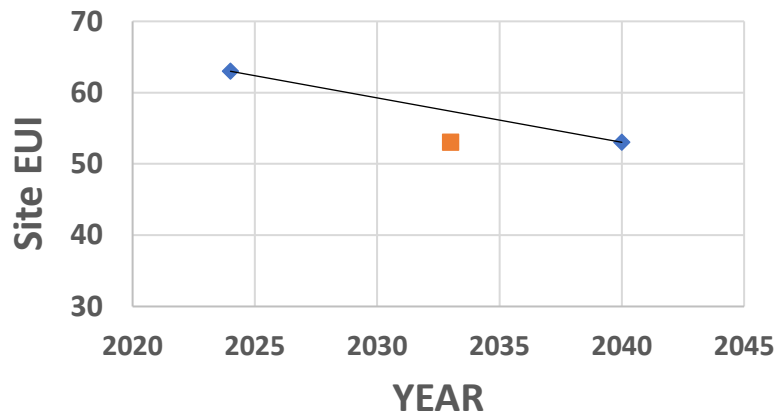
Health Care Inpatient



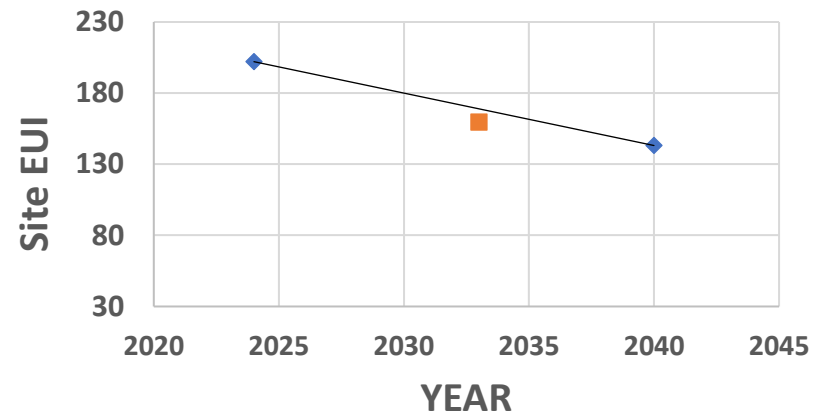
Enclosed Malls & Strip Malls



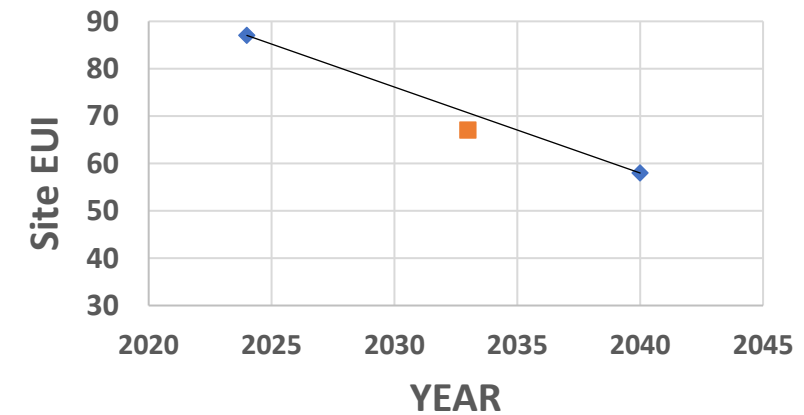
Office



Food Sales

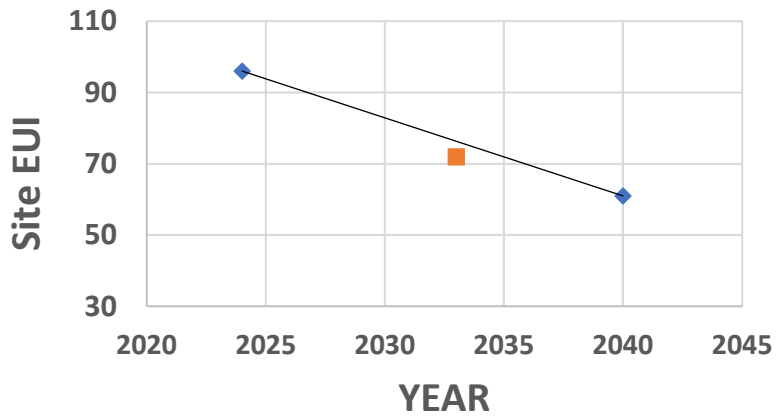


