

# Investing in Workforce Development and Training to Improve Energy Code Implementation

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Building energy codes are adopted and enforced by state, local, tribal, and territorial entities to provide minimum energy efficiency standards for the design and construction of new buildings and major renovations (Library of Congress 2023). Energy codes—which can either be standalone codes or a section of a broader building code—are a policy mechanism to lower energy costs for building owners and renters and protect public health, safety, and welfare during construction and occupancy. The key question is this: How do we ensure all stakeholders have the resources they need to work together to deliver these energy-efficient buildings?

This brief provides recommendations and case studies for workforce program administrators, training institutions, employers, and workers on how to support a robust workforce needed for effective code implementation. We identify common workforce challenges for each phase of a typical building project—from project initiation to post-construction—and strategies to overcome them. This brief does not include recommendations for the closure phase of a building project, which represents the final stage. The topic, which largely focuses on code officials, will be addressed in a separate resource.

This brief is significantly informed by lessons learned from the National Energy Codes Collaborative's technical advisory group (TAG) on workforce development. The group convened industry stakeholders—including architects, engineers, contractors, building code department officials, and workforce-focused nonprofits—to identify workforce challenges that impede implementation of building codes, identify approaches to build workforce capacity, and target partnerships among stakeholders to improve code compliance.

## The Challenge: A Need to Support the Workforce

Energy codes are typically detailed and are often updated every three years to include the latest cost-effective efficiency improvements and technologies. This may require the workforce to acquire new knowledge about building systems (e.g., HVAC, envelope assemblies, lighting, etc.) and undergo training on new technologies and construction practices.

The first step to supporting a workforce with adequate training and expertise is to understand who the workers are. Figure 1 illustrates the professions and trades involved during the energy code implementation process. The **core workforce** highlights professionals and tradespersons involved in the initiation, design and planning, construction, and monitoring and evaluation stages of a project. The **compliance workforce** includes occupations critical to the final stages of building construction, compliance, and building operations. The **market drivers** are broader stakeholders that elevate the demand for energy-efficient buildings and standardize energy-efficient technologies and construction practices; these drivers may also play a role in preparing the workforce to meet that demand to implement energy codes. The list for each circle is not comprehensive.



Figure 1. Mapping the energy code workforce

Occupations bolded in white represent individuals with multiple responsibilities across the different phases of a project. For example, HVAC contractors could weigh in on the feasibility of considering new energy-efficient technologies in the planning phase and later to install them. We recognize that this may be true for other professions and trades included in the figure, but we highlight a handful in white that have been identified as key across design and construction phases.

## Workforce Challenges that Hinder Code Implementation

We have identified four main categories of workforce challenges.

**Awareness and outreach.** Stakeholders note difficulty in raising awareness of updated energy codes, generating support and interest for careers specifically in the building energy efficiency sector, implementing energy codes, and effectively communicating the value of energy codes. Common challenges include:

- Building owners, contractors, and others on a project team may have limited awareness regarding the upfront costs, energy cost savings and affordability considerations, and benefits of energy code compliance, and may not communicate effectively with each other about these topics.
- Architects and engineers may not be familiar with every provision in the energy code or all updates when it is revised.
- Tradespersons may have limited understanding of building codes, beyond basic health and safety requirements. They may not be familiar with energy codes or be aware of relevant technologies and practices that can improve occupant comfort and save energy.
- Young adults and other job seekers may be unaware of opportunities and careers in the energy efficiency industry, especially in the building sector.

**Skills training.** Challenges involve gaps in adequate practical training, opportunities, and resources for workers to develop the expertise needed to deliver energy-efficient buildings.

- Builders, architects, and contractors may not always have access to foundational building science and energy code training or resources—especially when jurisdiction-specific resources are needed—or materials are difficult to find or costly (NEEP 2024).
- A lack of apprenticeships, available paid training, and funding support for builders and contractor businesses to provide on-the-job training discourages tradespersons from learning energy-efficient technologies, reinforcing bias favoring older technologies and practices (ICAST 2022).
- Contractors, electricians, and HVAC workers need cross-trade education and collaboration.
- A lack of multilingual training options can be an obstacle where tradespersons’ first language might not be English.

**Career pathways.** Challenges arise from lack of interest in joining the building trades and from the absence of clear pathways into this workforce or opportunities for career progression.

