

City Council

Special Meeting Agenda

Tuesday, September 27, 2022

Council Chambers

749 Main Street

7:00 PM

Members of the public are welcome to attend and give comments remotely; however, the in-person meeting may continue even if technology issues prevent remote participation.

- You can call in to **+1 408 638 0968 or 833 548 0282 (Toll Free)**, Webinar ID **#876 9127 0986**.
- You can log in via your computer. Please visit the City's website here to link to the meeting: www.louisvilleco.gov/council

The Council will accommodate public comments during the meeting. Anyone may also email comments to the Council prior to the meeting at Council@LouisvilleCO.gov.

1. CALL TO ORDER & ROLL CALL

2. DISCUSSION/DIRECTION – COMMERCIAL ENERGY CODE UPDATE OPTIONS *continued from 9/6/22*

- Staff Presentation
- Public Comments (Please limit to three minutes each)
- Council Questions & Comments
- Action

3. ADJOURN

Citizen Information

If you wish to speak at the City Council meeting, please fill out a sign-up card and present it to the City Clerk.

Persons with disabilities planning to attend the meeting who need sign language interpretation, translation services, assisted listening systems, Braille, taped material, or special transportation, should contact the City Clerk's Office at 303 335-4536. A forty-eight-hour notice is requested.

City of Louisville

City Council 749 Main Street Louisville CO 80027
303.335.4536 (phone) www.LouisvilleCO.gov

SUBJECT: DISCUSSION/DIRECTION – COMMERCIAL ENERGY CODE
UPDATE OPTIONS *continued from 9/6/22*

DATE: SEPTEMBER 27, 2022

PRESENTED BY: ROB ZUCCARO, PLANNING & BUILDING SAFETY DIRECTOR
CHAD ROOT, CHIEF BUILDING OFFICIAL
KAYLA BETZOLD, SUSTAINABILITY COORDINATOR

SUMMARY:

Staff and the City's consultants, Lotus Engineering (Lotus) and Sustainability and Group 14 Engineering (Group 14), are presenting a final report and recommendations on commercial building energy code options for Council consideration. The options being presented would add additional energy efficiency and/or renewable energy offset requirements for new commercial construction projects. Development of the final report included public and advisory board engagement, policy research and analysis, and modeling of cost and greenhouse gas impacts for several different commercial and multi-family scenarios.

Attachments 1 and 2 are the final Lotus and Group 14 report and presentation slides respectively. The consultant's report provides a more detailed explanation and discussion of the process, policy considerations and options presented. This staff report is intended as an introduction and brief summary of the report and options.

The final report presents three potential code options for consideration:

Regional Code Cohort Alignment Policy Option: The "Regional Code Cohort" is a group of 11 regional counties and municipalities looking at adoption of the 2021 International Energy Conservation Code (IECC) with several supporting amendments and electric preferred policies. While the City has already adopted the 2021 IECC, the Code Cohort version includes some additional amendments not contemplated by the City and a stronger electric preferred policy. This option includes updating the City's 2021 IECC amendments to match the Code Cohort and participate in development of a phase 2 strategy to develop net zero codes over time.

Policy Option 1 – Energy Use Intensity (EUI) Performance Standard: This option is to adopt a minimum Energy Use Intensity (EUI) performance standard for different building types. Meeting the EUI standard can be achieved through building efficiency upgrades alone, or a combination of building efficiency and on-site renewable energy production. Some industry types, such as laboratories, manufacturing, industrial or food processing, restaurants, and hospitals, would likely need exemptions from the EUI standard. This exemption could be from process loads necessary for these uses, or a broader exemption for the use type.

Policy Option 2 – 2021 IECC Appendix CC, Zero Energy Commercial Building Provisions: This option is to adopt 2021 IECC commercial net zero construction appendix. The appendix does not require increased building efficiency beyond the base 2021 IECC code, but does require renewable energy offsets to attain net zero. Only a portion of renewable offsets needed to meet the code could be achieved on site, with the remainder needing to be obtained off site, or more likely through purchase of Renewable Energy Certificates (RECs). Renewable off set requirements would need to be maintained for a 15-year period. The City could also consider all-electric requirements for new construction in addition to adoption of Appendix CC. Similar to Policy Option 1, industry types, such as laboratories, manufacturing, industrial or food processing, restaurants, and hospitals, would likely need exemptions from the net zero offset or all electric standard. This exemption could be from process loads necessary for these uses, or a broader exemption for the use type.

Staff, with the assistance of the Southwest Energy Efficiency Project (SWEET) and Shums Coda Associates, has developed draft codes for each of the three options described above (see Attachments 3-5). These are initial drafts to support the discussion. Based on Council direction, the preferred code option will need further development and refinement before being presented for adoption.

PUBLIC COMMENTS:

The project included two public open house meetings, an online survey and use of the EngageLouisvilleCO.org platform to keep the public informed and gather public comments. Public comments and the survey results are included as Appendix B to the consultant's final report. Additional public comments submitted directly to staff are included as Attachment 6.

ADVISORY BOARD REVIEW:

Louisville Sustainability Advisory Board (LSAB): LSAB received a presentation from the City's consultants at their July 20th meeting and had further discussions on the topic at their August 17th meeting (see Attachments 7 and 8 for minutes). A summary of comments from the July 20th meeting are included in the public input summary in Appendix B to the consultant report. LSAB has also provided a letter with more detailed comments and recommendations (see Attachment 9 for letter).

Building Code Board of Appeals (BCBOA): BCBOA received a presentation from the City's consultants at their July 21st meeting. Discussion is reflected in the attached minutes (see Attachment 10) and the public input summary in Appendix B to the consultant report.

Staff intends to take the preferred code option back to each board for review and recommendation to the City Council as part of the adoption process.

RECOMMENDATION:

Staff is seeking Council direction on one of the three presented options. Based on Council direction, staff will complete a draft ordinance for first and second reading. The consultant and staff recommend consideration of Policy Option 1, which would create an EUI standard. This option would promote more energy efficient buildings beyond the base 2021 IECC and provide more flexibility and lower first cost for commercial property owners to comply. A detailed discussion of each option and the recommendations are included the consultants' final report.

FISCAL IMPACT:

Staff does not anticipate a significant fiscal impact from any of the code options. However, if the CC Appendix is adopted, some staff time and resources will be needed to create a process to ensure appropriate contracts and agreements are in place and track those agreements over a 15-year period.

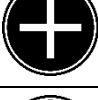
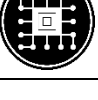
PROGRAM/SUB-PROGRAM IMPACT:

Consideration of a commercial energy code update relates to the Community Design, Development Review Sub-Program objective to promote public health, safety, comfort, convenience, prosperity and general welfare, and the Economic Prosperity objective to maintain positive business relationships and attract and retain a diverse mix of businesses that provide good employment opportunities for Louisville residents.

ATTACHMENT(S):

1. Lotus/Group 14 Report
2. Lotus/Group 14 Presentation
3. Draft Code – Regional Code Cohort Alignment
4. Draft Code Policy Option 1 – Energy Use Intensity Performance Standard
5. Draft Code Policy Option 2 – 2021 IECC Appendix CC Zero Energy Commercial Building Provisions
6. Public Comments
7. LSAB July 20, 2022 Minutes
8. LSAB August 17, 2022 Minutes
9. LSAB Recommendation Letter
10. BCBOA July 19, 2022 Minutes

STRATEGIC PLAN IMPACT:

☐	 Financial Stewardship & Asset Management	☒	 Reliable Core Services
☒	 Vibrant Economic Climate	☒	 Quality Programs & Amenities
☒	 Engaged Community	☐	 Healthy Workforce
☐	 Supportive Technology	☒	 Collaborative Regional Partner



Energy Code Update Recommendation Report

AUGUST 2022

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Executive Summary

The City of Louisville (the City) contracted with Group14 Engineering, PBC (Group14) and Lotus Engineering and Sustainability, LLC (Lotus) to explore updates to the City's current commercial energy code that would help the City reach their energy efficiency and greenhouse gas reduction goals. The City and consultant team examined commercial energy code policy options including higher efficiency requirements, all electric requirements, and net zero requirements. The scope of work included:

- Energy modeling of current code compliant heating, ventilation, and air conditioning systems in commercial and industrial building types to evaluate upfront cost, operational cost, and greenhouse gas (GHG) emissions. The energy modeling also included an analysis on the total solar PV required to make code compliant buildings (both mixed-fuel and all-electric) net zero. Finally, energy modeling was conducted to analyze the upfront cost, operational cost, and GHG emissions savings of buildings built to a higher efficiency performance standard.
- Research on existing commercial energy code policies from around the country.
- A public engagement process that solicited feedback on commercial code policy options via two City board meetings, two open-house style community meetings, and an online public engagement survey.

Three main policy options resulted from the project process:

- **Regional Code Cohort Alignment:** Aligning with a regional cohort of communities in and around Boulder County striving for consistent building code updates. Communities are adopting the 2021 International Energy Conservation Code (IECC) as the base code along with several supporting amendments to promote electrification and efficiency. Even though Louisville has already adopted the 2021 IECC, some of the anticipated cohort amendments would strengthen the Louisville code.
- **Policy Option 1:** Setting a minimum energy performance standard (through Energy Use Intensity (EUI) modeling at time of building permit) for commercial buildings. The energy performance standard would vary based on building type. A building owner could utilize onsite renewable energy to help reach the energy performance standard. This policy could include incentives for all building electrification.

- **Policy Option 2A & 2b:** Requiring net zero new commercial construction by adoption of Appendix CC of the 2021 IECC [2A]. The appendix does not require increased building efficiency above the 2021 IECC base code but does require renewable energy offsets to achieve net zero. Amendments to the appendix related to purchase of off-site renewable offsets would be needed to make implementation feasible. The City could also opt to add an all-electric new construction requirement to Appendix CC [2B].

Based on information and insight gleaned from the energy modeling and community input, the project team recommends the City adopt Policy Option 1, to set energy performance goals for commercial and industrial new construction. This option strikes a balance between Louisville's sustainability goals, economic considerations, and community needs.

1. Introduction

Climate change is impacting Colorado and the City of Louisville (the City / Louisville) today. This is evidenced by extreme weather events such as the Marshall Fire, an unusual and out-of-season wildfire exacerbated by a warming climate, long term drought, and statewide average temperature increases.

A press release published in April of 2022 by the Intergovernmental Panel on Climate Change begins with a sentence written in bold text: **“The evidence is clear: the time for action is now. We can halve emissions by 2030.”**ⁱ It is short and demanding, yet hopeful. The press release emphasizes the weight held by choices made in this decade and the power held by decision makers to “secure a livable future” for their communities.

1.1 THE CITY OF LOUISVILLE’S SUSTAINABILITY GOALS

The City of Louisville has recognized the need for climate action, and has made a strong commitment to public health and safety by way of the City’s clean energy and carbon emissions reduction goals which are outlined in Resolution 25, Series 2019,ⁱⁱ:

1. Meet all of Louisville’s municipal electric needs with 100% carbon-free sources by 2025.
2. Reduce core municipal GHG emissionsⁱⁱⁱ annually below the 2016 baseline through 2025.
3. Generate 75% of Louisville’s residential and commercial/industrial electric needs from carbon-free sources by 2030.
4. Reduce core community GHG emissions^{iv} annually below the 2016 baseline through 2030.

As reported in Louisville’s Sustainability Action Plan, electricity and natural gas are the City’s largest sources of emissions.^v Therefore, a crucial path forward for achieving these goals involves transforming energy use in the City’s residential and commercial building stock. Reducing the energy consumption of buildings and transitioning away from fossil-fuel combustion equipment are effective strategies to decrease emissions and support meeting electricity needs with carbon-free sources. This report focuses on code options for new buildings, but future efforts should address existing build stock to help meet carbon emission reduction goals.

1.2 CURRENT COMMERCIAL AND RESIDENTIAL CODE STANDARDS FOR NEW CONSTRUCTION

The lifetime of buildings constructed today ranges from 30 to 130 years.^{vi} If not built to a more stringent energy code, new construction can contribute to carbon pollution from less efficient buildings for generations, creating increasingly difficult conditions for climate change

mitigation. Model building codes for new construction present an opportunity for innovation, employing the built environment as a climate action tool, rather than an obstacle, that can support City goals. Building energy codes are an effective policy mechanism local government can utilize to decarbonize new construction, future-proof their building stock, and accelerate clean energy use.

The City of Louisville has already shown a commitment to climate action by adopting the 2021 International Energy Conservation Code (IECC) with amendments outlined in Table 1.

Commercial Buildings	Residential Buildings*
Increased insulation levels.	Increased insulation levels.
Increased doors and windows efficiency requirements.	Increased ductwork and piping insulation requirements.
Increased HVAC efficiency.	Mandatory heat recovery.
Electric vehicle charging and infrastructure.**	Electric vehicle charging and infrastructure.**
Electric-ready wherever gas appliances are installed.	Electric-ready wherever gas appliances are installed.
Solar-ready zone required (Appendix CB).	Solar-ready provisions required (Appendix RB).
	Net zero Appendix RC required.

*Marshall Fire rebuilds are exempt.

**Amendment to Municipal Code Chapter 17.20, Off-street Parking and Loading

Table 1: Overview of City of Louisville's current adopted code amendments.

2. Building for The Future: Energy Code Update

2.1 PROJECT OVERVIEW

The current adopted code and accompanying amendments encourage energy efficiency and the implementation of future-proofing strategies into new construction. However, these efforts alone will not be enough to fully achieve the City's energy and emissions reduction goals.

In their 2022 Work Plan,^{vii} Louisville City Council outlined Phase 2 of the 'Building for the Future' project, directing City Staff to “consider additional measures to code adopted in 2021, which could include the IECC Net Zero Commercial Appendix, other net zero goals and strategic implementation and all-electric construction requirements” specifically for new construction of single-family homes, multifamily buildings, and commercial buildings.

The City contracted with Group14 Engineering, PBC (Group14) and Lotus Engineering and Sustainability, LLC (Lotus) to identify policy options that would encourage higher efficiency, net zero development, and/or all electric development. The scope of work consisted of energy modeling of different building code scenarios, development of policy options based on research and the modeling results, and public engagement on the policy options developed.

A common framework used to create more effective sustainability strategies is consideration of the three pillars of sustainability: economy, environment, and equity. Creating a more sustainable Louisville requires consideration of the whole community, not just environmental impacts of the action being done. Recognizing this, the project team used the three pillars as guiding principles throughout this work.

2.1.1 ENERGY MODELING

For the first iteration of modeling, Group14 modeled four building types—multifamily, office, retail, and single-family home—with different heating, ventilation, and air conditioning (HVAC) designs that meet current Louisville energy codes. Each building type model consisted of mixed-fuel options that utilize natural gas and electricity, and all-electric options. All other variables such as insulation and lighting were modeled to meet the current code adopted by Louisville and remained constant for each system within each building type. The modeling examined upfront costs and annual costs of each HVAC system per building type, the amount of photovoltaics (PV) required for a building to be net zero with each HVAC system per building type, PV payback periods, and greenhouse gas (GHG) emissions at base code.

Additional modeling was conducted later in the project to investigate the upfront cost, operational cost, and GHG emissions from buildings complying with the finalized policy options.

2.1.2 POLICY RESEARCH

Group14 examined existing frameworks for all-electric and net zero energy codes from the City of Boulder, several jurisdictions in California, City of Boston, and New York City. This policy landscape review aimed to complement the energy modeling conducted, and the consulting team utilized both resources to best inform the commercial energy code policies recommended to the City of Louisville. For more detail on the on the policy research and initial energy modeling results, see Group14's report in Appendix A.

2.3 COMMUNITY OUTREACH

Public input is crucial to building community trust and ensuring feasibility when developing policies. Recognizing this, the consultant teams and City staff presented the project and energy code considerations to the public through multiple engagement opportunities:

1. Two open-house style community meetings.
2. An online survey that was open from June 27, 2022 to August 5, 2022.
3. Presentations to the Louisville Sustainability Advisory Board and the Building Code Board of Appeals.

Feedback from each engagement method was collected, data was cleaned and analyzed, and engagement results were incorporated into the final policy recommendation. For a full description of community outreach conducted and a summary of results, see Appendix B.

3. Project Results and Discussion

3.1 REFINING THE PROJECT SCOPE

As the 'Building for the Future' project progressed, the consultant team and City Staff continuously refined the energy modeling and the policy options, carefully considering efficacy and relevance to City Council intent. One result of this iterative process was shifting the focus of the analysis away from single-family home policy, due to the City having already adopted Appendix RC of the 2021 IECC. Consequently, the subsequent sections address policy options for commercial and industrial building types only.

Based on public feedback, improved analyses, and internal conversations, the project team finalized three policy options for the City Council's review, each of which are discussed below.

3.2 FINAL POLICY OPTIONS

Note: All policy options presented are in addition to the current Louisville energy code which includes the following provisions: 2021 IECC base code; Louisville-specific energy efficiency amendments; electric vehicle (EV) ready requirements; the solar-ready Appendix for residential and commercial; and electric-ready requirements for residential and commercial new construction.

3.2.1 ALIGNMENT WITH REGIONAL COHORT

POLICY DESCRIPTION

The City of Louisville could align with an existing regional cohort consisting of communities in and around Boulder County, working in a coordinated effort to adopt a regionally consistent building code (see Box 2). Louisville is a participant in the code cohort, but City Council direction led to an independent pursuit of community-specific options. Based on the City's current code, the primary changes Louisville would need to make are updating the City's current electric preferred standard to align with the cohort, updating the solar-ready appendix language to cover all buildings under the solar-ready requirements, and including additional code language to require cool roofs and high-efficiency horticulture lighting. Group14 did not conduct energy, cost, or greenhouse gas modeling for this code option, but the project team decided to include it due to expressed public interest in regional alignment. Additional detail on the amendments being considered by the Code Cohort are included in Appendix C.

Colorado Department of Local Affairs Code Cohort

Phase 1: Regional adoption of the 2021 IECC and supporting amendments including solar-ready requirements, EV-ready requirements, electric-preferred requirements, and additional efficiency requirements such as cool roofs and horticulture lighting. These amendments are applicable to residential and commercial buildings.

Phase 2: Beginning in August 2022, communities will work together to develop a roadmap to net zero new construction code for the region by 2030.

Participating communities include:

- City of Louisville
- City of Lafayette
- Town of Superior
- City of Northglenn
- Boulder County
- City and County of Broomfield
- Town of Erie
- City of Longmont

The City of Boulder, City of Westminster, and Town of Berthoud did not participate in Phase 1 but will participate in Phase 2.

Box 1: Code cohort overview.

DISCUSSION

Alignment with the regional code cohort's current IECC 2021 supporting amendments, and the future roadmap to net zero new construction would begin a code update process that increases stringency over time, allowing Council to take a stepped approach toward net zero code adoption by 2030. This approach would align Louisville with its neighboring communities and would provide Louisville an opportunity to co-develop a regional plan to get to net zero new construction. It's important to note that while a regional roadmap will be developed with the goal of consistency across the region, compliance, enforcement, and timelines for net zero code adoption may look unique to each community within the Cohort. Alignment with the Phase 1 code recommendations for the Cohort would increase efficiency requirements for mixed-fuel buildings but not all-electric buildings and does not require all-electric or net zero. This option represents the smallest step forward for above code policy options the City could consider and adopt.

3.2.2 POLICY OPTION 1: ENERGY PERFORMANCE STANDARDS FOR BUILDING TYPES

POLICY DESCRIPTION

New construction projects would be required to meet an energy performance standard that would be dictated by building type. The standards would be set using a metric called energy use intensity (EUI), which models the total energy consumption of a building for one year divided by the total square footage of the building. On-site PV could contribute to a building meeting the EUI target. Builders following a performance pathway for code compliance would need to meet their respective EUI targets and provide a modeling report as part of the building permit submittal.

If the builder were to pursue a prescriptive-based code compliance pathway, additional efficiency measures such as increased insulation levels and reduced lighting power densities would be required to deliver an equivalent level of efficiency as the energy performance standard.

PREDICTED ENERGY PERFORMANCE GOALS

The City of Boulder's building code^{viii} and the New Buildings Institute (NBI)^{ix} each have example energy performance standards, using site EUI as a metric, for various building types that the City of Louisville could look to (See Table 2). The City of Boulder standards were developed in 2018 off the previous code cycle. The City of Boulder is lowering these EUI targets ever few years to eventually achieve net zero. NBI's Zero Energy Performance Standards are based on the energy performance of best-in-class buildings for each building type. The NBI standards for Zero Energy Performance were developed with an 'efficiency only' lens, and do not consider the cost effectiveness of achieving the efficiency levels for all building types.

Building Type	City of Boulder Performance Standard (kBtu / sqft.)	NBI Zero Energy Performance Standard (kBtu / sqft.)
Medium office (5,000 – 50,000 sf)	23	21
Mid-rise apartment (Type R2)	32	23
Primary school	34	25
Small office (<5,000 sf)	19	17
Secondary school	31	29
Warehouse	11	9
Retail	NA	34

Table 2: Example energy performance goals for specific building types.

Group14 modeled predicted site EUI, upfront costs, and annual energy costs for each building type to achieve the NBI EUI targets (see Table 3) under this policy option. The Group14 model investigated the most cost-effective means of achieving the NBI standards using both efficiency and onsite PV to reach each standard. Note, this differs from the NBI methodology, which only incorporated energy efficiency measures to meet each target.

Building Type	HVAC Fuel Type	EUI targets modeled	Estimated Upfront Cost of HVAC without PV	EUI earned without PV	PV size required to reach EUI Target (kW)	Estimated Upfront Costs with PV	Annual Energy Cost Savings after PV
Multifamily	Mixed - Fuel	23	\$206,661	36	111kW	\$484,161	\$12,432
	All - Electric		\$182,500	23	4kW	\$192,500	\$448
Office	Mixed - Fuel	21	\$4,180,608	29	185kW	\$4,643,108	\$20,720
	All - Electric		\$4,353,828	29	177kW	\$4,796,328	\$19,824
Retail	Mixed - Fuel	34	\$1,123,500	103	310kW	\$1,898,500	\$34,720
	All - Electric		\$1,232,200	63	223kW	\$1,789,700	\$24,976

Table 3: EUI target modeling and associated costs for buildings compliant with Policy Option 1: Energy performance standards.

GREENHOUSE GAS EMISSIONS

To assess how this option might contribute to Louisville's emissions reduction goals, Group14 also modeled GHG emissions resulting from a building achieving its energy performance standard, based on the building type. Energy performance standards help to drive up energy efficiency and drive down building emissions, as illustrated in Figures 1 and 2. In each building type, for mixed fuel and all-electric systems, a building that has achieved its energy performance standard creates less GHG emissions than the same building compliant with current code.

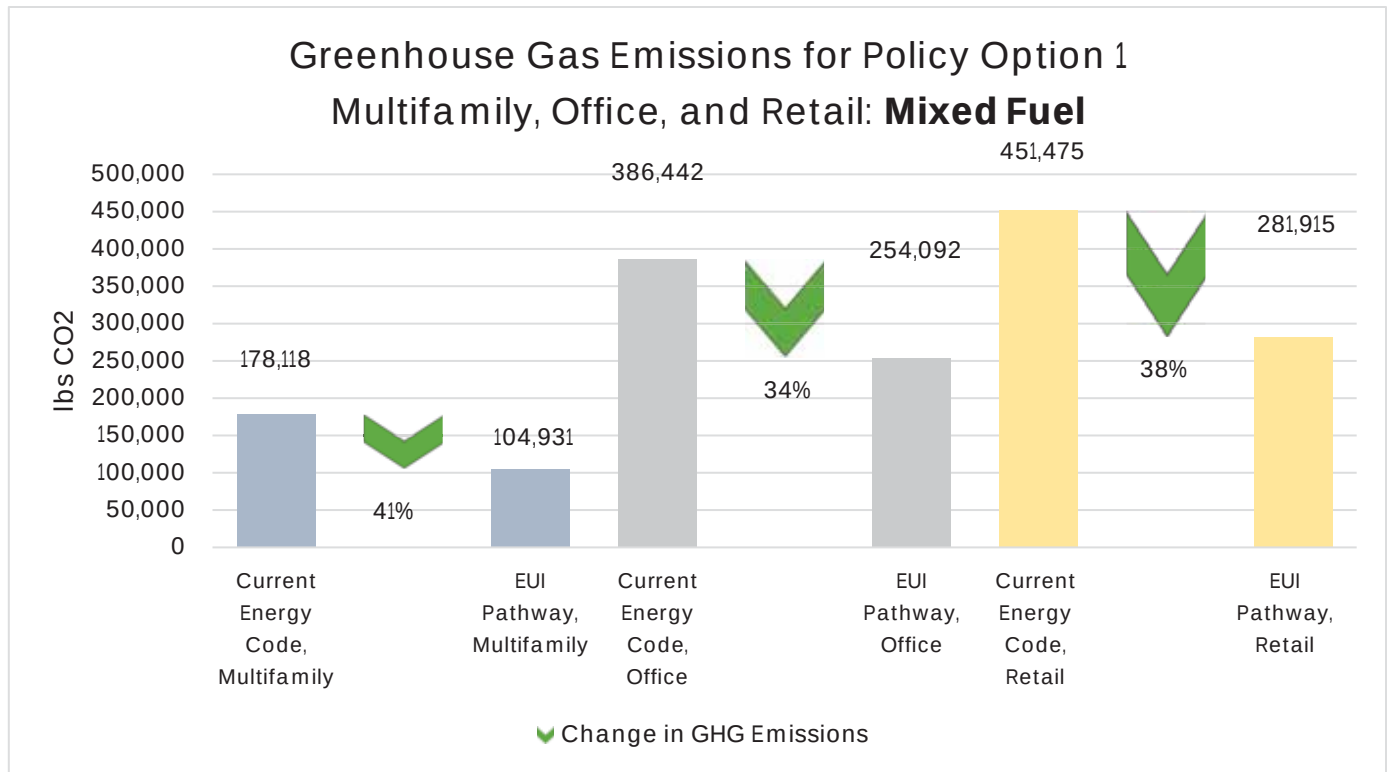


Figure 1: Annual GHG emissions for **mixed fuel** buildings compliant with current code, compared to GHG emissions for buildings compliant with Policy Option 1: Energy performance standards for building types.

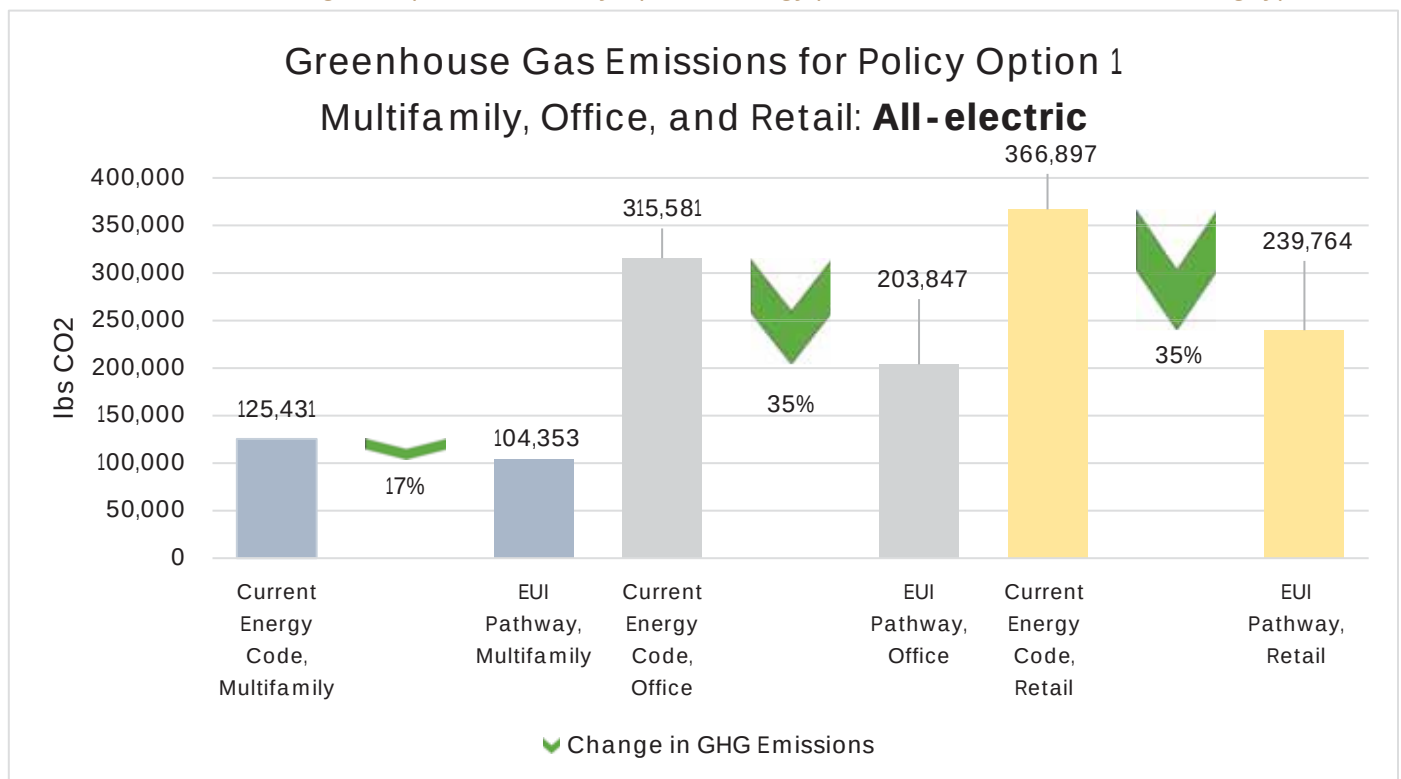


Figure 2: Annual GHG emissions for **all-electric** buildings compliant with current code, compared to GHG emissions for buildings compliant with Policy Option 1: Energy performance standards for building types.

DISCUSSION

Policy Option 1 is the most flexible of the code options. Buildings must reach an energy performance standard specific to that property type, but a building owner has options for how they chose to reach their energy performance standard. Onsite renewable energy can also contribute to the building's predicted EUI, adding another option in addition to efficiency to reach the target. This code results in more energy efficient, lower emitting buildings than the code package from the regional cohort and Appendix CC of the 2021 IECC.

All-electric buildings can reach much lower predicted EUIs because electricity has a lower energy density* than natural gas. Therefore, lower energy performance goals will naturally lead builders to all-electric options, which will result in lower GHG emissions over time as the electric grid becomes cleaner. This policy option allows the City to limit exemptions from the building code because energy performance standards can be applied to all building types, including those with high energy needs, such as a hospital. Finally, this option does not mandate building owners to invest in on or offsite PV to comply with code but provides building owners the option to use onsite PV to their own financial benefit if they so choose.

The NBI Standards modeled for this project are higher than both the City of Denver and the City of Boulder's standards for building types, making them more aggressive than local large cities surrounding Louisville. If the City chooses to pursue this policy option, additional analysis will be required to determine which targets are the most appropriate for the City of Louisville to adopt. Alignment with the City of Boulder's soon to be updated standards, could be advantageous to Louisville and would promote regional consistency.

Policy option 1 is the consultant and staff recommendation for the City's energy code. See Section 4 for further discussion.

3.2.3 POLICY OPTION 2A AND 2B: APPENDIX CC AND/OR ALL-ELECTRIC REQUIREMENT

POLICY DESCRIPTION

Policy Option 2A mandates compliance with Appendix CC of the 2021 IECC, zero energy commercial building provisions. Policy Option 2B builds upon 2A, adding a requirement that HVAC and plumbing systems must be all-electric. Appendix CC does not require commercial buildings to meet a higher level of efficiency above the base requirements in the IECC 2021. It does, however, require that commercial buildings must, in theory, offset 100% of the energy consumed onsite over a 15-year period using renewable energy. Note, it is likely that every commercial building will require both on and offsite renewable energy to reach the 100% offset requirement of Appendix CC. Procurement of offsite renewable energy to meet the 100% offset requirement is more complicated in practice. Appendix CC penalizes buildings

for procuring offsite renewables as opposed to generating 100% of their energy offset onsite, requiring buildings to procure more offsite renewables than a direct offset would require. These complications are discussed in more detail in the Offsite Procurement Discussion section below.

MODELED COST AND RENEWABLE ENERGY REQUIREMENTS

As noted previously, Group14 examined upfront cost and the annual energy bill costs for HVAC systems in each modeled building type (Office, Retail, Multifamily) that are compliant with current code. Further analysis for this policy option provided the amount of PV a building would be required to invest in, to achieve net zero and earn compliance with Appendix CC, as well as related cost data. It is important to note that in all cases, for commercial buildings that meet 2021 base code efficiency, covering the available roof area with PV did not result in a net zero building. Therefore, it is anticipated that all commercial buildings will need to invest in offsite PV to fulfill the requirements of Appendix CC. The cost of offsite PV procured via 15-year contracts for green retail tariffs and Renewable Energy Certificates (RECs) was also modeled. Results are outlined in Tables 4, 5, and 6. Though results vary by HVAC system, on average, all-electric systems with PV had a quicker payback period due to needing less renewable energy to offset their building energy use than natural gas systems.

Multifamily	Cost for Code Compliant Building		Costs for Onsite PV					Net Zero Offsite PV – REC Pricing		
	HVAC System Options	Upfront Cost of HVAC System	Total Annual Energy Bills	PV (kW) required for Net Zero	PV that can fit onsite (kW)	Cost of Onsite PV	Annual Energy Bill with Onsite PV	Total Annual Energy Cost Savings with PV	kW Remaining to Offset	Green Tariff Cost (15 years, purchased in kWhs) ^{xi}
Mixed Fuel Option 1	\$157,321	\$40,785	338 kW	98 kW	\$245,000	\$28,809	\$10,976	240 kW	\$137,303	\$70,482
Mixed Fuel Option 2	\$278,321	\$25,230	365 kW			\$14,254		267 kW	\$152,838	\$78,457
Mixed Fuel Option 3	\$267,321	\$38,038	303 kW			\$27,062		205 kW	\$117,259	\$60,193
Mixed Fuel Option 4	\$459,821	\$27,071	357 kW			\$16,095		259 kW	\$148,328	\$76,142
All-Electric Option 1	\$135,000	\$40,383	236 kW			\$29,407		138 kW	\$79,174	\$40,643
All-Electric Option 2	\$245,000	\$40,601	232 kW			\$29,625		134 kW	\$76,493	\$39,266
All-Electric Option 3	\$437,500	\$28,431	201 kW			\$17,455		103 kW	\$59,226	\$30,402

Table 4: Data detailing costs and PV amounts for a multifamily building under Policy Option 2A and 2B.

Office	Cost for Code Compliant Building		Net Zero Requirements and Costs for Onsite PV					Net Zero Offsite PV – REC Pricing		
	HVAC System Options	Upfront Cost of HVAC System	Total Annual Energy Bills	PV (kW) required for Net Zero	PV that can fit onsite (kW)	Cost of Onsite PV	Annual Energy Bill with Onsite PV	Total Annual Energy Cost Savings with PV	kW Remaining to Offset	Green Tariff Cost (15 years, purchased in kWhs) ^{xi}
Mixed Fuel Option 1	\$2,327,633	\$104,604	722 kW	250 kW	\$625,000	\$76,604	\$28,000	472 kW	\$285,152	\$146,378
Mixed Fuel Option 2	\$1,786,323	\$135,278	777 kW			\$107,278		527 kW	\$317,602	\$163,036
Mixed Fuel Option 3	\$4,492,873	\$95,077	772 kW			\$67,077		522 kW	\$315,006	\$161,703
All-Electric Option 1	\$1,948,716	\$131,993	755 kW			\$103,393		505 kW	\$304,622	\$156,373
All-Electric Option 2	\$3,789,170	\$90,551	544 kW			\$62,551		294 kW	\$179,548	\$92,168
All-Electric Option 3	\$3,464,384	\$94,324	567 kW			\$66,324		317 kW	\$192,996	\$99,071
All-Electric Option 4	\$4,005,694	\$103,660	578 kW			\$75,660		328 kW	\$199,485	\$102,403

Table 5: Data detailing costs and PV amounts for an office building under Policy Option 2A and 2B.

Retail	Cost for Code Compliant Building		Net Zero Requirements and Costs for Onsite PV					Net Zero Offsite PV – REC Pricing		
	Upfront Cost of HVAC System	Total Annual Energy Bills	PV (kW) required for Net Zero	PV that can fit onsite (kW)	Cost of Onsite PV	Total Annual Energy Bill with Onsite PV	Total Annual Energy Cost Savings with PV	kW Remaining to Offset	Green Tariff Cost (15 years, purchased in kWhs) ^{xi}	Unbundled RECs Cost (15 years, purchased in MWhs) ^{xii}
Mixed Fuel Option 1	\$570,500	\$164,492	1741 kW	600 kW	\$1,500,000	\$97,292	\$67,200	1,141 kW	\$689,194	\$353,786
Mixed Fuel Option 2	\$456,000	\$182,683	1564 kW			\$115,483		964 kW	\$584,178	\$299,878
Mixed Fuel Option 3	\$630,500	\$158,096	1566 kW			\$90,896		966 kW	\$585,261	\$300,434
All-Electric Option 1	\$660,000	\$193,161	1449 kW			\$125,961		849 kW	\$515,973	\$264,866
All-Electric Option 2	\$708,000	\$185,053	1369 kW			\$117,853		769 kW	\$468,337	\$240,413
All-Electric Option 3	\$3,167,500	\$156,491	1157 kW			\$89,291		557 kW	\$342,752	\$175,946

Table 6: Data detailing costs and PV amounts for a retail building under Policy Option 2A and 2B.

OFFSITE PROCUREMENT DISCUSSION

To achieve the net zero requirement for both Policy Options 2A and 2B, a typical commercial or industrial building would not be able to fit the necessary PV on the building's available roof space and must supplement by procuring offsite renewable energy. Appendix CC does not require a building to pursue onsite renewable energy before they purchase offsite offsets. To ensure building maximize onsite renewable energy, the City could consider amending Appendix CC to require building to max out their onsite PV potential before pursuing offsite offsets.

Options for offsite procurement include community solar gardens, REC purchases, green retail tariffs, and virtual power purchase agreements (VPPAs). In Appendix CC, offsite renewable energy procurement is penalized based on the type of offsite a building pursues. For any remaining energy that must be offset offsite, a procurement factor must be applied which will increase the offsite renewables a building must procure. The procurement factor is a penalty for opting for offsite purchasing instead of onsite renewable energy generation and is required per the energy offset calculations in Appendix CC.

Appendix CC lists specific offsite offset requirements which mandate that renewable energy must be generated within the utility service territory and the contract must be 15 years in length, among others. As a result, there is a feasibility challenge with this policy option including insufficient onsite roof space to completely offset energy use, limited availability of local offsite renewable resources like community solar gardens, and constraints on open-market REC procurements that meet the requirements of Appendix CC.

Green retail tariffs, which are RECs purchased directly from the electric utility, pose a challenge for Appendix CC compliance. Green retail tariffs cannot be procured on a 15-year contract basis, and they only cover building electricity consumption, not overall building energy consumption.

Community solar gardens are local and can be procured on a 15-year contract basis, however, according to discussions with Xcel Energy, there is limited availability and high demand for these gardens, making it unlikely that a building owner would be able to procure the necessary offsite PV to comply with code.

RECs tend to be low cost and an easy procurement method, making them a popular option for offsetting energy use. However, they likely do not represent local renewable energy generation and there is no 15-year contract option available, thus violating the Appendix CC requirements.

Virtual PPAs can have 15-year contracts, however, like RECs, the renewable energy generation might not be local, making this option potentially invalid according to Appendix CC.

For Policy Options 2A and 2B to be feasible, City staff would need to amend the Appendix CC language to accommodate for the challenges in offsite procurement and to require onsite PV be required ahead of offsite procurement.

Offsite Renewable Energy Procurement

Unbundled Renewable Energy Certificate (REC):

a market-based instrument that represents the property rights to the environmental, social, and other non-power attributes of renewable energy generation. A REC is one megawatt-hour of electricity generated and delivered to the grid.

Community solar: an offsite solar installation that a customer can contribute funds to and receive the benefits of via bill credit.

Green retail tariff: a program offered by utilities in which a customer can buy renewable energy credits at an additional charge to cover monthly electric use.

Virtual Power Purchase Agreement (PPA): a method for large commercial entities to purchase offsite renewable energy at a fixed rate for a fixed amount of time.

GREENHOUSE GAS EMISSIONS

The GHG impact of Policy Options 2A and 2B must be viewed through two lenses: GHG reductions from onsite renewable energy and GHG reductions from offsite renewable energy.

If a building utilizes onsite PV to achieve the net zero requirement, that onsite renewable energy generation will create a direct reduction of GHG emissions. This is the same emissions reduction mechanism that occurs from PV installed to comply with the requirements of Policy Option 1.

GHG emission reductions from offsite renewable energy vary due to several factors such as procurement method and location of the renewable energy that was purchased. In addition, Appendix CC penalizes buildings for purchasing offsite energy in the form of RECs, via the procurement factor. For example, purchasing enough RECs in theory could offset all emissions created by the building. However, when a property owner purchases a REC, they are buying the right to a unit of energy from a solar garden or a wind farm that already exists, and would have existed if the building owner did not purchase the REC. Thus, the building owner's purchase is not generating any new renewable energy resources that would offset the emissions produced by the building. This would not be the case for a local community solar garden since the purchase would contribute to the development of new renewable energy resources.

Furthermore, the emissions intensity of the grid (how clean or dirty the power source for the grid is) where the renewable energy is being purchased from impacts GHG reduction. If the grid the building is drawing power from is cleaner than the grid the building owner is buying RECs from, the REC purchase has a larger GHG reduction impact but if the situation were reversed, the REC purchase has a smaller GHG reduction impact.

GHG emission reductions from Policy Options 2A and 2B are outlined below (Figures 3, 4 and 5). Net zero emissions represent a scenario in which the building has installed the maximum amount of PV they can fit on their available roof space. Figure 6 shows the emissions savings resulting from the remaining energy use being offset by RECs, with a procurement factor applied. Code compliant HVAC systems, both mixed fuel and all-electric, were modeled for each building type. Policy Options 2A and 2B have much larger GHG emissions reductions than Policy Option 1, as expected due to the nature of a net zero and/or all-electric building.

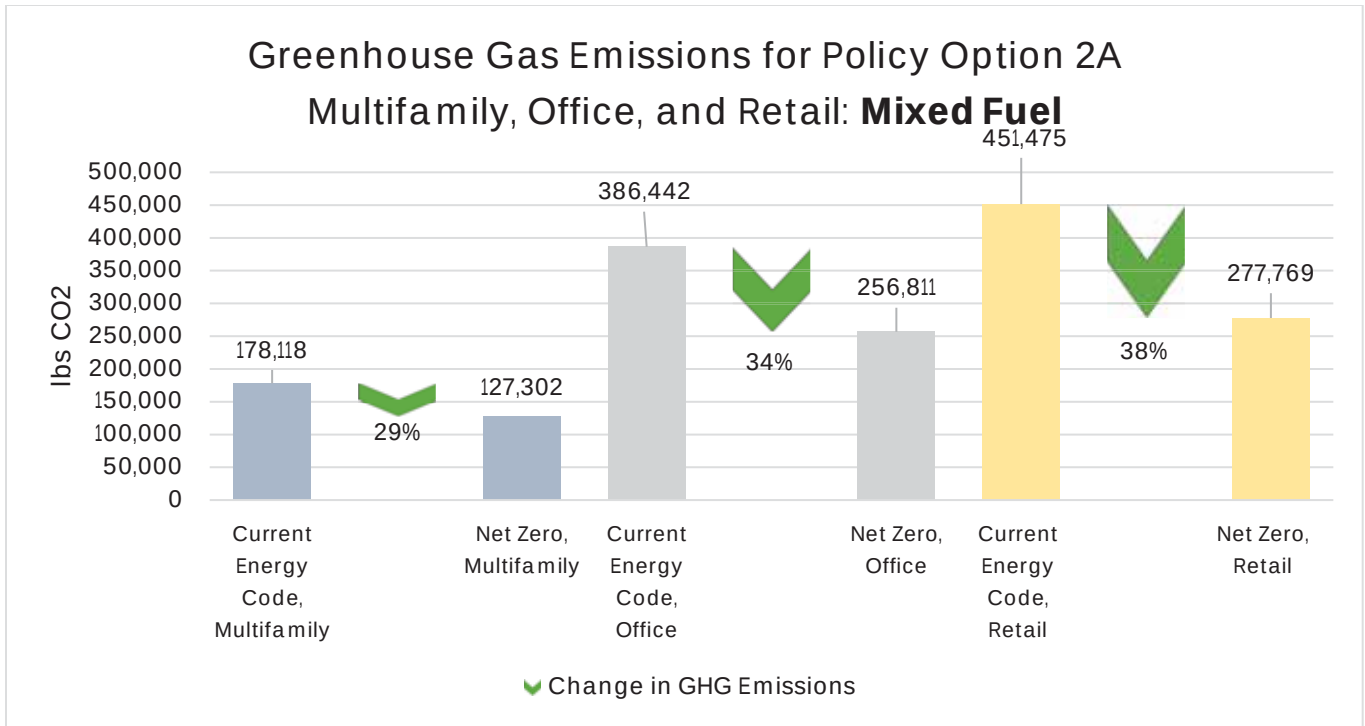


Figure 3: Annual GHG emissions for **mixed fuel** buildings compliant with current code, compared to GHG emissions for **mixed fuel** buildings compliant with Policy Option 2A: Appendix CC, Net Zero.

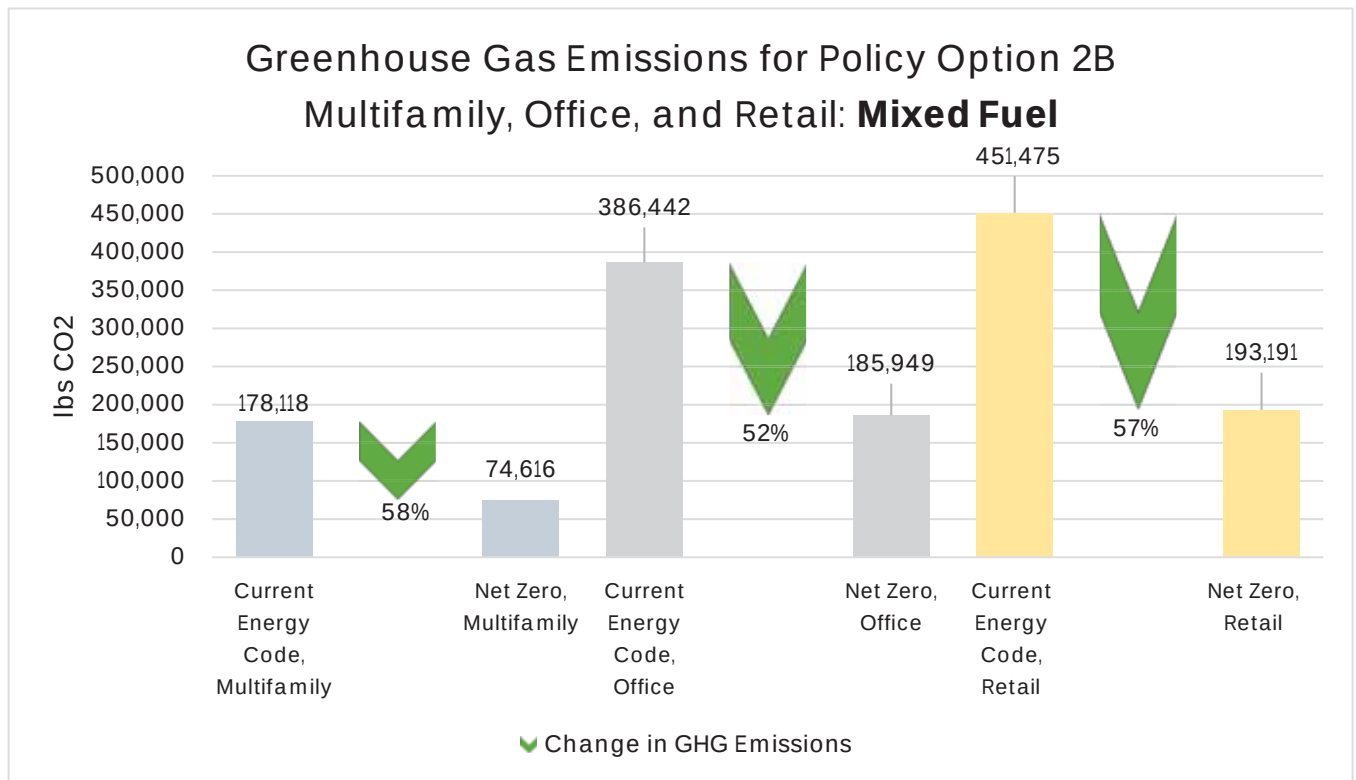


Figure 4: Annual GHG emissions for **mixed fuel** buildings compliant with current code, compared to GHG emissions for **all-electric** buildings compliant with Policy Option 2B: Appendix CC, Net Zero + all-electric.

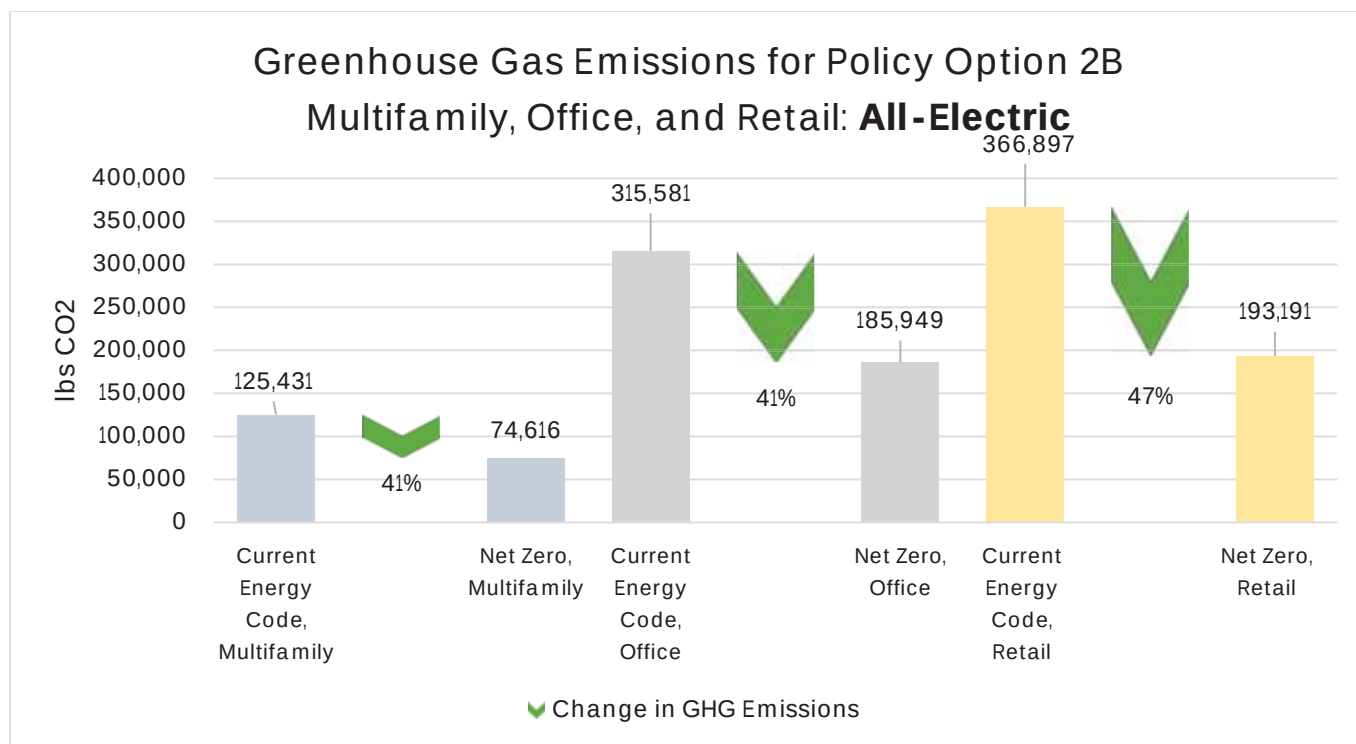


Figure 4: GHG emissions for **all-electric** buildings compliant with current code, compared to GHG emissions for **all-electric** buildings compliant with Policy Option 2B: Appendix CC, Net Zero + all-electric.

The GHG emissions modeling for unbundled REC purchasing used the nationwide average electricity emissions intensity, 0.85 lbs/kWh, as reported by the Energy Information Administration. The GHG calculations also included a mandatory application of a procurement factor which requires buildings who offset with RECs to purchase five times the total RECs required for a full offset.

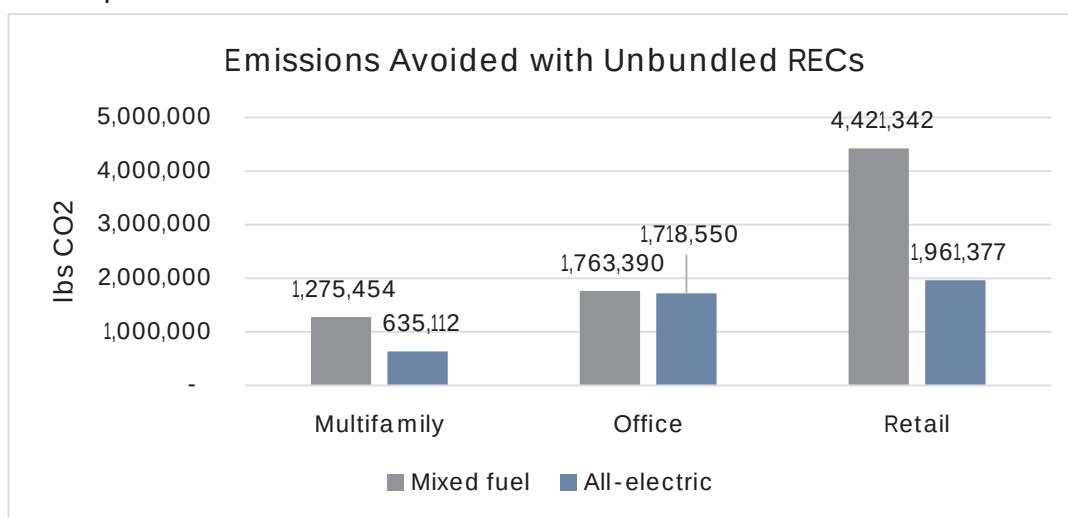


Figure 5: Emissions avoided with unbundled RECs purchased to offset any energy consumption remaining after installing the maximum amount of onsite PV.

DISCUSSION

Policy Options 2A and 2B are most aggressive options in reducing GHG emissions through onsite PV, but do not increase the energy efficiency of the building over base code. Policy Options 2A and 2B require net zero with onsite and offsite PV, and 2B is the only option that also mandates all-electric, disallowing fuel choice. Exemptions for both Policy Options 2A and 2B could be considered for certain building types that contain processes that cannot be net zero or all-electric due to unfeasible cost or lack of technology. These process load exemptions may impact buildings such as laboratories, manufacturing facilities, industrial processing, restaurants, and/or hospitals. If exempted, these process loads, under Policy Options 2A and 2B would be exempt from the net zero or all-electric requirement.

These policy options do come with complications, including the need to amend Appendix CC for offsite procurement and the variability of the potential GHG impacts. Additionally, post hoc modeling revealed that the payback period for PV installation is no less than 22 years for any HVAC system in any of the building types modeled. The upfront investment building owners would need to make in onsite PV will payback overtime, but it's important to note that investments in offsite PV will always be an additional cost and will never represent revenue or financial benefit.

3.3 OVERALL PUBLIC FEEDBACK SUMMARY

The public engagement process was conducted with recognition that an energy code update will impact community members from all sectors. An in-depth review and analysis of the input received can be found in Appendix B.

General feedback from all public outreach methods indicated that the Louisville community does not feel ready for an aggressive approach to energy code updates. This is indicated by levels of support for each of the recommendations (Figures 7, 8, 9, and 10) and by both written and oral comments (Appendix B). While some were supportive of the desire to achieve sustainability goals, many showed concern about the upfront and ongoing costs that the code updates would impose on the community, the capability of the grid to handle electrification pushes, and the very limited access to offsite renewable energy.

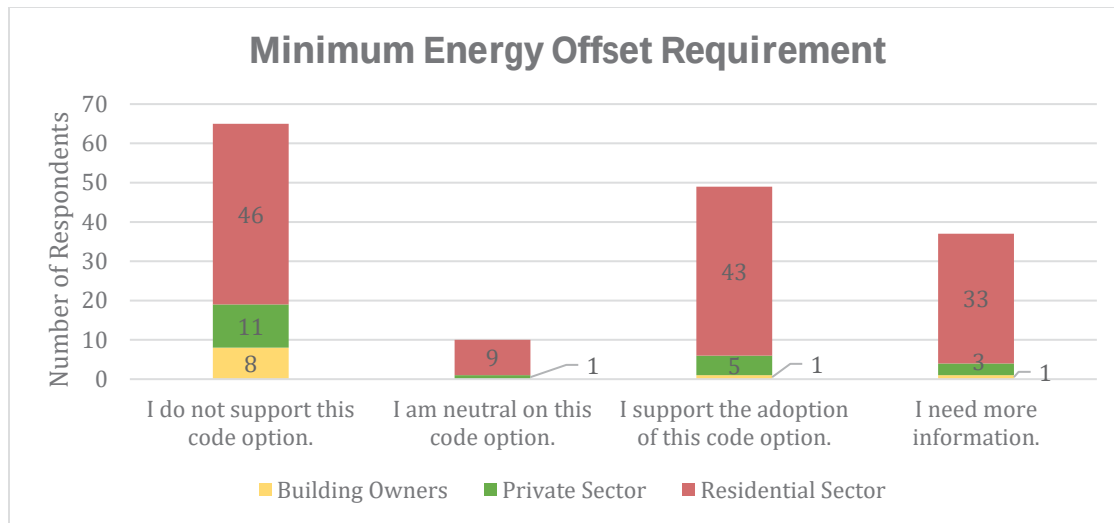


Figure 7: All sector levels of support for Minimum Energy Offset code option. **How supportive would you be of including a minimum energy offset requirement in addition to the 2021 code, which would require on-site or off-site solar?**

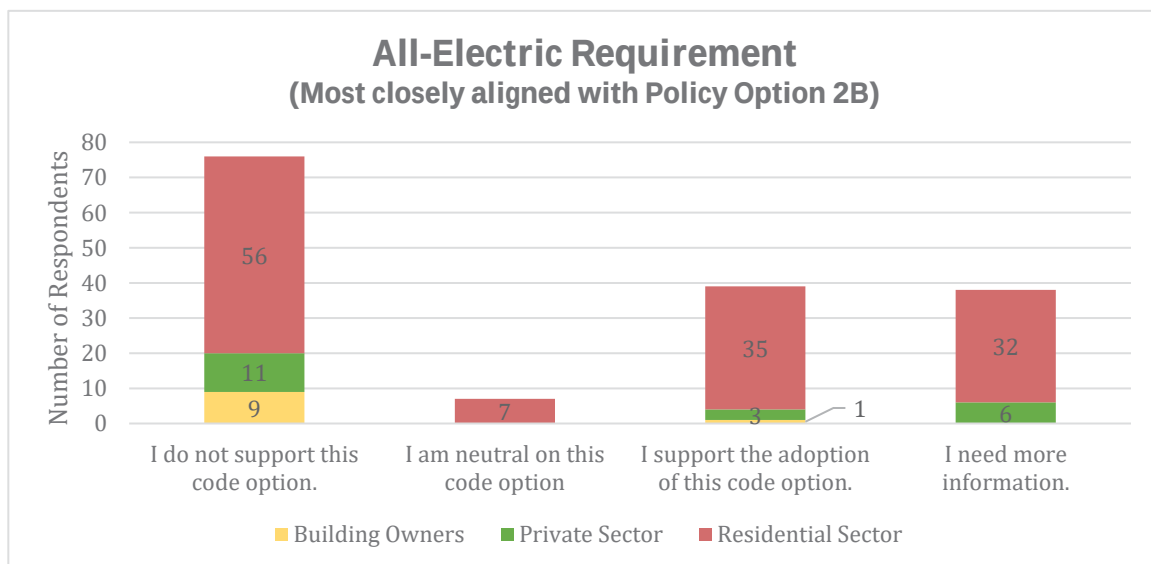


Figure 8: All sector levels of support for All-Electric Requirement code option. **How supportive would you be if the City were to consider an all-electric requirement for new commercial construction code if industrial processes were exempt?**

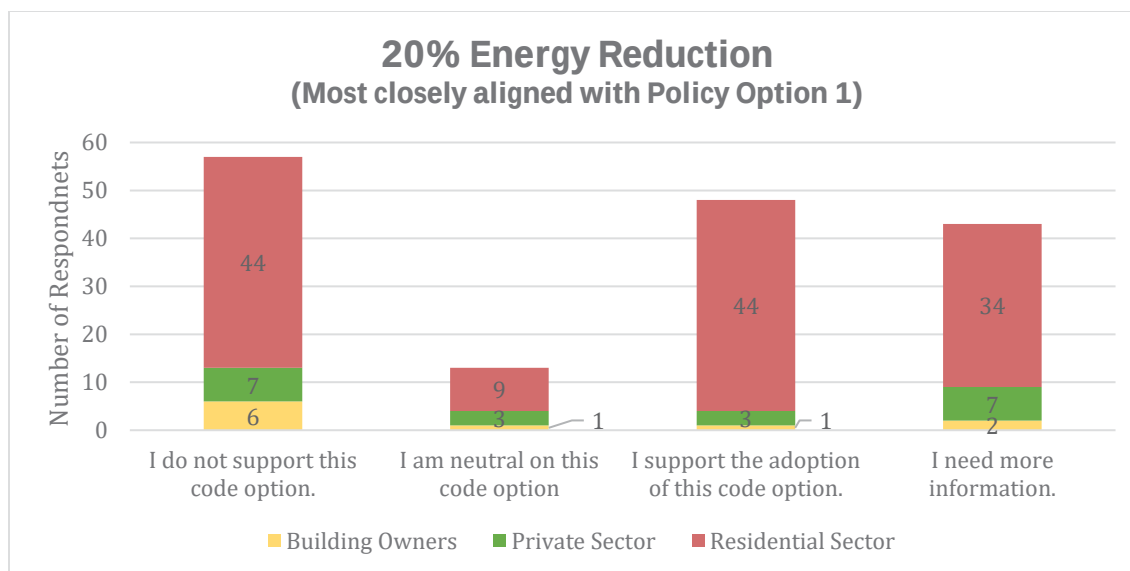


Figure 9: All sector levels of support for 20% Energy Reduction code option. **How supportive would you be if the City were to consider an energy code that required a 20% reduction in energy use from the 2021 energy code for commercial construction?**

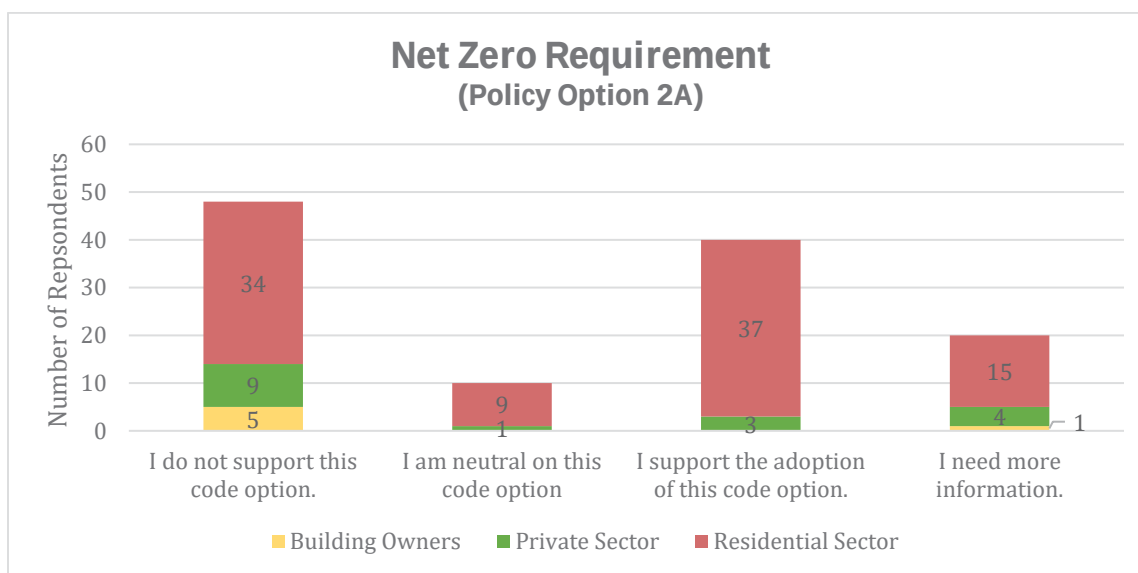


Figure 10: All sector levels of support for Net Zero code option. **How supportive would you be if the City were to consider a commercial energy code that required net zero energy through efficiency and onsite/off-site renewable energy?**

In the online public engagement survey, the project team asked business and building owners what payback period they would tolerate for the additional upfront costs of installing solar for net zero and all-electric buildings. It is important to note that most respondents indicated that they would not tolerate any increased upfront cost, despite the payback period. Three out of ten building owners selected a payback period of zero-to-5-years, and

only one building owner was comfortable with a 10-20-year timeframe. Six out of 22 business owners would be comfortable with a zero-to-5-year payback timeframe, only two selected payback periods of 10 years or more, and six others were not interested in solar at all. In sum, according to the survey, the tolerance threshold for increasing upfront costs for onsite solar, all-electric construction, and net zero construction is low.

