Metropolitan ENERGY CENTER

Energy Codes, Standards, and Human Impacts

in the Kansas City Region

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A report of Metropolitan Energy Center

Mary English, Brittanie Giroux and Emily Wolfe

About the Energy Solutions Hub

Metropolitan Energy Center (MEC) is a Missouri not-for-profit organization, founded in 1983. Our mission is to create resource efficiency, environmental health, and economic vitality in the Kansas City region and beyond. A catalyst for community partnerships focused on energy conservation, MEC works primarily through its Building Performance and Sustainable Transportation programs improving the places people work, play, and call home. Every energy dollar conserved through our work remains available for investment in the local economy. MEC also acts as an aggregator and funder for local projects that achieve energy efficiency in Kansas and Missouri, distributing nearly $20 million in the last decade, helping to reduce greenhouse gas emissions in the buildings and transportation sectors by more than 300 tons.

Our building performance program, Energy Solutions Hub, offers technical assistance, information, and education to building owners, residents, and renters. Its operating goal is to improve the health and wellness of all people who occupy the buildings and the outdoor spaces affected by emissions in the Kansas City region. From advocacy efforts to coordination of workforce development opportunities, our team connects promising partnerships to the best resources available, until our region realizes a completely clean-energy society.

This report is a result of one of those partnerships. *EnergyWorks KC – Energy Solutions Hub* was funded by Kansas City's Office of Environmental Quality under a U.S. Department of Energy grant. Its purpose is to facilitate compliance with the City's Energy Empowerment ordinance; to raise awareness and implementation of energy efficiency best practices in commercial and residential buildings in the KC metro; to create momentum around better building policy and execution through offering training and resources; to study the impact of energy efficiency in our homes and generate a healthy homes initiative; and to incorporate energy justice as a major foundation of our work.

Acknowledgements

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Executive Summary

Since the days our ancient ancestors started erecting structures to get out of their damp, dark caves, buildings have been our haven from the elements. As our technology has improved from sod, thatched roofs, and log structures, our faith in our buildings has grown into one of the bedrocks of civilizations around the globe.

In the modern era, new construction has the latest and greatest innovations available to society to protect us from Mother Nature's fiercest tendencies. As technologies have improved, the general belief might be our newly built homes and buildings and those undergoing major renovations are utilizing new technologies to create ever more reliable shelters. Unfortunately, that assumption does not always reflect reality. During the cold snap in 2021 and record-breaking summer temperatures, communities across the Kansas City area continue to experience firsthand the detrimental impacts of living in inefficient homes.

So, where do people go when our structures do not offer enough protection from extreme weather events and poor outdoor air quality? It is a tough question to answer, especially as we grapple with our changing climate. However, by adopting and complying with the most updated building codes, including good energy codes based on the latest version of the International Energy Conservation Code (IECC, herein referred to as "the energy code"), municipalities can provide residents safe, healthy, and comfortable places to live and work for years to come.

Now, you may be wondering: What exactly is an energy code? How much does the energy code matter in my municipality? And why is it so important? The goal of this report is to provide an overview of our region's various building code policies and discuss how the efficiency of our homes and buildings impacts human health, wellbeing, and the economy. And with the unprecedented quantity of federal funds through the Inflation Reduction Act (IRA), along with the Infrastructure Investment and Jobs Act (IIJA), there is no better time to invest in energy efficiency and update our energy codes to create a strong growth in clean energy jobs and healthy and more equitable communities.

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The Impact of Energy Codes

The primary goal of any energy code is to conserve energy; however, their impact can go far beyond improving the energy efficiency of buildings. Energy efficiency, according to the U.S. Department of Energy (DOE) is "the use of less energy to perform the same task or produce the same result. Energy-efficient homes and buildings use less energy to heat, cool, and run appliances and electronics, and energy-efficient manufacturing facilities use less energy to produce goods."[1] This is a very simple definition for a subject that, if implemented correctly, could be a universal remedy for so many more of society's issues.

Healthier, More Comfortable Buildings

Energy codes have everything to do with occupants' comfort and health. They ensures our buildings stay dry, remain at a consistent temperature throughout each room, have correct humidity levels, and stay allergen free. To ensure the code operates as intended, building performance professionals release an updated energy code package every three years; using a whole building approach to evaluate how different components work together. One example is proper building tightness and ventilation. Proper building tightness, which is achieved through insulation and air sealing, guards occupants from outdoor pollutants, mold, mildew, and extreme temperatures. Ventilation removes indoor pollutants which can be caused by fuel-burning appliances, tobacco products, building materials and furnishings, or household cleaning products. Another example is during extreme temperature days in the summer and winter when there are often large temperature differences between inside a home or building and outside. If there are gaps in the insultation or air sealing, it can lead to consistent condensation which can often lead to mold growth – which can have a detrimental effect on human health, especially for more vulnerable populations.

Unhealthy buildings even result in a distinct medical condition, known as sick building syndrome. A study conducted in Europe found one in six

An updated and enforced energy code:

- Creates healthier and more comfortable buildings.
- Protects residents from extreme weather.
- Promotes energy equity.
- Boosts economic development.

[1] https://www.energy.gov/eere/energy-efficiency

Europeans are living in a home that makes them sick.[2] In summary, unhealthy buildings are a widespread problem that need political and public attention and each component of the code plays an integral role ensuring we have safe and comfortable places to work, go to school, and call home.

In partnership with Kansas City's own Children's Mercy Hospital and the University of Missouri – Kansas City (UMKC), MEC recently published a study that turned out to be stunningly significant. The study found a reduction of pediatric asthma encounters for children diagnosed with asthma residing in homes in the Kansas City metro that received energy efficiency improvements. *The difference between the weatherized set of homes and the control group where no weatherization was executed was a 34% reduction in hospital visits for asthma.*[3] This study demonstrates that an efficient home can truly be lifesaving.

Extreme Weather Protection

Like seat belts in cars and railings on bridges, a well-constructed building, using the fundamentals of building science, protect humans from a vast array of potentially harmful events like extreme weather and lesser-known issues such as poor air quality. According to the Federal Emergency Management Agency (FEMA), mitigation efforts such as building code adoption and enforcement is one of the strongest strategies jurisdictions can take to protect a community against the effects of natural hazards. Mitigation increases occupant health and safety during a disaster, protects the local tax base, helps with continuity of essential services, and supports more rapid recovery from disasters. The energy code contains certain safeguards to minimize the damage a flood or storm can cause to walls, floors, ceiling insulation, windows, and ducts. When combined with other stringent buildings codes, our communities, urban and rural, stand stronger in the face of whatever natural disaster comes their way.[4] In 2022 FEMA published a first-of-its-kind Building Codes Strategy program, toolkit, and other resources to help our nation become one step closer to living in an area that is safer and stronger against natural hazards.

In addition to shielding residents from extreme weather, the energy code protects our pocketbooks. According to the National Oceanic and Atmospheric Administration, in 2021 weather and climate disasters killed 688 people and cost $1 billion or more, totaling $145 billion. It is also worth

Did you know Children's Mercy Hospital in Kansas City has a Healthy Homes Program?

Their team helps make children's homes safer by performing healthy home environmental assessments, general indoor air quality checkups, moisture and dampness assessments, and more.

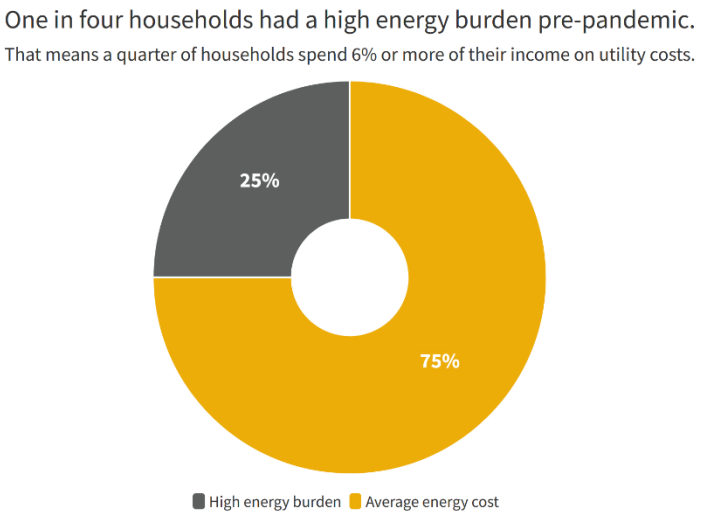
[2] https://www.env-health.org/wp-content/uploads/2018/05/Healthy-Buildings-Briefing.pdf
[3] https://metroenergy.org/wp-content/uploads/2023/07/Health-Impacts-of-EWKC-Program-Activities.pdf
[4] https://www.fema.gov/emergency-managers/risk-management/building-science/building-codes-strategy

noting that 2021 ranked as the fourth-warmest year on record in the U.S.[5] Updating the energy code as recommended by energy experts can help ensure we are more prepared to cope with extreme weather conditions.