- Career progression paths, especially for roles focused on energy-efficient building delivery, are not clearly defined. There is a general lack of awareness about roles and the opportunities in the building energy efficiency sector (Thorsell 2024).
- Varying licensing and credentialing requirements between rural and metropolitan areas, as well as across neighboring jurisdictions and states, create barriers for workers. These requirements can prevent individuals from accessing jobs in nearby areas, even if they are geographically close to the job site.
- High turnover due to the construction industry’s boom-and-bust cycles can present a challenge. The stability of energy efficiency jobs, competitive wages, and opportunities for advancement are not highlighted enough to attract a broader range of talent.
- Code enforcement agencies—typically building departments—can face staffing challenges due to insufficient funding for hiring new employees, aging workforce nearing retirement, and a lack of new entrants to help expand capacity (ICC 2014).

**Navigating the intricate language and processes of codes.** Challenges can stem from an insufficient understanding of building practices and systems such as HVAC and envelope assemblies among the codes workforce, which are essential for implementing the full scope of energy codes.

- Training resources often include complex, technical language and are provided in formats that may not be accessible to all intended audiences.
- Inconsistent code adoption processes make it challenging for workers to keep up with new iterations of codes, specifically their energy-efficient practices and technology requirements. This can cause confusion within the industry and create the need for retraining.
- Significant changes in energy codes, especially when made without sufficient education and training, can slow compliance, as workers may not fully understand how new technologies and practices relate to updated requirements. For example, limited access to training and tools for performance-based codes can leave code officials and field inspectors unclear on how to properly interpret and enforce energy code provisions (Evans 2017).

## Strategies to Prepare and Expand the Codes Workforce

In this brief, we examine the first four project phases shown in figure 2, identifying the workers involved, the key challenges they face, and the strategies that can help. For each phase, we include a case study demonstrating how a program or training resource has overcome a challenge described.



Figure 2. Framework to provide clarity on how the codes workforce contributes to each stage of a project. Aligning workforce development efforts with these phases can build and position the workforce to deliver energy-efficient buildings.

## Project Initiation

The project initiation phase lays the groundwork for establishing a process for how stakeholders should construct or upgrade buildings to comply with energy efficiency standards. The project team defines the scope and objectives, gathers information on available technologies and how they can be installed and integrated, conducts feasibility studies (e.g., site analysis, preliminary budgets), and identifies key compliance requirements. Builders and developers, subcontractors, architects, engineers, and code officials should be aligned on expectations and compliance needs before a building's design and construction.

**Key professions/trades:** Builders and developers, general contractors, subcontractors, architects, engineers, lenders, municipal government building staff, and building department officials.

Challenges	Strategies to overcome challenges
Awareness and outreach	<ul style="list-style-type: none"> <li>Raise awareness of energy efficiency requirements and energy code compliance responsibilities</li> <li>Offer various learning methods (e.g., in-person training, online courses)</li> <li>Include energy code updates and changes in training material to inform workers about the latest requirements</li> </ul>
Skills training	<ul style="list-style-type: none"> <li>Create targeted training for architects and engineers covering key areas such as building envelope design and mechanical systems and offer essential technical knowledge needed in the initial phase of a project</li> </ul>
Career pathways	<ul style="list-style-type: none"> <li>Provide information on career pathways for professions or trades in the energy codes space</li> <li>Provide structured yet flexible training that allows participants to focus on the areas where they need the most improvement or experience, facilitating their career advancement</li> </ul>

	<ul style="list-style-type: none"> <li>• Offer Continuing Education Units (CEUs) through established industry organizations such as the International Code Council (ICC), American Institute of Architects (AIA), and ASHRAE, supporting career development and helping professionals maintain certifications</li> <li>• Make training financially free or offer affordable options and potentially financial assistance to allow workers to upskill and build their expertise in energy codes</li> </ul>
Code language and processes	<ul style="list-style-type: none"> <li>• Simplify the language in training materials or instructions on energy codes, prioritizing practical application and key priorities</li> <li>• Provide guidance on how to navigate documentation and compliance processes effectively</li> </ul>

## Program in action: Urban Green Council Energy Code Training

The Urban Green Council's *Crushing the Code* training program is a great resource for professionals involved in the project initiation phase, including builders, developers, architects, and engineers. It provides in-person and online courses that help participants learn about and comply with the 2020 New York State (NYS) and City energy codes. Participants can obtain continuing education credits and practical guidance on compliance pathways, testing, and documentation.