The project team also wanted to use the survey to assess where community values fall as

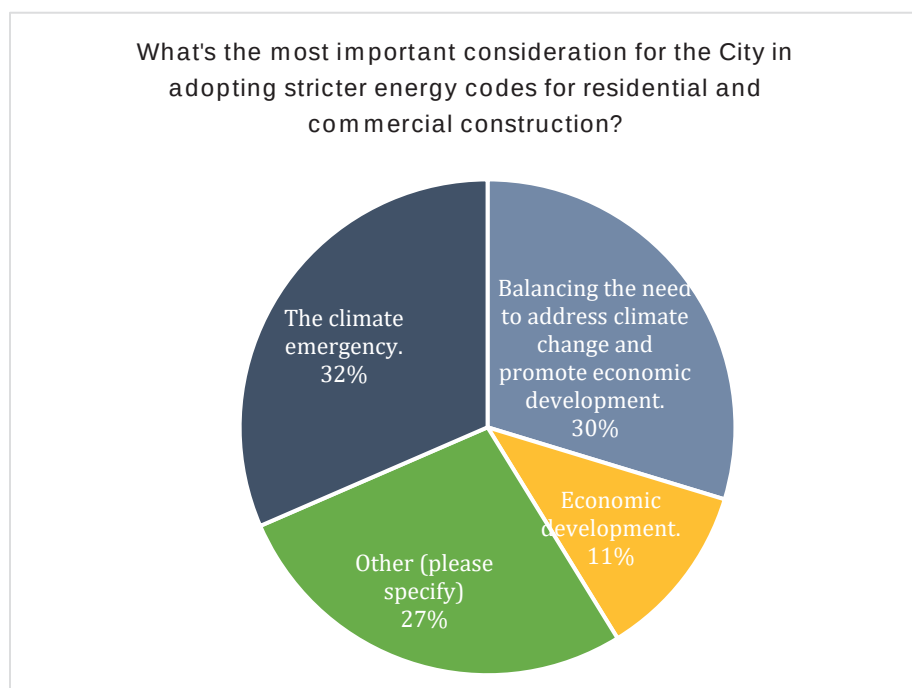


Figure 11: Percentage breakdown of answers for important considerations for stricter energy code.

they relate to adopting stricter energy codes. The survey asked, "What's the most important consideration for the City in adopting stricter energy codes for residential and commercial construction?". The results of this question emphasized the need for balance (Figure 11) and reinforced sentiments heard from the other public engagement sessions and shown by the support assessment questions. Overall, the community wants council to carefully consider this ordinance and

focus on understanding its potential impacts, rather than rushing to be a leader in the energy code space.

4. Conclusion

4.1 FINAL POLICY RECOMMENDATION

The project team diligently considered the City of Louisville's sustainability goals, the energy modeling and policy research, public feedback, and the estimated GHG impacts of the policies when deliberating a final recommendation for Louisville's energy code. **Based on a need for balance and feasibility, the project team recommends City Council pursue Policy Option 1: Energy Performance Standards for Building Types.**

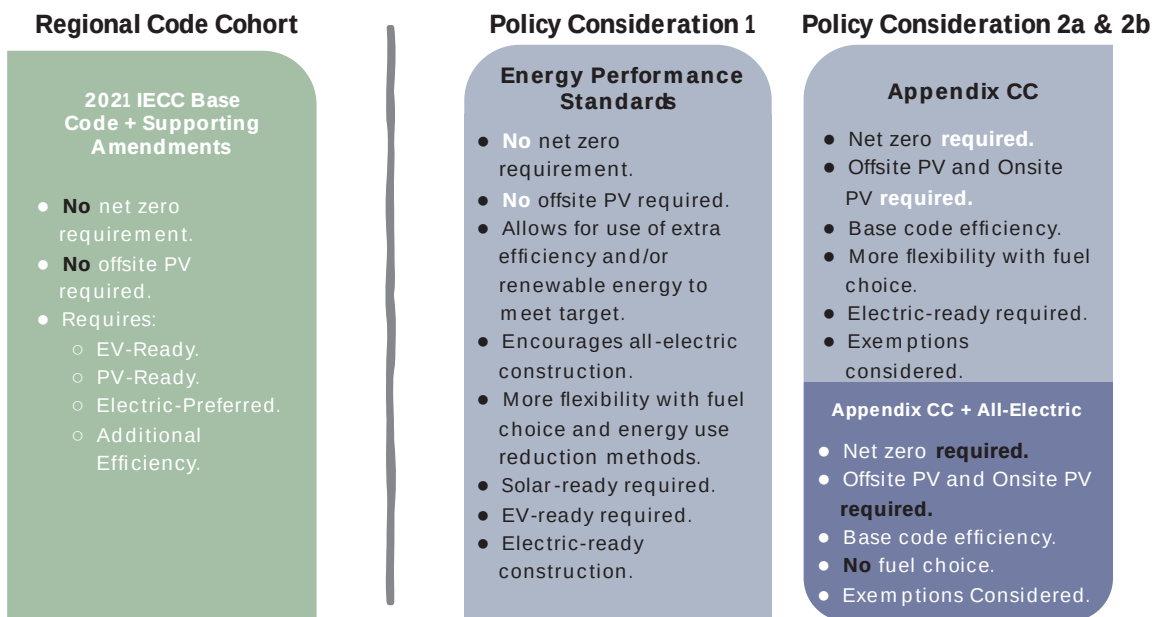


Figure 12: Summary graphic detailing the features of each policy option.

Energy performance standards emphasize energy efficiency and result in lower emitting buildings, thus contributing to Louisville's sustainability goals. There is also no net zero or all-electric requirement, which increases feasibility for building owners, and significantly reduces the upfront cost impacts. While all-electric systems are not mandated in this policy option, energy performance goals, via EUI targets, are more easily achieved with all-electric HVAC and plumbing systems than mixed-fuel systems. Therefore, this code option encourages all-electric new construction while still giving developers and owners choice. Additionally, the code option encourages local renewable energy generation because onsite renewable energy installation can help a building owner achieve the energy performance goal. The last advantage to this code option is that exemptions are not necessary. Buildings with heavy energy loads can still pursue energy use reduction via other efficiency measures.

Policy Option 1 does not create as large of a GHG reduction as Policy Options 2A and 2B, since it is a less aggressive code package. However, the annual energy costs of this policy option were generally lower than those in a building compliant with current code, depending on the building type and system installed. Annual energy costs of Policy Options 2A and 2B are generally lower than both current code compliant buildings and buildings modeled with Policy Option 1 requirements, but PV and offsite renewable energy add significant costs. Under Policy Option 1, a building owner could opt to utilize PV, onsite or offsite, if they would like it to contribute to the building's energy performance standard, but only if they deem it financially beneficial. Thus, Policy Option 1 provides more flexibility with the cost burden a building owner is willing to take on.

4.2 FUTURE CONSIDERATIONS

The project team and the City recognize that stricter building energy codes alone will not achieve the City of Louisville's energy and climate goals. This section captures ideas that were brought forward throughout the project that the City could consider to further support achieving these goals.

First, public engagement brought many questions about how the code updates will impact existing buildings. Current code language says that an addition, alteration, repair, or renovation must be completed to the most up-to-date code for the scope of work intended (if the scope of the project triggers requirements in the code). Any building components not in the intended scope of work do not need to be brought up to code. The project team recommends that council carefully consider how existing buildings will be impacted by the new commercial construction code, including the cost impacts of the code update they choose to enact on these types of existing building projects. Making additions, alterations, repairs and/or renovations too expensive may encourage a property owner to scrape and rebuild rather than renovate. This would create more embodied carbon and obstruct the City's sustainability efforts. Existing buildings can be used as a climate action strategy if additions, alterations, repairs and/or renovations are allowed to pursue a prescriptive pathway to incremental efficiency improvements. The 2021 building code is more efficient than any previous code cycle and consequently, incremental changes to the existing building stock will still be impactful.

Other policy mechanisms also exist to address the existing building stock, that may be more appropriate than new construction code triggers. Benchmarking and building performance standards stand out as the most pursued policy mechanism to address existing building energy use and GHG emissions. The City of Louisville can look to City of Denver^{xiii} or City of Boulder's^{xiv} benchmarking programs for examples.

For a more holistic approach to increasing the positive environmental impact of new construction, the City can also look into green building codes and certifications. The International Green Construction Code (IgCC)^{xv} and LEED^{xvi} certifications are two examples of options that address building sustainability more comprehensively, including requirements topic areas like waste, materials management, water use, land use, and connectivity.

ⁱ <https://www.ipcc.ch/report/ar6/wg3/resources/press/press-release/>

ⁱⁱ <https://www.louisvilleco.gov/home/showpublisheddocument/25430/637114996226870000>

ⁱⁱⁱ "Core Municipal GHG Emissions" refers to the total GHG emissions from all municipal activity.

^{iv} "Core Community GHG Emissions" refers to the total GHG emissions from the entire City of Louisville including all residential, commercial, and industrial energy consumption.

^v <https://www.louisvilleco.gov/home/showpublisheddocument/28886/637376646025230000>

^{vi} <https://www.mckinsey.com/industries/engineering-construction-and-building-materials/our-insights/call-for-action-seizing-the-decarbonization-opportunity-in-construction>

^{vii} <https://www.google.com/url?q=https://www.louisvilleco.gov/home/showpublisheddocument?id%3D22360&sa=D&source=docs&ust=1660286628507708&usq=AOvVaw1EUGqL2jm5HmMJ3ZUliJzc>

^{viii} <https://bouldercolorado.gov/services/building-performance-ordinance>

^{ix} <https://newbuildings.org/wp-content/uploads/2019/09/ZeroEnergyCommercialBuildingTargets.pdf>

^x https://energyeducation.ca/encyclopedia/Energy_density

^{xi} Note, 15-year contracts are not available for Green Retail Tariffs. Green Retail Tariffs can also only be purchased to offset electricity use. Pricing shown here is meant for informative purposes only.

^{xii} Note, 15-year contracts are not available for unbundled RECs. Pricing in table reflects REC pricing today.

^{xiii} <https://www.denvergov.org/Government/Agencies-Departments-Offices/Agencies-Departments-Offices-Directory/Climate-Action-Sustainability-Resiliency/Goals-and-Policies/Energize-Denver-Benchmarking>

^{xiv} <https://bouldercolorado.gov/services/building-performance-ordinance>

^{xv} <https://codes.iccsafe.org/content/IGCC2021P1/preface#:~:text=The%20IgCC%20is%20a%20model,on%20the%20natural%20environment%20and>

^{xvi} <https://www.usgbc.org/leed>

ENERGY CODE ANALYSIS – ENERGY MODELING AND POLICY CONSIDERATIONS

6/24/2022

PREPARED BY:

Anna McCullough, P.E.

amccullough@group14eng.com

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LIST OF ABBREVIATIONS

Abbreviation	Definition
ACH	Air Changes per Hour
BTU	British Thermal Unit
CO2	Carbon Dioxide
CSG	Community Solar Garden
DHW	Domestic Hot Water
DOAS	Dedicated Outdoor Air System
ECO	Energy Conservation Opportunity
ECM	Energy Conservation Measure (synonymous to ECO)
EUI	Energy Utilization Index
ERI	Energy Rating Index
ERV	Energy Recovery Ventilator
EV	Electric Vehicle
F	Fahrenheit
FCU	Fan Coil Unit
FY	Fiscal Year
HERS	Home Energy Rating System
HSPF	Heating Seasonal Performance Factor
HVAC	Heating, Ventilation, and Air-Conditioning
HW	Hot Water
IECC	International Energy Conservation Code
IWG	Inches of Water Gauge
kBtu	Thousand British Thermal Units
kW	Kilowatt/Thousand Watts
kWh	Kilowatt Hour
PNNL	Pacific Northwest National Laboratory
PV	Photovoltaic
SEER	Seasonal Energy Efficiency Ratio
SCC	Social Cost of Carbon
Sq. Ft., SF	Square Foot
TBD	To Be Determined
UEF	Uniform Energy Factor

1 INTRODUCTION

1.1 Executive Summary

Group14's scope for this report is to evaluate the current energy codes established in the City of Louisville and to provide recommendations for future all-electric and net zero codes to meet the City's carbon reduction goals. To produce this report, Group14 has modeled four different building types:

1. Multifamily building – 42,000 SF
2. Office building – 110,000 SF
3. Commercial development – 90,000 SF
4. Single family home – 2,820 SF

These energy models were created with feedback from the City's planning department as well as average CBECS data for the mountain west region. Each building type is modeled with different HVAC designs which meet the current Louisville energy codes (both Mixed-Fuel and all-electric). Greenhouse gas emissions and net present value analysis is also provided.

In the policy section of this report, all-electric and net zero energy codes from around the country are analyzed. Recommendations are made to push Louisville's energy codes towards all-electric, net zero new construction, while also considering the upcoming IECC code cycles and codes in surrounding counties.

Our energy modeling results show that the all-electric buildings have much lower carbon emissions than mixed fuel buildings but typically have slightly higher annual energy costs. First costs between both the mixed fuel and all-electric designs are similar, due to the current Louisville requirement for all-electric ready new construction. The cost to install the electric infrastructure drives up the cost of the mixed fuel buildings.

2 ENERGY MODELING RESULTS

2.1 Multifamily Building

The multifamily building modeled is typical of multifamily new construction in the City of Louisville. This design is three stories tall, 42,000 SF, with wood framed walls. The different HVAC system options modeled are:

- Mixed-Fuel options:
 - 1: Packaged terminal heat pumps (9.5 EER and 2.9 COP)
 - Ventilation provided through the unit
 - 95% efficient natural gas water heaters
 - C406 pathway: Efficient fossil fuel water heater, Reduced lighting power
 - 2: Split DX fan coil units (SEER 14) with combined heating and domestic water heating
 - Ventilation provided by exhaust fans running continuously
 - 95% efficient natural gas water heaters
 - C406 pathway: Efficient fossil fuel water heater, Reduced lighting power
 - 3: Split heat pumps (SEER 14, 9.2 HSPF)
 - Ventilation provided by exhaust fans running continuously
 - 95% efficient natural gas water heaters
 - C406 pathway: Efficient fossil fuel water heater, Reduced lighting power
 - 4: Water source heat pumps (13 EER, 4.3 COP)
 - Supplemental 80% efficient boiler
 - Variable speed cooling tower
 - Ventilation provided by exhaust fans running continuously
 - 95% efficient natural gas water heaters
 - C406 pathway: Efficient fossil fuel water heater, Reduced lighting power
- All-Electric Options:
 - 1: Packaged terminal heat pumps (10.0 EER, 3.2 COP)
 - Ventilation provided by exhaust fans running continuously
 - Heat pump domestic water heater with supplementary electric heat (3.0 UEF)
 - C406 pathway: 5% cooling improvement, 10% heating improvement, reduced lighting power, heat pump water heater
 - 2: Split heat pumps (SEER 14.7, 9.0 HSPF)
 - Ventilation provided by exhaust fans running continuously
 - Heat pump domestic water heater with supplementary electric heat (3.0 UEF)
 - C406 pathway: 5% cooling improvement, 10% heating improvement, reduced lighting power, heat pump water heater
 - 3: Water source heat pumps (13.6 EER, 4.3 COP)
 - Supplemental electric boiler
 - Ventilation provided by exhaust fans running continuously
 - Heat pump domestic water heater with supplementary electric heat (3.0 UEF) with condenser water heat recovery
 - C406 pathway: 5% cooling improvement, 10% heating improvement, reduced lighting power, heat pump water heater

All other inputs to the energy models meet the existing Louisville energy code (2021 IECC with amendments), including insulation and glazing values. The options comply with the code via the prescriptive path, which includes compliance with Section C406. Each design reflects the most cost-effective compliance pathway. All energy



modeling for the multifamily building assumer commercial utility rates – the building is on a master electrical utility meter with submeters serving each unit.

Multifamily - System Type	Annual Energy Cost	First Cost	Annual Energy Cost with PV Required for Net Zero Energy	First Cost with PV Required for Net Zero Energy
Mixed Fuel Option1	\$40,785	\$157,321	\$4,329	\$1,001,660
Mixed Fuel Option 2	\$25,230	\$278,321	\$8,461	\$1,190,470
Mixed Fuel Option 3	\$38,038	\$267,321	\$4,131	\$1,024,164
Mixed Fuel Option 4	\$27,071	\$459,821	\$7,578	\$1,352,283
All-Electric Option1	\$40,383	\$135,000	\$13,924	\$725,600
All-Electric Option 2	\$40,601	\$245,000	\$14,667	\$823,897
All-Electric Option 3	\$28,431	\$437,500	\$5,873	\$941,024

The first cost analysis for the multifamily building show that the mixed fuel options are similar first costs to the all-electric option due to the electric-ready infrastructure required under the current Louisville energy code.

Our energy modeling results show that the multifamily buildings with gas heating have lower annual energy costs than those that are all-electric. When photovoltaics are considered to make the buildings net zero, however, we found that the all-electric options require less PV and have a positive net present value. This positive net present value is calculated over a period of 20 years, with a 3% energy escalation rate. Each net present value option is evaluated against Mixed Fuel Option 1. A positive net present value means that the investment in the estimated initial construction investment is paid off before the end of the 20-year period.

Multifamily	PV Size Required for Net Zero Energy (kW)
Mixed Fuel Option1	338
Mixed Fuel Option 2	365
Mixed Fuel Option 3	303
Mixed Fuel Option 4	357
All-Electric Option1	236
All-Electric Option 2	232

All-Electric Option 3

201

Multifamily	Payback, No PV Included (years)	Payback, Net Zero (years)
Mixed Fuel Option1		
Mixed Fuel Option 2	9	>50
Mixed Fuel Option 3	>50	>50
Mixed Fuel Option 4	37	>50
All-Electric Option1	1	1
All-Electric Option 2	>50	1
All-Electric Option 3	39	1

Another important note is the greenhouse gas emissions created by each system type. Using NREL's Cambium tool, Group14 calculated the hourly greenhouse gas emissions throughout the year based on the average emissions expected in the entire State of Colorado. With Xcel Energy's goal to be 79% carbon neutral by 2035, we expect that the greenhouse gas emissions of these design options will be much lower in 2035, rather than the values shown in our analysis.

Without PV, the mixed fuel options have average emissions of 170,000 lbs CO₂ in 2022 as compared to 110,000 lbs CO₂ for the all-electric options. In 2035, the average carbon emissions drop to 95,000 lbs CO₂ for the mixed fuel options and 67,000 lbs CO₂ for the all-electric options.

2.2 Office Building

The office building is a 110,000 SF, 3-story building with metal-framed walls and is 40% glazed. To select the size of this building, we used information from the 2018 CBECS data for the average size of an office building in the mountain west region. The different HVAC options modeled are as follows:

- Mixed-Fuel options:
 - 1: Packaged VAV with hot water reheat (10.3 EER)
 - Condensing boilers (94% efficient)
 - 80% efficient natural gas water heaters
 - C406 pathway: 5% cooling efficiency improvement, reduced lighting power
 - 2: Packaged VAV with gas heat and electric reheat (10.3 EER)
 - 80% efficient natural gas water heater
 - C406 pathway: 5% cooling efficiency improvement, reduced lighting power

- 3: Four pipe fan coil units
 - Ventilation is provided by a DOAS with gas heat and DX cooling (80% efficient and 9.8 EER, 3.3 COP)
 - Chilled water is provided by air cooled chiller (9.7 FL | 16.1 IPLV)
 - Heating water is provided by 94% efficient central boilers
 - 80% efficient natural gas water heater
 - C406 pathway: Dedicated outdoor air system, reduced lighting power
- All Electric Options:
 - 1: Packaged VAV with heat pump and electric reheat (10.3 EER)
 - Energy recovery ventilation (0.5 effectiveness)
 - Electric water heating
 - C406 pathway: 5% cooling efficiency improvement, reduced lighting power
 - 2: Water source heat pumps (13 EER, 4.3 COP)
 - Condenser water loop is served by variable speed cooling tower and electric boiler
 - Ventilation is provided by a heat pump DOAS (9.8 EER, 3.3 COP)
 - Energy recovery ventilation (0.5 effectiveness)
 - Electric water heating
 - C406 pathway: Dedicated outdoor air system, reduced lighting power
 - 3: Variable refrigerant flow (SEER 13, 7.7 HSPF)
 - Ventilation is provided by a heat pump DOAS (9.8 EER, 3.3 COP)
 - Energy recovery ventilation (0.5 effectiveness)
 - Electric water heating
 - C406 pathway: Dedicated outdoor air system, reduced lighting power
 - 4: Two pipe fan coil units with chilled water cooling and electric heating coils
 - Ventilation is provided by a DOAS with gas heat and DX cooling (80% efficient and 9.8 EER, 3.3 COP) with energy recovery ventilation (0.5 effectiveness)
 - Chilled water is provided by air cooled chiller (9.7 FL | 16.1 IPLV)
 - Electric water heating
 - C406 pathway: Dedicated outdoor air system, reduced lighting power

Our analysis of the different office buildings shows that the annual energy costs of an all-electric office building are comparative to that of a Mixed-Fuel building. Heating energy use in offices is relatively small and is primarily for heating outdoor air for ventilation.

Office - System Type	Annual Energy Cost	First Cost	Annual Energy Cost with PV Required for Net Zero Energy	First Cost with PV Required for Net Zero Energy
Mixed Fuel Option 1	\$104,604	\$2,327,633	\$23,730	\$4,132,873
Mixed Fuel Option 2	\$135,278	\$1,786,323	\$48,276	\$3,728,323
Mixed Fuel Option 3	\$95,077	\$4,492,873	\$8,835	\$6,423,932
All-Electric Option 1	\$131,993	\$1,948,716	\$47,442	\$3,836,012
All-Electric Option 2	\$90,551	\$3,789,170	\$29,616	\$5,149,336
All-Electric Option 3	\$94,324	\$3,464,384	\$30,850	\$4,881,224
All-Electric Option 4	\$103,660	\$4,005,694	\$38,960	\$5,449,886

The predicted energy use of the modeled office buildings is lower than actual building performance due to how office buildings are operated. Often, building owners will increase the operational hours of their building for cleaning crews or early/late workers, and even operate them 24/7 to maintain a single zone at a prescribed temperature. The analysis assumes a standard 7 AM – 6 PM, Monday through Friday, occupancy schedule. In addition, control settings are often overridden to limit economizer operation and hold the supply air temperature at 50-55 F rather than allowing the supply temperature to reset upwards when the outside air is cooler.

To meet net zero, the photovoltaic systems sizes predicted are too large to fit on the roof of the example building. The buildings would be required to purchase off-site PV to fully offset the building's energy use.

Office	PV Size Required for Net Zero Energy (kW)	Estimated PV Area (SF)
Mixed Fuel Option 1	722	103,157
Mixed Fuel Option 2	777	110,971
Mixed Fuel Option 3	772	110,346
All-Electric Option 1	755	107,845
All-Electric Option 2	544	77,724
All-Electric Option 3	567	80,962
All-Electric Option 4	578	82,525



The net present value analysis for the office buildings shows that the buildings will not pay back within the expected life of the equipment for most of the options. Each net present value option is evaluated against Mixed Fuel Option 1. The two most cost-effective options, Mixed-Fuel options 1 and 2 without PV, are the cheapest first cost options that were analyzed, as expected. With PV, Mixed Fuel Option 2 and All-Electric Option 1 are more cost-effective than Mixed Fuel Option 1.

Office	Payback, No PV Included (years)	Payback, Net Zero (years)
Mixed Fuel Option 1		
Mixed Fuel Option 2	1	1
Mixed Fuel Option 3	>50	>50
All-Electric Option 1	1	1
All-Electric Option 2	>50	>50
All-Electric Option 3	>50	>50
All-Electric Option 4	>50	>50

The carbon emissions analysis shows that the all-electric designs show much lower emissions than the Mixed-Fuel options. In 2022, the mixed-fuel buildings have an average carbon emissions of 380,000 lbs CO₂. In 2035, they have a predicted emissions of 215,000 lbs CO₂. The all-electric buildings have an average carbon emissions of 315,000 lbs CO₂ in 2022 and 170,000 lbs CO₂ in 2035.

2.3 Commercial Development

The commercial development is assumed to be a strip mall with two food service anchors – a café and a quick-service restaurant. The building is 90,000 SF with concrete block walls and is one story. The building size was determined via the 2018 CBECS data for the mountain west region. The different HVAC options modeled are as follows:

- Mixed-Fuel options:
 - 1: Packaged single-zone rooftop units with DX cooling (SEER 14) and gas heat (80% efficient)
 - Café and food service: 80% efficient natural gas water heaters
 - Retail: electric water heating
 - C406 pathway: Reduced lighting power
 - 2: Packaged single-zone rooftop units with heat pump and back-up electric heat (SEER 14, 8.0 HSPF)
 - Café and food service: 80% efficient natural gas water heaters
 - Retail: electric water heating
 - C406 pathway: Reduced lighting power



- 3: Packaged variable volume single-zone rooftop units with DX cooling (SEER 14) and gas heat (80% efficient)
 - Café and food service: 80% efficient natural gas water heaters
 - Retail: electric water heating
 - C406 pathway: Reduced lighting power
- All-Electric Options:
 - 1: Packaged single-zone rooftop units with heat pump and back-up electric heat (SEER 14, 8.0 HSPF)
 - Energy recovery ventilation (0.5 effectiveness)
 - Electric water heating
 - C406 pathway: Reduced lighting power
 - 2: Packaged single zone rooftop units with heat pump and back-up electric heat (SEER 14, 8.0 HSPF)
 - Energy recovery ventilation (0.5 effectiveness)
 - Electric water heating
 - C406 pathway: Reduced lighting power
 - 3: Water source heat pumps (13 EER, 4.3 COP)
 - Loop is served by electric boiler and variable speed cooling tower
 - Ventilation is provided by a heat pump DOAS (9.8 EER, 3.3 COP) with energy recovery ventilation (0.5 effectiveness)
 - Café and food service: Electric water heating
 - Retail: electric water heating
 - C406 pathway: Reduced lighting power

In the commercial development models, due to the high service water heating and plug load requirements, the annual energy costs of the mixed fuel buildings are, on average, slightly lower than the all-electric energy costs.

Commercial Development - System Type	Annual Energy Cost	First Cost	Annual Energy Cost with PV Required for Net Zero Energy	First Cost with PV Required for Net Zero Energy
Mixed Fuel Option 1	\$164,492	\$570,500	\$23,730	\$4,923,423
Mixed Fuel Option 2	\$182,683	\$456,000	\$48,276	\$4,366,330
Mixed Fuel Option 3	\$158,096	\$630,500	\$8,835	\$4,545,393
All-Electric Option 1	\$193,161	\$660,000	\$47,442	\$4,282,873
All-Electric Option 2	\$185,053	\$708,000	\$29,616	\$4,130,109
All-Electric Option 3	\$156,491	\$3,167,500	\$30,850	\$6,060,323

The high internal loads drive up the amount of PV energy required to make the building net zero energy. The predicted size of the PV systems will not fit on the roof of the building off-site PV would need to be purchased to achieve net zero energy.

Commercial Development	<i>PV Size Required for Net Zero Energy (kW)</i>	<i>Estimated PV Area (SF)</i>
Mixed Fuel Option 1	1741	248,738
Mixed Fuel Option 2	1564	223,447
Mixed Fuel Option 3	1566	223,708
All-Electric Option 1	1449	207,021
All-Electric Option 2	1369	195,549
All-Electric Option 3	1157	165,304

While the net present value of the options without renewables is mostly negative, the net present value of the designs including renewables is mostly positive. Each net present value option is evaluated against Mixed Fuel Option 1. This assumes that the building will be paid for all of the electricity generated by the PV. However, as noted, the buildings do not have space for all of the onsite solar. Systems of this size are not often available in community solar gardens. With Xcel Energy's goal of net zero energy production by 2035, the requirement for photovoltaics to offset energy use would be greatly reduced in the coming years, as the electricity provided to these buildings moves closer to meeting the net zero carbon emissions goal.

Commercial Development	Payback, No PV Included (years)	Payback, Net Zero (years)
Mixed Fuel Option 1		
Mixed Fuel Option 2	1	1
Mixed Fuel Option 3	12	1
All-Electric Option 1	>50	1
All-Electric Option 2	>50	1
All-Electric Option 3	>50	>50

The carbon emissions analysis, like those above, show that carbon emissions for the all-electric buildings are much lower than those of the mixed fuel buildings. This is due to the high amount of service water required by the food service tenants. The average emissions for a mixed-fuel retail building in 2022 is 850,000 lbs CO₂. In 2035,



the mixed-fuel buildings are expected to have an average emissions of 470,000 lbs CO₂. The all-electric design options have an expected average emissions of 680,000 lbs CO₂ in 2022 and 380,000 lbs CO₂ in 2035.

2.4 Single-Family Home

The single-family home is a 2,820 SF 2-story home with a finished basement. The different HVAC options modeled are as follows:

- Mixed-Fuel options:
 - 1: 96% efficient gas furnace with SEER 16 split DX cooling
 - 0.92 UEF water heater
 - 2: Split heat pump with back-up gas heat (SEER 16, HSPF 10, 96% efficient gas back-up)
 - 0.92 UEF water heater
- All Electric Options:
 - 1: Split heat pump with back-up gas heat (SEER 16, HSPF 10, 96% efficient gas back-up)
 - 3.0 UEF heat pump water heater with supplementary electric resistance heat
 - 2: Ground source heat pump (18 EER, 3.7 COP)
 - 3.0 UEF heat pump water heater with supplementary electric resistance heat
- Appendix RC Options
 - Mixed Fuel Option: 96% efficient furnace with SEER 21 cooling
 - 0.94 UEF water heater
 - All-Electric Option: Cold climate heat pump
 - 3.48 UEF heat pump water heater

In our analysis of the single-family home options, we found that the annual energy costs of the all-electric homes are only slightly higher than the lowest cost option. This is due to the highly efficient and cost-effective all-electric design options available to residential consumers. The design options compliant with Appendix RC have the lowest annual energy costs.

Single-Family Home - System Type	Annual Energy Cost	First Cost	Annual Energy Cost with PV Required for Net Zero Energy	First Cost with PV Required for Net Zero Energy
Mixed Fuel Option 1	\$2,375	\$4,040	\$386	\$51,775
Mixed Fuel Option 2	\$2,388	\$4,540	\$371	\$51,135
All-Electric Option 1	\$2,511	\$3,255	\$966	\$37,738
All-Electric Option 2	\$2,026	\$22,405	\$807	\$49,621

Mixed Fuel Option - Appendix RC	\$1,946	19805	\$302	\$61,128
All-Electric Option - Appendix RC	\$1,795	21750	\$519	\$50,249

The PV system sizes required for each option are shown below. The all-electric options require the smallest PV sizes to reach net zero energy. The mixed-fuel system options and the Appendix RC compliant mixed-fuel system option require a much larger PV size when compared to the all-electric system options.

Single-Family Home	<i>PV Size Required for Net Zero Energy (kW)</i>
Mixed Fuel Option 1	19
Mixed Fuel Option 2	19
All-Electric Option 1	14
All-Electric Option 2	11
Mixed Fuel Option - Appendix RC	17
All-Electric Option - Appendix RC	11

To achieve net zero energy, the PV will only fit on a home that has optimal sun exposure and a large enough roof to fit the PV. This will not be feasible on most homes, which will require enrollment in a community solar program to meet the net zero requirement. COSSA has stated that there will be enough community solar available for homeowners in the City of Louisville. The cost of community solar will not increase utility bills or have an enrollment cost.

Single-Family Home	Payback, No PV Included (years)	Payback, Net Zero (years)
Mixed Fuel Option 1		
Mixed Fuel Option 2	>50	1
All-Electric Option 1	1	1
All-Electric Option 2	>50	1
Mixed Fuel Option - Appendix RC	>50	>50



All-Electric Option - Appendix RC

>50

1

The net present value analysis shows that most of the options have a negative net present value without on-site PV. Each net present value option is evaluated against Mixed Fuel Option 1. This means that the systems will not pay back within the system life span, mainly due to the high cost of electricity in comparison to the mixed fuel baseline. When on-site PV is added, however, the net present values become positive, meaning they will pay back before the end of the 20-year analysis period.

Consistent with the analysis above, the carbon emissions of the all-electric options have much lower greenhouse gas emissions than the Mixed-Fuel options. The design option compliant with Appendix RC that has natural gas use has more carbon emissions than the all-electric new construction options that do not comply with Appendix RC. The average carbon emissions of the mixed-fuel options is 9,000 lbs CO₂ in 2022 and 5,000 lbs CO₂ in 2035. The all-electric options have an estimated average carbon emissions of 6,000 lbs CO₂ in 2022 and 3,500 lbs in 2035.

3 POLICY CONSIDERATIONS

Across the country, from Seattle to Boston, cities are establishing building energy codes to reduce carbon emissions for new construction. The City of Louisville has a goal to create a new construction energy code that will set them on a path towards net zero energy buildings. Louisville's current amendments to the 2021 IECC require some additional energy savings and all-electric ready construction items:

Commercial New Construction

- Increased insulation levels
- Increased fenestration efficiency requirements
- Increased HVAC efficiency
- Electric vehicle charging and infrastructure
- Electric-ready wherever gas appliances are installed
- Solar-ready zone required

Residential New Construction

- Increased insulation levels
- Increased ductwork and piping insulation requirements
- Mandatory heat recovery
- Electric vehicle charging and infrastructure
- Electric-ready wherever gas appliances are installed
- Net zero Appendix RC required

To further increase the energy savings and carbon reduction potential of Louisville's energy code, this report discusses different advanced energy codes across the country and makes recommendations on the future cycles of Louisville's energy code development.

Background

Throughout California, multiple cities require all-electric new construction. In colder climate zones, such as Boston and New York City, jurisdictions have adopted their states' optional stretch codes. These codes require additional energy savings such as mandatory energy recovery, electric vehicle charging, or in some cases a net zero new construction provision that requires electric-ready new construction.

In Colorado, a new bill (HB 22-1362) recently passed that requires jurisdictions to update their energy code to the 2021 version of the IECC when one or more of their building codes are updated. Beginning in July 2023, jurisdictions will also be required to adopt electric and solar-ready requirements and begin enforcing a low energy and carbon code when one or more of their building codes are updated. This sets a great precedent for increasing the energy efficiency requirements of Louisville's energy code.

In the 2021 IECC, there are two appendices, Appendix CC and RC which require net zero commercial and residential new construction, respectively. Appendix CC gives two options for net zero new construction: 1- for buildings complying with the prescriptive pathway energy use intensities are established for each building type and must be offset by either on-site or off-site renewables, or 2- for buildings complying with the performance pathway, they must offset their predicted energy use shown by an energy model with on-site or off-site renewables. Appendix RC, which is currently adopted by the City of Louisville, requires that new construction homes have an ERI rating of 47 or less and the predicted energy use must be offset by on-site or off-site renewables.

Another code to consider in this discussion is Boulder's energy code. In this code, buildings with an estimated construction cost of \$500,000 or greater are required to comply with the performance path. This path prescribes maximum Energy Use Intensities (EUIs) that the building design must meet, shown through an energy model. After construction, building owners must reserve funds in escrow to cover the cost to reduce the building's energy use if the building does not meet the maximum allowed EUI.

In addition to these existing codes, there are amendments to the 2024 IECC that have passed preliminary committee approval which will further increase the energy savings of the base code. The all-electric-ready new construction amendment requires that anytime a natural gas appliance will be installed that appropriately sized electric infrastructure will be installed to accommodate a future electrical appliance. The on-site renewable energy amendment will require 0.75 W/sf gross floor area, not to exceed the combined gross conditioned floor area of the three largest floors on all new-construction commercial buildings. These addendums to the 2024 IECC will reduce the carbon emissions of new construction buildings and will encourage all-electric new construction. The IECC will continue to push towards net zero new construction with each code cycle, which will provide a framework for jurisdictions also hoping to require net zero new construction.

There are hurdles to providing all-electric new construction for commercial buildings. In comparison to all-electric space heating and domestic water heating, annual heating costs with natural gas are lower. In Louisville's climate specifically, we find that heat pump systems will have to utilize electric resistance heating during very cold times, further driving up annual energy costs. Additionally, demand response controls for reducing peak energy use and costs are not yet widely supported by Xcel Energy in large commercial buildings. We expect that this hurdle will be overcome in the coming years.

In addition to these climate and utility hurdles, we have found that industrial, laboratory, and manufacturing buildings all have systems that currently cannot be electrified. In Louisville there are major food, machinery, and plastics manufacturers, with specialized processes that use natural gas and cannot currently be replicated with electricity. In the energy codes discussed above, these processes are exempt from the electrification requirement, including the all-electric ready new construction requirement.

Resiliency is another factor to consider in this decision-making process. The Marshall Fire has highlighted concerns on how to make sure Louisville is a safe, resilient place to live and work. Through the energy codes, resiliency can be increased by requiring on-site solar and peak shifting controls to reduce demand and therefore peak loads on the grid.

Considerations

For the City of Louisville, we are recommending three different pathways for commercial energy code adoption:

- Option 1: Require all-electric-ready new construction as an addendum to the 2021 IECC, with on-site or off-site PV required to match the 2024 IECC on-site renewable amendment.
- Option 2: Require projects above a certain construction cost (or size) to meet a maximum-allowed EUI that is low enough that an all-electric design will comply more easily than a Mixed-Fuel building. Provide a prescriptive pathway that requires an equivalent amount of energy efficiency as the performance pathway. All new construction will be required to be electric-ready.
- Option 3: Require all-electric ready, net-zero new construction for all buildings and utilize Appendix CC from the 2021 IECC for buildings that do not pursue the performance path for compliance.
- Option 3B: Require all-electric net zero new construction for all buildings and utilize Appendix CC from the 2021 IECC for buildings that do not pursue the performance path for compliance.

For residential energy code adoption, Louisville has already adopted Appendix RC as a mandatory measure for all new construction buildings. Our recommendation is to amend Appendix RC to allow HERS ratings in lieu of ERI scores. This appendix maintains that buildings can comply with the code with or without natural gas; however, the appendix greatly incentivizes all-electric new construction to meet the energy scores calculated during design. Appendix RC also requires homes to offset their energy use with on-site or off-site renewables.

Discussion

Option 1

This option, seen as the least stringent of the three policies listed above, also requires the least number of amendments for the City of Louisville. This simple code can easily be automatically updated as each new version of the IECC is released.

This code would have the following main items:

- 2021 IECC adopted as the base code (currently adopted in Louisville)
- Electric vehicle charging and electric vehicle ready spaces amended (currently adopted in Louisville)
- All-electric or all-electric ready construction required (currently adopted in Louisville)
- On-site or off-site PV required to match the amendment to the 2024 IECC, alternatively, PV could be provided as required to offset any carbon emissions by natural gas systems used on site.
- Automatic update to the newest version of the IECC upon release

There are many benefits to this code pathway – primarily that the energy code for Louisville will continue to be updated as the code is updated. This also allows for engineers, architects, and building owners to navigate code updates and expectations.

Option 2

In this option, Louisville would use the City of Boulder's Energy Code as a framework for their efficiency code. Boulder's code has additional energy efficiency requirements above the 2018 IECC base code and is estimated to provide 20% additional energy efficiency. The additional energy savings are through mandatory and prescriptive compliance items such as:

- Air barrier testing
- Additional insulation levels
- Additional HVAC controls
- Reduced lighting power densities and additional lighting controls
- Electric vehicle charging
- Solar-ready zone
- Site energy Use Intensity (EUI) targets for the performance pathway

There are many benefits to aligning Louisville's energy code with the City of Boulder. Firstly, creating a unified energy code throughout the area would be beneficial for potential building owners and developers. A consistent energy code will set expectations and establish cost estimates and investments for new construction in the region. In addition, the EUI approach simplifies performance modeling by eliminating a baseline model to compare to.

If Louisville wishes to create a similar code based on the 2021 IECC, analysis could be performed to customize a set of EUIs for performance compliance. City of Boulder mandatory measures could be adopted along with additional mandatory measures, including:

Electric vehicle charging and electric vehicle ready spaces amended (currently adopted in Louisville)

All-electric or all-electric ready construction required (currently adopted in Louisville)

Along with this approach, all-electric buildings could be provided with a simpler path to code compliance and mixed-fuel buildings could require additional energy savings to above the base code to show compliance. For example, an all-electric building would solely have to meet the mandatory requirements in the base code,

however a mixed-fuel building would have to show 10% additional energy savings above the base code. This encourages designers and owners to build all-electric buildings without requiring all-electric new construction for all buildings.

The code maximum EUIs would be difficult to achieve via a Mixed-Fuel building and easier to meet for an all-electric building. As seen in our energy modeling results, the all-electric buildings that comply with Louisville's current energy code have lower energy use intensities than their mixed-use equivalents.

In this pathway, industrial and laboratory occupancies would use a traditional performance modeling compliance pathway and show energy savings. This allows industrial and laboratory occupancies to exclude process energy use from the energy savings calculation, including those processes that utilize natural gas. This results in energy-efficient envelope, lighting and HVAC systems having to offset increased heating and cooling loads from the process equipment.

In addition to this pathway, we recommend that on-site PV is incentivized by Louisville for buildings where PV is best suited, for example buildings with large, open roof spaces and sites that are optimized for solar production. Xcel Energy is targeting 2035 for zero carbon electricity production. There are benefits to buildings with on-site photovoltaics; however, utility-scale photovoltaics are generally better maintained than smaller systems.

Option 3

Under this option, Appendix CC of the 2021 IECC would be made mandatory for new construction commercial buildings. This appendix requires that buildings complying prescriptively provide a set amount of photovoltaics to offset their building's energy use based on their occupancy type. Performance compliance pathways are required to offset their building's estimated energy use shown through an energy model. This net zero requirement can be met through on-site or off-site photovoltaics.

The benefit to this pathway is that the Appendix will continue to be updated to be more effective at each iteration of code amendments at the national level until, hopefully, it is codified in the energy code. While this pathway is the most energy efficient and effective at reducing operational carbon, net zero construction has the highest first cost of all three pathways. The pathway also needs a post-construction performance assessment, such as benchmarking, to confirm net-zero achievement.

Option 3B

Under this option, Appendix CC of the 2021 IECC would be mandatory, with an additional requirement for all-electric new construction. No combustion systems would be allowed, except for the following occupancy types:

- Industrial
- Laboratories
- Manufacturing

In these building types, HVAC and plumbing systems would be required to be all-electric, however processes requiring natural gas would not be. For example, a steam industrial process that requires a large amount of steam would not be required to be electrified.

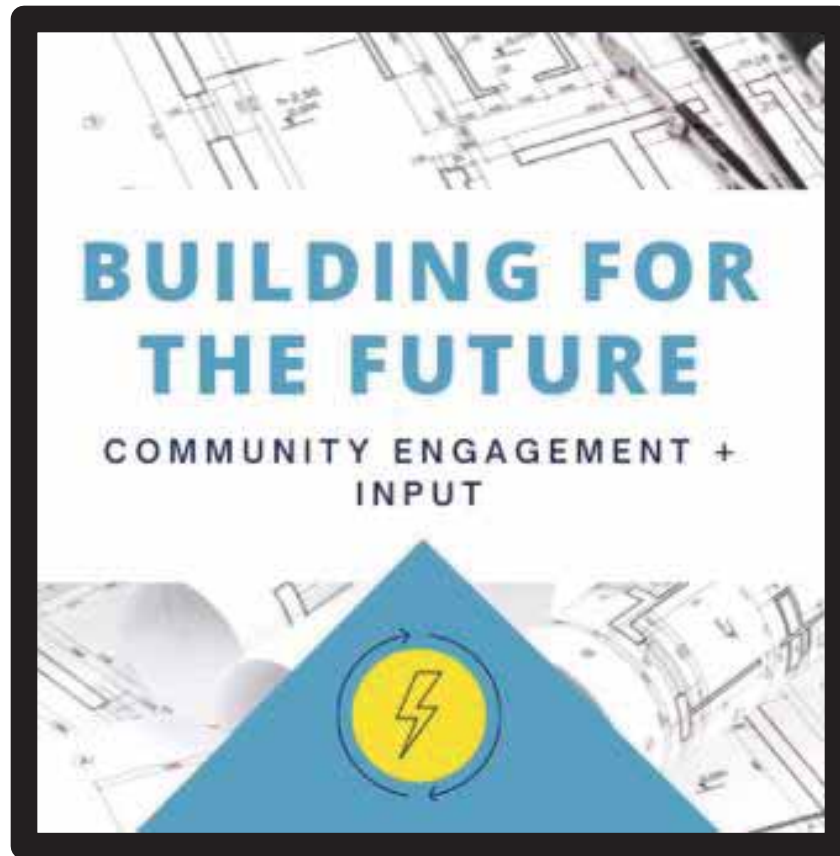
Future Work

Based on the desired pathway that City Council selects for their energy code, future work will include development of a set of mandatory, prescriptive, and performance measures to ensure that each pathway provides equivalent levels of energy efficiency requirements. Additional work is needed to ensure that resiliency considerations are made for renewable energy systems required, including battery back-up for both peak shifting and emergency power when possible. Any prescriptive pathway set by the city should encourage all-electric new construction and reduce use of natural gas.

4 CONCLUSION

The City of Louisville goals to reduce energy use and greenhouse gas emissions are important steps in addressing our climate crisis. Louisville relies on Xcel Energy for their electricity. Xcel Energy's goal to deliver carbon-free electricity by 2035 is realistic and results in Louisville having access to much cleaner power than the power provided to the rest of the state. Our recommendation is to leverage Xcel Energy's goal to deliver carbon-free electricity by 2035, and focus the energy code on energy efficiency, all-electric buildings, and renewables to offset gas use.

Louisville is surrounded by other counties that also have goals to reduce emissions and increase the efficiency required by the energy code. Creating an energy code that is similar and consistent across the region lets business developers and homeowners know what to expect when looking for a place to build, and helps contractors and engineers find the most cost-effective and energy efficient ways to meet the code. This will improve the efficiency of commercial and residential buildings across the region and encourage designers to find the most cost-effective solutions to the code.



City of Louisville Energy Code Update Public Engagement Summary

August 2022

Background

In 2021, the City of Louisville adopted the 2021 International Energy Conservation Code (IECC) with specific amendments that included more stringent efficiency requirements, and a requirement for electric-readiness and EV-readiness for all new construction. The City also adopted the Zero Energy Appendix (Appendix RC) that requires net zero energy construction for all new single-family homes in the City.

Now, the City is considering additional code options that would encourage higher efficiency, net zero, and/or all electric for multi-family and commercial new construction. Energy modeling was conducted to evaluate the City's current energy codes and other code development options. The modeling also investigated the up-front cost, annual cost, and lifetime cost of building to the new potential standards.

Public input is critical to the investigation and development of these new multi-family and commercial code options. Code changes impact multiple sectors of the community, from building developers to businesses to tenants and homeowners. City staff engaged the broader public through an online survey and two community meetings. In addition, the City staff engaged with two of the City's boards, the Louisville Sustainability Advisory Board, and the Building Code Board of Appeals, to present code options for feedback. The feedback received from this outreach will support City staff in identifying unforeseen barriers or challenges with new building code policy and will help inform where the opportunity is to drive more efficiency and climate protection in the building code.

City of Louisville Energy Code Update Public Engagement Survey

SURVEY METHODOLOGY

The survey questions were designed with the goal of capturing feedback and assessing support levels for potential code options for the Louisville community, as well as to gain an understanding of the perceived impacts of the code update. This was gathered through a combination of multiple choice and open-ended response questions. The open-ended questions were included to give respondents sufficient opportunity to provide comments. Demographics information was collected to understand what sectors and communities responded to the survey, and which might require additional outreach. Choice logic was used to tailor questions to three main groups: Group 1, Building Owners/Developers, Group 2, Business and Tradespersons, and Group 3, Residential. The survey was designed using SurveyMonkey software and was distributed via publication on the EngageLouisville



website, email listservs, and advertised during the two community meetings. The survey was open from June 27, 2022 to August 5, 2022.

Results of the survey were analyzed to find and remove duplicate responses and to determine whether incomplete responses should be included. Multiple choice question results were summarized and converted into sector-specific charts. Open-ended responses were categorized and summarized.

SURVEY RESULTS

Key Takeaways	
The survey had a total of 206 responses. <i>Note: the total number of answers per question may vary from the total number of respondents due to incomplete surveys.</i>	
Nearly $\frac{3}{4}$ of survey takers were homeowners, with the remaining $\frac{1}{4}$ representing building owners and industry professionals.	
Generally, survey takers tended to lean toward opposing each of the code policy considerations. However, the number of survey takers who supported each of the code policy considerations was still significant.	
Survey takers perceived the largest barriers to energy code updates to be additional cost burdens and creating a hostile environment for businesses.	
Survey takers saw the largest benefits to energy code updates to be greenhouse gas reductions and public health improvements (i.e., air quality).	
Survey takers expressed themselves in a wide variety of open responses. Some expressed staunch support for code updates, others expressed staunch opposition. A few of these comments are highlighted below.	
Example responses from those opposing the energy code updates:	Example responses from those supporting the energy code updates:
"Louisville is already not attracting new businesses like surrounding communities are. I want a vibrant economy here and I want to help businesses, not create barriers."	"If we work together (industry and government) to GREATLY reduce the GHG emissions of homes and buildings in the Denver metropolitan area, then we have addressed one of the largest sectors of emissions in CO. This would give upcoming generations a foothold to fight the omnipresent climate crisis. We must invest NOW to help future generations, it's not about us."

“Cost. I am supportive of #'s 21-24, but I think the considerations need a very careful approach with financial implications well laid out in either case studies or similar programs in the U.S. Its tough to for a smaller town, like Louisville, to be on the bleeding edge of the change without a City like Denver helping to lead the way.”	“Commercial buildings consume large quantities of power - often 24/7. Since they consume large amounts of power, addressing their electricity consumption should have a real benefit from a climate change perspective.”
“1) Addressing climate change while promoting economic development is a prime concern. 2) However, many people will not be able to afford the upgrades!”	“While the impacts to the environment are obvious, I think what these codes can represent is the start of a workforce that is trained in building to higher standards. Codes like these are the future of buildings and it has to start somewhere, so let's start that here!”

DEMOGRAPHICS

The survey asked for race/ethnicity, sector represented, and whether the respondent lives and/or works in the City of Louisville.

RACE/ETHNICITY

- White (83%)
- Hispanic or Latino (3%)
- Multiracial or Biracial (2%)
- Native American or Alaskan Native (1%)
- Asian or Pacific Islander (1%).
- The remaining were write-in responses with many failing to specify.

90% of survey respondents live in Louisville and 42% of respondents work in Louisville.

Most survey respondents were homeowners (74%). The breakdown of the remaining sectors is illustrated in Figure 1. Sector selection determined which questions the respondent would receive. Building Owner and Building Developer selectors were placed in the Building Owner/Developer Group. Business Owner / Manager, Energy Efficiency Expert, Engineer, Architect, or Designer, General Contractor, and Other business were placed in the Business and Tradespersons Group. Those who selected Home Owner,

Affordable Housing Representative, or Residential Tenant or Occupant were placed in the Residential Group.

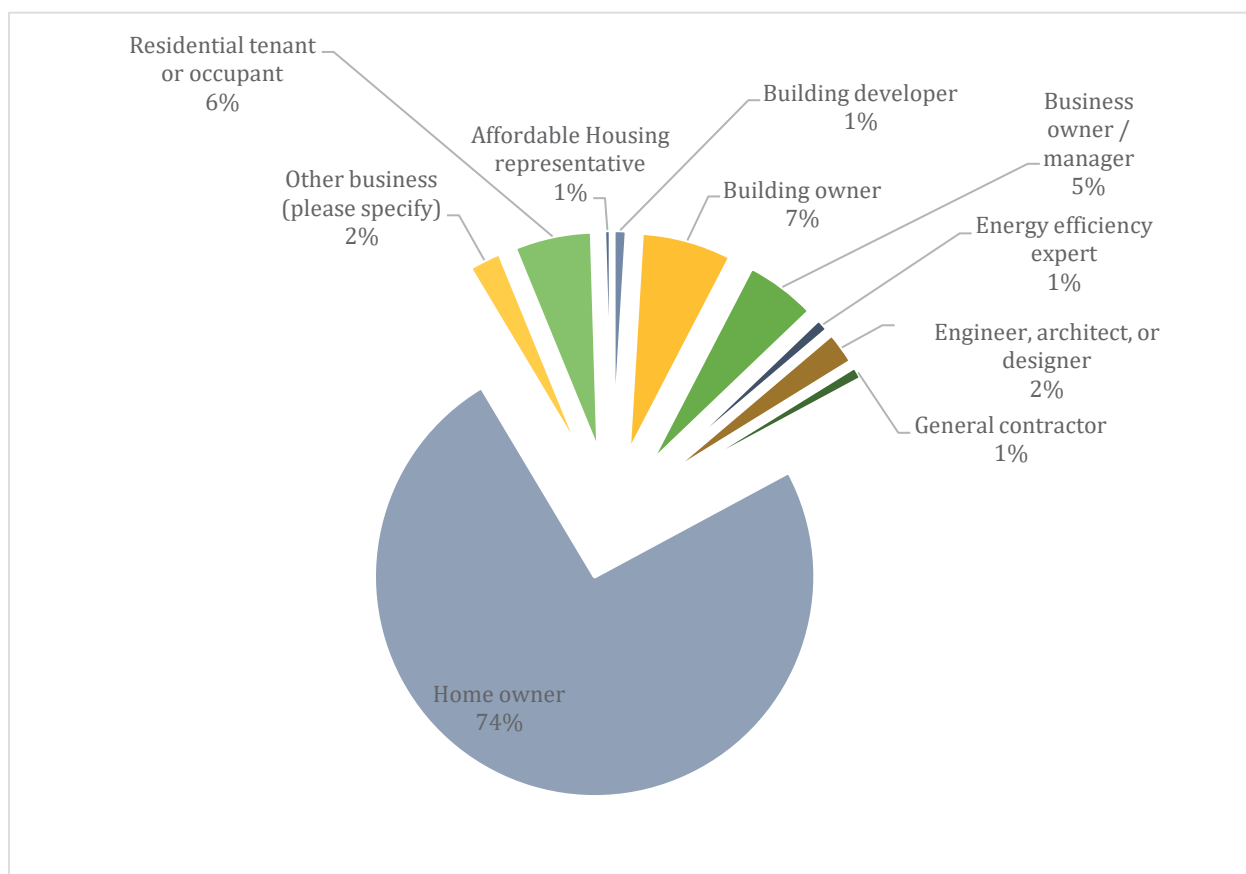


Figure 1: Breakdown of sectors represented in online survey.

SUMMARY OF SURVEY RESULTS FROM ALL GROUPS

IMPORTANT CONSIDERATIONS FOR ADOPTING CODE UPDATES

WHAT'S THE MOST IMPORTANT CONSIDERATION FOR THE CITY IN ADOPTING STRICTER ENERGY CODES FOR RESIDENTIAL AND COMMERCIAL CONSTRUCTION?

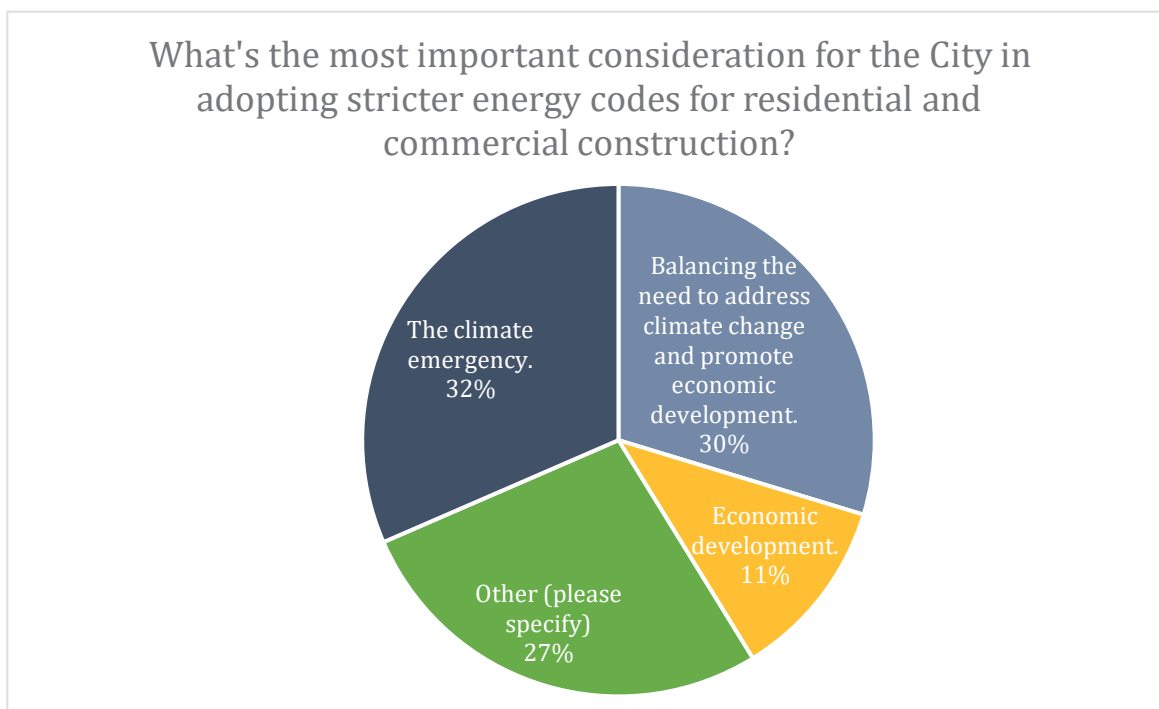


Figure 2: Percentage breakdown of answers for important considerations for stricter energy code.

To evaluate how survey respondents' values may influence their support of code updates or other sustainability measures, the survey asked respondents "What's the most important consideration for the City in adopting stricter energy codes for residential and commercial construction?" See Figure 2 for a breakdown of the results.

'Other' answers included responses expressing the need for cost/benefit analyses, desires for less government interference, and cost concerns. (See Appendix A for open-ended responses.)

SUPPORT FOR CODE CONSIDERATIONS

Survey takers were given questions describing potential City code considerations and asked to indicate their level of support via a 3-point Likert scale ranging from opposition to full support, with a fourth answer choice allowing respondents to indicate if they need more information to decide. Results are illustrated in Figures 3-6.

HOW SUPPORTIVE WOULD YOU BE OF INCLUDING A MINIMUM ENERGY OFFSET REQUIREMENT IN ADDITION TO THE 2021 CODE, WHICH WOULD REQUIRE ON - SITE OR OFF - SITE SOLAR?

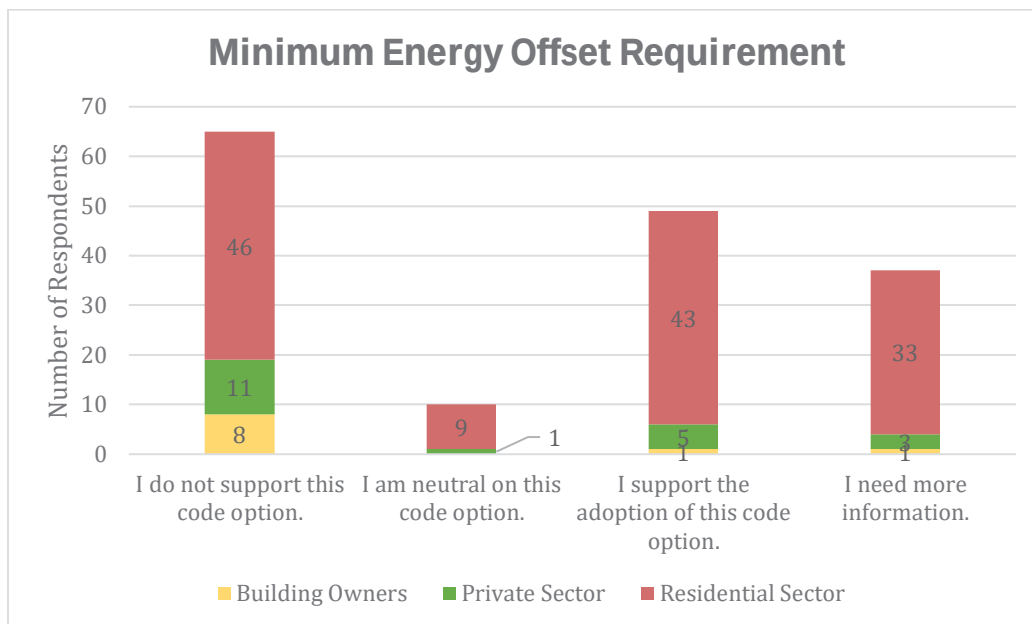


Figure 3: All sector levels of support for Minimum Energy Offset code option.

