



**ACT 47 BUILDING ENERGY
CODE STUDY COMMITTEE
REPORT TO THE
VERMONT LEGISLATURE**

December 1, 2023 – Draft 10/24/2023

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Acknowledgements

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List of Acronyms

AG	Vermont Attorney General
AHJ	Authority Having Jurisdiction
BECSC	Act 47 Building Energy Code Study Committee
CAP	Consumer Assistance Program (of the Attorney General's Office)
CBES	Commercial Building Energy Standards
CO	Certificate of Occupancy
DFS	Division of Fire Safety (within the Department of Public Safety)
DHP	Division of Historic Preservation
EAN	Energy Action Network
ECAC	Energy Code Assistance Center
EEU	Energy Efficiency Utility
EFG	Energy Futures Group
DOE	U.S. Department of Energy
EUI	Energy Use Intensity
EVT	Efficiency Vermont
GWSA	Global Warming Solution Act
HERS	Home Energy Rating System
HVAC	Heating, Ventilation, and Air Conditioning
IECC	International Energy Conservation Code
IRC	International Residential Code
ISP	Industry standard practice
OPR	Office of Professional Regulation (within the Secretary of State's office)
PSD	Department of Public Service
RBES	Residential Building Energy Standards
SOS	Vermont Secretary of State's Office

Executive Summary

The Act 47 Building Energy Codes Study Committee (BECSC) was convened by the 2023 Vermont Legislature to address issues related to declining compliance rates with the Residential Building Energy Standards (RBES) and Commercial Building Energy Standards (CBES), the statewide “building energy codes.” Specifically, the Committee was charged with the following directives:

- 1) Assess how the building energy codes interact with the fire and building safety codes.
- 2) Consider and recommend strategies to increase awareness of and compliance with the RBES and CBES, including the potential designation of the Division of Fire Safety (DFS) in the Department of Public Safety as the statewide authority having jurisdiction (AHJ) for administration, interpretation, and enforcement, in conjunction with DFS’ existing jurisdiction, over building codes.
- 3) Evaluate current cost-effectiveness analyses for the RBES and the CBES, whether they include or should include nonenergy benefits such as public health benefits and the cost of carbon, and how that impacts the affordability of housing projects and provide recommendations.

The Committee met **seven** times over the summer and fall of 2023 and compiled the following recommendations to the Legislature to address the three charges above that could put Vermont back on a path to meet the state’s goal of “net zero ready” construction by 2030 for both RBES and CBES.

- 1) The Committee recognized the fact that no state agency is singly in charge of administering the RBES and CBES and the lack of a statewide residential *building* code are impeding progress and compliance with the energy codes.

The Committee recommends naming the Division of Fire Safety (DFS) as Vermont’s AHJ to administer all energy codes. This change will need to go through the legislative process, will take some time to plan and develop, and will require a funding plan. But without a single entity in charge of Vermont’s energy codes, we will not be able to organize and coordinate the effort to achieve our “net zero ready” goal by 2030.

At the same time, the Committee recognized that the lack of a statewide residential *building* code means potential for increasing building science failures as builders try to construct to the energy codes without the “scaffolding” of a building code to guide sound building practices. The Committee recommends further exploration of a building code for Vermont.

- 2) The Committee developed a comprehensive list of recommended strategies to increase awareness and compliance with the energy codes including the following:
 - A. Make structural, statutory and policy changes to Vermont’s energy code environment.
 - B. Improve administration of the energy codes.
 - C. Increase awareness that energy codes are mandatory.
 - D. Improve workforce training and support.
 - E. Increase support of and funding for above-base code projects.
 - F. Coordinate with the U.S. Department of Energy’s (DOE) grant to Energy Futures Group for the “Vermont Energy Code Administration Project” to develop and implement a phased longer-term plan.

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- 3) The Committee recommends calculating energy code "cost effectiveness" as has been done historically from the consumers' perspective for a typical Vermont new home based on achieving positive cash flow for energy code improvements from current code levels, financed in a typical mortgage. Additionally, the Committee recommends establishing a new committee of energy, economic, and housing experts to research and address whether and how to best include the cost of carbon and non-energy benefits in building energy codes.

Findings, background, and details on the recommendations summarized above are included in the full report.

Findings

The Act 47 findings related to energy code compliance state the following:

"The General Assembly finds that:

- 1) Vermont established the Residential Building Energy Standards (RBES) in 1997 and the Commercial Building Energy Standards (CBES) in 2007. The Public Service Department is responsible for adopting and updating these codes regularly but does not have the capacity to administer or enforce them.
- 2) The RBES and CBES are mandatory, but while municipalities with building departments handle some aspects of review and inspection, there is no State agency or office designated to interpret, administer, and enforce them.
- 3) The Division of Fire Safety (DFS) in the Department of Public Safety is responsible for development, administration, and enforcement of building codes but does not currently have expertise or capacity to add administration or enforcement of energy codes in buildings.
- 4) Studies in recent years show compliance with the RBES at about 54 percent and CBES at about 87 percent, with both rates declining. Both codes are scheduled to become more stringent with the goal of "net-zero ready" by 2030.
- 5) In December 2022, the U.S. Department of Energy issued the Bipartisan Infrastructure Law: Resilient and Efficient Codes Implementation Funding Opportunity Announcement. The first \$45 million of a five-year \$225 million program is available in 2023. Vermont's increased code compliance plans should include contingencies for this potential funding."¹

The Act 47 Building Energy Codes Study Committee (BECSC) concurs with the Legislature's findings and identified a few additional findings, including the following:

- 1) Lack of a single state agency as the "Authority Having Jurisdiction" over energy codes is hampering energy code administration and compliance.
- 2) Lack of a statewide residential *building* code is also hindering sound building science-based construction and could serve as the "scaffolding" structure to not only provide a reference for proper building practices but would also be the logical place in which to embed RBES.