Promotes Energy Equity

Individuals and families with insufficient income must too often choose between paying their utility bills and spending their money on other necessities. Even when living in smaller homes, low-income families use more energy per square foot than their wealthier counterparts, while still experiencing hotter homes in the summer and colder homes in the winter due to poor construction and maintenance of buildings.[6] These households are often described as "energy burdened" or put more simply – a household's energy bills are too high. Researchers define households who spend 6% or more on energy costs as energy burdened." A home that may be considered affordable to rent or own cannot literally be classified as "affordable" if it generates high utility bills or expensive trips to the hospital for asthma attacks.

Figure 1. Energy Burdens in US Households.



Source: American Council for an Energy-Efficient Economy. Graphic by Vicky Diaz-Camacho | Flatland

Between neighborhoods in our region, there is a vast difference in availability of quality, energy efficient housing. The disparity is directly correlated to discriminatory housing practices such as redlining. During the F.D. Roosevelt presidency, many programs were created to safeguard banking and housing institutions. One such program was the Homeowners Loan Act distributed by the Homeowners Loan Corporation. Government loans were given to prospective homeowners based on race, ethnicity, and location. Grades were assigned to neighborhoods ranging from A "Best" to D "Hazardous."[7] In Kansas City, one of the most visible examples of discrimination and disenfranchisement of Black residents is seen in the Troost divide, a product of years of redlining, racial housing covenants, and disinvestment in Black neighborhoods.[8] Housing stock within the East side of Troost along with several other pockets in the Kansas City region is of poor quality and creates high utility bills.

While the energy code alone cannot solve the immense issues caused by redlining, requiring all homes and buildings to be more efficient is one step communities can take to promote energy equity and to correct historical wrongdoings. An updated energy code that is enforced not only protects individuals' and families' health, but saves households money, enabling a more consistent living environment, especially for renters who have little to no control over the efficiency of their homes.

[5] https://www.npr.org/2022/01/11/1072077479/extreme-weather-in-u-s-cost-688-lives-and-145-billion-noaa
[6] https://www.ase.org/blog/low-income-households-pay-lot-energy-efficiency-can-help-cut-costs
[7] https://dsl.richmond.edu/panorama/redlining/#loc=12/39.046/-94.688&city=greater-kansas-city-mo
[8] https://www.kcur.org/community/2014-03-27/how-troost-became-a-major-divide-in-kansas-city

Boosts Economic Development

As the energy code and standards are updated and adopted, new employment opportunities become available. Meeting energy efficiency standards requires the help of additional technical experts, including duct and air leakage professionals, quality control assessors, building and system commissioning agents, energy auditors, and code compliance officers.[9] Clean Jobs Midwest details the size of the clean energy sector and shows how focusing recovery policies on clean energy can help reinvigorate our region's economy. They also provide an overview of clean energy employment jobs in Midwest states, including Kansas and Missouri. For example, clean energy companies employed almost 24,000 Kansans at the end of 2021, a 5% increase from 2020 and a return in growth after an unprecedented decline in 2020 due to the COVID-19 pandemic. In Missouri clean energy companies provided more than 54,000 jobs in 2021, and they also saw a 5% increase from 2020.[10] While clean energy jobs are on the rise, the field needs to focus on diversity, equity, and inclusion which is discussed more in-depth in the Best Practices and Model Implementors section of this report. By incorporating a diversity of experience and expertise, the field will be more holistic, innovative, and ultimately reach more communities.

In addition to creating jobs, the energy code also boosts the local economy by letting people reinvest the money they are saving on energy costs. The energy code, and the provisions in it, are tested for their cost-effectiveness. It is the only building code that pays for itself.[11] Economic analysis indicates that every dollar spent on energy code compliance and enforcement yields $6 dollars in energy savings.[12] When governments invest in energy codes, their citizens have additional money to invest in their residences and local economies.

[9] https://www.energycodes.gov/resource-center/ACE/adoption/step1
[10] https://www.cleanjobsmidwest.com/
[11] https://www.builderonline.com/building/building-science/energy-codes-are-life-safety-codes_o
[12] https://www.energy.gov/sites/prod/files/gcprod/documents/Energy_Code_Enforcement_Funding_Task_Force_-_Fact_Sheet.pdf

National Energy Code and Standards

Below is an overview of the national energy code and standards. In determining these standards, the United States Department of Energy (U.S. DOE) strives to achieve the maximum practicable, cost-effective improvements in energy efficiency while providing safe, healthy buildings for individuals and families.

Energy codes and standards are broken down into three stages:

- Development
- Adoption
- Compliance

Development

For new construction and major renovations (residential and commercial), the energy code and standards lay out the *minimum* energy efficiency requirements as a *package*. The U.S. DOE supports and participates in the building energy code development processes administered by American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) and the International Code Council (ICC). The U.S. DOE is then required by law to issue a determination as to whether the latest edition of ASHRAE Standard 90.1 and the latest version of the International Energy Conservation Code (IECC) will improve building energy efficiency compared to the previous edition.[13] Updates are also made so it is easier for design, building, and enforcement communities to comply with the update code.

IECC vs. ASHRAE Standard 90.1

Both the IECC and ASHRAE energy standards are considered acceptable compliance paths for commercial buildings. The IECC is one of a suite of model national building codes revised every three years. It lays out minimum efficiency standards for commercial and residential buildings. Commercial provisions fall into four main sections: building envelope, mechanical systems, electrical power and lighting, and service water heating (residential provisions are distributed among the first three). In addition to providing its own updated recommendations, the IECC also references ASHRAE Standard 90.1 (standard for buildings except low-rise residential buildings) as an alternative compliance path for commercial buildings. ASHRAE Standard 90.1 is updated triennially on years differing from the IECC. Both ASHRAE and IECC update their codes and standards through processes involving code officials, builders, energy efficiency advocates, and other industry stakeholders.[14]

[13] https://www.energycodes.gov/development
[14] https://www.architectmagazine.com/technology/code-override-states-and-cities-press-ahead-on-efficiency-standards_o

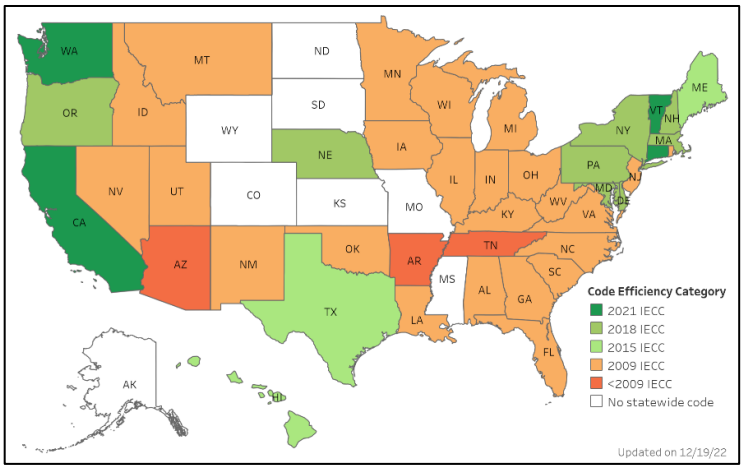
New Construction vs. Major Renovations

New construction consists of building from the ground up. Major renovations go beyond cosmetic repairs of a building and involve working with its critical systems (mechanical, electrical, plumbing, structural components, etc.). The energy code and standards apply to both new construction and major renovations, but the enforcement mechanisms often vary with major renovations being more challenging to track and regulate. Both levels of construction require a building permit (an official approval to proceed with construction) and a Certificate of Occupancy (indication the building meets its building-code requirements and can be reoccupied) from the local authority.[15] However, it is unknown how many major renovations are performed without building permits.

Adoption

The DOE supports the ICC's work through analysis and dissemination. However, the energy code and standards are adopted and enforced by the authority having jurisdiction (state, county, or municipality). Some states adopt standard statewide building codes, but in home rule states, jurisdictions can adopt their own building codes. Jurisdictions may modify or amend codes, but there is considerable benefit in terms of energy savings, cost-effectiveness, and assistance from the DOE, ICC and ASHRAE by maintaining the model code as written.[16] Kansas and Missouri are two of eight home rule states.[17] Therefore, our codes are adopted at the local level.

Figure 2. State adoption of the IECC for residential buildings as of 2022.



Source: U.S. Department of Energy (DOE) Building Energy Codes Program. (BECP)

Challenges for Home Rule States

Leaving code adoption up to local jurisdictions with no statewide oversight often creates a patchwork of confusing and outdated codes. The energy code can get left behind because of misunderstandings about its costs and savings, health and safety impacts, and building science principles.[18] These additional obstacles can also result in weaker energy policies. Jurisdictions with smaller budgets may opt for less efficient codes—or no codes at all—out of concerns about the costs to governments and builders. But because of the connections between energy efficiency, health, and equity, these decisions can unintentionally push costs onto residents in the form of higher utility bills and higher healthcare costs. Such decisions can also reinforce the likelihood that one's health and success is determined by their zip code.