HOW SUPPORTIVE WOULD YOU BE IF THE CITY WERE TO CONSIDER AN ALL -ELECTRIC REQUIREMENT FOR NEW COMMERCIAL CONSTRUCTION CODE IF INDUSTRIAL PROCESSES WERE EXEMPT?

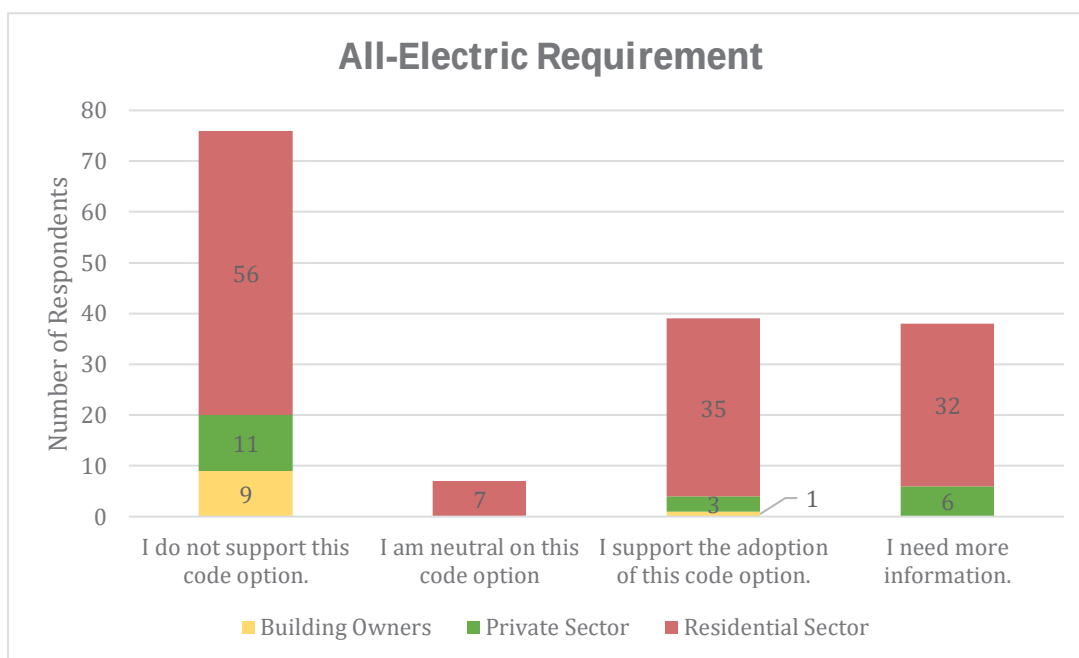


Figure 4: All sector levels of support for All-Electric Requirement code option.

HOW SUPPORTIVE WOULD YOU BE IF THE CITY WERE TO CONSIDER AN ENERGY CODE THAT REQUIRED A 20% REDUCTION IN ENERGY USE FROM THE 2021 ENERGY CODE FOR COMMERCIAL CONSTRUCTION?

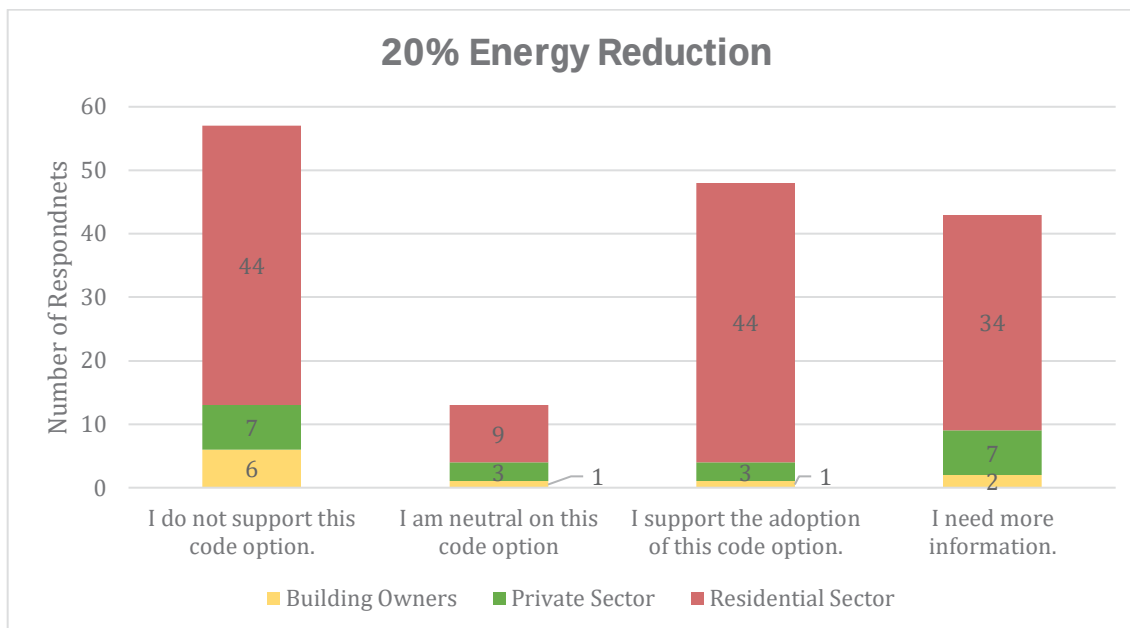


Figure 5: All sector levels of support for 20% Energy Reduction code option.

HOW SUPPORTIVE WOULD YOU BE IF THE CITY WERE TO CONSIDER A COMMERCIAL ENERGY CODE THAT REQUIRED NET ZERO ENERGY THROUGH EFFICIENCY AND ONSITE/OFF - SITE RENEWABLE ENERGY?

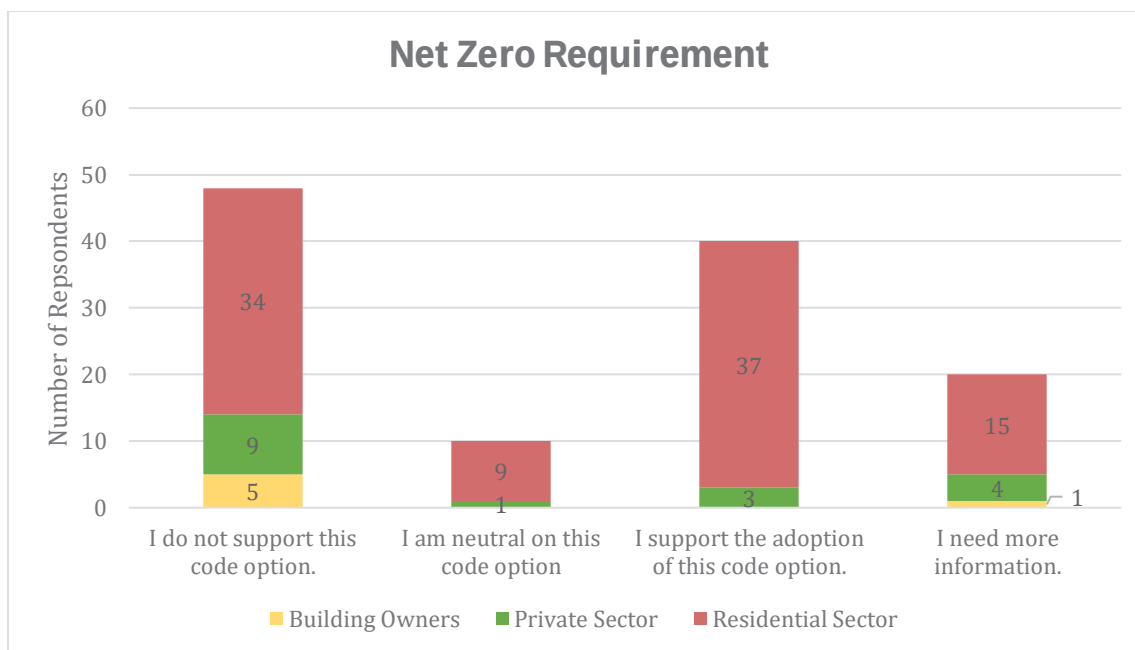


Figure 6: All sector levels of support for Net Zero code option.

BARRIERS AND BENEFITS

The survey asked open-ended questions to assess what respondents' perceived barriers and benefits were to the code considerations presented to them. The following provides a summary of the open-response comments received in the survey.

Summarized Barriers:

- Cost burdens for builders and tenants alike.
- The code considerations will make the City of Louisville a hostile environment for businesses.
- Residents and builders have a lack of knowledge and education regarding the benefits of code upgrades.

Summarized Benefits:

- Cleaner air.
- Clean energy use and greenhouse gas reductions.
- Increased energy efficiency in buildings.

See Appendix A for a complete list of responses.

EQUITY CONSIDERATIONS

All participants were asked the open-ended question: "Are there any considerations to address equity for low-income residents or disproportionately impacted communities that the City of Louisville should consider for any of the three commercial code scenarios considered above?"

Common themes resulting from survey responses included:

- Ensuring affordable/inclusionary housing is not unduly burdened by cost because of implementing these energy codes.
- Suggestions that the City provide grants and financial mechanisms for those who qualify.

See Appendix A for a complete list of responses.

BUILDING OWNERS & DEVELOPER GROUP RESPONSES

The Building Owner / Developer Group had 16 total responses, however, not everyone answered each question.

One survey taker expressed great enthusiasm and support for energy code upgrades. The rest were at the opposite end of the spectrum, showing opposition to all code considerations.

DOES YOUR COMPANY HAVE SUSTAINABILITY OR CLIMATE RELATED GOALS?

5 respondents have started or are fully implementing sustainability/climate goals at their company, while 6 do not have any goals.

WOULD YOU PREFER ENERGY CODE REQUIREMENTS THAT:

- (Performance approach). Set an energy consumption performance target and allow for flexibility in how a building meets that requirement which can include onsite PV if needed to meet the performance target.
- (Performance + prescriptive approach). Set an energy consumption performance target that specifies an efficiency standards for equipment that must be met and requires mandatory PV on all new buildings.

7 building owners selected the performance approach and 3 selected the performance + prescriptive approach.

SUPPORT FOR CODE CONSIDERATIONS

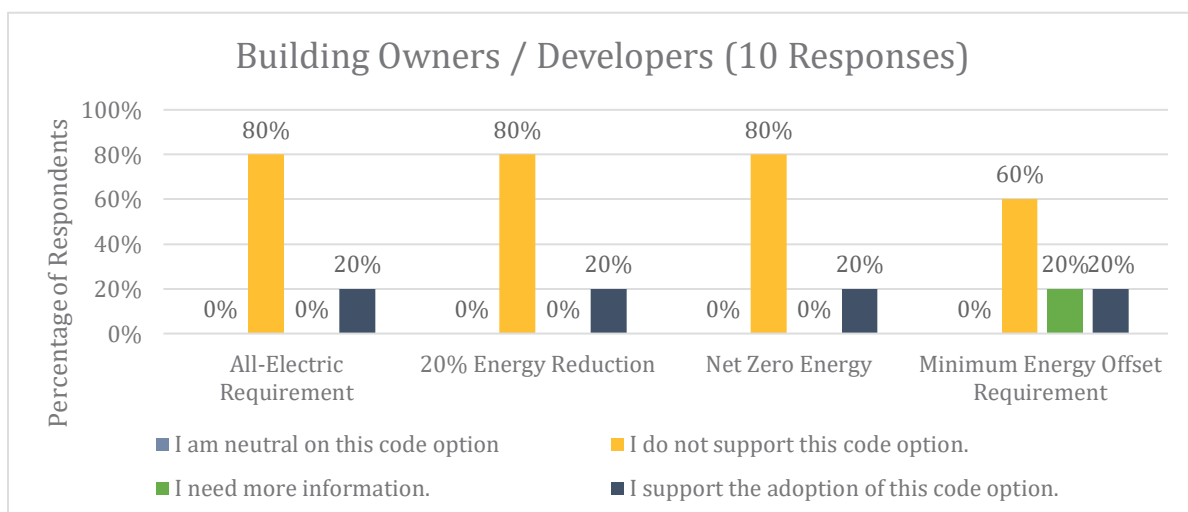


Figure 7: Building Owners / Developers sector levels of support for code options.

BUSINESS + TRADESPERSONS GROUP RESPONSES

The Business + Tradespersons Group had 25 total responses, however, not everyone answered each question.

The survey asked about location of their workspaces.

- 5 own their office/workspace in the City of Louisville.
- 7 rent their office/workspace in the City of Louisville.
- 10 do not have an office/workspace in the City of Louisville.

DOES YOUR COMPANY HAVE SUSTAINABILITY OR CLIMATE RELATED GOALS?

9 respondents do not have sustainability goals, plans, or programs in place. 13 have either begun efforts or have established sustainability plans and/or programs and goals at their company.

SUPPORT FOR CODE CONSIDERATIONS

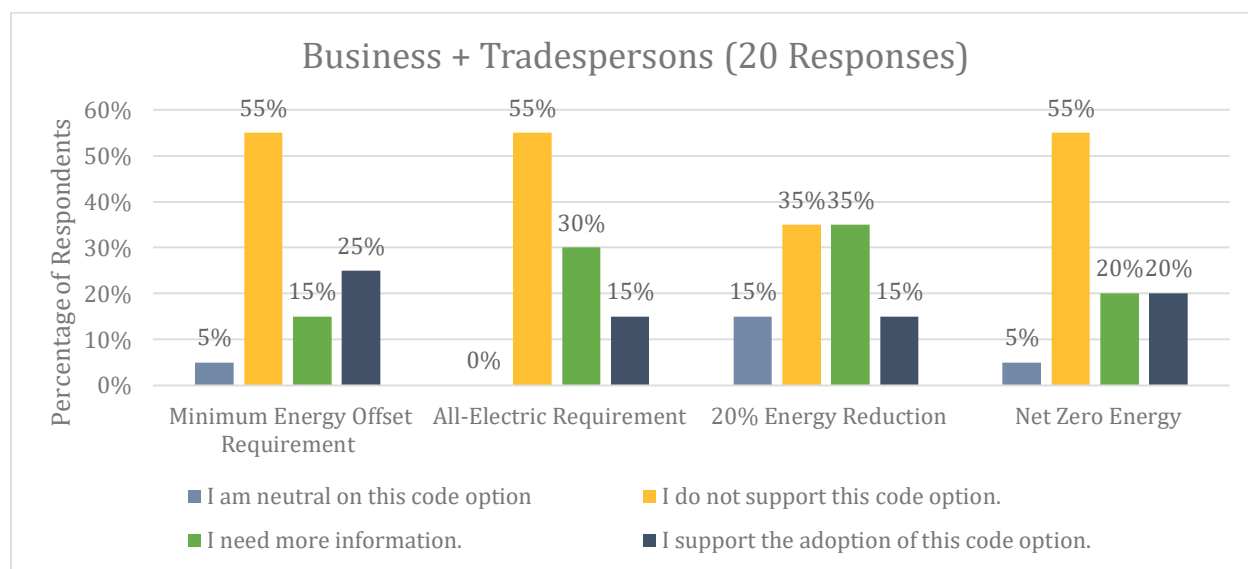


Figure 8: Business + Tradespersons sector levels of support for code options.

RESIDENTIAL GROUP RESPONSES

The Residential Group had 169 total responses, however, not everyone answered each question.

OUTSIDE OF THE MARSHALL FIRE REBUILD EFFORTS, DO YOU PLAN TO BUILD A NEW HOME OR UNDERGO A MAJOR RETROFIT ON YOUR HOME IN THE NEXT 1-3 YEARS?

- 31 respondents' homes are part of the Marshall Fire rebuild effort.

- 19 are planning a major retrofit in the next 1-3 years.
- 81 are not planning any major retrofits.

DO YOU CURRENTLY LIVE IN AN ALL-ELECTRIC AND/OR NET ZERO HOME OR HAVE YOU TAKEN STEPS TO START TO ELECTRIFY YOUR HOME?

- 22 respondents are working on electrifying their home.
- 21 are working on making their home net zero.
- 88 are not doing either.

SUPPORT FOR CODE CONSIDERATIONS

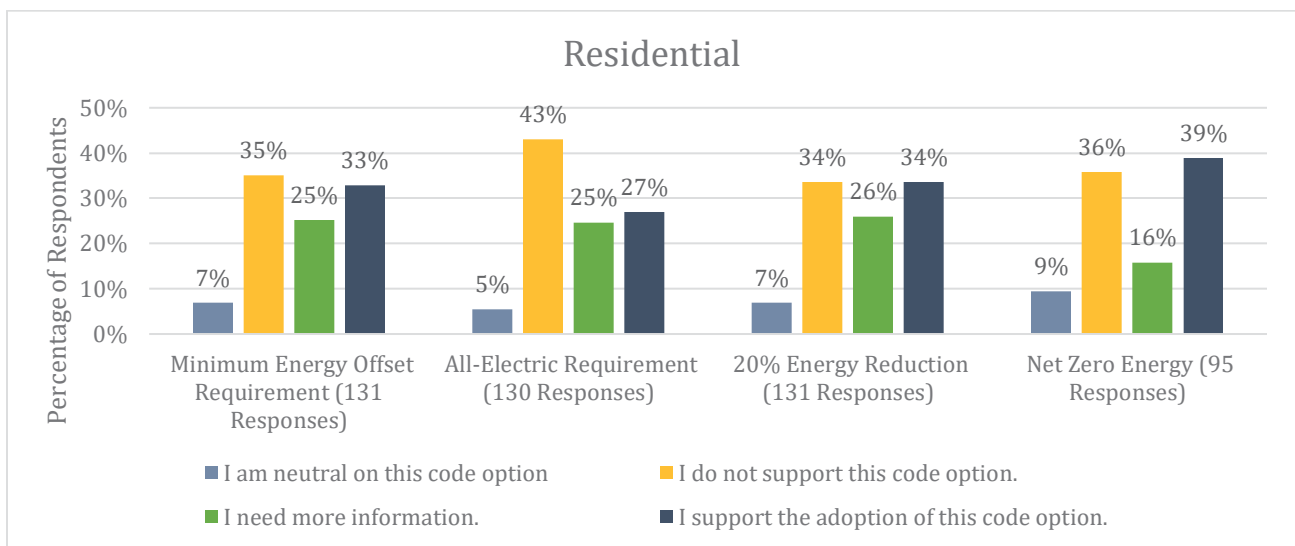


Figure 9: Residential sector levels of support for code options.

Community Meetings

The City of Louisville held two community meetings. The first was June 29th, 2022 from 6:00pm to 8:00pm. The second was July 28th, 2022 from 11:30am to 1:30pm. The meetings were held in open-house format, with a presentation outlining the code modeling and policy considerations, followed by time for participants to ask questions and make comments.

In both meetings, similar concerns to those brought up in the online survey were expressed. Questions and comments included (summarized, not direct quotes):

- Concern that businesses are leaving Louisville.
- Concern about costs imposed by these policy considerations.
- Concern of the electric grid not being able to handle energy code update impacts and Xcel not delivering on their stated renewable energy goals.
- Emphasis on building types that would qualify for exemptions.



- Curiosity and questions about alignment with regional code update efforts.
- A desire for the City to look closely at code for existing buildings.
- Emphasis on pushing energy efficiency before pushing electrification of building systems.
- The City should take its time developing the ordinance, rather than rushing to be a leader in this space. Careful consideration of impacts needs to be made.

Board Meetings

LOUISVILLE SUSTAINABILITY ADVISORY BOARD

The energy code update modeling, policy considerations, and preliminary survey results were presented to the Louisville Sustainability Advisory Board (LSAB) Meeting on July 20th, 2022. This was an information session. Throughout the presentation, opportunity was given for board members to comment, as well as the public to give comment during designated public comment periods. Summarized comments and questions included:

- There is a need to push Xcel to implement resiliency measures and redundancy if we are going to electrify our systems.
- How does this project relate to existing buildings?
- Expressed need to emphasize greenhouse gas emissions benefits of the code updates.
- Concern about procuring offsite solar: lack of information available, lack of available offsite solar, and lack of funding to create more offsite solar.
- Exemptions for certain building types from code updates could create a loophole and could hinder Louisville's progress toward sustainability goals.
- How will small businesses be impacted by the code updates?
- There needs to be a scale of options ranging from a code update that is easy, a code update that is balanced, and a code update that is high impact but difficult to implement.

BUILDING CODE BOARD OF APPEALS

A similar presentation to the one given to LSAB was given to the Louisville Building Code Board of Appeals on July 21st, 2022, also as an information and feedback collection session. Summarized comments and questions included:

- Louisville has limited access to offsite renewable energy.
- Several questions related to the feasibility of limiting commercial energy consumption via Site Energy Use Intensity targets, and how successful City of Boulder's efforts were with energy performance targets.



- Board members sought confirmation that the modeling would apply to building types that exist in the City of Louisville.
- Concern regarding the capability of the electric grid to handle buildings built to stricter commercial energy codes and/or built to be all-electric, and the reliability of Xcel's renewable energy goals.
- Curiosity about other regional code efforts and whether the 2021 IECC has been implemented elsewhere.

Appendix A: Open-ended Responses from Online Survey

**Click the page number in the Table of Contents above to navigate to the open-ended responses for the following questions.*

What is your biggest concern or perceived barrier to the commercial code considerations presented? 15
In your opinion, what is the biggest benefit to the commercial code considerations presented? 23
Are there any considerations to address equity for low-income residents or disproportionately impacted communities that the City of Louisville should consider for any of the three commercial code scenarios considered above?

33
What's the most important consideration for the City in adopting stricter energy codes for residential and commercial construction? 39

WHAT IS YOUR BIGGEST CONCERN OR PERCEIVED BARRIER TO THE COMMERCIAL CODE CONSIDERATIONS PRESENTED?

The impact to current businesses in the market and attracting new businesses as costs to implement such an aggressive code would unfairly impact business - need to be implemented slowly over a long time.
Perception that we cannot afford efficiency improvements and businesses will locate elsewhere.
There needs to be a clear presentation of the cost to builders and potential tenants. Each measure needs a cost and how long it will take to see a return on their investment. In addition what are the incentives for their participation in the plan.
Cost. You put the burden on these companies and they won't build here. That impacts locals who then don't have opportunity to work there. Let the free market do its thing. Companies have to have a good reason to take all the economic risks they do to build. Putting restrictions just makes them go elsewhere.
I think there is a very big loophole for industrial buildings. We need to look more closely at what we could require of industrial builds. I would support natural gas for emergency backup but not for processes.
Cost. We also have quite a few unoccupied buildings
Violation of owners rights to their own property.
The market needs time to process this type of change
Unreasonable cost with no clear benefit Business owners will gk elsewhere
Economic hardships for new businesses
Discouraging business development in Louisville.

It may be difficult to guarantee clean-energy sources when weather reduces solar and when commercial operations continue after dark. (Battery storage systems may not be ready to scale up, or may cost too much.)
COST vs payback / benefit
I would like to first read comments from the existing commercial business and building owners. We don't want to drive away business. We want to retain and attract business.
We need more businesses in the area. The city will be relying only on homeowners taxes for funding at the rate we are losing businesses.
We need to make the City attractive to potential investors and not become too expensive. That said, Redtail Ridge, because it's an entirely new development at this point, should be held to the highest standards. In addition, I would like to see large parking lots replaced by garages to reduce the amount of pavement and increase natural landscape. Commercial properties need to include charging stations for EVs
Cost and the effect of not considering any balance toward economic development of our city - it's lifeblood.
I am all for lowering emissions and energy efficiency but I believe the cities "net zero" approach is ill advised, expensive and another elitist move that will increase the cost of housing for a minimal real world benefit.
Businesses and developers will fight this tooth and nail
Pushing cost to business owners
Will it keep business away being cost prohibitive?
Cost, added lead time on construction.
Cost
Business leaving and not choosing Louisville to build
Some commercial occupants might have specialized needs that could necessitate gas/ fossil fuels. We will need fossil fuels for decades.
This will increase cost for businesses in Louisville. We have already lost most of our cornerstone businesses to neighboring communities. This will continue to occur until there are no businesses left if we continue to make it more expensive for them to operate here.
Overreach by the city Government and costs. There is already a huge vacancy of commercial space in Louisville and this would prohibit businesses from moving to Louisville.
Companies will not consider Louisville as viable option for building their business.
Not enough valid, non political info

You are very focused on the wrong thing. There are so many empty buildings in the city... all this will do is raise the construction cost which will raise the rent which means that that we have more buildings to this new code with no value other than sitting empty. There should not be a mandate that should be an option if a developer wants to do it.
Louisville is already driving businesses out.
Fear of costs, fear of regulations
Ability of small local businesses to absorb costs
Ignorant people
The City already is perceived as business unfriendly.
That it will turn away business from Louisville. But we already have so much vacant buildings I am not concerned. They can use those first
Causing businesses to move. Money is the driver for all businesses. Tax incentives, subsidies, or loans may reduce this risk.
Louisville is already not attracting new businesses like surrounding communities are. I want a vibrant economy here and I want to help businesses, not create barriers.
It will make Louisville even less desirable as a place for new commercial buildings.
Inability to recoup costs.
I would be forced out of business
Louisville has already driven large businesses from here, I can't imagine that they will like the new requirement. Why do you think businesses (especially in the building industry) do not want to be in Boulder County and specifically Boulder.
Developers might be entrenched in traditional construction designs and methods
costs, impractical, no impact on climate change
You drive business out of Louisville when you create building requirements that drive the cost of commercial build out so much higher than surrounding cities. We are losing commercial along the McCaslin corridor left and right. We should be focusing on how to bring companies here rather than giving them another reason to go to Lafayette or Superior.
Think the city needs to focus on sustaining homes and businesses. Not sustainability.
silly government hand outs to companies to reduce their risk to almost negligible for the promise that they'll follow the rules
We believe that it will hurt the economy of Louisville. Costs in construction are at an all time high with the limited supply chain. Adding code that will increase cost will only deter business and residents from moving into Louisville. I also fear that if

businesses need to expand they will look to our neighboring cities that offer lower rent, tax breaks, and less restrictions (lower cost) in construction.
Loss of potential and existing businesses
Potential upfront costs and how that might affect tenants
Increased costs will drive away business
The elimination of businesses using natural gas. This would severely impact many small businesses in Louisville - restaurants, for example.
The city already has an anti-business climate. By issuing more mandates that raise costs it will just drive potential businesses to neighboring communities.
question whether what is considered sustainable today will be supported by facts in the future
Louisville is already seen as being anti-business. Why would we make it harder to attract new businesses?
Cost
A lack of real financial analysis of current cost of future certainty of costs.
Lead times for equipment
Unjustified and will not bring interest to Louisville. These actions will chase more business out.
That the costs will drive businesses away from the city and prevent new businesses from opening.
Driving businesses away. Need to balance the energy requirements with other incentives
Companies wanting to maximize profit.
They are greedy and wanted to do their own way. They will try to bypass this code by saying oh we cannot do this due to lack of technology higher cost or infeasible with current energy needs. Do not give them any incentives because if you do, we the city of Louisville will be on the hook.
Efficiency is great. Will this draw or discourage small businesses? We already have lost many businesses to neighboring communities. Where will the off-sight collectors be placed? What will that do to Open Space? Have long-term health effects been studied? Will more staff need to be hired to regulate and oversee this change? Has research been done to see the actual energy savings?
Business choosing to locate elsewhere
Cost. I am supportive of #'s 21-24, but I think the considerations need a very careful approach with financial implications well laid out in either case studies or similar programs in the U.S. Its tough to for a smaller town, like Louisville, to be on the bleeding edge of the change without a City like Denver helping to lead the way.
Lack of understanding is probably the biggest barrier.

I'd want to know more about upfront costs and whether this was being done in concert with nearby municipalities. I like the requirement to reduce energy use/become more efficient better than any specific code requirement.
N/A, I am unfamiliar with commercial building codes.
I am ignorant of the processes used in commercial buildings that are sufficiently energy intensive to require using gas. That said, I think ASHP or GSHP is the only way to go for both commercial and residential, going forward. If we cannot eliminate gas entirely, we should strive to significantly reduce it where ever possible. Heat Pump technology is sufficiently advanced that heating and cooling can use it effectively. Same for Water heating. In Commercial environments, the time horizons are longer (then some residential), so ROI should be easily achievable.
The fact that there is a lot of commercial tenants moving out of Louisville recently - Kohls, Lowes, Sams Club, etc
If the building envelope is not enhanced even beyond what is proposed. The biggest energy losses in buildings is through a lack of air tightness, then lack of glazing performance and then thermal performance. All three of these areas should be addressed before electrification. By reducing energy loads HVAC and ventilation equipment can be properly sized to meet the lower energy demand and offset costs would be much smaller and easier to manage financially.
Louisville is already business hostile. Look at all the stores leaving town of all sizes. The last thing we need is another barrier.
Just electric requirements aren't enough, we need to be sure that all energy in from renewable sources
Same as residential - lack of contractors with experience
Until the industry knows how to do this, it would likely leave us stuck with old, inefficient buildings for a long time.
Louisville continues do drive businesses out of town. This will accelerate the trend.
Reduction in number of companies wanting to build in Louisville, which means higher costs for new home owners.N/
General opinion: Corporations will always resist increased financial of their operations, regardless of the impact on the environment.
cost
Reduces business opportunities in the city. Drives businesses to surrounding cities.
Top down approach is not good.
I wonder what the specific downsides to this would be.
Too restrictive

Big concern is if higher construction costs will make Louisville less desirable for future commercial growth.
Cost, heavy-handed mandate
Disproportionate impact on small local businesses, who already have a hard time getting off the ground relative to national chains.
businesses moving out elsewhere...
Expense and reduced demand for businesses to locate in Louisville due to cost (energy and rent)
Cost to businesses that could deter them from investment in Louisville.
I need to understand the cost impacts and the impact on businesses deciding to reside in Louisville. What is the balance 'goal' to increase businesses in Louisville especially since our town hasn't had any noticeable growth in years. Especially in the McCaslin corridor. We are falling behind our neighboring towns. If it is now or in the future a result of too many regulations or cost similar to Boulder then it is an economic issue for the town and its tax paying residents that have to pick up the revenue shortage.
Massive extra cost, making the business uncompetitive. Better to operate outside Louisville
I worry that the same thing that happened with the residential code will happen with the commercial code: builders convincing people/companies that it can't be done, or can't be done affordably. Perhaps incentives for builders to get training for building to new standards could help with that (I believe EMU Systems is doing something like this).
Cost
It is none of government's business. You have enough trouble doing what you ARE supposed to do.
State wide adoption and regional cooperation.
People don't want to have to pay more, despite the climate crisis.
Incentivizing companies to go down this path
Added cost for no benefit.
Cost and efficiency for the company
Need more info
Companies will relocate to a cheaper city.
If it's too expensive to operate a business here they will go elsewhere.
It might deter new businesses coming into the city.
Cost
Businesses in Louisville cannot afford to convert to electric. It's best for restaurants to remain on gas. That's how good is made.



Ability for our tenants to operate their businesses.
They would hamstring an already suffering business community and will drive potential new businesses to surrounding communities.
Louisville has already become a more business-hostile environment, and we have a lot of empty commercial space that needs to be addressed. I'd hope the city would pay more attention to fixing this issue instead of possibly making it even more difficult to do business in Louisville.
Businesses will look elsewhere to build. City Council of Louisville would appear to be anti-business.
This will backfire by encouraging businesses to claim false exemptions and go outside the permitting process in order to get their projects completed and online. This will result in a less efficient product than leaving the current code as-is. (Again I'm not even going into the bigger economic risks of being so far ahead of the pack, energy wise)
companies would elect not to be in Louisville
Upfront costs, willingness of commercial businesses to adopt
cost
Cost
Cost of doing business becomes too high; the code is implemented without staging and/or enough advance warning.
No!
Lots of technical details in these code questions. Is the technology realistically available to be aggressive in the commercial code? Much of the commercial buildings are already built. How will these buildings be included in the commercial code? This needs to be considered now. If the new code requirements only apply to new commercial construction, it will be a "feel good" action that doesn't accomplish much except make new commercial impractical.
I think there are others with legitimate needs for gas during the transition to 100% electric. For example, a hospital needs a way to generate power for patients hooked up to oxygen and other life saving equipment. Similarly, people with certain medical conditions may have the legitimate needs. I don't know.
No flexibility.
Louisville has a lot of empty commercial buildings today. Why would a company whose goal is to make money and stay in business want to pay extra to build or pay extra for monthly bills. Maybe put more effort into water conservation and bringing businesses back to our community

That commercial interests will find a way to get less stringent codes than the residents are required to meet, resulting in the smallest burden being placed on those with the most amount of money.
The cost that will be past down to the buy of goods. There is no free, taxes and fees must be passed on. Everyone is living pay check to pay check, City needs to figure out how to reduce fees and taxes so business come in and pay property tax.
cost to the business; property taxes are already too high
I'm sure they are also concerned about the upfront costs and payback period
May drive business away
Businesses not wanting to do business in Louisville
I have lived in Louisville for 37 years. I have watched Superior, Broomfield, Lafayette and even Erie grow their commercial presence while Louisville continues to lose both retail and non-retail (with the exception fo the Colorado Tech Center). Adding cost burdens that make building -- and operating a business, since those costs have to be passed on to the tenants -- in Louisville even less competitive does not seem like a smart thing to do right now.
Cost, short term
It may drive some warehouse and pot greenhouse operations outside of the code affected areas (boo-hoo to that) and it may require increases in electrical generation capabilities that would require additional peaker natural gas turbines until alternative electric supplie comes online. In other words it could be short term disruptive to lectrical energy capacity if a large amount of natural gas heating capacity were suddenly required to be all electric resitive heaters. Best to pay outside consultants to model these complex issues before adopting potentially disruptive new codes.
The significant increase in cost to businesses who would move to a more energy friendly city. Louisville could lose a lot of business by these plans.
That the wrong actions are being mandated to really improve our community environment. We have bad air all too often. Minimize commuting. Maximize use of public transportation to enter and leave our business community corridors. Not allowing large commuting populations nor businesses utilizing such into our community. Not allowing any more green spaces to be covered with concrete and asphalt. Having rigidly strict emission standards and elimination of diesel vehicles in our community. Having a zero tolerance and high penalties and fines for idling diesel trucks and vehicles unnecessarily in our community. Encouraging all existing businesses to develop solar panels on their large roof expenses as well as encouraging the same for residents. Creating for provisions that replace solar panels after hail events without having the residents have to pay out of pocket

removal and reinstallation fees. Do not let Xcel energy limit the amount of solar production per resident or per business we should be able to produce all that we want and contribute it to the grid without penalties from Excel energy.
Uncertain; need more information
net zero energy should be mandatory
It could discourage commercial development
None because I believe it will help keep out some of the worst area developers
Additional cost and pollution required by current means of production, which means dirty fuels to produce the amount of electricity you propose.
Driving business away from Louisville
availability of contractors with sufficient expertise
commercial buildings have too many complications. unlike residential, the users are often not the owners. sometimes there are multiple users within on energy meter.

IN YOUR OPINION, WHAT IS THE BIGGEST BENEFIT TO THE COMMERCIAL CODE CONSIDERATIONS PRESENTED?

none, based on the current requirement - it is not feasible with today's technology and can't be afforded.
Climate change action.
If done with attention to detail, it will reduce green house gas emissions. But we need to pay attention to the bottom line. We need to find ways to attract and promote those businesses that are climate change conscious. Offer them ongoing incentives and showcase them as leaders meeting the stated goals.
none. if and when it becomes feasible to build in this way, then companies will naturally do so when the technology is available at affordable costs.
It will be a great foundation for the future - -let's not work incrementally on these codes, it's important to get this done.
Way less emissions
Not sure I see a benefit
This could lead to a large drop in carbon-based energy use in the energy-intensive commercial sector.
The 2021 codes continues to improve the energy usage of commercial buildings and is broadly understood and interpreted.
More efficient use of power
Cleaner air
Addressing climate change

Making some individual's in the city management feel like they are saving the world. Unfortunately they are shifting the financial impact to residents.
Reducing Louisville's carbon footprint
Environmental impacts, forward thinking community
I don't see a benefit for businesses.
Energy efficiency
Meeting the agenda of the city is all it's benefiting
Smaller footprint
There are none you are breaking our community.
Climate change impacts
I see no benefit at all
Future of the planet
Environmental impact
The environment, not worrying about the environment being able to support my future possible children
sustainability
Clean energy use. Lower carbon emissions
Be responsible beyond an individual's \$.
None
Climate
We have to make these changes but it must provide resilient solutions, particularly in the face of climate change, I am particularly interested in subsidies for on-site or community solar solutions. If the grid has challenges, our proposals should provide resilient solutions.
Investing in the community where your business resides
Virtue signaling.
Commercial buildings likely have a much larger environmental footprint than residential buildings
I think it is a detractor and one of the reasons I sold my business in town.
encouraging companies to blend in with the culture of energy independence
It has the potential to save energy.
Non. I guess the council and mayor can feel like they have made a difference.. when in fact the city is becoming blighted (business). Maybe more efforts should be placed on business retention and promotion for new businesses
Savings in the long -run, plus client support due to the energy saving practices
No benefit, companies will select options that meet their needs at a reasonable cost.



While I'm all for doing all we can to lessen the impact buildings have on the environment, the main cause of global warming is vehicle exhaust. Why is the city not addressing this, rather than considering a code that might severely impact small businesses while failing to address the major causes of global warming.
Marginal impacts on overall climate
energy savings, but the savings must offset actual cost in a reasonable amount of time (5 years)
Don't see one
Incremental improvements are good if done in a more thoughtful way in cooperation with businesses and property owners. Louisville is no longer friendly to homeowners or businesses. This proposal makes that worse.
We have to get to decarbonized buildings & policy is the only way it will happen.
There are none that would justify these actions.
Better energy efficiency for new structures.
It is necessary.
The energy saving being cost effective in both short and long terms.
Saving our planet
Building better buildings.
These proposals sound good in theory. Educating Louisville residents and businesses about what these all mean and how you decided on them would be great. For example, I'm wondering why a 20% reduction? Why not more?
Reduction in overall emissions of GHGs.
N/A, I am unfamiliar with commercial building codes.
N/A for this question. However, perhaps a consideration for luring commercial customers - if they perceive the cost of building too high, they may take a pass on Louisville. They would need to be shown when the ROI is realized.
Stringency. You presented the proposals at a high level (20% reduction, net zero) but there is a lot of information still needed to make any kind of decision on the proposal at this time. How compliance is shown and differences based on building types and end-use.
Creating the conversation around what it means to be energy efficient.
Using renewable energy sources!
A livable planet
Until the industry knows how to do this, it would likely leave us stuck with old, inefficient buildings for a long time.
Should free up parking with lots of empty parking lots.
Need more information
pretty questionable as to any benefit

Makes city leadership appear effective
Let businesses decide for themselves.
lower energy costs and help towards reducing the effects of climate change
Too restrictive
This will reduce the carbon footprint for new - construction commercial properties.
Reducing reliance on fossil fuels and their emissions.
none at this moment
Insulation improvement is ok.
Impact on climate change
I'm all for residential and commercial to build to the latest standards but need to balance against cost and the ability to meet those requirements as they are a moving target (trained installers, rebates, etc)
While the impacts to the environment are obvious, I think what these codes can represent is the start of a workforce that is trained in building to higher standards. Codes like these are the future of buildings and it has to start somewhere, so let's start that here!
If we work together (industry and government) to GREATLY reduce the GHG emissions of homes and buildings in the Denver metropolitan area, then we have addressed one of the largest sectors of emissions in CO. This would give upcoming generations a foothold to fight the omnipresent climate crisis. We must invest NOW to help future generations, it's not about us.
They will help combat global warming and benefit the environment.
Less energy usage, more sustainability
There are none. Again, add incentives for different areas you want to increase.
Unsure, one community is a start but unless the world changes, not sure there is a benefit to justify forcing the cost on business since there are empty buildings here already
Need more info
Greatly reducing or eliminating direct fossil fuel consumption.
Benefit to the climate and setting an example to other communities of what is possible.
Some energy savings
Better for the environment
Zero
The general idea of being more energy efficient.
There would be a marginal benefit to the environment but without wide geographic support, it would be drop in the bucket at the expense of the local business community.



Increased energy efficiency is a really good thing, but it cannot be so expensive that it makes Louisville too expensive a place to do business.
none
Please don't lump me into the "Non-Environmentalism" category, but the answer is none. I think the current IECC without the additional code considerations will make more of an impact than adding additional modifications because you will have greater compliance.
There is no benefit
Environmental impact / Sustainability
Long term benefits
environmental
Climate
Climate change
If they actually have a positive environmental effect, that's good. But I'm concerned that this is just greenwashing.
Nothing!
Addresses climate change. But there are many options to accomplish this including better site design and addressing urban heat island effects. Why were mature trees removed from former Sam's Club parking lot? Actions like these also affect the energy use of existing buildings.
It will make surrounding cities more attractive for commercial investment. That's a benefit, right?
Commercial building consume large quantities of power - often 24/7. Since they consume large amounts of power, addressing their electricity consumption should have a real benefit from a climate change perspective.
Some kind of offset.
Solar is a good option for everyone to help offset carbon at least in the summer with a/c running via electricity. Won't help alot in the winter.
It'll save our planet and keep our home livable.
Business will just go to other places to setup business.
environment
I wonder if there could be a way to requiring commercial entities greater than a certain size to adopt stricter codes. Offer incentives for smaller sized businesses?
Image/marketing
A cleaner environment and help to balance who has to follow the codes
Same as residential... climate friendly, and -- not including the amortized cost of building to the new codes -- potentially less expensive to operate.

Even more important for longer term commercial buildings - should invest the money upfront for longer term payback.
Adopting new all electric codes would potentially drive out low cost industry and help a more expensive office and high tech client driven workspace. It would force developers to seek a higher paying end user rather than low cost warehouse space tenants that would likely site their operations along the I25 corridor.
We need to make sure businesses are not causing further environmental harm to our community or our world.
None
You are missing the point when you allow large expanses of concrete and asphalt to be installed, when you allow thousands of cars to enter and leave and traverse the community, when you are not limiting the types of emissions a vehicle such as diesel vehicles and not encouraging more electric vehicles, when you allow Xcel energy to limit the amount of solar production and not reimburse anyone who super produces power, when you don't even consider developing a solar farm in our community but rather have thousands of vehicles bringing in pollution and covering up green space with heat producing buildings in parking lots.
Uncertain; need more information
net zero energy should be mandatory
Climate impact reduction
Louisville will finally be taking real steps to address the global climate emergency
Not at this time. Look into the future with your crystal ball and see when we can have "clean electricity production".
Making sure that the upgrades can be achieved through cost savings that the city can bring.
reduction in greenhouse gas emissions
Louisville would feel good when meeting with other local communities.

What HVAC systems, process loads, other appliances, or specific building types do you think would need to be exempted from the commercial code options presented? (The rationale for exemptions could be prohibitively higher cost to operate, infeasible with current energy needs, technology does not exist, etc.)

all retail and industrial uses need to be exempt - maybe office building is a place to start with it occurring over a long timeframe.
Backup storage and generation where technology is emerging.
Where ever there is a trade off in the profit margin that can not be justified by incentives or tax breaks.

All
I think we need to be careful about making exemptions - - with the rate that technology is progressing, it is extremely likely that more accessible paths toward a more stringent commercial code. I don't agree with exempting industrial from the commercial codes in a blanket fashion. Also there needs to be a way to update the requirements as new technology becomes available.
The policy should not be enacted.
Not sure at this point
I don't support the requirement for full electrification for businesses.
Industry specific would be things related to food production. I am sure there are many more industry specific needs for the use of gas.
Tax subsidies, perhaps at the Federal level, to encourage self-sufficiency with solar and newer technologies
This is way too technical a question to pose to residents. Come on.
There should not be exemptions, the law should not have prohibitively higher costs for any resident or business and absolutely should not be based on technology that does not exist.
Heat for industrial processes - no electrical options for some, excessive cost, lower reliability.
I don't know enough about this to offer any informed comment.
We should not adopt this code!
All of them. Let the owner decide.
All should be exempted. Costs in reality are always prohibited. Costs in your studies are always lower than actual. You need to present a realistic costs not just from advocates for net zero.
Backup heat sources for very low temp and emergency backup to electrical heat.
Don't know
Manufacturing, R&D, small business in non-tech sectors
Cooking, industrial uses, backup power.
coffee roasters
ALL of them - this needs to be optional
I don't feel qualified to respond
For new commercial spaces, there should be NO exemptions. All new commercial businesses should adhere to a net zero energy code.
there should be no exemptions based solely on the code affecting the company's profit. that is, if being all electric means their profits are 50% less than if they used gas, that is not a good enough reason for the exemption. i.e., if they are profitable,

but will be more profitable with the exemption, then that would not realize the benefit the code is trying to achieve
Without gas it would be impossible for a restaurant to operate. Electric equipment is nearly double the cost of gas.
the commercial codes are burdensome
Gas fired cooking equipment (restaurants), gas fired boil kettles (breweries), etc. Disallowing the use of natural gas would be infeasible and prohibitively costly to achieve for many small businesses in Louisville.
system requirements that are more stringent than the prevailing local codes in the State of Colorado
I do not support the proposed requirements in any form
Acute healthcare (like new Avista Buildings)
All
Older and historic structures, restaurants and breweries (all use gas appliances).
None, they can afford the requirement changes and should follow the commercial code to the "T". it is not fair to give them exemptions and while we the residents have to suffer.
Are there enough choices in all electric HVAC systems to make this reasonable?
All of the above
Hot water heating, which is currently more difficult through an air-source heat pump due to the larger scale of hot water use in Commercial buildings. Historic Preservation projects should be exempt on some level.
Again, I'd rather see a requirement to build to reduce energy use and emissions to a defined lower level than a requirement to use/not use any particular appliance or technology.
N/A, I am unfamiliar with commercial building codes.
HVAC and water: I think all electric should be used here. Stove: induction has been shown to be a good alternative by chefs, though it takes some getting used to. N/A for other areas. If you leave it to the builder or client to figure out how to be successful, it may not happen. I suggest having some strategies already worked out and available for builders/clients to review/modify.
Not my expertise so cannot say with any kind of knowledge base. I imagine cooking equipment would be one type of equipment. As for HVAC, that can easily be electrified with cold climate heat pump technology.
Frankly, I don't think any building type or industry should be exempt. There are examples all over the world of rec centers, Hospital, manufacturing buildings, restaurants, etc. already using significantly less energy
None



The city should allow enough gas heat to keep vacant buildings from freezing up in the winter.
All of the above.
Need more information
Business that use natural gas as part of their product or services delivered
I don't recommend adopting the codes in the first place.
I don't know how to answer this question.
As with residential, make these code changes optional vs. mandatory
all of them; make it a choice
RTUs, water heaters, stove.
I don't have enough background to make an informed opinion on this.
ALL
I'm not sure I know enough about commercial building sciences to answer this question at the moment.
technology does not exist
all should be exempt
Let's obtain grants to help industry have the MOST efficient and low GHG emission options available to them! This is essential!
I'm not familiar enough with these to comment.
depends on the type of building
Commercial HVAC
Need more info
Restaurants
not sure
New builds and restaurants
Warehouse heaters, processing/production equipment, water heaters.
I think it is premature to adopt this code so exemptions become irrelevant.
High costs.
It is already clear that restaurants can't operate. Any electric heat pump systems are too high of a risk. I have not had any projects that were striving to be close to net zero have their mechanical systems in place for very long because they are such un-tested technology. The waste in removing and disposing those systems when the next generation comes along simply negates any perceived benefit.
Not sure
don't know
Non profits, depends on type of business.
Let us build what we want! Stop controlling us!



All of them. This is all pointless and stupid.
Hospitals would need flexibility.
Furnace
Heating. There is not enough electrical power nor the infrastructure to support the load. It will take 50 years to provide the power and infrastructure to support all electric. Batteries and not here yet so extra solar energy can't be stored for night usage. City should be listening to electrical engineers that understand the real physics of going all electric. I had a hybrid and the batteries were almost gone in 7 years.
ones that make cost prohibitive
Higher operating costs
Don't know enough to weigh in on this.
None - there are biofuel based fireplaces in lieu of gas and with homes becoming substantially more efficient who needs to burn a precious resource for ambience
Obvious potential exemptions for many existing businesses who have insufficient insulation to afford an all electric forced air heating system. Natural gas direct vent heaters are also extremely efficient as 100 percent of the heat from natural gas combustion is forced into the building airspace but at the expense of air quality and worker pulmonary health. Buildings that use DV forced air heaters often run with open rollup doors in wintertime and have almost no insulation in a metal framed and sided warehouse structure.
All electric will significantly increase the cost for doing business in Louisville. Even if all lights are LED, higher insulation requirements, etc.
Do not allow Excel energy to limit solar panel production on any warehouse or building. You're missing the problem you're using the wrong solutions and so many of your standards that you're trying to adopt. You are destroying the community by allowing a super large development for business and commuting. You are making solar intolerable with Exel energy limits and standards. A lot of these standards seem to be a smoke screen for bigger problems and that is what is so upsetting to this business oriented person. Why do you let the big guy destroy our environment and expect all of us small guys to do some minuscule and expensive compensation. The big climate change pollution elephant in the corner is your big Red Tail ridge Project.
Uncertain; need more information
no exemptions, please
None
See above.
None, Exempt them all!

retail, restaurant, industrial, and office. easier to implement on hospitality, event space, big box retail,

ARE THERE ANY CONSIDERATIONS TO ADDRESS EQUITY FOR LOW-INCOME RESIDENTS OR DISPROPORTIONATELY IMPACTED COMMUNITIES THAT THE CITY OF LOUISVILLE SHOULD CONSIDER FOR ANY OF THE THREE COMMERCIAL CODE SCENARIOS CONSIDERED ABOVE?

don't understand the question
Low income housing when residents are faced with rent increases.
Address the issues through small business loans and grants. Provide consulting services to assist with application of the best solution for their business need.
Yeah...don't increase cost and make it even harder to live here or hav a business here
There's a tradeoff between higher building costs now and lower energy costs over time. I don't think we should modify the code to help with affordability. we need to require 30% affordable housing in new builds. that's a better way to take care of this.
Construction prices will increase and low income families will be less likely to live in Louisville.
There needs to be an option in this area
I don't support the requirement for full electrification for businesses.
Apply tiered rates that are low for low-income residents- -these would be offset by higher rates for heavier users of energy (e.g., large homes).
No additional subsidies of politically chosen groups should not be increased due to the additional requirements placed by the City, the City should first exempt them.
Affordable housing needs to include standards for energy efficiency to reduce the level of HVAC needs, plus subsidies, as appropriate
Certainly - when I hear city council talk about affordable housing, but then consider cliff legislation on net zero, the former comes off purely as a political, hollow gesture a la the CAC.
Yes, stop with the elitist environmental laws that hurt low income residents and place unnecessary burden on higher income families by covering those costs through additional fees and taxes.
I imagine there would be
You shouldn't force this on anyone
Providing grants/scholarships for businesses of low-income residents in order for them to comply with new standards and allow them to remain valuable productive members of our community.

Again I don't know.
If we lose all of our businesses the entire tax burden for our community will need to be supported by the remaining residents including the low income residents
No, you should not even be considering this change.
Low income is relative! It's very expensive to live here even if you are middle class
We are being pushed out of our community by all these extra mandates that end up costing me a lot more money. My family is a fourth generation in this community and it's sad to see mandates pushing us out
Yes, allowing for rebates and incentives. Both UPFRONT and post building
City/county needs to build affordable housing following all these environment code
Care for them with full explanation of their long term work and needs. They need to meet our new codes.
Absolutely! Please make decisions that don't hurt people financially.
Yes, lower income demographic always bears the brunt. Subsidies and grants may be an option.
grants, incentives, financing
What low-income residents? The City has long since driven them out of town with prohibitive costs and burdensome regulations.
All of this makes it harder to provide low-income housing. Allow increased density.
If you force me out of business I expect to be compensated. You approved this equipment in 2019
Construction incentives, and awareness of any exemptions that disproportionately impact certain communities
louisville appears fairly uniform with respect to race/economics except for artificial affordable housing occupants
Yes, especially for low to middle income families rebuilding after the fire.
government assistance for people not for companies. not sure if that makes sense, but the government is of the people, by the people, and for the people. any code should more greatly affect / benefit the people before _any_ company's profits. Not saying revenue ... profits.
Equity for low income. What a joke of a question. What low income resident can come to or even live in Louisville at this time?
This may be too off-topic to this code, but make sure that all low-income housing is required to provide recycling AND composting for all residents.
Consideration should be made for any person living, working, or doing business in Louisville as to the feasibility and reality of requiring something that could both cost and impact these people in a very negative way. Consideration should also

be given for the economic impact of these codes and how the city could lessen that impact. Making a code requirement like this may be noble and desirable, but there needs to be a balance.
No - if the city recognizes there is an impact then it should waive that impact for everyone.
No. If you adopt them, everyone should have to pay the cost.
Yes. Provide support for non-profit groups and low-income renters.
A fund to provide onsite/ offsite solar.
Yes, these groups should be considered for all scenarios or it will significantly reduce diversity in an already minimally diverse area.
How to lower the cost of entry for low income residents.
It is in the Xcel rebates for leap, Xcel should provide more options for those who are living low income/impacted communities.
Are you creating a system that automatically needs to be subsidized? How difficult is it to apply and receive subsidies? Will this eliminate or reduce businesses owned by those for whom English is a second language? Are you willing to burden your citizens even more than the current rates?
No. Upfront costs will be paid for in energy savings
Incentivize inclusionary housing projects to reach certain levels of energy efficiency or energy independence with their projects.
I don't know.
Yes, criteria for considering equity and providing the subsidies or exemptions to achieve equity should be built into any ordinance.
N/A, I am unfamiliar with commercial building codes.
Absolutely - I think the only way to address this is through grants or some kind of funding from the city
Again, it is actually easier to make multi family homes more energy efficient than stand along buildings. If anything affordable housing should be held to a higher standard. It has greater long term benefits for the occupants than typical code built structures.
Set and meet these code requirements for everyone. Be sure to confer with these communities for the best solutions to meet their needs. Low-income residents and disproportionately impacted communities should be eligible for city grants to meet this code, we must invest in these communities.
Louisville is virtually uniformly white, so not really relevant
There should be free community solar and subsidized retrofits available for low incomes

The city should hire staff to pretend to care about low income residents. Boulder has used this scam for decades.
Low income residents would have a difficult time living in Louisville because the cost of living here is becoming prohibitive for lower and middle class residents.
Need more information
Don't raise costs for any residents or businesses
I don't recommend adopting the codes in the first place.
Yes, I wonder how all of these changes affect the poor. Are these changes that only the wealthy can handle? Does this make this area even less affordable? How does this affect diversity and equality?
Yes, there should be income-based subsidies rather than exemptions. Poorer communities of color are disproportionately affected by dirty air, water, and other environmental issues, yet we are all part of their cause. We should prioritize community-wide change toward electrification, and support those who cannot afford it with subsidies.
for all residents!
Energy costs will be higher.
Just concerns about cost impacts.
DO NOT negatively impact any of the residents
Yeah, they shouldn't have to pay a dime of it. Tax the rich. :)
Yes, white people need to pay a privileged levy that pays the difference for all new buildings to meet the new codes and not the business themselves.
Only if they are not paying for it.
Yes, low income residents should get the most support. Education, funding, and follow through from local government and industry should center those most impacted. Grants should be centered on supporting these communities FIRST!
Perhaps give them subsidies.
I'm not familiar with good solutions. I recently learned of bonds like https://nlhc.org/resource/field-atlanta-passes-homeless-opportunity-bond and https://ballotpedia.org/California_Proposition_84,_Housing_and_Homeless_Bond_Measure_(1988)
We need to build low-income housing and subsidize energy bill costs for low-income residents.
There should be.
No.
Yes.
The city already doesn't have a balanced budget so to damage the business community - a major revenue source for the city - and then try to come up with

the money to make up for the damage is a downward spiral. The correct approach is to build the business community up first and then look at code updates when the community can absorb them.
No. The CC needs to help the Marshall Fire rebuild victims first before addressing "equity" of commercial builds for low-income residents or disproportionately impacted communities.
You cannot have this conversation and have a conversation about equity and low income at the same time. The only businesses that would choose to move forward under the proposed codes would be doing so by spending extra funds to make a statement. They will not simply absorb those costs. They will be passed along further creating a divide.
Businesses that help people/families shouldn't be scared away by all of these codes
Control control control
How about treating all residents equally instead of trying to foment class warfare?
There should be incentives or grants for low income citizens and public facilities primarily servicing low income citizens.
Low income can't afford to build in Louisville so no it is not needed
Generally low income residents are exposed to more pollution because they live in lower income areas, closer to higher commercial pollutants. Requiring new commercial construction to do better and be better, should arguably improve the health and quality of life for those living in low income areas. In fact, it'll eventually be better for all of us.
Why have anyone paying the high costs?
No specifics, but I do think there should be considerations for these type of residents.
Would like incentives for prior home owners/businesses especially if new construction is getting
I do not understand the question
Yes. We need to make some accommodations to allow for affordable housing. One of the key attributes Louisville had going for it was its focus on community (for lack of a better word). I wonder how much this counts any more as I look at some of the decisions/rules/requirements coming out of the Louisville City Council.
Build government sponsored low income housing
How many low income qualifying businesses operate within Louisville City limits. Can the be expempted if their numbers are very low?
Equity should be top of mind. Ideally, grants would be available rather than exceptions to the code.

Low income would be impacted the most by the increased costs for all electric homes.
Exchanging homes into LED lights is a significant savings at minimal cost. No diesel vehicles be allowed in the community. You must allow natural gas options for heating. Electric heating and clothes drying can be exorbitantly more expensive. Quit preserving historic outmoded homes as if they are some kind of sacred cow. We must stop having to preserve old miners shacks and kit homes for some kind of aesthetic. Allow new and more efficient structures to replace them. Encourage all warehouse structures and residences to produce all the solar power that they want to contribute without penalties and without limits into our grid. If you don't limit what larger building surfaces can produce you'll have plenty of extra energy to help out with programs to contribute to disadvantaged or low income homes. Community Solar Farm. Whether affluent or financially struggling it is horrible to mandate more appliances such as heat pumps and electric furnaces and electric heating elements in a home where Xcel energy also has the ability to limit how much solar is produced per unit of residential and commercial space. Shame on you for your plans and financial obligations to buy these electric utilities for our homes and businesses when you allow the electricity company to maintain high prices and not reward those who can super produce more electricity. You are allowing Xcel energy to torture us and some of us are not dumb enough to fall for it.
Uncertain; need more information
all people benefit from all-renewable, net zero codes
Some short term break should be given up front.
Yes. I don't have enough info to comment in specifics, but the City should always consider low-income/disproportionately impacted communities in everything it does. That's part of being an inclusive and equitable community.
Don't impose any more silly restrictions upon any of us at this time. It makes no sense. Encourage a 10-20% reduction and incentives but don't impoverish anyone for a silly goal of all-electric before everyone can afford it. Remember that you're trying to be inclusive. On the other hand I do not entirely approve of incentives- which is only another word for taking tax dollars from some to give to others. That has to be done carefully for deserving people who can prove they need help which I do support.
Dont adopt them and low income residents will be able to live in Louisville.
The effects of climate change already impact such communities more severely, providing further motivation for the adoption of stronger building codes.

If you make residential and commercial properties more expensive to build, you are going to continue to push lower income residents and business' out of Louisville.

WHAT'S THE MOST IMPORTANT CONSIDERATION FOR THE CITY IN ADOPTING STRICTER ENERGY CODES FOR RESIDENTIAL AND COMMERCIAL CONSTRUCTION? ('OTHER' ANSWERS)

Be aware of the cost and burden this places on residents and the assumption that these costly requirements and rules have no proof to help alter any human impact on the environment

Energy codes for construction are a violation the property rights of residential and commercial property owners. Regulations take away the ability of the property owner to use their property as they see fit and decrease the value. Each individual is in the best position to decide how to best built their property to suit their needs.

City cannot be unreasonable with building code demands. Turning into Boulder will drive away residents like me.

We almost had to move our 42 year old business out of Louisville because of costs. With Boulder, Broomfield and now Erie pulling the larger businesses away from Louisville we should be a safe haven for small businesses and need to be careful policies do not price them/us out of 80027.

The city should not adopt stricter energy requirements we are already losing businesses and can not afford to lose more

Affordability impact on culture, making it affordable for mid - class and fixed income households

This isn't important at all

I disagree with stricter energy codes

HONESTLY balancing the need to address energy efficiency and promote economic development.

how about making this optional!

should not be mandated if has no meaningful impact on climate and is impractical for multiple reasons

I don't think they should

Stricter codes well hurt economic development

reasonable cost benefit analysis

I don't believe the city should make stricter codes at this time

Cost to residents and building owners

You ignore residential costs. Balance climate change with reasonable costs to business and residential owners and renters.

Don't enforce any of these.



all of above. also City of Louisville should provide electric bike rebates Denver is beating us to the punch and they are effective and ahead of us. we need to step up our game
Research from various sources, don't just go with the trend. What are the long-term costs from creation to post-use of materials? What is the true gain of efficiency? The difference between the 2018 and 2021 codes are not gigantic, yet the cost differences are huge.
Cost/benefit analysis
Priceing out people who are not "true believers."
Stop making it astronomically impossible for our children to live here!!!!
none of the above; sensible and based on citizens' affordability and needs
NOT imposing extra costs on the homeowners
COST
Less government interference with construction.
Impact on economic development and growth
1) Addressing climate change while promoting economic development is a prime concerns. 2) However, many people will not be able to afford the upgrades!!!! While my husband and I are able to afford them, the installation of solar panels, for instance, is tricky given the amount of hail storms we have here in Louisville wherein the solar panels break. It takes an extremely long time to get them replaced. The hail storm of 2018 was a prime example wherein pretty much everyone in Louisville had to replace their roofs. Those with solar panels waited as long as a year to have them replaced. How much product will be available given the decrease of a plethora of products due to the Covid-19 pandemic?
Businesses and residences need to recover from a massive fire and a possible redesign. We do not need to spend money on unsustainable programs. Louisville residents need to recover and rebuild before we go green unnecessarily.
The city council implemented building codes to conform to their political agenda. They "thought they would have time to figure it out".
Does it actually support your goals
Codes should not be stricter. The city will be making it more difficult to afford updating homes or building new
Diversity of residents, can't price some people out with this
There is no climate emergency, it's all about control! I should be able to have what I want in my house, not what the government says I should have! Are you going to pay my bills?
Why don't you stop imposing stupid regulations that make the city a less affordable and less desirable place to live?

I do not support all electric. Doesn't it still require coal or some other gas emitting resources to create electricity? Xcel will only allow so electricity for solar panels. Electric heat is not as warm or affordable as gas.

The economic development and climate change issues *do* need to be balanced in order for fixes to the climate emergency to work, which means that both the climate emergency and economic development must be number 1 priorities.

High cost of electricity and infrastructure to provided power, unlike CA with rolling blackouts.

Traffic congestion and smog. Bad air quality days.

I'm all for all-electric but it is not feasible at this time. We can barely produce or afford it. The grid is not adequate for the additional load and the price is going to increase, not decrease - am I correct?

costs are ultimately passed onto users of the building. if its too difficult/expensive in louisville, they will go to erie, longmont, lafayette, etc. it will only hurt Louisville is they do not maintain competitiveness with the nearby communities.