The courses are taught by experienced practitioners and feature interactive lessons, real-world case studies, and detailed breakdowns of new and mandatory code provisions. The program is designed for architects, engineers, contractors, code enforcement officials, building owners and operators, and students pursuing careers in the building industry. Training is provided at no cost for students and code enforcement officials.

The New York State Code training program is structured around the 2020 Energy Conservation Construction Code of New York State (ECCCNYS) and is broken down into residential and commercial tracks. Each track includes core training modules in two key areas: building envelope (e.g., air-sealing and insulation requirements) and building systems (e.g., heating, cooling, hot water, ventilation, and lighting efficiency).

A 2023 energy code compliance study conducted in New York identified that a lack of training and resources on code changes, along with limited early-stage communication between energy code and design professionals and contractors, makes it harder to integrate energy code requirements during design and permitting, ultimately leading to compliance challenges later in the project (NYSERDA 2023). The *Crushing the Code* program includes core training modules, as well as an Energy Code 101 course that provides an overview of the energy code, its purpose, future direction, and compliance pathways, addressing key training gaps highlighted in the compliance module. The compliance module guides participants through the documentation, testing, and inspections needed to verify compliance for both residential and commercial projects. Participants can choose individual modules based on their specific interests or knowledge gaps or complete the full series for a comprehensive grasp of the ECCCNYS.

The New York City Energy Code Training Program similarly helps building and design professionals understand and comply with the 2020 New York City Energy Conservation Code (NYCECC), which includes some more stringent efficiency requirements than the state code and aligns with the city's emissions reduction policies. Professionals working in NYC must comply with both the city and the statewide energy code, making access to clear and up-to-date training materials essential. The program



consists of two eight-hour live modules, focused separately on commercial and residential buildings. The Crushing the Code NYC: Commercial module covers all mandatory provisions of the 2020 NYCECC for commercial buildings, including key updates, compliance strategies, and ways to avoid project delays due to code objections. The Crushing the Code NYC: Residential segment covers all requirements of the 2020 NYCECC for residential buildings, including significant code changes, compliance pathways, and best practices for energy-efficient design.

Urban Green has trained over 16,000 professionals across three code cycles (Urban Green Council n.d.)

## Project Design and Planning

This project phase involves creating detailed plans and drawings, including architectural, structural, and mechanical designs, and includes preparation to ensure that energy code compliance is integrated into the building plans. This phase typically involves collaboration among architects and engineers to develop a comprehensive set of design drawings and specifications to ensure that the project aligns with code requirements. More recent project delivery processes (e.g., “design-build”) include contractors at this stage.

**Key professions/trades:** Architects, estimators, engineers, developers, plan examiners, site inspectors, general contractors, and subcontractors

Challenges	Strategies to overcome challenges
Awareness and outreach	<ul style="list-style-type: none"> <li>• Distribute outreach brochures and fact sheets to provide clear explanations of building energy efficiency and code requirements</li> <li>• Offer architects and engineers tools and trainings on resources such as REScheck and COMcheck code compliance software applications to help navigate energy code compliance</li> <li>• Promote accessible, easy-to-understand resources highlighting compliance steps and benefits</li> </ul>
Skills training	<ul style="list-style-type: none"> <li>• Provide on-demand training with flexible hours, offering options to accommodate different learning preferences. These trainings can focus on building envelopes and systems tailored to both residential and commercial buildings</li> <li>• Cover key code aspects and specific technologies to ensure comprehensive understanding of how proper design and implementation can save energy and enhance occupant comfort</li> <li>• Develop specialized training to equip individuals with the skills for energy-efficient building design and construction</li> </ul>
Career pathways	<ul style="list-style-type: none"> <li>• Offer CEUs and other training through recognized organizations like AIA, ICC and ASHRAE to enhance workforce outcomes</li> <li>• Offer training options for various building types and technologies, helping workers advance in their careers in particular practices or areas of interest</li> <li>• Highlight growth opportunities for professionals and link to other resources offered through industry partners that workers can pursue.</li> </ul>