¹ <https://legislature.vermont.gov/Documents/2024/Docs/ACTS/ACT047/ACT047%20As%20Enacted.pdf>

Assessment of Problems and Underlying Issues

Vermont’s Residential Building Energy Standards (RBES) and Commercial Building Energy Standards (CBES) are minimum standards of energy efficiency for new and renovated buildings in the state. Though following these energy codes is mandatory, compliance has been decreasing over time. The lack of compliance with the energy codes is detrimental to Vermont builders and homeowners, and underscores larger problems, including the lack of an authority having jurisdiction (AHJ) in Vermont energy code administration.

The latest Vermont Department of Public Service (PSD)’s “2020 Vermont Single-Family Residential New Construction Baseline and Code Compliance Study”² conducted by NMR Group showed that 54% of residential buildings surveyed complied with the 2015 RBES, the standard set two code cycle updates ago. The “2021 Vermont Business Sector Market Characterization and Assessment Study”³ conducted by Cadmus showed 87% compliance with the 2015 Commercial Building Energy Standards (CBES). These rates of compliance are down from the previous Code Compliance Studies, which showed a 66% compliance rate with the 2011 RBES and 92% compliance with 2011 CBES.

The Vermont energy codes are mandated to be updated every three years, on a cycle corresponding with the issuance of a new national building energy standard by the International Energy Conservation Code (IECC). Each code update results in more stringent energy efficiency requirements, and therefore lower building energy use intensity (EUI, or MMBtu/sq. ft.), as Vermont strives to hit its target of net-zero ready construction for all newly constructed buildings by 2030.⁴ Figure 1 below illustrates the past recorded compliance rates with RBES in comparison to the EUI required by each standard set by RBES.

² <https://publicservice.vermont.gov/efficiency/evaluations-and-studies>

³ <https://publicservice.vermont.gov/efficiency/evaluations-and-studies>

⁴ https://publicservice.vermont.gov/sites/dps/files/documents/VT%20Energy%20Code%20Roadmap11-19_8_FINAL.pdf

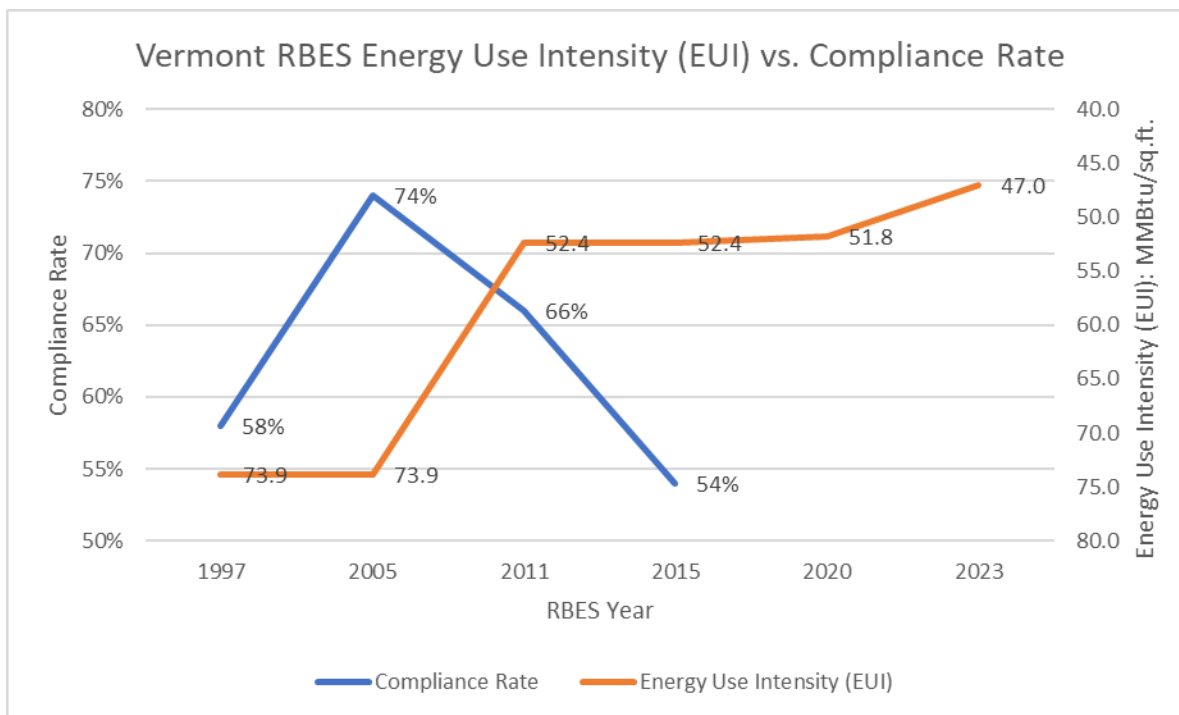


Figure 1. RBES code compliance in relation to Energy Use Intensity (EUI or MMBtu/sq. ft.) requirement improving over time.

Since 2015, the year which the latest Code Compliance Study was measured against, Vermont has adopted the more stringent 2020 RBES and is in the process of adopting an even stronger RBES (to go into effect in 2024). It is therefore likely that compliance with the more recent RBES is less than 50%. This means that Vermont is missing out on the opportunity to save homeowners money on their energy bills and reduce greenhouse gas emissions from its energy use. While new construction represents a relatively small part of Vermont’s total energy use, building energy codes are one way for the state to reduce Vermonters’ energy use, thereby lowering greenhouse gas emissions, and is one piece of the Vermont’s efforts to meet the Global Warming Solution Act (GWSA) requirements. The Vermont Energy Action Network (EAN) 2023 report shows that Vermont is lagging in meeting its energy and climate goals.⁵

The decrease in code compliance is indicative of a larger problem: the lack of statewide administrative authority, with the PSD developing and updating energy codes and the Division of Fire Safety (DFS) at the Department of Public Safety administering building safety codes for commercial, multifamily and rental buildings (but not one- to three-unit owner-occupied residences). At the same time, a handful of municipalities administer building and energy codes locally. But there is currently no statute or statewide mechanism that establishes statewide authority for code interpretation, project review, inspections, conflict resolution, variances, appeals, reporting, or enforcement for single-family residential owner-occupied homes. This lack of a central authority is problematic.