Appendix B: Survey Questions

Demographic Questions:

- 1) Name & email
- 2) Would you like to be updated by email on the energy code development process?
 - a) Yes
 - b) No
- 3) Which of the following best describes you (check all that apply)? (*optional*)
 - a) Asian or Pacific Islander
 - b) Black or African American
 - c) Hispanic or Latino
 - d) Native American or Alaskan Native
 - e) Native Hawaiian or Other Pacific Islander
 - f) White
 - g) Multiracial or Biracial
 - h) A race/ethnicity not listed here (write-in)
- 4) What sector do you primarily represent (select one):
 - a) Building owner
 - b) Building Developer
 - c) Business owner/manager
 - d) Tradesperson (electrician, plumber, etc.)
 - e) Energy efficiency expert
 - f) Energy or facility manager
 - g) Engineer, Architect or Designer
 - h) General Contractor

- i) Affordable Housing representative
 - j) Residential tenant or occupant
 - k) Home owner
 - l) Other Business (Write-in)
- 5) Are you currently operating a business or considering owning/operating a business within the City of Louisville?
- a) Already owns or operates in a business located in Louisville.
 - b) Already owns or operates in a business that conducts business in Louisville but is not located in the City.
 - c) Considering starting or expanding a business in Louisville.
 - d) No I am not.
- 6) Do you work within the City of Louisville?
- a) Yes
 - b) No
- 7) Do you live within the City of Louisville?
- a) Yes
 - b) No
- 8) How would you rate your knowledge/understanding of the City of Louisville's current energy code?
- a) (Scale 1-10)

Group 1: Building Owner / Building Developer

Note: For all open-response questions, if you don't know or do not have feedback, please write -in NA.

Page 1 Group 1

- 9) Does your company have sustainability or climate related goals?
- a) Yes, we have a sustainability plan/program and goals.



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- b) Yes, we have started small efforts to be more sustainable but no official plan/program or goals.
 - c) No, we've discussed internally but don't have climate or sustainability goals, plans, or programs.
 - d) No, we don't have climate or sustainability goals, plans or programs.
- 10) If so, please provide a high-level overview of your sustainability/climate related goals, plans, or programs.
- a) [open-ended / optional]
- 11) Are you planning any major building or tenant space retrofits within the next 1-3 years?
- a) Yes.
 - b) Yes after 3+ years.
 - c) No.
- 12) Do you have plans to build or acquire new property(ies) within the City of Louisville in the next 1-3 years?
- a) Yes.
 - b) Yes after 3+ years.
 - c) No.
- 13) What are your main considerations when operating and/or working in Louisville?
(check all that apply)
- a) Cost of doing business
 - b) Comfort
 - c) Environmental impact / Sustainability
 - d) Culture/community
 - e) Rules/regulations
 - f) Other (write-in)

- 14) How would you rate your experience installing/maintaining heat-pumps and other efficient all-electric HVAC systems?
 - a) [scale 1-10]
- 15) Do any of your current buildings or tenant spaces utilize heat-pumps or other efficient all-electric HVAC systems?
 - a) Yes, more than one.
 - b) Yes, just one.
 - c) No.
- 16) How often do you currently design/build/install all-electric HVAC systems in new construction projects?
 - a) Never.
 - b) Minority of projects.
 - c) Approximately half of all projects.
 - d) Majority of the projects.
- 17) What's the most important consideration for the City in adopting stricter energy codes for residential and commercial construction?
 - a) The climate emergency.
 - b) Economic development.
 - c) Balancing the need to address climate change and promote economic development.
 - d) Other [write-in].

Group 1 Page 2

Intro:

Current Energy Code:

The City of Louisville has adopted the 2021 IECC, as well as additional amendments requiring further energy savings and all-electric construction items:



Commercial New Construction

- Increased insulation levels
- Increased fenestration efficiency requirements
- Increased HVAC efficiency
- Electric vehicle charging and infrastructure
- Electric-ready wherever gas appliances are installed
- Solar-ready zone required

Residential New Construction

- Increased insulation levels
- Increased ductwork and piping insulation requirements
- Mandatory heat recovery
- Electric vehicle charging and infrastructure
- Electric-ready wherever gas appliances are installed
- Net zero Appendix RC required

Commercial Code Scenarios for Consideration:

The City of Louisville is considering updates to the commercial energy code to improve the environmental and operational performance of new commercial buildings. These updates could include, but are not limited to, all-electric new construction, stricter efficiency requirements, energy offset requirements using solar, or net zero requirements, such as those found in Appendix CC of the current IECC 2021 code.

Residential Code Scenarios for Consideration:

For residential energy code adoption, Louisville has already adopted Appendix RC as a mandatory measure for all new construction buildings. The Appendix RC requires new single-family residential homes to meet a specific energy efficiency criteria and offset their energy use with onsite or offsite solar. Future residential code scenarios could include all-electric construction requirements.

Note, for all open response questions, if you don't know or do not have feedback, please write in NA.

Questions Page 2 Group 1

18) How do you perceive the new considerations for energy code would impact your ability to develop/design/build housing affordably in the City of Louisville?

a) [open ended]



- 19) How do you perceive the new considerations for energy code would impact your ability to develop/design/build commercial buildings in the City of Louisville?
- a) [open ended]
- 20) Do you need/want training on the current energy code?
- a) Yes
- b) No
- 21) Would you need/want training on the proposed codes/policies if enacted?
- a) Yes
- b) No
- 22) What data or information do you need to better understand the potential impacts of energy code options on your business and operations?
- a) [open-ended]
- 23) Would you prefer energy code requirements that:
- a) Set an energy consumption performance target and allow for flexibility in how a building meets that requirement which can include onsite PV if needed to meet the performance target. (Performance approach).
- b) Set an energy consumption performance target that specifies an efficiency standards for equipment that must be met and requires mandatory solar on all new buildings. (Performance + prescriptive approach).
- 24) How much flexibility in building design would you prefer to achieve code/policy requirements?
- a) The more flexibility the better.
- b) Some flexibility but some clear expectations/rules.
- c) Set prescriptive standards (equipment efficiency, envelope requirements, mandatory solar, etc).
- 25) Would you be willing to pay more upfront for all-electric new construction with onsite solar if the payback was longer in order to reduce the carbon/environmental impact of the building?

- a) Not willing
 - b) Somewhat not willing
 - c) Undecided
 - d) Somewhat willing
 - e) Willing
- 26) What is the payback time frame that you would be comfortable with, for additional upfront costs that support carbon reduction, all-electric, or net zero construction?
- a) 0-5 years
 - b) 5-10 years
 - c) 10-20 years
 - d) 20-30 years
 - e) 30+ years
 - f) I am not interested in increasing upfront construction costs for carbon reduction.
- 27) What payback period would be your minimum threshold to consider solar onsite for a mixed-fuel building if it represented a higher up-front cost?
- a) 0-5 years
 - b) 5-10 years
 - c) 10-20 years
 - d) 20-30 years
 - e) 30+ years
 - f) I am not interested in increasing upfront construction costs for solar.
- 28) What payback period would be your minimum threshold to consider solar onsite for an all-electric building if it represented a higher up-front cost?
- a) 0-5 years

- b) 5-10 years
 - c) 10-20 years
 - d) 20-30 years
 - e) 30+ years
 - f) I am not interested in increasing upfront construction costs for solar.
- 29) The City has in place the IECC 2021 code along with some efficiency strengthening amendments. How supportive would you be of including a minimum energy offset requirement in addition to the 2021 code, which would require on-site or off-site solar?
- a) I do not support this code option.
 - b) I am neutral on this code option.
 - c) I support the adoption of this code option.
 - d) I need more information.
- 30) How supportive would you be if the City were to consider an all-electric requirement for new commercial construction code if industrial processes were exempt?
- a) I do not support this code option.
 - b) I am neutral on this code option.
 - c) I support the adoption of this code option.
 - d) I need more information.
- 31) How supportive would you be if the City were to consider an energy code that required a 20% reduction in energy use from the 2021 energy code for commercial construction?
- a) I do not support this code option.
 - b) I am neutral on this code option.
 - c) I support the adoption of this code option.
 - d) I need more information.

32) How supportive would you be if the City were to consider a commercial energy code that required net zero energy through efficiency and onsite/off-site renewable energy?

- a) I do not support this code option.
- b) I am neutral on this code option.
- c) I support the adoption of this code option.
- d) I need more information.

33) What is your biggest concern or perceived barrier to the commercial code considerations presented?

- a) [open-ended question]

34) In your opinion, what is the biggest benefit to the commercial code considerations presented?

- a) [open-ended question / optional]

35) What HVAC systems, process loads, other appliances, or specific building types do you think would need to be exempted from the commercial code options presented? (The rationale for exemptions could be prohibitively higher cost to operate, infeasible with current energy needs, technology does not exist, etc.)

- a) [open-ended question / optional]

36) Are there any considerations to address equity for low-income residents or disproportionately impacted communities that the City of Louisville should consider for any of the three commercial code scenarios considered above?

- a) [open-ended question / optional]

37) If the City provides incentives for energy efficiency or electrification upgrades, would you be more likely to support this code adoption?

- a) I already support this code option.
- b) Not likely to change my support.
- c) Somewhat likely to change my support.

- d) Yes, it would change my support.

Group 2: Business Owner, Tradesperson (electrician, plumber, etc), Energy Efficiency Expert, Energy or Facility Manager, Engineer, Architect, Designer, General Contractor and Other Business.

Group 2 Page 1

Note, for all open response questions, if you don't know or do not have feedback, please write in NA.

- 38) Does your business rent or own your office/workplace in the City of Louisville?
- a) Rent.
 - b) Own.
 - c) Don't have an office/workplace in the City of Louisville.
- 39) Does your company have sustainability or climate related goals?
- a) Yes, we have a sustainability plan/program and goals.
 - b) Yes, we have started small efforts to be more sustainable but no official plan/program or goals.
 - c) No, we've discussed internally but don't have climate or sustainability goals, plans, or programs.
 - d) No, we don't have climate or sustainability goals, plans or programs.
- 40) If so, please provide a high-level overview of your sustainability/climate related goals, plans, or programs.
- a) [open-ended]
- 41) Do you have plans to build new or retrofit existing office space within the City of Louisville in the next 1-3 years?
- a) Yes
 - b) Yes after 3+ years
 - c) No

- 42) What payback period would be your minimum threshold to consider solar onsite for your business?
- a) 0-5 years
 - b) 5-10 years
 - c) 10-20 years
 - d) 20-30 years
 - e) 30+ years
 - f) I am not interested in solar for my business.
 - g) I already have solar onsite for my business.
- 43) What are your main considerations when operating and/or working in Louisville? (check all that apply)
- a) Cost
 - b) Comfort
 - c) Environmental impact / Sustainability
 - d) Culture/community
 - e) Rules/regulations
 - f) Other (write-in)
- 44) How would you rate your experience designing/building/installing heat-pumps and other efficient all-electric HVAC systems?
- a) [scale 1-10 or Not Applicable]
- 45) What's the most important consideration for the City in adopting stricter energy codes for residential and commercial construction?
- a) The climate emergency.
 - b) Economic development.
 - c) Balancing the need to address climate change and promote economic development.

d) Other [write-in].

Group 2 Page 2

Intro:

Current Energy Code:

The City of Louisville has adopted the 2021 IECC, as well as additional amendments requiring further energy savings and all-electric construction items:

Commercial New Construction

- Increased insulation levels
- Increased fenestration efficiency requirements
- Increased HVAC efficiency
- Electric vehicle charging and infrastructure
- Electric-ready wherever gas appliances are installed
- Solar-ready zone required

Residential New Construction

- Increased insulation levels
- Increased ductwork and piping insulation requirements
- Mandatory heat recovery
- Electric vehicle charging and infrastructure
- Electric-ready wherever gas appliances are installed
- Net zero Appendix RC required

Commercial Code Scenarios for Consideration:

The City of Louisville is considering updates to the commercial energy code to improve the environmental and operational performance of new commercial buildings. These updates could include, but are not limited to, all-electric new construction, stricter efficiency requirements, energy offset requirements using solar, or net zero requirements, such as those found in Appendix CC of the current IECC 2021 code.

Residential Code Scenarios for Consideration:

For residential energy code adoption, Louisville has already adopted Appendix RC as a mandatory measure for all new construction buildings. The Appendix RC requires new single-family residential homes to meet a specific energy efficiency criteria and offset their energy use with onsite or offsite solar. Future residential code scenarios could include all-electric construction requirements.

Note, for all open response questions, if you don't know or do not have feedback, please write in NA.

Questions Page 2 Group 2:

- 46) How do you perceive the new considerations for energy code would impact your ability to maintain or expand your current business in the City of Louisville?
- a) [open ended]
- 47) Do you need/want training on the current energy code?
- a) Yes
- b) No
- 48) Would you need/want training on the proposed codes/policies if enacted?
- a) Yes
- b) No
- 49) What data or information do you need to better understand the potential impacts of energy code options on your business and operations?
- a) [open-ended]
- 50) The City has in place the IECC 2021 code along with some efficiency strengthening amendments. How supportive would you be of including a minimum energy offset requirement in addition to the 2021 code, which would require on-site or off-site solar?
- a) I do not support this code option.
- b) I am neutral on this code option.
- c) I support the adoption of this code option.
- d) I need more information.
- 51) How supportive would you be if the City were to consider an all-electric requirement for new commercial construction code if industrial processes were exempt?



- a) I do not support this code option.
 - b) I am neutral on this code option.
 - c) I support the adoption of this code option.
 - d) I need more information.
- 52) How supportive would you be if the City were to consider an energy code that required a 20% reduction in energy use from the 2021 energy code for commercial construction?
- a) I do not support this code option.
 - b) I am neutral on this code option.
 - c) I support the adoption of this code option.
 - d) I need more information.
- 53) How supportive would you be if the City were to consider a commercial energy code that required net zero energy through efficiency and onsite/off-site renewable energy?
- a) I do not support this code option.
 - b) I am neutral on this code option.
 - c) I support the adoption of this code option.
 - d) I need more information.
- 54) What is your biggest concern or perceived barrier to the commercial code considerations presented?
- a) [open-ended question]
- 55) In your opinion, what is the biggest benefit to the commercial code considerations presented?
- a) [open-ended question / optional]
- 56) What HVAC systems, process loads, other appliances, or specific building types do you think would need to be exempted from the commercial code options presented? (The rationale for exemptions could be prohibitively higher



cost to operate, infeasible with current energy needs, technology does not exist, etc.)

a) [open-ended question / optional]

57) Are there any considerations to address equity for low-income residents or disproportionately impacted communities that the City of Louisville should consider for any of the three commercial code scenarios considered above?

a) [open-ended question / optional]

58) If the City provides incentives for energy efficiency or electrification upgrades, would you be more likely to support this code adoption?

a) I already support this code option.

b) Not likely to change my support.

c) Somewhat likely to change my support.

d) Yes, it would change my support.

Group 3: Residential Section

Group 3, Page 1

Intro:

Current Energy Code:

The City of Louisville has adopted the 2021 IECC, as well as additional amendments requiring further energy savings and all-electric construction items:

Commercial New Construction

- Increased insulation levels
- Increased fenestration efficiency requirements
- Increased HVAC efficiency
- Electric vehicle charging and infrastructure

Residential New Construction

- Increased insulation levels
- Increased ductwork and piping insulation requirements
- Mandatory heat recovery
- Electric vehicle charging and infrastructure

- Electric-ready wherever gas appliances are installed
- Solar-ready zone required
- Electric-ready wherever gas appliances are installed
- Net zero Appendix RC required

Commercial Code Scenarios for Consideration:

The City of Louisville is considering updates to the commercial energy code to improve the environmental and operational performance of new commercial buildings. These updates could include, but are not limited to, all-electric new construction, stricter efficiency requirements, energy offset requirements using solar, or net zero requirements, such as those found in Appendix CC of the current IECC 2021 code.

Residential Code Scenarios for Consideration:

For residential energy code adoption, Louisville has already adopted Appendix RC as a mandatory measure for all new construction buildings. The Appendix RC requires new single-family residential homes to meet a specific energy efficiency criteria and offset their energy use with onsite or offsite solar. Future residential code scenarios could include all-electric construction requirements.

Note, for all open response questions, if you don't know or do not have feedback, please write in NA.

Page 1 Group 3 Questions:

59) What are your main considerations for choosing to live in Louisville? (check all that apply)

- a) Cost
- b) Comfort
- c) Environmental impact / Sustainability
- d) Culture/community
- e) Rules/regulations
- f) Other (write-in)

60) Outside the Marshall Fire rebuild efforts, do you plan to build a new home or undergo a major retrofit on your home in the next 1-3 years

- a) Yes
- b) No
- c) My home is part of the Marshall Fire rebuild effort.

61) Do you currently live in an all-electric and/or net zero home OR have you taken steps to start to electrify your home?

- a) Yes, I live in an all-electric home.
- b) Yes, I live in a net-zero home.
- c) Yes, I am working on electrifying my home.
- d) Yes, I am working on making my home net zero energy.
- e) No.

62) Do you currently have solar installed on your home?

- a) Yes.
- b) No.

63) What's the most important consideration for the City in adopting stricter energy codes for residential and commercial construction?

- a) The climate emergency.
- b) Economic development.
- c) Balancing the need to address climate change and promote economic development.
- d) Other [write-in].

The City has adopted the Zero Energy Appendix (Appendix RC) for all new single-family home construction:

64) Do you have a clear understanding of the City of Louisville's current residential new construction code requirements?

- a) [Sliding scale 1-5]



- 65) How do you perceive that Louisville's residential building code standards impact affordability of housing in the City?
- a) Positively impact housing by reducing energy costs for residents and tenants.
 - b) Negatively impact housing by increasing upfront costs.
 - c) I don't see there being an impact.
 - d) Other [write-in].
- 66) What is your biggest concern or perceived barrier to building new homes to the Zero Energy Appendix?
- a) [open-ended question]
- 67) In your opinion, what is the biggest benefit to building new homes to the Zero Energy Appendix?
- a) [open-ended question / optional]
- 68) If the City were to consider an all-electric requirement for new single-family home construction:
- 69) What is your biggest concern or perceived barrier to building all-electric new homes?
- a) [open-ended question]
- 70) In your opinion, what is the biggest benefit to building all-electric new homes?
- a) [open-ended question / optional]
- 71) Should there be an exemption or flexibility granted for certain community members to allow them to build with natural gas?
- a) [open-ended question / optional]
- 72) If the City provides incentives for electrification, would you be more likely to support an all-electric code requirement for new single-family home construction?
- a) I already support this code option.
 - b) Not likely to change my support.

- c) Somewhat likely to change my support.
- d) Yes, it would change my support.

Optional Commercial Code Questions for Group 3:

The City of Louisville is considering updates to the commercial energy code to improve the environmental and operational performance of new commercial buildings. These updates could include, but are not limited to, all-electric new construction, stricter efficiency requirements, energy offset requirements using solar, or net zero requirements, such as those found in Appendix CC of the current IECC 2021 code.

73) The City has in place the IECC 2021 code along with some efficiency strengthening amendments. How supportive would you be of including a minimum energy offset requirement in addition to the 2021 code, which would require on-site or off-site solar?

- a) I do not support this code option.
- b) I am neutral on this code option.
- c) I support the adoption of this code option.
- d) I need more information.

74) How supportive would you be if the City were to consider an all-electric requirement for new commercial construction code if industrial processes were exempt?

- a) I do not support this code option.
- b) I am neutral on this code option.
- c) I support the adoption of this code option.
- d) I need more information.

75) How supportive would you be if the City were to consider an energy code that required a 20% reduction in energy use from the 2021 energy code for commercial construction?

- a) I do not support this code option.
- b) I am neutral on this code option.

c) I support the adoption of this code option.

d) I need more information.

76) How supportive would you be if the City were to consider a commercial energy code that required net zero energy through efficiency and onsite/off-site renewable energy?

a) I do not support this code option.

b) I am neutral on this code option.

c) I support the adoption of this code option.

d) I need more information.

77) What is your biggest concern or perceived barrier to the commercial code considerations presented?

a) [open-ended question]

78) In your opinion, what is the biggest benefit to the commercial code considerations presented?

a) [open-ended question / optional]

79) What HVAC systems, process loads, other appliances, or specific building types do you think would need to be exempted from the commercial code options presented? (The rationale for exemptions could be prohibitively higher cost to operate, infeasible with current energy needs, technology does not exist, etc.)

a) [open-ended question / optional]

80) Are there any considerations to address equity for low-income residents or disproportionately impacted communities that the City of Louisville should consider for any of the three commercial code scenarios considered above?

a) [open-ended question / optional]

81) If the City provides incentives for energy efficiency or electrification upgrades, would you be more likely to support this code adoption?

a) I already support this code option.

b) Not likely to change my support.

- c) Somewhat likely to change my support.
- d) Yes, it would change my support.

2021 International Energy Conservation Code



About I-Codes: Building codes improve the quality of construction of the built environment and thereby promote the health, safety, resiliency, affordability, sustainability, and general welfare of our communities. Building codes set a bare minimum construction quality that local officials deem necessary and that consumers expect. Most jurisdictions across the country adopt model building codes published by the International Code Council, and these are updated every three years in an extensive process involving builders, trades, architects, manufacturers and suppliers, low-income advocates, and, crucially, local building officials who are ultimately responsible for enforcing the codes. These codes are then adopted at local level. The 2021 codes are the most recent edition.

About the 2021 International Energy Conservation Code (IECC): After two previous cycles of stagnant efficiency, building officials voted overwhelmingly in favor of provisions in the latest IECC to strengthen energy efficiency. Overall, the 2021 IECC reduces energy by 8-9% (and reduces energy bills by 8-9%) compared to the previous 2018 IECC. The 2021 also includes language clean-up and clarifications, and an expanded focus on flexibility and options. Most of the changes "tighten up" provisions already in the code. Key changes for residential new construction include a better "thermal envelope" (e.g. walls, insulation, windows, doors, etc.), windows that take into account "solar heat gain" in climate zone 5B (the climate zone for the front range of Colorado), changes to duct testing, and increased use of lighting controls. On the commercial side, key changes include air barrier commissioning (i.e. testing and verification of the layer in walls that keeps outside air out and clean, conditioned inside air in), more efficient mechanical systems, technology for energy monitoring in larger buildings so that building operators can better measure and track their building's energy use, and increased options for additional energy efficiency "points."

Jurisdictions with the 2021 IECC: Arapahoe County, Aurora, Fort Collins, Larimer County, Longmont, Louisville, Parker, Superior, and Vail. At least 39 other jurisdictions covering 49% of Colorado's population have announced plans to adopt the 2021 IECC within the next year.

New Colorado Law (2022): The Colorado legislature passed a new bipartisan law that updates minimum energy code requirements. Jurisdictions must adopt at least the 2021 IECC, along with EV-ready, PV-ready, and electric-ready, when updating any other building codes between July 1, 2023 and July 1, 2026. After that date, jurisdictions must adopt at least a low-energy and carbon code. A new Energy Code Board will identify code language for the EV-ready, PV-ready, electric-ready, and low energy and carbon code, and jurisdictions can choose to adopt that code language, something equivalent, or something stronger.

Cost Discussion: An extensive [analysis](#) from the Pacific Northwest National Labs (PNNL, the entity charged by the U.S. Congress to perform energy code cost-effectiveness studies) calculates that the increased first cost per household is \$3,376 for the 2021 IECC versus the 2015 IECC in Climate Zone 5B (as of Dec. 2021). PNNL's analysis is considered the most credible compared to other estimates because of PNNL's long-standing peer-reviewed methodology, and its absence of profit motive or conflict of interest. The majority of the first cost increase compared to the 2015 IECC is an increase in insulation levels. (Cost data is roughly similar between the 2015 and 2018 IECC, since the efficiency levels were similar.)

- Note: Applying a 19% inflation/supply chain adder as recommended by the National Association of Home Builders, and slightly increasing the size of the average house to better represent our region, yields an increased first cost of \$5,118, per PNNL. Also, natural gas prices for residential customers in Colorado have nearly doubled since the study, which would improve the energy cost savings as compared to the original report.

Increased First Cost (vs 2015)	Mortgage Increase	Annual Energy Savings	Net Savings	Years to Positive Savings	Lifecycle Cost Savings
\$3,376	\$122	\$161	\$20/yr	9	\$1,247

Mild/Medium/Aggressive Rating: Mild. The 2021 IECC is the minimum energy code required by the state of Colorado and even before the state law, jurisdictions covering half of Colorado's population had already announced plans to adopt it. As such, "mild" also includes EV-ready, PV-ready, and electric-ready as required by Colorado law. A "medium" rating would include a higher degree of electric transition – for instance, allowing a choice of either all-electric or mixed fuel new construction but requiring mixed fuel homes and buildings to pursue additional energy efficiency to make up for the extra emissions from fossil gas use onsite. An "aggressive" rating would include either all-electric requirements, the zero energy appendices, or both.

Notes on Cost Studies:

- In a memo to Marshall fire households, the Home Builders Association. of Metro Denver estimated \$100,000 in additional upfront costs for 2021 IECC, then scaled back to \$11,000 at the state legislature in April 2022 based on a [study](#) from Home Innovation Research Labs for National Association of Home Builders.
- Another [study](#) from ICF International showed HIRL/NAHB's \$11,000 estimate used incorrect economic assumptions, and determined that the estimates in PNNL's [study](#) are more accurate.
- A City of Louisville survey of two builders estimated \$6,450 in additional first cost for the 2021 IECC vs Louisville's amended 2018 IECC (for a slightly larger house size).
- Natural gas prices were \$6.06/thousand cubic feet in PNNL's analysis, versus \$11.93 as of April 2022, [per EIA](#).

Prepared For: DOLA Code Cohort for Northwestern Metro / Boulder County

Date Updated: July 19, 2022



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Solar-Ready



About: Solar-Ready appendices (RB for residential and CB for commercial) are officially prepared by the International Code Council as “add-on” to the IECC. They prepare homes and buildings for the future installation of solar by requiring conduit, space on the electrical panel, space reserved on the roof free from obstructions and shady objects, adequate roof structural capacity, notation on construction documentation, and a permanent certificate. Shady roofs are exempted. The current appendices only include multifamily buildings 4-5 stories tall, so an amendment is needed to include all multifamily buildings – a provision we call “expanded solar-ready”.

Cost Discussion: Upfront costs are minimal (<\$200). Cost savings include avoiding the need to tear up walls, redo wiring, and potentially upgrade an electrical panel. They also avoid the situation where roof penetrations for attic vents, etc. are poorly placed in a way that prevents future solar.

Jurisdictions with Solar-Ready: Avon, Boulder, Boulder County, Breckenridge,* Craig, Denver, Fort Collins, Frisco,* Golden, Lafayette, Louisville, Superior, Vail, and Wheat Ridge. Others considering or in the process of adopting it, besides Code Cohort communities, include Eagle County (*via Summit County sustainability program). Note: a new 2022 Colorado law requires all upcoming IECC adoptions to include solar-ready provisions equivalent to or better than a version to be identified by the state’s Energy Code Board. We highly anticipate Appendices RB and CB with the multifamily fix will meet the law.

Mild/Medium/Aggressive Rating: Mild. A “medium” rating would require solar to actually be installed on some buildings for part of the energy load, plus a residential solar access law. An “aggressive” rating would require solar installed on all buildings for all of the energy load, a residential solar access law, and a retrofit policy.

Prepared For: DOLA Code Cohort for Northwestern Metro / Boulder County

Date Updated: July 7, 2022



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EV-Ready



About: Electric Vehicle Ready (EV-Ready) appendices prepare homes and buildings for the current transition to electric vehicles. These appendices recognize that the vast majority of all electric vehicle charging will occur at home, with some charging infrastructure needed at work or around town. New single family homes will require one EV-ready space, and new multifamily and commercial buildings will require a percentage of EV-capable, EV-ready, and EV-installed spaces depending on the building type and use.

- Note: EV-ready is especially important for multifamily buildings, for equity reasons, since renters can't retrofit their parking lot or garage to install a 240-volt outlet on their own.

These percentages align with levels recently approved by Denver's code committee, and are less than the percentages adopted in some other jurisdictions (Superior, for instance). Multifamily percentages were reduced to ease the cost impact to new housing, and commercial building percentages were reduced to account for charging behavior based on building type.

1. "EV-Capable" parking space Electrical panel capacity + branch circuit + raceway				
2. "EV-Ready" parking space EV-Capable + 240-volt outlet				
3. "EVSE-Installed" parking space Install a minimum number of Level 2 charging stations				
Building Type	Minimum EV Installed Spaces	Minimum EV Ready Spaces	Minimum EV Capable Spaces	
Single-family Duplex, Townhome	N/A	1 Space	N/A	
Group A, B, E, M	10%	5%	10%	
Group F, I, R-3, R-4	2%	0%	5%	
Group R-1 and R-2 ^a	15%	5%	40%	
Group S-2 Parking Garages	10%	5%	0%	

a. Where all (100%) parking serving R-2 occupancies are EV ready spaces, requirements for EVSE spaces for R-2 occupancies shall not apply.

(In I-code terminology, Group A is Assembly, B is Business, E is Education, F is Factory & Industrial, I is Institutional, M is Mercantile, R-1 is transient residential, R-2 is apartments and other non-transient residential, R-3 and R-4 are small group homes including halfway houses, rehab centers, care facilities, etc., and S is Storage.)

Market Discussion: EVs comprised 9% of new vehicle sales in Colorado in Q1 2022, and dealers continue to have long waitlists, especially with the recent rises in gas prices. All major auto brands have announced plans to shift the majority of their fleets to EVs by the mid-2030s or sooner. Newer models have ranges of well over 300 miles. Besides the reduced environmental impact, buyers like the faster acceleration, the low maintenance, the safety ratings, and the convenience of avoiding trips to the gas station.

Cost Discussion: One EV-ready space for a single-family home averages about \$325-\$400 at the time of construction. Federal and Xcel Energy rebates are available. Retrofitting even just the wiring later can run \$481-\$1,493 per space (depending on the distance from the panel to the garage) plus potential costs to upgrade the electrical panel. For commercial and multifamily, costs can run \$300 for EV-capable, \$1,300 for EV-ready, and \$2,500 for EV-Installed per space. Federal, Colorado, and Xcel Energy rebates are available. Retrofits done later can cost several times more, and may include the need to tear up and rebuild walls (and in the case of commercial and multifamily, parking lots and landscaping), redo wiring, and upgrade the electrical panel.

Jurisdictions with EV-Ready: Aspen, Avon, Boulder, Boulder County, Breckenridge, Denver, Dillon, Durango, Eagle County, Fort Collins, Frisco, Golden, Lafayette, Lakewood, Larimer County, Louisville, Pueblo County, Steamboat, Summit County, Superior, Westminster, and Vail. Others in the Code Cohort communities are also planning to adopt it. Note: a new 2022 Colorado law requires all upcoming IECC adoptions to include EV-ready provisions equivalent to or better than a version to be identified by the state's Energy Code Board. We highly anticipate these amendments will meet the new law.

Mild/Medium/Aggressive Rating: Medium. A "mild" rating would have lower percentages for commercial and multifamily. An "aggressive" rating would require every space in multifamily to have some level of infrastructure, plus a policy for renovations.



Prepared For: DOLA Code Cohort for Northwestern Metro Area / Boulder County

Date Updated: July 7, 2022

Electric-Ready and Electric Preferred



About: Electric-ready amendments prepare homes and buildings for the choice between electric and gas equipment and appliances by ensuring they have the wiring and panel capacity available for future electric equipment (and enough physical space, in the case of water heaters). Electric-transition amendments, the next step, still allow new construction to be either all-electric or "mixed fuel" (e.g. natural gas) but mixed fuel homes and buildings require extra efficiency to make up for extra emissions.

In particular, the residential amendments in the prescriptive path require mixed fuel homes to select three "additional efficiency packages" instead of one. Mixed fuel homes choosing the "Energy Rating Index" (ERI) pathway would seek a score of 50 instead of 55.* For commercial buildings, mixed fuel buildings would choose extra efficiency options totaling an extra 10 points. The amendment also fixes two places in the commercial code where gas equipment was given more points than electric.

Market Developments: Air source heat pumps have been commonplace in other parts of the country, and are now making inroads in Colorado thanks to rapid technological developments that allow "cold climate" heat pumps to supply heat even when outdoor temps fall to -22F. Other configurations are possible as well, such as a non-cold-climate heat pump plus extra "strip heat" that can kick in for extra cold times. (This configuration is cheaper upfront but more expensive to run in extra cold temperatures when the heat strips are on.) For water heating, heat pump water heaters are an easy replacement for a typical gas or electric hot water storage tank. Finally, on the cooking side, some homeowners may express a preference for gas, but induction stoves are proving their mettle with twice-as-fast boil times, more finely-tunable controls, safety protections (e.g. the ability to touch the burner and not get burned) and the near-elimination of harmful air pollutants that lead to increased asthma rates and other respiratory distress.

Cost Discussion: Upfront costs depend highly on the configuration selected by the builder. All-electric homes, depending on supply chain availability and builder/contractor familiarity, can be built at no additional cost compared to mixed fuel [1]. Although the upfront costs of an air source heat pump and heat pump water heater are typically more than gas equivalents, the big savings come from avoiding the gas connection and gas piping costs to and within the home or building, and state and utility rebates offset the cost as well. For mixed fuel homes, electric-ready infrastructure is estimated at \$300 for a water heater and the same for a stove (or possibly increased to \$400 each with inflation and a tight labor market). No additional costs are incurred for electric readiness for a furnace, because central air conditioning or other space cooling would be provided anyway.

* Before 5% efficiency required in R401

(Cost Discussion Cont'd) A high-efficiency gas furnace (95-96% AFUE vs 92-93% AFUE), one of the most likely options for the required "additional efficiency package," is a difference of \$200-\$500 plus labor [2]. Data from the forthcoming Colorado Residential Field Study shows half of new homes are installing high-efficiency gas furnaces already. For water heaters, the difference between meeting the federal minimum efficiency standards of 0.63 UEF and an 0.92 UEF on-demand water heater is \$500 plus labor [3] [4]. After heating and water heating, mixed fuel homes would then need to select one more "additional efficiency package" from the list provided in the 2021 IECC.

- Note: separate market transformation efforts are underway to train builders and contractors for the transition to all-electric equipment, and the familiarity and economies of scale are expected to bring total costs down as well.

Jurisdictions with Electric-Ready and/or Electric Transition: Boulder, Boulder County, Denver (in progress), Fort Collins, Longmont, Louisville, Superior, other Code Cohort communities (in progress). Note: a new 2022 Colorado law requires all upcoming IECC adoptions to include electric-ready provisions equivalent to or better than a version to be identified by the state's Energy Code Board. We highly anticipate these amendments will be in compliance with the law.

Mild/Medium/Aggressive Rating: Medium. A "mild" rating would be just electric ready – i.e. just the wiring and panel capacity. An "aggressive" rating would require all-electric heating and water heating for most residential, multifamily, and commercial buildings, or, even further, no gas connections at all.

[1] Despite a few recent studies, a couple local home builders report challenges getting the costs to "pencil out." State policies passed since then, like the 10% tax credit for heat pumps, heat pump water heaters, and panels, plus regulatory dockets underway at the Public Utilities Commission, may improve the cost calculations.

[2] Manufacturer model database review from electrification expert David Petroy, January 23, 2022. Note: Mr. Petroy notes that some comparisons may show wider differences because more efficient models are more likely to have higher-end "bells and whistles" that don't affect performance.

[3] Home Depot website comparison of in-stock 0.64 UEF gas storage water heater (\$800) and 0.93 gas tankless water heater (\$1,300), Feb 9, 2022.

[4] Another full study on the economics of all-electric homes in CO is available at <https://swenergy.org/pubs/heat-pump-study-2022>

Prepared For: DOLA Code Cohort for Northwestern Metro Area / Boulder County

Date Updated: July 5, 2022



LOTUS
Engineering & Sustainability



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Efficiency Amendments

About: One amendment improves the lighting efficiency in horticulture facilities, and another amendment addresses the heat island effect, as explained below.

These two were selected from a wide array of other strengthening amendments, including a review of other nearby jurisdictions' codes, decarbonization model codes, and the 2024 IECC proposals. These two were selected based on a balance of technical and practical implementability, simple code language, and sustainability impact.

No additional efficiency-strengthening amendments are proposed for residential buildings (beyond those in the electric preferred proposals). This is recognition of the already-decent efficiency improvements in the 2021 IECC, the current challenges with the cost of construction, and the general preferences for simplicity and focused impact.

Horticulture lighting. Energy consumption from lighting in marijuana grow facilities, as well as other indoor agricultural facilities, is staggering, and is projected to continue increasing. Lighting can account for 50% to 80% of an indoor facility's energy use and 30% of a greenhouse's energy use. Traditionally, grow facilities hadn't invested in efficient lighting because of uncertainty in their market and shifting legal policies. This proposal is cost-neutral for greenhouses and has a [3-year payback](#) for indoor facilities. This proposal has been approved by the 2024 IECC Commercial Consensus Committee.



Cool roofs. Cool roofs are made of materials that reflect more sunlight and absorb less heat. They are usually, though not always, made of lighter-color materials. Cool roofs still allow the installation of solar panels, skylights, mechanical equipment, rooftop amenities, and/or vegetative roofs at the building owner's discretion. This only affects low-sloped (i.e. flat or nearly flat) roofs, and it doesn't apply to roof repairs or replacements. Cool roofs are already in the IECC, but this brings them into our climate zone (5B) in recognition of increased summer temperatures and the growing problem of the heat island effect. Higher urban temperatures also speed the formation of ground-level ozone, the primary component of smog. Costs for a cool roof are equivalent to costs for a black roof, and most suppliers and contractors supply both types. Energy costs are not notably impacted, because more recent energy codes have high amounts of insulation in the attic that limit the roof's impact on inside temperatures. Instead, as noted, the significant benefits here are for reducing heat island and improving air quality.

Jurisdictions with Efficiency Amendments: Denver requires a cool roof and has improved horticulture lighting. Other jurisdictions in the area have selected various other amendments to increase the efficiency of their homes and buildings, including Boulder, Boulder County, Breckenridge, Denver, Fort Collins, Frisco, Golden, Louisville, Summit County, and Superior.

Mild/Medium/Aggressive Rating: Medium. A “mild” rating would be just the 2021 IECC unamended. An “aggressive” rating would have prescriptive table updates, stricter performance path requirements (e.g. 10% more efficient), and/or more amendments approved for the 2024 IECC.

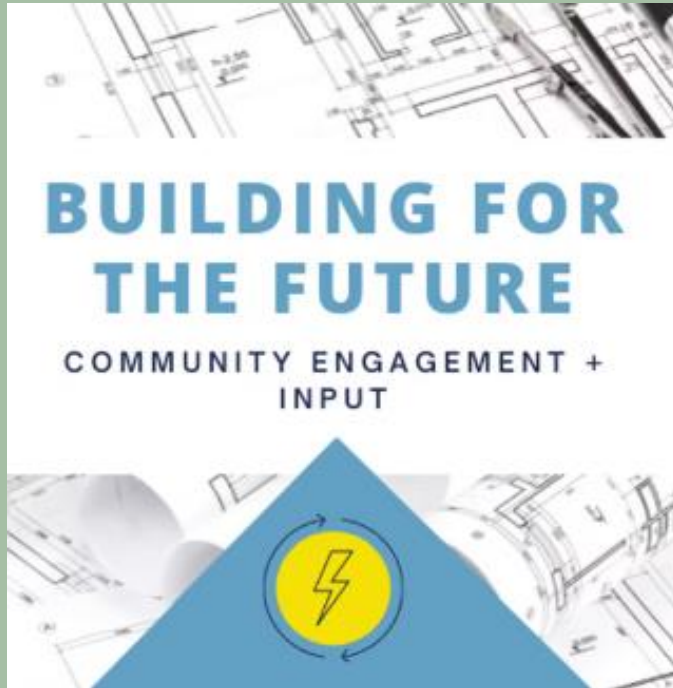
Prepared For: DOLA Code Cohort for Northwestern Metro Area / Boulder County
Date Updated: July 7, 2022



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Louisville Energy Code Update

City Council
Meeting
Sept 27, 2022



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Engineering & Sustainability



Introductions to the Team

Kayla Betzold

City of Louisville
Sustainability
Coordinator

Rob Zuccaro

City of Louisville
Director of Planning
and Building Safety

Kim Schlaepfer

**Lotus Engineering &
Sustainability**
Senior Associate of
Climate Mitigation &
Resiliency Planning

Claire Kantor

**Lotus Engineering &
Sustainability**
Research Associate

Anna McCullough

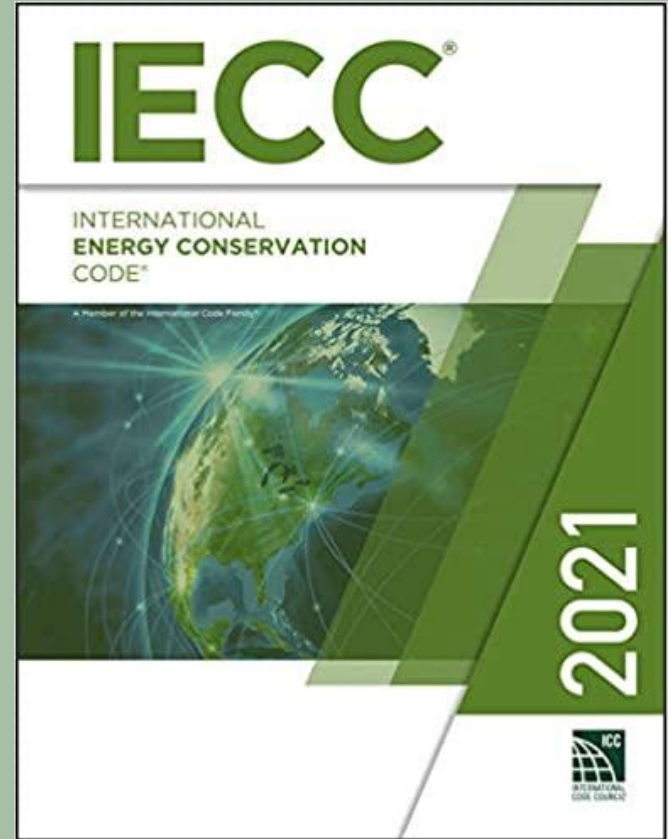
Group14 Engineering
Energy Project Manager

City of Louisville Council Adopted Clean Energy and Carbon Emission Reduction Goals*

- ❖ Meet all of Louisville's municipal electric needs with 100% carbon-free sources by 2025.
- ❖ Reduce core municipal GHG emissions annually below the 2016 baseline through 2025.
- ❖ Generate 75% of Louisville's residential and commercial/industrial electric needs from carbon-free sources by 2030.
- ❖ Reduce core community greenhouse emissions annually below the 2016 baseline through 2030.

Louisville's Green Building Code Efforts

- Adoption of the 2021 IECC
- Residential & Commercial Supporting Amendments
- Appendix RC, Net Zero Energy Residential Building Provisions



Current Code for New Construction

Commercial

- Increased insulation levels
- Increased doors and windows efficiency requirements
- Increased HVAC efficiency
- Electric vehicle charging and infrastructure
- Electric-ready wherever gas appliances are installed
- Solar-ready zone required

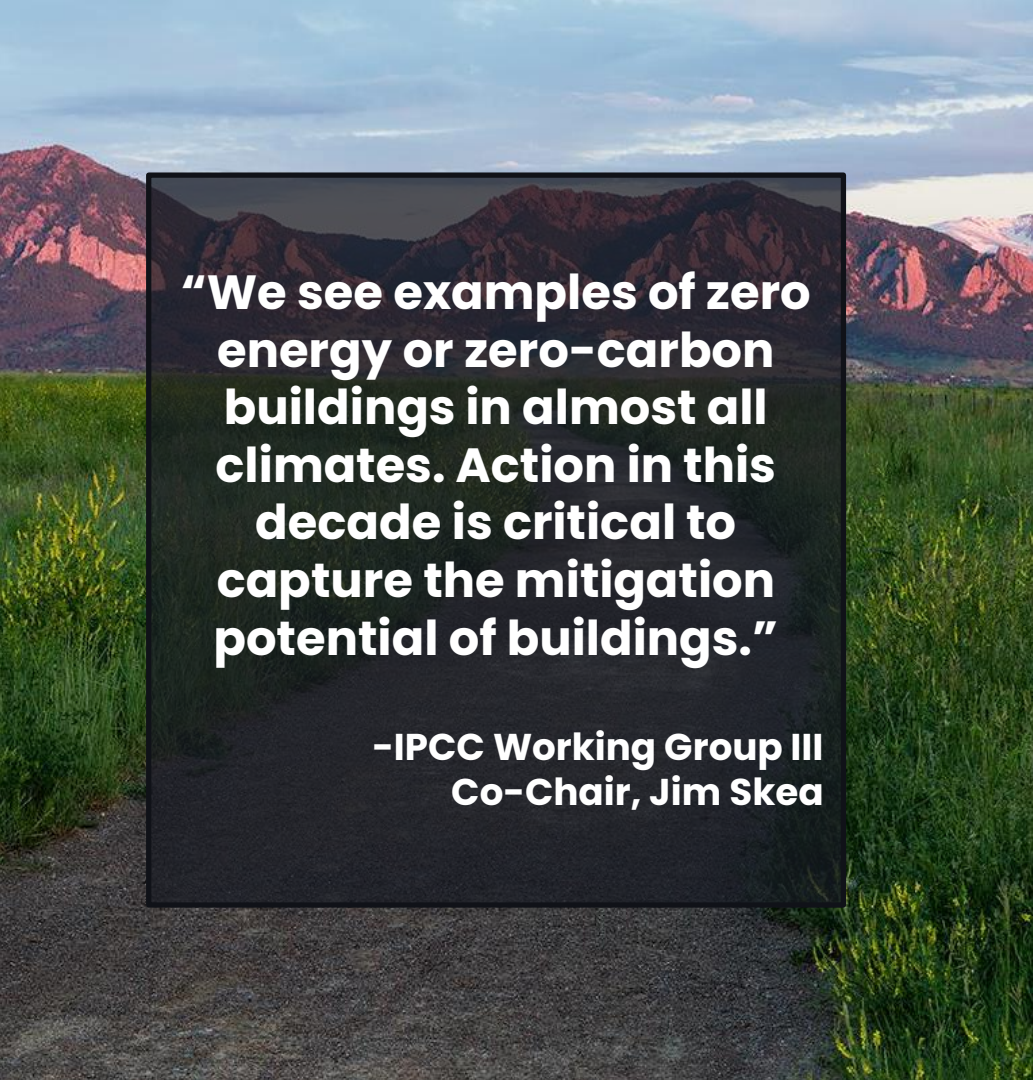
Residential*

- Increased insulation levels
- Increased ductwork and piping insulation requirements
- Mandatory heat recovery
- Electric vehicle charging and infrastructure
- Electric-ready wherever gas appliances are installed
- Net zero Appendix RC required



Electric-Readiness: A residential home or commercial building that uses natural gas for space and/or water heating and has pre-wiring and a dedicated circuit for future all-electric equipment.

Appendix RC: An appendix in the 2021 IECC that requires new single-family residential homes to meet a specific energy efficiency criteria and offset their energy use with onsite or offsite solar.



“We see examples of zero energy or zero-carbon buildings in almost all climates. Action in this decade is critical to capture the mitigation potential of buildings.”

**–IPCC Working Group III
Co-Chair, Jim Skea**

Why adopt additional code amendments?

- **Climate change** is happening right here, right now in Colorado
- Climate change is a public health issue
- Local communities have an opportunity to be leaders

Next Phase of Sustainable Building Codes

Adoption of different new construction code options that will encourage **higher efficiency, net zero** and/or **all electric** new construction for:

- Multi-family buildings
- Commercial buildings

Regional Code Cohort

Phase 1

Adopt the IECC 2021 + supporting amendments that are consistent across the region. These amendments include:

- Solar-ready requirements.
- EV-ready requirements.
- Electric-preferred requirements
- Additional efficiency requirements.

Applicable to BOTH residential and commercial buildings.

Phase 2

Develop a roadmap to Net Zero new construction code for the region by 2030.

Phase 2 is starting in August of 2022 and will be wrapped up by Dec 2022.

Regional Code Cohort

Participating Communities:

- Louisville
- Superior
- Boulder County
- Erie
- Lafayette
- Northglenn
- Broomfield*
- Longmont

Phase 2 Only:

- Boulder
- Westminster
- Berthoud

Electric-Preferred: For any building that uses natural gas systems, they must meet the following requirements:

- Electric-ready.
- Select one or more additional efficiency packages from code.

Policy Considerations



Modeling to Inform Policy

Multi-Family Building

3 stories tall
42,000 square feet
Wood framed walls

Office Building

3 stories tall
110,000 square feet
Metal framed walls

Retail Building

Strip mall – 1 story with café and fast-food restaurant
90,000 square feet
Concrete block walls

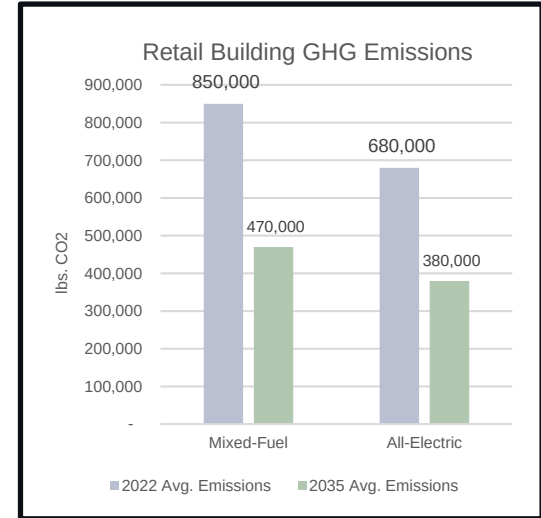
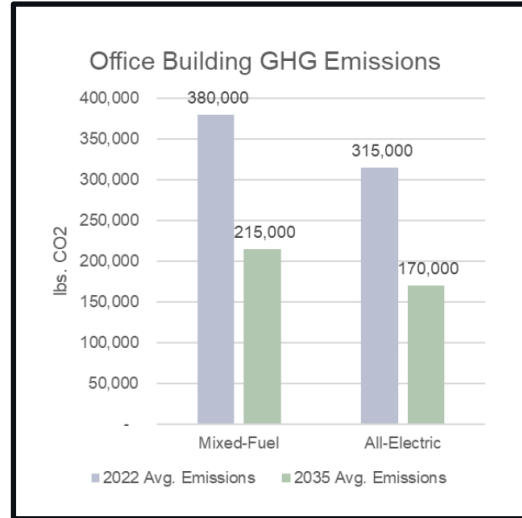
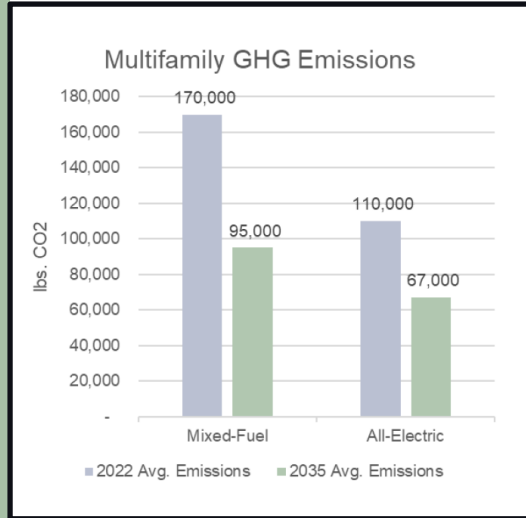
Single-Family Building

2 stories tall
2,820 square feet
Finished basement

For different HVAC designs:

- Upfront costs
- Annual costs
- Amount of PV required for building to be net zero
- Payback periods
- Greenhouse gas emissions

GHG Emissions Savings Code Compliant Buildings Over Time



Policy Concepts Under Consideration

Current Louisville Energy Code:

- 2021 International Energy Conservation Code.
- Louisville-specific efficiency amendments.
- EV-ready + solar-ready + electric-ready.



Net Zero with
Renewable Energy



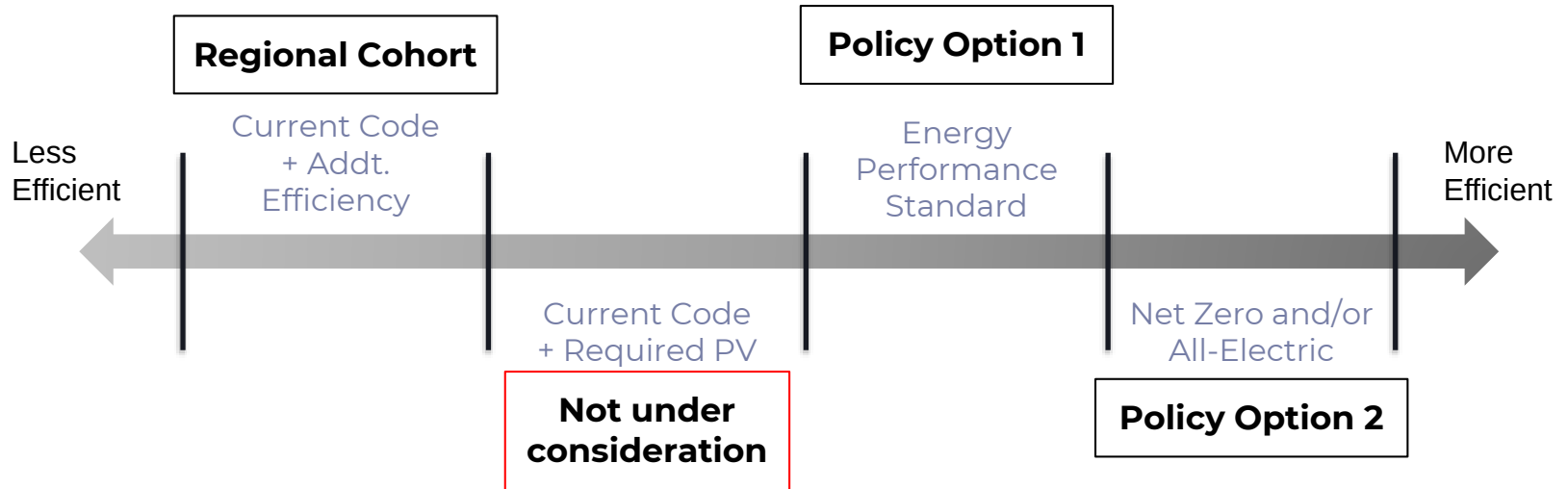
Enhanced Energy
Efficiency



All-Electric

Option Spectrum

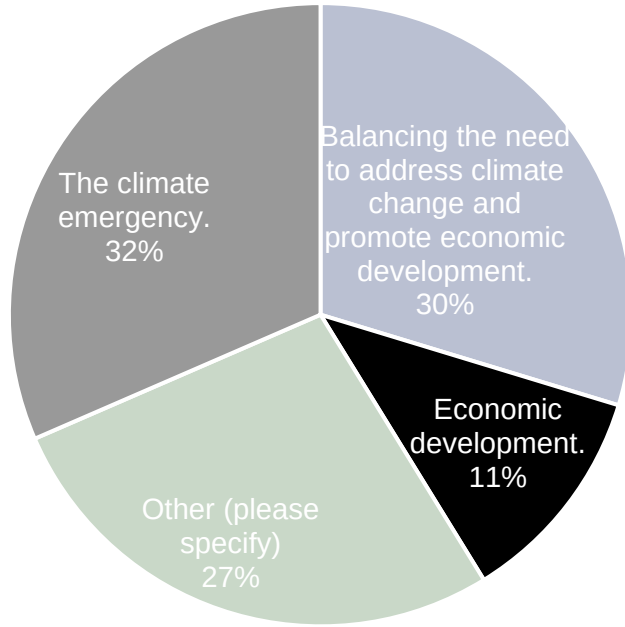
Strategic steps down the continuum
OR
Move all at once



Public Engagement Feedback

Key Takeaways Survey

What's the most important consideration for the City in adopting stricter energy codes for residential and commercial construction?



- “Other” Write-in Responses
 - “Cost/benefit analysis”
 - “NOT imposing extra costs on the homeowners”
 - “Sensible and based on citizens’ affordability and needs”
 - “Less government interference with construction”
 - “Research from various sources, don't just go with the trend. What are the long-term costs from creation to post-use of materials? What is the true gain of efficiency? The difference between the 2018 and 2021 codes are not gigantic, yet the cost differences are huge.”

Key Takeaways

General feedback from all public outreach methods indicated that the Louisville community does not feel ready for an aggressive approach to energy code updates.

Across sectors and policy considerations, the main concern is financial:

- Cost to builders and tenants.
- Upfront costs for housing.
- Costs will drive businesses away from Louisville .

Key Takeaways from Public Engagement

- Generally, participants in all public engagement sessions tended to **lean toward opposing** each of the code policy considerations. However, the number of participants who **supported each of the code policy considerations was still significant**.
- The **largest benefits** to energy code updates were perceived to be greenhouse gas reductions and public health improvements (i.e., air quality).
- Curiosity and questions about alignment with **Regional code effort**.
- The City **should take its time** developing the ordinance, rather than rushing to be a leader in this space. Careful **consideration of impacts** needs to be made.
- Questions on how new building code would **impact existing buildings** and businesses.
- Concern about **procuring offsite solar**: lack of information available, lack of available offsite solar, and lack of funding to create more offsite solar (LSAB).
- There **needs to be a scale of options** ranging from a code update that is easy, a code update that is balanced, and a code update that is high impact but difficult to implement (LSAB).
- Several questions related to the **feasibility of limiting commercial energy consumption via site EUI targets**, and how successful City of Boulder's efforts were with energy performance targets (Building Code Board).
- Concern regarding the **capability of the electric grid to handle buildings built to stricter commercial energy codes** and/or built to be all-electric, and the reliability of Xcel's renewable energy goals (Building Code Board).

Policy Consideration [1]

Energy Performance Standards for Building Types

Require projects to meet a maximum-allowed energy use per square foot (EUI) for the performance pathway and require additional efficiency measures for the prescriptive path. On-site PV can contribute to EUI target.

Require a solar-ready zone, electric-ready construction, and EV-readiness.

Energy Performance Standards

The table shows example energy performance standards that could be set for specific building types. The column on the right showcases the energy score a building would need to achieve to reach Zero Energy Performance.

Zero energy buildings are ultra-low energy buildings capable of producing all the energy they consume over the course of a year from onsite renewable energy resources.

Building Type	City of Boulder Performance Standards (kBtu / sqft.)	NBI Zero Energy Performance Standards (kBtu / sqft.)
Medium office (5,000 – 50,000 sf)	23	21
Mid-rise apartment (Type R2)	32	23
Primary school	34	25
Small office (<5,000 sf)	19	17
Secondary school	31	29
Warehouse	11	9
Retail*	NA	34

Predicted Energy Performance for Code Compliant Buildings in Louisville

Retail Building*

Office Building

Multifamily Building

Code Compliant Building		Zero Energy Performance Standard	Code Compliant Buildings		Zero Energy Performance Standard	Code Compliant Buildings		Zero Energy Performance Standard
HVAC System Options	Site EUI (kBtu/SF-yr)		HVAC System Options	Site EUI (kBtu/SF-yr)		HVAC System Options	Site EUI (kBtu/SF-yr)	
Mixed Fuel Option 1	95	34	Mixed Fuel Option 1	33	21	Mixed Fuel Option 1	39	23
Mixed Fuel Option 2	86		Mixed Fuel Option 2	36		Mixed Fuel Option 2	42	
Mixed Fuel Option 3	86		Mixed Fuel Option 3	35		Mixed Fuel Option 3	35	
All-Electric Option 1	79		All-Electric Option 1	35		Mixed Fuel Option 4	41	
All-Electric Option 2	75		All-Electric Option 2	25		All-Electric Option 1	27	
All-Electric Option 3	63		All-Electric Option 3	26		All-Electric Option 2	27	
			All-Electric Option 4	26		All-Electric Option 3	23	

*The model retail building includes two restaurants, which are typically high energy users. The NBI Zero Energy Performance Goal for retail buildings does not include restaurants, resulting in a much lower goal.