Lodging

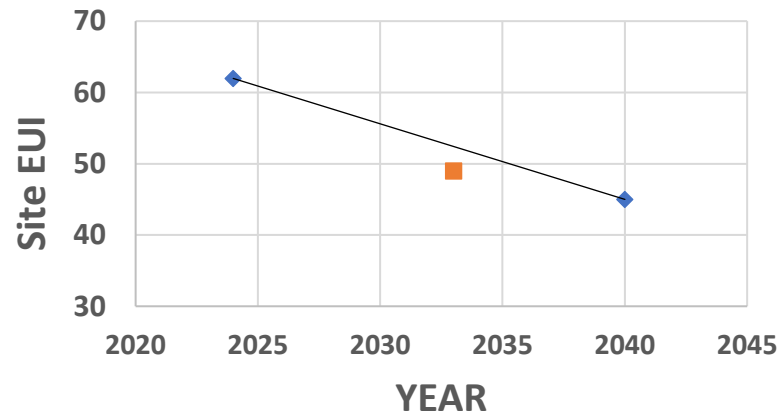


EE/ZNC Consideration: On the Road to 2040

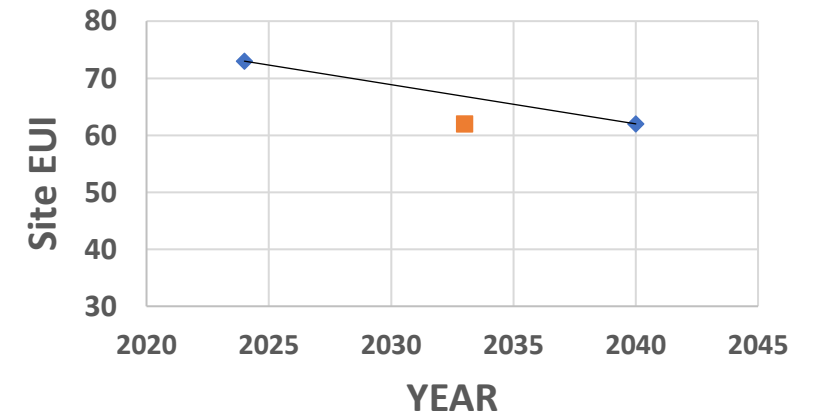
Public Assembly



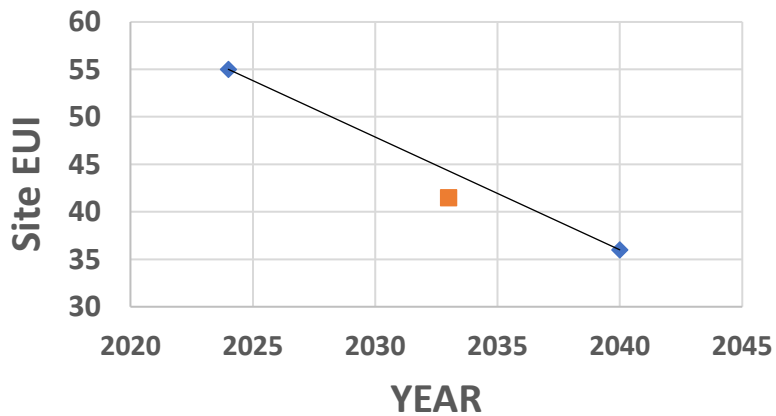
Mercantile Retail (not a mall)