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| Code language and processes | <ul style="list-style-type: none"> <li>• Provide step-by-step guides and flowcharts to simplify the compliance process that workers can access early on</li> <li>• Offer tools that break down complex code language into actionable steps for tradespeople, highlighting mandatory aspects of the code</li> <li>• Offer tools that help identify required documentation early in the planning process, ensuring timely project approval and permitting</li> </ul> |
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## *Program in action: Energy Code Ace – California Title 24, Part 6 Building Energy Code Resources*

Energy Code Ace supports compliance with the California Energy Code (CEC)<sup>1</sup> by providing training, resources, and outreach to market actors. Funded by California utility customers and implemented by investor-owned utilities,<sup>2</sup> Energy Code Ace works closely with the California Energy Commission to deliver training and resources such as project design checklists and code factsheets at no cost for all users statewide. Energy Code Ace removes barriers to compliance and creates awareness about code requirements in a friendly, accessible manner. Training is available in multiple formats, including in-person classes, online courses, and YouTube videos, making it accessible to a wide range of participants.

Energy Code Ace includes valuable tools and features that guide the workforce during the planning phase. These tools include:

- **Forms Ace™ tool.** This tool helps identify the CEC forms that a project (whether an addition, alteration, or new construction) needs prior to obtaining final permits from the Authority Having Jurisdiction (Energy Code Ace n.d.) It provides easy access to download and fill out the forms or use the *Virtual Compliance Assistant* for nonresidential and low-rise multifamily forms to auto-fill details based on project specifics and checks for compliance.
- **Navigator Ace.** This tool offers a step-by-step guide to the CEC compliance process, presented in an easy-to-follow flowchart that outlines each action and identifies the specific workforce actor responsible for carrying it out. Users select the residential or nonresidential category and the performance or prescriptive compliance path, and get details and links to relevant resources, code language, and tools. The tool allows users to expand individual steps for print-ready PDFs or download the full set of steps as a single PDF. This tool helps professionals understand what is required early in the planning process.
- **Ace Training:** Energy Code Ace offers a comprehensive portfolio of on-demand and live online training options on California's Energy Code, tailored to a range of industry professionals working with both residential and commercial buildings. The training covers various building types, specific technologies such as water heating, and all key aspects of the code necessary for effective project planning and compliance. Participants can earn CEUs upon completion through recognized organizations like AIA, ICC, or ASHRAE.

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<sup>1</sup> We use “CEC” here for simplicity. The full name of California’s energy code is “Building Energy Efficiency Standards for Residential and Nonresidential Buildings.” It is often referred to simply as “Title 24,” based on its designation in the California Code of Regulations under Title 24, Part 6. [energy.ca.gov/programs-and-topics/programs/building-energy-efficiency-standards/2022-building-energy-efficiency](https://energy.ca.gov/programs-and-topics/programs/building-energy-efficiency-standards/2022-building-energy-efficiency).

<sup>2</sup> This includes Pacific Gas and Electric Company, San Diego Gas and Electric, and Southern California Edison.

In addition to these resources, Energy Code Ace offers code compliance checklists, outreach brochures featuring tools and resources tailored to specific workforce professionals, and fact sheets that clearly explain code requirements for various technologies (Energy Code Ace n.d.)

## Project Construction

This project phase covers building construction and installation of building equipment and systems. Construction includes acquiring the necessary materials, equipment, and services for the project; on-site installation and inspections; verifying compliance of design specifications; and any other work related to ensuring that building systems and components meet energy code requirements. There can also be changes to the design if unanticipated field conditions are encountered.

**Key professions/trades:** Building trades, general contractor, subcontractors, architects, engineers, consultants, estimators, commissioning professionals, unions, and training providers.