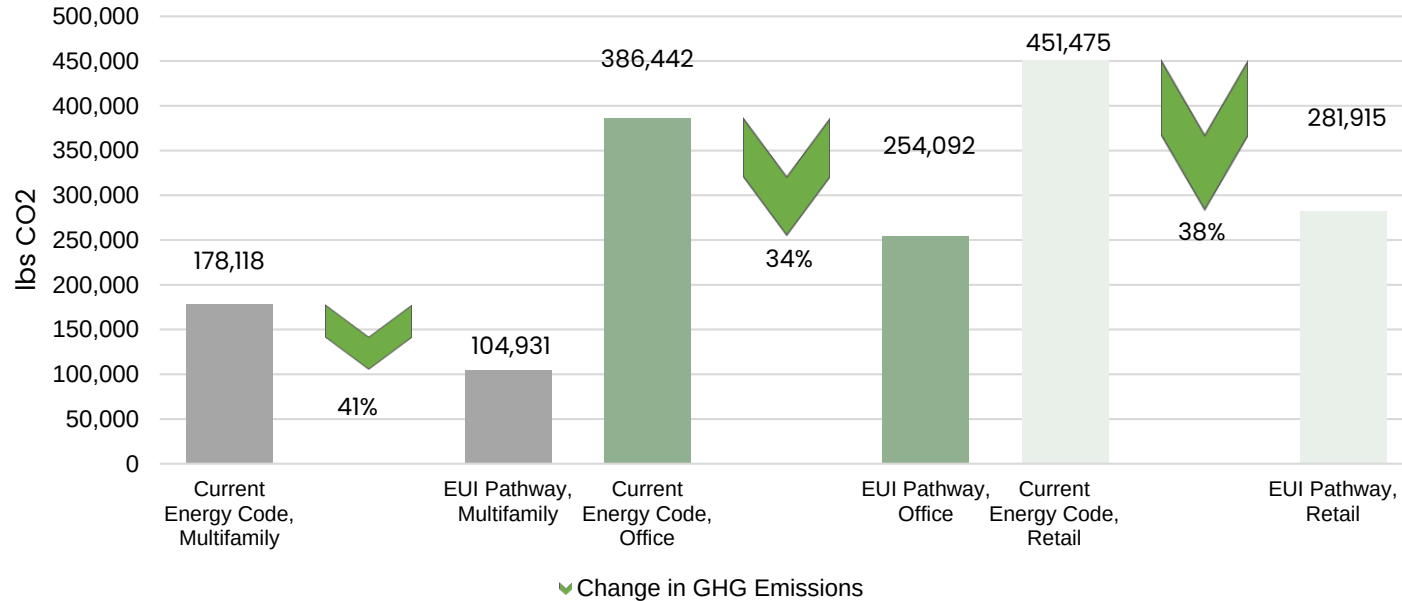
Policy Option 1: Modeled Costs

Building Type	HVAC Fuel Type	EUI targets modeled	Estimated Upfront Cost of HVAC without PV	EUI earned without PV	PV size required to reach EUI Target (kW)	Estimated Upfront Costs with PV	Annual Energy Cost Savings after PV
Multifamily	Mixed-Fuel	23	\$206,661	36	111kW	\$484,161	\$12,432
	All-Electric		\$182,500	23	4kW	\$192,500	\$448
Office	Mixed-Fuel	21	\$4,180,608	29	185kW	\$4,643,108	\$20,720
	All-Electric		\$4,353,828	29	177kW	\$4,796,328	\$19,824
Retail	Mixed-Fuel	34	\$1,123,500	103	310kW	\$1,898,500	\$34,720
	All-Electric		\$1,232,200	63	223kW	\$1,789,700	\$24,976

Policy Option 1: GHG Emissions

Greenhouse Gas Emissions for Policy Option 1

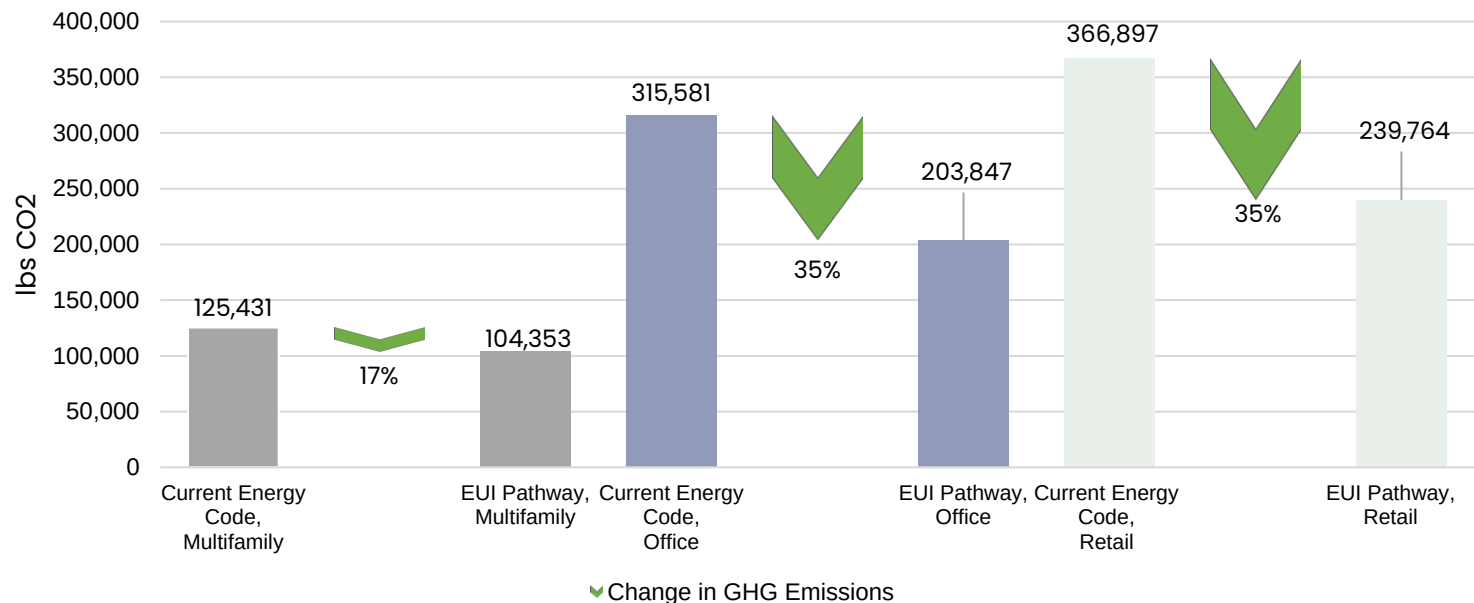
Multifamily, Office, and Retail: **Mixed Fuel**



Policy Option 1: GHG Emissions

Greenhouse Gas Emissions for Policy Option 1

Multifamily, Office, and Retail: **All-electric**



Policy Consideration [2A+2B]

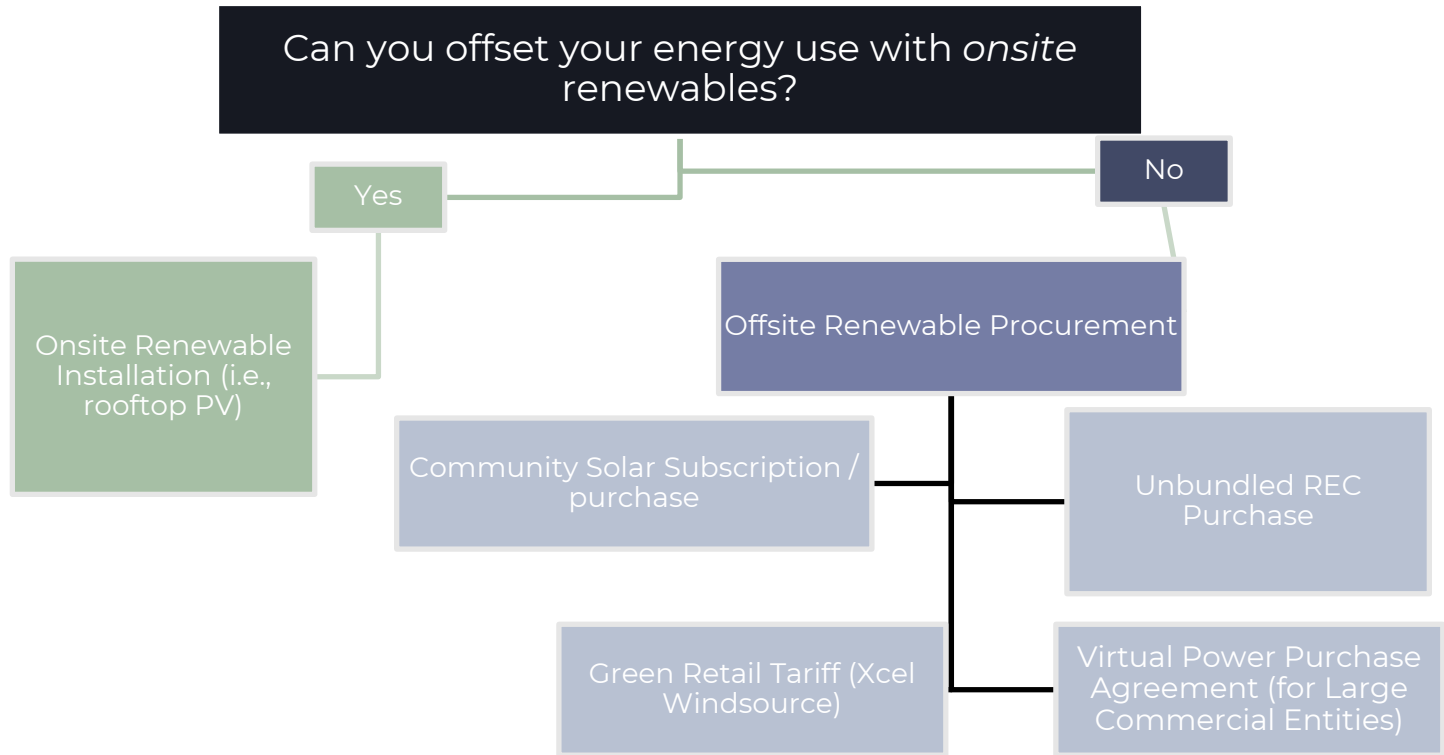
Appendix CC

[2A] Require net zero new construction for all buildings and utilize Appendix CC from the 2021 IECC. Electric-ready and EV-readiness required.

[2B] Require all-electric new construction built to Appendix CC with required on-site or off-site PV. EV-readiness required.

Exceptions/Reduction of Offset and/or All-Electric: Industrial, Laboratories, Manufacturing, Restaurants, Hospitals

Appendix CC – Renewable Procurement Requirements



Appendix CC – Renewable Procurement Requirements

	Unbundled RECs*	Green Retail Tariff*	Community Solar	Virtual PPA
Pros	• Low Cost. • Easy to purchase.	• Low Cost. • From local utility.	• Local renewable energy generation. • 15-year contracts.	• 15-year contracts.
Cons	• No guarantee of local generation. • Do not meet code contract length requirements.	• Do not meet code contract length requirements. • Only covers electric use.	• Very limited availability and high demand.	• May not be local. • Additional work to set up VPPA contract/project.

*All of these options will require amendments to Appendix CC language in order to be feasible. Note all offsite procurement options must use a procurement factor to calculate the total offsite offset required.

Policy Option 2a & b Applied to Multifamily Building

Multifamily	Cost for Code Compliant Building		Costs for Onsite PV					Net Zero Offsite PV – REC Pricing		
	HVAC System Options	Upfront Cost of HVAC System	Total Annual Energy Bills	PV (kW) required for Net Zero	PV that can fit onsite (kW)	Cost of Onsite PV	Annual Energy Bill with Onsite PV	Total Annual Energy Cost Savings with PV	kW Remaining to Offset	Green Tariff Cost (15 years, purchased in kWhs)
Mixed Fuel Option 1	\$157,321	\$40,785	338 kW	98 kW	\$245,000	\$28,809	\$10,976	240 kW	\$137,303	\$70,482
Mixed Fuel Option 2	\$278,321	\$25,230	365 kW			\$14,254		267 kW	\$152,838	\$78,457
Mixed Fuel Option 3	\$267,321	\$38,038	303 kW			\$27,062		205 kW	\$117,259	\$60,193
Mixed Fuel Option 4	\$459,821	\$27,071	357 kW			\$16,095		259 kW	\$148,328	\$76,142
All-Electric Option 1	\$135,000	\$40,383	236 kW			\$29,407		138 kW	\$79,174	\$40,643
All-Electric Option 2	\$245,000	\$40,601	232 kW			\$29,625		134 kW	\$76,493	\$39,266
All-Electric Option 3	\$437,500	\$28,431	201 kW			\$17,455		103 kW	\$59,226	\$30,402

Policy Option 2a & b Applied to Office Building

Office HVAC System Options	Cost for Code Compliant Building		Net Zero Requirements and Costs for Onsite PV					Net Zero Offsite PV – REC Pricing		
	Upfront Cost of HVAC System	Total Annual Energy Bills	PV (kW) required for Net Zero	PV that can fit onsite (kW)	Cost of Onsite PV	Annual Energy Bill with Onsite PV	Total Annual Energy Cost Savings with PV	kW Remaining to Offset	Green Tariff Cost (15 years, purchased in kWhs)	Unbundled RECs Cost (15 years, purchased in MWhs)
Mixed Fuel Option 1	\$2,327,633	\$104,604	722 kW	250 kW	\$625,000	\$76,604	\$28,000	472 kW	\$285,152	\$146,378
Mixed Fuel Option 2	\$1,786,323	\$135,278	777 kW			\$107,278		527 kW	\$317,602	\$163,036
Mixed Fuel Option 3	\$4,492,873	\$95,077	772 kW			\$67,077		522 kW	\$315,006	\$161,703
All-Electric Option 1	\$1,948,716	\$131,993	755 kW			\$103,393		505 kW	\$304,622	\$156,373
All-Electric Option 2	\$3,789,170	\$90,551	544 kW			\$62,551		294 kW	\$179,548	\$92,168
All-Electric Option 3	\$3,464,384	\$94,324	567 kW			\$66,324		317 kW	\$192,996	\$99,071
All-Electric Option 4	\$4,005,694	\$103,660	578 kW			\$75,660		328 kW	\$199,485	\$102,403

Policy Option 2a & b Applied to Retail Building

Retail	Cost for Code Compliant Building		Net Zero Requirements and Costs for Onsite PV					Net Zero Offsite PV – REC Pricing		
	Upfront Cost of HVAC System	Total Annual Energy Bills	PV (kW) required for Net Zero	PV that can fit onsite (kW)	Cost of Onsite PV	Total Annual Energy Bill with Onsite PV	Total Annual Energy Cost Savings with PV	kW Remaining to Offset	Green Tariff Cost (15 years, purchased in kWhs)	Unbundle d RECs Cost (15 years, purchased in MWhs)
Mixed Fuel Option 1	\$570,500	\$164,492	1741 kW	600 kW	\$1,500,000	\$97,292	\$67,200	1,141 kW	\$689,194	\$353,786
Mixed Fuel Option 2	\$456,000	\$182,683	1564 kW			\$115,483		964 kW	\$584,178	\$299,878
Mixed Fuel Option 3	\$630,500	\$158,096	1566 kW			\$90,896		966 kW	\$585,261	\$300,434
All-Electric Option 1	\$660,000	\$193,161	1449 kW			\$125,961		849 kW	\$515,973	\$264,866
All-Electric Option 2	\$708,000	\$185,053	1369 kW			\$117,853		769 kW	\$468,337	\$240,413
All-Electric Option 3	\$3,167,500	\$156,491	1157 kW			\$89,291		557 kW	\$342,752	\$175,946

GHG Emission Savings from Policy Option 2

Appendix CC and Appendix CC all-electric

GHG savings should be viewed through two lenses:

1. GHG reductions from onsite renewable energy
2. GHG reductions from offsite renewable energy procurement.

Onsite Renewable Energy

- ✓ Local carbon offset.
- ✓ Directly contributes to local electric grid.
- ✓ GHG savings correlates with fossil fuel electricity being offset from the **Colorado specific grid.**

Offsite Renewable Energy (Modeled option: RECs)

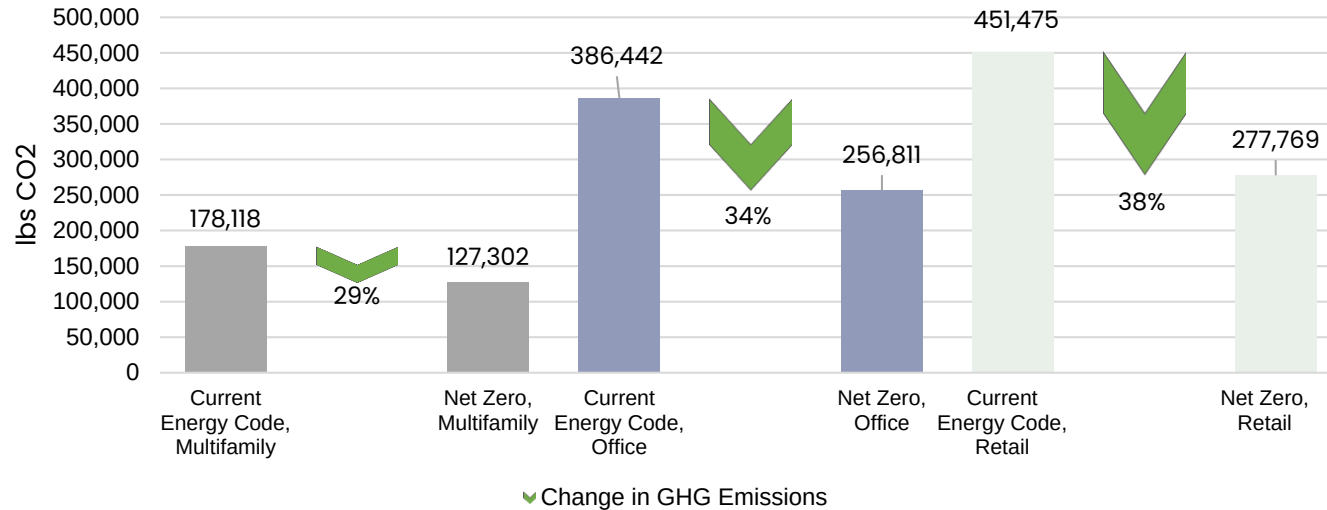
- ✓ No ability to track the location of REC generation.
- ✓ Contributes to GHG savings but does not contribute to new renewable energy resources.
- ✓ GHG savings correlate with fossil fuel electricity being offset **where the energy is produced** (nat. avg. used for modeling).
- ✓ Procurement factor.

GHG Emissions Policy Option 2: Onsite PV

Greenhouse Gas Emissions for Policy Option 2A

Multifamily, Office, and Retail:

Mixed Fuel to Net Zero Mixed Fuel (Policy 2A)



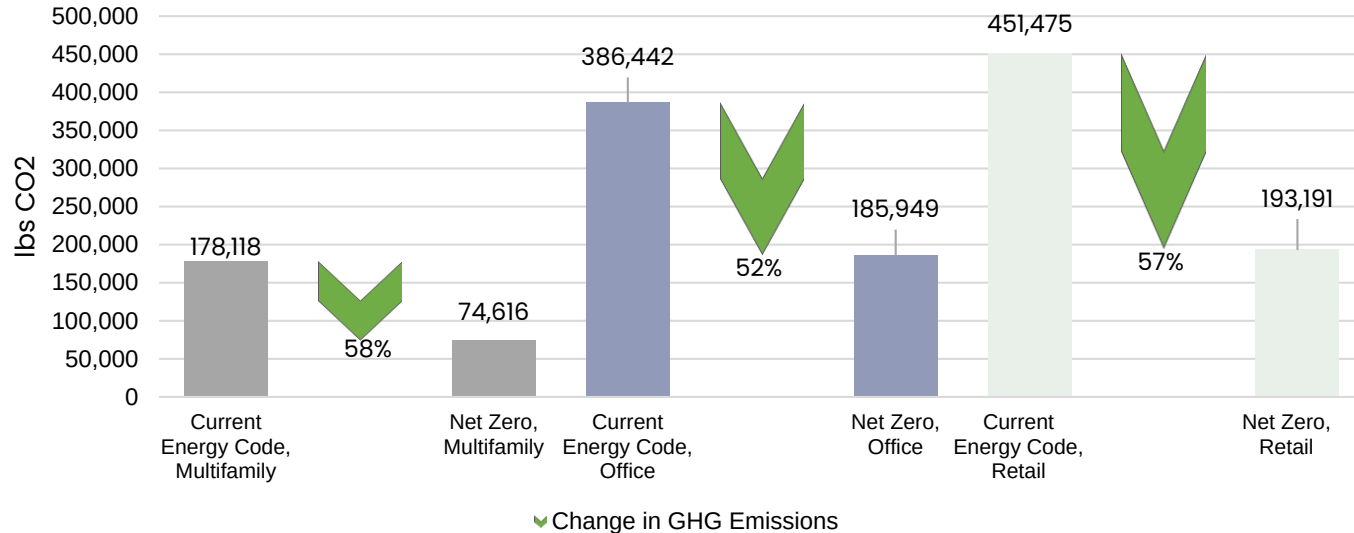
Annual GHG emissions for **mixed fuel** buildings compliant with current code, compared to GHG emissions for **mixed fuel** buildings compliant with Policy Option 2A: Appendix CC, Net Zero. This chart represents GHG savings from **onsite PV only**.

GHG Emissions Policy Option 2: Onsite PV

Greenhouse Gas Emissions for Policy Option 2B

Multifamily, Office, and Retail:

Mixed Fuel to Net Zero All-Electric (Policy 2B)



Annual GHG emissions for **mixed fuel** buildings compliant with current code, compared to GHG emissions for **all-electric** buildings compliant with Policy Option 2B: Appendix CC, Net Zero + all-electric.

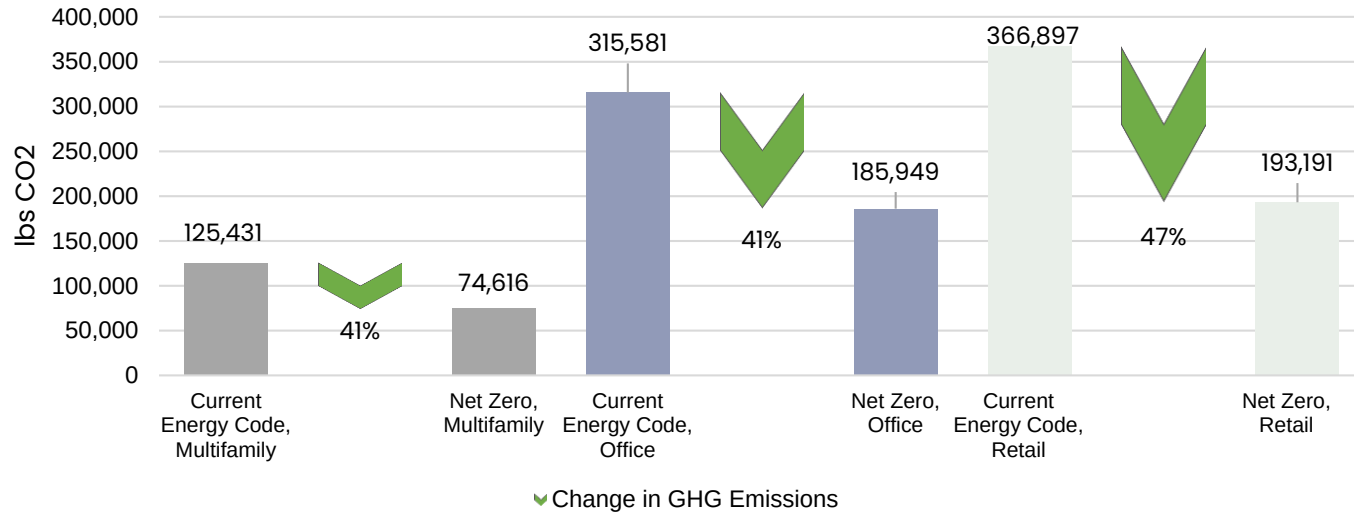
This chart represents GHG savings from **onsite PV only**.

GHG Emissions Policy Option 2: Onsite PV

Greenhouse Gas Emissions for Policy Option 2B

Multifamily, Office, and Retail:

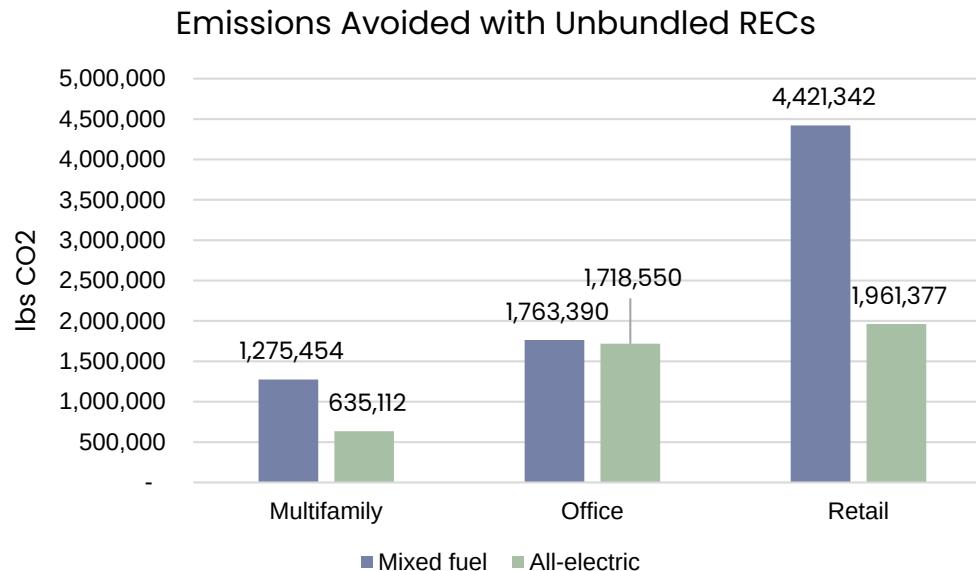
All-Electric to All-Electric Net Zero (Policy 2B)



Annual GHG emissions for **all-electric** buildings compliant with current code, compared to GHG emissions for **all-electric** buildings compliant with Policy Option 2B: Appendix CC, Net Zero + all-electric.

This chart represents GHG savings from **onsite PV only**.

GHG Emissions Policy Option 2: Offsite Renewable Energy



- ✓ Uses the national average emission factor for the electricity grid of 0.85 lbs/kWh (Source, EIA)
- ✓ Includes Appendix CC “procurement factor”, a penalty for pursuing RECs as the procurement option which requires 5x the RECs to be purchased compared to the total offset needed.

Policy Option Summary

Regional Code Cohort

2021 IECC Base Code + Supporting Amendments

- **No** net zero requirement.
- **No** offsite PV required.
- Requires:
 - EV-Ready.
 - PV-Ready.
 - Electric-Preferred.
 - Additional Efficiency.

Policy Consideration 1

Energy Performance Standards

- **No** net zero requirement.
- **No** offsite PV required.
- Allows for use of extra efficiency and/or renewable energy to meet target.
- Encourages all-electric construction.
- More flexibility with fuel choice and energy use reduction methods.
- Solar-ready required.
- EV-ready required.
- Electric-ready construction.

Policy Consideration 2a & 2b

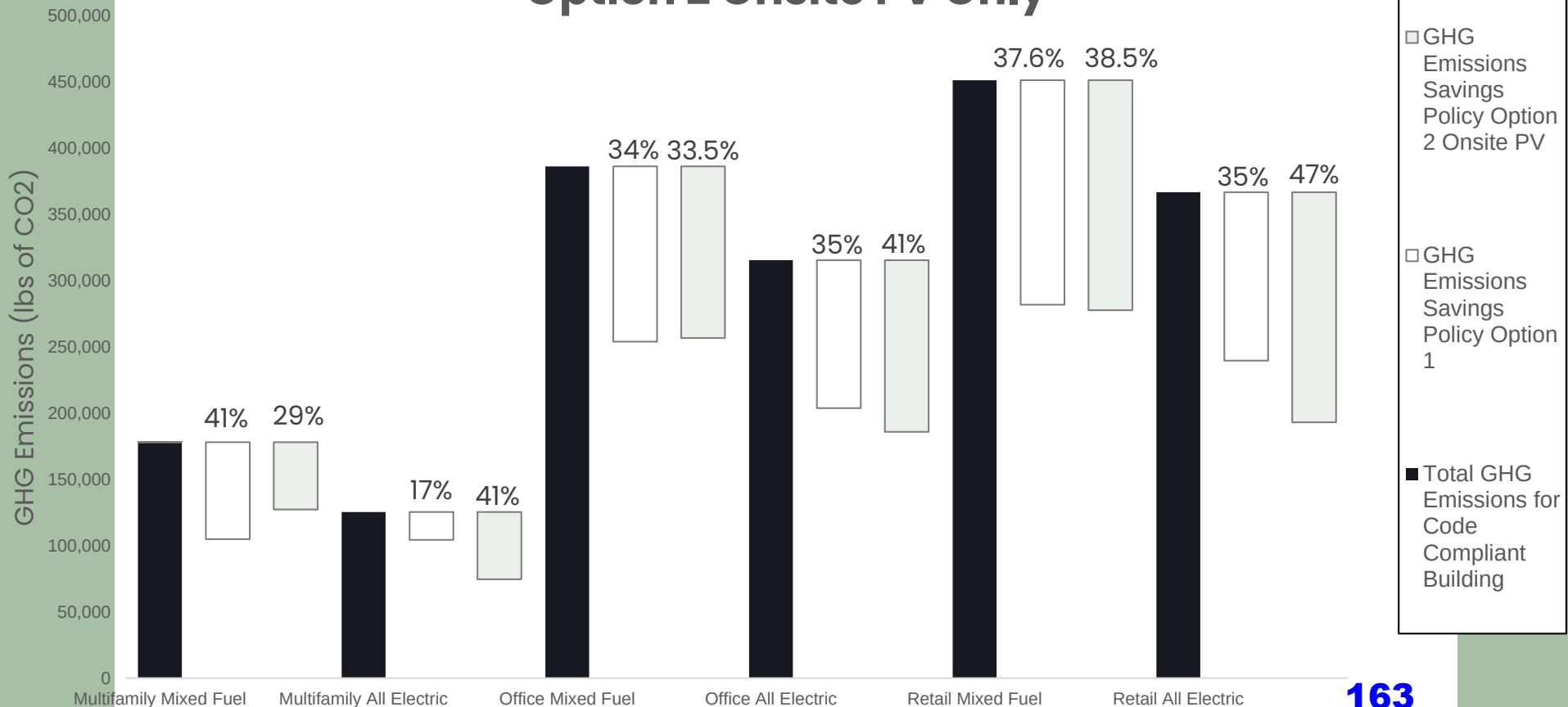
Appendix CC

- Net zero **required**.
- Offsite PV and Onsite PV **required**.
- Base code efficiency.
- More flexibility with fuel choice.
- Electric-ready required.
- Exemptions considered.

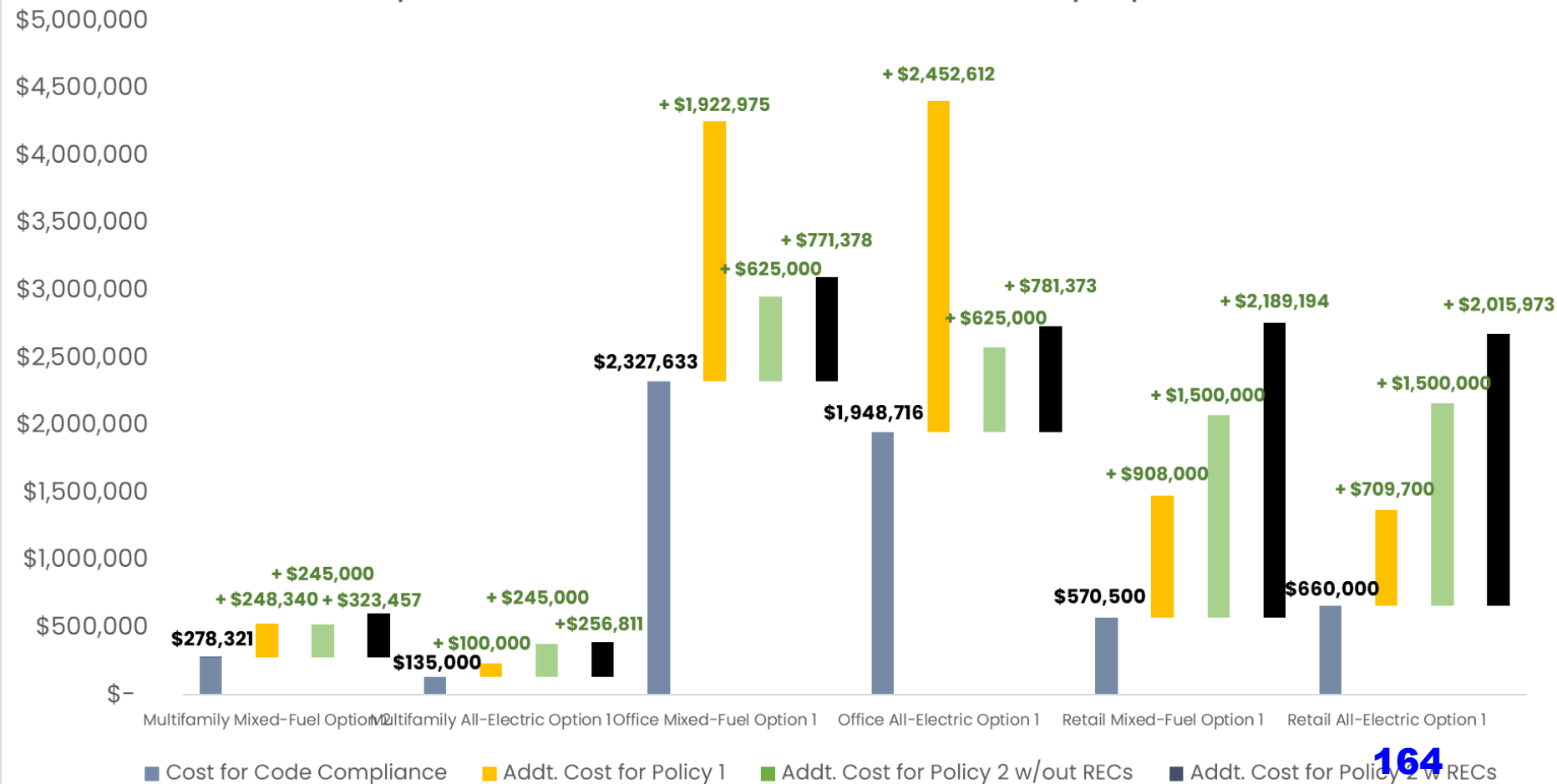
Appendix CC + All-Electric

- Net zero **required**.
- Offsite PV and Onsite PV **required**.
- Base code efficiency.
- **No** fuel choice.
- Exemptions Considered.

GHG Savings Comparison: Policy Option 1 & Policy Option 2 Onsite PV Only



Cost Comparison between Base Code & Policy Options 1, 2A, 2B



How Codes Interact with Existing Buildings

Replacing a Boiler

- New HVAC system must meet current code for minimum efficiency.
- No other alterations required.

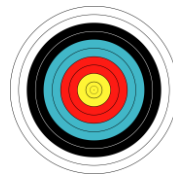
Adding 25% Floor Area

- All new floor area must meet the prescriptive measures in the code.
- Any untouched part of the building does not need to comply with code.

New code will need to consider existing building upgrades.

Recommendation

The project team recommends the City of Louisville move forward with Policy Option 1: Energy Performance Standards.



- ✓ Provides flexibility for building owners to comply with code and allows for fuel choice.
- ✓ Does not require PV but building owners can use onsite PV to help earn energy goal.
- ✓ EUI targets are easier to earn with all-electric buildings, which will incentivize building owners to build all-electric. All-electric buildings will save significant GHG emissions over time as the grid becomes greener.
- ✓ This option does not require exemptions because of prohibitive cost and lack of technology so high energy consuming buildings can comply (hospitals for example).
- ✓ Does not align with the Code Cohort but aligns with the City of Boulder's code.

Discussion & Questions?

DRAFT AMENDMENTS FOR 2021 IECC ADOPTION

To: Code Cohort

From: Lotus, SWEEP, Shums Coda (consultant team for DOLA Codes Cohort)

Date: July 5, 2022

Re: Version 2 of Cohort Amendments

Note: This is the “Explanatory” version but we’re also sending a “Clean” version that doesn’t have the blue text, strikeouts, or underlines. We are also happy to customize further to be in the same format you use for your ordinance and/or the same number/lettering system you use in your code.

Changes since Version 1:

- We extensively paired down efficiency supporting amendments based on guidance from Erie building department. The only efficiency-strengthening amendments that remain are 1) horticulture lighting (approved by the 2024 IECC Commercial Consensus Committee) and 2) cool roofs (which is more for heat island than efficiency).
- Reducing the efficiency amendments to just those four acknowledges the already decent efficiency improvements in the 2021 IECC, the current challenges with the cost of construction, and the general preferences for simplicity and focused impact.
- We revised the EV-ready appendices to match Denver’s and the 2024 IECC Consensus Committee’s recently-approved versions (they are similar). Also, we moved the EV-ready appendices from the IBC and IRC into the IECC because of a new state law that requires upcoming local IECC adoptions to include EV-ready.

[COMMUNITY NAME] ORDINANCE NO. [INSERT]

AN ORDINANCE ADOPTING THE 2021 INTERNATIONAL BUILDING CODE, 2021 INTERNATIONAL RESIDENTIAL CODE, [INSERT OTHERS], AND 2021 INTERNATIONAL ENERGY CONSERVATION CODE, WITH AMENDMENTS

WHEREAS, the [Council] recognizes that the 2021 International Building Code, 2021 International Residential Code, [list others], and 2021 International Energy Conservation Code, with amendments, collectively referred here as the I-Codes, will improve the construction and maintenance of the built environment and will thereby promote the health, safety, resiliency, affordability, sustainability, and general welfare of our community; and

WHEREAS, ... [references to local plans]

WHEREAS, the [Council] recognizes that the 2021 International Energy Conservation Code, with amendments, is essential for improving the energy performance of homes and buildings;

WHEREAS, buildings are responsible for 40 percent of greenhouse gas emissions in the United States, and reducing building greenhouse emissions is essential for reducing the impacts of climate change, including mitigating local disaster events such as wildfires, droughts, and other severe weather;

WHEREAS, [Community] agreed to collaborate with neighboring communities to adopt a consistent version of the 2021 International Energy Conservation Code with supporting amendments;

WHEREAS, the [Council] desires to adopt the 2021 I-Codes by reference with certain amendments as described in this ordinance;

NOW, THEREFORE, BE IT ORDAINED BY THE [COUNCIL] OF [COMMUNITY] the following:

Section 1. The [Council] hereby makes and adopts the determinations and findings contained in the recitals set forth above.

Section 2. Title [xx] Chapter [xx] of the Code of Ordinances, [Community], Colorado, is hereby repealed and replaced with the following.

INTERNATIONAL RESIDENTIAL CODE

Section xx. The International Residential Code, 2021 Edition, (the "2021 IRC"), as published by the International Code Council, 500 New Jersey Avenue, NW, 6th Floor, Washington, DC 20001, a copy of which is on file and open for inspection in the office of the [city/town/county] clerk, is hereby adopted by reference subject to the additions, amendments, and appendices set forth herein. The 2021 IRC includes the new Appendix RD as set forth below.

The 2021 IRC is amended as follows:

1. **Chapter 11 [RE] ENERGY EFFICIENCY** is hereby deleted in its entirety and all provisions for energy efficiency shall comply with the currently adopted International Energy Conservation Code, residential provisions, and its local amendments because the language of this chapter is duplicated therein.

INTERNATIONAL ENERGY CONSERVATION CODE

Section xx. The International Energy Conservation Code, 2021 Edition, (the "IECC"), as published by the International Code Council, 500 New Jersey Avenue, NW, 6th Floor, Washington, DC 20001, a copy of which is on file and open for inspection in the office of the [city/town/county] clerk, is hereby adopted by reference subject to the additions, amendments, and appendices set forth herein. The IECC includes appendices CB and RB by the International Code Council, and new appendices CD and RD as set forth below. The subject matter of the IECC includes the design of energy-efficient and high-performance buildings and related energy uses including mechanical, lighting, power systems, and electric vehicle infrastructure for the purpose of protecting the public health, safety and welfare. The 2021 IECC, as amended in this Article, shall apply to all property within the [Community].

The IECC is amended as follows:

COMMERCIAL

2. Section C101.1 Title is retained in its entirety with the following amendments:

C101.1 Title. This code shall be known as the International Energy Conservation Code of [City/Town/County], and shall be cited as such. It is referred to herein as "this code" or "the IECC."

This ensures fuel source, electric-ready, solar-ready, and EV-ready are shown on the construction documents. Since some of these are new elements, this also helps with compliance. (Matches Fort Collins.)

3. **Section C103.2 Information on construction documents**, is amended by modifying item 6 and adding items 14, 15, and 16 as follows:
 6. Mechanical and service water heating systems and equipment types, sizes, fuel source, and efficiencies.
 14. Details of additional electric infrastructure, including branch circuits, conduit, or pre-wiring, and panel capacity in compliance with the provisions of this code.
 15. Location of pathways for routing of raceways or cable from the solar ready zone to the electrical service panel.
 16. Location of designated EVSE spaces, EVSE Universal spaces, EV-Ready spaces, and EV-Capable spaces in parking facilities.

This adds the electric-ready infrastructure to inspection.

4. Section C105.2.5 Electrical system is amended to read:

C105.2.5 Electrical system. Inspection shall verify lighting system controls, components, ~~and~~ meters, and additional electric infrastructure, as required by the code, *approved* plans and specifications.

This adds definitions to accommodate all-electric building (matches Superior) and demand response, as well as horticulture lighting. (Approved by 2024 IECC Commercial Consensus Committee.)

5. **Section C202 GENERAL DEFINITIONS** is amended to add or revise the following definitions in alphabetical order:

ALL-ELECTRIC BUILDING. A building and building site that contains no *combustion equipment*, or plumbing for *combustion equipment*, and that uses heat pump technology as the primary supply for heating, cooling, and service water heating loads.

COMBUSTION EQUIPMENT: Any equipment or appliances used for space heating, cooling, water heating (including pools and spas), cooking, clothes drying or lighting that uses natural gas, propane, other fuel gas, or fuel oil.

DEMAND RESPONSIVE CONTROL. An automatic control that can receive and automatically respond to demand response requests from a utility, electrical system operator, or third-party demand response program provider.

HORTICULTURAL LIGHTING. Electric lighting used for horticultural production, cultivation or maintenance.

MIXED-FUEL BUILDING. A building and building site that contains *combustion equipment*, or plumbing for *combustion equipment*, for space heating, cooling, water heating (including pools and spas), cooking, or clothes drying.

PHOTOSYNTHETIC PHOTON EFFICACY (PPE). Photosynthetic photon flux emitted by a light source divided by its electrical input power in units of micromoles per second per watt, or micromoles per joule (μmol/J) between 400-700nm as defined by ANSI/ASABE S640.

This adds electric-ready and electric-preferred for commercial buildings selecting the Total Building Performance path.

6. Section C401.2.1 International Energy Conservation Code, item 2, is amended to read as follows:

2. Total Building Performance. The Total Building Performance option requires compliance with Section C407 and, for mixed fuel buildings, Section C405.13 and 10 credits from Tables C406.1(1) through C406.1(5).

This adds electric-ready and electric-preferred for commercial buildings selecting ASHRAE 90.1.

7. Section C401.2.2 ASHRAE 90.1 is amended to read as follows:

C401.2.2 ASHRAE 90.1. Commercial buildings shall comply with the requirements of ANSI/ASHRAE/IESNA 90.1 and, for mixed fuel buildings, Section C405.13 and 10 credits from Tables C406.1(1) through C406.1(5).

This expands the cool roof requirement to climate zone 5. Note: This doesn't impact solar panels, skylights, mechanical equipment, rooftop amenities, vegetative roofs, etc. and it doesn't apply to roof repairs, recoverings, or replacements.

8. Section C402.3 Roof solar reflectance and thermal emittance, first sentence, is amended as follows, with the other parts of the section to remain:

C402.3 Roof solar reflectance and thermal emittance. Low-sloped roofs directly above conditioned spaces in ~~Climate Zones 0 through 3~~ shall comply with one or more of the options in Table C402.3.

This ensures that renewable energy used to meet the exemption is not also double-counted towards compliance with C406.

9. C404.2.1 High input service water-heating systems, item 1 under exceptions, is amended as follows with the other exceptions to remain:

C404.2.1 High input service water-heating systems. Gas-fired water-heating equipment installed in new buildings shall be in compliance with this section. Where a singular piece of water-heating equipment serves the entire building and the input rating of the equipment is 1,000,000 Btu/h (293 kW) or greater, such equipment shall have a thermal efficiency, Et, of not less than 92 percent. Where multiple pieces of water-heating equipment serve the building and the combined input rating of the water-heating equipment is 1,000,000 Btu/h (293 kW) or greater, the combined input-capacity-weighted-average thermal efficiency, Et, shall not be less than 90 percent.

Exceptions:

1. Where not less than 50 percent of the annual *service water heating* requirement is provided by *on-site renewable energy* or site-recovered energy not including any capacity used for compliance with Section C406 of this code, the minimum thermal efficiency requirements of this section shall not apply.

This is part of electric-ready. It ensures sufficient physical space for future electric water heating systems. It only applies to water heaters with a clear path to electrification presently and exempts systems that don't. (Matches Denver.)

10. Section C404.10 is added as follows:

C404.10 Water heating equipment location. Water heaters with *combustion equipment* shall be located in a space with the following characteristics:

1. Minimum dimensions of 3 feet by 3 feet by 7 feet high.
2. Minimum volume of 760 cubic feet, or the equivalent of one 16-inch by 24-inch grill to a heated space and one 8-inch duct of no more than 10 feet in length for cool exhaust air.
3. Contains a condensate drain that is no more than 2 inches higher than the base of the installed water heater and allows natural draining without pump assistance, installed within 3 feet of the water heater.

Exceptions:

1. Instantaneous water heaters located within 10 feet of the point of use.
2. Water heats with an input capacity of more than 300,000 Btu/h.

Given the very high energy use of indoor agriculture, in particular marijuana grow facilities, this helps improve the efficiency of the lighting. (Approved by 2024 IECC Commercial Consensus Committee.)

11. Section C405.4 Lighting for plant growth and maintenance is re-titled “Horticultural Lighting” and amended to read as follows:

C405.4 Lighting for plant growth and maintenance. Horticultural Lighting. ~~Not less than 95 percent of the luminaires used for plant growth and maintenance shall have a photon efficiency of not less than 1.6 $\mu\text{mol/J}$ as defined in accordance with ANSI/ASABE S640. Permanently installed luminaires shall have a *photosynthetic photon efficacy* of not less than 1.7 $\mu\text{mol/J}$ for horticultural lighting in greenhouses and not less than 1.9 $\mu\text{mol/J}$ for all other horticultural lighting. Luminaires for horticultural lighting in greenhouses shall be controlled by a device that automatically turns off the luminaire when sufficient daylight is available. Luminaires for horticultural lighting shall be controlled by a device that automatically turns off the luminaire at specific programmed times.~~

This disallows gas-powered lighting. Gas lighting is rarely used anymore, but this adds assurance that it can't be. (Matches Superior).

12. Section C405.5.3 Gas lighting is amended to read as follows:

Section C405.5.3. Gas lighting. Gas fired lighting appliances ~~shall not be equipped with continuously burning pilot ignition systems~~ are not permitted.

Adding a category for monitoring EV charging separately allows the building load to be measured independently from this non-building load. This will be critical with the wider adoption of Building Performance Standards or other existing building energy use policies as it will allow EV charging to be easily excluded from the building loads for the purposes of regulating actual energy use in buildings. (Approved for the 2024 IECC by the full Commercial Consensus Committee.)

13. **Table C405.12.2 ENERGY USE CATEGORIES** is amended to add a new line at the end:

<u>Electric vehicle charging</u>	<u>Electric vehicle charging loads.</u>
----------------------------------	---

This adds electric-ready wiring for combustion equipment. (Matches Denver.)

14. A new Section C405.13 is added to read as follows:

Commented [CB1]: Note: Erie will take this out since marijuana grow facilities are prohibited there.

C405.13 Additional electric infrastructure. All combustion equipment shall be provided with a junction box that is connected to an electrical panel by continuous raceways that meet the following requirements:

1. The junction box, raceway, and bus bar in the electric panel and conductors serving the electric panel shall be sized to accommodate electric equipment sized to serve the same load as the combustion equipment.
2. The panel shall have reserved physical space for a three-pole circuit breaker.
3. The junction box and electrical panel directory entry for the dedicated circuit breaker space shall have labels stating "For future electric equipment."
4. The junction box shall allow for the electric equipment to be installed within the same place of the combustion equipment that it replaces.

Exceptions:

1. Warm air furnaces serving spaces that also have space cooling.
2. Water heating equipment with an input capacity more than 300,000 Btu/h
3. Industrial, manufacturing, laboratory, and high hazard occupancy combustion equipment.

This is the electric-preferred section. To encourage electrification of buildings while allowing for mixed-fuel construction, mixed fuel buildings are required to achieve more efficiency credits (20 instead of 10). (NOTE: This is where a community can go more or less aggressively towards decarbonization and net zero. For example, Denver is proposing ~40 credits for mixed fuel (depending on building type).

15. Section C406.1 Additional energy efficiency credit requirements, first sentence, is amended to read as follows with the other parts of the paragraph and section to remain:

C406.1 Additional energy efficiency credit requirements. New all-electric buildings shall achieve a total of 10 credits and new mixed-fuel buildings shall achieve a total of 20 credits from Tables C406.1(1) through C406.1(5) where the table is selected based on the use group of the building and from credit calculations as specified in relevant subsections of C406.

Continuing with electric preferred, this fixes a problem where fossil fuel water heaters were given more credits than high-efficiency electric. (This problem is also fixed in the 2024 IECC by the Commercial Consensus Committee.)

16. TABLE C406.1(2) ADDITIONAL ENERGY EFFICIENCY CREDITS FOR GROUP R AND I OCCUPANCIES is retained in its entirety, except Sections C406.7.3 and C406.7.4 in Climate Zone 5B only are amended to read as follows:

TABLE C406.1(2)
ADDITIONAL ENERGY EFFICIENCY CREDITS FOR GROUP R AND I OCCUPANCIES

SECTION	CLIMATE ZONE 5B
C406.7.3: Efficient fossil fuel water heater ^b	9 3
C406.7.4: Heat pump water heater ^b	5 9

17. TABLE C406.1(3) ADDITIONAL ENERGY EFFICIENCY CREDITS FOR GROUP E OCCUPANCIES is retained in its entirety, except Sections C406.7.3 and C406.7.4 in Climate Zone 5B only are amended to read as follows:

TABLE C406.1(3)
ADDITIONAL ENERGY EFFICIENCY CREDITS FOR GROUP E OCCUPANCIES

SECTION	CLIMATE ZONE 5B
C406.7.3: Efficient fossil fuel water heater ^a	3 <u>N/A</u>
C406.7.4: Heat pump water heater ^a	4 <u>3</u>

a. For schools with showers or full-service kitchens.

TABLE C406.1(5) ADDITIONAL ENERGY EFFICIENCY CREDITS FOR OTHER OCCUPANCIES is retained in its entirety, except Sections C406.7.3 and C406.7.4 in Climate Zone 5B only are amended to read as follows:

TABLE C406.1(5)
ADDITIONAL ENERGY EFFICIENCY CREDITS FOR OTHER^a OCCUPANCIES

SECTION	CLIMATE ZONE 5B
C406.7.3: Efficient fossil fuel water heater ^b	9 <u>3</u>
C406.7.4: Heat pump water heater ^b	5 <u>9</u>

a. Other occupancies include all groups except Groups B, E, I, M, and R.

b. For occupancy groups listed in Section 406.7.1

This adds the thermal energy certification, slab and radiant heating insulation, and cool roofs to the Total Building Performance pathway, to match the other pathways.

18. TABLE C407.2 REQUIREMENTS FOR TOTAL BUILDING PERFORMANCE is retained in its entirety and amended to add the following items:

TABLE C407.2
REQUIREMENTS FOR TOTAL BUILDING PERFORMANCE

SECTION	TITLE
Envelope	
<u>C401.3</u>	<u>Thermal envelope certificate</u>
<u>C402.2.4</u>	<u>Slabs-on-grade</u>
<u>C402.2.6</u>	<u>Insulation of radiant heating system</u>
<u>C402.3</u>	<u>Roof solar reflectance and thermal emittance</u>

COMMERCIAL APPENDIX CB

This is part of the solar-ready adoption. This amendment fixes the gap for multi-family. (Aligns with Superior.)

19. CB103.1, first sentence, is amended to read as follows, with the exceptions to remain:

CB103.1 General. A solar-ready zone shall be located on the roof of all new buildings that are ~~five stories or less in height above grade plane~~ subject to the commercial provisions of the IECC and that are oriented between 110 degrees and 270 degrees of true north or have low-slope roofs. Solar-ready zones shall comply with Sections CB103.2 through CB103.9.

COMMERCIAL APPENDIX CD

This is the EV-ready appendix for commercial and commercial multi-family (four stories and greater). (Mostly matches the version approved by the 2024 IECC Commercial Consensus Committee and Denver's 2021 IECC Technical Advisory Committee.¹)

20. Add Appendix CD to read as follows:

APPENDIX CD EV READINESS - COMMERCIAL

CD101. Purpose and intent. The purpose and intent of this Appendix CD is to accommodate the growing need for EV charging infrastructure. Including these measures during initial commercial construction substantially reduces the costs and difficulty of installing EV infrastructure at a later date.

CD102. Applicability. This Appendix CD shall apply to all new commercial construction to which the current International Building Code applies.

Section CD103. Definitions.

AUTOMOBILE PARKING SPACE. A space within a building or private or public parking lot, exclusive of driveways, ramps, columns, office, and work areas, for the parking of an automobile.

DIRECT CURRENT FAST CHARGING (DCFC) EVSE: EV power transfer infrastructure capable of fast charging on a 100A or higher 480VAC three-phase branch circuit. AC power is converted into a controlled DC voltage and current within the *EVSE* that will then directly charge the *electric vehicle*.

EV LOAD MANAGEMENT SYSTEM: A system designed to allocate charging capacity among multiple *EVSE* and that complies with the current National Electric Code.

¹ Groups A (Assembly) and M (Mercantile) match Denver's (10%/5%/10%) rather than the 2024 (10%/0%/10%). Group B (Business) matches Denver (10%/5%/10%) rather than the 2024 (15%/0%/30%). Group E (Education) matches Denver's (10%/5%/10%) rather than the 2024 (2%/0%/5%). Groups R-1 and R-2 match Denver's (10%/5%/40%) rather than the 2024 (20%/5%/75%). Compared to both, this appendix adds extra flexibility to "trade up" to more valuable charging infrastructure, at the owner/developer's discretion.

ELECTRIC VEHICLE (EV). An automotive-type vehicle for on-road use, such as passenger automobiles, buses, trucks, vans, neighborhood *electric vehicles*, and electric motorcycles, primarily powered by an electric motor that draws current from an electric source.

ELECTRIC VEHICLE SUPPLY EQUIPMENT (EVSE). Equipment for plug-in power transfer including the ungrounded, grounded, and equipment grounding conductors, and the *electric vehicle* connectors, attachment plugs, personal protection system and all other fittings, devices, power outlets or apparatus installed specifically for the purpose of transferring energy between the premises wiring and the *electric vehicle*.

ELECTRIC VEHICLE SUPPLY EQUIPMENT INSTALLED SPACE (EVSE space). An automobile parking space that is provided with a dedicated *EVSE* connection.

ELECTRIC VEHICLE CAPABLE SPACE (EV CAPABLE SPACE). A designated automobile parking space that is provided with electrical infrastructure, such as, but not limited to, raceways, cables, electrical capacity, and panelboard or other electrical distribution equipment space, necessary for the future installation of an *EVSE*.

ELECTRIC VEHICLE READY SPACE (EV READY SPACE). An automobile parking space that is provided with a branch circuit and either an outlet, junction box or receptacle, that will support an installed *EVSE*.

UNIVERSAL VEHICLE CHARGING STATION. A charging station installed in a parking space for a minimum vehicle width of 120 inches (3048 mm) with 36 inch access aisles (915 mm) on each side.

CD104 Electric vehicle power transfer infrastructure. New parking facilities shall be provided with *electric vehicle* power transfer infrastructure in compliance with Sections CD104.1 through CD104.6, CD105, and CD106.

CD104.1 Quantity. The number of required *EVSE* spaces, *EV ready* spaces, and *EV capable* spaces shall be determined in accordance with this Section and Table CD104.1 based on the total number of *automobile parking spaces* and shall be rounded up to the nearest whole number. For R-2 buildings, the Table requirements shall be based on the total number of dwelling units or the total number of *automobile parking spaces*, whichever is less.

1. Where more than one parking facility is provided on a building site, the number of required *automobile parking spaces* required to have EV power transfer infrastructure shall be calculated separately for each parking facility.
2. Where one shared parking facility serves multiple building occupancies, the required number of spaces shall be determined proportionally based on the floor area of each building occupancy.
3. Installed *EVSE* spaces that exceed the minimum requirements of this section may be used to meet minimum requirements for *EV ready* spaces and *EV capable* spaces.
4. Installed *EV ready* spaces that exceed the minimum requirements of this section may be used to meet minimum requirements for *EV capable* spaces.
5. Where the number of *EV ready* spaces allocated for R-2 occupancies is equal to the number of dwelling units or to the number of *automobile parking spaces*, whichever is less, requirements for *EVSE* spaces for R-2 occupancies shall not apply.
6. In commercial multi-family (R-2, R-3, and R-4) complexes, four stories or greater, that contain multiple buildings, required EV spaces shall be dispersed throughout parking areas so that each building has access to a similar number of spaces per dwelling unit.

7. Requirements for a Group S-2 parking garage shall be determined by the occupancies served by that parking garage. Where new *automobile parking spaces* do not serve specific occupancies, the values for Group S-2 parking garage in Table CD104.1 shall be used.
8. Direct Current Fast Charging. The number of *EVSE* spaces for Groups A, B, E, I, M and S-2 Occupancies may be reduced by up to ten per *DCFC EVSE* provided that the building includes not less than one parking space equipped with a *DCFC EVSE* and not less than one *EV ready* space. A maximum of fifty spaces may be reduced from the total number of *EVSE* spaces.

Exception: Parking facilities, serving occupancies other than R-2 with fewer than 10 *automobile parking spaces*.

TABLE CD104.1
REQUIRED EV POWER TRANSFER INFRASTRUCTURE

BUILDING TYPE	MINIMUM EV INSTALLED SPACES	MINIMUM EV READY SPACES	MINIMUM EV CAPABLE SPACES
Group A, B, E, M	10%	5%	10%
Group F, I, R-3, R-4	2%	0%	5%
Group R-1 and R-2 ^a	15%	5%	40%
Group S-2 Parking Garages	10%	5%	0%

a. Where all (100%) parking serving R-2 occupancies are *EV ready* spaces, requirements for *EVSE* spaces for R-2 occupancies shall not apply.

CD104.2 EV capable spaces. Each *EV capable* space used to meet the requirements of Section CD104.1 shall comply with all of the following:

1. A continuous raceway or cable assembly shall be installed between an enclosure or outlet located within 3 feet (914 mm) of the *EV capable* space and a suitable panelboard or other onsite electrical distribution equipment.
2. Installed raceway or cable assembly shall be sized and rated to supply a minimum circuit capacity in accordance with CD104.5
3. The electrical distribution equipment to which the raceway or cable assembly connects shall have sufficient dedicated space and spare electrical capacity for a 2-pole circuit breaker or set of fuses.
4. The electrical enclosure or outlet and the electrical distribution equipment directory shall be marked: "For future electric vehicle supply equipment (EVSE)."
5. Reserved capacity shall be no less than 4.1 kVA (20A 208/240V) for each *EV capable* space.

CD104.3 EV ready spaces. Each branch circuit serving *EV ready* spaces used to meet the requirements of Section CD104.1 shall comply with all of the following:

1. Terminate at an outlet or enclosure, located within 3 feet (914 mm) of each *EV ready* space it serves.
2. Have a minimum circuit capacity in accordance with CD104.5.

3. The panelboard or other electrical distribution equipment directory shall designate the branch circuit as "For electric vehicle supply equipment (EVSE)" and the outlet or enclosure shall be marked "For electric vehicle supply equipment (EVSE)."

CD104.4 EVSE spaces. An installed *EVSE* with multiple output connections shall be permitted to serve multiple *EVSE* spaces. Each *EVSE* installed to meet the requirements of Section CD104.1, serving either a single *EVSE* space or multiple *EVSE* spaces, shall comply with all of the following:

1. Have a minimum circuit capacity in accordance with CD104.5.
2. Have a minimum charging rate in accordance with CD104.4.1.
3. Be located within 3 feet (914 mm) of each *EVSE* space it serves.
4. Be installed in accordance with Section CD104.6 and CD104.7.

CD104.4.1 EVSE minimum charging rate. Each installed *EVSE* shall comply with one of the following:

1. Be capable of charging at a minimum rate of 6.2 kVA (or 30A at 208/240V).
2. When serving multiple *EVSE* spaces and controlled by an energy management system providing load management, be capable of simultaneously charging each *EVSE* space at a minimum rate of no less than 3.3 kVA.
3. When serving *EVSE* spaces allowed to have a minimum circuit capacity of 2.7 kVA in accordance with CD104.5.1 and controlled by an energy management system providing load management, be capable of simultaneously charging each *EVSE* space at a minimum rate of no less than 2.1 kVA.

CD104.5 Circuit capacity. The capacity of electrical infrastructure serving each *EV capable* space, *EV ready* space, and *EVSE* space shall comply with one of the following:

1. A branch circuit shall have a rated capacity not less than 8.3 kVA (or 40A at 208/240V) for each *EV ready* space or *EVSE* space it serves.
2. The requirements of CD104.5.1.

CD104.5.1 Circuit capacity management. The capacity of each branch circuit serving multiple *EVSE* spaces, *EV ready* spaces or *EV capable* spaces designed to be controlled by an energy management system providing load management in accordance with NFPA 70, shall comply with one of the following:

1. Have a minimum capacity of 4.1 kVA per space.
2. Have a minimum capacity of 2.7 kVA per space when serving *EV ready* spaces or *EVSE* spaces for a building site where all (100%) of the automobile parking spaces are designed to be *EV ready* or *EVSE* spaces.

CD104.6 EVSE installation. *EVSE* shall be installed in accordance with NFPA 70 and shall be listed and labeled in accordance with UL 2202 or UL 2594.

CD104.7. EVSE ENERGY STAR. All *EVSE* shall be ENERGY STAR certified.

CD105. Universal vehicle charging stations. Where *electric vehicle* charging stations are provided for public use, or where *electric vehicle* charging stations are shared by multiple multi-family dwelling units, the number of universal vehicle charging stations shall be provided in accordance with Table CD104.1. When multiple stalls are required, access aisles may be shared.

**TABLE CD105.1
UNIVERSAL EV SPACE REQUIREMENTS**

TOTAL # OF EV CHARGING STATIONS	MINIMUM # OF UNIVERSAL VEHICLE CHARGING STATIONS
1 or more	25%

CD106. Identification. Construction documents shall designate all *EV capable* spaces, *EV ready* spaces and *EVSE* spaces and indicate the locations of conduit and termination points serving them. The circuit breakers or circuit breaker spaces reserved for the *EV capable* spaces, *EV ready* spaces, and *EVSE* spaces shall be clearly identified in the panel board directory. The conduit for *EV capable* spaces shall be clearly identified at both the panel board and the termination point at the parking space.

RESIDENTIAL

21. Section R101.1 Title is retained in its entirety with the following amendments:

R101.1 Title. This code shall be known as the International Energy Conservation Code of [City/Town/County], and shall be cited as such. It is referred to herein as “this code” or “the IECC.”

This ensures fuel source, electric-ready, solar-ready, and EV-ready are shown on the construction documents. Since some of these are new elements, this also helps with compliance. (Matches Fort Collins.)

22. **Section R103.2 Information on construction documents,** is amended by modifying item 6 and adding items 10, 11, and 12 as follows:

- 6. Mechanical and service water heating systems and equipment types, sizes, fuel source, and efficiencies.
- 10. Details of additional electric infrastructure, including branch circuits, conduit, or pre-wiring, and panel capacity in compliance with the provisions of this code.
- 11. Location of pathways for routing of raceways or cable from the solar ready zone to the electrical service panel.
- 12. Location of designated EVSE spaces, EVSE Universal spaces, EV-Ready spaces, and EV-Capable spaces in parking facilities, as applicable.

This adds definitions to accommodate all-electric buildings. (Matches Superior.)

23. **Section R202 GENERAL DEFINITIONS** is amended to add the following definitions in alphabetical order:

ALL-ELECTRIC BUILDING. A *building* and building site that contains no *combustion equipment*, or plumbing for *combustion equipment*, and that uses heat pump technology as the primary supply for heating, cooling, and service water heating loads.

COMBUSTION EQUIPMENT: Any equipment or appliances used for space heating, cooling, water heating (including pools and spas), cooking, clothes drying or lighting that uses natural gas, propane, other fuel gas, or fuel oil.

MIXED-FUEL BUILDING. A *building* and building site that contains *combustion equipment*, or plumbing for *combustion equipment*, for space heating, cooling, water heating (including pools and spas), cooking, or clothes drying.

This encourages electrification and more evenly weighs the impact of the additional efficiency credits by requiring a mixed-fuel home to select three packages whereas an all-electric home selects one. Of the three packages required for the mixed-fuel home, one must address the envelope (improved envelope or reduced infiltration plus better ventilation) while the remaining two impact HVAC (better equipment or more efficient ducts) and water-heating (better equipment) requirements.