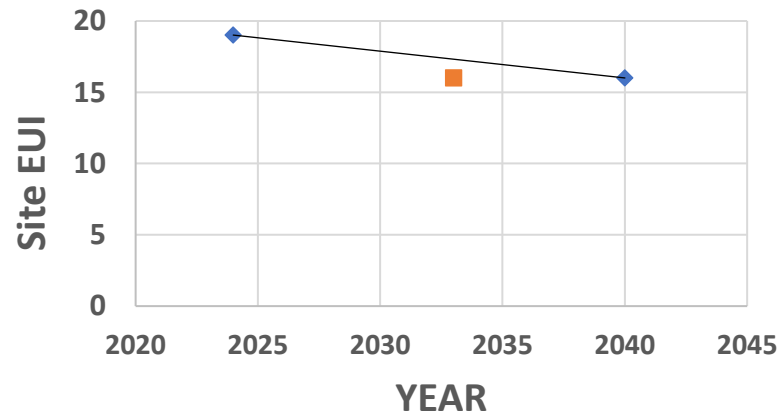
Health care outpatient



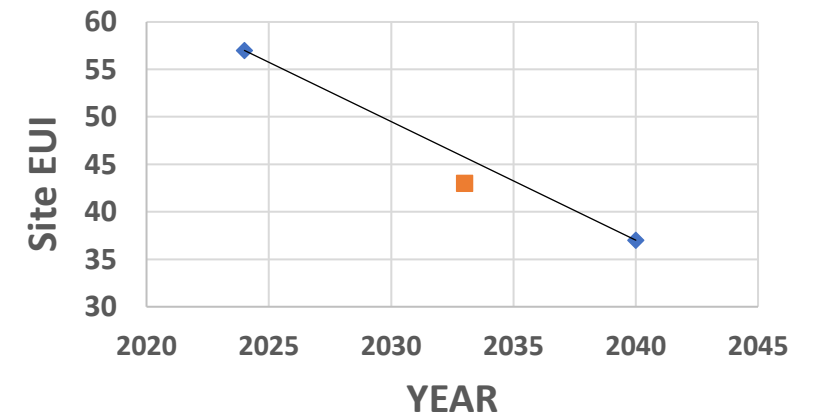
Education K-12



Warehouse and Storage

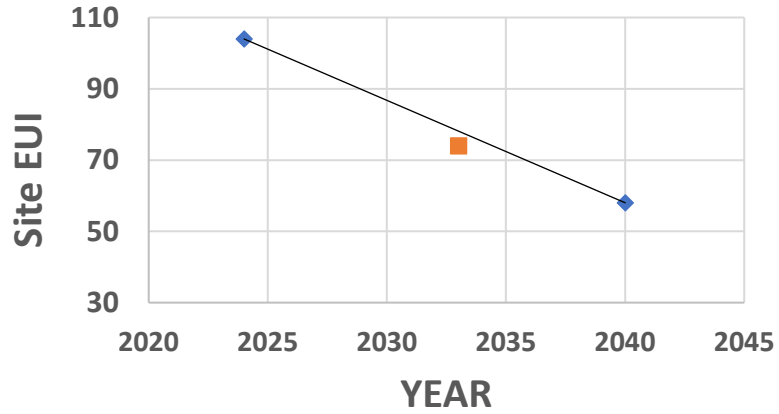


Religious Worship

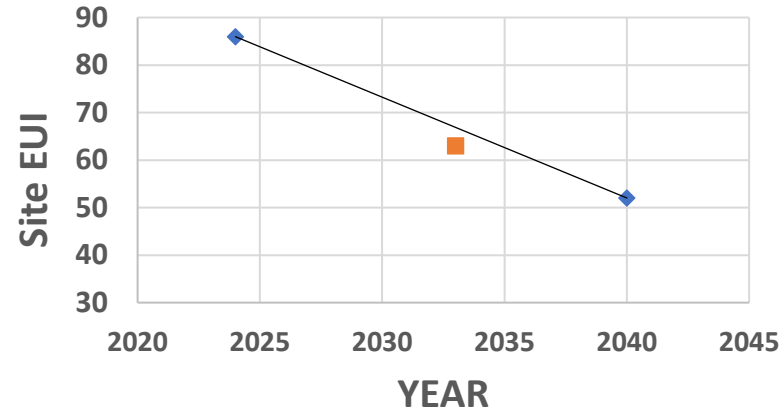


EE/ZNC Consideration: On the Road to 2040

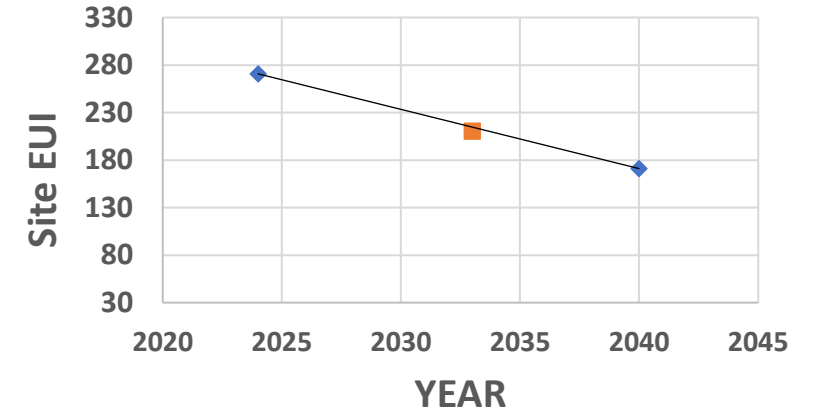
Education



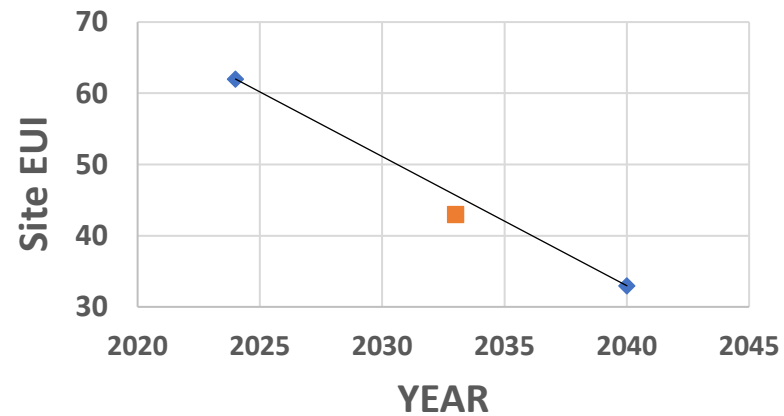
Public Order and Safety



Food Service



Service



Reduction in Site EUI: Other Jurisdictions

Denver

- Law passed in 2022, sets target for 2030
- By 2030, goal of 30% reduction in median site EUI by building type
- This is an interim target; goal is net zero energy by 2040

St. Louis

- 4-year compliance cycles
- Standard set May, 2021 with compliance due May, 2025
- Target is the 35th percentile EUI
 - On a normal bell curve, this is about 17% below median
- This is an interim target, goal is zero GHG emissions by 2050