In the American Council for an Energy-Efficient Economy's (ACEEE) State Energy Efficiency Scorecard report for 2022, they evaluated and scored states in six primary policy areas: utility and public benefits, transportation, building energy efficiency, state government–led initiatives around energy efficiency, industrial energy efficiency, and appliance and equipment standards. Each state was eligible to receive 50 possible points. Except for Colorado, home

[15] https://www.usgbc.org/glossary/
[16] http://www.mwalliance.org/sites/default/files/meea-research/energy_codes_101_9.17.17.pdf
[17] https://www.energycodes.gov/state-portal
[18] http://www.swenergy.org/a-new-model-for-energy-codes-in-home-rule-states

rule states and states with no statewide code (Alaska, Colorado, Kansas, Mississippi, Missouri, North Dakota, South Dakota, and Wyoming) ranked 29th or worse on the scorecard. *Kansas ranked 49th, and Missouri came in at 29th.*[19] The scorecard demonstrates there are significant opportunities for Kansas and Missouri to improve their energy efficiency efforts.

Compliance

Code officials, as well as other professionals involved in compliance verification, must ensure buildings comply with the energy code. Code enforcement is complementary to compliance, and strategies vary according to a state or local government's regulatory authority and available resources. Builders can choose between two primary compliance paths: Prescriptive or Performance.[20]

Prescriptive Path

A fast, definitive, and conservative approach to code compliance. It includes a comprehensive checklist of the building components and characteristics that can affect energy consumption. It is most often used for small-scale projects.[21] Should a contractor or developer choose to comply by the prescriptive path, they must follow all requirements of the code as prescribed.

Performative Path

The building performance path uses energy modeling software to calculate the annual energy consumption and costs of a building. Instead of setting minimum standards for individual building components, the goal is a building with an Energy Use Intensity (EUI) equivalent to, or better than, one built to the prescriptive code.[22] Developers and contractors may choose to comply by this path and use tradeoffs in each section rather than complying with each of the prescriptive requirements. Energy modeling must be done prior to construction beginning to determine if the building complies using the scoring methodology.

Additional information about the compliance paths is provided in the Build Cost Impacts of the Energy Code section of this report.

[19] https://www.aceee.org/sites/default/files/pdfs/u2206.pdf
[20] https://www.energycodes.gov/resource-center/ace/compliance/step2
[21] https://www.wbdg.org/resources/energy-codes-and-standards
[22] https://bcapcodes.org/compliance-portal/design/energy-modeling/

Recent Codes

Between the 1980s and 2006, the energy code was truly minimal, and the U.S. DOE perused marginal improvements. In 2004 the DOE successfully advocated for a major rewrite of the IECC (which became the 2006 IECC), but the emphasis was on format, not code stringency. However, both the 2009 and 2012 versions included provisions that resulted in substantial improvements in energy efficiency compared to the 2006 code.[23] Below is additional information regarding the most recent versions.

With the City of Kansas City, MO passing an ordinance in October 2022 to adopt the 2021 IECC, eyes are on the city to see how the increase in efficiency requirements is implemented in a region not traditionally known for adopting progressive building policies. The updated code goes into effect in October of 2023.

2018 IECC

There were only minor improvements in efficiency of the 2018 IECC over the 2015 version. However, efficiency advocates saw this as an accomplishment due to several proposals that would have significantly weakened the code – nearly all were defeated.[24] Some changes to the 2018 code included clarification on how the Energy Rating Index (ERI) path is calculated and requiring commercial buildings (including multi-family) to have more efficient showerheads.[25]

2021 IECC

In addition to catching up to modern-day building technology and practices, the 2021 IECC offers two new optional appendices ("Zero Energy Home Appendix" and "Zero Code Renewable Energy Appendix") to provide states and cities with pathways to incorporate zero-energy performance requirements into their code. Some states also develop "stretch codes" and other approaches to allow jurisdictions to go beyond minimum code requirements. The 2021 IECC provides an opportunity to reduce millions of tons of carbon from entering the atmosphere while reducing energy bills for tenants, homeowners, and business owners.[26] To learn more about the 2021 IECC, which was recently adopted by the City of Kansas City, MO, contact MEC for additional information.

2024 IECC

The 2024 IECC is in the final stages of reviews and release. During the process, items from 2021 IECC may be adjusted or expanded. The 2024 IECC is expected to be published by Fall of 2023. MEC will update this report accordingly when the final energy code is released.

[23] https://www.energy.gov/sites/prod/files/2013/12/f6/iecc_overview.pdf
[24] https://www.nrdc.org/experts/lauren-urbanek/2018-building-energy-code-holds-line-efficiency
[25] http://energyoutlook.naseo.org/Data/Sites/13/media/presentations/Haack-ICF.pdf
[26] https://newbuildings.org/code_policy/2021-iecc-national-model-energy-code-base-codes/

Build Cost Impacts of the Energy Code

As previously stated, the energy code and the provisions in it are tested for their cost-effectiveness – it is the only building code that pays for itself. After each new model energy code is published, the U.S. DOE must determine if the new version saves energy relative to the old version. To support the U.S. DOE in evaluating the energy and economic impacts associated with the updated building codes, Pacific Northwest National Laboratory (PNNL) conducts an analysis using the prescriptive compliance path in residential buildings in every state. Even with an extensive development and review process, construction costs to implement an updated energy code is a constant debate within the industry, especially in the residential sector.

Cellulose insulation is lower cost, versatile and effective in many applications.

Residential Cost Effectiveness of the 2021 IECC in Kansas and Missouri

To estimate the cost impact of residential code changes, PNNL developed a single-family prototype building and a low-rise multifamily prototype building to represent typical new residential building construction. Below are the key characteristics of the prototypes:

Single-Family Prototype

A two-story home with a roughly 30-ft by 40-ft rectangular shape, 2,376 sq. ft. of conditioned floor area excluding the conditioned basement (if any), and window area equal to 15% of the conditioned floor area equally distributed toward the four cardinal directions.

Multifamily Prototype

A three-story building with 18 dwelling units (6 units per floor), each unit having conditioned floor area of 1,200 sq. ft. and window area equal to approximately 23% of the exterior wall area (not including breezeway walls) equally distributed toward the four cardinal directions.

Using the above protypes and a prescriptive compliance path, PNNL identified below the per-dwelling-unit impact of the improvements in the 2021 IECC on consumer cash flow compared to the 2009 IECC for Kansas and Missouri.[27] [28]

[27] https://www.energycodes.gov/sites/default/files/2021-07/KansasResidentialCostEffectiveness_2021_0.pdf

[28] https://www.energycodes.gov/sites/default/files/2021-07/MissouriResidentialCostEffectiveness_2021.pdf

Figure 3. Kansas Consumer cash flow complying with the 2021 IECC compared to the 2009 IECC.

	Cost/Benefit	Climate Zone 4A	Climate Zone 5A	State Average
A	Incremental down payment and other first costs	$575	$522	$574
B	Annual energy savings (year one)	$712	$704	$712
C	Annual mortgage increase	$199	$180	$198
D*	Net annual cost of mortgage interest deductions, mortgage insurance, and property taxes (year one)	$61	$56	$61
E = [B-(C+D)]	Net annual cash flow savings (year one)	$452	$468	$453
F = [A/E]	Years to positive savings, including up-front cost impacts	2	2	2

Source: https://www.energycodes.gov/sites/default/files/2021-07/KansasResidentialCostEffectiveness_2021_0.pdf

**Item D includes mortgage interest deductions, mortgage insurance, and property taxes for the first year. Deductions can partially or completely offset insurance and tax costs. As such, the "net" result appears relatively small or is sometimes even negative.*

Figure 4. Missouri Consumer cash flow complying with the 2021 IECC compared to the 2009 IECC.

	Cost/Benefit	Climate Zone 4A	Climate Zone 5A	State Average
A	Incremental down payment and other first costs	$703	$638	$700
B	Annual energy savings (year one)	$675	$743	$677
C	Annual mortgage increase	$243	$221	$242
D*	Net annual cost of mortgage interest deductions, mortgage insurance, and property taxes (year one)	$54	$49	$54
E = [B-(C+D)]	Net annual cash flow savings (year one)	$377	$473	$381
F = [A/E]	Years to positive savings, including up-front cost impacts	2	2	2

Source: https://www.energycodes.gov/sites/default/files/2021-07/KansasResidentialCostEffectiveness_2021_0.pdf

**Item D includes mortgage interest deductions, mortgage insurance, and property taxes for the first year. Deductions can partially or completely offset insurance and tax costs. As such, the "net" result appears relatively small or is sometimes even negative.*

Compliance Options' Impact on Cost and Flexibility

As previously stated, builders can choose between two primary compliance paths in the energy code: prescriptive or performance. The performance path uses energy modeling software to calculate the annual energy consumption and costs of a building instead of setting minimum standards for individual building components (i.e., the prescriptive path). The performance path allows builders to use tradeoffs to design a house that uses less energy by customizing the efficiency-related attributes of the home. For example, a home could use more insulation in the walls, but install heating and cooling equipment with a lower efficiency rating, yet still meet the code requirements.