It is important to note that while we do have statewide *energy* codes (i.e., RBES and CBES), Vermont does *not* have a statewide residential *building* code. Most states have a residential building code, which establishes building standards that ensure safe and durable construction standards the health and safety

⁵<https://www.eanvt.org/annual-report/>

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of the building occupants in line with the International Residential Code (IRC).⁶ The lack of a residential building code not only could impact safe and durable construction practices, but also means that there is no statewide structure for administering energy codes to address issues like code interpretation, conflicts, variances, integration with building science issues and other issues. While this is out of scope for the charge given to the Act 47 Building Energy Code Study Committee (BECSC), the Committee suggests that it would be useful for the Legislature to consider investigating a residential building code that would address all construction elements, proper building science, and serve as the structure to house the energy codes.

The BECSC discussed the negative impact that the RBES compliance disparity has on builders. With only about half of buildings being built to 2015 RBES, builders who build to the energy code are at a disadvantage and feel that they are operating on an unlevel playing field. Additionally, the Committee discussed the concept that customers, given the option to adhere to RBES at slightly higher upfront cost, will often choose not to adhere to RBES, despite the potential for the building energy improvements to pay off over time. These issues directly negatively affect Vermonters.

There are a number of problems associated with the lack of awareness and compliance with energy codes. Lack of knowledge of how to comply with energy code – coupled with a lack of a residential building code – has resulted in a rising number of building failures and “sick” buildings. Current standard practice to comply with the energy codes typically includes more insulation and air sealing than a decade or two ago. This requires a more sophisticated understanding of moisture management and indoor air quality. A recent VTDigger article increased public awareness of this issue. The article detailed instances of houses with improper spray foam insulation in Vermont, leading to building failures, including moisture damage and mold.⁷



Figure 2. Remediation crew repairing relatively new Vermont home extensively damaged by moisture from indoor air that migrated into the walls (courtesy of Jim Bradley, Hayward Design Build).

⁶ <https://publicservice.vermont.gov/sites/dps/files/documents/50%20State%20comparison%20v.0904%20-%20S.Vitzhum.pdf>

⁷ <https://vtdigger.org/2023/05/22/i-wanted-to-cry-devastating-risks-of-spray-foam-insulation-hidden-from-vermont-homeowners/>

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The Vermont Attorney General (AG)'s Consumer Assistance Program (CAP) has been recording construction related complaints since 2012.⁸ They have found 85 deficit-related complaints, with 52 specifying damages totaling \$543,000, or an average of about \$10,000 each. Larger cases are typically pursued by insurers with non-disclosure agreements that don't report the damages, leaving these smaller cases reported to the AG's office. Since 2012 there have been 36 (42%) complaints related to HVAC/mechanical/plumbing, 26 (31%) carpentry/building envelope related complaints, and 23 (27%) solar related issues. Since 2012, complaints have also been increasing annually. Anecdotally, members of the Committee reported many more known cases. The small number of reported cases compared to anecdotes reflects the lack of authority in Vermont. There is no identified authority to report cases to as a consumer. Cases with larger losses typically go through insurance and/or court and are often settled with non-disclosure agreements. There is no designated authority in Vermont whose focus is to improve either building science or the building profession's competence.

The issue of building failures is directly related to another issue: a lack of participation in builder training. The Committee agreed that knowledge of building science is important for builders, particularly when complying with energy code. Yet the Committee acknowledged that there is a lack of participation in training which would enable builders to master building science principles and assist them in building to the energy code. Without energy code enforcement and lack of consumer demand for code compliant construction, many builders do not take the time to get trained. There is no statewide requirement for continuing builder education and training, which likely contributes to the problem.

The Committee also discussed a lack of documentation, as an issue negatively impacting Vermont energy code administration. This includes inconsistent filing of RBES certificates, which are intended to document compliance with RBES. In addition, there is no central database of building permits, and an inadequate tracking of investigation and resolution of structural and health and safety problems.

Vermont Energy Code Background

Energy Code History and Current Status

Vermont statute 30 V.S.A. § 51 established residential building energy standards.⁹ The statute was initially passed by the Vermont legislature in May 1997 and sets a minimum standard of energy efficiency for new and renovated residential buildings three stories or less.

RBES includes two levels of stringency: base code and stretch code. The base code is the standard level of energy efficiency that all new and renovated residential buildings three stories or less must meet. The stretch code is the required level of energy efficiency for all Act 250 projects and in Vermont towns that choose to implement a higher energy standard. The stretch code includes higher points requirement to achieve compliance.¹⁰

The statute requires that "appropriate revisions are made promptly after the issuance of updated standards for residential construction under the IECC." Updates to the energy code are designed to

⁸ Data provided by Sandra Vitzthum via email to EFG on 10/21/2023.

⁹ <https://legislature.vermont.gov/statutes/section/30/002/00051>

¹⁰ https://publicservice.vermont.gov/sites/dps/files/documents/2020-VT_Residential_Energy_Code_Handbook_v8.pdf

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provide reductions in energy use and emissions over the life of a building. RBES has been updated in 2006, 2011, 2015, and 2020, and has been updated again this year, with the latest RBES update going into effect in 2024 (target effective date of July 1, 2024).

CBES was enacted into law in 2006 by statute 30 V.S.A. § 53 and took effect January 1, 2007.¹¹ It is the energy code for all commercial buildings and residential building four stories or greater above grade in Vermont. Like RBES, CBES is required to be updated with appropriate revisions in line with the IECC or ASHRAE standard, whichever provides the greatest level of energy savings. CBES has been updated in 2011, 2015, and 2020, and has been updated again this year, with the latest CBES update going into effect in 2024 (target effective date of July 1, 2024).