Washington State

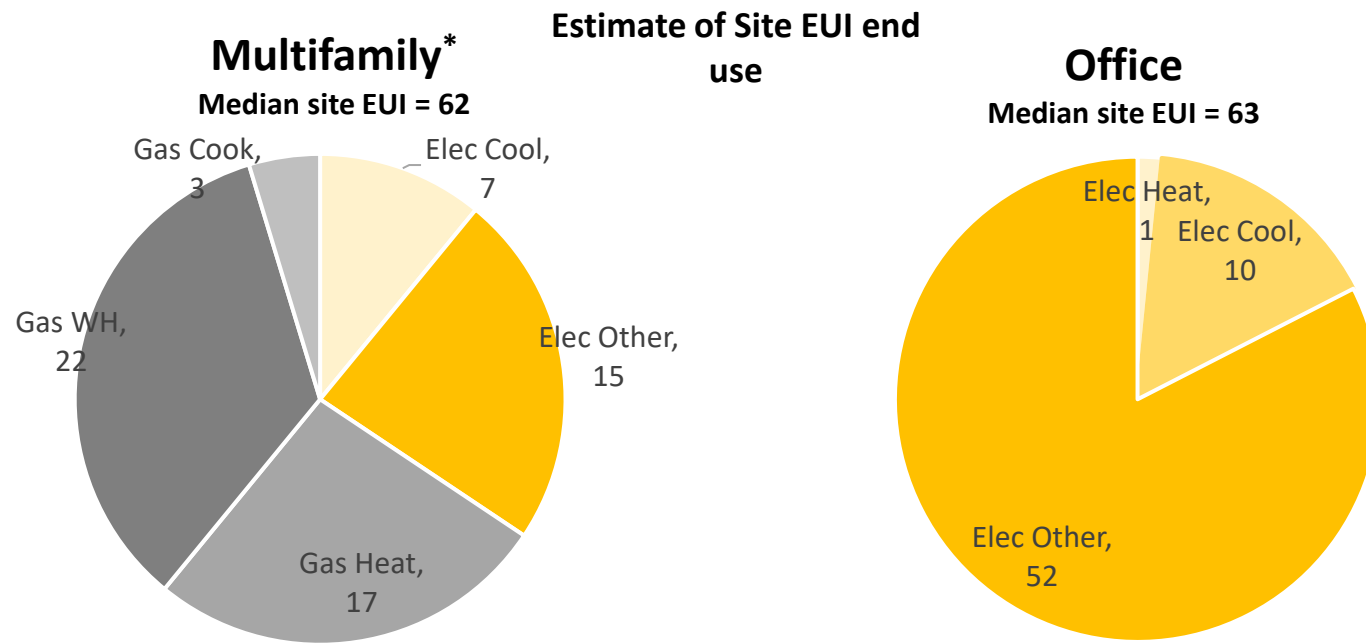
- 5-year compliance cycles
- First cycle ends 2026-2028, depending on building size
- EUI target is 40th percentile
- This is an interim target, goal is net-zero emissions by 2050

% Reduction from Median for Site EUI Options (BEPS Technical Report)

Building Type	2019 Median	EE	EE-ZNC Mid-Point	ZNC	% of covered area
Multifamily	62	-11%	-27%	-44%	34%
Office	63	-16%	-16%	-16%	31%
Enclosed/Strip Mall	111	-13%	-22%	-31%	7%
Health Care Inpatient	305	-12%	-25%	-39%	4%
Lodging	87	-13%	-23%	-33%	4%
Warehouse/storage	19	-16%	-16%	-16%	4%
Other	235	-16%	-23%	-29%	3.5%
Retail	62	-15%	-21%	-27%	3.1%
Food Sales	202	-13%	-21%	-29%	2.5%
Public Assembly	96	-14%	-25%	-36%	2.1%
K-12 School	55	-15%	-24%	-35%	1.8%
Religious worship	57	-14%	-25%	-35%	1.5%
Health Care Outpatient	73	-15%	-15%	-15%	1.3%
Higher Education	104	-13%	-29%	-44%	0.2%
Public Order/Safety	86	-14%	-27%	-40%	0.2%
Food Service	271	-8%	-23%	-37%	0.01%

Example Building Types – Achievable Savings

- Different buildings types use energy differently to meet their occupancy needs, and source that energy in different ways
- Some building types are already substantially electric (e.g., offices)
- Building types with large gas uses have more potential for reductions in site EUI (e.g., multifamily)



Site EUI	2019 Median	EE % reduction from median	Mid-Point % reduction from median	ZNC % reduction from median
Multifamily	62	11%	27%	44%
Office	63	16%	16%	16%