24. Section R401.2.5 Additional energy efficiency is amended as follows:

R401.2.5 Additional energy efficiency. This section establishes additional requirements applicable to all compliance approaches to achieve additional energy efficiency.

1. For buildings complying with Section R401.2.1, ~~one of the additional efficiency package options shall be installed according to Section R408.2~~ the building shall meet one of the following:
 - 1.1. For all-electric buildings, one of the additional efficiency package options shall be installed according to Section R408.2.
 - 2.2. For mixed-fuel buildings, three of the additional efficiency packages shall be installed, at least one of which addresses the envelope.
2. For buildings complying with Section R401.2.2, the building shall meet one of the following:
 - 2.1. For all-electric buildings, one of the additional efficiency package options in Section R408.2 shall be installed without including such measures in the proposed design under Section R405.
 - 2.2. For mixed-fuel buildings, three of the additional efficiency packages shall be installed, at least one of which addresses the envelope, without including such measures in the proposed design under Section R405.
 - 2.3. For all-electric buildings, the proposed design of the building under Section R405.3 shall have an annual energy cost that is less than or equal to 95 percent of the annual energy cost of the standard reference design.
 - 2.4. For mixed-fuel buildings, the proposed design of the building under Section R405.3 shall have an annual energy cost that is less than or equal to 80 percent of the annual energy cost of the standard reference design.
3. For buildings complying with the Energy Rating Index alternative Section R401.2.3, the Energy Rating Index value shall be at least 5 percent less than the Energy Rating Index target specified in Table R406.5.

The options selected for compliance shall be identified in the certificate required by Section R401.3.

This adds fuel sources, solar-ready, and electric-ready information to the certificate.

25. Section R401.3 Certificate, item 4, is amended and new items 8, 9, and 10 are added as follows:

R401.3 Certificate. A permanent certificate shall be completed by the builder or other approved party and posted on a wall in the space where the furnace is located, a utility room or an approved location inside the building. Where located on an electrical panel, the certificate shall not cover or obstruct the visibility of the circuit directory label, service disconnect label or other required labels. The certification shall indicate the following:

4. The types, sizes, fuel sources, and efficiencies of heating, cooling and service water heating equipment. Where a gas-fired unvented room heater, electric furnace or baseboard electric heater is installed in the residence, the certificate shall indicate “gas-fired unvented room heater,” “electric furnace” or “baseboard electric heater,” as appropriate. An efficiency shall not be indicated for gas-fired unvented room heaters, electric furnaces and electric baseboard heaters.
8. The fuel sources for cooking and clothes drying equipment.
9. Where combustion equipment is installed, the certificate shall indicate information on the installation of additional electric infrastructure including which equipment and/or appliances include additional electric infrastructure, capacity reserved on the electrical service panel for replacement of each piece of combustion equipment and/or appliance
10. Where a solar-ready zone is provided, the certificate shall indicate the location, dimensions, and capacity reserved on the electrical service panel.

This and the next are part of electric-ready. They ensure sufficient physical space for future electric water heating systems. (Matches Denver.)

26. Section R403.5 Service hot water systems is amended as follows:

R403.5 Service hot water systems. Energy conservation measures for service hot water systems shall be in accordance with Sections R403.5.1 through ~~R403.5.3~~ R403.5.4.

27. Section R403.5.4 Water heating equipment location is added as follows:

R403.5.4 Water heating equipment location. Water heaters with *combustion equipment* shall be located in a space with the following characteristics:

1. Minimum dimensions of 3 feet by 3 feet by 7 feet high.
2. Minimum volume of 760 cubic feet, or the equivalent of one 16-inch by 24-inch grill to a heated space and one 8-inch duct of no more than 10 feet in length for cool exhaust air.
3. Contains a condensate drain that is no more than 2 inches higher than the base of the installed water heater and allows natural draining without pump assistance, installed within 3 feet of the water heater.

Exceptions:

1. Water heaters with an input capacity of greater than 300,000 Btu/h that serves multiple dwelling units or sleeping units.

This prohibits fuel gas lighting. This type of lighting is rare. (Matches Superior.)

28. Section R404.1.1 Fuel gas lighting is amended to read as follows:

Section R404.1.1. Fuel gas lighting. Fuel gas lighting systems are prohibited.

This adds electric-ready wiring for combustion equipment. (Aligns with Superior, Denver, and Fort Collins.)

29. A new Section R404.4 Additional electric infrastructure is added as follows:

R404.4 Additional electric infrastructure. All *combustion equipment* shall be installed in accordance with Section R403.5.4 and shall be provided with a junction box that is connected to an electrical panel by continuous raceways that meet the following requirements:

1. The junction box, raceway, and bus bar in the electric panel and conductors serving the electric panel shall be sized to accommodate electric equipment sized to serve the same load as the *combustion equipment*.
2. The panel shall have reserved physical space for a dual-pole circuit breaker.
3. The junction box and electrical panel directory entry for the dedicated circuit breaker space shall have labels stating “For future electric equipment.”
4. The junction box shall allow for the electric equipment to be installed within the same place of the *combustion equipment* that it replaces.

Exceptions:

1. Fossil fuel space heating equipment where a 208/240-volt electrical circuit with a minimum capacity of 40 amps exists for space cooling equipment.
2. Water heating equipment with an input capacity greater than 300,000 Btu/h that serves multiple dwelling units or sleeping units.

This adds electric-ready to the Total Building Performance table.

30. Table R405.2 Requirements for Total Building Performance adds a new row under Mechanical and a new row under Electrical Power and Lighting Systems as follows:

TABLE R405.2 REQUIREMENTS FOR TOTAL BUILDING PERFORMANCE

SECTION	TITLE
Mechanical	
<u>R403.5.4</u>	<u>Water heating equipment location</u>
Electrical Power and Lighting Systems	
<u>R404.4</u>	<u>Additional electric infrastructure</u>

This clarifies that the ERI can use the HERS Index.

31. Section R406.2 ERI compliance, first paragraph, is amended to read as follows with the other parts of the section to remain:

R406.2 ERI compliance. Compliance based on the ERI, utilizing the HERS Index Score, requires that the rated design meets all of the following:

1. The requirements of the sections indicated within Table R406.2.
2. The maximum ERI of Table R406.5.

This adds electric-ready to the ERI mandatory requirements table.

32. Table R406.2 Requirements for Energy Rating Index adds a new row under Mechanical and a new row under Electrical Power and Lighting Systems as follows:

TABLE R406.2 REQUIREMENTS FOR ENERGY RATING INDEX

SECTION	TITLE
Mechanical	
<u>R403.5.4</u>	<u>Water heating equipment</u>
Electrical Power and Lighting Systems	
<u>R404.4</u>	<u>Additional electric infrastructure</u>

This incorporates electric-preferred into the ERI path.

33. Section R406.5 ERI-based compliance is amended as follows:

R406.5 ERI-based compliance. Compliance based on an ERI analysis requires that the rated proposed design and confirmed built dwelling be shown to have an ERI less than or equal to the appropriate value for the proposed all-electric or mixed-fuel building as indicated in Table R406.4 when compared to the ERI reference design.

TABLE R406.5 MAXIMUM ENERGY RATING INDEX

CLIMATE ZONE	ALL-ELECTRIC BUILDING	<u>MIXED FUEL BUILDING</u>
5	55	<u>50</u>

RESIDENTIAL APPENDIX RB

This is part of the solar-ready adoption. These two amendments, along with a similar amendment in Appendix CB, fixes the gap for multi-family. (Aligns with Superior).

34. Appendix RB Title is amended to read: “**Appendix RB Solar Ready Provisions.**”

35. RB103.1, first sentence, is amended as follows, with the rest of the section remaining:

RB103.1 General. New ~~detached one- and two-family dwellings, and townhouses~~ residential buildings with not less than 600 square feet (55.74 m²) of roof area oriented between 110 degrees and 270 degrees of true north shall comply with Sections RB103.2 through RB103.8.

This is the EV-ready appendix for residential, including multi-family three stories or less.

36. Add Appendix RD to read as follows:

APPENDIX RD EV READINESS - RESIDENTIAL

RD101. Purpose and intent. The purpose and intent of this Appendix RD is to accommodate the growing need for EV charging infrastructure, in particular meeting preferences for charging at home. Including these measures during initial construction substantially reduces the costs and difficulty of installing EV infrastructure at a later date.

RD102. Applicability. This Appendix RD shall apply to all new residential construction to which the International Residential Code applies.

RD103. Definitions.

AUTOMOBILE PARKING SPACE. A space within a building or private or public parking lot, exclusive of driveways, ramps, columns, office, and work areas, for the parking of an automobile.

DIRECT CURRENT FAST CHARGING (DCFC) EVSE: EV power transfer infrastructure capable of fast charging on a 100A or higher 480VAC three-phase branch circuit. AC power is converted into a controlled DC voltage and current within the *EVSE* that will then directly charge the *electric vehicle*.

EV LOAD MANAGEMENT SYSTEM: A system designed to allocate charging capacity among multiple *EVSE* and that complies with the current National Electric Code.

ELECTRIC VEHICLE (EV). An automotive-type vehicle for on-road use, such as passenger automobiles, buses, trucks, vans, neighborhood *electric vehicles*, and electric motorcycles, primarily powered by an electric motor that draws current from an electric source.

ELECTRIC VEHICLE SUPPLY EQUIPMENT (EVSE). Equipment for plug-in power transfer including the ungrounded, grounded, and equipment grounding conductors, and the *electric vehicle* connectors, attachment plugs, personal protection system and all other fittings, devices, power outlets or apparatus installed specifically for the purpose of transferring energy between the premises wiring and the *electric vehicle*.

ELECTRIC VEHICLE SUPPLY EQUIPMENT INSTALLED SPACE (EVSE space). An automobile parking space that is provided with a dedicated *EVSE* connection.

ELECTRIC VEHICLE CAPABLE SPACE (EV CAPABLE SPACE). A designated automobile parking space that is provided with electrical infrastructure, such as, but not limited to, raceways, cables, electrical capacity, and panelboard or other electrical distribution equipment space, necessary for the future installation of an *EVSE*.

ELECTRIC VEHICLE READY SPACE (EV READY SPACE). An automobile parking space that is provided with a branch circuit and either an outlet, junction box or receptacle, that will support an installed *EVSE*.

UNIVERSAL VEHICLE CHARGING STATION. A charging station installed in a parking space for a minimum vehicle width of 120 inches (3048 mm) with 36 inch access aisles (915 mm) on each side.

RD104 One- and two- family dwellings and townhouses. One *EV ready* space shall be provided for each dwelling unit. The branch circuit shall be identified as *EV ready* in the service panel or subpanel directory, and the termination location shall be marked as *EV ready*.

Exception: Dwelling units where no parking spaces are either required or provided.

RD105 Residential multi-family dwellings, 3-stories or less. New dwelling units for residential multi-family buildings, other than duplexes and townhomes, shall be provided with *electric vehicle* power transfer infrastructure in compliance with Sections RD105.1 through RD105.6 and Sections RD106 through RD107.

RD105.1 Quantity. The number of required *EVSE* spaces, *EV ready* spaces, and *EV capable* spaces shall be determined in accordance with this Section and Table RD105.1 based on the total number of *automobile parking spaces* and shall be rounded up to the nearest whole number. For R-2 buildings, the Table requirements shall be based on the total number of dwelling units or the total number of *automobile parking spaces*, whichever is less.

1. Where more than one parking facility is provided on a building site, the number of required *automobile parking spaces* required to have EV power transfer infrastructure shall be calculated separately for each parking facility.
2. Installed *EVSE* spaces that exceed the minimum requirements of this section may be used to meet minimum requirements for *EV ready* spaces and *EV capable* spaces.
3. Installed *EV ready* spaces that exceed the minimum requirements of this section may be used to meet minimum requirements for *EV capable* spaces.
4. Where the number of *EV ready* spaces allocated for R-2 occupancies is equal to the number of dwelling units or to the number of *automobile parking spaces* allocated to R-2 occupancies, whichever is less, requirements for *EVSE* spaces for R-2 occupancies shall not apply.
5. In residential multi-family complexes that contain multiple buildings, required EV spaces shall be dispersed throughout parking areas so that each building has access to a similar number of spaces per dwelling unit.

**TABLE RD105.1
REQUIRED EV POWER TRANSFER INFRASTRUCTURE FOR MULTI-FAMILY**

BUILDING TYPE	MINIMUM EV INSTALLED SPACES	MINIMUM EV READY SPACES	MINIMUM EV CAPABLE SPACES
Group R-1 and R-2 ^a	15%	5%	40%
Group R-3 and R-4	2%	0%	5%

a. Where all (100%) parking serving R-2 occupancies are EV ready spaces, requirements for *EVSE* spaces for R-2 occupancies shall not apply.

RD105.2 EV capable spaces. Each *EV capable* space used to meet the requirements of Section RD105.1 shall comply with all of the following:

1. A continuous raceway or cable assembly shall be installed between an enclosure or outlet located within 3 feet (914 mm) of the *EV capable* space and a suitable panelboard or other onsite electrical distribution equipment.
2. Installed raceway or cable assembly shall be sized and rated to supply a minimum circuit capacity in accordance with RD105.5
3. The electrical distribution equipment to which the raceway or cable assembly connects shall have sufficient dedicated space and spare electrical capacity for a 2-pole circuit breaker or set of fuses.
4. The electrical enclosure or outlet and the electrical distribution equipment directory shall be marked: "For future electric vehicle supply equipment (EVSE)."

5. Reserved capacity shall be no less than 4.1 kVA (20A 208/240V) for each *EV capable* space.

RD105.3 EV ready spaces. Each branch circuit serving *EV ready* spaces used to meet the requirements of Section RD105.1 shall comply with all of the following:

1. Terminate at an outlet or enclosure, located within 3 feet (914 mm) of each *EV ready* space it serves.
2. Have a minimum circuit capacity in accordance with RD105.5.
3. The panelboard or other electrical distribution equipment directory shall designate the branch circuit as "For electric vehicle supply equipment (EVSE)" and the outlet or enclosure shall be marked "For electric vehicle supply equipment (EVSE)."

RD105.4 EVSE spaces. An installed *EVSE* with multiple output connections shall be permitted to serve multiple *EVSE* spaces. Each *EVSE* installed to meet the requirements of Section RD105.1, serving either a single *EVSE* space or multiple *EVSE* spaces, shall comply with all of the following:

1. Have a minimum circuit capacity in accordance with RD105.5.
2. Have a minimum charging rate in accordance with RD105.4.1.
3. Be located within 3 feet (914 mm) of each *EVSE* space it serves.
4. Be installed in accordance with Section RD105.6 and RD105.7

RD105.4.1 EVSE minimum charging rate. Each installed *EVSE* shall comply with one of the following:

1. Be capable of charging at a minimum rate of 6.2 kVA (or 30A at 208/240V).
2. When serving multiple *EVSE* spaces and controlled by an energy management system providing load management, be capable of simultaneously charging each *EVSE* space at a minimum rate of no less than 3.3 kVA.
3. When serving *EVSE* spaces allowed to have a minimum circuit capacity of 2.7 kVA in accordance with RD104.5.1 and controlled by an energy management system providing load management, be capable of simultaneously charging each *EVSE* space at a minimum rate of no less than 2.1 kVA.

RD105.5 Circuit capacity. The capacity of electrical infrastructure serving each *EV capable* space, *EV ready* space, and *EVSE* space shall comply with one of the following:

1. A branch circuit shall have a rated capacity not less than 8.3 kVA (or 40A at 208/240V) for each *EV ready* space or *EVSE* space it serves.
2. The requirements of RD104.5.1.

RD105.5.1 Circuit capacity management. The capacity of each branch circuit serving multiple *EVSE* spaces, *EV ready* spaces or *EV capable* spaces designed to be controlled by an energy management system providing load management in accordance with NFPA 70, shall comply with one of the following:

1. Have a minimum capacity of 4.1 kVA per space.
2. Have a minimum capacity of 2.7 kVA per space when serving *EV ready* spaces or *EVSE* spaces for a building site when all (100%) of the automobile parking spaces are designed to be *EV ready* or *EVSE* spaces.

RD105.6 EVSE installation. *EVSE* shall be installed in accordance with NFPA 70 and shall be listed and labeled in accordance with UL 2202 or UL 2594.

RD105.7. EVSE ENERGY STAR. All *EVSE* shall be ENERGY STAR certified.

RD106. Universal vehicle charging stations. Where *electric vehicle* charging stations are provided for public use, or where *electric vehicle* charging stations are shared by multiple multi-family dwelling units, the number of universal vehicle charging stations shall be provided in accordance with Table RD106.1. When multiple stalls are required, access aisles may be shared.

**TABLE RD106.1
UNIVERSAL EV SPACE REQUIREMENTS**

TOTAL # OF EV CHARGING STATIONS	MINIMUM # OF UNIVERSAL VEHICLE CHARGING STATIONS
1 or more	25%

RD107. Identification. Construction documents shall designate all EV Capable spaces, EV Ready spaces and EV Installed spaces and indicate the locations of conduit and termination points serving them. The circuit breakers or circuit breaker spaces reserved for the EV Capable spaces, EV Ready spaces, and EV Installed spaces shall be clearly identified in the panel board directory. The conduit for EV Capable spaces shall be clearly identified at both the panel board and the termination point at the parking space.

Chapter, 15.18.020 of the Louisville Municipal Code, concerning adoption of appendices to the 2021 International Energy Conservation Code, is hereby amended to read as follows, with new text in underline:

5. Section C401.2.1 International Energy Conservation Code, is hereby deleted and replaced to read as follows:

C401.2.1 International Energy Conservation Code

Commercial buildings shall **be built all-electric unless the fuel gas options of C403.3.2 and the additional electric infrastructure requirements of C405.14 are met. All buildings must comply** with the following:

1. City of Louisville's Prescriptive Compliance. Existing buildings and their building sites shall comply with the The Prescriptive Compliance option which requires compliance with Sections C401.3, C401.4, C402 through C406, and Section C408.
2. New buildings and their building site shall comply with the requirements of Section C407.

Exceptions: the following building types and occupancies shall be exempt.

- a. Laboratories
 - b. Manufacturing facilities
 - c. Industrial processing
 - d. Restaurants
 - e. Hospitals
3. Core and shell buildings shall be required to comply with the provisions of Section C402.1.3 through C402.5 of the 2021 International Energy Conservation Code, as amended by the City. A letter of agreement shall be provided to the City signed by the building owner or its agent stating the tenant spaces shall meet the EUI target established in Table C407.3.1.

Section C407 Total Building Performance, is hereby deleted and replaced to read as follows:

C407.1 Scope. This section established criteria for compliance utilizing ASHRAE 90.1 Appendix G, with modification. This section shall provide the modifications to this standard. All end use load components within and associated with the building and their building sites shall be modeled.

Exception: Energy used to recharge or refuel vehicles shall be excluded from compliance modeling. Energy supplied to vehicle charging shall be submetered.

C407.2 Mandatory. The requirements in this section are mandatory requirements and shall be required in addition to the provisions of ASHRAE 90.1 Appendix G.

C407.3 Compliance. Compliance shall be based on the building performance as determined in accordance with C407.3. Energy use for the proposed design shall be reported to the code official as energy use intensity (EUI) in kBtu/sf/yr.

C407.3.1 Fixed EUI Targets. Buildings and their sites shall demonstrate a fixed energy use intensity (EUI) that meets the established EUI target of Table C407.3.1. Buildings with multiple occupancies listed in Table C407.3.1 shall develop a performance target based on gross square footage area of each occupancy type.

Table C407.3.1 Fixed EUI Targets.

<u>Building Type</u>	<u>Performance Target</u> <u>(kBtu/ft²)</u>
<u>Small Office (>5,000 sq²)</u>	<u>TBD</u>
<u>Medium Office (5,000 – 50,000 sq²)</u>	<u>TBD</u>
<u>Large Office (>50,000 sq²)</u>	<u>TBD</u>
<u>R-2 Occupancy</u>	<u>TBD</u>
<u>R-1 Occupancy</u>	<u>TBD</u>
<u>Business</u>	<u>TBD</u>
<u>Warehouse</u>	<u>TBD</u>
<u>Storage</u>	<u>TBD</u>
<u>Coffee Shops</u>	<u>TBD</u>
<u>Schools</u>	<u>TBD</u>

C407.3.2 Projected performance outcome documentation for permit application. Documentation to verify compliance with this section shall be provided to the code official.

C407.3.2.1 Projected compliance report. Permit submittals shall include a report documenting the proposed design is projected to meet the EUI target in accordance with ASHRAE 90.1 Appendix G. The compliance report shall include the following specific information beyond the information required in ASHRAE 90.1 Appendix G:

1. Address of the building
2. An inspection checklist documenting the building component characteristics of the proposed design.
3. Name of individual completing the report
4. Name and version of compliance software tool.
5. Documentation of the reduction in energy use associated with on-site energy

C407.3.2.2 Construction plan requirements. Construction plans shall depict all component characteristics of the proposed design utilized for the EUI in accordance with ASHRAE 90.1 Appendix G.

C407.3.3 Measured performance. Projects shall demonstrate compliance with this code by documenting that the building has achieved the EUI performance calculated based on metered energy use after occupancy.

C407.3.3.1 Demonstration of operating energy use. Metered energy data shall be reported to the building official using Energy Star Portfolio Manager, and adjusted for the percentage of floor area occupied. While at least 75 percent occupied, the building shall operate at or below its assigned energy use target established in Section C407.3.1 for any recording period of 12 consecutive months that is completed within three years of the date of the Certificate of Occupancy. The owner shall notify the building official when this 12- month period has been successfully completed.

C407.3.4 Solar requirements. On-site renewable energy generated by a system installed as part of this project that is used by the building shall be subtracted from the proposed design energy consumption prior to calculating the proposed building performance.

C407.4 Energy monitoring All projects must install submetering or monitoring capabilities to support building energy performance analysis. The project must include capabilities to store and access a 24-month continuous data set on an ongoing basis.

C407.4.1 Individual fuel sources. All fuel sources serving the building must be separately metered. Individual meters used to comply with this section may not serve multiple buildings.

C407.4.2 On-site renewable energy production. Energy production from on-site renewable energy systems must be independently metered.

C407.4.3 End-use metering. Measurement devices shall be installed in new buildings to monitor the electric energy use of each of the following

separately:

1. Total electric energy.
2. HVAC systems energy use.
3. Interior lighting.
4. Exterior lighting.
5. Receptacle circuits.
6. Data centers representing over 10 percent of total building load or 5 percent of building floor area.
7. Other process loads that represent 10 percent or more of total building energy use based on building energy use modeling.

C407.4.4 Electric vehicle (EV) supply equipment. EV supply equipment must be metered independently from other building loads.

C407.4.5 Tenant metering. For buildings with tenants, individual tenant energy loads shall be capable of being separately monitored.

ORDINANCE NO. XX, SERIES 2022

AN ORDINANCE ADOPTING BY REFERENCE THE 2021 INTERNATIONAL ENERGY CONSERVATION CODE APPENDIX CC – ZERO ENERGY COMMERCIAL BUILDING PROVISIONS

WHEREAS, the City Council has adopted from time to time certain building and construction standards; and

WHEREAS, it is deemed to be in the interest of the public health, safety and general welfare to adopt by reference thereto the 2021 International Energy Conservation Code Appendix CC – Zero Energy Commercial Building Provisions; and

WHEREAS, the City of Louisville remains committed to its adopted goals to reduce energy consumption, increase clean energy sources, and support the transition to a low-carbon community as outlined in the Sustainability Action Plan and Resolution 25, Series 2019, “A Resolution Setting Clean Energy and Carbon Reduction Goals”; and

WHEREAS, reducing building energy consumption is an effective strategy to reduce community-wide energy consumption and increase long-term cost savings for residents and businesses; and

WHEREAS, the City Council adopted the 2021 International Energy Conservation Code by Ordinance 1816, Series 21, including requirements for solar readiness, electric vehicle charging infrastructure, and building electrification to build a more resilient building stock and support future building and transportation electrification efforts pursued by residents and businesses; and

WHEREAS, the City Council, after proper notice as required by law, has held a public hearing on this ordinance providing for the adoption of said codes; and

WHEREAS, the 2021 edition of the International Energy Conservation Code Appendix CC – Zero Energy Commercial Building Provisions has been submitted to the City Council in writing and the City Council has determined that such code should be adopted as herein set forth.

NOW, THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF LOUISVILLE, COLORADO:

Section 1. Chapter, 15.18.020 of the Louisville Municipal Code, concerning adoption of appendices to the 2021 International Energy Conservation Code, is hereby amended to read as follows, with new text in underline:

The following appendices of the 2021 International Energy Conservation Code are hereby specifically adopted; any appendices not listed are not adopted: Appendix CB, Solar Ready Zone – Commercial, Appendix CC – Zero Energy

Commercial Building Provisions, and Appendix RB, Solar Ready Provisions – Detached One and Two-Family Dwellings and Townhouses. Group R2, R3, and R4, three stories or less shall comply with Appendix RB.

Section 2. Section 15.18.030 of the Louisville Municipal Code, concerning amendments to the 2021 International Energy Conservation Code, is hereby amended to add a new subsection 41, concerning Appendix CC – Zero Energy Commercial Building Provisions, to read as follows, and to renumber of all subsequent subsections:

41. **Section CC103.1, Renewable energy**, is hereby deleted and replaced with the following:

On-site renewable energy systems shall be installed, or off-site renewable energy shall be procured to offset the building energy as calculated in Equation CC-1. Process loads for laboratories, manufacturing facilities, industrial processing, restaurants and hospitals shall be exempt from the building energy use in the calculation.

Section 3. Section 15.18.030 of the Louisville Municipal Code, concerning amendments to the 2021 International Energy Conservation Code, is hereby amended to add a new subsection 42, concerning Appendix CC – Zero Energy Commercial Building Provisions, to read as follows, and to renumber of all subsequent subsections:

42. **Section CC103.3.1, Requirements for all procurement methods, Subsection 7**, is hereby deleted and replaced with the following:

CC103.3.1 Requirements for all procurement methods

The following are considered qualifying off-site renewable energy procurement methods:

7. Unbundled Renewable Energy Certificates (RECs): certificates purchased by the owner representing the environmental benefits of renewable energy generation that are sold separately from the electrical power, and are a Green-e Climate Certified Offset or equivalent certification approved by the Building Official.

Section 4. Section 15.18.030 of the Louisville Municipal Code, concerning amendments to the 2021 International Energy Conservation Code, is hereby amended to add a new subsection 43, concerning Appendix CC – Zero Energy Commercial Building Provisions, to read as follows, and to renumber of all subsequent subsections:

43. **Section CC103.3.2 Requirements for all procurement methods**, is hereby deleted and replaced with the following:

CC103.3.2 Requirements for all procurement methods

The following requirements shall apply to all *off-site renewable energy* procurement methods:

1. The building owner shall sign and maintain a legally binding contract or series of continuous contracts to procure qualifying off-site renewable energy for a period of not less than 15 years from the time of issuance of a the first Certificate of Occupancy for the property.
2. The procurement contract or contracts shall be structured to survive a partial or full transfer of ownership of the property.
3. The building owner shall sign an agreement with the City that qualifying off-site procurement methods be provided and that proof of a qualifying contract or series of continues contracts for a period of not less than 15 years from the time of issuance of a the first Certificate of Occupancy for the property be submitted to the City annually.
4. RECs and other environmental attributes associated with the procured *off-site renewable energy* shall be assigned to the building project for the duration of the contract or contracts.
5. The renewable energy generating source shall include one or more of the following: photovoltaic systems, solar thermal power plants, geothermal power plants and wind turbines.
6. The generation source shall be located where the energy can be delivered to the building site by the same utility or distribution entity, the same independent system operator (ISO) or regional transmission organization (RTO), or within integrated ISOs (electric coordination council), except that Unbundled Renewable Energy Certificates (RECs) may be purchased without this restriction.
7. The *off-site renewable energy* producer shall maintain transparent accounting that clearly assigns production to the building, except that Unbundled Renewable Energy Certificates (RECs) may be purchased without this restriction. Records on power sent to or purchased by the building shall be retained by the building owner and made available for inspection by the code official upon request, except that Unbundled Renewable Energy Certificates (RECs) may be purchased without this restriction.

Section 5. If any article, section, paragraph, sentence, clause, or phrase of this ordinance is held to be unconstitutional or invalid for any reason, such decision shall not affect the validity or constitutionality of the remaining portions of this ordinance. The City Council hereby declares that it would have passed this ordinance and each part or parts hereof irrespective of the fact that any one part or parts be declared unconstitutional or invalid.

Section 6. The repeal or modification of any provision of any prior ordinance by this ordinance shall not release, extinguish, alter, modify, or change in whole or in part any penalty, forfeiture or liability, either civil or criminal, which shall have been incurred under such provision,

and each provision shall be treated and held as still remaining in force for the purpose of sustaining any judgment, decree, or order which can or may be rendered, entered, or made in such actions, suits, proceedings, or prosecutions.

Section 7. All other ordinances or portions thereof inconsistent or conflicting with this ordinance or any portion hereof are hereby repealed to the extent of such inconsistency or conflict.

INTRODUCED, READ, PASSED ON FIRST READING, AND ORDERED PUBLISHED this _____ day of _____, 2022.

Ashley Stolzmann, Mayor

ATTEST:

Meredyth Muth, City Clerk

APPROVED AS TO FORM:

Kelly PC, City Attorney

PASSED AND ADOPTED ON SECOND AND FINAL READING, this _____ day of _____, 2022.

Ashley Stolzmann, Mayor

ATTEST:

Meredyth Muth, City Clerk

From: [Susan Loo](#)
To: [City Council](#)
Cc: [Jeff Durbin](#); [Megan Davis](#); [Rob Zuccaro](#); [Kayla Betzold](#); [Austin Brown](#)
Subject: The Business of America is Business
Date: Friday, July 1, 2022 1:06:48 AM

I only recently became aware council has resurrected the 2021 IECC with Net Zero Appendix for commercial properties.

The public notice on this topic has been non-existent, I doubt anyone but a select few know you are reconsidering it. For instance, for yesterday's public hearing, it was not listed anywhere on the City's website that was easily accessible. An issue of this importance should be prominently featured on the city's Home page; surely it is as important as "Summer Storywalk" or "Totally Toddler". How about a press release?

I question the timing of implementing this radically untested, costly code in our town at this time. One, inflation is unsettling everyone. Two, you recently surveyed our business community, the results were dismal
<<https://www.louisvilleco.gov/home/showpublisheddocument/35276/637907050751930000>>.
Business thinks you don't care about or understand their needs.

The Louisville economy is suffering. It was suffering before Marshall Fire; the fire has accelerated the process. If you open your eyes as you travel through town, it's turned into a shabby shadow of the best small town in the U.S. Dying, ill-maintained public landscaping. We've had dead, untrimmed tree limbs on McCaslin for over two years. Weeds everywhere, flowers nowhere. Tally the businesses that have recently left or are leaving. Kohl's, Alfalfa's, Lowe's, Carrabba's, Outback, Chase Bank, Medtronic, Walgreen's. Check out the peeling paint on Cinebarre or the Grain Elevator.

City presentations say net zero only applies to "new construction". It's disingenuous to give people the impression that existing structures are not included in the proposed new code. We have thousands of square feet in currently unoccupied buildings that this code will apply to if someone is ambitious enough to redevelop. Why would anyone in their right mind want to build or redevelop in Louisville when they can do so in Erie, Broomfield, or Lafayette for a lot less cost and hassle?

City officials have indicated state legislation to apply net zero to the entire state is coming. Legislation like that would level the playing field. Why not wait for it and the entire economic environment to improve?

Then a question still exists on XCEL's capacity to meet all-electric net zero needs—and on the folly of not having natural gas back-up in an emergency.

In this discussion, the key piece of data missing is what the adoption of commercial net zero does to the economic vitality of our town. Your consultants need to quantify that before anything else moves forward.

==CAUTION: EXTERNAL EMAIL==

This email originated from outside the City of Louisville's email environment. Do not click links or open attachments unless you validate the sender and know the content is safe. Please contact IT if you believe this email is suspicious.

Rob Zuccaro

Subject: FW: Overextended: It's Time to Rethink Subsidized Gas Line Extensions (RMI Report)

From: Susan N <susan@nedell.com>

Sent: Tuesday, December 14, 2021 10:17 AM

To: Maxine Most <cmaxmost@icloud.com>; Deborah Fahey <faheydeb@gmail.com>; hley Stolzmann <ashleys@louisvilleco.gov>

Cc: RJ Harrington <rj@sustainableactionconsulting.com>

Subject: Overextended: It's Time to Rethink Subsidized Gas Line Extensions (RMI Report)

Hello to you all!

This article be helpful as you develop Louisville policy to require all new construction to be **all electric**:

[Overextended: It's Time to Rethink Subsidized Gas Line Extensions](#)

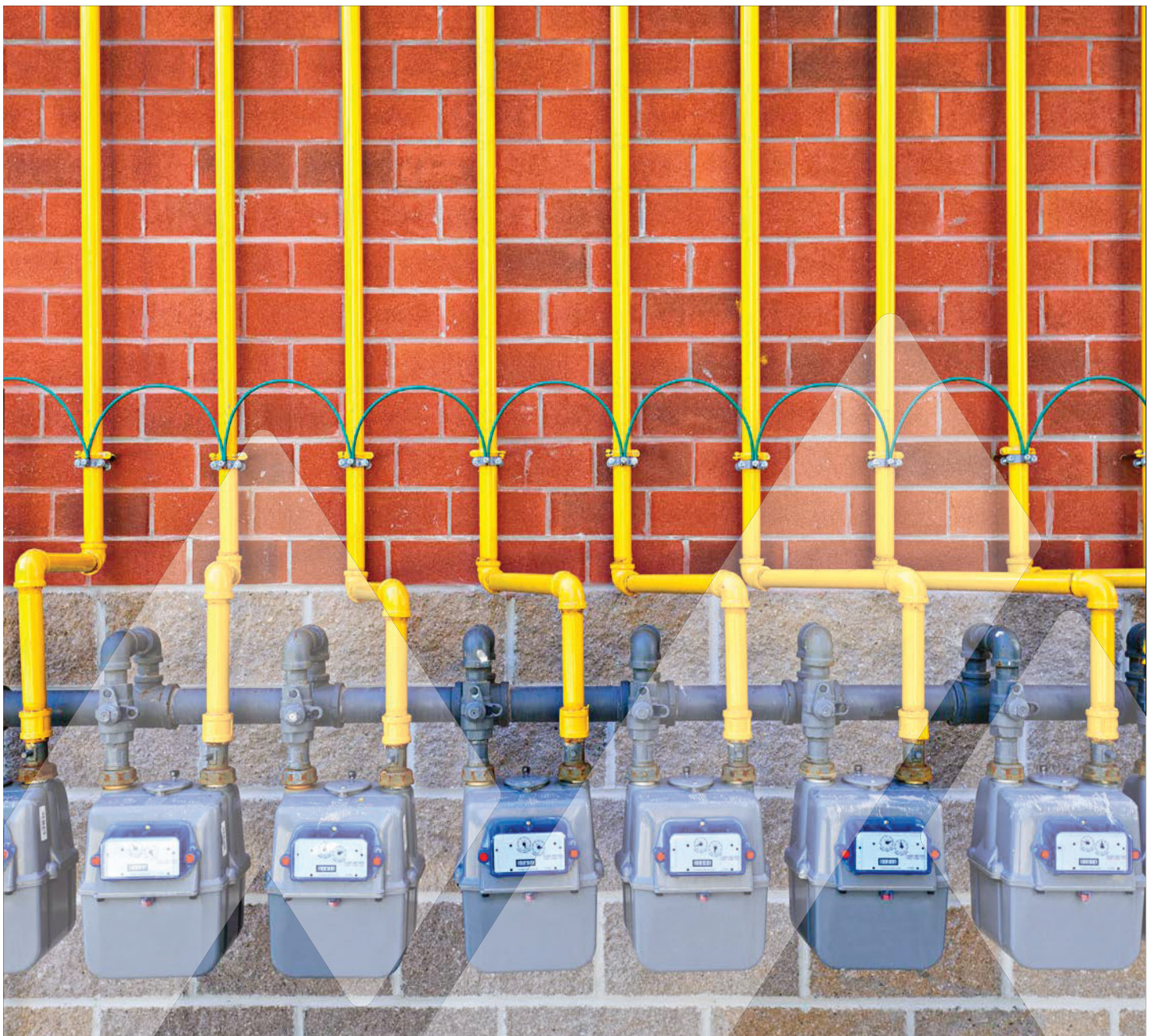
Best,

Susan



Overextended

It's Time to Rethink Subsidized Gas Line Extensions



December 2021

Authors

Authors

Abigail Lalakea Alter

Sherri Billimoria

Mike Hennen

Authors listed alphabetically. All authors from RMI unless otherwise noted.

Contacts

Abigail Lalakea Alter, aalter@rmi.org

Sherri Billimoria, sbillimoria@rmi.org

Mike Hennen, mhennen@rmi.org

Abigail Lalakea Alter, Sherri Billimoria, and Mike Hennen,
Overextended: It's Time to Rethink Subsidized Gas Line Extensions, RMI, 2021,
<https://rmi.org/insight/its-time-to-rethink-subsidized-gas-line-extensions/>.

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About RMI

RMI is an independent nonprofit founded in 1982 that transforms global energy systems through market-driven solutions to align with a 1.5°C future and secure a clean, prosperous, zero-carbon future for all. We work in the world's most critical geographies and engage businesses, policymakers, communities, and NGOs to identify and scale energy system interventions that will cut greenhouse gas emissions at least 50 percent by 2030. RMI has offices in Basalt and Boulder, Colorado; New York City; Oakland, California; Washington, D.C.; and Beijing.

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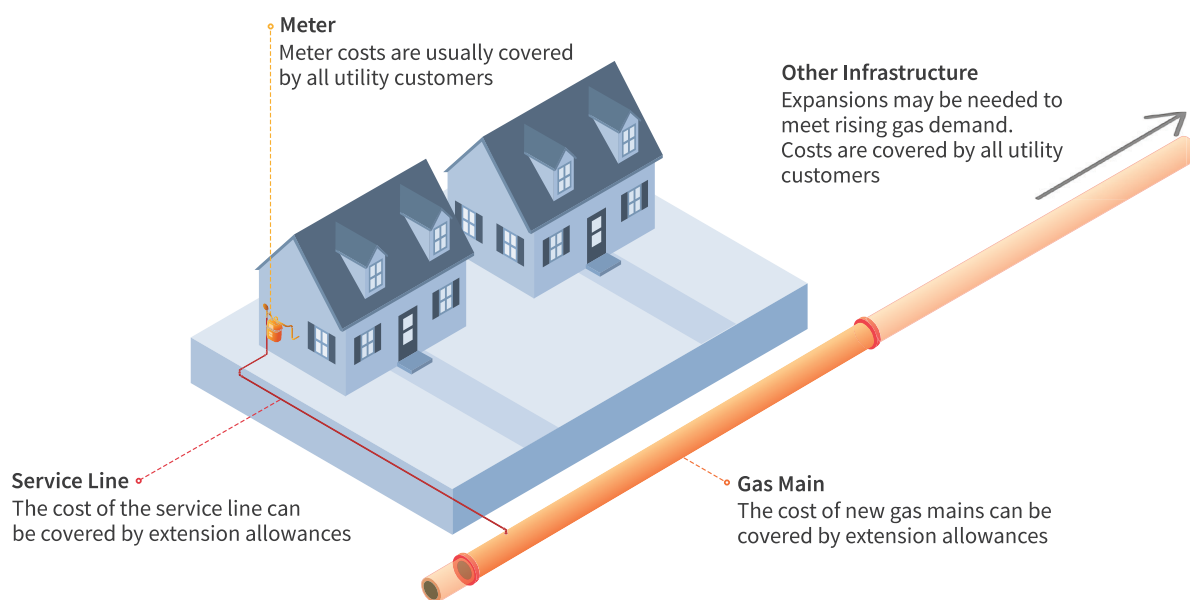
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Highlights

- Utilities typically subsidize the cost of extending service to new customers, in a practice known as line extension allowances. Subsidized extensions of natural gas service pass hundreds of millions of dollars in costs to existing customers while expanding the fossil fuel system.
- While these policies made sense in the past, their climate and economic rationale is increasingly challenged by expected reductions in future gas use, the growing costs of maintaining the existing distribution system, and the imperative to phase out fossil fuels.
- Utility regulators should reform line extension allowances to eliminate subsidies for gas, support state climate policies, and reduce the financial burden on existing gas customers.

Exhibit 1

Infrastructure associated with extension allowances



Background

America's local gas distribution systems serve 77 million homes and businesses, delivering 8 trillion cubic feet of natural gas each year, and with it more than 400 million tons of carbon dioxide emissions, plus further climate-warming emissions from methane leakage.¹ These systems are growing—with more than 600,000 new customers added each year—but that trend is completely at odds with state and federal decarbonization goals that require a shift away from gas. Thus, the operational lifetime of new gas infrastructure is increasingly uncertain.²

For decades, new customers who want the gas system extended to their building have enjoyed a policy by which their utility covers some or all of the construction costs associated with this gas infrastructure. These policies, generally known as line extension allowances, are common for both electric and gas utilities. They effectively result in existing and future utility customers paying for new customers to join the system, based partly on the expectation that there will be network benefits to adding customers to the system.ⁱ Utilities do not typically provide clear reports on the total amount spent on gas line extension allowances, making it extremely difficult to track and quantify these costs. Absent central reporting, best-guess estimates by advocates have found numbers in the range of \$100 million annually in California and \$200 million annually in New York.³

The underlying rationale for this practice varies and is described in greater detail later in this report. Typically, it relies on an economic argument either that (a) the new customer will eventually contribute net positive revenue for the utility through their future bills, or (b) individual customers' share of total system costs should remain constant, and accordingly, the allowance amount is set to ensure this fairness. In some cases, other considerations factor in—the presumption that expanded use of gas continues to provide a broader public benefit, for instance.

Several states are actively reconsidering gas line allowances through open proceedings—Washington State recently adjusted its allowances, and Public Utilities Commission staff in California have proposed eliminating gas line allowances entirely. Yet on the whole, these allowance policies have remained despite a series of changes that challenge the wisdom of expanding the gas system and increasing gas usage.

First, as the existing gas distribution system has gotten older, and as high-profile gas leaks and explosions have called attention to safety risks, gas utilities have dramatically ramped up spending on the system, driving up customer costs. This trend can be seen in Exhibit 2.

i. For a given project, the amount funded by the utility (that is, by all customers) is called the “line extension allowance” or “construction allowance,” and the amount funded by the new customers is called the “customer contribution” or sometimes “contribution in aid of construction” (CIAC).

Second, even as the impacts of climate change have become clearer and more severe, the expansion of the US gas system means that greenhouse gas emissions from the buildings sector have remained flat or increased. That is, while buildings have become more efficient, the growing number of buildings burning gas—due to oil-to-gas conversions as well as population growth—counteracts these benefits.⁴

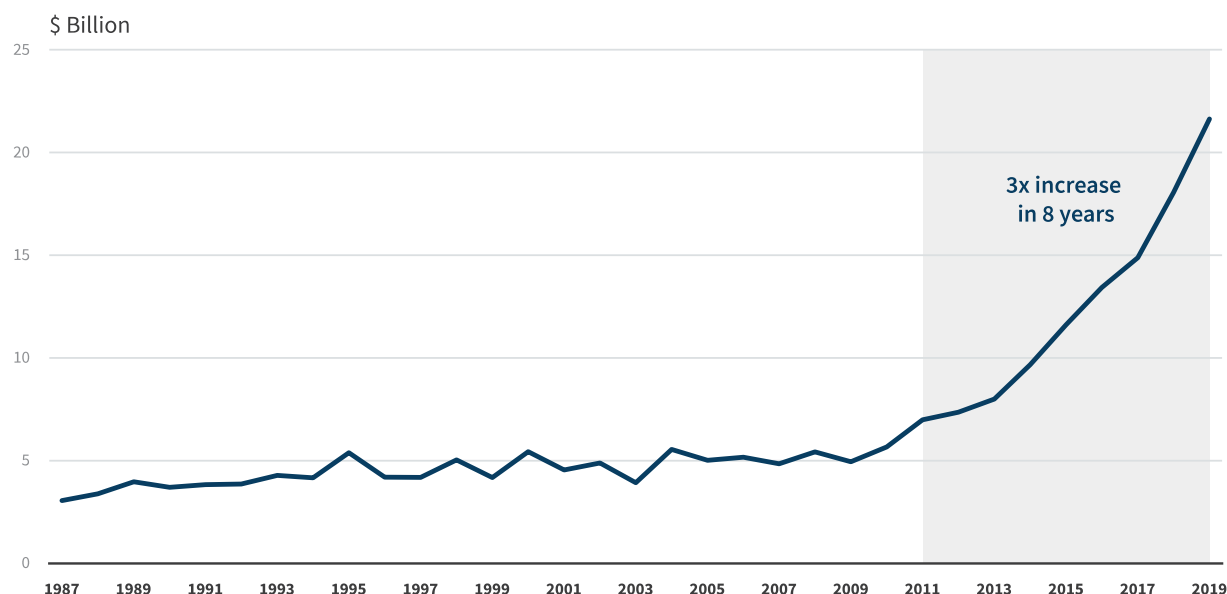
And third, new policies have emerged to cut these emissions and encourage fuel switching away from gas to the electricity system for residential and commercial buildings, leading to projections of dramatically reduced gas use in the future. This trend could make it more difficult for utilities to cover the fixed costs of the gas system, especially if those costs are rising and the system is expanding while the customer base shrinks.⁵

Taken together, this shifting context upends the rationale for the widespread practice of utilities bearing the costs of constructing gas lines to new buildings and new customers, and then passing these costs on to ratepayers for decades to come. Gas line extensions, as they exist today, are no longer supported by a sound economic justification and are ripe for reform, both to protect customers from financial risk and to support climate and public health goals. In the remainder of this report, we will expand on the typical rationale for gas line extension allowances, describe how a changing context undermines this rationale, and offer recommendations for reform.

Exhibit 2

Utility spending on the gas distribution system has grown rapidly in recent years

US gas utility distribution system construction expenditures, 1987-2019



Source: American Gas Association, <https://www.aga.org/research/data/construction-expenditures/>

Why Gas Line Extension Allowances Exist

Gas line extension allowances have historically been justified by economic arguments that sharing system-expansion costs between existing and new customers is fair, along with the presumption that expanded gas service provides a public benefit. There is no single standard for determining fair cost sharing between existing and new customers, but we highlight two examples below. Detailed examples of how these policies work in practice can be found in the Appendix.

Economic Rationale: Revenue-Based

Construction allowances are often calculated via a revenue-based rationale, based on the expectation that new customers' bill payments will eventually cover and then exceed the cost of the line extension that brings them onto the system. The formulas determining these allowance amounts can incorporate the expected volume of gas the new customer will use over many years, and therefore the expected revenue via the customer's bills. Part of the logic is that the revenues collected by new customers will put downward pressure on the rates for all customers. That is, the fixed costs of maintaining the system will be spread across more customers, thereby lowering rates. Utilities that have used a revenue-based approach include Avista Utilities in Washington State and Pacific Gas and Electric in California.⁶

Determining an allowance based on expected revenue involves some combination of variables tied to the expected gas consumption of the new building, such as:

- **Years of expected life:** once gas service is established, the customer is expected to use gas at the same volume for decades. In some cases, the customer is expected to use gas in perpetuity.
- **Square footage:** the size of the building will dictate the heating load.
- **Number and type of appliances:** some utilities allocate a specific allowance for each appliance, with different amounts based on the expected usage of a furnace, water heater, clothes dryer, and stove.
- **Adjustment factors:** these factors are designed to reflect the portion of revenues that supports infrastructure investment, as opposed to gas commodity costs, utility administration, maintenance costs, etc.

Economic Rationale: Embedded Cost

In some cases, the primary objective of a line extension allowance is to ensure fairness, such that no customer subsidizes another customer. As a proxy metric for fairness, some utilities seek to hold constant the existing infrastructure investment on behalf of each customer, such that no new customer subsidizes an existing customer. In practice, this can mean calculating the average amount of existing investment in the rate base per customer and providing that same amount to the new customer. Although not

explicitly based on future revenue calculations, these allowances commonly still rely on the expectation of permanent gas service, in which the new customer will contribute to the costs of the gas system through their bills. Examples of utilities taking this approach include Xcel Energy Colorado and gas utilities in Wisconsin, where embedded cost is detailed in statute.⁷

Public Benefits Rationale

Gas line allowances make it easier to expand access to gas, with the implicit and often explicit belief that gas use itself serves a public good. Historically, line extension allowances, combined with the obligation to serve customers, have supported universal access to gas and ensured that gas utilities do not restrict service to more profitable customers or those in White or upper-class neighborhoods. Over the past decade, state governments and utilities have frequently justified generous line extension policies on the basis that gas has lower emissions and/or lower cost than the alternatives. These assumptions no longer hold, given the emergence of lower-emissions electric heating solutions, greater awareness of methane leakage, and recent volatility in gas prices.⁸

Yet many states have clearly stated their goal to expand gas, often through oil-to-gas conversions. In 2013, Connecticut's Public Utilities Regulatory Authority approved a gas expansion program for nearly 300,000 new customers,⁹ in accordance with the state's Energy Strategy, noting "the emerging opportunity provided by shale gas for a lower-cost, less-polluting, and domestically available (and thus more reliable) foundation for society's energy needs."¹⁰ In 2012, the New York Public Service Commission (PSC) opened a proceeding focused on gas expansion, asserting benefits of natural gas in terms of price, emissions, low-income household access, economic development, and reliability. In that proceeding, National Grid stated that it is "good public policy to provide entitlements even though some of the costs may be socialized because all customers benefit from the expansion of gas."¹¹ In August 2021, Illinois Governor JB Pritzker signed a bill intended to extend gas service to a rural community by allowing the gas utility to provide up to 250% of its normal gas line extension allowance.¹²

At a nationwide level, in 2017, the National Association of Regulatory Utility Commissions convened a task force focused on education to "bring the benefits of natural gas as an energy source to more consumers," detailing the many gas expansion programs in states across the country.¹³ Over the past decade, dozens of states have approved gas expansion plans for utilities, sometimes even offering incentives to utilities for system expansion or approving incentives to customers switching to gas service. The American Gas Association (AGA) boasts that a new gas customer is added every minute of every day.¹⁴

Other Approaches

Another method, though less common, provides a set number of feet of gas pipeline, regardless of the expected usage of that building. For example, New York's statute provides a "100-foot rule," requiring utilities to pay for 100 feet of pipeline per new customer. This approach can result in under-recovery of costs, as the cost of construction may—and often does—outweigh the expected revenue from that customer.¹⁵ Additionally, this kind of policy often requires the utility to pay for the footage no matter the per-foot installed cost; some installations may be vastly more expensive and less economic than others.

In all cases, when the cost of constructing the main and service extensions exceeds the allowance (or the length of extension exceeds the utility's obligation to provide free footage), customers are required to

pay the difference. Depending on the utility, this amount might be paid up front or applied as a monthly surcharge on the new customer's bill. Some utilities also allow for some or all of a customer's contribution to the cost of the main extension to be refunded if additional customers hook up to the extension within a given period of time (typically between 5 and 10 years).ⁱⁱ Other costs that new customers may cause, such as the cost of their gas meters or new pipelines and capacity infrastructure built to match rising demand, are usually covered by the utility and excluded from these calculations.¹⁶

Water Utility Extension Policies

While both gas and electric utilities tend to apply a similar rationale to their line extension allowance policies, water utilities have quite different approaches to allocating extension costs, offering an informative comparison of alternate philosophies for cost allocation.

As regulated monopoly utilities, water and gas systems have some economic similarities. Both utilities share principles of fair rate design and have high fixed capital costs for infrastructure with variable operating costs. Both water and gas have generally been considered public goods and necessities. However, unlike water or electricity, gas exclusively serves uses in buildings that could be met through other technologies or resources. Still, gas utilities incentivize system expansion by lowering the up-front costs of gas service to new customers (via line extension allowances, utility advance programs, and refund structures), whereas water utilities typically place much of the capital burden of system expansion on new customers.

Water utilities do not typically provide construction allowances, and many also charge system development charges (SDCs, also known as system development fees, or SDFs) for new hookups. For many water utilities, the economic rationale for new customer fees is a goal of keeping rates constant across new and old customers (i.e., using these fees to keep certain capital expenditures out of the rate base), and this parity across existing and new customers is valued more highly than lowering the up-front costs to new customers. These charges are meant to account for the benefits new customers receive from the capital investment that has already occurred in the water system. While this helps keep rates stable, it creates a positive feedback loop for smaller utilities with small rate bases that must therefore continue to charge SDCs in order to keep rates flat.

Both approaches to allocating the costs of system expansion—construction allowances and SDCs—involve trade-offs in what regulators and utilities consider to be fair and in the public interest.

ii. For example, Xcel's refund policy for gas main extensions in Colorado allows for refunds up to the full amount of the customer's contribution based on the number of additional customers that connect to that main extension within 10 years of its construction. Specifically, the tariff sheet states: "For each additional Permanent Service customer connected directly to a gas Distribution Main Extension under an Extension Agreement upon which there is unrefunded Construction Payment remaining, Company will recalculate the extension considering the costs of any additional facilities and considering the Construction Allowance provided by such additional customer or customers, as well as appropriate sharing of Construction Payment requirements among all customers to be served by the gas Distribution Main Extension." (See p. 191 at https://www.xcelenergy.com/staticfiles/xcel/PDF/Regulatory/psco_gas_entire_tariff.pdf.)

Changing Context Challenges the Rationale

Both the economic and public benefits rationales for gas line extension allowances assume permanent gas use at today's volumes—but this is at odds with climate policies, improved electric heating technologies, and shifting market trends. Furthermore, gas construction allowances pose a direct barrier to electrification, which is a critical climate strategy. Additionally, there is growing recognition that widespread gas combustion poses major risks to the global climate and to public health.ⁱⁱⁱ

Context and Expectations for Future Gas Use Have Changed

Gas line extension policies are based on outdated and risky assumptions of a future with consistent or growing gas usage. Climate plans in states across the country clearly demonstrate that a shift away from gas use in buildings is a key component of the most cost-effective decarbonization pathways. Several states have already enacted policies that call for a substantial decline in gas consumption, such as:

- Colorado's Greenhouse Gas Roadmap shows a 94% reduction in gas usage in residential and commercial sectors by 2050.¹⁷
- Massachusetts states that “electrification of space and water heating is a low-risk, cost-effective strategy for decarbonizing the majority of buildings,” and “the use of gas for building heat must start to decline in the near term.”¹⁸
- Maryland's Greenhouse Gas Reduction Act Plan shows the residential building sector dominated by electric heat pumps by 2050.¹⁹
- New Jersey's Energy Master Plan requires a transition plan for a fully electrified building sector.²⁰
- New York's Climate Action Council found that all mitigation scenarios that meet the requirements of the Community Protection and Climate Leadership Act rely on “more rapid and widespread end-use electrification and efficiency.”²¹

These policies and plans, and others like them across the country, make clear that meeting climate goals will require vast changes to the way gas is used in buildings today.

iii. For more on the air quality and health impacts of gas use, see the report [Gas Stoves: Health and Air Quality Impacts and Solutions](#).

While hydrogen and other alternative fuels may be used in specific applications, overall gas use is likely to decline dramatically through both expanded energy efficiency and electrification. The supply of alternative fuels such as renewable natural gas (RNG), or methane-rich gas captured from decomposing organic matter, simply cannot meet the needs of the end uses currently served by gas at anywhere near today's volumes. The optimistic scenario from the American Gas Foundation (AGF) and ICF International finds that potential RNG supply would meet only 12% of current US gas demand by 2040. This limited supply would come with high costs of \$7–\$20 per MMBtu for RNG, compared with \$2–\$4 for fossil gas in 2020 and \$5–\$6 during the late 2021 gas price spike at the time of this report's writing.²²

Natural Resources Defense Council's assessment of the ecologically sound supply of RNG is about half the AGF's estimate, just 3%–7% of current US gas demand.²³ Given these constraints—in addition to questions about life-cycle carbon emissions from alternative fuels—it is clear that a decarbonized future will require major declines in gas consumption, through both efficiency and electrification.

Instead of reflecting this declining trajectory of gas consumption, line extension calculations implicitly assume new buildings will use gas far into the future. For most of its gas utilities, Washington State has used a “perpetual net present value” calculation, assuming new gas customers will provide revenue forever.^{iv} Xcel Energy in Colorado requires “permanent service ... where sufficient revenue to support the necessary investment is assured.”²⁴

In addition to a decline in the number of gas customers, the average customer's annual gas consumption is also likely to decrease over time, but extension policy assumes consumption will remain constant. In fact, gas use per household is already declining due to higher-efficiency gas appliances, better envelope sealing and insulation, and other efficiency measures.²⁵ Some gas utilities are initiating strategies for partial electrification,²⁶ in which customers would maintain gas service but consume much less gas. These strategies would undermine many of the calculations of future revenues from new gas customers.

Existing gas line extension policies across the country result in significant expenditure to expand the system. Yet given the expected changes in gas demand, utilities may not recover this expense through new revenues, which would require additional rate increases and pose financial risk to utility customers. Basing capital expenditures on the flawed assumption that households will continue to use a constant amount of gas every year, for decades to come, is a risky fantasy.

Line Extension Allowances Distort the True Costs of the System

By shifting costs onto existing ratepayers, developers of new buildings are not responsible for the true cost of construction. If developers were faced with the full cost of gas service—including several thousand dollars that are usually subsidized—they would be more likely to build all-electric. Line extension allowances create a situation in which developers do not have incentive to guard against the risks that gas customers may face down the line. That is, the decision makers in building design (e.g., developers, builders, and engineers) choose the option cheapest for them, while other gas system customers bear the up-front costs and the risk of escalating future costs on a transitioning gas system.

iv. On October 29, 2021, the Washington Utilities and Transportation Commission issued a decision in Proceeding No. UG-210729 directing Avista, Cascade, and Puget Sound Energy to file revised line extension allowances. The new allowances will be calculated using a modified perpetual net present value calculation with an updated discount timeframe of seven years.

Current line extension policies create an uneven playing field for end-use technologies that don't use gas, such as ground-source and air-source heat pumps and induction stoves. The money currently spent on gas lines could instead be spent on cleaner alternatives that do not run the risk of burdening future customers with the cost of underutilized assets.

Line extension allowances can also encourage developers to make inefficient decisions. Consider a new commercial building, where all-electric construction would require additional infrastructure, such as a larger transformer. Currently, that additional cost, especially compared to a gas line offered for free or at low cost, could incent a developer to instead build with both gas and electricity. An expanded electric allowance that covered more costly electric service infrastructure, or otherwise offset the cost of all-electric buildings, would put the technologies on more even footing.

Expanding Gas Service No Longer Provides Public Benefit

Fundamentally, gas usage must decline to meet targets for zero or net-zero emissions across the US economy. Continuing to burn gas in homes and businesses is in direct opposition to this goal, because of its contribution to greenhouse gas emissions and the viability of electrification as an alternative.

Expanded gas use also contributes to direct emissions of methane via leaks. Given the extremely high global warming potential of methane, the UN Environment Programme clearly states that “reducing human-caused methane emissions is one of the most cost-effective strategies to rapidly reduce the rate of warming and contribute significantly to global efforts to limit temperature rise to 1.5°C.”²⁷ Additionally, the alternatives to gas equipment, from heat pumps to electric and induction cooking, reduce human health harms caused by indoor air pollution from gas combustion.²⁸

As discussed in the previous section, many states have highlighted that gas demand will need to fall dramatically in coming years to meet climate goals. Some utilities are beginning to clearly state that gas use will decline. In New York, Rochester Gas & Electric and National Grid's upstate business have agreed in joint proposals to stop further increases in gas sales, and to stop promoting oil-to-gas conversions.²⁹ Central Hudson has committed to reducing its gas sales.³⁰ ConEdison recently released a request for proposals for non-pipe alternatives to replacing leak-prone pipes. Alternatives to continued gas infrastructure investment (for example, electrification and demand flexibility) would allow for strategic pipe abandonment.³¹

Further, expanding gas service poses several important equity risks. As electrification becomes more prominent, there is a real risk of a utility “death spiral” where wealthier customers leave the gas system, leaving lower-income and renting populations responsible for paying for existing gas infrastructure.

Recommendations

Given the changing economic landscape and shifting societal priorities, the rationale for utility gas line extension allowances is no longer justified. In response, we offer three key recommendations:

- 1. End or reform gas line extension allowances:** Given the economic risks that declining gas consumption will undermine new customer revenues over time, states have a strong basis for reforming line extension allowances. Additionally, the increased risk of stranded costs associated with expanding gas infrastructure and the growing recognition of the climate and health hazards posed by expanded gas use provide further reason to move away from these policies. At minimum, this necessitates a recalculation of allowance values with a diminished view of future gas sales and revenues. A stronger and more straightforward solution would be to eliminate the practice altogether. Leading states may also consider a model inspired by water utilities, in which new customers pay a system access fee that directly supports energy affordability for existing customers during gas system decarbonization.
- 2. Expand electric line extension allowances for carbon-free buildings:** While the changing context challenges the rationale for gas line extension allowances, electricity service continues to be a necessity for all customers. A shift from new construction with gas to all-electric buildings is emerging as both a necessary climate strategy and an opportunity to eliminate the human health impacts of indoor fossil fuel combustion.³² All-electric buildings will consume more electricity than their mixed-fuel counterparts and deliver greater revenue to electric utilities over time, but they are usually not eligible for any greater electric line extension allowances. Regulators can reform electric line extension policies to offer a higher allowance for all-electric buildings, in recognition both of their greater revenue contribution and their role in supporting climate policies. Such a policy was recently introduced for Portland General Electric when the Oregon Public Utility Commission approved a higher allowance for all-electric customers.³³

Notably, solely eliminating gas allowances creates the specific risk of increasing costs of construction for new affordable housing or other socially desirable construction and reducing the number of new units built. Expanding electric allowances and other all-electric incentives can support affordability and level the playing field. Pilot data suggests that there is minimal to no additional cost for all-electric multifamily buildings for affordable housing.³⁴

- 3. Evaluate the potential for line extension allowances to support new carbon-free energy services:** In some contexts, gas utilities might build and operate shared geothermal heating loops. This strategy is being piloted in Massachusetts by Eversource Energy and HEET, through the GeoMicroDistrict model, where utilities' district geothermal infrastructure delivers heating and cooling to multiple customers.³⁵ If regulators find it in the public interest to expand this model, it will need its own category of line extension policy and enabling regulation.

The Path Forward

The changes needed to align line extension policies with climate goals and customer interests could be initiated through different channels, and the best path forward will likely vary by state. Avenues for reform may be led by legislatures or regulators. Lawmakers may pass new laws to alter gas line extension policy or direct their state utility commissions to take action. In states like New York or Wisconsin, where gas line extension is written into statute, legislative change will be required. Or public utility commissions (PUCs)—who are tasked with ensuring safe, reliable, and affordable energy services—can amend their rules or instruct utilities to change their line extension policies. Because state utility commissions are increasingly tasked with addressing climate issues as part of their decision-making, eliminating or changing gas line extension allowances often fits within the existing mandate of PUCs.