Past Efforts

Addressing energy code administration and compliance has been an ongoing effort in Vermont for over a decade. In 2012, the PSD published the “Vermont Energy Code Compliance Report”, which intended to provide a roadmap to “achieve 90% compliance with Vermont’s then current commercial and residential building energy codes by February 1, 2017.”¹² The roadmap also included a plan to address how to implement RBES and CBES trainings and included suggestions for “unified energy code enforcement measures, as well as a process to evaluate and report annual rates of energy code compliance.”¹³ And in 2013, EFG worked on an update to that report, “Vermont Code Compliance Recent Initiatives 12-5-13”, which included a survey of initiatives intended to address energy code administration and compliance a decade ago.¹⁴

The Committee has noted some past and ongoing efforts to increase energy code compliance. Builder trainings, for example, are one way Vermont has tried to increase awareness of and ability to build to the energy code. Organizations that have offered building energy code trainings in the past (and some of which continue still) include Efficiency Vermont (EVT), Building Trade Association of Vermont (BTAVT), Vermont Builders and Remodelers Association (VBRA), and Association of General Contractors (AGC).

The Committee has also noted some additional efforts towards energy code administration outside of builder training efforts. For example, the DFS currently requires that a commercial building have a CBES certificate in order to issue a certificate of occupancy. Municipalities are also required by Act 89 (of 2013) to notify residents of the energy codes when issuing building permits and certificates of occupancy (CO) (for those towns that issue permits and COs). There are three main provisions in Act 89 relating to the energy code. One is that town officials must provide RBES and CBES information when someone applies for a building or zoning permit. Additionally, any building that requires a CO must be certified for CBES or RBES compliance before the CO is issued. Municipalities have the option of adopting the stretch code if and when the Commission of PSD adopts such a code.¹⁵

¹¹ <https://legislature.vermont.gov/statutes/section/30/002/00053>

¹² https://publicservice.vermont.gov/sites/dps/files/documents/Vermont_Energy_Code_Compliance_Plan%20FINAL.pdf

¹³ https://publicservice.vermont.gov/sites/dps/files/documents/Vermont_Energy_Code_Compliance_Plan%20FINAL.pdf

¹⁴ <https://publicservice.vermont.gov/efficiency/building-energy-standards/building-energy-code-study-committee>

¹⁵ Municipal Guide for Vermont Energy Codes and Above-Code Programs, Energy Code Assistance Center, September 2013.

Office of Professional Regulation (OPR) Builder Registry

The Office of Professional Regulation (OPR) builder registry is an effort closely related to energy codes and could be an important part of improving energy code administration. The builder registry, as required by Vermont law passed in 2022,¹⁶ was established in April 2023. OPR requires that contractors who perform residential construction for a homeowner where the estimated value of the contract is \$10,000 or more are required to register. OPR evaluates complaints related to builders on the registry to determine if a contractor has committed fraud but does not evaluate complaints for issues related to quality of work. Additionally, the builder registry allows contractors to list optional approved certifications, which provides consumers with a publicly available venue for searching for certified contractors. See the PSD website for a presentation given to the Committee by the Vermont Secretary of State's Office (SOS) and OPR on the contractor registry.¹⁷

Resilient and Efficient Codes Implementation Department of Energy (DOE) Grant

As an effort outside of this Committee, Energy Futures Group (EFG) assembled a team of Vermont energy code stakeholders to apply for funding through the Department of Energy (DOE)'s Bipartisan Infrastructure Law: Resilient and Efficient Codes Implementation Funding Opportunity Announcement (FOA): DE-FOA-0002813. The team includes the Vermont Secretary of State (SOS) and their Office of Professional Regulation (OPR); the International Code Council (ICC); Vermont's energy efficiency utilities (EEUs) including Efficiency Vermont (EVT), Burlington Electric Department (BED) and Vermont Gas Systems (VGS); and the Vermont Association of Planning and Development Agencies (VAPDA). In July 2023, the team was awarded \$1 million through this FOA.¹⁸

The overall goal for the project is to develop and implement an energy code administration system for Vermont that will result in significant and sustained improvement in energy code compliance. The intent of the funding available through this grant is to take what has been accomplished by this Committee and continue to further the efforts towards improved Vermont energy code administration. This will include building off this report to develop an energy code administration and funding plan, convening an advisory committee to provide input to the plan, advance Vermont's energy professionals workforce, and continue efforts towards education and training in support of Vermont's building energy professionals.

Legislative Directive

Governor Scott signed Act 47, also known as the "HOME Act", into law on June 5, 2023, to enable new opportunities for housing development. Section 23 of Act 47 named an "Energy Code Compliance; Study Committee" with a goal to "...to recommend strategies for increasing compliance

¹⁶ <https://legislature.vermont.gov/Documents/2022/Docs/ACTS/ACT182/ACT182%20As%20Enacted.pdf#page=19>

¹⁷

<https://publicservice.vermont.gov/sites/dps/files/documents/RBES%20CBES%20Committee%20Presentation.pdf>

¹⁸ <https://www.energy.gov/eere/buildings/articles/meet-btos-newest-projects-support-more-resilient-and-efficient-building>

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with the Residential Building Energy Standards (RBES) and Commercial Building Energy Standards (CBES).” Powers and duties included the following three charges (re-ordered for clarity):

1. Assess how the building energy codes interact with the fire and building safety codes.
2. Consider and recommend strategies to increase awareness of and compliance with the RBES and CBES, including the potential designation of the Division of Fire Safety (DFS) in the Department of Public Safety as the statewide authority having jurisdiction for administration, interpretation, and enforcement, in conjunction with DFS’ existing jurisdiction, over building codes; and
3. Evaluate current cost-effectiveness analyses for the RBES and the CBES, whether they include or should include nonenergy benefits such as public health benefits and the cost of carbon, and how that impacts the affordability of housing projects and provide recommendations.

The Building Energy Code Study Committee (BECSC) reviewed and discussed these charges and provides the following recommendations, organized by “charge”.

Charge 1: Assess how the building energy codes interact with the fire and building safety codes

Vermont currently has no statewide fire and building safety codes that cover all buildings. The Division of Fire Safety (DFS) has jurisdiction over public buildings, multifamily buildings greater than three units, and rental properties. They currently do not have any jurisdiction over owner-occupied buildings of one to three units.