* MF, Old, Tall typology from DC benchmarking data

% of Buildings Needing to Reduce Site EUI to Reach Target

	Total covered	EE	EE-ZNC midpoint	ZNC
Office	391	81%	81%	81%
MF-New-Tall <i>(built after 1980, 4 stories and up)</i>	145	38%	59%	79%
Warehouse and storage	144	51%	51%	51%
MF-Short <i>(3 stories and shorter)</i>	101	56%	67%	89%
MF-Old-Tall <i>(built before 1980, 4 stories and up)</i>	90	70%	80%	90%
Mercantile Retail (other than mall)	82	71%	71%	71%
Other	76	66%	74%	74%
Lodging	73	60%	84%	93%
Religious Worship	71	61%	70%	70%
Food Sales	55	76%	76%	89%
Public Assembly	53	53%	53%	64%
Mercantile Enclosed and strip malls	45	64%	64%	69%
Education - K-12 School	40	83%	88%	98%
Health care Outpatient	38	87%	87%	87%
Public order and safety	11	100%	100%	100%
Health care Inpatient	10	100%	100%	100%
Education	3	33%	33%	33%
Food Service	1	100%	100%	100%
Total % of Buildings Needing To Reduce Site EUI to Reach Target	1429	66%	72%	78%

Impact: County-Wide Energy and Emissions Reductions

	EE	EE-ZNC midpoint	ZNC
Reduction in Site EUI vs baseline	23%	28%	35%
Reduction in On-site Fossil Fuel Emissions (<i>direct emissions</i>)	46%	66%	86%
Reduction in total emissions vs baseline (NO change from today's grid)	19%	22%	26%
Reduction in total emissions (carbon free electric supply)	87%	92%	97%

Impact: County-Wide Estimated Financial Costs and Savings

Costs = full cost of new system, not incremental cost above standard replacement.

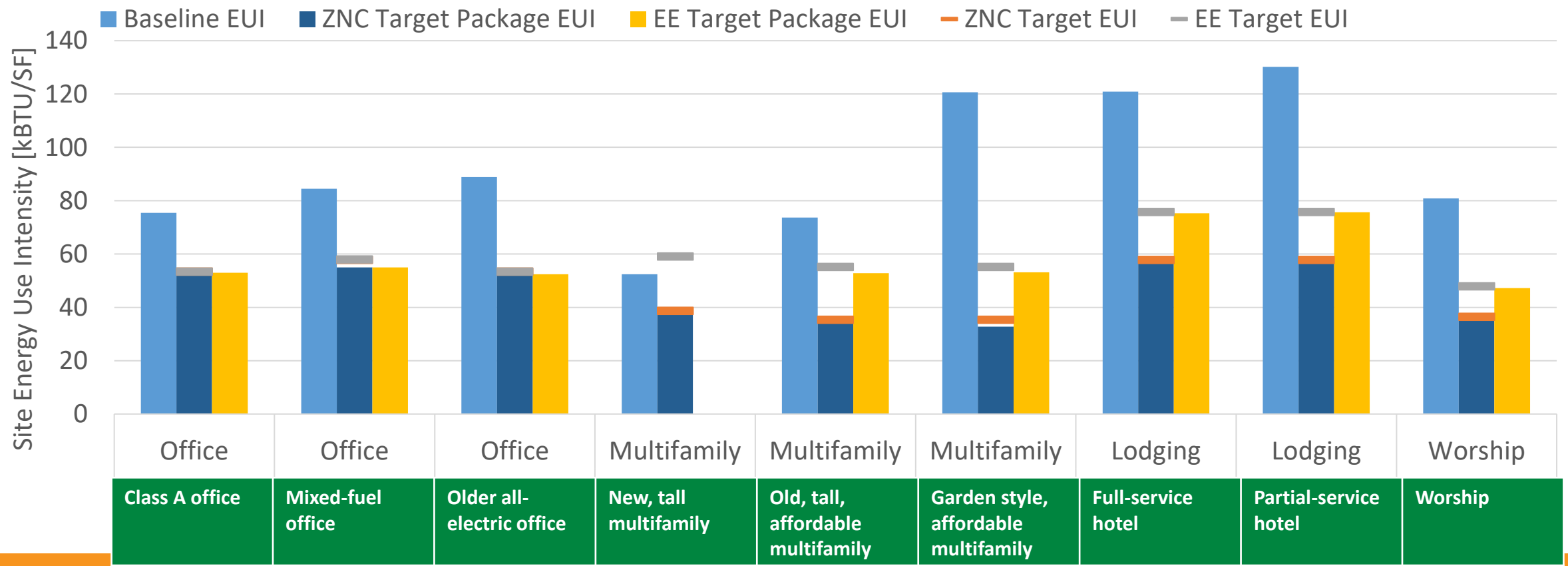
	No BEPS	EE	EE-ZNC midpoint	ZNC	
Energy Costs (annual, post-BEPS)	\$543	\$458	\$451	\$437	<i>Million</i>
Energy Cost Savings (annual, post-BEPS vs baseline)	\$0	\$85	\$92	\$106	<i>Million</i>
% Energy Cost Savings (annual, post-BEPS vs baseline)	0%	16%	17%	19%	<i>% lower than baseline</i>
Total BEPS Related Capital Cost* (average/sf total)	\$0	\$7.20	\$10.35	\$13.95	<i>\$/SF</i>
BEPS Related Capital Cost* / SF / year (annual average over 10 years)	\$0	\$0.72	\$1.04	\$1.40	<i>\$/SF/year</i>

Most major in-building equipment (i.e., mechanical equipment) is likely to be replaced prior to 2035. This capital cost can be redirected toward deeper retrofit projects. This creates a lower “effective” cost of compliance, but baseline capital costs are highly building dependent on factors outside of the study. Baseline capital cost outlay, financial incentives, and financing were too building-specific to determine, and thus, are not included in this report.