Energy modeling for residential buildings

Since 2015 the IECC has specified an Energy Rating Index (ERI) target score for each climate zone. The most used ERI in the U.S. is the Residential Energy Services Network (RESNET) HERS® Index which is the nationally recognized system for inspecting, testing, and calculating a home's energy performance. To determine a home's HERS® Index (the lower the number, the more energy efficient the home), a certified Home Energy Rater assesses the energy efficiency of a home assigning it a relative performance score.[29] Home Energy Raters use approved energy modeling software, combined with inspection and equipment testing services, to oversee the efficiency criteria being used by the builders. In Kansas 1,773 homes were HERS rated in 2021 and the average HERS Index Score was 68. In Missouri 508 homes were rated, and the average score was 59.[30] In the unamended 2021 IECC, a HERS Index Score of 54 is required for Climate Zone 4 which covers the Kansas City metro.

The performative path is harder to quantify on construction cost increases due to the multiple options that can be used to customize different attributes of a home. However, through energy modeling simulation, HERS Providers can estimate the lowest construction costs to comply with the IECC. A report was produced for the Kansas City region by the EnergySmart Institute to calculate the estimated cost to build a home to the 2021 IECC using the performative path.[31] Below is an overview of the report's findings.

Energy Modeling for Commercial Buildings

There are a variety of energy modeling and calculation software programs available for determining the energy efficiency of commercial buildings. Most architectural and engineering firms and professionals choose one energy modeling software program for commercial projects. However, larger firms pull energy related details from a tool like REVIT and input them into specialized clean energy software for determining solar angles, shadows, and fractions plus other areas like grid optimization and demand response/control, smart systems, etc.[32] To view a complete list of the energy modeling software available, visit Building Energy Software Tools.[33]

[29] https://www.resnet.us/raters/hers-raters/#:~:text=What%20is%20a%20HERS%20Rater,according%20to%20the%20RESNET%20Standards
[30] https://www.resnet.us/wp-content/uploads/2021-HERS-Activity-by-State-1-11-22.pdf
[31] Report estimates performed by EnergySmart Institute: https://energysmartinstitute.com/
[32] Riead, K. (2023). Association of Energy Engineers. (E. Wolfe, Interviewer).
[33] https://www.buildingenergysoftwaretools.com/

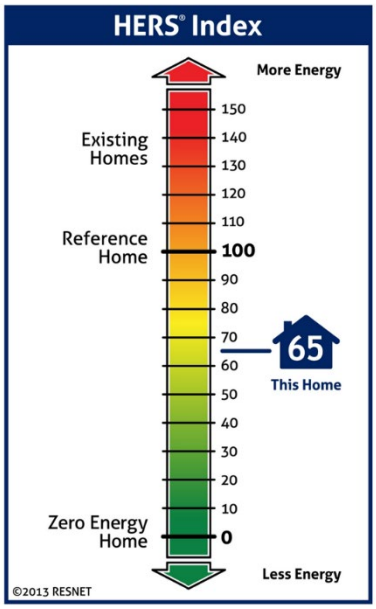
Figure 5. HERS® Index Score complying with the 2021 IECC compared to the 2009 IECC.

2,260 sq. ft. home with a conditioned basement in the Kansas City area		
	HERS Index Score	*Additional Costs (est.)
2009 IECC	80	
2021 IECC	54	$3,813 - $7,645

Source: REMRate or _____.

**Construction cost estimates used REMRate for modeling purposes.*[34]

Figure 6. Graphic Presenting HERS® Index Scores.



A certified Home Energy Rater assesses the energy efficiency of a home, assigning it a relative performance score. The lower the number, the more energy efficient the home. A typical home built to 2006 energy efficiency standards scores 100 on the HERS Index.

- **A home with a HERS Index Score of 70 is 30% more energy efficient than a standard new home**
- **A home with a HERS Index Score of 130 is 30% less energy efficient than a standard new home**

Source: Residential Energy Services Network (RESNET).

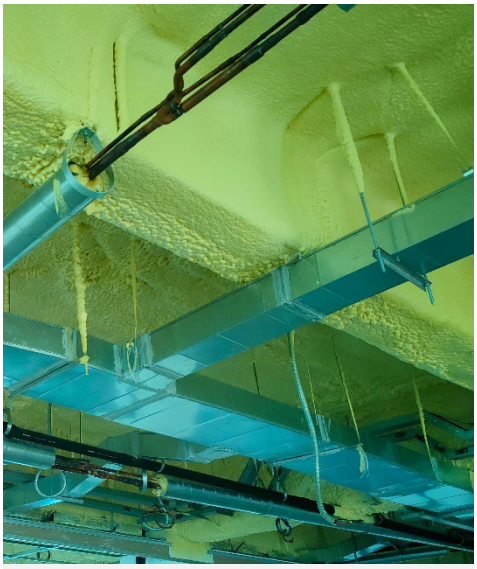
[34] https://www.remrate.com/

Best Practices and Model Implementors

Highlighted below are actions organizations, states, and cities have taken to address discrepancies and misunderstandings surrounding the energy code and to improve efficiency standards in home rule and non-home rule states. These examples can serve as a model for other communities as they develop policies and programs to meet the needs of their residents.

Best Practices

- Communicate benefits and necessities.
- Provide training for industry professionals.
- Coordinate collaboration among jurisdictions.
- Adopt building energy benchmarking and performance standards.
- Require energy disclosure of homes for sale and rent.
- Utilize equity driven approaches.



Duct testing will be required in both the Residential and Commercial in 2021 IECC.

Communicate Benefits and Necessities

To address the incorrect perception that the energy code is nonessential and merely "nice to have," several organizations strive to create more awareness that it is truly lifesaving.

Metropolitan Energy Center (MEC)

While presenting the energy code via blogs, conference presentations, or at community meetings, MEC strives to use real-world examples demonstrating how the code does more than save a few dollars. To engage residents and make energy efficiency more tangible, MEC staff collaborates with other organizations, such as Children's Mercy Hospital's Healthy Homes program, as much as possible. Additionally, community outreach has been made a priority to include residents that have been historically left out of these conversations.

Through their outreach efforts, MEC noticed a need to better educate policymakers in the Kansas City region – the people who ultimately determine what code is adopted. As a result, they hosted a webinar, *What is an energy code, anyway? Policymakers hold the keys to better buildings in Kansas City.*[35] The virtual webinar discussed how the energy code is developed and adopted, challenges for home rule states, and the impact it has on residents. The webinar had individuals from nineteen municipalities across Kansas and Missouri in attendance including a local building official who called it "enlightening."

[35] https://www.youtube.com/watch?v=EnCwzQFqLsY

Midwest Energy Efficiency Alliance (MEEA)

MEEA, a collaborative network which advances energy efficiency in the Midwest, communicates that the energy code exists to protect building occupants and communities. Outdated or unenforced energy codes can lead to buildings with poor indoor air quality, dangerous mold growth, and rotting structural members, which not only cost the owner more money in higher operating costs, but also impact occupants' health.[36] MEEA is a valuable resource when looking for best practices and/or lessons learned from other communities in their 13-state region. MEEA also hosts a quarterly energy code collaborative meeting.

Provide Training for Industry Professionals

Beyond adoption, the energy code and standards are only impactful if they are implemented and complied with; therefore, training is critical to the design, building, and enforcement communities. However, local code officials often lack adequate resources to provide additional training on energy efficiency and building science.[37] To encourage code adoption and compliance, states have pursued various routes to ensure training is available.

Colorado (Home Rule State)

The Colorado Energy Office (CEO) has statutory requirements to ensure energy code training available in Colorado. CEO provides city staff and private sector professionals training and technical assistance to help them adopt, implement, and comply with new codes. The program is funded through general state funds and provided by an external vendor. Training is prioritized for smaller jurisdictions with fewer resources. To maximize training dollars, Xcel Energy provides training if the jurisdiction is in their territory.[38] Colorado is one of many states making efforts to provide more resources to their building officials, especially in municipalities with less resources.

The City Energy Project Assessment Methodology for Energy Code Compliance in Medium to Large Cities

Historically, the U.S. DOE has focused on statewide code compliance protocols. The City Energy Project methodology is designed to assist cities in identifying residential and commercial energy code compliance issues and specific areas jurisdictions should focus on in order to improve their compliance rates.[39] While the tool is available online at no cost, Institute for Market Transformation (IMT) works with cities directly to complete the assessment or develop a request for proposal if they would like an outside organization to complete the assessment. The goal of the tool is to help cities determine their general compliance rate and identify specific, targeted recommendations to improve compliance. IMT stated lack of training and staff time are often the biggest barriers identified.[40]

[36] https://www.sierraclub.org/sites/www.sierraclub.org/files/sce-authors/u7451/codes%20life%20safety%20flier%20v8.pdf
[37] https://www.marc.org/Environment/Energy/pdf/reecswhitepaper-full.aspx
[38] https://energyoffice.colorado.gov/climate-energy/energy-policy/building-energy-codes
[39] https://www.imt.org/resources/the-city-energy-project-assessment-methodology-for-energy-code-compliance-i/
[40] Cheslak, K. (2019). Institute for Market Transformation. (E. Wolfe, Interviewer).