The DFS has adopted and amended a number of nationally recognized safety standards to protect certain buildings and systems in those buildings. Covered codes¹⁹ include the following:

- Vermont Fire and Building Safety Code
- Vermont Electrical Safety Rules
- Vermont Plumbing Rules
- Vermont Elevator Safety Rules
- Vermont Access Rules (ADA)

DFS’ mission is “to protect the public and fire service through coordinated efforts in code enforcement, fire service training, public education, hazardous materials response, fire investigation and urban search and rescue. Thereby, maximizing life safety and property conservation and minimizing environmental impacts due to fire, natural disasters, and other emergencies in the State of Vermont.”²⁰ Their mission is accomplished by the following for the buildings over which they have jurisdiction:

- Code Review
- Permits

¹⁹ https://firesafety.vermont.gov/sites/firesafety/files/documents/dfs_codesheet_codes%20.pdf

²⁰ <https://firesafety.vermont.gov/>

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- Inspections
- Trade Licensing and Certifications
- Legislative Rule Making
- Emergency Response - Life Safety and Hazard Mitigation
- Investigation
- Fire Safety Education and Training
- Fire Service Training and Certifications

Vermont's building energy codes (RBES and CBES) interact with four state agencies in different ways but lack any unified authority among the agencies to oversee the energy codes. These agencies include the DFS, the Department of Public Service (PSD), the Secretary of State (SOS), and the Division of Historic Preservation (DHP).

As noted above, the DFS is focused primarily on public safety and not on energy. But they do check to ensure that CBES will be met for commercial new construction and rehabilitation projects and whether a CBES certificate is filed at the completion of a project. Given their building code authority over public and multifamily buildings, DFS does play an oversight and interpretation role over CBES, but not RBES.

The PSD is the primary agency with responsibility for RBES and CBES promulgation, certificate collection, and education. While they provide some energy code interpretation, the PSD has never been named as Vermont's authority having jurisdiction (AHJ) and so does not have the responsibility nor power to serve as the ultimate arbiter of energy code oversight and interpretation.

The SOS' Office of Professional Regulation (OPR) launched a "builder registry" in April 2023 that will likely display certifications earned by contractors who have taken energy code trainings but will not provide any indication of builder competence with building science or energy codes. The builder registry is just getting off the ground so has not yet had an opportunity to become fully developed or utilized to abate fraud and provide consumer protection in the building trades.

And finally, the Agency of Commerce and Community Development's Division of Historic Preservation (DHP) reviews and validates exemption requests to RBES and CBES if compliance with a particular provision would threaten, degrade, or destroy the historic form, fabric, or function of a building.

As shown in Figure 1, unlike in most other states where there is a single entity with authority over all building codes, energy codes, and workforce training, Vermont has an unorganized, dispersed arrangement with no single entity with authority over single-family homes.

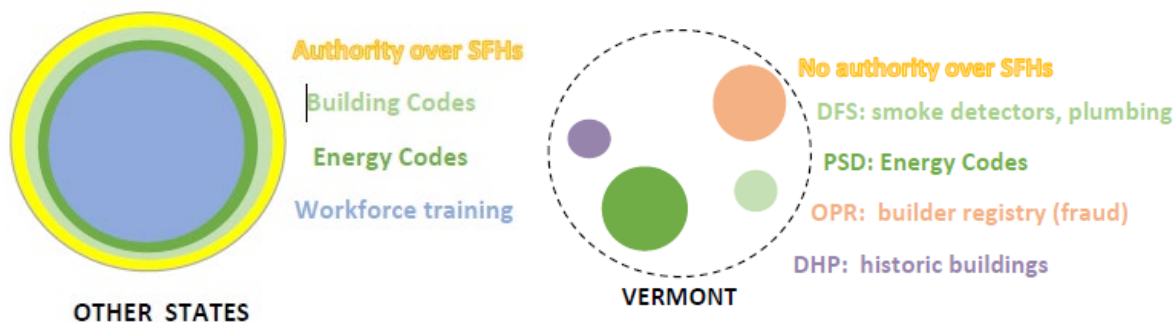


Figure 3. Authority over Single Family Homes (SFHs) as organized in most other states vs. Vermont's dispersed arrangement (courtesy of Sandra Vitzthum).

Charge 2: Recommended strategies to increase awareness of and compliance with RBES and CBES...

The Act 47 Committee provides several recommended strategies to increase awareness and compliance with RBES and CBES. These are organized under six overarching recommendations with more suggestions and details under each major recommendation:

- A. Make structural, statutory and policy changes to Vermont's energy code environment.
- B. Improve administration of the energy codes.
- C. Increase awareness that energy codes are mandatory.
- D. Improve workforce training and support.
- E. Increase support of and funding for above-base code projects.
- F. Coordinate with the U.S. DOE's grant to Energy Futures Group for the "Vermont Energy Code Administration Project" to develop and implement a phased longer-term plan.

A. Make structural, statutory and policy changes to Vermont's energy code environment.

The most significant structural change that can be made to positively impact Vermont's energy code environment would be to designate the DFS as the statewide authority having jurisdiction (AHJ) for administration, interpretation, and enforcement--in conjunction with DFS' existing jurisdiction--over building and energy codes for *all* building construction – public and private, commercial and residential. This would be a foundational change in Vermont's code environment but would provide the necessary structure that the state is currently lacking to have one agency in charge of all things building and energy codes.

How energy codes interact with building codes

Energy codes work best when they are integrated with building codes. When they are not combined, building science failures and occupant health issues can occur. For instance, with high R-value roof requirements, if the details are not followed due to lack of a building code, moisture trapping roof rot problems can shorten the life of a new roof. Or, without a building code to ensure safe combustion air standards for heating and hot water equipment, air-tightness standards in the energy code could cause serious appliance back drafting possibly leading to occupant sickness or even death.

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A first step in supporting Vermont's energy code environment would be to name the DFS as the AHJ for energy codes. In line with this new expanded role, the Committee suggests consideration of a new name: "Division of Fire *and Building Safety*". These structural changes will take time to implement, so it will be important to phase in the authority over time commensurate with available budgets and staffing.