Challenges	Strategies to overcome challenges
Awareness and Outreach	<ul style="list-style-type: none"> <li>Collaborate with industry groups, building code departments, and workforce organizations to navigate updated codes and increase awareness of energy code compliance requirements</li> <li>Provide checklists, field guides, and FAQs to help engineers, consultants, and tradespersons understand and comply with energy code requirements</li> </ul>
Skills training	<ul style="list-style-type: none"> <li>Provide in-person and online training covering energy-efficient technologies and practices, including full-day, half-day, and self-paced sessions to accommodate different learning needs</li> <li>Incorporate resources like COMCheck and other code compliance tools into education programs to support practical application</li> </ul>
Career pathways	<ul style="list-style-type: none"> <li>Partner with contractors and building professionals to expand career opportunities to deliver energy-efficient buildings and improve energy code compliance</li> <li>Develop training programs that contribute to industry-recognized certifications to enhance career development</li> </ul>
Complex code language and processes	<ul style="list-style-type: none"> <li>Create user-friendly resources that break down complex language into clear, actionable steps</li> <li>Offer resources that can be used on project sites, such as on-site training by circuit riders, to help project teams navigate challenges throughout construction</li> <li>Provide guidance on specific requirements for renovation and retrofits under the latest energy codes to reduce confusion during project implementation</li> </ul>

## Program in action: Colorado's Building Energy Codes Adoption Program

The Colorado Energy Office's Building Energy Codes Adoption Program helps local jurisdictions navigate updated energy codes. This program provides free, customized training, building department and



stakeholder resources, and technical assistance tailored to jurisdictional needs. The program resources also include a toolkit that offers a comprehensive suite of compliance resources, including detailed checklist flowcharts for both commercial and residential buildings, broken down by resources for different professionals and tradespersons, as well as training on using compliance tools, commissioning checklists, and guidance on requirements for blower door test and third-party verification (Colorado Energy Office n.d.) It also features recorded training sessions on technical compliance tests, tailored for professionals such as local building inspectors and code officials (Colorado Energy Office n.d.).

To support code implementation in rural communities, the Colorado Energy Office has provided blower door and duct leakage training and certification support over the past year, drawing strong participation (10–30 attendees per session) (A. Berry, senior program manager for building codes, Colorado Energy Office, pers. comm., 2025). To build on this momentum, the Energy Office is now following up with trainees to offer incentives, encouraging them to complete certification and begin performing this work in their communities.

Alongside the resources, the Colorado Energy Office also offers an Energy Code Helpline to provide step-by-step support for code adoption and how to comply. Both are collaborative efforts between the Colorado Energy Office and Xcel Energy (CO Codes Helping n.d.) Xcel Energy’s Colorado Energy Codes and Standards Program further supports the program by connecting builders, architects, code officials, and other professionals to various compliance resources, including guides, databases, and specialized tools, to ensure successful energy code navigation and implementation. Communities set their own compliance goals, and Xcel Energy assists in achieving them.

In addition, the Colorado Energy Office engages in the statewide Colorado Energy Code Compliance Collaborative, a network of industry stakeholders dedicated to enhancing energy code enforcement and ensuring compliance. Other resources available from the Colorado Energy Office and Xcel include technical tools for modernizing building codes; residential and commercial construction resources for the 2021 and 2018 IECC; an ongoing webinar series; energy code training and technical assistance; Xcel Energy technical assistance; grants; I-code Expert Webinars; and a ticket submission platform for addressing compliance and implementation-related questions.

## Project Monitoring and Evaluation

The project monitoring and evaluation phase ensures that building systems are installed and perform as expected and evaluates any changes needed to improve building performance or comply with energy codes. Activities include commissioning new systems; testing, adjusting, and balancing HVAC systems; conducting blower door tests to measure a building’s airtightness; detecting thermal defects and duct leakages; and verifying performance to confirm that newly constructed buildings are operating to meet intended energy performance goals. Proactive project monitoring and evaluation can help address issues such as uneven heating and cooling, poor indoor air quality, occupant comfort and higher-than-expected energy usage. This phase requires collaboration between owners, contractors, subcontractors, commissioning professionals, and testers. Increasingly, energy codes have specific requirements for testing and commissioning that can create new workforce needs.

**Key professions/trades:** Testers, raters, code officials, inspectors, commissioning professionals, contractors, and subcontractors.