Impact: Case Study Buildings – Technical Feasibility

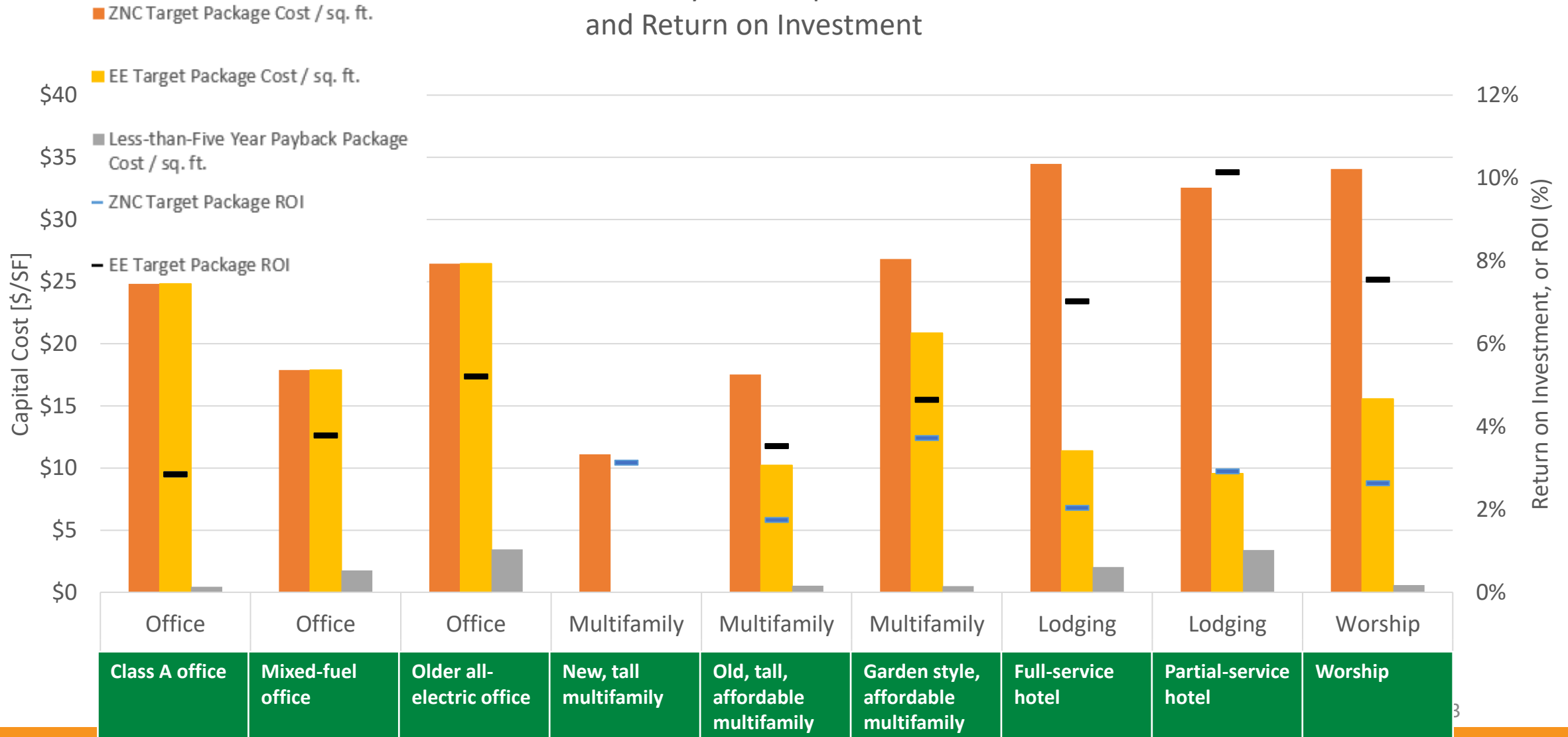
- In all case studies, the ZNC target was technically achievable with existing technology and systems through a combination of energy efficiency, electrification, and on-site solar PV
- Targets are technically achievable using today’s technology

Case Study Energy Use Intensity (EUI) Targets and Impact of Packages



Impact: Case Study Buildings – Costs/Benefits by Building

Case Study Total Capital Costs and Return on Investment



Impact: Case Study Buildings – Costs/Benefits

- The ZNC target packages delivered a positive return on investment for all case-study buildings
- The EE target packages generally offered a stronger ROI compared to the ZNC target packages due to the less intensive energy savings required. For some buildings, electrification was still a strategy for reaching the EE target.
- The EE-ZNC Mid-Point was not examined in case studies but is likely to be in the middle. Some buildings may experience a “cliff” where electrifying some systems may be necessary to further reduce site EUI.
- Costs = full cost of new systems over whole BEPS period, not incremental cost above standard replacement.