A designated AHJ would play a critical role in overseeing all aspects of the energy codes including serving as a single point of contact for interpretation, conflict resolution, plan review, site visits, variance determination, addressing appeals, education and training of all building trades, enforcement, record-keeping, reporting, municipal support, promulgation of new codes, etc. The AHJ would provide a clear chain of authority and could coordinate with other state agencies, counties, municipalities, and the private sector for effective, efficient and a unified administration of the energy codes.

This new role for DFS would require time to plan, develop systems, staff up, and prepare for offering these services. It will be important to develop a reasonable timeline and to phase in these functions over time.

There will also be a cost to these changes that will be important to estimate, to identify funding sources, and to develop a plan to cover these costs. At the same time, there may be opportunities to be creative and innovative in approaching how to offer and cover the cost of some of these services. For instance, as the DFS does now for many of its other code support services, they could contract out technical services until such expertise can be brought in-house. There may also be opportunities for partnering with Vermont's Energy Efficiency Utilities (EEUs) to support increased energy code compliance in exchange for claiming resulting energy savings.

We recognize that it is beyond the charge of the Act 47 Committee to recommend that the state adopt a single-family residential building code. However, there was so much discussion regarding the recognition that this is a root cause of Vermont's slipping energy code compliance rates and emerging building science issues that the Committee felt the need to put forward the suggestion that a future study committee address the question of statewide adoption of a building code. We felt that a residential building code could serve as the "scaffolding" to support safe and sound building practices, the integration of building science, and energy efficiency in all new construction and renovations statewide.

As a separate step in supporting Vermont's energy code environment, recognizing the declining compliance rates with RBES with each subsequent adoption of a new more stringent energy code, the Committee recommends considering amending or postponing the energy code update cycle. Instead of spending the time to update the energy codes, those efforts may be better spent focusing on ways to close the compliance gap. Both RBES and CBES enabling legislation requires the PSD to regularly update these energy codes, so there would need to be legislation to change that update cycle.

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It is also important to recognize that Vermont's 2022 Comprehensive Energy Plan sets a target to achieve net-zero ready construction for all newly constructed buildings by 2030.²¹ If the energy code update cycle were postponed, that goal may not be met in terms of the energy code enacted, but as this report addresses, compliance with existing energy codes may in fact deliver more energy savings.

B. Improve administration of the energy codes.

Currently, there is no central data system for registering a residential construction project that reports what is being built, where, when, by who and whether it meets RBES. Commercial projects need to be reviewed by the DFS for building code compliance and usually involve a professional architect or engineer, so they are captured in the DFS database system, which is currently being updated and enhanced. But there are no central records of residential projects. For towns that issue permits and certificates of occupancy, they will keep records on file in the town office along with completed RBES and CBES certificates, but that does not always happen. Nor do all builders regularly file RBES and CBES certificates with the PSD which they are also supposed to do. And if they do, there is no publicly available database of filed energy code certificates for towns, lenders, lawyers, buyers, or anyone else to check without physically driving to the town and pulling the files. With no centralized filing system in place, it is very challenging to know what is happening with residential construction, how we can influence its compliance with energy codes, and whether compliance rates change over time.

Vermont needs to develop a construction certificate application process that captures basic building information, verifies that the design will meet the energy code at the beginning of the construction process to impact design decisions, and upon completion generates an RBES or CBES certificate. This should be able to be accomplished online, determined automatically by the system, and generate an energy code certificate that can be printed.

A centralized publicly accessible database could eliminate the current burden imposed by filing in town records, would aid in title searches and could provide valuable housing planning and reporting data. Such a system could also help reduce the need for active enforcement if lenders, closing attorneys, town zoning administrators and others had access to the information in the database. Systems like Hanover, New Hampshire's²² could serve as a model. The new DFS system for tracking commercial projects could also potentially be expanded to serve as the residential buildings repository. Alternatively, Vermont's Grand List²³ database should be examined as a possible repository if it could be expanded to serve the purpose of holding building project information and energy code compliance certificates. It already holds unique information on each Vermont property and could theoretically have fields added to show energy code compliance status. The Grand List is not currently available as an online accessible or searchable database. Copies of the Grand List database and reports can be obtained from the Department of Taxes. However, communication with the Department of Taxes indicates that in the future the Grand List will be put up online and available for public access.²⁴

²¹ https://publicservice.vermont.gov/sites/dps/files/documents/2022VermontComprehensiveEnergyPlan_0.pdf p. 180

²² <https://hanover.portal.iworq.net/HANOVER/new-permit/600/676>

²³ <https://tax.vermont.gov/tag/grand-list>

²⁴ Personal communication between Richard Faesy and Paul at TAX.RETT@vermont.gov on 10/20/23.

However, just having a central housing database available will not ensure that it is used. To get builders and designers to register their projects and then generate an energy code certificate at the end of the process, they will need to be strongly encouraged to participate. Options range from “carrots” to “sticks” including offering incentives to requiring participation.

To develop a central database of housing projects and energy code certificates may cost \$50,000 if added to an existing data system. It would also require extensive and ongoing training of builders, designers, and everyone else in the construction and housing industry to inform them of its presence and use which could be upwards of \$100,000 per year.²⁵

C. Increase awareness that energy codes are mandatory.

Regardless of the approaches to improve energy code administration, it will take an ongoing effort to ensure that every builder, designer, supplier, subcontractor, lender, agent, lawyer, and everyone else involved in Vermont construction, finance, and real estate are made aware of the presence and requirements of the energy codes. Several efforts are already in place to get the word out on energy codes including information in the Agency of Natural Resources’ Project Review sheets and their Permit Guidebook. As well, municipalities are required to provide RBES and CBES information when someone applies for a building permit. But more can always be done. Additional recommendations to increase energy code awareness include the following:

- a. Bill Stuffers - Develop bill stuffers that municipalities can include in their property tax and water bills and utilities can include in their electric, gas, water and sewer bills.
- b. Loan Closing Checklists - Ensure that the inclusion of energy code certificates is included on lenders’ and real estate attorneys’ mortgage loan closing checklists.
- c. Contractor Training Certification on Agency Websites - Include certifications demonstrating energy code training participation on the Office of Professional Regulation’s (OPR) Contractor Registry²⁶ and DFS’s Trades Licensing and Certification²⁷ webpages. Require Contractors (OPR) and Trades (DFS) to disclose at registration and renewal whether they have obtained training and continuing education in RBES/CBES appropriate to their trade.
- d. State, Regional and Municipal Websites - Use other existing state and municipal interfaces, such as zoning permit, septic design and sewer hookup websites, to emphasize RBES/CBES requirements.
- e. Contract Templates - Ask OPR to add information about the RBES/CBES requirements in any contract template they make available to contractors.
- f. Contractor Commitment - Ask Contractors (OPR) and Trades (DFS) to agree to follow RBES/CBES mandates both as a general requirement and in specifics appropriate to their trade as part of registration and renewal.

²⁵ Estimated costs are provided for many of the recommendations to provide some level of indication of financial impact. These costs are professional judgements from staff and Committee members.

²⁶ <https://sos.vermont.gov/residential-contractors/>

²⁷ <https://firesafety.vermont.gov/licensing>

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Costs for each of these measures would be relatively low running from perhaps \$1,000-5,000 to program a website or update a checklist with some RBES/CBES information. It may cost \$10,000 - \$20,000 to print and distribute bill stuffers and brochures. To maintain a concerted ongoing effort to increase energy code awareness may cost \$50,000 to \$100,000 annually.

D. Improve workforce training and support.

Regardless of how the energy codes are promoted and administered, there will always be a need to provide workforce training. Builders, designers, subcontractors, suppliers, and others will all need to understand energy code background and details and how to comply. Towards this end, the construction workforce will need to be trained and supported, including the following approaches:

- a. Training Materials - Develop accessible and readily available energy code and building science training for builders, designers, subcontractors, developers, building distributors and suppliers, planners, housers, municipalities, real estate agents, lenders, appraisers and other audiences with an interest in housing, construction, and finance in various formats and levels of detail.
- b. Trainings - Make training available regularly in various formats and venues to all of the audiences listed above. Make it clear that RBES and CBES are required energy codes and how comply with the codes. Coordinate energy code training through tech centers, efficiency utilities, professional organizations, trade groups, state agencies, regional organizations, municipalities, and the proposed Weatherization Training Center.
- c. Circuit Rider - Offer energy code and building science circuit rider support services including on site to assist in real-situation solutions and problem solving.
- d. Training Certification - Develop a certification to demonstrate energy code proficiency and coordinate with OPR's Contractor Registry to list the certification.
- e. Energy Consultants Support - Train, certify, and support third-party energy consultants (Building Performance Institute (BPI) certified energy auditors and consultants, Home Energy Rating System (HERS) raters, Weatherization Assistance Program (WAP) staff, HEAT Squad, etc.) to provide direct support to builders for both base-code and above-code services. Support for RBES and CBES projects could be provided using energy consultants to provide plan review and/or meeting prior to construction; assist builder with filing the permit or application and completing the owner/contractor agreement; do site inspections with blower-door test at critical junctures during construction; provide visits at close-in prior to insulation, at insulation prior to interior wall cladding, and at substantial completion; and assist the builder with closing out online application and producing the RBES or CBES certificate.
- f. Energy Code Assistance Center - Coordinate the existing Efficiency Vermont Energy Code Assistance Center (ECAC) with the DFS to offer code interpretation, project support, training, and specific energy code advice.
- g. DOE Grant Support - Utilize the U.S. Department of Energy (DOE) funded "Vermont Energy Code Administration Project" grant to Energy Futures Group (EFG) to support workforce training and support including hiring a full-circuit rider for two years and extensive training. See below for additional grant-supported activities.

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- h. Future Funding – While DOE’s “Vermont Energy Code Administration Project” grant will provide funding for 2024-2026, there will be additional funding needs during this time and beyond for workforce energy code training and support. Building out DFS’ energy code administration capabilities, hiring support staff, developing systems, supporting the ECAC, reaching other audiences with training, and promulgating the next versions of RBES and CBES are all necessary activities requiring funding. On-going funding needs to support these development, implementation, and dissemination activities could cost \$250,000 - \$500,000 per year. The U.S. DOE has numerous energy code support grants available to states that could be pursued.

E. Increase support of and funding for base-code and above-base code compliance.

Given the low energy code compliance rates for RBES (estimated to be less than 50% compliance as discussed above), and the lack of an existing infrastructure in place in Vermont to support increasing compliance, the Committee suggests leveraging the existing expertise and capacity of the EEU’s to support the building community to reverse this trend. While the EEU’s are not interested in being the “energy code police”, there are opportunities for them to support the construction industry and claim energy savings that can help meet their savings goals. They can do so by supporting the building community with technical assistance, training, offering incentives and other approaches as they do in other markets such as promoting weatherization and heat pumps. The PSD and Public Utilities Commission (PUC) will need to approve a framework and mechanism for measuring savings due to the impact of their support and then reward savings credit based on increased compliance rates. This can be a win-win arrangement that could both help increase RBES compliance and reward the EEU’s with “claimable savings” for their efforts for moving homes to code levels from sub-code baseline conditions.

While there is a significant amount of support required to bring most residential new construction to RBES, there is also a need to support building projects for both RBES and CBES to that go beyond the base code levels. Currently, the EEU’s offer incentives and claim savings for projects that are built better than code. This approach should continue, but in order to incentivize the EEU’s to support projects all the way up to the “net zero” level of performance, savings should be rewarded to the EEU’s from baseline code conditions and not from the code in place today which is the current approach.

Funding for EEU support could theoretically be covered through existing funding mechanisms, but would take away from other EEU activities and programs. Statewide EEU costs for offering these services may be in the vicinity of \$2 million per year.