Metropolitan Energy Center (MEC)

To help fill the training gap in the Kansas City metro, in partnership with EnergySmart Institute and sponsored by the City of Kansas City, MO, in 2022 MEC began offering building science and energy code training, at no cost and for continuing education hours with a focus on the 2021 IECC. Prior to the training, MEC met with several local municipalities to ensure the training would meet their needs. As a result, over 152 industry stakeholders including code officials, city planners, contractors, builders, state employees, and emerging professionals from over 10 municipalities in the Kansas City region attended the six courses that were offered in 2022 and at the beginning of 2023.

In July of 2023, MEC was notified they were one of 27 applicants to get the green light from the U.S. DOE to provide workforce development in support of better building policy.[41] The program, which will kick-off in 2024, brings together an extensive and diverse multistate network of 30 regional, state, and local community partners—including two growing community-based organizations—to build a workforce of energy-efficiency-related vocations in disadvantaged communities in urban and rural areas across Kansas and Missouri.

"Very informative training for those that are less experienced in; to those that are well-versed in the energy code, well taught! Great for code officials, building inspectors, building industry at all levels involved in design, construction and enforcement to understand and meet the ICC minimum efficiency standards for buildings. Most of all they did this all at no cost to the participants and provided free ICC continuing education credits! Highly recommend this class when available again."

- Feedback from attendee of MEC's 2021 IECC training.

Utility Engagement

Thirty plus states across the U.S. and the District of Columbia have utilities that provide resources to support jurisdictions as they adopt, implement, and comply with updated energy codes. For example, several Arizona utilities have programs that provide municipalities code training support and resources. In return these utilities can count the energy savings towards legislation implemented in their state that requires them to provide programs and cost recovery mechanisms to reduce the consumption of electricity or natural gas by their customers. Supporting energy code adoption and compliance provides an opportunity for utilities to have a critical role in the intersection of health, affordable housing, and energy equity. It can also help states turn their full attention to upgrading existing buildings.

Coordinate Collaboration Among Jurisdictions

In lieu of any statewide oversight, several organizations across the U.S. encourage neighboring jurisdictions in home rule states to form code collaboratives that work together on energy code initiatives. Below are two examples of these efforts.

[41] https://metroenergy.org/mec-receives-6-8-million-to-support-resilient-and-efficient-building-codes-and-policy/

Metropolitan Energy Center (MEC)

Due to Kansas and Missouri being home rule states, there is often a patchwork of building codes adopted with some municipalities having no codes at all. While there are efforts to have a consistent energy code in the Kansas City metro, municipalities often adopt the code in varying years and with slightly different amendments. Between 2018 and 2022, the majority of municipalities in the Kansas City metro have adopted a heavily amended 2018 IECC. In addition to Kansas City, MO, there are a few outliers including Overland Park, KS and the Unified Government (UG) of Wyandotte County/KCK. Overland Park created their own prescriptive path for residential buildings and has only two amendments for commercial buildings. The UG does not have any amendments for commercial buildings.

Photo from one of MEC's 2021 IECC trainings offered to code officials and industry stakeholders in the Kansas City region.

To help build consensus and encourage collaboration in the Kansas City region, MEC offers training and resources at no cost whenever possible to local policymakers, municipal staff, industry professionals, and those interested in energy efficiency. Not only do these offerings provide attendees with valuable information and resources, but it is also an opportunity to gather individuals from various communities in one space to discuss the energy code, best practices, and lessons learned.

Midwest Energy Efficiency Alliance (MEEA)

Several states in MEEA's thirteen-state region (including the Ameren utility territory in Missouri) participate in code collaboratives to identify potential opportunities and resources for improving energy code adoption and compliance.[42] The collaboratives consist of energy code stakeholders such as building officials, advocates, raters, suppliers, state energy office, etc.

To comply with Recovery Act requirements, in 2016 the Missouri DOE partnered with MEEA to collect data about residential construction practices as they relate to the energy code. As a result of the study, Ameren Missouri funded a three-year program to improve understanding and support compliance with local residential energy codes.

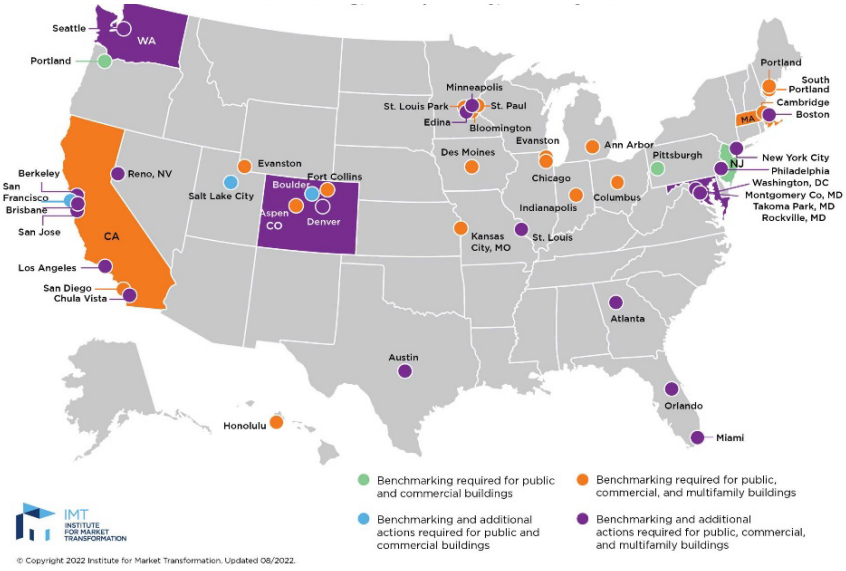
Adopt Building Energy Benchmarking and Building Performance Standards

Because tracking buildings' energy and water use is crucial to achieving reductions in energy consumption (you can't change what you don't measure), several jurisdictions across the U.S. have adopted energy benchmarking policies for existing commercial and multifamily buildings. Benchmarking serves as a mechanism to measure energy performance of a single building over time, relative to other similar buildings, or to modeled simulations of a reference building built to a specific standard (such as an energy code.)"[43] The

[42] https://www.mwalliance.org/missouri-energy-codes-collaborative
[43] https://www.energy.gov/eere/slsc/building-energy-use-benchmarking

typical platform used for benchmarking programs is ENERGY STAR® Portfolio Manager®. Like energy code implementation, benchmarking policies are only impactful if they are complied with. Implementation requires policy development, outreach, technical assistance, quality assurance/quality control, and efforts to maximize energy efficiency.[44] It is crucial that adequate support and resources are available to building owners if a municipality chooses to adopt a benchmarking policy.

Figure 7. Benchmarking policies in the U.S.



Source: Institute for Market Transformation.

In addition to energy benchmarking, municipalities are also adopting Building Energy Performance Standards (BEPS) policies.[45] BEPS are outcome-based policies and laws aimed at reducing the carbon impact of the built environment by requiring existing buildings to meet energy and/or greenhouse gas emissions-based performance targets. When combined with building codes, BEPS are powerful policy tools that can empower state and local governments to deliver on their energy and carbon goals for the building sector.

The DOE Building Technologies Office (BTO) through the Building Energy Codes Program, provides Technical Assistance to jurisdictions interested in exploring BPS programs.[46] Below are examples of municipalities who have adopted energy benchmarking and BEPS policies.

City of Kansas City, Missouri

Kansas City, MO implemented its Benchmarking ordinance in 2016 which requires all buildings, with a few exceptions, of 50,000 square feet or larger to submit their energy and water use data to the city using ENERGY STAR® Portfolio Manager® on an annual basis. Though compliance is mandatory by both municipal and private building managers, the city does not have a penalty for those who do not comply. The current participation rate for private building managers is roughly 60%. As outlined in the City's Climate Protection and Resiliency Plan, the next step, if a resolution is passed by City Council would be to implement a BEPS policy and use the metrics already available in ENERGY STAR® Portfolio Manager® to determine compliance.[47]

MEC is currently under contract to facilitate benchmarking compliance for private commercial and multifamily buildings. Compliance for City owned buildings is managed by the City's Office of Environmental Quality (OEQ). MEC interviewed staff from cities across the U.S. with benchmarking policies to identify best practices and lessons learned. Below are some highlights from their conversations:

[44] https://www.hennepin.us/benchmarking
[45] https://www.energycodes.gov/BPS
[46] https://www.energycodes.gov/BPS
[47] https://indd.adobe.com/view/420afb37-76c2-47e8-b078-f16d508febaf

- Compliance is enforced by the Health Department (Minneapolis, MN).
- Low-performing buildings (those with an ENERGY STAR® score of 75 or less) are required to complete an energy evaluation, which is provided at no cost, every five years (Minneapolis, MN).[48]
- Utilities upload buildings energy and water use data directly into ENERGY STAR® Portfolio Manager® (New York City, NY).
- A label with the buildings' letter grade and energy efficiency score must be prominently posted. Buildings who did not benchmark or are not required to do so must also post labels notifying the public (New York City, NY).[49]

City of St. Louis, Missouri

The Building Energy Performance Standard (BEPS) was unanimously passed by the St. Louis Board of Aldermen and signed into law by Mayor Krewson in May 2020. With its passage, St. Louis became the fourth jurisdiction in the country and the first in the Midwest to mandate significant reductions in building energy use with this ambitious law.