Challenges	Strategies to overcome challenges
Awareness and Outreach	<ul style="list-style-type: none"> <li>• Develop training resources in multiple formats to increase reach and accessibility for key monitoring and evaluation procedures, including testing, adjusting, and balancing (TAB) of HVAC systems; conducting blower door tests; performing duct leakage testing, and commissioning systems</li> <li>• Use targeted outreach methods to inform communities about available support and tools, such as a list of qualified service providers in the region</li> </ul>
Skills training	<ul style="list-style-type: none"> <li>• Design training resources to meet specific compliance needs and goals of each jurisdiction such as TAB, blower door tests, thermographic inspection to detect thermal defects and air leakages, ensuring effective compliance and creating job opportunities to support the achievement of these objectives</li> </ul>
Career pathways	<ul style="list-style-type: none"> <li>• Offer financially accessible trainings (e.g., free resources and classes) on measurement and verification processes</li> <li>• Provide access to diagnostic tools through lending libraries for commissioning professionals and engineers, and helping to offset the cost of buying new equipment needed to capture data on system performance</li> <li>• Create workforce development opportunities by aligning training programs with local industry demands for testers and commissioning professionals</li> </ul>
Complex code language and processes	<ul style="list-style-type: none"> <li>• Offer technical assistance and support through multiple channels, including helpdesks, online platforms, and expert webinars to address compliance-related needs early on</li> <li>• Develop checklists that simplify building system monitoring and evaluation requirements and help accelerate code compliance</li> <li>• Facilitate peer-to-peer learning and knowledge exchange through collaboratives and other forums where experiences can be shared</li> </ul>

## *Program in action: Southface Institute Resource Library and Training Resources*

Southface Institute provides a comprehensive suite of training sessions and resources that could serve as a model for other states and jurisdictions. Developed in partnership with the Georgia Environmental Finance Authority and the Department of Community Affairs to support compliance with Georgia’s 2020 residential and commercial energy codes, these resources include curriculum materials, field guides, compliance tools, and webinars tailored for designers, contractors, subcontractors, and inspectors.

Instructors offer flexible training, including both full-day and half-day sessions offered in person and online, covering residential and commercial energy codes. The sessions focus on teaching building science fundamentals, which are increasingly important for tradespeople to understand as energy efficiency technologies advance, compliance pathways change, and best practices as energy efficiency evolves (Truitt 2022). Key topics include insulation and air sealing, ventilation strategies, mechanical and lighting systems, and training on compliance software (e.g., RESCheck). Studies show these topics are strongly correlated with higher code compliance rates (DOE 2013).

Supplemental resources such as field guides, trade-off calculation tools, and white papers provide additional technical support. Video training covers specific compliance topics, including energy code walk-through inspections, duct and envelope tightness verification, and commercial lighting and mechanical system requirements. Through these resources, participants obtain an understanding of Georgia's energy codes, stay informed of changes to the code, and implement best practices for constructing and maintaining energy-efficient buildings.

In addition to resources that are specific to the Georgia energy codes, Southface offers several training resources on model energy codes and building science principles. Southface has engaged thousands of workers through its various training offerings (Southface Institute 2023). In addition to directly supporting project implementation, the technical training programs help participants earn industry-recognized certifications, such as the Building Performance Institute's (BPI) Duct and Envelope Tightness Verifier and HERS Rater certifications, fostering professional development for individuals.

## Project Closure

The project closure phase is the last step of a project, signaling that a building is completed, all contract requirements are met, and the building complies with the local building and energy codes. This phase includes final inspections completed by code officials, inspectors, and third-party raters. Contractors conduct walkthroughs of the building facility to identify areas that require improvements and make corrections as needed; consultants and code officials then draft a comprehensive documentation of the inspection reports and technical submittals to the building owner, confirming the facility meets code requirements. This brief does not include recommendations for this project phase. Future work will help identify strategies for successfully completing a building project.

## Next Steps for the Codes Community

While energy codes set minimum standards, many building projects have shown how to cost-effectively adopt energy efficiency measures going far beyond the applicable code. A trained workforce is necessary for effective code implementation and to achieve higher levels of energy efficiency. This brief highlights strategies to overcome workforce challenges, such as a lack of awareness of potential career pathways or the gaps in training resources for workers to develop the expertise needed to deliver energy-efficient buildings. Addressing these challenges can build and position the workforce to deliver energy-efficient buildings and improve capacity to review and inspect buildings to ensure compliance with local or state codes. Fortunately, there are comprehensive training programs that provide robust regional support and can serve as valuable models for other states and localities to replicate.

The National Energy Codes Collaborative will continue efforts to facilitate collaboration among states and localities, sharing effective approaches to developing a well-trained building energy efficiency workforce; developing resources that explore specific skills or certifications for key professionals, trades and code officials; and conducting research on emerging approaches to workforce development that promote effective energy code implementation.

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