Changing gas line extension policies represents a clear near-term action; while the transition to a clean, affordable building sector will require funding as well as many other policy and program changes, utilities and PUCs can act now. Gas line policies as they stand today pose significant financial risk to utility customers and exacerbate the challenge of decarbonizing the built environment. In practice, they act as an obscure fossil fuel subsidy and perpetuate a system that contributes significantly to climate change. Both climate urgency and financial prudence require reform of this niche but important policy.

Additional strategies for building decarbonization can be found in our 2020 report, [*Regulatory Solutions for Building Decarbonization: Tools for Commissions and Other Government Agencies*](#), as well as our 2021 report, [*Decarbonizing Homes: Improving Health in Low-Income Communities through Beneficial Electrification*](#).³⁶

Appendix: Case Studies

Line extension policies vary broadly from state to state. Some states, like New York, have specific and broad statutory requirements that determine how gas line extension policy is implemented. Other states, like California, require utilities to use a specific equation when calculating their allowances. Still others, like Colorado, have a universal framework that requires utilities to balance cost allocation between new and existing customers, but each utility applies to the Public Utilities Commission (PUC) for approval of its own method of calculation. In order to demonstrate a variety of approaches, we examine gas line extension policies in four states.

California

Current structure/practice: Revenue-based rationale

- Utilities are required by statute to provide access to service at reasonable cost.
- The California Public Utilities Commissions (CPUC) requires gas line extension allowances to be calculated based on the additional revenue the utility expects to receive as a result of each gas appliance installed by the new customer.
- Under current policies, allowances range from \$1,700 to \$2,700 for residential customers.
- For nonresidential customers, utilities calculate allowances on a case-by-case basis, using the same formula used to derive the standardized residential allowances.
- A recent staff proposal in the CPUC's Building Decarbonization Rulemaking docket (R.19-01-011) recommended eliminating allowances and other incentives for gas line extensions to encourage all-electric new construction.³⁷

What can key actors do to modify current practice?

Legislature: State lawmakers could pass a bill requiring the CPUC to act (e.g., via a rulemaking) to align gas line extension policies with California's climate goals.

Public Utilities Commission: The CPUC could act in line with the staff proposal to eliminate gas line allowances and reform electric line extension policies to lower the up-front costs of building electrification. In addition to docket R.19-01-011, the ongoing gas planning proceeding (R.20-01-007) focuses on gas policy and planning and also implicates gas line extensions.

Utilities: In the absence of state action, utilities could propose eliminating gas line allowances of their own accord based on an argument that providing line extension allowances is no longer a reasonable use of ratepayer dollars.

Washington State

Current structure/practice: Revenue-based rationale

- Until recently, the Washington Utilities and Transportation Commission (UTC) has allowed three out of four gas utilities to calculate line extension allowances using a method that assumes new customers will remain on the gas system indefinitely, called the perpetual net present value (PNPV) method. (The other gas utility uses a formula based on expected usage.)
- Under existing policies, allowances for these three utilities range from \$3,500 to \$4,600 for new residential customers.
- Allowances for nonresidential rate classes vary from utility to utility; some calculate allowances on a dollars-per-therm (estimated annual usage) basis, whereas others use a simple cost cap.^v
- The UTC issued a decision in October 2021 directing gas utilities to file revised line extension allowances based on a modified PNPV with an updated discount timeframe of seven years, which will result in allowances of roughly \$2,000.^{38,vi}

What can key actors do to modify current practice?

Legislature: State lawmakers could pass a bill to eliminate gas line extension allowances.

Utilities and Transportation Commission: The UTC could unilaterally eliminate gas line extension allowances by determining, among other things, that facilitating expansion of the gas system is no longer a reasonable use of ratepayer dollars. In September 2021, the UTC chair opened a docket to “consider whether natural gas utilities should continue to use the perpetual net present value methodology to calculate natural gas line extension allowances” (UTC Docket UG-210729). While commissioners have thus far declined to completely eliminate allowances for gas line extensions, they indicated that this issue would likely be discussed at greater length in the UTC’s broader decarbonization docket, U-210553.

Utilities: Gas utilities could apply to the UTC for approval to reduce or eliminate their gas line extension allowances.

v. Cascade’s tariff has a \$14,746 cost cap for commercial allowances: https://www.cngc.com/wp-content/uploads/PDFs/Rates-Tariffs/Washington/2021_tariffs/8-Extension-of-Distribution-Facilities-Rule.pdf.

vi. \$2,000 is approximately how high allowances were prior to the implementation of the original PNPV method in the 2010s.

New York

Current structure/practice: Revenue-based rationale

- Utilities are statutorily required by Public Service Law, Section 31, to provide at least 100 feet of pipeline to new residential customers, free of charge.^{vii}
- The New York Public Service Commission (PSC) has allowed utilities to expand this entitlement to provide new gas heating customers up to 100 feet of main plus 100 feet of service line extension for free.
- Utilities have testified in prior proceedings that these extensions are typically not revenue-justified.
- Policies for nonresidential customers vary but generally provide up to 100 feet of pipeline for free (some utilities do not provide free footage for dual-fuel nonresidential customers).^{viii}

What can key actors do to modify current practice?

Legislature: Lawmakers would need to modify Public Service Law. Both the obligation to serve and the requirement to provide up to 100 feet of pipe for free require legislative amendment in order for other actors to align line extension policies with the state's climate laws.

Public Service Commission: Absent legislative action, the PSC could roll back its expansion of Public Service Law language to allow at most 100 feet of free pipeline. The PSC could also increase electric allowances to incentivize (and increase universal access to) efficient electric heating.

Utilities: Gas utilities can limit their gas line extension policies to the exact statutory language (i.e., providing exactly 100 feet for free). Utilities could also report the costs of the line extensions to support their assertions that these extensions are not revenue-justified, and they could argue for the modification of both gas and electric allowances to support electrification.

vii. New York's Public Service Law, Section 31, specifically states: "In the case of any application for service to a building which is not supplied with electricity or gas, a utility corporation or municipality shall be obligated to provide service to such a building, provided however, that the commission may require applicants for service to buildings located in excess of one hundred feet from gas or electric transmission lines to pay or agree in writing to pay material and installation costs relating to the applicant's proportion of the pipe, conduit, duct or wire, or other facilities to be installed." See <https://codes.findlaw.com/ny/public-service-law/pbs-sect-31.html>.

viii. For example, Brooklyn Union Gas (d/b/a National Grid) does not have an explicit policy for dual-fuel nonresidential customers. Note that "dual-fuel" in this context refers to customers whose gas end uses (typically generators) can be operated using a fuel other than gas (such as fuel oil).

Colorado

Current structure/practice: Embedded-cost rationale^{ix}

- Utilities are required by statute to publish their line extension policies, including “provisions addressing steps to ameliorate the rate and service impact upon existing customers.”³⁹
- Utilities’ allowances are based on an “average embedded cost” formula that approximates a new customer’s contribution to sharing the fixed costs of the existing gas system.
- Allowances for new residential customers typically range from \$550 to \$1,400.^x
- Policies for new commercial customers vary, but utilities tend to provide roughly \$1,500 allowances for service lines and calculate allowances for main extensions on a case-by-case basis.^{xi}

What can key actors do to modify current practice?

Legislature: Lawmakers could either eliminate gas line extension allowances outright or direct the PUC to modify its rules.

Public Utilities Commission: The Colorado PUC could eliminate gas line extension allowances or amend its rules governing line extension policies. Of note, the PUC recently listed gas line extension policies among the gas rules that may need to be modified in alignment with recent legislation and Colorado’s climate goals.^{xii}

Utilities: Modifications to utilities’ methods of calculating line extension allowances are subject to PUC approval, which is based on the Commission’s assessment of whether the allowances allocate costs fairly between existing and new customers. Utilities could apply to eliminate line extension allowances based on an argument that any amount of allowance does not allocate costs fairly among existing and new customers.

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- ix.** Colorado’s largest gas utility (Public Service Company of Colorado, d/b/a Xcel Energy) uses an embedded-cost rationale; other gas utilities in the state use different methods of calculating line extension allowances.
- x.** The Mountain Division of Colorado Natural Gas provides allowances of up to \$7,335.
- xi.** Xcel’s policy can be found on page 236 (Tariff Sheet No. R87) of its tariff sheets:
https://www.xcelenergy.com/staticfiles/xcel/PDF/Regulatory/psco_gas_entire_tariff.pdf.
- xii.** See Decision No. C21-0516 in Proceeding No. 21M-0395G and Decision No. C21-0610 in Proceeding No. 21R-0449G. Decision C21-0610 proposes to amend Colorado’s gas rules for line extensions by requiring that line extension policies adhere to the “principle that the full incremental cost associated with new development and growth shall be borne generally by the customers that cause those incremental costs” and that such policies must align with the state’s greenhouse gas emissions reduction goals.

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Rob Zuccaro

From: Richard Simpson <rsim586133@aol.com>
Sent: Thursday, November 18, 2021 11:23 AM
To: Ashley Stolzmann; City Council
Subject: 2021 IECC Code

In reference to your adoption of the 2021 International Energy Conservation Code I would like to point out a few facts.

While I appreciate your effort to have new construction in Louisville contribute to environmentally sound standards, unless your electricity is being produced by a non-carbon fossil fueled source there is still a carbon footprint.

60% of the electricity generated in the U.S. last year came from fossil fuel combustion. Therefor unless your electricity is generated by water, wind, solar or nuclear fission you are still making a carbon footprint.

There is no question Electric vehicles (EVs) are a good thing and potentially cleaner and greener than internal combustion engines BUT they are not a silver bullet that will save the planet overnight. Building an EV produces 30-40% more emissions than a conventional car. Most of the increase is from the battery production; minerals such as lithium and cobalt currently require energy intensive mining and thus today's battery factories have a very high carbon footprint. Not to mention the issue of recycling of the used batteries.

Your adoption of the IECC will certainly raise the cost of new construction in a city that already has soaring housing costs.

I am not in favor of your proposal to require buildings to run solely on electric energy which at this time is far more expensive.

Richard Simpson
1560 Ridgeview Dr
Louisville, CO

Rob Zuccaro

From: Casey Schneebeck <casey415@gmail.com>
Sent: Wednesday, December 1, 2021 12:10 PM
To: City Council
Subject: Measures for Greater Energy Efficiency

Hello Council Members,

I just read the Measures for Greater Energy Efficiency article in the Winter 21-22 edition of the Community Update. I fully support requiring all new construction to have EV charging infrastructure and to be built with all electric systems. I oppose allowing natural gas in buildings with the ability to convert at a later date. If the natural gas loophole is allowed to go through, I propose including an end date where they are forced to switch to electric.

I signed up for updates on the Energy Code Update page and look forward to participating in this process.

Thank you for your time,

Casey Schneebeck
415-722-9768
218 Hoover Ave
Louisville, CO

Twenty questions for the City concerning energy-related commercial building code changes

Introductory comments: One of the more difficult aspects of writing these questions is that there is evidently no current draft of the Code that is readily available and that the Code itself is extremely long, detailed, and difficult even for experts in the field to plow through. Hopefully, these questions will help a more focused picture come to light.

Further, it is clear that climate change is real and that the use and abuse of energy are factors in that climate change. It is also clear that responses to climate change have to be practical and should take a regional, statewide, national, or international approach. Changes in Louisville regulations that simply move the problem to Broomfield, Lafayette, Erie, or elsewhere 'further out' are less than no help, even exacerbating the problems.

That said, here are the questions. Numbering is for convenience of reference, and do not reflect the importance of the questions or potential answers. The importance will vary depending upon the interests of the questioners and responders.

1. Will the Code ban the use of natural gas, either now or in the future in commercial buildings? Please note that many small businesses, including restaurants, breweries, coffee roasters, bakeries, and others cannot convert to all-electric appliances due to the lack of adequate equipment, lack of affordable equipment, inability to change processes (BBQ, bakers, wood fired pizza, and roasters), inability to maintain product quality, inability to serve customers quickly, lack of training, and very likely other reasons. Even if conversion were possible, small business lacks the access to capital to meet the costs and to weather the delays in obtaining the equipment. Production kitchens do not share the simple 'put in a new range' alternative that is possible in residential homes.
2. The health of Avista hospital is of vital importance to Downtown and all of Louisville. Will there be a 'hospital exemption' from the Code, and specifically including an exception to a ban on natural gas? Will there be a medical research, laboratory, urgent care, and medical office building exception to encourage those highly desired businesses to locate here?
3. Will there be an exception for a "change in use" of a structure that is vacant? Without an exception, the cost of replacing HVAC equipment and installing very high levels of insulation in buildings that were not designed for it could, and likely will, discourage the creative reuse of our currently vacant buildings. These include, but are not limited to, (a) the Historic Downtown Grain Elevator, (b) the Downtown Chase Bank, (c) Empty Kohls, (d) empty Lowes, (e) vacant Carrara's, (f) vacant former auto parts-scrapping store next door, (g) empty Alfalfa's, and (h) empty spaces in CTC and elsewhere listed on several real estate listing websites. Possible other sites may include (i) the Walgreens on SBR, (j) Ascent Church (by the way, a fine reuse of that building that possibly could not have happened if the insulation requirements of the code applied), and other buildings in town. While the majority of these sites are not in Downtown, the reuse of these buildings could represent a 'rising tide that lifts all boats,' with their occupancy contributing to the vibrancy of the City, including the health of Downtown.
4. How will 'change in use' be defined? For example, if a change in use changes a more energy intensive activity into a less energy intensive one, will that less energy intensive use be discouraged by having to comply with the Code? Will the Code include a provision for a waiver in this situation? Has the City researched the cost of new construction in the surrounding communities (such as Broomfield and Erie) as compared to the cost of retrofitting comparable buildings in Louisville? Has the City consulted with builders or developers concerning their preferences about trying to reconstruct existing buildings with a changed use as compared with starting new ones with longer commute times?

5. What will be the estimated additional time, expertise and cost needed for an applicant to prepare an application arising from new regulations (especially additional architect, legal, and engineer time)? What will be the additional time for the City to process a building permit application? Will there be additional inspections during construction? Will the City provide a screened or approved list of knowledgeable architects, engineers, designers, contractors, and other professionals who are acceptable to the City and appropriately licensed (Will additional City licenses be needed for professionals to work here on Code matters)? What additional City staff and consultants will be needed—and given the current scarcity of labor—are the needed personnel and consultants available at a price the City is willing to pay? Would the City consider a waiver of use tax, sales tax, and/or permit fees for the costs of compliance? How long will it take City staff to get up to speed? Have new submitted forms been drafted for applicants? Do compliant examples exist?
6. Has the HPC been consulted on the potential impacts of the Code on historic structures, including impacts on new construction added to historic structures? Will HPC funds (grants, loans) be available to help pay for the upgrades, and when will those programs be in place? Aside from the HPC, what grant and loan programs will be available to businesses, including from the City and the LRC? Reimbursement programs are often ‘not good enough’ for small businesses that can’t obtain the money in the first place to be reimbursed later: funds ‘up front’ without excessive application requirements would be essential for small businesses.
7. Will there be Code exceptions for building plans that have already been approved, but not yet built, such as the Moxie expansion and the Main Street offices of Boulder Creek Builders?
8. What exceptions will be available for minor alterations to existing structures (whether historic or not)? What will be considered minor?
9. Is foundation insulation feasible on historic buildings, including those with no setbacks? This may not be an issue if historic structures and zero lot line buildings are exempt, however, it raises the question of whether City staff be given the flexibility to quickly approve simple waivers in situations where waivers make sense, without having to return to City Council.
10. How will the likely decrease in ‘air changes per hour’ affect indoor air quality, particularly as it relates to Covid transmission? Has the City prepared a study, risk assessment, or list of potential unintended health and other consequences to share with the public?
11. Has Louisville been working with the state—which is possibly considering a statewide approach in the next legislative session—and nearby municipalities to take a regional approach to Code implementation to avoid having businesses (especially restaurants) moving to other communities rather than locate or expand here when their leases expire? Should Louisville coordinate the timing of its Code approval efforts to avoid incomparable regulations that conflict with the state or unintentionally lead important businesses to locate or relocate elsewhere? Loss of Downtown restaurants, especially award-winning ones, due to Code compliance issues would be a disaster for Downtown and the City. What’s the rush—shouldn’t the questions be answered and the City receive more business buy-in prior to adoption of the new Code? What have been the experiences of other U.S. cities that have adopted the Code?
12. Will the electric grid, especially in the older neighborhoods and Downtown be able to support the additional electric power requirements? Is new line construction needed? Will line improvements be underground? Will their construction result in significant traffic disruptions? There have also been concerns about the shift in fuels from natural gas to electric power plants that are fired by coal, gas, and nuclear. What impacts will this have? Are solar panels, wind, storage, and other equipment currently available or are supply chain disruptions an issue? If there are supply chain problems, will waivers from immediate Code compliance be available to allow a project (in either a new,

change in use, or existing building) to proceed, with later compliance when equipment is available? The question of waivers or delayed compliance not only applies to solar and wind production equipment, but also to in-building HVAC and process equipment (such as stoves, boilers, and specialized equipment like roasters). Some residents and at least one local appliance retailer have reported months-long delays for getting relatively simple residential appliances: has the City determined whether the same holds true for commercial equipment? At meeting held at the Library, there was a mention of an 'industrial process' exception, what exactly is an 'industrial process' and what will be exempt? Would an industrial process have to be located in an industrial zoned building, such as in CTC, or can it be also include a small use in any commercial building, such as brewing equipment located in a non-industrial zone?

13. Has the Fire District been consulted? Does it have a position on the Code? How does the Code affect the Fire District's desire for a southern station?
14. Can trees be planted to offset any of the requirements? Would the City make City land available for planting?
15. The City is currently working on its decarbonization plan, what will be the City's schedule for compliance?
16. Has the City received a report on the energy consumed in building materials, particularly for increased insulation, compared with the energy savings to be achieved by that insulation?
17. Does the City have calculations of estimated payback periods—or the length of time that it takes for the energy cost savings from an improvement to pay the up-front costs of the improvement plus its financing costs—to share with the community? Relatively short payback periods, especially if they allow for amortization of up-front costs during the term of a business lease, could help lessen concerns about new requirements.
18. Have the EVC, LRC, and Planning Commission held hearings or meetings on the proposed changes and/or provided input to staff and City Council? If not, when will that occur? Has the City considered staff attendance at a meeting of the CTC Metro District Board of Directors and/or Property Owners Association to solicit comments? The Main Street Louisville BID Board should also be informed.
19. Will the cost of retrofits encourage demolition of historic structures in order for the owner or tenant to 'start over' rather than taking on the uncertainty and cost of Code compliance in an old structure that may need major upgrades or changes in use?

Oh my, only 19.

Thank you,

Rick Kron
Resident, since 1987, of
746 West Fir Court
Louisville, CO 80027

Questions for the City concerning energy-related building code changes from the Board of Directors of the Downtown Business Association of Louisville, Inc.

Last week's Energy Code meeting at the Recreation Center triggered a number of additional questions and suggested some edits for the 20 questions (actually 19) that were previously submitted by Mr. Kron. The revised 19 questions are included below, with the most substantial changes coming in items 9, 12, and 16.

The Board of Directors of the Downtown Business Association of Louisville has reviewed the prior questions, has added additional questions, and discussed others. Earlier today (8/4/22), the Board voted to submit all of the questions to the City with the backing of the Board.

Timely answers are needed.

The additional questions are:

20. Will the required EV charging stations make those spaces unavailable for non-EV vehicles? If the EV charging spaces will not be available to others, has there been a study of the effects of the loss of those spaces on fuel use resulting from increased searching for conventional spaces? If the EV charging spaces are not to be used by others, will private parking space owners be expected to enforce the restricted use of the privately owned EV charging spaces or will the police do that? Will the City be providing EV charging spaces in its lots? If so, will those be exclusive?

21. Installing a standby 220v electric line in an existing commercial kitchen (in the event of a renovation, change in use, or replacement of an existing gas stove for a new one) might require running the electric line behind cabinets, through historic walls, at odd angles or curves, and/or dropped through ceilings. Is the current Louisville commercial electrical code compatible with the requirement for these new electric lines if they are in retrofit locations where they were not previously anticipated?

22. The Regional Code Cohort is working together to decide on its preferred collective action. Is the City's accelerated schedule risking the solidarity of that cooperative effort? If the City gets out ahead of the rest of the cohort, the City risks the possibility of the loss of businesses to surrounding communities. If losses happen, there is a substantial risk that other communities will see the bad experience and choose not to follow the City's example. A failed experiment in a City with Louisville's prominence could be a real setback to the adoption of the Code in other communities. Is that possibility worth the risk when a regional or state approach might, and likely would, avoid it?

23. At last week's meeting, an architect related some of his experience with new efficient HVAC systems in Boulder, in particular noting that trained installers and maintenance technicians for new HVAC systems are unavailable or in short supply. Will the City be assisting with training programs through our high schools, community colleges, or our appliance businesses to help fill this gap? Will the City offer incentives for businesses and workers in the installation and maintenance fields to locate here?

24. At last week's Code meeting, there was a rather confusing presentation concerning the use of off-site solar, RECs, and other alternatives. It seems that three of the four alternatives would not be usable due to a requirement for 15 year supply contracts. Why is there a 15 year requirement as opposed to another number or no number at all? If a requirement exists, it would seem that simply putting the requirement in place and having the building owner decide how to meet it could be a better approach. A related question is why penalize off-site solar

options? What is the HPC's position on the addition of solar panels or windmills on historic buildings?

25. How will the life cycle of a building enter into the Code requirements in a change in use situation? Will buildings with short remaining useful lives simply be demolished rather than comply with the Code? How will this impact entrepreneurship and start-ups when older buildings are not available at lower rents? Artists also tend to use older, cheaper, buildings; how will their ability to acquire studio and display spaces be affected?

26. Are home offices subject to the Code requirements?

27. A commercial building owner at the meeting noted that the building owner would most likely pay the costs to bring a building up to the Code, but the 'payback' benefits, if any, would accrue to the tenant. Has the City or the Regional Code Cohort made estimates of rent increases that would come from Code compliance?

28. Some of the City's currently vacant buildings are unlikely to be filled by a single tenant (as has been the case for the former Hobby Lobby space). In the event a formerly single-user building, such as Kohls or Lowes, is split into several occupancies, will the Code require compliance for the entire building or for each separate user space?

29. Has there been a study of potential electric rate increases arising from increased demand due to increased electrification demand and/or electrical demand increases due to the elimination of natural gas? What would be the effects of increases on local businesses, particularly existing businesses with existing equipment?

30. What would the penalties be for non-compliance? Will new procedures be needed for appeals, and what would they be? Will the people handling appeals receive training on Code provisions?

31. Will the proposed specific 'triggers' be explained to, and vetted with, the business community prior to their adoption? There is a concern that there will not be sufficient time or opportunity for review and comment.

32. The DBA Board questioned: Does a conversion to all-electric use makes sense, especially in the short term, while XCEL generates over 50% of its electricity from coal and natural gas, and projects continued use of those fuels for decades in the future? Will the generation of carbon emissions increase in the short term, especially there are supply shortages slowing the construction of solar and wind alternatives?

33. The multifamily housing sector and developers were conspicuously absent from the two City public engagement meetings: has the City engaged with them in some other way? The sample multifamily building showed at the meetings is a five story design. Will the City allow five story apartment buildings? How will the Code affect the affordability of multifamily units, both in rent and in operating costs? In turn, how will the implementation of the Code in multifamily construction affect the City's achievement of its diversity and inclusion goals, especially as they relate to young families, if the Code increases housing costs?

34. Is it in the best interests of Louisville to proceed with the Code, without coordination with the state or the Regional Code Cohort, at this time in the wake of: COVID, pandemic related temporary closures of businesses, the Marshall Fire and loss of New Year's business, the displacement of people from the Fire and widespread under-insurance, inflation increasing the costs of doing business and costs for residents, potential recession, global and local supply shortages of material and equipment (especially appliances) due to pandemic and war,

increased interest rates that impact construction and other costs, labor shortages, permanent retail business closures that are cutting City tax revenues and likely forcing budget cuts, Medtronic's departure, and active recruitment of Louisville businesses by nearby communities seeking their relocation?

It is highly likely that this last item, active recruitment, will increase if the Code is unilaterally adopted by Louisville without at least the Regional Code Cohort simultaneously adopting it, or if the Code that is adopted includes a current or future prohibition on the use of natural gas for restaurants and other gas-dependent activities mentioned in Question 1 below.

The Board may find that there are more questions to be asked, and may bring them up in the future, but the questions above plus the questions below are enough for now.

Sincerely,

The Board of Directors
Downtown Business Association of Louisville, Inc.
August 5, 2022

The prior questions, with some editing, follow:

Twenty questions for the City concerning energy-related commercial building code changes
(Revised 8/4/2022)

Introductory comments: One of the more difficult aspects of writing these questions is that there is evidently no current draft of the Code that is readily available and that the Code itself is extremely long, detailed, and difficult even for experts in the field to plow through. Hopefully, these questions will help a more focused picture come to light.

Further, it is clear that climate change is real and that the use and abuse of energy are factors in that climate change. It is also clear that responses to climate change have to be practical and should take a regional, statewide, national, or international approach. Changes in Louisville regulations that simply move the problem to Broomfield, Lafayette, Erie, or elsewhere 'further out' are less than no help, even exacerbating the problems.

That said, here are the questions. Numbering is for convenience of reference, and does not reflect the importance of the questions or potential answers. The importance of each question may vary depending upon the interests of the questioners and responders.

1. Will the Code ban the use of natural gas, either now or in the future in commercial buildings? Please note that many small businesses, including restaurants, breweries, coffee roasters, bakeries, and others cannot convert to all-electric appliances due to the lack of adequate equipment, lack of affordable equipment, inability to change processes (BBQ, bakers, wood fired pizza, and roasters), inability to maintain product quality, inability to serve customers quickly, lack of training, and very likely other reasons. Even if conversion were possible, small business lacks the access to capital to meet the costs and to weather the delays in obtaining the equipment. Production kitchens do not share the simple 'put in a new range' alternative that is possible in residential homes.

2. The health of Avista Hospital is of vital importance to Downtown and all of Louisville. Will there be a 'hospital exemption' from the Code, and specifically including an exception to a ban on natural gas? Will there be a medical research, laboratory, urgent care, and medical office building exception to encourage those highly desired businesses to locate here?
3. Will there be an exception for a "change in use" of a structure that is vacant? Without an exception, the cost of replacing HVAC equipment and installing very high levels of insulation in buildings that were not designed for them could, and likely will, discourage the creative reuse of our currently vacant buildings. These buildings include, but are not limited to, (a) the Historic Downtown Grain Elevator, (b) Downtown Chase Bank, (c) empty Kohls, (d) empty Lowes, (e) vacant Carrabba's Italian Grill, (f) vacant former auto parts-scrapbooking store next door to Carrabba's, (g) empty Alfalfa's, and (h) empty spaces in CTC and elsewhere listed on several real estate listing websites. Possible future sites may include (i) the Walgreens on SBR, (j) Ascent Church (by the way, currently a fine existing reuse of that building that possibly could not have happened if the insulation requirements of the Code applied at the time of that reuse), and other buildings in the City. While the majority of these sites are not in Downtown, the future reuse of these buildings could represent a 'rising tide that lifts all boats,' with their occupancy contributing to the vibrancy of the City, including the health of Downtown.
4. How will 'change in use' be defined? For example, if a change in use changes a more energy intensive activity into a less energy intensive one, will that less energy intensive use be discouraged by having to comply with the Code? Will the Code include a provision for a waiver in this situation? Has the City researched the cost of new construction in the surrounding communities (such as Broomfield and Erie) as compared to the cost of retrofitting comparable buildings in Louisville? Has the City consulted with builders or developers concerning their preferences about trying to reconstruct existing buildings with a changed use as compared with starting new ones with longer commute times?
5. What will be the estimated additional time, expertise and cost needed for an applicant to prepare an application arising from new regulations (especially additional architect, attorney, and engineer time)? What will be the additional time for the City to process a building permit application? Will there be additional inspections during construction? Will the City provide a screened or approved list of knowledgeable architects, engineers, designers, contractors, and other professionals who are acceptable to the City and appropriately licensed? Will additional City licenses be needed for professionals to work here on Code matters? What additional City staff and consultants will be needed—and given the current scarcity of labor—are the needed personnel and consultants available at a price the City is willing to pay? Would the City consider a waiver of use tax, sales tax, and/or permit fees for the costs of compliance? How long will it take City staff to get up to speed? Have new blank submittal forms been drafted for applicants? Do compliant examples of completed forms exist?
6. Has the HPC been consulted on the potential impacts of the Code on historic structures, including impacts on new construction added to historic structures? Will HPC funds (grants, loans) be available to help pay for the upgrades, and when will those programs be in place? Aside from the HPC, what grant and loan programs will be available to businesses, including from the City and the LRC? Reimbursement programs are often 'not good enough' for small businesses that can't obtain the money in the first place to be reimbursed later: funds 'up front' without excessive application requirements would be essential for small businesses.
7. Will there be Code exceptions for building plans that have already been approved, but not yet built, such as the Moxie expansion and the Main Street offices of Boulder Creek Builders?
8. What exceptions will be available for minor alterations to existing structures (whether historic or not)? What will be considered minor?

9. Is foundation insulation feasible on historic buildings, including those with no setbacks? In particular, will there be exemptions from additional exterior foundation insulation requirements on Main Street where additional exterior insulation would further narrow the already narrow sidewalks? This may not be an issue if historic structures and zero lot line buildings are exempt, however, it raises the question of whether City staff will be given the flexibility to quickly approve simple waivers in situations where waivers make sense, without having to return to City Council.
10. How will the likely decrease in 'air changes per hour' affect indoor air quality, particularly as it relates to Covid transmission? Has the City prepared a study, risk assessment, or list of potential unintended health and other consequences to share with the public?
11. Has Louisville been working with the state—which is possibly considering a statewide approach in the next legislative session—and nearby municipalities, including the City and County of Broomfield, to take a regional approach to Code content and implementation to avoid having businesses (especially restaurants) moving to other communities rather than locate or expand here when their leases expire? Should Louisville coordinate the timing of its Code approval efforts to avoid incompatible regulations that conflict with the state or other local regulations or that unintentionally lead important businesses to locate or relocate elsewhere? Loss of Downtown restaurants, especially award-winning ones, due to Code compliance issues would be a disaster for Downtown and the City. What's the rush—shouldn't the questions be answered and the City receive more business buy-in prior to adoption of the new Code? What have been the experiences of other U.S. cities that have adopted the Code?
12. Will the electric grid, especially in the older neighborhoods and Downtown be able to support the additional electric power requirements? Is new line construction needed? Will line improvements be underground? Will their construction result in significant traffic disruptions? Has XCEL provided a definitive conclusion on what, if anything, needs to be done to the grid and who will pay for it? There have also been concerns about the shift in fuels from natural gas to electric power plants that are fired by coal, gas, and nuclear. What impacts will this have? Are solar panels, wind, storage, and other equipment currently available or are supply chain disruptions an issue? If there are supply chain problems, will waivers from immediate Code compliance be available to allow a project (in either a new, change in use, or existing building) to proceed, with later compliance when equipment is available? The question of waivers or delayed compliance not only applies to solar and wind production equipment, but also to in-building HVAC and process equipment (such as stoves, boilers, and specialized equipment like roasters). Some residents and at least one local appliance retailer have reported months-long delays for getting relatively simple residential appliances: has the City determined whether the same holds true for commercial equipment? At the City's public input meeting held at the Library, there was a mention of an 'industrial process' exception, what exactly is an 'industrial process' and what will be exempt? Would an industrial process have to be located in an industrial zoned building, such as in CTC, or can an industrial process be also include a small use in any commercial building, such as brewing equipment located in a non-industrial zone?
13. Has the Fire District been consulted? Does it have a position on the Code? How does the Code affect the Fire District's desire for a southern station?
14. Can trees be planted to offset any of the requirements? Would the City make City land available for planting? The City Arboretum could use more trees.
15. The City is currently working on its decarbonization plan, what will be the City's schedule for compliance?
16. Has the City received a report on the energy consumed in building materials, particularly for increased insulation, compared with the energy savings to be achieved by that insulation? Has the City studied the amount of imbedded energy in existing

buildings that would be lost if Code compliance precludes their reuse? For example, it took a lot of energy to produce and install the materials that are currently in the former Kohl's building—if that building is torn down because the cost of compliance with the Code is higher than 'starting over,' what is the energy cost of the lost materials, lost installation, and new demolition and how do they compare with the potential savings that would have come from application of the Code to the existing building?

17. Does the City have calculations of estimated payback periods—or the length of time that it takes for the energy cost savings from an improvement to pay the up-front costs of the improvement plus its financing costs—to share with the community? Relatively short payback periods, especially if they allow for amortization of up-front costs during the term of a business lease, could help lessen concerns about new requirements.
18. Have the EVC, LRC, and Planning Commission held hearings or meetings on the proposed changes and/or provided input to staff and City Council? If not, when will that occur? Has the City considered staff attendance at a meeting of the CTC Metro District Board of Directors and/or Property Owners Association to solicit comments? The Main Street Louisville BID Board should also be informed.
19. Will the cost of retrofits encourage demolition of historic structures in order for the owner or tenant to 'start over' rather than taking on the uncertainty and cost of Code compliance in an old structure that may need major upgrades or changes in use?

Sincerely,

The Board of Directors
Downtown Business Association of Louisville, Inc.

Rob Zuccaro

From: Elizabeth Otto <elzbeth.otto@aim.com>
Sent: Wednesday, November 17, 2021 1:24 PM
To: City Council
Subject: New building standards

Dear Louisville City Council,

I just read in the local paper about the legislation you recently passed that would adopt new sustainable building codes for future construction in the City.

Thank you so much!! I full heartedly agree with this decision and do hope the Planning Commission adopts them. (I have written to Robert Zuccaro under separate cover.)

Thanks,

Sincerely,

Elizabeth Otto

p.s. I still see City vehicles standing still and idling their engines. But good to see we have at least one electric vehicle in the fleet.

e

Meredyth Muth

From: Larry Donner <larrydonner@comcast.net>
Sent: Thursday, June 30, 2022 9:13 PM
To: City Council
Cc: Jeff Durbin; Rob Zuccaro; Kayla Betzold
Subject: Net-Zero Survey
Attachments: Biased Energy Survey.pdf

In my 73 years, I have seen some egregious push polls but this “survey” from the City of Louisville is one of the worst examples I ever have seen. No matter what a respondent believes with regard to the proposed net-zero codes, the results will be used to show “overwhelming” support for the new codes.

The whole premise of the survey is that net-zero is "God's Word" and that any dissenters are stupid and destined for “Hell” or even worse agents of the Devil themselves.

It appears that whoever assembled this survey is so biased, they see it as an honest survey. It definitely is not.

The City of Louisville should be embarrassed to be associated with such a defective product.

Larry Donner
1020 Willow Pl.

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From: [Mike Kranzdorf](#)
To: [Rob Zuccaro](#); [Chad Root](#); [Kayla Betzold](#)
Subject: Energy Code Update Materials
Date: Wednesday, July 20, 2022 1:14:08 PM

Hello Energy Code Update "Who's Listening" team,

Can you answer some questions in advance of the next Energy Code Update meeting?

What is in "Cost for Code Compliant Building" and "Net Zero Requirements and Costs"? Are they just the mechanical systems or does they include all of the various installation, distribution and metering systems required for different scenarios?

Why are all of the Photo Voltaic requirements higher for mixed-fuel scenarios than for all-electric ones? If a building uses gas for part of its power source, one would think it uses less electricity, not more.

For the retail and multi-family buildings, is there one electric meter for the entire premises? This is not typical for these types of buildings. Does the model include costs for a building owner to distribute, measure and bill for electricity? Would Xcel allow such a building to be built, with no electric meters on individual suites? If there are multiple meters, how does a developer allocate panels to units without knowing tenant demand at construction?

Retail tenants' energy use varies widely across users, such as a 3,000 SF brewery and a 3,000 SF karate studio. Is the single retail model an average of some kind? Where was the model obtained from?

For single family buildings and for-sale multi-family units, the cost of Net Zero construction will be passed directly to buyers. For multi-family rentals and office and retail buildings, in order for the PV payback to work, all leases must include the requirement for tenants to pay full retail price for electricity to the landlord for the estimated 20-30 years. Is this considered to be a reasonable assumption among those constructing these models?

Why is there no industrial model? This is probably the hardest to model across tenant and use types. It also represents more square footage built or in planning than any other type in Louisville. Will models be completed before this goes to City Council?

Thank you,

Mike Kranzdorf
Amterre Property Group LLC
720-304-3200

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Rob Zuccaro

Subject: FW: Proposed commercial building code,

-----Original Message-----

From: Rick Kron <rickkronco@gmail.com>

Sent: Monday, June 27, 2022 1:32 PM

To: Mark Oberholzer <ober129@gmail.com>; Jenni Hlawatsch <jenni@singingcookstore.com>; Tom Horst <tom@crystalspringsbrewing.com>; Eric Reed <info@acmefinegoods.com>; Greg Reedy <Greg.Reedy@edwardjones.com>; Heather Bingaman <Heatherandresen@hotmail.com>

Cc: Austin Brown <abrown@louisvilleco.gov>

Subject: Proposed commercial building code,

Good afternoon (maybe not so good after you've seen this email):

As has been mentioned, the City is looking into adopting a new energy-related building code for commercial structures. A very brief summary is on the City's website...look under 'news' and click on "Building for the future, Energy code update."

THERE IS an 'open house' scheduled for This Wednesday from 6-8 p.m. at the Library first floor meeting room. The city website has a link to the sign-up page for the open house.

Downtown needs to have a presence there. I've signed up. I believe that more are needed.

I'm hoping the open house can shed some light on a number of questions:

The new energy code could be a huge issue for most of the buildings downtown depending on the "triggers" that would mandate the use of the new code. While new building construction is likely to have to comply with all or part of the new code (which could include banishing the use of natural gas for any purpose), will renovations of existing structures be required to comply? How major of a renovation would trigger the use of the new code? Would a sign or fence permit trigger it? What about Building Renovations that do not add additional square footage, such as a bathroom renovation or update? If building square feet are added, how many new feet would have to be added before the new code applies? Does the new code only apply to the new space or would the entire building have to comply (possibly requiring major increases in wall and ceiling insulation along with the possible replacement of natural gas appliances and/or furnaces in historic downtown buildings)? Will historic structures be exempt, and if so, how will 'historic' be defined? Although Avista is not in downtown, its continued presence in Louisville is of vital interest to downtown, how is it affected and has its management been consulted?

What would compliance cost in dollars? What are the projected payback periods for the items in the new code due to energy savings?

Will permits and inspections be impacted (especially given limited staff and the projected increased workload due to the Marshall Fire rebuilding)?

Will the new code result in owners and tenants foregoing needed renovations? Will it result in our growing businesses choosing to grow outside of Louisville rather than expanding here?

Tom, I think the presence of someone from the Chamber would be especially good.

Rick

Sent from my iPad

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From: [John Cowley](#)
To: [Kayla Betzold](#)
Subject: Follow-up information regarding Advisory Board meeting of Wed., July 20, 2022
Date: Saturday, July 23, 2022 3:06:19 PM

To: Louisville Sustainability Advisory Board
From: John Cowley, Louisville resident, 303 Fairfield Ln.
jrcowley@idcomm.com
Date: July 23, 2022

Subject: Follow-up information regarding Advisory Board meeting of Wednesday, July 20, 2022

Thank you for your informative meeting on Wednesday. There seem to be too many relevant issues to be covered in a single meeting. Following are expansions on my comments offered via Zoom, including too much (but hopefully useful) detail:

1. OVERRIDING GOAL: Often unmentioned, efforts at “sustainability” have the overriding purpose of countering climate change. The most important thing we can do locally is everything possible to meet our 2030 goal of 75% carbon-free energy for all of Louisville (while limiting financial impacts).

To support this goal, Louisville could create a frequently-updated web dashboard, such as this one set up by an oversight group which reports on Boulder’s progress:

<https://empowerourfuture.org/xcel-city-of-boulder-oversight/>

2. EMPHASIZING CO2 SAVINGS: Foremost, the purpose of raising sustainability standards is to reduce the community’s carbon footprint. The community needs to be educated to appreciate that this goal will usually incur some costs, to reduce much-larger costs down the road.

Perhaps the “cost” of the various options for new standards could use a metric, such as “annual pounds CO2 prevented per \$100 cost incurred” – the higher this ratio, the more cost-effective a new standard would be. Then, standards could be evaluated against each other.

Here are some relations to convert electrical “kWh” and natural-gas “therms” to “pounds CO2”:

A. “1.0 therm” of natural gas burnt produces “11.7 lbs. of CO2 emissions” (from U.S. EPA, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2004)

B. Electrical equivalence of CO2 cost of natural gas: 10.9 kWh per therm (*see Xcel, below)

C. 0.000477 metric tons* (2,200 lbs) of CO2 per kWh (at Xcel’s current carbon & clean mix)

D. To convert solar panel “kW” power sizing to “kWh” annual energy produced, multiply:

Annual energy in kilowatt-hours (kWh) = power x 4.2 hrs/day* x 365 days/year

*(B. through D. are based on relations in “City-of-Louisville-2021.xls” downloaded from

https://www.xcelenergy.com/community_energy_reports)

EXAMPLE: Evaluate the first entry in meeting's Chart: Policy Consideration [1]:

Multifamily Building PV system of 31.5 kW power; cost: \$78,750:

Approx. annual energy produced, kWh = $31.5 \times 4.2 \times 365 = 48,300$ kWh

Annual savings in Pounds CO₂ = $48,290 \text{ kWh} \times 0.000477 \text{ T/kWh} \times 2,200 \text{ lbs/T} = 50,700 \text{ lbs}$

For this PV array: ANNUAL CO₂ SAVINGS RATIO = $50,700/(\$78,750/100) = 64 \text{ lbs}/\100

PLUS, at an effective \$0.15 per kWh, FINANCIAL SAVINGS = $48,300 \text{ kWh} \times 0.15 = \$7,200$ per year

3. CONFERRING WITH BOULDER ON THEIR "FREE" CITY SOLAR INSTALLATIONS:

Generation Solar – Project Overview

<https://bouldercolorado.gov/projects/generation-solar>

"The Climate Initiatives department created Generation Solar to bring an innovative, collaborative approach to solar procurement across multiple city departments and properties. The city is paying no upfront capital investment costs for the solar and will realize savings in operating costs throughout the life of the new systems."

This might sound "too good to be true", but it seems to be real:

"Fourteen city facilities are included in this project, totaling 2.1 MW of renewably generated power".

A recent webinar concluded with a recommendation that "solar installations are best located where the energy is directly used during daylight hours." (July 21, 2022 Empower Hour: Geof Syphers of Sonoma Clean Power) That suggests that solar could primarily be promoted for industrial rooftops, or adjacent parcels, such as in CTC.

Boulder's financial partner's website lists several capabilities that may be useful in meeting Louisville's needs such as this. (website: <https://unicosolar.com/solutions/>) The projects' builder was Namaste Solar.

4. INFORMING PUBLIC HOW TO FIND AND JOIN SOLAR FARMS

My roof has a poor orientation relative to the southerly ideal for solar panels. There is also tree shading. But brief research into local-area solar farms left me confused about organizational trust, billing, cost savings if any, commitments, etc.

The City of Louisville could motivate and speed up residents' use of solar by providing an informative overview (printed or web-based) of what solar farms are available and how to subscribe. Make it as easy as "one click" to subscribe, once the user's choice is made.

Here is an example of an explanatory website you could direct residents to – saving them the frustrations and dead ends in doing their own searches. (I stumbled on this today):

<https://blog.namastesolar.com/solar-farms-in-colorado>

For city planners, the above website might offer some enticing ideas:

"Namaste Solar is always looking for new land for community solar development. If you have more than 10 acres of relatively flat, unshaded

land that you want to put to work for your community and for the environment, you may be able to earn passive income from a long-term community solar lease agreement. You can reach out to us by filling out this short form.”

(Disclaimer: I have no business relationship with Namaste Solar or other organizations mentioned here.)

5. INSTALLING EV CHARGERS

The arrival of many brands and models of Electric Vehicles will accelerate in the next year or two. “Cities with many EV chargers will draw the most visitors!” Louisville could get “ahead of the curve” by:

A. Incentivizing apartment property owners to install chargers. This will attract renters, since many new EV owners will not be homeowners. (GM’s goals are to mass-produce lower-cost EVs.) This appears to be part of the sustainability codes under discussion.

B. Installing many more chargers on City properties, such as at the golf course, Rec Center, downtown parking. (Some could be perks for city employees...)

C. Seeking out U.S. and Colorado subsidies for EV chargers, such as from the recent Infrastructure bills.

D. Keeping in mind that “EV charging is best done in the daytime, when solar-array output can be excessive”. This was an idea also from the Empower Hour webinar mentioned in 3. above.

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Questions for the City concerning energy-related building code changes from the Board of Directors of the Downtown Business Association of Louisville, Inc.

Last week's Energy Code meeting at the Recreation Center triggered a number of additional questions and suggested some edits for the 20 questions (actually 19) that were previously submitted by Mr. Kron. The revised 19 questions are included below, with the most substantial changes coming in items 9, 12, and 16.

The Board of Directors of the Downtown Business Association of Louisville has reviewed the prior questions, has added additional questions, and discussed others. Earlier today (8/4/22), the Board voted to submit all of the questions to the City with the backing of the Board.

Timely answers are needed.

The additional questions are:

20. Will the required EV charging stations make those spaces unavailable for non-EV vehicles? If the EV charging spaces will not be available to others, has there been a study of the effects of the loss of those spaces on fuel use resulting from increased searching for conventional spaces? If the EV charging spaces are not to be used by others, will private parking space owners be expected to enforce the restricted use of the privately owned EV charging spaces or will the police do that? Will the City be providing EV charging spaces in its lots? If so, will those be exclusive?

21. Installing a standby 220v electric line in an existing commercial kitchen (in the event of a renovation, change in use, or replacement of an existing gas stove for a new one) might require running the electric line behind cabinets, through historic walls, at odd angles or curves, and/or dropped through ceilings. Is the current Louisville commercial electrical code compatible with the requirement for these new electric lines if they are in retrofit locations where they were not previously anticipated?

22. The Regional Code Cohort is working together to decide on its preferred collective action. Is the City's accelerated schedule risking the solidarity of that cooperative effort? If the City gets out ahead of the rest of the cohort, the City risks the possibility of the loss of businesses to surrounding communities. If losses happen, there is a substantial risk that other communities will see the bad experience and choose not to follow the City's example. A failed experiment in a City with Louisville's prominence could be a real setback to the adoption of the Code in other communities. Is that possibility worth the risk when a regional or state approach might, and likely would, avoid it?

23. At last week's meeting, an architect related some of his experience with new efficient HVAC systems in Boulder, in particular noting that trained installers and maintenance technicians for new HVAC systems are unavailable or in short supply. Will the City be assisting with training programs through our high schools, community colleges, or our appliance businesses to help fill this gap? Will the City offer incentives for businesses and workers in the installation and maintenance fields to locate here?

24. At last week's Code meeting, there was a rather confusing presentation concerning the use of off-site solar, RECs, and other alternatives. It seems that three of the four alternatives would not be usable due to a requirement for 15 year supply contracts. Why is there a 15 year requirement as opposed to another number or no number at all? If a requirement exists, it would seem that simply putting the requirement in place and having the building owner decide how to meet it could be a better approach. A related question is why penalize off-site solar

options? What is the HPC's position on the addition of solar panels or windmills on historic buildings?

25. How will the life cycle of a building enter into the Code requirements in a change in use situation? Will buildings with short remaining useful lives simply be demolished rather than comply with the Code? How will this impact entrepreneurship and start-ups when older buildings are not available at lower rents? Artists also tend to use older, cheaper, buildings; how will their ability to acquire studio and display spaces be affected?

26. Are home offices subject to the Code requirements?

27. A commercial building owner at the meeting noted that the building owner would most likely pay the costs to bring a building up to the Code, but the 'payback' benefits, if any, would accrue to the tenant. Has the City or the Regional Code Cohort made estimates of rent increases that would come from Code compliance?

28. Some of the City's currently vacant buildings are unlikely to be filled by a single tenant (as has been the case for the former Hobby Lobby space). In the event a formerly single-user building, such as Kohls or Lowes, is split into several occupancies, will the Code require compliance for the entire building or for each separate user space?

29. Has there been a study of potential electric rate increases arising from increased demand due to increased electrification demand and/or electrical demand increases due to the elimination of natural gas? What would be the effects of increases on local businesses, particularly existing businesses with existing equipment?

30. What would the penalties be for non-compliance? Will new procedures be needed for appeals, and what would they be? Will the people handling appeals receive training on Code provisions?

31. Will the proposed specific 'triggers' be explained to, and vetted with, the business community prior to their adoption? There is a concern that there will not be sufficient time or opportunity for review and comment.

32. The DBA Board questioned: Does a conversion to all-electric use makes sense, especially in the short term, while XCEL generates over 50% of its electricity from coal and natural gas, and projects continued use of those fuels for decades in the future? Will the generation of carbon emissions increase in the short term, especially there are supply shortages slowing the construction of solar and wind alternatives?

33. The multifamily housing sector and developers were conspicuously absent from the two City public engagement meetings: has the City engaged with them in some other way? The sample multifamily building showed at the meetings is a five story design. Will the City allow five story apartment buildings? How will the Code affect the affordability of multifamily units, both in rent and in operating costs? In turn, how will the implementation of the Code in multifamily construction affect the City's achievement of its diversity and inclusion goals, especially as they relate to young families, if the Code increases housing costs?

34. Is it in the best interests of Louisville to proceed with the Code, without coordination with the state or the Regional Code Cohort, at this time in the wake of: COVID, pandemic related temporary closures of businesses, the Marshall Fire and loss of New Year's business, the displacement of people from the Fire and widespread under-insurance, inflation increasing the costs of doing business and costs for residents, potential recession, global and local supply shortages of material and equipment (especially appliances) due to pandemic and war,

increased interest rates that impact construction and other costs, labor shortages, permanent retail business closures that are cutting City tax revenues and likely forcing budget cuts, Medtronic's departure, and active recruitment of Louisville businesses by nearby communities seeking their relocation?

It is highly likely that this last item, active recruitment, will increase if the Code is unilaterally adopted by Louisville without at least the Regional Code Cohort simultaneously adopting it, or if the Code that is adopted includes a current or future prohibition on the use of natural gas for restaurants and other gas-dependent activities mentioned in Question 1 below.

The Board may find that there are more questions to be asked, and may bring them up in the future, but the questions above plus the questions below are enough for now.

Sincerely,

The Board of Directors
Downtown Business Association of Louisville, Inc.
August 5, 2022

The prior questions, with some editing, follow:

Twenty questions for the City concerning energy-related commercial building code changes
(Revised 8/4/2022)

Introductory comments: One of the more difficult aspects of writing these questions is that there is evidently no current draft of the Code that is readily available and that the Code itself is extremely long, detailed, and difficult even for experts in the field to plow through. Hopefully, these questions will help a more focused picture come to light.

Further, it is clear that climate change is real and that the use and abuse of energy are factors in that climate change. It is also clear that responses to climate change have to be practical and should take a regional, statewide, national, or international approach. Changes in Louisville regulations that simply move the problem to Broomfield, Lafayette, Erie, or elsewhere 'further out' are less than no help, even exacerbating the problems.

That said, here are the questions. Numbering is for convenience of reference, and does not reflect the importance of the questions or potential answers. The importance of each question may vary depending upon the interests of the questioners and responders.

1. Will the Code ban the use of natural gas, either now or in the future in commercial buildings? Please note that many small businesses, including restaurants, breweries, coffee roasters, bakeries, and others cannot convert to all-electric appliances due to the lack of adequate equipment, lack of affordable equipment, inability to change processes (BBQ, bakers, wood fired pizza, and roasters), inability to maintain product quality, inability to serve customers quickly, lack of training, and very likely other reasons. Even if conversion were possible, small business lacks the access to capital to meet the costs and to weather the delays in obtaining the equipment. Production kitchens do not share the simple 'put in a new range' alternative that is possible in residential homes.

2. The health of Avista Hospital is of vital importance to Downtown and all of Louisville. Will there be a 'hospital exemption' from the Code, and specifically including an exception to a ban on natural gas? Will there be a medical research, laboratory, urgent care, and medical office building exception to encourage those highly desired businesses to locate here?
3. Will there be an exception for a "change in use" of a structure that is vacant? Without an exception, the cost of replacing HVAC equipment and installing very high levels of insulation in buildings that were not designed for them could, and likely will, discourage the creative reuse of our currently vacant buildings. These buildings include, but are not limited to, (a) the Historic Downtown Grain Elevator, (b) Downtown Chase Bank, (c) empty Kohls, (d) empty Lowes, (e) vacant Carrabba's Italian Grill, (f) vacant former auto parts-scrapbooking store next door to Carrabba's, (g) empty Alfalfa's, and (h) empty spaces in CTC and elsewhere listed on several real estate listing websites. Possible future sites may include (i) the Walgreens on SBR, (j) Ascent Church (by the way, currently a fine existing reuse of that building that possibly could not have happened if the insulation requirements of the Code applied at the time of that reuse), and other buildings in the City. While the majority of these sites are not in Downtown, the future reuse of these buildings could represent a 'rising tide that lifts all boats,' with their occupancy contributing to the vibrancy of the City, including the health of Downtown.
4. How will 'change in use' be defined? For example, if a change in use changes a more energy intensive activity into a less energy intensive one, will that less energy intensive use be discouraged by having to comply with the Code? Will the Code include a provision for a waiver in this situation? Has the City researched the cost of new construction in the surrounding communities (such as Broomfield and Erie) as compared to the cost of retrofitting comparable buildings in Louisville? Has the City consulted with builders or developers concerning their preferences about trying to reconstruct existing buildings with a changed use as compared with starting new ones with longer commute times?
5. What will be the estimated additional time, expertise and cost needed for an applicant to prepare an application arising from new regulations (especially additional architect, attorney, and engineer time)? What will be the additional time for the City to process a building permit application? Will there be additional inspections during construction? Will the City provide a screened or approved list of knowledgeable architects, engineers, designers, contractors, and other professionals who are acceptable to the City and appropriately licensed? Will additional City licenses be needed for professionals to work here on Code matters? What additional City staff and consultants will be needed—and given the current scarcity of labor—are the needed personnel and consultants available at a price the City is willing to pay? Would the City consider a waiver of use tax, sales tax, and/or permit fees for the costs of compliance? How long will it take City staff to get up to speed? Have new blank submittal forms been drafted for applicants? Do compliant examples of completed forms exist?
6. Has the HPC been consulted on the potential impacts of the Code on historic structures, including impacts on new construction added to historic structures? Will HPC funds (grants, loans) be available to help pay for the upgrades, and when will those programs be in place? Aside from the HPC, what grant and loan programs will be available to businesses, including from the City and the LRC? Reimbursement programs are often 'not good enough' for small businesses that can't obtain the money in the first place to be reimbursed later: funds 'up front' without excessive application requirements would be essential for small businesses.
7. Will there be Code exceptions for building plans that have already been approved, but not yet built, such as the Moxie expansion and the Main Street offices of Boulder Creek Builders?
8. What exceptions will be available for minor alterations to existing structures (whether historic or not)? What will be considered minor?

9. Is foundation insulation feasible on historic buildings, including those with no setbacks? In particular, will there be exemptions from additional exterior foundation insulation requirements on Main Street where additional exterior insulation would further narrow the already narrow sidewalks? This may not be an issue if historic structures and zero lot line buildings are exempt, however, it raises the question of whether City staff will be given the flexibility to quickly approve simple waivers in situations where waivers make sense, without having to return to City Council.
10. How will the likely decrease in 'air changes per hour' affect indoor air quality, particularly as it relates to Covid transmission? Has the City prepared a study, risk assessment, or list of potential unintended health and other consequences to share with the public?
11. Has Louisville been working with the state—which is possibly considering a statewide approach in the next legislative session—and nearby municipalities, including the City and County of Broomfield, to take a regional approach to Code content and implementation to avoid having businesses (especially restaurants) moving to other communities rather than locate or expand here when their leases expire? Should Louisville coordinate the timing of its Code approval efforts to avoid incompatible regulations that conflict with the state or other local regulations or that unintentionally lead important businesses to locate or relocate elsewhere? Loss of Downtown restaurants, especially award-winning ones, due to Code compliance issues would be a disaster for Downtown and the City. What's the rush—shouldn't the questions be answered and the City receive more business buy-in prior to adoption of the new Code? What have been the experiences of other U.S. cities that have adopted the Code?
12. Will the electric grid, especially in the older neighborhoods and Downtown be able to support the additional electric power requirements? Is new line construction needed? Will line improvements be underground? Will their construction result in significant traffic disruptions? Has XCEL provided a definitive conclusion on what, if anything, needs to be done to the grid and who will pay for it? There have also been concerns about the shift in fuels from natural gas to electric power plants that are fired by coal, gas, and nuclear. What impacts will this have? Are solar panels, wind, storage, and other equipment currently available or are supply chain disruptions an issue? If there are supply chain problems, will waivers from immediate Code compliance be available to allow a project (in either a new, change in use, or existing building) to proceed, with later compliance when equipment is available? The question of waivers or delayed compliance not only applies to solar and wind production equipment, but also to in-building HVAC and process equipment (such as stoves, boilers, and specialized equipment like roasters). Some residents and at least one local appliance retailer have reported months-long delays for getting relatively simple residential appliances: has the City determined whether the same holds true for commercial equipment? At the City's public input meeting held at the Library, there was a mention of an 'industrial process' exception, what exactly is an 'industrial process' and what will be exempt? Would an industrial process have to be located in an industrial zoned building, such as in CTC, or can an industrial process be also include a small use in any commercial building, such as brewing equipment located in a non-industrial zone?
13. Has the Fire District been consulted? Does it have a position on the Code? How does the Code affect the Fire District's desire for a southern station?
14. Can trees be planted to offset any of the requirements? Would the City make City land available for planting? The City Arboretum could use more trees.
15. The City is currently working on its decarbonization plan, what will be the City's schedule for compliance?
16. Has the City received a report on the energy consumed in building materials, particularly for increased insulation, compared with the energy savings to be achieved by that insulation? Has the City studied the amount of imbedded energy in existing

buildings that would be lost if Code compliance precludes their reuse? For example, it took a lot of energy to produce and install the materials that are currently in the former Kohl's building—if that building is torn down because the cost of compliance with the Code is higher than 'starting over,' what is the energy cost of the lost materials, lost installation, and new demolition and how do they compare with the potential savings that would have come from application of the Code to the existing building?

17. Does the City have calculations of estimated payback periods—or the length of time that it takes for the energy cost savings from an improvement to pay the up-front costs of the improvement plus its financing costs—to share with the community? Relatively short payback periods, especially if they allow for amortization of up-front costs during the term of a business lease, could help lessen concerns about new requirements.
18. Have the EVC, LRC, and Planning Commission held hearings or meetings on the proposed changes and/or provided input to staff and City Council? If not, when will that occur? Has the City considered staff attendance at a meeting of the CTC Metro District Board of Directors and/or Property Owners Association to solicit comments? The Main Street Louisville BID Board should also be informed.
19. Will the cost of retrofits encourage demolition of historic structures in order for the owner or tenant to 'start over' rather than taking on the uncertainty and cost of Code compliance in an old structure that may need major upgrades or changes in use?

Sincerely,

The Board of Directors
Downtown Business Association of Louisville, Inc.

From: [Sally Blair](#)
To: [City Council](#); [Rob Zuccaro](#); [Lisa Ritchie](#)
Subject: Commercial energy code
Date: Thursday, September 8, 2022 4:47:35 PM

Hello City Council,

You outlasted me on Tuesday night, I can't stay awake past 10pm. ;)

I wanted to express my support for Staff's recommendation to advance Option 1 in the meeting packet. I thank the City and Staff for working with local experts to conduct outreach and analysis to recommend several options that meet Louisville's climate goals and consider local and regional building codes. This code option moves Louisville towards meeting our climate goals, but does not fully meet those goals. We have a long way to go yet. We have very recently and acutely experienced a climate disaster and these climate hardships will continue if we as a community do not take bold and aggressive action. Boulder has had one of the most stringent energy codes in the region for many years and it has not economically devastated the City. It is an easy thing to say building energy upgrades will cost too much, but we are living the devastation and cost of climate change. I encourage you to consider the near and long-term future of the City and our residents while making this decision. Thank you.

Sally Blair
401 County Rd

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Louisville Sustainability Advisory Board

Meeting Minutes

July 20, 2022

Louisville Public Library

951 Spruce Street, Second Floor Board Room

6:30 - 8:00 p.m.

1. Call to Order

Todd called the meeting to order at 6:35 p.m.

2. Roll Call

Present: Tiffany Boyd, Seth Adams Kayla Betzold- staff liaison

Online: Dan Mellish, Josh Cooperman, Todd Budin

3. Approval of Agenda

Agenda was approved.

4. Approval of Minutes

May meeting minutes were approved.

5. Public Comment 6:35 P.M.

Comment #1

This morning, several members of the city lost power. The Electric system failed.

- 2 things pending:
 - Beneficial electrification
 - Franchise agreement - coming up for renewal with incumbent monopoly utility.
- Franchise agreement - so many of us have pushed Xcel so hard to move in the direction they're moving in. Something needs to be done.
- Helps to develop transportation electrification infrastructure.
- If we don't have resiliency or redundancy we take a big risk. Too many eggs in one basket type of situation.
- We need to invest in our citizen's ability to provide onsite storage or convince incumbent monopoly to have resiliency and redundancy.

Comment #2

- Tomorrow, 1-5pm is City Council's budget retreat.
- Are there pressing items the sustainability board would like the council to address for the coming 2 years?
- There will be a public comment section at the beginning, but no discussion throughout the meeting.
- **Response:** Retreat is mainly focused on capital improvement requests. Funds have been submitted for electrification + fleet requests, parks requests, and facilities upgrades.
- **Response:** In our comprehensive plan, City of Boulder has a community values matrix that they run capital improvements through. A way to think about which plans need to be prioritized. This would be a neat thing to start thinking about regionally. NIMBY is common, so values are an important lens when looking at capital improvement projects.
 - Critical we at least keep up with surrounding communities.
- Bag tax for restaurants:
 - Restaurants' software providers don't have a way for them to charge for the tax. How can we improve their software or give them another option for charging?
 - Conversations with sales tax are occurring, so we can add this to the agenda.

6. Energy Code Update

- Phase 2 of the Energy Code project.
 - This phase looks at new commercial construction building code updates.
 - Consultants have been conducting energy modeling and we've been looking at potential policy considerations.

Meeting Outcomes

- Collect LSAB feedback on policy considerations. No final vote or consensus, just looking for general discussion.
- Building Code Board of Appeals will hear this presentation tomorrow night (7/21).
- Using all of this feedback, we will draft an ordinance that will outline on of these policies, this will go to council for feedback/direction, then the ordinance will come back to LSAB for approval.

City of Louisville Sustainability Goals

- (see slides and Resolution 25, Series 2019)

Why adopt additional code amendments?