The ordinance covers municipal, commercial, institutional, and residential properties 50,000 square feet and larger. Most buildings have four years (May 4, 2025) to meet the required standard for their building type.[50] Qualified affordable housing buildings and houses of worship have six years to meet the standard (May 4, 2027). One benefit of providing additional time for these building types is to allow owners to wrap energy upgrades into larger improvement projects at the time of mortgage refinance. Property owners will have the flexibility to decide what combination of physical or operational improvements can best achieve the standard. Standards are calculated so at least 65% of buildings must improve their energy performance. The Building Division for the City of St. Louis has identified four guiding principles for the target setting process:

Figure 8. New York City Building Label.

Source: New York City Department of Buildings.

1. Facilitate energy and cost savings for building owners.
2. Support the City of St. Louis in achieving its greenhouse gas emissions reduction goal (100% reduction by 2050).
3. Ensure that the target setting process is transparent, equitable, and clearly communicated.
4. Demonstrate that implementing building energy performance standards is achievable in a smaller, non-coastal city.[51]

Require Energy Disclosure of Homes for Sale and Rent

To illuminate the value of home energy, several cities and states have adopted policies requiring building owners to disclose utility costs, energy audit/assessment results, or energy efficiency features when a property is listed for sale or rent.

[48] https://www.minneapolismn.gov/government/programs-initiatives/environmental-programs/energy-benchmarking/
[49] https://www.nyc.gov/site/buildings/codes/benchmarking.page
[50] https://www.stlouis-mo.gov/government/departments/public-safety/building/building-energy-improvement-board/documents/upload/ApprovedBEPS_05-03-21.pdf
[51] https://www.stlouis-mo.gov/government/departments/public-safety/building/building-energy-improvement-board/beps-targets.cfm

Truth in Sale of Housing

Minneapolis, MN requires a Truth in Sale of Housing (TISH) Report which includes an Energy Disclosure Report prior the below types of sales.[52] The data not only helps inform prospective homebuyers, but is also beginning to fill in a Map of Energy Scores (which is based on a scale of 0-100) across the city which is administered by their Center for Energy and Environment.[53]

- Sale by owner
- Sale by real estate agent
- Real estate agent-assisted sale
- Advertising home sale
- Contract for deed
- Other title transfer

To learn about other municipalities' disclosure efforts or view instructions on tailoring strategies to meet local policy objectives, check out MEEA's Time of Sale Energy Disclosure fact sheet and ACEEE's Residential Energy Use Disclosure: A Guide for Policymakers.[54] [55]

Figure 9. Slide from MEC 2023 webinar: *What is an energy code anyway? Policymakers hold the keys to better buildings in Kansas City.*

Source: Census Reporter.

[52] https://www.minneapolismn.gov/resident-services/property-housing/buying-selling/tish/
[53] https://www.mncee.org/energy-disclosure?find-energy-scores
[54] https://www.mwalliance.org/sites/default/files/meea-research/energy-disclosure-fact_sheet.pdf
[55] https://www.aceee.org/toolkit/2014/01/residential-energy-use-disclosure-guide-policymakers

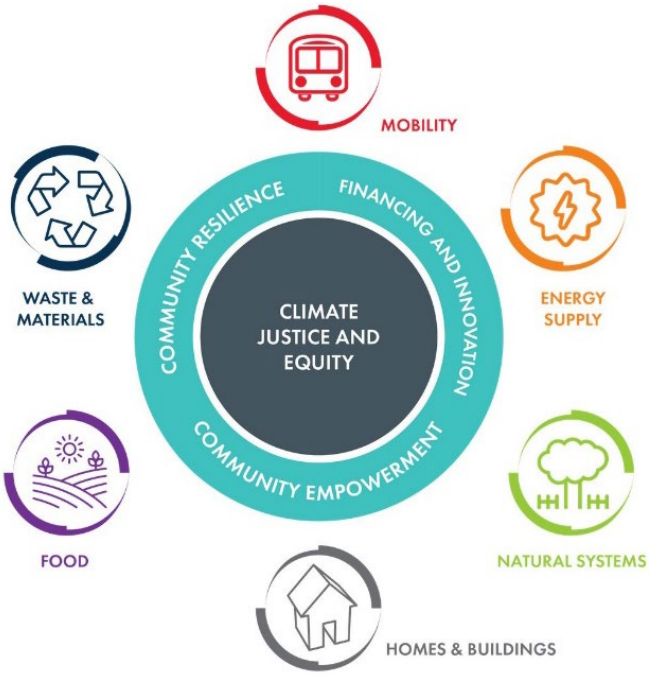
Time of Rent Energy Disclosure

Like time of sale energy disclosure policies, time of rent policies are also increasing in number. One example is Austin, TX. Owners of multifamily buildings must provide prospective renters with an energy guide. The guide provides estimated monthly electric bills, details on the property, and energy audit results.[56] The ordinance also requires multifamily properties that receive electricity from Austin Energy have a specialized energy audit of the residential units once the building is ten years old.[57] A similar policy would be extremely impactful in Kansas City since nearly half of its residents are renters. KC Tenants included a renter energy disclosure policy in their proposed Tenants Bill of Rights, but unfortunately, it was extremely watered down once the ordinance was passed.[58]

Utilize Equity-Driven Approaches

Utilities are a major component of housing and living costs, but renters and low-income families often live in older, less energy-efficient homes and do not have access to lifesaving and cost-saving energy efficiency programs. Increasingly, cities and states are taking steps to address energy inequity through community-based, targeted energy efficiency efforts to meet the needs of their residents.

Figure 10. Targets of KCMO Climate Protection and Resiliency Plan.



Source: City of Kansas City, MO Climate Protection and Resiliency Plan.

Adopt Policies that Strengthen Low-Income Programs

Utilities and for and nonprofit organizations often develop programs targeted to low-income residents. Unfortunately, these types of programs are often under-utilized for a variety of reasons – stigma (for example, identifying certain groups by their income level), false assumptions due to not engaging with a community when designing a program, or making programs that are difficult to navigate. For additional examples on how to ensure programs are well utilized, consider watching the recorded webinar, *Maximizing impact of energy affordability assistance programs*[59] which documents useful examples and resources for implementing fair and equitable programs.

Conduct Real, Meaningful Engagement with Communities

Some cities structure their public engagement strategies in ways that increase feedback from residents living in energy inefficient housing. In 2021 Kansas City, MO held community outreach sessions to gather input on the City's Climate Protection and Resiliency Plan. The City employed Climate Justice workers who engaged with individual

[56] https://austinenergy.com/-/media/project/websites/austinenergy/energy-efficiency/ecadmfenergyguideform.pdf?sc_lang=en&hash=6E0DB14F2DE96686731C286C97062B34
[57] https://austinenergy.com/energy-efficiency/ecad-ordinance/for-multifamily-properties
[58] https://flatlandkc.org/news-issues/many-feel-the-chill-of-mounting-utility-bills/
[59] https://www.youtube.com/watch?v=umLInODP1dg

residents and advocacy groups including but not limited to faith groups, youth, neighborhood associations, affordable housing organizations and environmental, economic, racial, gender, family, and disabled, to ensure their lived experience was taken into consideration while drafting the plan.

Federal funds may fall under the Justice40 Initiative, which requires 40% of the overall benefits of certain federal investments flow to disadvantaged communities that are marginalized, underserved, and overburdened by pollution.

Develop a Diverse Workforce

To execute the programs funded through the Inflation Reduction Act (IRA), Infrastructure Investment and Jobs Act (IIJA), and other federal funding, a robust, qualified workforce must be available. When conducting outreach for possible project partners, evaluate your pool of contacts and communication channels to ensure you are not only reaching out to organizations you are familiar with or those who typically receive federal funds. Consider connecting with building and trade unions, local community colleges and universities, or national and local societies for minority and women professionals. While this process may take more time and effort, it will help ensure projects and federal funding reach more communities.

Once relationships are formed, it is important to remember things like cost-share requirements, lack of grant writers, or lack of knowledge about the federal grant process may inhibit participation from startup companies, small municipalities, and community-based organizations because budgets or staff time for these entities are often tightly constrained. Larger entities do not encounter as many challenges to generate fiscally viable cost-share plans because they are more likely to possess financial reserves. Those larger entities are also more likely to be controlled by a team of demographically homogeneous leadership. One idea MEC implemented in a current transportation project is requiring for-profit and larger municipality project sub grantees to donate funds to a pool that can be utilized by small and rural municipalities or nonprofit organizations that are unable to meet cost-share requirements.