F. Coordinate with EFG and the DOE grant in support of the Vermont Energy Code Administration Project.

Energy Futures Group (EFG) has been awarded a three-year grant to support the development of an energy code system in Vermont. This can be considered as a “phase 2” to the Act 47 BECSC and a follow-on to many of the recommendations coming out of this report. This \$1 million will fund energy code administration planning, builder training development, energy code trainings, a full-time circuit rider for

two years, municipality outreach and training sponsorships, development of the OPR’s Contractor Registry training certification, and support of HERS Raters.

Timeline of Recommendations

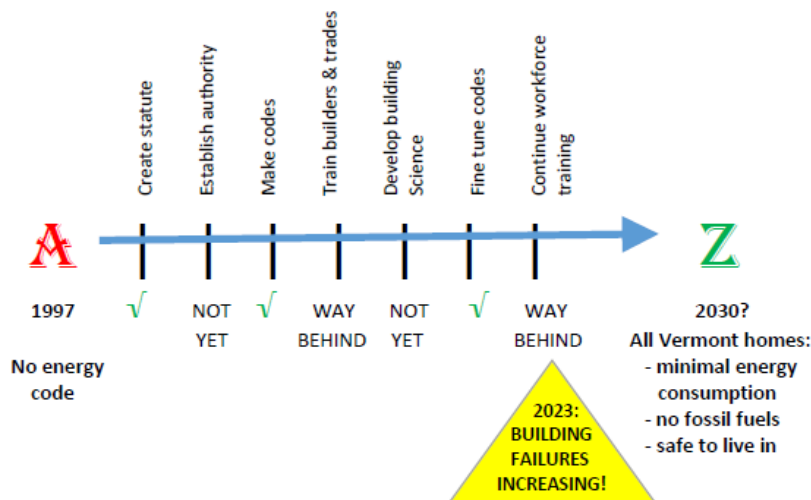


Figure 4. (Placeholder for a timeline of next steps. The Committee needs to weigh in on the appropriate graphic to use here.)

Charge 3: Evaluation of cost-effectiveness analysis for RBES and CBES.

The Committee formed a subcommittee to address the Legislature’s charge to “evaluate current cost-effectiveness analyses for the RBES and the CBES, whether they include or should include nonenergy benefits such as public health benefits and the cost of carbon, and how that impacts the affordability of housing projects and provide recommendations.” The subcommittee met three times and then presented its recommendations to the full Committee. The Committee’s recommendations follow:

1. Continue calculating energy code "cost effectiveness" as has been done historically from the consumers' perspective for a typical Vermont new home based on achieving positive cash flow assuming incremental costs (net of incentives that are only available to all customers statewide for the full three-plus-year code cycle, otherwise incentives should not be included) for energy code improvements from current code levels, financed in a 30-year mortgage for RBES (15 years for CBES) at the current construction costs and mortgage rate using average current Vermont fuel costs. Provide the following analyses:
 - a. Cash flow
 - b. Return on Investment (ROI)
 - c. Simple Payback
 - d. For informational purposes only but not to be used as the basis of determining “cost effectiveness” and as called for in the 2022 Vermont Comprehensive Energy Plan, include a calculation that adjusts the fuel savings benefits by the social cost of carbon, using a range of the social cost of carbon values based on regional studies referenced by the PUC and EEU

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2. Establish a new committee of energy, economic, and housing experts to research and address whether and how to best include the cost of carbon and non-energy benefits in building energy codes for new and existing buildings. This committee's charge should be:
 - a. Develop a methodology for determining an appropriate level of the cost of carbon and non-energy benefits for calculating societal cost effectiveness for building code evolution based on evolving research, PUC proceedings, and approved tools that include the social cost of carbon and health benefits.
 - b. Address the relationship of "cost of carbon" screening to "net zero capable" 2030 state goals for energy codes and the state's broader climate goals. Determine a methodology for defining "net zero capable" code standard.
 - c. Determine a policy framework for how state and/or utility incentives may be structured to subsidize all or major portions of "cost of carbon" measures with a focus on equity.
 - d. Identify opportunities through the DPU process and other approaches to cover the societal cost of carbon with incentives in order to shift the costs of the more efficient buildings from the owner to society since they will receive the benefits. Filling this last increment between the current energy code and "net zero ready" may be the role that EEU's play in the new construction market to provide the technical assistance and/or incentives in exchange for claiming the energy and carbon savings.
 - e. Additionally, analyze costs and savings from the new construction market "industry standard practice" (ISP) in addition to the legacy approach that analyzes costs and savings from the existing code level. Consider sample sizes and self-selection biases with the existing PSD market assessment studies. With available funding since it may be costly to administer, consider using a Delphi panel of experts to determine the current market ISP rather than relying on the PSD's market assessment studies that look back at earlier code versions.

Conclusion

The Act 47 BECS was pleased to tackle the Legislature's charge to address energy code issues and provide comprehensive, sensible, and impactful recommendations that can make a difference for more energy efficient, safer, and healthier homes that will result in a positive climate impact. The Committee is proud to have engaged in a respectful, informed, and productive series of meetings among a diversity of interests and perspectives. We are gratified to be able to carry forward the Vermont tradition of civil discourse, finding common ground, and making progress. We thank the Legislature for this opportunity and would be happy to follow up with any additional information, answers to any questions, or provide follow-up testimony.

Appendix

- a. Purpose/ logistics of Committee
 - i. Six meetings. The first meeting was convened on July 14, 2023, and the final official meeting shall be held on or before October 31, 2023. Meeting minutes posted on PSD website
- b. Committee members
 - i. List of committee members
 - ii. List of Act 47 committee member requirements
- c. Link to PSD website for: Committee meetings notes, pitches (could be a matrix of pitches), resources and research on other states, cost effectiveness PowerPoint
- d. Other strategies considered and not recommended by the committee
 - 1. Enforcement mechanisms
 - 2. Title impact
 - 3. Full builder licensure (credentials or competency testing)
 - 4. Existing certifications (LEED, NGBS, EnergyStar Home, Passive House)
 - 5. Certificate of Occupancy (implying state-required building permit)