	EE	ZNC
Cost* per square foot	\$10 - \$26 Average: \$17	\$11 - \$34 Average: \$25
Annual savings per square foot	\$0.30 - \$1.40 Average: \$0.90	\$0.30 - \$1.50 Average: \$0.77
Simple Payback	13 – 35 years Average: 24 years	19 – 57 years Average: 32 years
Return on Investment	3% – 10% Average: 6%	2% – 5% Average: 3%

EUIs of Case Studies

	SF	EUI	EE	ZNC	EE cost	ZNC cost	EUI Relative to Building Type
Class A Office	225,000	75	53	53	\$ 5,280,000	\$ 5,280,000	in highest 25%
Mixed-Use Office	250,000	85	58	58	\$ 4,832,000	\$ 4,832,000	in highest 12%
Older, All-Electric Office	250,000	85	53	53	\$ 6,215,000	\$ 6,215,000	in highest 12%
Multifamily New – Tall	140,000	55	59	39	meets EE	\$ 1,434,000	in highest 33%
Multifamily Old – Tall	125,000	75	55	35	\$ 1,293,000	\$ 2,221,000	in highest 25%
Multifamily Short / Garden	50,000	120	55	35	\$ 1,261,000	\$ 1,621,000	in highest 5%
Lodging Full-service	175,000	120	76	58	\$ 1,967,000	\$ 5,959,000	in highest 10%
Lodging Partial-service	225,000	130	76	58	\$ 2,105,000	\$ 7,170,000	in highest 10%
Worship	100,000	85	48	36	\$ 1,401,000	\$ 3,063,000	in highest 10%

- *Costs = full cost of new systems over whole BEPS period, not incremental cost above standard replacement, and do not include any incentives.*

Summary

		EE	EE-ZNC Midpoint	ZNC
Technical feasibility	Pros	Provides most options to reach	May be reached through aggressive EE and/or elec for some buildings	Proven to be technically feasible with existing technology
	Cons		May be a cliff at which elec of some systems is necessary	Fewer options to reach as elec is usually required
Economic feasibility	Pros	Most cost-effective option		Costs may be offset some by future EmPOWER incentives
	Cons	May lead buildings to be far from state goals, setting them up for alternative compliance payments		Most expensive as electrification is often required to reach target
Alignment with state/goals	Pros		Puts buildings on path to net direct GHG	Largest direct and total GHG emissions reduction; most directly aligned with state direct GHG goals
	Cons	Likely to allow installation of combustion equipment and still reach the target	May still allow combustion to remain. May leave significant work from mid-2030s to 2040 if state adopts ZNC target	



Under-Resourced Buildings

Under Resourced Buildings

The Law says:

- The Department may establish additional criteria recommended by the Building Performance Improvement Board for qualified affordable housing, non-profit buildings, and other buildings as appropriate to modify compliance with interim or final performance standards by regulation.

Regulation Goals:

- Outline which other building types, if any, are appropriate to be considered under-resourced buildings
- Outline extensions, adjustments, alternative compliance paths, or other compliance modifications for under-resourced buildings
- Focus on *policy* levers rather than financial or technical support measures for these groups
 - Timeline adjustments
 - Target adjustments
 - Compliance paths

Under Resourced Buildings in Other Jurisdictions

Typical to provide more time, but keep same targets

St. Louis – provides more time for URBs

- Qualified affordable housing buildings and houses of worship will have six years to meet the standard

DC – provides more time for URBs

- DOEE may approve a delay of compliance for more than three (3) years (extended delay) for Qualifying Affordable Housing buildings.

Under Resourced Buildings in Other Jurisdictions

Denver

- Is located in [Denver's NEST neighborhoods](#) with a high prioritization ranking on the [Under-Resourced Building equity index](#)
- Has affordable housing units or otherwise serving frontline communities
- Has human service providers as tenants/owners (like homeless shelters, food pantries, or senior centers)
- Is of significance to community members with a high prioritization ranking on the Under-Resourced Building equity index
- Is located in a in a Census tract below the Denver median income and/or with a high prioritization ranking on the Under-Resourced Building equity index, serving frontline communities
- Is located in a Census tract with a high prioritization ranking on the under-resourced building equity index with affordable rents (below 1/3 of the monthly Denver median income)

- After reviewing your application, we will offer you technical services and assistance based on the under-resourced building criteria, your Energize Denver performance target, your equity index score and other information in your application. Qualified buildings will be able to access services and support in January 2023.