Mobilize Federal Funding

As previously mentioned, the recent IRA, along with the IIJA, fund multiple programs and tax incentives to improve the energy efficiency of new and existing commercial and public buildings. The 179D tax deduction was also revamped and now includes a new pathway for retrofits. Even larger broad greenhouse gas emission reduction programs under the IRA could be used to reduce emissions from commercial buildings. The EPA allocated $5 billion for Climate Pollution Reduction Grants and $3 billion for Environmental and Climate Justice Block Grants. However, the programs use a variety of mechanisms to offer varying incentives with varying goals and criteria. ACEEE's Commercial Building Incentives brief, and their below table, summarizes programs that will or could provide significant resources for energy efficiency improvements in commercial and public buildings.[60] ACEEE also created a brief for home energy upgrade incentives.[61] It can be overwhelming to navigate various funding opportunities so MEC is here as resource to help determine what program(s) may work best for your project.

[60] https://www.aceee.org/sites/default/files/pdfs/commercial_building_incentives_2-1-23.pdf
[61] https://www.aceee.org/policy-brief/2022/09/home-energy-upgrade-incentives-programs-inflation-reduction-act-and-other

Figure 11. Summary of selected programs for commercial buildings in recent federal legislation.

Program	Funding	How distributed?	When?	Who is eligible?	What is eligible?
179D tax deduction	No separate estimate	Via tax returns (see table 1)	Starting 1/1/23 (under old rules in 2022)	Owners of commercial buildings and multifamily over three stories (nonprofits and governments may transfer the deduction)	New buildings and retrofit projects that reduce building energy use by at least 25%
Revolving Loan Fund (DOE)	$250 million in IIJA	Loans + up to 25% grants and technical assist	After DOE guidance and state plans	Owners of homes and commercial buildings (small businesses or low-income for grants)	Energy audits and upgrades or retrofits to implement recommended cost-effective measures
Energy Auditor Training (DOE)	$40 million in IIJA	State and 3rd party training programs	After DOE guidance and state plans	Individuals	Training and certification to conduct energy audits (commercial or residential), including up to 10% for wages
Renew America's Schools (DOE)	$500 million in IIJA	Grants	After DOE guidance	Consortia of local education agencies and partners	Energy improvements and AFVs and AFV infrastructure at public schools
Energy Efficiency Materials Pilot (DOE)	$50 million in IIJA	Grants (up to $200,000)	After DOE guidance	Nonprofit organizations that own buildings	Energy-efficient HVAC, lighting, roofs, windows, and doors
Greenhouse Gas Reduction Fund (EPA)	$27 billion (buildings portion unknown)	Grants, loans, other financial assistance, and technical assist	To distributing orgs, 2023–2024	Unspecified, but much of it for low-income and disadvantaged communities; distributed via states, tribes, cities, and nonprofit orgs	Zero emission technologies and projects to reduce or avoid GHG emissions and other forms of air pollution

Source: ACEEE Commercial Building Incentives Brief.

AFV=Alternative Fueled Vehicle; DOE=Department of Energy; EPA=Environmental Protection Agency; HVAC=heating, ventilating, and air-conditioning system; IIJA=Infrastructure Investment and Jobs Act; SEO=state energy office.

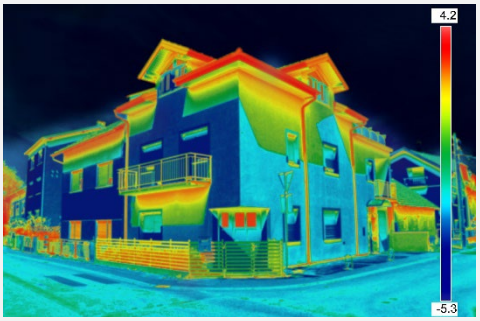
Additionally, Congress passed energy efficiency improvements within Veterans Affairs policies through the Joseph Maxwell Cleland and Robert Joseph Dole Memorial Veterans Benefits and Health Care Improvement Act of 2022. Loans for homes through the program must include an estimate of the expected energy cost savings specific to the home and a HERS Index Score. To carry about the energy efficiency portion of the loan program, an advisory group consisting of the following interest groups was formed, consisting of mortgage lenders, appraisers, energy raters and residential energy consumption experts, energy efficiency organizations, real estate agents, home builders and remodelers, consumer advocates, and veterans' service organizations.[62] This legislation was another example of how the federal government has placed more emphasis on how energy efficiency intersects with health, safety, and affordable housing.

[62] https://www.wibw.com/2023/01/03/legislation-baring-dole-name-passes-senate-order-help-veterans/

Issues Surrounding Energy Efficiency

for the Kansas City region

Due to Kansas and Missouri both being home rule states, the energy code and standards vary greatly across their many jurisdictions, with several smaller municipalities, counties and rural areas lacking energy codes and, in some cases, lacking building codes entirely. Developers and builders are also incentivized to cut costs in design and build, not for lifetime of structure. However, below are examples of progress that has been made in the Kansas City region to address discrepancies and misunderstandings surrounding the energy code and to improve energy efficiency.



Thermal Imaging of an exterior residence.

Kansas City Metro

As a result of funds provided through the American Recovery and Reinvestment Act of 2009 (ARRA), there was a coordinated effort across the Kansas City metro to have more efficient homes and buildings. Mid-America Regional Council (MARC) formed a consortium of the eleven of the fourteen jurisdictions in the Kansas City metro that received funds through ARRA. In addition to other accomplishments, several participating jurisdictions adopted the 2009 and 2012 IECC.[63] More recently a majority of municipalities in the metro have adopted a heavily amended 2018 IECC between 2018 and 2022. In addition to Kansas City, MO with their recent adoption of 2021 IECC, there are a few outliers including Overland Park, KS and the Unified Government (UG) of Wyandotte County/KCK. Overland Park created their own prescriptive path for residential buildings and has only two amendments for commercial buildings. The UG does not have any amendments for commercial buildings. See Figure 12 for additional details regarding adoption across the metro.

[63] https://www.marc.org/Environment/Energy/pdf/REECS-Final-Report.aspx

Figure 12. Summary of IECC adoption across the Kansas City metro.

Municipality	IECC Adopted	Year Adopted	Residential Amendments	Commercial Amendments
Johnson County	2018 IECC	2020	Yes	Yes
Overland Park, KS	2018 IECC	2020	Yes	Yes
Olathe, KS	2018 IECC	2019	Yes	Yes
Shawnee, KS	2018 IECC	2019	Yes	Yes
Lenexa, KS	2012 IECC	2018	Yes	Yes
Leawood, KS	2018 IECC	2020	Yes	Yes
Prairie Village, KS	2018 IECC	2021	Yes	Yes
Gardner, KS	2018 IECC	2020	Yes	Yes
Merriem, KS	2018 IECC	2020	Yes	Yes
Mission, KS	2018 IECC	2020	Yes	Yes
Roeland Park, KS	2018 IECC	2022	Yes	Yes
De Soto, KS	2018 IECC	2018	Yes	Yes
Fairway, KS	2012 IECC	2015	Yes	Yes
UG	2018 IECC	2022	Yes	No
City of Kansas City, MO	2021 IECC	2023	No	No
Lee's Summit, MO	2018 IECC	2019	Yes	N/A
Liberty, MO	2018 IECC	2021	Yes	Yes

Source: Municipalities' official websites.

In addition to MEC, several organizations (see below for a few examples) are providing resources and taking action to improve the efficiency of our region's building stock.

Building Energy Exchange – Kansas City (BE-Ex) was borne out of joint efforts by MARC and Climate Action KC to help the region achieve net-zero greenhouse gas emissions by 2050. Their mission is to advance building energy performance by mobilizing the professional expertise, funding, and technical resources needed to address affordability, improve the health and comfort of residents, and position Kansas City as a resilient and carbon-neutral region.[64]

Johnson County Contractor Licensing Program offers a variety of classes and education (commercial and residential) for continuing education credit. Classes are available to anyone and touch on a variety of topics including energy efficiency and the IECC.[65]

KC Tenants is the citywide tenant union in Kansas City, an organization led by a multiracial, multigenerational base of poor and working-class tenants in Kansas City. KC Tenants organizes to ensure that everyone in Kansas City has a safe, accessible, and truly affordable home.[66]

[64] https://www.be-exkc.org/about
[65] https://www.jocogov.org/dept/planning-and-codes/cls/education-and-classes
[66] https://kctenants.org/about

The Metropolitan Kansas City Chapter of the International Code Council (MKC-ICC) was formed to promote safety relating to the construction and use of building and is comprised of building officials, inspectors, contractors, architects, engineers, and industry professionals from Kansas and Missouri areas. [67] In January of 2020, the Chapter provided training on residential and commercial provisions in the 2018 IECC.

The U.S. Green Building Council Central Plains Chapter is committed to transforming how our buildings are designed, constructed, and operated through LEED, enabling an environmentally and socially responsible, healthy, and prosperous environment that improves the quality of life. Their members and volunteers work with us in Kansas and Missouri to create and provide a depth of knowledge surrounding all areas of green building.[68]

Statewide Efforts

Kansas

- In 2016 Kansas Corporation Commission (KCC) conducted a survey of building codes adopted in select cities and counties. The results are summarized in the 2016 Kansas Building Codes Summary.[69]
- To comply with ARRA requirements in 2009, an energy efficiency building codes working group was established in Kansas. The group held several meetings in 2009, 2010, and 2011 and endorsed an approach that encouraged voluntary code adoption by local jurisdictions and the development of effective equivalency options for builders and owners.
- K.S.A. 66-1228 requires the person building or selling a previously unoccupied new residential building (single family or multi-family unit of four units or less) to disclose certain energy efficiency characteristics using the Kansas Energy Efficiency Disclosure form (which utilizes 2006 IECC standards) to the buyer or prospective buyers at any time upon request.