- Climate change is here, happening now in Colorado and in Louisville.
- Local leaders have an opportunity to act and make changes in the building space.

Current Green Building Efforts

- Adoption of 2021 IECC
- Appendix RC = Zero energy appendix applying to single family home.
- (see slide *Current Code for New Construction* for list of current code elements)
- **Electric-readiness:** a home needs pre-wiring and panel capacity to support all-electric equipment installations in the future.

Next Phase of Energy Code Update

- Considerations include higher efficiency, net zero, and/or all-electric new construction options.
- (see *slides for definitions*)

3 pillars of sustainability

- Economic, social, environmental
- Want to ensure these recommendations strike a balance between all three pillars.

Modeling to Inform Policy

- To ensure these policies are based on data and reality, we conducted modeling with G14.
- Goal was to understand upfront and annual costs of various HVAC systems, and evaluate greenhouse gas emissions.
- Each building modeled was modeled to meet current Louisville code.
- Other community policies currently in place were researched to inform the modeling.
- None of this is set in stone. There could be a mix and match.

Policy Consideration 1

- Current Louisville code
 - 1a) The 2024 codes are currently being drafted. One proposal in 2024 code is to require buildings to install 0.75 W/sf for the largest 3 floors.
 - 1b) max out the roof space with PV
 - 1c) Provide enough PV to offset any carbon emissions from natural gas used onsite.
- PV Required to match 2024 proposal:
 - Size and cost outlined in table for buildings modeled.
- PV that fits on the roof:

- Size and cost outlined in table for building modeled.
 - Significant jump from 1a.
- PV required to offset natural gas consumption onsite.
 - In some cases, the roofspace is smaller than the PV system size that would be required, in other cases, it fits.

Question: Can you elaborate on 'offset' in the context of the presentation?

- Per EIA, we calculated the carbon emissions from natural gas used onsite, and the carbon emissions avoided in Xcel territory by using onsite PV. To provide enough PV to negate those carbon emissions, we calculated total carbon emissions avoided by using PV.

Policy Consideration 2

- **EUI Targets for Building Types**
 - Projects need to meet a maximum allowable energy use per square foot (EUI) through a performance pathway.
 - Onsite PV would be able to contribute to reducing the site EUI.
 - EUI is total energy use per square foot in a building. PV itself doesn't necessarily reduce a building's energy. But, this would allow PV to contribute to the EUI target.
- Targets listed on the slide are just examples to showcase how the policy could work.
 - The New Buildings Institute is an organization that helps support building decarbonization. They have cost studies and a few code standards that overlay the International Energy Conservation Code.
 - They have put together a list of recommended EUI targets.
- **Modeling Scenario Results**
 - The options on the left of the table are different HVAC systems. The middle column are the different EUIs the systems would deliver. The right column is the NBI recommended target.
 - The graph showcases upfront costs and annual energy costs.
 - Factors such as additional lighting efficiency, envelope efficiencies, etc. were not changed. The buildings modeled are code compliant for City of Louisville.
 - There is a delta between base code and new system, but the amount depends on which system is chosen.
 - For **Retail Building**:
 - The model includes two restaurants - a fast food restaurant and a sit-down restaurant. Restaurants have a high energy load. NBI does not have a recommended EUI for retail building that includes restaurants.

- **Question:** How do these models compare to cost of the building itself?
 - We estimate that an HVAC system is about 20-40% of a building's first cost. It can be a really high percentage or really low, just based on the type of system chosen.

Policy Option 3a

- Appendix CC use and enforcement.
 - RC equivalent that Louisville has already adopted that has enhanced efficiency requirements and offset of energy used via onsite and/or offsite PV.
 - Note: There would be a number of exceptions to appendix CC. To be decided, but industrial processes, labs, restaurants, etc. would be considered.
- **Question:** Can you speak to existing buildings with this?
 - All of this is TBD. Typically, the energy code doesn't step in until there is a major renovation or total rehab of a building. For an amendment like this, it would be part of the process to consider existing buildings.

Policy Option 3b

- Appendix CC, but requiring it to be all-electric.
 - You have to be net zero, including enhanced efficiency, and you have to build all-electric system.
 - There is potential for exceptions/reductions for industrial processes, labs, restaurants, etc. We don't want to inhibit energy density needs.
- Appendix CC has the requirement for the full offset. Typically, we cannot fit all of the PV required on the building itself. Most commercial buildings will have to procure offsite renewables.
 - Renewable Procurement Requirements.
 - 7 options (see slide).
 - Wholesale market is not applicable in Colorado due there not being a wholesale market.
 - Most relevant are that the contract has to have a duration of not less than 15 years and the generation source must be located where the energy can be delivered to the building site.
 - Unbundled RECs can not trace where the generation happened. They are not necessarily an option that works in our energy market.
 - Community renewables, virtual PPAs, or direct ownership are the only pieces that would be able to work.
- In Xcel Energy's programs
 - Windsource- subscriber keeps it, but no 15 year contracts.

- Renewable*Connect - community solar you can buy into, but it sells out very quickly.
- Solar*Rewards - Xcel Energy buys all the recs. Xcel pays you an incentive to sell the RECs back to Xcel for the solar you're producing onsite.
- Net metering - customer can keep the RECs but there are still incentives to sell it back to Xcel.
- If you can't offset with onsite renewables, there are options.
 - Virtual PPAs (Power Purchase Agreement) - there is a developer who develops the renewable energy. The customer commits to buying the energy produced for a set rate for a set amount of time.
 - Often pursued by larger private entities.
- For Pros and Cons, see slide.
- For RECs and Green Retail Tariff, compliance might not be feasible.
 - Discussions will continue to get to the bottom of unanswered questions.
- There is a pathway in Appendix CC that allows you to use a set EUI rather than an energy model to calculate how much PV you need to comply with the appendix.
- The amount of PV that would fit on the roof vs. the amount of PV required to offset has a big delta.
- Not drawing conclusions at this point because we want to incorporate feedback from the board and the public as we move along in this process.

Public Feedback

- Most survey respondents were homeowners.
- We asked the public about balancing environmental and economic considerations. What is most important?
 - Majority by a slim margin said climate emergency was most important.
- Within the survey, we asked about policy options.
 - Majority did not support.
 - Most support was net zero energy with efficiency.

Option Spectrum

- Can pursue code options through a stepped approach, moving through the continuum, or, we can move all at once.
- There is a regional code cohort effort pursuing stepped options over time.
- **Question:** Where are the other stakeholders in engaging the public with this feedback?

- **Response:** The rest of the cohort is not considering as aggressive of code options as Louisville. The cohort is mostly considering the readiness requirements, and electric-preferred is not a huge cost burden.
 - Not a ton of pushback in that public engagement.
- **Question:** Are there other examples of this step down?
 - **Response:** The next phase of the cohort effort is a stepped approach to net zero code. City of Boulder already has a code roadmap.

Public Comment on Agenda Item

Comment #1:

- Offsite solar comes up a lot. I have wanted offsite solar because I can't do solar panel and it is hard to find info about local solar farms, how they work, their business models, etc. It would be nice if the City had this info available.
- If Louisville is going to meet the 2030 emissions reduction goal, Louisville needs many megawatts of offsite solar. Are there plans or contracts in place for building?
- A lot of emphasis about cost. We wouldn't have this conversation if we didn't have a climate crisis. CO2 should be emphasized. Not as emotional as cost, but the CO2 savings need to be as meaningful.
- City of Boulder has a solar system in place - Generation Solar. Website claims it's not costing anything. Louisville should look into this.
- Is there money available from the federal government or the state? Is Louisville working to access this?

Comment #2

- Cost- what are the biggest variables in the cost? As technology advances, cost will decrease. Fuel could go up.
- Exemptions for industrial, manufacturing, and labs. This could be a gray area or loophole for uses that don't match our sustainability goals, how will that be handled?
- This was difficult to understand. Is there a correlation between difficulty of understanding and difficulty to implement? Some ease is important.
- Any projections from the state? Will they adopt some of these codes?
- What does solar-ready mean? Readiness is just hypothetical.

Comment #3

- Should we be emailing Kayla or putting it into Engage Louisville?
- For communicating to neighbors, if we don't do this, the cost burden calls on our prodigy. We have been discounting our children's future for

generations. We have had a local catastrophe and significant evidence impacting our present, not just our future. We need to look at what discounting these costs means for our prodigy.

- Where is the regional cohort and what is it?
- The stool slide: promote economic development. Donut economics builds on circular benefits. What's the state going to do?
- Engagement opportunities: July 28th is during business hours. Was this presentation the same?
- For the modeling numbers: it is good but complex to show us your source. When I do the calculation, looking at the 2024 code, it has been influenced by the American Natural Gas Alliance. \$2.50/W, .75W/sf is way less than my home (family of 4) currently uses onsite solar?

Discussion

- .75w.ssf policy seems super low.
- The last two options: none of them covered even 50% of onsite. This is a big gap and there's not a lot of offsite infrastructure.
- Exceptions: this is hard because there are a lot of places that can't not rely on gas. Giving those with the biggest impact exceptions is tough.
- Confusion with smaller businesses around exemptions. We talked about getting clarification on existing vs. new. Thinking about retrofitting, there's a big need for small businesses to get solid communication from the city. What is the City doing with their own municipality? Lead by example.
 - City plan for own energy consumption.
 - A lot of people want to know about grants and support to get this done. This will push people out of Louisville, unless they know this information and any help that is available.
- Need to look at carbon reduction. Educational pieces around climate action should be built into the options.
- Don't fully understand nuances between the different options, based on categories I would think about or care about.
 - Upfront cost, ongoing cost savings, etc.
 - CO2 impact, ease of implementation, feasibility.
 - If developers and builders can't make it happen, they have to jump through so many hoops.
 - Think through the distilling layer to help the City Council make a decision.
- Easy, balanced, hardcore dimensions.

- LSAB should think about our approach and going a little more middle of the road. Our unwillingness to bend on 2021 Residential Codes led to a lot of pushback from the community.
- The more you can talk about regional solutions/participation, the more receptive the council will be.
- **Question:** I went to the community meeting. Would it be possible to add to the charts information on what kind of GHG reductions we're getting from the different options?
- **Question:** When you list an upfront or annual cost, it is a number and doesn't have any context for those not in the industry. What percentage of the whole building is the cost? What is a reasonable annual cost for the whole building? Need a reference point.
- Is there something else we can do to get more input from business owners?
 - We've sent it to business groups: Chambers, Tech Center listing, etc.
 - Second EV newsletter went out today.
- Heard fear from existing small businesses that they'll be put out of business. A lot are worried about not being able to use natural gas.

7. Discussion Item: Letters of Support

LSAB made a motion to approve two letters of support – the Parks Superintendent and the Inclusionary Housing Code Amendment – and the letters of support were approved with consensus from the full group.

8. Administrative Tasks

None

9. Adjourn

The meeting was adjourned at 8:17 p.m.

Louisville Sustainability Advisory Board

Meeting Minutes

**August 17, 2022
Louisville Public Library
951 Spruce Street, Second Floor Board Room
6:30 - 8:00 p.m.**

1. Call to Order

Todd called the meeting to order at 6:35 p.m.

2. Roll Call

Present: Todd Budin, Josh Cooperman, Megan Otteson, Dan Mellish, Kayla Betzold – staff liaison
Online: Lev Szentkiralyi

3. Approval of Agenda

Agenda was approved.

4. Approval of Minutes

May meeting minutes were approved.

5. Public Comment 6:35 P.M.

Comment #1 - RJ Harrington stated that LSAB's policy to limit public comment from each member of the public to one 3-minute session makes it difficult to weigh in on individual agenda items throughout the LSAB meetings, and he does not feel this policy is aligned with what the City intends for public comments.

6. Staff Updates

Result of the City's Budget Retreat:

- The city will finalize the budget in November.
- Kayla was asked to cut the city Sustainability programming budget request by 75%. The original Sustainability programming budget was \$200,000/year, and the current request is now \$50,000 per year.
- LSAB had recommended specific line-items be included in the budget. Kayla had to cut some of these line items due to requirement to cut the original budget request
 - The staffing support request was cut, but a line item for electrification programming is still in the current budget request.
 - Kayla is working with Energy Smart to discuss what an electrification rebate program could look like in case this line item gets approved.
- The Capital Improvement request did not include funding for electric municipal park equipment.
- **ACTION ITEMS:**
 - Kayla will look into whether LSAB could apply for grants. Kayla thinks the city will need to receive the money.
 - Kayla would appreciate us passing along grant opportunities to her. Louisville has policies around which grants the city can apply for, and government grants are normally eligible.

Sustainability Website

- **ACTION ITEM:**
 - Kayla would like us to give her recommendations for how to improve it.

RFP for firm to develop Internal Decarbonization Plan:

- The internal decarbonization plan RFP was presented to Council on July 26 and was approved unanimously. An internal team will review applications, interview firms and contract with a firm by the end of

September. The budget amendment and contract is scheduled on Council's consent agenda for October 18, 2022.

Louisville Reusable Bags:

- Louisville has been offering bags to grocery stores, and we only have a few boxes left.

7. Discussion Item: Energy Code Update Letter of Support

Kayla summarized 4 potential commercial and multifamily energy code policy pathways for the City Council to consider. Kayla's presentation is contained in the 8/17/22 meeting agenda packet. The four pathways summarized are as follows:

Option 1: Regional Code Cohort (make a roadmap for net zero by 2030 or 2035, but it's not enforceable)

Option 2: Adopt one of the three following policies:

- Policy 1: Energy Performance Goal. This option would entail adopting Energy Use Intensity (EUI) targets for different commercial and multifamily building segments. Although this option does not require all-electric new construction or net-zero energy status, buildings would likely need to adopt heat pump and heat pump water technology if the City adopts stringent EUI targets.
 - Considerations:
 - No net zero requirement.
 - No offsite PV required.
 - Allows for use of extra efficiency and/or renewable energy to meet target.
 - Encourages all-electric construction.
 - More flexibility with fuel choice and energy use reduction methods.
 - Solar-ready required.
 - EV-ready required.
 - Electric-ready construction.

- The City of Boulder has had an energy performance goal for more than 10 years.
- From an enforcement standpoint, buildings would need to hire an energy rater to assess their building EUI, and the buildings would need to meet or exceed their EUI targets to get their building approved by the city.
- Policy 2a: Net Zero Code (Appendix CC): Buildings would need to install enough renewable energy and/or purchase enough Renewable Energy Credits (RECs) to offset their annual energy usage. Buildings would be required to be electric-ready and electric vehicle ready.
Exceptions/reductions of the offset requirement could potentially be granted to industrial facilities, laboratories, manufacturing, hospitals, and restaurants.
 - Considerations:
 - Net zero required.
 - Offsite PV and Onsite PV required.
 - Base code efficiency.
 - More flexibility with fuel choice.
 - Electric-ready required.
 - Exemptions considered.
- Policy 2b: Net Zero Code (Appendix CC) and All-Electric: Buildings would need to install enough renewable energy and/or purchase enough Renewable Energy Credits (RECs) to offset their annual energy usage. Buildings would be required to be all-electric and electric vehicle ready. Exceptions/reductions of the offset requirement could potentially be granted to industrial facilities, laboratories, manufacturing, hospitals, and restaurants.
 - Considerations:
 - Net zero required.
 - Offsite PV and Onsite PV required.
 - Base code efficiency.

- Fuel choice.
- Exemptions Considered.

LSAB drafted an outline for a letter of support in regards to Lotus Sustainability's September 6th presentation on various commercial and multifamily energy code pathways.

ACTION ITEM: Lev will turn the following outline into a formal letter by EOD

Friday August 26th:

- LSAB submits this letter in support of the presentation submitted by Lotus Sustainability to the City Council on September 6, 2022.
- Regardless whether the City Council decides to pursue a policy to strengthen our commercial and multifamily energy codes in the near-term, LSAB encourages the City to participate in the Phase II Regional Cohort that will take place between August 2022 and December 2022. Participation in the Phase II Regional Cohort, which will focus on developing a non-enforceable roadmap to a net-zero energy commercial and multifamily building code by 2030, will enable Louisville to continue to be part of the regional conversation around energy code development and to share lessons and best practices with our neighboring municipalities.
- If the City Council decides to take an additional step beyond the Regional Cohort and pursue enforceable energy code policy changes in the near-term, LSAB recommends that the City Council pursue Policy 1, known as the Energy Performance Goal policy. LSAB believes that of the three proposed policies, the Energy Performance Goal policy is most aligned with the sustainability values of our board. The Energy Performance Goal policy would require that buildings reduce their Energy Use Intensity (EUI) beyond what the current code requires; in other words, new construction will need to be built more energy-efficient and / or with more onsite renewable energy to meet the target EUIs than the current code requires. However, Policy 2a (Net Zero Energy Code with Appendix CC) and Policy 2b (Net Zero Energy Code with Appendix CC + All-Electric Requirements) would not require new buildings to use less energy than the current code

requires; instead, they are only required to off-set their energy usage with offsite renewable energy purchased through renewable energy credits. In other words, buildings constructed under Policies 2a and 2b would be less efficient than buildings constructed under Policies 2a or 2b.

Kayla thinks we can get a template together for future letters of supports.

8. Discussion Item: Eco-Tober

- Centaurus High School is organizing this event, and various local sustainability organizations will participate.
- LSAB agreed to act as a vendor: Dan might be able to do the second session, and Todd and Josh will volunteer
- **ACTION ITEMS:**
 - Kayla will sign up Louisville as a vendor
 - Kayla is asking for other vendor ideas for Eco-tober

9. Administrative Tasks

LSAB approved changing the date on our letter of support for the Inclusionary Housing Code Amendment to Sept 6, 2022.

Megan volunteered to submit a draft article on composting for the October City Sustainability Spotlight, due by Sept 15th.

- 200 - 300 word range.
- Todd recommends providing basic info, a call to action, and lots of links for more info. He did a topic on heat pumps.

Topics for future newsletters:

- Deborah Fahey suggested a spring article on natural insecticides.

10. Adjourn

The meeting was adjourned.

Memorandum

To: Louisville City Council Members
From: Louisville Sustainability Advisory Board
Date: August 29, 2022
Re: Louisville Energy Code Update

Dear members of the Louisville City Council,

The Louisville Sustainability Advisory Board writes to advise on your consideration of updates to the City's commercial building codes. While the Board generally supports strengthening the City's building codes as a robust means to advance environmental sustainability and, specifically, to mitigate climate change, the Board recognizes that environmental sustainability is not the only factor to weigh. At present the Board is not prepared to advocate for or against updating the City's commercial building codes. After viewing and discussing the consultants' presentation of their findings, the Board remains insufficiently informed on many aspects of the complex issue of updating commercial building codes.

Nevertheless, the Board wishes to make two broad recommendations. First, as discussed further below, if City Council decides to proceed with updates to the City's commercial building codes, then the Board recommends policies based on Energy Use Intensity building performance goals.

Second, irregardless of City Council's decision, the Louisville Sustainability Advisory Board expresses its support of Louisville's continued investment in and commitment to the Regional Code Cohort. The Board recognizes that reducing regional greenhouse gas emissions and helping to mitigate regional and global effects of climate change are complex collective action problems, which cannot be achieved with unilateral initiatives, but which require the concerted and sustained effort of diverse stakeholders. Accordingly, the Board stresses the importance of collaborating with neighboring municipalities in the Cohort to implement meaningful reforms in energy-efficiency ordinances—reforms, moreover, that

achieve continuity across municipalities so that local industry stakeholders are held to comparable energy codes. The Board cautions that the absence of such continuity may create an unconstructively competitive (as opposed to a transparent and collaborative) relationship between neighboring municipalities, by incentivizing industry stakeholders to relocate or threaten to relocate their businesses to locales with weaker energy policy ordinances. As detailed in the Louisville 2020 Sustainability Action Plan, economic vitality is a key priority of any sustainability effort, but it cannot come at the expense of other, equally foundational, sustainability priorities.

The Board's support of the Regional Code Cohort, however, includes an important caveat that the Board hopes City Council will seriously consider. Namely, if the Cohort of municipalities—which includes Louisville, Superior, Erie, Lafayette, Northglenn, Broomfield, and Longmont (as well as Boulder County)—fails to identify and effectively implement meaningful energy policy ordinances, then the City of Louisville, driven by its commitment to being a leader in environmental sustainability, should move forward with its own energy-efficiency planning.

The Board agrees that such unilateral efforts should focus on implementing Energy Use Intensity (EUI) performance goals with new (multi-family and commercial construction) projects required to meet a maximum allowable energy use per square foot to achieve greater energy efficiency. The Board's reasoning here is three-fold.

First, the Board supports policies that result in greater energy efficiency, which EUI performance goals achieve.

Second, other policy alternatives—including the proposed Net-Zero and Net-Zero/All-Electric options—would allow the construction of new multifamily and commercial buildings that in fact do not perform well, but which still meet energy-reduction goals by offsetting these associated emissions with on-site solar or off-site renewable credits. However, a standard by which greater energy efficiency is not required so long as off-sets are satisfied is no meaningful standard at all. An off-setting standard would imply that the City is willing to tolerate wasteful energy practices, as well as off-sets to natural gas, which is a cleaner but still environmentally-unsustainable alternative, both of which contradict Louisville's commitment to curb regional greenhouse gas emissions and to work to mitigate the regional

and global effects of climate change. This is to say that energy reduction must be a guiding principle for any substantive reform. Yet, alternative standards to EUI performance goals would also imply that Louisville is willing to tolerate the social inequities entailed by off-setting programs.

This concern constitutes the Board's third reason for embracing EUI performance goals, should the Regional Code Cohort fail to establish and implement substantive energy-efficiency ordinances. Namely, any sustainability initiative—here, ordinances that can achieve greater energy efficiency in new multi-family and commercial construction projects—must effectively balance environmental stewardship, social equity, and economic vitality (as detailed in the 2020 Sustainability Action Plan). However, standards that would permit new energy-inefficient construction projects so long as they compensate for their inefficiencies with off-site renewable credits would ensure that the communities in which energy providers (like Xcel) have yet to implement infrastructure for renewable energy production will disproportionately bear the environmental health effects of our inefficiencies. Until energy providers have effectively transitioned to renewable energy sources across Colorado and the western United States, communities near coal- and natural-gas-burning power plants—which are often poor and/or historically minority and under-represented communities—will suffer the inequitable and unjust consequences of our unnecessarily-higher rates of energy consumption.

This is a pressing, complex and contentious issue that the Board hopes City Council will address only after extensive deliberation with the diverse stakeholders involved, and after due consideration of the broader, long-term social, environmental, and economic benefits and costs of alternative policy approaches.

Best regards,

The Louisville Sustainability Advisory Board

Building Code Board of Appeals

Meeting Minutes

July 21, 2022

Zoom Meeting Online

6:30 PM

Call to Order: Berry called the meeting to order at 6:40 PM.

Roll Call was taken and the following members were present:

Board Members Present:

Matt Berry
Christian Dino
Steve Knapp

Board Members Absent:

Mason Gatto (joined later)
Peter Geise (joined later)

Staff Members Present:

Elizabeth Schettler, Senior
Administrative Assistant
Jenny Lane, Permit Technician
Randy Dewitz, Inspector
Kayla Betzold, Sustainability
Coordinator

Third Party Presenters:

Claire Kantor, Lotus Engineering and
Sustainability
Kim Schlaepfer, Lotus Engineering
and Sustainability
Anna McCollough, Group 14

Approval of Agenda:

Berry moved and **Dino** seconded a motion to approve the agenda as prepared by staff. Voice vote. Motion passed 3-0.

Berry suggested moving the election of officers to the end of the meeting.

Berry moved and **Dino** seconded a motion to move the election vote to the end of the meeting. Voice vote. Motion passed 3-0.

Peter Geise joined the meeting.

Approval of Posting Locations and Open Government Pamphlet

City of Louisville

Department of Planning and Building Safety

749 Main Street Louisville CO 80027

303.335.4584 (phone) 303.335.4550 (fax) www.LouisvilleCO.gov

Establish the following locations for posting of agendas:

*City Hall
Library
Recreation/Senior Center
Police Department/Municipal Court
Web site: www.LouisvilleCO.gov*

Berry moved and **Dino** seconded a motion to approve the Approval of Posting Locations and Open Government Pamphlet. Voice vote. Motion passed 4-0.

Public Comments on Items not on the Agenda:

None heard.

Discussion Items:

2022 Commercial Energy Code Discussion

Betzold explained the discussion of incorporating the Commercial Energy Code (Phase 2) has been under discussion with Lotus, Group 14 and Rob Zuccaro, Director of Planning and Building Safety, since March or April of 2022. The presentation will include energy modeling and types of policy to be considered. A Public Engagement Survey has been open since June, 2022 and is open through August 5, 2022. There was also a community meeting at the end of June and the results were brought to the Sustainability Advisory Board on July 20, 2022. Comments from the Sustainability Advisory Board and the Building Code Board of Appeals will be compiled and presented to City Council at the beginning of September and will receive direction from City Council at that meeting. **Geise** is having trouble connecting. **Betzold** indicated that the beginning of the presentation is an overview and if he missed the first few minutes he would not miss anything critical.

Schlaepfer introduced herself, **Kantor**, and **McCollough**. **Schlaepfer** explained the outline for the presentation: high-level overview, modeling, and policy considerations and asking for discussion and feedback from the board based on the options to be presented.

Schlaepfer shared her screen to show the Power Point presentation as printed in the meeting packet. **Schlaepfer** explained the agenda:

Sustainability Goals
Current Adopted Code Review and Next Code Phase
Policy Options
Public Feedback
Discussion
Q & A

Results from Public and Board feedback will be used to draft an ordinance to City Council to be presented in September. Once the final ordinance is ready, it will be shared with the BCBOA for a final consensus vote.

Betzold added that this is on City Council's work plan for 2022, under the area of Community Design and specifically references Phase 2 of the Commercial Building Energy Code.

Schlaepfer presented the slides as noted in the meeting packet.

City of Louisville Clean Energy Goals:

City of Louisville Council Adopted Clean Energy and Carbon Emission Reduction Goals*

- ❖ *Meet all of Louisville's municipal electric needs with 100% carbon-free sources by 2025.*
- ❖ *Reduce core municipal GHG emissions annually below the 2016 baseline through 2025.*
- ❖ *Generate 75% of Louisville's residential and commercial/industrial electric needs from carbon-free sources by 2030.*
- ❖ *Reduce core community greenhouse emissions annually below the 2016 baseline through 2030.*

**Resolution 25, Series 2019 – Adopted by Louisville City Council on August 6, 2019*

Schlaepfer explained the existing Energy Code adopted in 2021 and current Commercial code, then went on to explain the next phase of the proposed energy update:

Next Phase of Energy Code Update

*The City is considering additional new construction code options that will encourage **higher efficiency**, **net zero** and/or **all electric** new construction for:*

- *Multi-family buildings*
- *Commercial buildings*

The City is also reviewing all electric options for single family homes.

Schlaepfer explained the three pillars of sustainability:

Economic:

- ***Affordable?***
- ***Promote economic development?***

Social:

- ***Equitable?***
- ***Community benefits?***

Environmental:

- **Reduce energy use?**
- **Reduce GHGs?**
- **Improve air quality?**

Schlaepfer explained that they had community engagement meetings and an online survey to collect input to use as part of the presentation to City Council.

Schlaepfer explained the three policy considerations for Commercial Energy Code:

Policy Consideration [1]

2021 IECC, EV readiness, and electric-readiness with on-site or off-site PV required. Options for PV requirements:

1. Alignment with IECC 2024 Proposal: 0.75 W/sf for largest three floors of building
2. PV on all available roof space.
3. PV provided as to offset any carbon emissions by natural gas systems on site.

Option 1. PV Required to Match 2024 IECC Proposal

Building Type	PV System Size (kW)	PV System SF	Estimated First Cost
Multifamily Building (3 stories, 42,000 SF)	31.5 kW	3,150 SF	\$78,750
Office Building (3 stories, 110,000 SF)	82.5 kW	8,250 SF	\$206,250
Retail Building (1 story, 90,000 SF)	67.5 kW	6,750 SF	\$168,750

Option 2. PV that fits on Roof

Building Type	PV System Size (kW)	PV System SF	Estimated First Cost
Multifamily Building (3 stories, 42,000 SF)	98 kW	9,800 SF	\$245,000
Office Building (3 stories, 110,000 SF)	250 kW	25,000 SF	\$625,000
Retail Building (1 story, 90,000 SF)	600 kW	60,000 SF	\$1,500,000

Option 3. PV Required to Offset Natural Gas Consumption On-Site

Building Type	PV that can fit on the Roof (kW)	PV System Size (kW)	PV System SF	Estimated First Cost
Average Mixed-Fuel Multifamily Building	98 kW	176 kW	17,600 SF	\$440,000
Average Mixed-Fuel Office Building	250 kW	153 kW	15,300 SF	\$382,500
Average Mixed-Fuel Retail Building	600 kW	608 kW	60,800 SF	\$1,520,000

Policy Consideration [2]

- Require projects to meet a maximum-allowed energy use per square foot (EUI) for the performance pathway and require additional efficiency measures for the prescriptive path. Onsite PV can contribute to EUI target.
- Require a solar-ready zone, electric-ready construction, and EV-readiness.

Boulder Fixed EUI Targets

Building Type	Performance Targets (kBtu / square foot)
Medium office (5,000 – 50,000 sf)	23
Mid-rise apartment (Type R2)	32
Primary school	34
Small office (<5,000 sf)	19
Secondary school	31
Warehouse	11

NBI Zero Energy Performance Targets

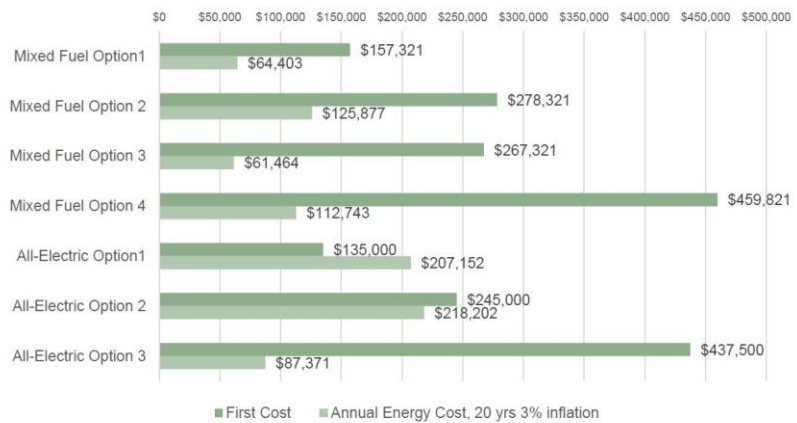
Zero energy performance targets for various building types and climate zones
Values are site energy use intensities (EUIs) [kBtu/sf/yr]¹

Building Type	1A	1B	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	5C	6A	6B	7	8
Primary School	26	25	26	25	27	23	21	27	24	24	28	25	24	29	26	30	39
Low-Rise Apartment	20	21	19	20	21	19	17	21	20	20	24	21	20	24	23	27	31
Medium Office	24	24	23	23	23	21	17	22	20	20	24	21	20	25	23	22	27
Small Office	19	20	18	19	18	18	16	17	18	17	18	17	16	18	18	20	24
Secondary School	29	29	26	27	26	25	22	24	26	26	25	29	23	24	24	25	35
Public Assembly	27	28	27	27	28	26	24	28	26	26	30	28	27	31	29	34	40
Standalone Retail ²	27	30	26	28	25	26	21	25	26	26	26	28	26	27	26	29	35
Mid-Rise Apartment	22	23	21	22	23	21	19	24	22	22	26	23	23	27	25	30	34
Strip Mall ²	30	33	31	32	33	29	25	34	29	31	39	34	33	41	37	46	60
High-Rise Apartment ²	28	28	27	27	28	26	22	29	27	27	33	29	27	33	30	37	43
Warehouse	5	8	6	8	7	7	7	9	8	8	11	9	9	11	10	15	16
Small Hotel ³	36	35	35	35	35	34	32	36	34	34	38	35	34	39	37	41	47
Fire Station ⁴	29	30	29	29	30	28	25	30	28	28	33	30	29	33	31	36	43

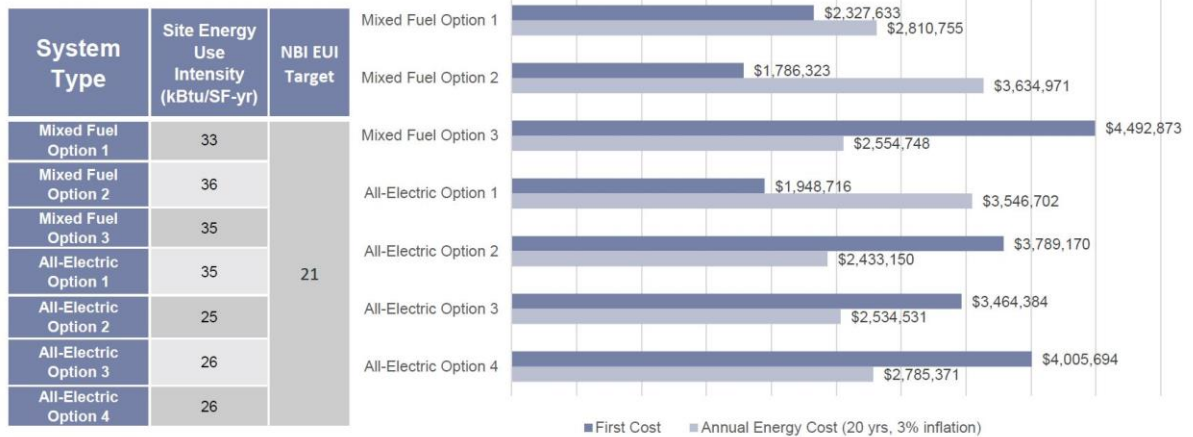
Multifamily

System Type	Site Energy Use Intensity (kBtu/SF-yr)	NBI EUI Target
Mixed Fuel Option 1	39	21
Mixed Fuel Option 2	42	
Mixed Fuel Option 3	35	
Mixed Fuel Option 4	41	
All-Electric Option 1	27	
All-Electric Option 2	27	
All-Electric Option 3	23	

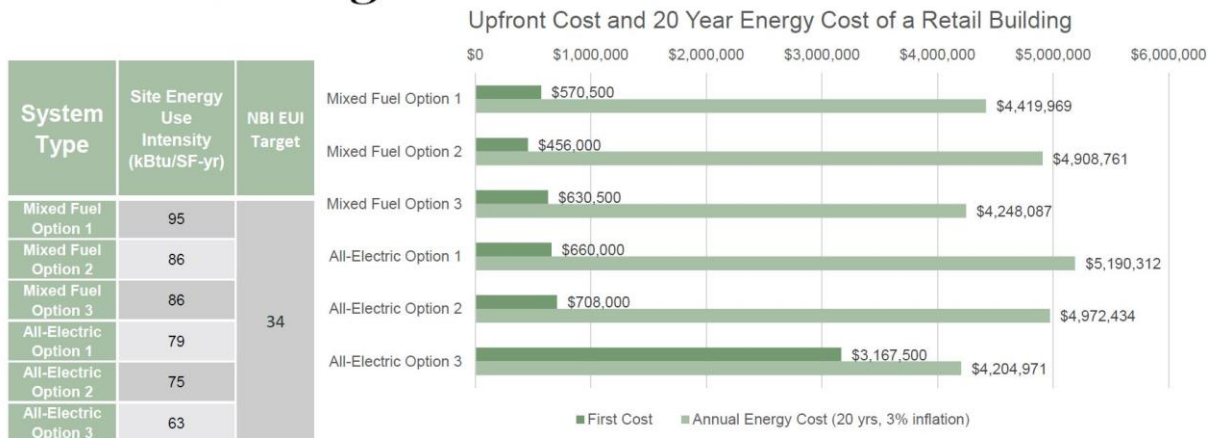
Upfront Cost and 20 Year Energy Cost of a Multi-Family Building



Office Building



Retail Building



Gatto joined the meeting.

Giese asked how, in a Multifamily building, how could the cost be maintained if each unit was individually metered. [refer to page 36 of the meeting packet]. **Schlaepfer** and **McCollough** explained that it is more of a design standard than an operational target. Compliance for the code would be met with the energy model. **Giese** said he did not see how the model would be inline with the actual implementation if each unit has it's own meter and that the model does not fit real installation. **Schlaepfer** further explained that once the building is built, unless the City installed a benchmark program to track operational energy of the building, individual metering does not present a problem for code compliance.

Schlaepfer continued presenting the slides from the meeting packet. She noted from page 38 in the packet, regarding Retail, that the model they did for Louisville includes

two restaurants. The NBI target on this slide does not include restaurants, so the Delta is quite different between the two targets.

Schlaepfer continued presenting the slides from the meeting packet.

Policy Consideration [3A] - Appendix CC

- Require net zero new construction for all buildings and utilize Appendix CC from the 2021 IECC. Electric-ready and EV readiness required.
- Exceptions/Reduction of Offset: Industrial, Laboratories, Manufacturing, Restaurants

Policy Consideration [3B] - All-electric new construction + Net Zero

- Require all-electric new construction with required on-site or off-site PV. EV-readiness required.
- Exceptions/reductions of offset and/or for All-Electric: Industrial, Laboratories, Manufacturing, Restaurants

Policy Consideration [3] - Appendix CC – Renewable Procurement Requirements

CC103.3.1 Qualifying off-site procurement methods.

The following are considered qualifying off-site renewable energy procurement methods:

1. Community renewables: an off-site renewable energy system for which the owner has purchased or leased renewable energy capacity along with other subscribers.
2. Renewable energy investment fund: an entity that installs renewable energy capacity on behalf of the owner.
3. Virtual power purchase agreement: a power purchase agreement for off-site renewable energy where the owner agrees to purchase renewable energy output at a fixed price schedule.
4. Direct ownership: an off-site renewable energy system owned by the building project owner.
5. Direct access to wholesale market: an agreement between the owner and a renewable energy developer to purchase renewable energy.
6. Green retail tariffs: a program by the retail electricity provider to provide 100-percent renewable energy to the owner.
7. Unbundled Renewable Energy Certificates (RECs): certificates purchased by the owner representing the environmental benefits of renewable energy generation that are sold separately from the electric power.

CC103.3.2 Requirements for all procurement methods.

The following requirements shall apply to all off-site renewable energy procurement methods:

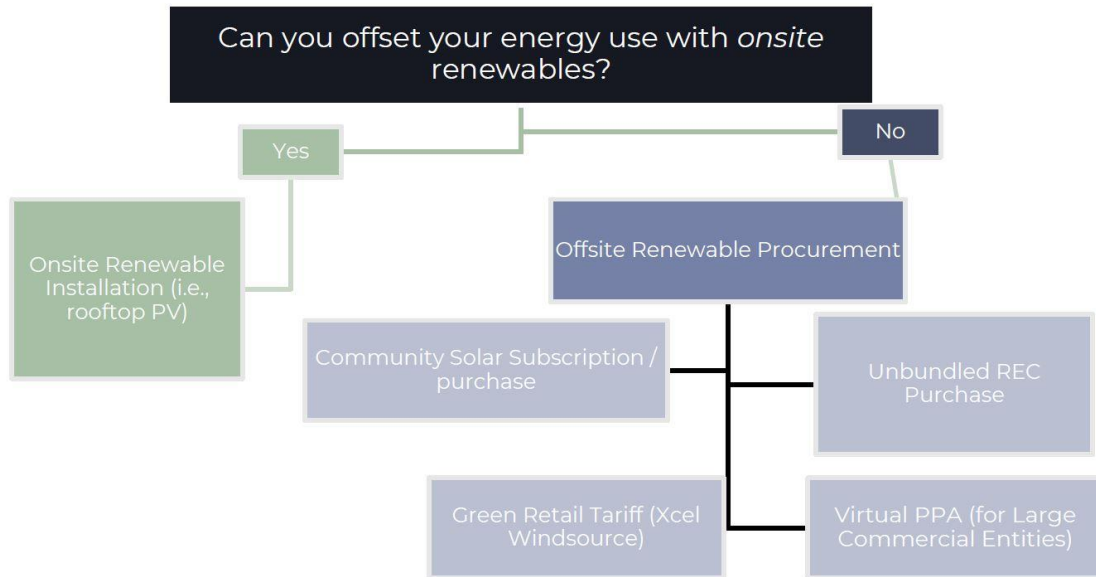
1. The building owner shall sign a legally binding contract to procure qualifying *off-site renewable energy*.
2. The procurement contract shall have duration of not less than 15 years and shall be structured to survive a partial or full transfer of ownership of the property.
3. RECs and other environmental attributes associated with the procured *off-site renewable energy* shall be assigned to the building project for the duration of the contract.
4. The *renewable energy* generating source shall include one or more of the following: photovoltaic systems, solar thermal power plants, geothermal power plants and wind turbines.
5. The generation source shall be located where the energy can be delivered to the *building site* by the same utility or distribution entity, the same independent system operator (ISO) or regional transmission organization (RTO), or within integrated ISOs (electric coordination council).
6. The *off-site renewable energy* producer shall maintain transparent accounting that clearly assigns production to the building. Records on power sent to or purchased by the building shall be retained by the building owner and made available for inspection by the code official upon request.

Xcel Energy RECs Who owns the REC?

Ownership under our renewable programs varies. For some programs, we retire the RECs to the subscriber, while for other programs, we keep the RECs to meet our company's renewable energy requirements and goals.

Here's a guide to our program REC ownership:

- Windsource - **Subscriber**
- Renewable*Connect - **Subscriber**
- Solar*Rewards - Xcel Energy
- Solar*Rewards Community - Xcel Energy
- Solar*Rewards for Income Qualified Customers - Xcel Energy
- Net Metering - **Customer**



	Unbundled RECs	Green Retail Tariff	Community Solar	Virtual PPA
Pros	• Low Cost. • Easy to purchase.	• Low Cost. • Easy to purchase. • From local utility.	• Impactful – local renewable energy generation.	• Guarantee additionality. • 15-year contracts.
Cons	• May not be local. • May not contribute to additionality. • Always a cost (no revenue stream). • No 15 year contracts.	• May not contribute to additionality. • Always a cost (no revenue stream). • No 15 year contracts.	• Limited availability. • Annual cost (no revenue stream).	• May not be local. • Additional work to set up VPPA contract/project.

Betzold stopped **Schlaepfer** and asked if there were questions for them at this point.
[page 44 of packet]

Gatto asked about solar procurement and what is considered “local” if a builder needed to use off-site solar procurement. **Schlaepfer** responded that typically national solar procurement would be used. She also said that PPAs would typically be produced wherever solar is the cheapest to produce.

Gatto also asked that since Louisville is limited in space available, is there anything that would be considered “local” within Boulder County or Colorado that are in the works or are being developed. **Schlaepfer** explained that anything within Xcel’s territory would be able to contribute to that.

Gatto also asked as far as commercial building limiting their consumption, are there any examples of municipalities (City of Boulder?) meeting those energy reductions, how viable is it?

McCollough asked if **Gatto** was referring to the EUI targets. **Gatto** confirmed. **McCollough** stated that the City of Boulder set this code in 2018. They’ve had success with it. She stated there were two ways building can comply. 1) Developer wants gas; design mixed fuel building and use onsite PV to reduce EUI to meet target. Or 2) Create an all electric building, resulting in lower EUI and it’s easier to hit the EUI targets.

McCollough further added that Boulder is working on amending code to make it more energy efficient but no they do not have specifics yet.

Gatto asked if the Google campus building in Boulder met those standards. **McCollough** confirmed.

Betzold asked if there were additional thoughts or questions from the board.

Berry asked what is the most pragmatic path, for example, for a 30,000 square foot warehouse? He stated that options did not sound appealing for smaller developments, which is the majority of what exists in Louisville. The projects he has been involved in, the first question from the developer is cost.

McCollough used City of Boulder as an example for performance energy code. Boulder’s code states that if building costs \$500,000 or greater, required to comply with a performance path. They will have to hire an energy modeler to prove that they are code compliant. She used example showing that Boulder has a fixed EUI target of 11, adding that it is very achievable for a 30,000 square foot warehouse. EUIs can be mixed based on the types of occupancy in the building. She stated that the EUIs are achievable by smaller building because they are based on energy use per square foot and that larger buildings will have a harder time meeting it because they have

larger systems and more occupants. All electric constructions systems are more expensive than natural gas systems.

McCollough stated that current code requires building to be built as all-electric ready. **McCollough** used the Multifamily slide, citing the first cost of the Mixed Fuel option of \$157,231 as an example and that it includes the all-electric ready infrastructure. The all-electric upfront counterpart is only \$135,000 since natural gas would not need to be installed.

Berry stated he wanted to make sure that with these options we were taking into consideration the types of building that would be built in Louisville.

Dino asked how this would translate into an existing Tenant Improvement of existing space. What are the differences between what is required to provide initially and what a new tenant is now required to provide under a new code that would be adopted.

McCollough explained that typically there would be a minimum square footage (about 10,000 square feet in her experience) for a Tenant Improvement to comply with this path, otherwise it would be under the prescriptive path.

Dino gave an example of an existing building with multiple tenants using the 10,000 square foot minimum as an example. With 100,000 square foot of space and one tenant is looking to build out a 20,000 portion, all the other spaces are occupied, what is the realistic likelihood that the one tenant will be willing to pay for the infrastructure for the entire building to meet that code.

McCollough explained that this scenario is something that would need to be worked out.

Berry asked how many other municipalities in our metro area have adopted some or all of the 2021 commercial IECC. He further clarified that the City of Boulder has created their own and have not adopted the 2021 IECC for Commercial as written.

McCollough answered that the City of Boulder has used the 2018 IECC Commercial code as their model with enhancements and that the City of Denver is working on amending the 2021 IECC Commercial code with EUI performance targets.

McCollough deferred to **Schlaepfer** to provide examples of other municipalities that have adopted the 2021 IECC Commercial Energy Code.

Schlaepfer answered that only the City of Boulder has adopted any part of the 2021 IECC Commercial Energy Code. **Schlaepfer** further explained that there is a regional cohort that is being organized right now including Boulder County, Erie, City and County of Broomfield, Longmont, and Northglenn. The cohort is working to adopt the 2021 Energy base code along with solar-ready, EV-ready, electric, and "electric preferred." Louisville and Superior had already adopted the 2021 Energy Code for

Residential. Council meetings have begun in each of these municipalities to adopt the package of amendments, with the exception of the City and County of Broomfield, who will adopt the 2021 IECC code in 2023. To her knowledge, no other municipality in Colorado has adopted the Appendix CC.

Geise commented that the electric grid and that looking at the main commercial area of Louisville, the CTC, that Xcel has not updated their electrical lines coming into that area. **Geise** also gave an example of how eight people in residential Trail Ridge Dr had Teslas and maxxed out the grid.

Dino commented that Xcel is using the same infrastructure in the Marshall Fire burn area in the Trail Ridge/Arapahoe area of Louisville and that Xcel is installing infrastructure that does not support the residential energy code that Louisville has already adopted.

Geise commented that if Xcel cannot deliver the electrical grid necessary to support the proposed changes, the changes cannot be implemented.

Schlaepfer stated that Xcel has long range goals to support clean energy resources and that these proposed changes would be slow since they would only address new construction which would be slow.

Dino stated that since Xcel is already implementing old infrastructure in the Marshall Fire burn area where they know we have passed the 2021 IECC for residential and are still choosing to implement old infrastructure.

Betshold indicated that Xcel has told the City of Louisville that they are planning on providing infrastructure to allow the ability for 320 Amp service for each home.

Geise said that without the infrastructure in place in Colorado, the cost of electric will be more expensive if Colorado has to pay for electricity outside the state in order to meet the demand here if we require all electric.

Dino expressed that he has trying to get Xcel Energy to provide temporary power on site for the rebuild and the contractors working for Xcel have told him that Xcel has already issued purchase orders for transformers that do not meet the requirements that Betshold said they will provide. Dino further expressed that he does not believe that Xcel will provide the infrastructure until it fails.

Betshold said she would work with City staff on the issue.

Schlaepfer stated Xcel hasn't been given any directive from that shows they will require all-electric.

Geise asked for clarification of why one business owner who owns four restaurants would be given more of a break than another who has a large warehouse with distribution, even if the square footage is the same for both.

McCollough responded that with their policy research that the technology for restaurants to use all-electric is not readily available or cost effective, so that industrial and restaurants would not be as strict as other types.

Geise expressed concern that the building requirements cannot be sustained or that an owner would need all available space to meet solar requirements and standards. **McCollough** agreed that the Appendix CC implementation would be difficult to meet.

Dino expressed concern over the residential implementation and disagreed with the choice to implement it as it was decided. **Dino** further explained that the document that was presented to City Council in 2021 as a collaboration between the BCBOA and City staff did not represent their ideas. He explained that he does not support this code adoption because the infrastructure is not there, Louisville has already lost some businesses to adjacent communities.

Dino suggested the group take a straw vote as whether or not they would approve of the general adoption of the 2021 IECC for Commercial and that if the City adopts the code it is against the recommendation of the BCBOA. **Knapp** seconded.

Berry asked if there were any votes for recommending the 2021 IECC Commercial code. **Gatto** voted yes with recommendations. **Berry** asked which members vote to not adopt any of it. **Berry** and **Dino** voted no. **Giese** would like to see the rest of the slides.

Lane interrupted to clarify that the purpose of the meeting wasn't to have any official vote but just to present information to the Board.

Berry clarified that it was just a straw poll to understand which members agree with the overall adoption of any portion of the IECC commercial code. **Berry** added that with reference to the 2021 IECC residential code adoption in October of 2021 that Appendix RC was never given to the Board for consideration and was a major change but was presented as if the BCBOA had agreed with it so their trust for the process is damaged and that their comments are accurately presented to City Council.

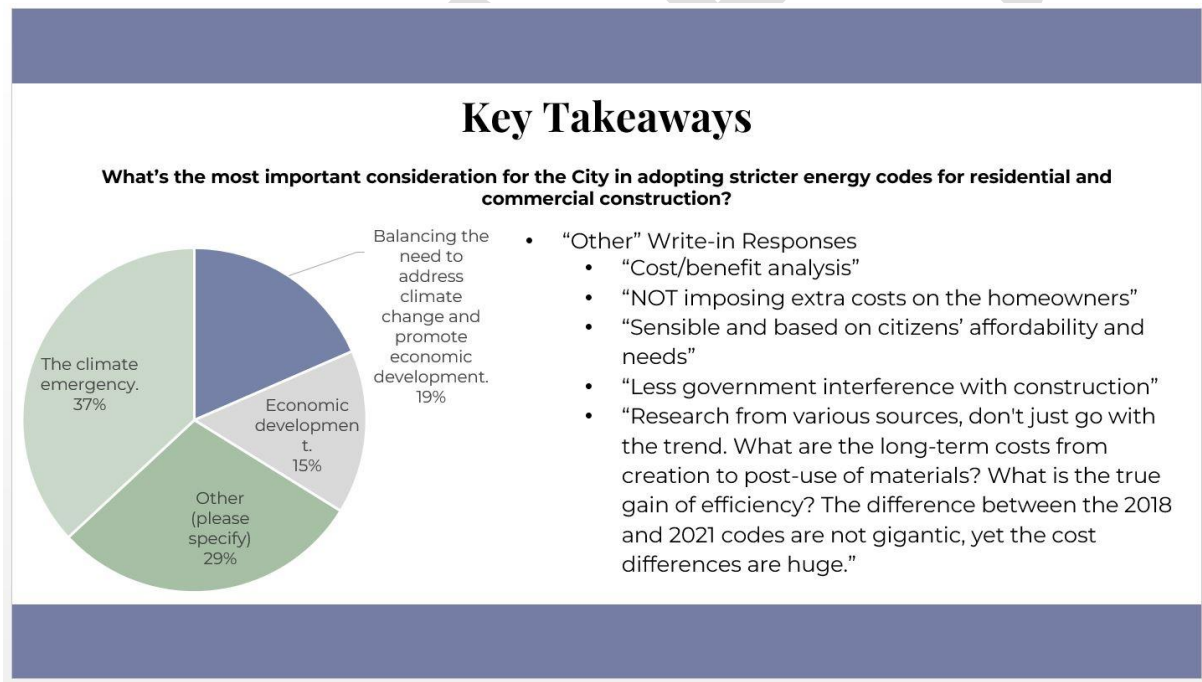
Dino added that when City Council adopted Appendix RC that it created a moratorium on new building permits for over a month and if the BCBOA had been asked in their an advisory role they could have advised as to how to adopt it without issues.

Berry noted that he has several projects that are waiting on Xcel equipment. **Giese** also added he has a project where he has been waiting on Xcel for six months on a meter set for a commercial building.

Betzhold asked if there were any more specific comments regarding policy considerations. Gatto added that he would like to see the slides. **Betzhold** directed **Schlaepfer** to present the slides concerning public feedback.

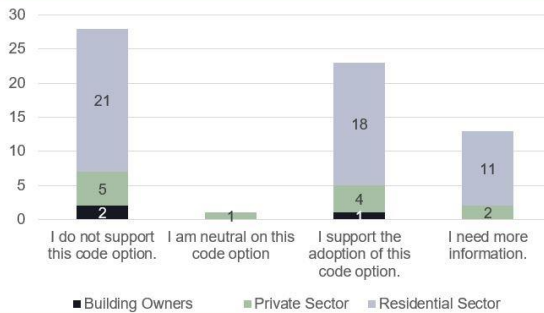
Berry asked where the public feedback came from. **Betzhold** clarified that outreach the City of Louisville did, it was in the June and July Economic Vitality newsletter, in City communications, a news item on website, and hosting public meetings as well as social media. Public feedback was from the survey.

Schlaepfer presented results from the public survey to date. The majority is from homeowners, only 30% of respondents were from the commercial sector. The main overall concern is cost; cost to builders and tenants as well as driving business away from Louisville. The second most concern was builders' lack of knowledge regarding new technology. The most common benefit was fighting climate change.

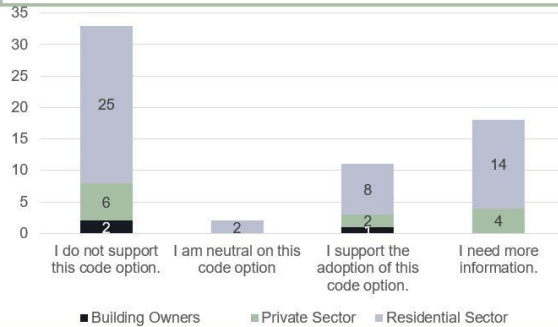


Key Takeaways Support for Code Considerations

Including a minimum energy offset requirement in addition to the 2021 code, which would require on-site or off-site solar

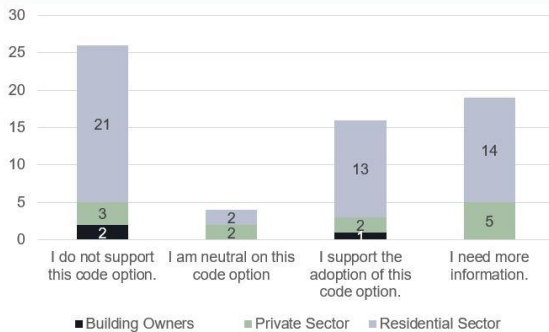


All-electric requirement for new commercial construction code if industrial processes were exempt.

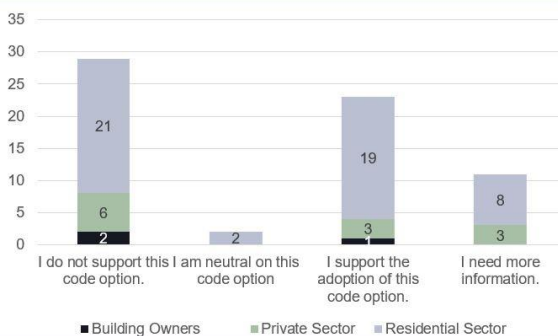


Key Takeaways Support for Code Considerations

A 20% reduction in energy use from the 2021 energy code for commercial construction



Net zero energy through efficiency and onsite/off-site renewable energy



Schlaepfer indicated that only two building owners responded to the survey.

Building Owner Responses	
Building Owner #1	Building Owner #2
How do you perceive the new considerations for energy code would impact your ability to develop/design/build housing affordably in the City of Louisville?	
<i>"It will determine if I want to pay more to stay or go next door to Broomfield."</i>	<i>"If we make these changes regionally, then industry and government are working together to make it economically viable for all stakeholders. Regionally cooperation is KEY!!!!"</i>
What data or information do you need to better understand the potential impacts of energy code options on your business and operations?	
<i>"Bottom line cost increases."</i>	<i>"We need GC, builders, and developers to lead the charge for net-zero construction which is run by renewables. This will not happen overnight, but if people within the industry are leading the charge, then government policies are partners and not the enemy. The climate crisis requires cooperation at all levels."</i>
Payback time frame tolerances for upfront costs and onsite solar:	
<i>"I am not interested in increasing upfront construction costs for carbon reduction."</i>	<i>"10-20 years"</i>

Geise and **Berry** asked if there was a way to get more building owner responses.

Schlaepfer and **Betzhold** responded that the Chamber of Commerce has also shared the survey in their emails as well and that any ideas to get more feedback would be welcome since the survey would only be open for a few more weeks. **Betzhold** also recommended that the Board members could forward the link to the survey to business owners.

Geise asked if there were any other responses since the slides were created, and **Betzhold** added that there were ten responses since the slides were created; nine residential respondents and one business owner.

Schlaepfer continued with the slides.

Other Comments

"The residential net zero appendices did not get much discussion before they passed. Now Marshall Fire victims are letting you know what they think about that. I hope you will take that into consideration in regard to the commercial codes."
(Community meeting comment)

"These proposals sound good in theory. Educating Louisville residents and businesses about what these all mean and how you decided on them would be great. For example, I'm wondering why a 20% reduction? Why not more?"
(Home owner)

"I'd want to know more about upfront costs and whether this was being done in concert with nearby municipalities. I like the requirement to reduce energy use/become more efficient better than any specific code requirement." (Home owner)

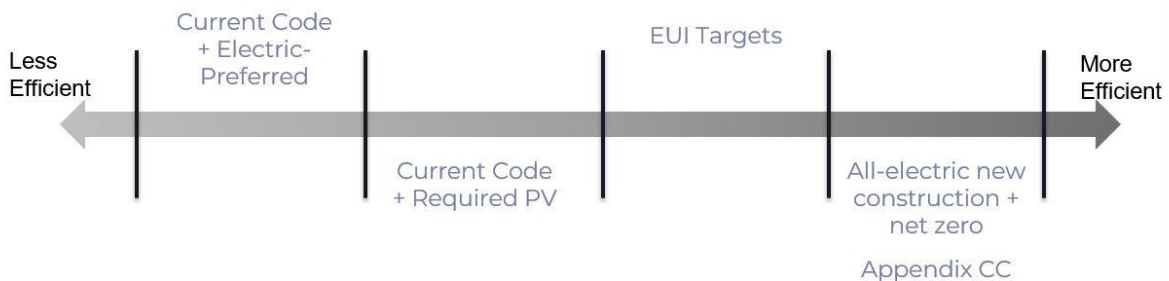
Option Spectrum: For Discussion

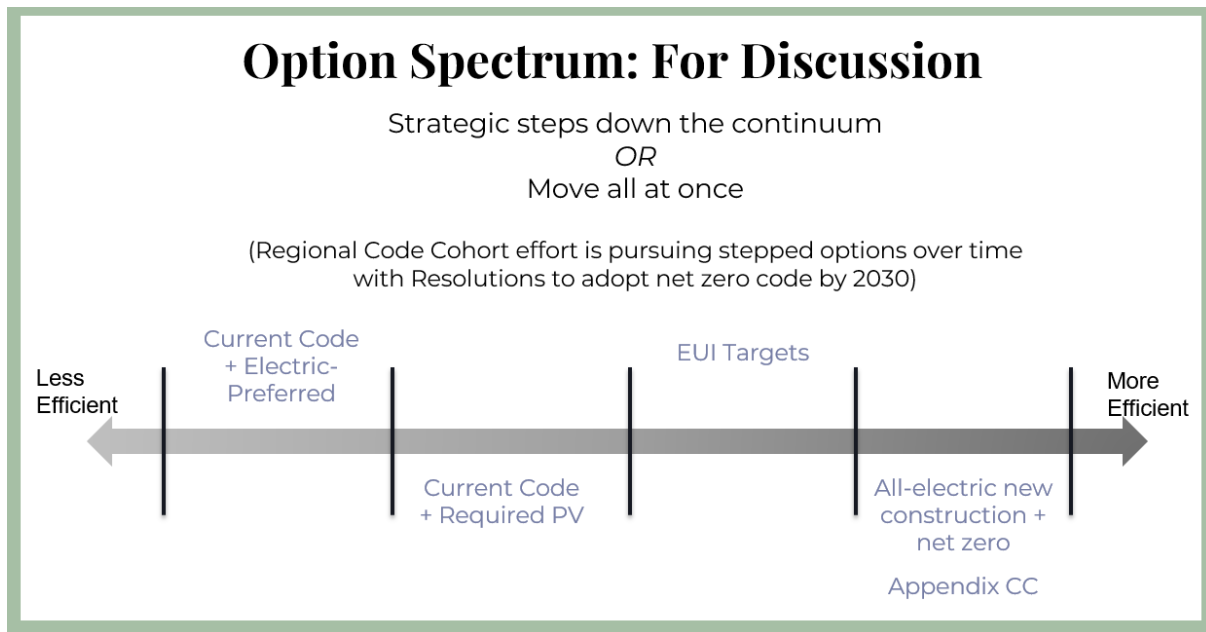
Strategic steps down the continuum

OR

Move all at once

(Regional Code Cohort effort is pursuing stepped options over time with Resolutions to adopt net zero code by 2030)





Schlaepfer reiterated that the Board's input is very necessary and helpful when trying to decide which path to choose and that a potential recommendation could be a stepped approach to start at the left end of the spectrum and takes steps in the future.

Schlaepfer also reiterated that Phase I of the Regional Cohort is to get all the communities to adopt the 2021 IECC plus electric preferred and PV preferred. Phase II would begin in August to begin a roadmap to net-zero energy codes.

Geise thanked the external groups for the slideshow presentation.

Betzhold encouraged the Board to continue to research the options presented and the plan is to bring back information back to this Board in September.

Knapp asked if there was any further information for research. **Schlaepfer** answered that the slideshow was available as well as the information on the Engage Louisville website.

Schlaepfer, Berry, and Dino discussed how to get the survey and information out to larger developers and building owners.

Schlaepfer, Betzhold, and Kantor and McCollugh left the meeting.

Election of Officers:

Berry asked for nominations for Chairperson and Vice-Chairperson.

Dino nominated **Berry** for Chairperson and **Gatto** seconded the motion. Voice vote. Motion passed 5-0.

Dino nominated **Geise** for Vice-Chairperson and **Berry** seconded the motion. Voice vote. Motion passed 5-0.

Berry reminded the Staff to check on term limits and **Geise** asked to have a list of everyone's term limits.

Staff Comments:

None heard.

Discussion Items for Next Meeting:

Not enough time to put packet together based on City Council meeting. No indication as to when the next meeting will take place.

Adjourn:

Berry moved and **Gatto** seconded a motion to adjourn the meeting. The meeting was adjourned at 8:05 PM.