Discussion

Regulation Goals:

- Other building types, if any, are appropriate to be considered under-resourced buildings?
- Extensions, adjustments, alternative compliance paths, or other compliance modifications for under-resourced buildings?
 - Focus on *policy* levers rather than financial or technical support measures for these groups



Incentives Brainstorm

Available Incentives



County Tax Incentives

- New energy performance tax credit for new and existing buildings



EmPOWER MD incentives

- Staff O&M training, building tune ups, rebates



Financing and technical assistance offered by [Montgomery County Green Bank](#) and [MD Clean Energy Center](#)



MEA programs

- Grants, financing, CHP, EV charging, solar, resiliency hubs



Federal Incentives

- Tax credits/deductions (179-D, ITC, etc)

Incentives for energy efficiency buildings

- [Denver, Colorado](#) – has a 0.25% sales tax raising \$40 million a year for climate fund
 - **Building Electrification Pilot Program**
 - Cover additional cost of installing heat pump compared to replacement cost of a similar natural gas system
 - **Steam-to-Electric Conversion Incentive Program**
 - financial incentives to encourage buildings to disconnect from steam and electrify their natural gas systems.
 - **Renewables & Resilience Incentive Program for Human Service Providers (Shelter, Senior Center)**
 - Cover cost to install solar. Battery storage, EV charging.
 - **Healthy Homes Program**
 - Cash incentive replace gas appliances with electric induction stoves and heat pump heating and cooling systems specifically designed for cold climate performance

Incentives for energy efficiency buildings

Washington State

- State incentive funds totaling \$75 million.
- [Early Adopter Incentive Program](#)
 - An eligible building owner that demonstrates early compliance with the Clean Buildings Standard may receive a one-time base incentive payment of \$0.85 per gross square foot of floor area

Incentives for energy efficiency buildings – MF/AMH

Seattle, Washington

- [Multifamily Weatherization](#)
 - Multifamily building owners must commit to keep rents affordable for at least three years and at least half of tenants must meet income qualifications in order to apply for energy efficiency grants which can cover up to 90% of the costs.

Washington DC

- [Affordable Housing Retrofit Accelerator](#)
 - Enhanced technical and financial assistance to owners and managers of qualifying affordable multifamily buildings that do not meet the BEPS: ASHRAE Level II audit at no cost, assistance with understanding and choosing the proper BEPS Compliance Pathway, access to direct financial and contractor support and enhanced, access to financing opportunities from the DC Green Bank.

Maryland Dept. of Housing and Community Development

- [Multifamily Energy Efficiency and Housing Affordability Program](#)
 - Typical funding amounts range between \$2,500 and \$3,000 per unit. Projects are eligible to receive up to \$4,500 for Qualified Project Managers to assist the owner with the application or other required documents, energy audit coordination, finding and managing contractors, construction schedules, creating and submitting requisitions, and assisting with any inspections required by the Program.

Discussion

- What are the major barriers to implementing EE/elec projects?
 - Up-front capital
 - Justifying investments from a SPB/ROI perspective
 - Technical support
 - Others?
- Which sectors are particularly challenged in the areas above?
- Where are there gaps in existing incentives or technical support programs?

Next Steps

- Finalize site EUI recommendations
- Continue under-resourced buildings discussion
- Building Performance Improvement Plans
 - Need to determine criteria under which a BPIP will be allowed – “financial infeasibility” and circumstances outside of an owner’s control
 - Need to determine implementation requirements – “cost effective” measures
- Renewable Energy Allowance
 - May make it easier to reach the County’s BEPS providing a “credit” for renewable energy

Helpful Links

- [Benchmarking and Performance Standards Law](#)
- [Benchmarking Website](#)
- [BEPS Website](#)
- [Building Performance Improvement Board Website](#) (will include agendas, notes, and presentations)
- [BEPS Stakeholder workgroup + report](#) – completed before bill was introduced to gather stakeholder input on BEPS policy elements
- [BEPS Technical Report](#) – outlines options for site EUI targets by building type group and assesses feasibility and costs in representative case study buildings
 - [Presentation](#) of BEPS Technical Report to Council Transportation & Environment Committee
- [Allowance for Renewable Energy Technical Report and Recommendations](#) - provides information on determining how a renewable energy allowance should be defined and implemented within BEPS regulations
- On weather and business normalization:
 - [EPA technical reference guide on weather normalized energy use](#)
 - [EPA's Recommended Metrics and Normalization Methods for Use in State and Local Building Performance Standards document](#)

Helpful Links (continued)

- [Maryland Clean Energy Center 10/25 Webinar, Solutions to Achieve Building Energy Performance Standards recording](#)
- [Maryland Department of Environment BEPS page](#)

Questions?

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BPIB Webpage

<https://www.montgomerycountymd.gov/green/energy/bpib.html>

Stay Informed

Check BEPS website for real-time updates:

<https://www.montgomerycountymd.gov/green/energy/beps.html>

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