Key Takeaways

- The Kansas City region grapples with energy code disparities stemming from the home rule structure in Kansas and Missouri.
- Coordinated efforts, fueled by the 2009 ARRA, have led to improved energy efficiency in the metro.
- Various organizations actively contribute to regional building efficiency to improve the places communities work, play and call home.

[67] https://metrokcicc.org/
[68] https://www.usgbc.org/chapters/usgbc-central-plains
[69] https://kcc.ks.gov/images/PDFs/kansas-energy-office/codes/2016_kansas_codes_collaborative_spreadsheet.pdf

Missouri

- The energy code adopted by jurisdictions throughout the state are listed on the State of Missouri Data Portal. Eastern Missouri communities are generally on the 2003 I-codes and moving/have moved to the 2009 version, and western communities are generally on the 2006 I-codes and moving to the 2012 version.[70]
- In 2015 the Missouri DOE began administering the Missouri Home Energy Certification program. This voluntary program is designed to promote energy efficient single-family homes (new and existing). It uses the Green Building Registry (GBR) to generate a custom-designed Missouri scorecard to certify qualifying homes with a Gold or Silver certification.[71]
- In 2014 Governor Jay Nixon signed Executive Order 14-06 which directed the Missouri Department of Economic Development, Division of Energy (DED-DE) to develop the state's first comprehensive energy plan by May 2015. After conducting their analysis and soliciting public input, the plan identified recommendations to create more jobs, grow the economy, improve the reliability and resilience of energy systems, and keep utility bills affordable.[72]
- In 2010 two bills were proposed that would have adopted a statewide energy code; however, both failed to advance beyond legislative committees.

[70] https://data.mo.gov/Economic-Development/City-Building-Codes-for-Missouri/hhyk-mgim
[71] https://energy.mo.gov/GreenBuildingRegistryMO
[72] https://energy.mo.gov/sites/energy/files/Executive_Summary_FINAL_10.05.2015.pdf

Glossary of Terms

American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE): A global society advancing human well-being through sustainable technology for the built environment. The Society and its members focus on building systems, energy efficiency, indoor air quality, refrigeration and sustainability within the industry.

> **ASHRAE Level 1 Energy Audit:** The basic starting point for building energy optimization. It consists of an initial review of the property's utility bills and a brief site survey of the building, its systems, and its modes of operation. The primary objective of the audit is to provide a savings and cost analysis of low-cost/no-cost measures. It may also provide a list of more capital-intensive improvements that merit further consideration.

> **ASHRAE Standard 90.1:** Standard that provides the minimum requirements for energy-efficient design of most buildings, except low-rise residential buildings. It offers, in detail the minimum energy-efficient requirements for design and construction of new buildings and their systems, new portions of buildings and their systems, and new systems and equipment in existing buildings, as well as criteria for determining compliance with these requirements.

Building energy benchmarking: A mechanism to measure energy performance of a single building over time, relative to other similar buildings, or to modeled simulations of a reference building built to a specific standard (such as an energy code).

Building performance: Also referred to as "building science" this is the practice of looking at the building as a system with many operating "parts" that if designed properly will dictate how well that building carries out its functions. These parts include, but may not be limited to depending on technology used: HVAC (defined below), lighting, building shell (defined below), water shed and other attributes.

Building shell: Also referred to as the building envelope, this is the makeup of walls, floor and ceiling that make up the conditioned boundary between the air conditioned/ heated space and the rest of the building that will not be included as inside this boundary.

Energy Rating Index (ERI): An optional compliance path incorporated in the IECC since 2015. The most used ERI in the U.S. is the Residential Energy Services Network (RESNET) HERS Index, which is the industry standard for measuring a home's energy efficiency and the nationally recognized system for inspecting, testing and calculating a home's energy performance. The 2015 and 2018 IECC specify an ERI target score for each climate zone.

> **RESNET Index:** The U.S. DOE determined a typical resale home scores 130 on the HERS Index while a home built to the 2006 IECC is awarded a rating of 100. A net zero energy home scores an ERI of 0. A certified RESNET HERS Rater does an energy rating on a home to calculate its score.

ENERGY STAR® Portfolio Manager®: An interactive energy management tool, created by the EPA, that allows building owners to securely track and assess energy and water consumption across a building portfolio.

Portfolio Manager can help set investment priorities, identify under-performing buildings, verify efficiency improvements, and apply for ENERGY STAR certification for superior energy performance.

> **ENERGY STAR certification:** Like a lightbulb or refrigerator, a building can earn an earn ENERGY STAR certification for being an energy-efficient top performer that saves money without sacrificing performance. To be certified, a building must meet strict energy performance standards set by EPA.

Green Building Registry (GBR): Created by Earth Advantage, this platform is designed to automatically pull home energy data from qualified sources like the U.S. Department of Energy (DOE) Home Energy Score™ (HES or HEScore), Residential Energy Services Network (RESNET), and other qualified certification and energy efficiency programs.

Heating, Ventilation and Air Conditioning (HVAC): The term HVAC is most used. This describes the systems that condition and ventilate the air inside a building. (Note: when the term used is HVAC-R the "R" refers to Refrigeration which is sometimes included in this category.)

Home Energy Score: A score developed by the DOE that provides homeowners, buyers, and renters directly comparable and credible information about a home's energy use. Like a miles-per-gallon rating for a car, the score is based on a standard assessment of energy-related assets to easily compare energy use across the housing market. DOE-trained assessors can provide the Home Energy Score within an energy audit, home inspection package, or as a standalone product.

Home Performance with ENERGY STAR: Program that connects homeowners with experienced and trusted contractors that can help them understand their home's energy use and identify home improvements that increase energy performance, improve comfort and health, and lower utility bills.

Home-rule: A delegation of power from the state to its sub-units of governments (including counties, municipalities, towns, or villages). That power is limited to specific fields and subject to constant judicial interpretation but creates local autonomy and limits the degree of state interference in local affairs. The powers and limits of home rule authority are defined state-by-state. They can be defined by each state's constitution and/or statutes enacted by its legislature.

International Code Council (ICC): A nonprofit association that provides a wide range of building safety solutions including product evaluation, accreditation, certification, codification, and training. It develops model codes and standards used worldwide to construct safe, sustainable, affordable and resilient structures.

International Energy Conservation Code (IECC): Code officials recognize the need for a modern, up-to-date energy code addressing the design of energy-efficient buildings through requirements emphasizing performance. The IECC is designed to meet these needs through model code regulations that will result in the optimal utilization of fossil fuel and nondepletable resources in all communities. It contains separate provisions for commercial and low-rise residential buildings (three stories or less in height above grade).

National Green Building Standard (NGBS) New Green Home: Certification provides independent, third-party verification that a home, apartment building, or land development is designed and built to achieve high performance in six key areas: site design, resource efficiency, water efficiency, energy efficiency, indoor environmental quality, and building operation and maintenance.

Passive House: A voluntary standard for energy efficiency in a building, which reduces the building's ecological footprint. It results in ultra-low energy buildings that require little energy for space heating or cooling. Passive building principles can be applied to all building types – from single-family homes to multifamily apartment buildings, offices, and skyscrapers.

Redlining: The practice of denying a creditworthy applicant a loan for housing in a certain neighborhood even though the applicant may otherwise be eligible for the loan. The term refers to the presumed practice of mortgage lenders of drawing red lines around portions of a map to indicate areas or neighborhoods in which they do not want to make loans. Redlining on a racial basis has been held by the courts to be an illegal practice. It is unlawful under the FHAct only when done on a prohibited basis. Redlining an area on the basis of such considerations as the fact that the area lies on a fault line or a flood plain is not prohibited.

Sick building syndrome: A condition affecting office workers, typically marked by headaches and respiratory problems, attributed to unhealthy factors in the working environment such as poor ventilation, or poorly constructed building features that can lead to mold growth or other unhealthy compounds in the air.

Truth in Sale of Housing (TISH) report: Evaluation required in certain Minnesota cities for any sale of a single-family house, duplex, townhouse, or first-time condo conversion. The report is focused on risks to life or health and usually made up of recommended and required fixes. Evaluations are completed by a licensed evaluator.

U.S. Green Building Council (USGBC) LEED Certified Home: Leadership in Energy and Environmental Design (LEED), is the most widely used green building rating system in the world. Available for virtually all building, community and home project types, LEED provides a framework to create healthy, highly efficient and cost-saving green buildings.

Vulnerable Populations: Groups that through location, socio-economic factors, individual health factors or a combination of all are at risk of illness, destitution, or death if systems, buildings and/or neighborhoods are not addressed to create shelter from poor air quality, extreme weather conditions or socio-economic hardship.